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# Basic Crane Design and Stress Analysis

Appendix: Figures

Course No: M03-055

Credit: 3 PDH

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ROTATION SLEW, WORM GEAR DRIVE



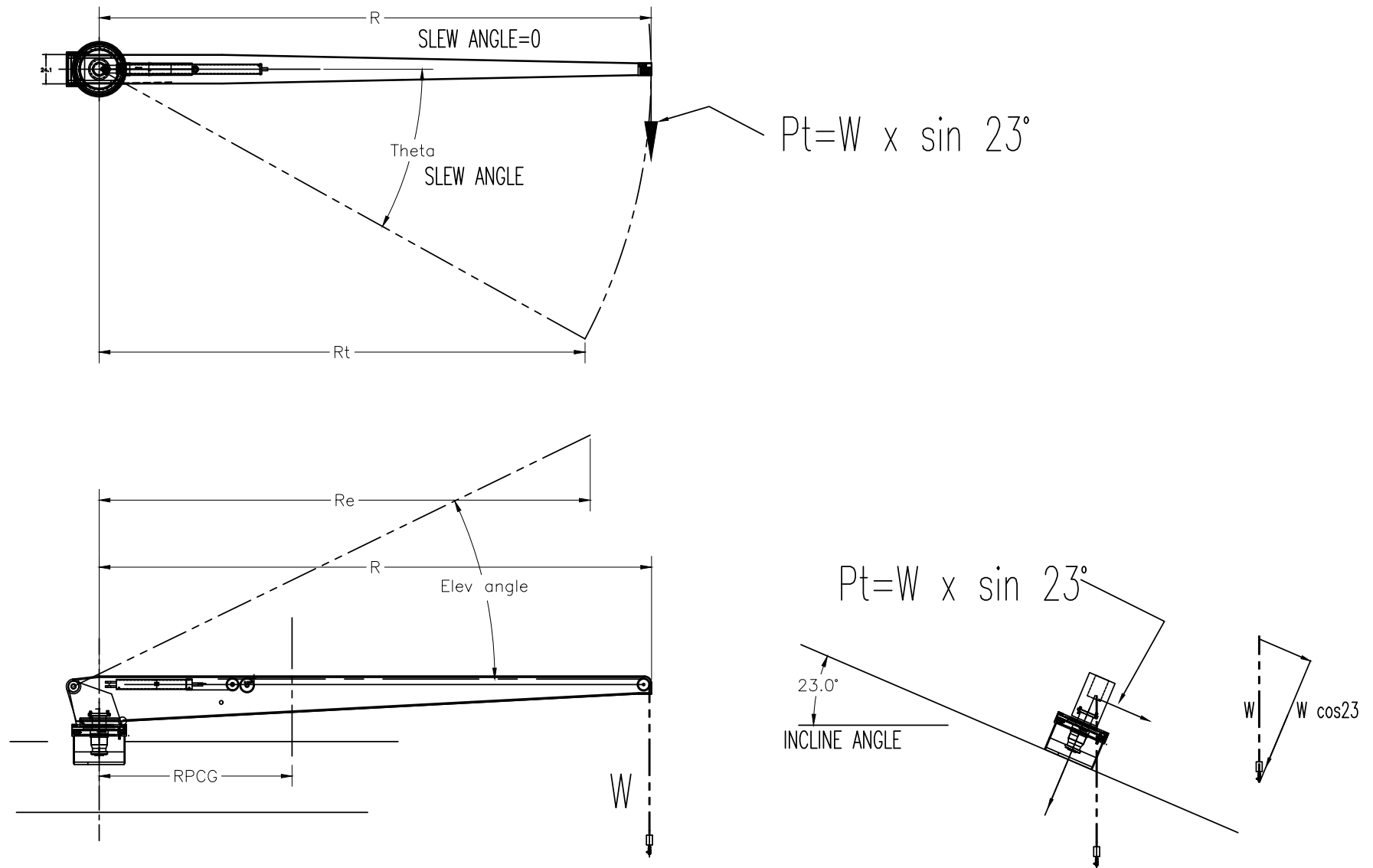


FIG M1.0—A CRANE ROTATIONAL TORQUE

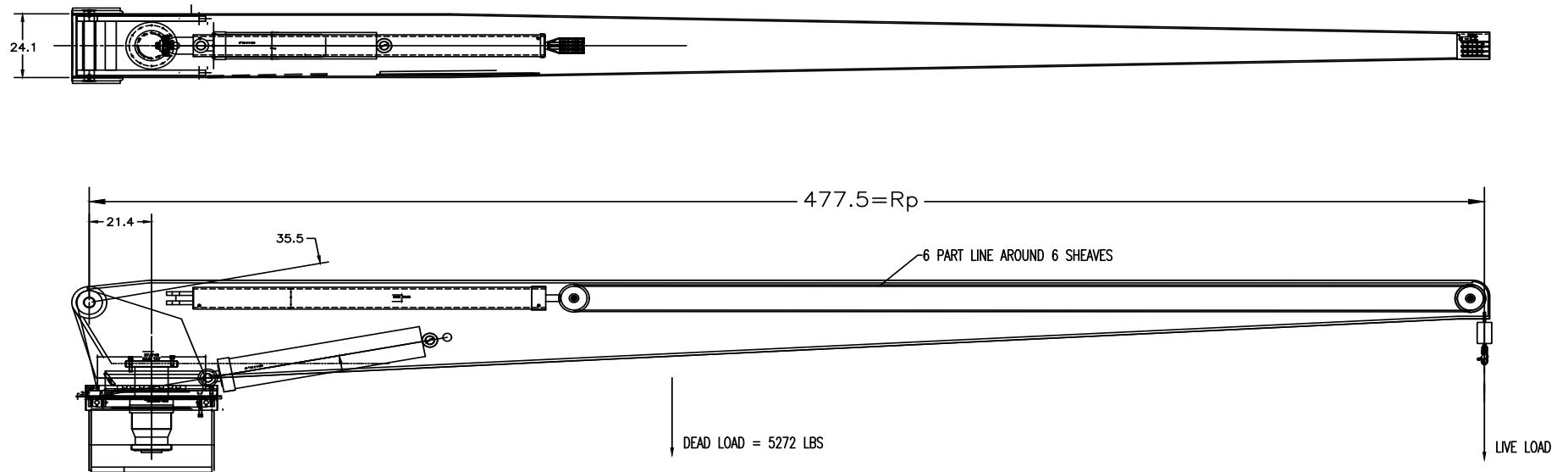
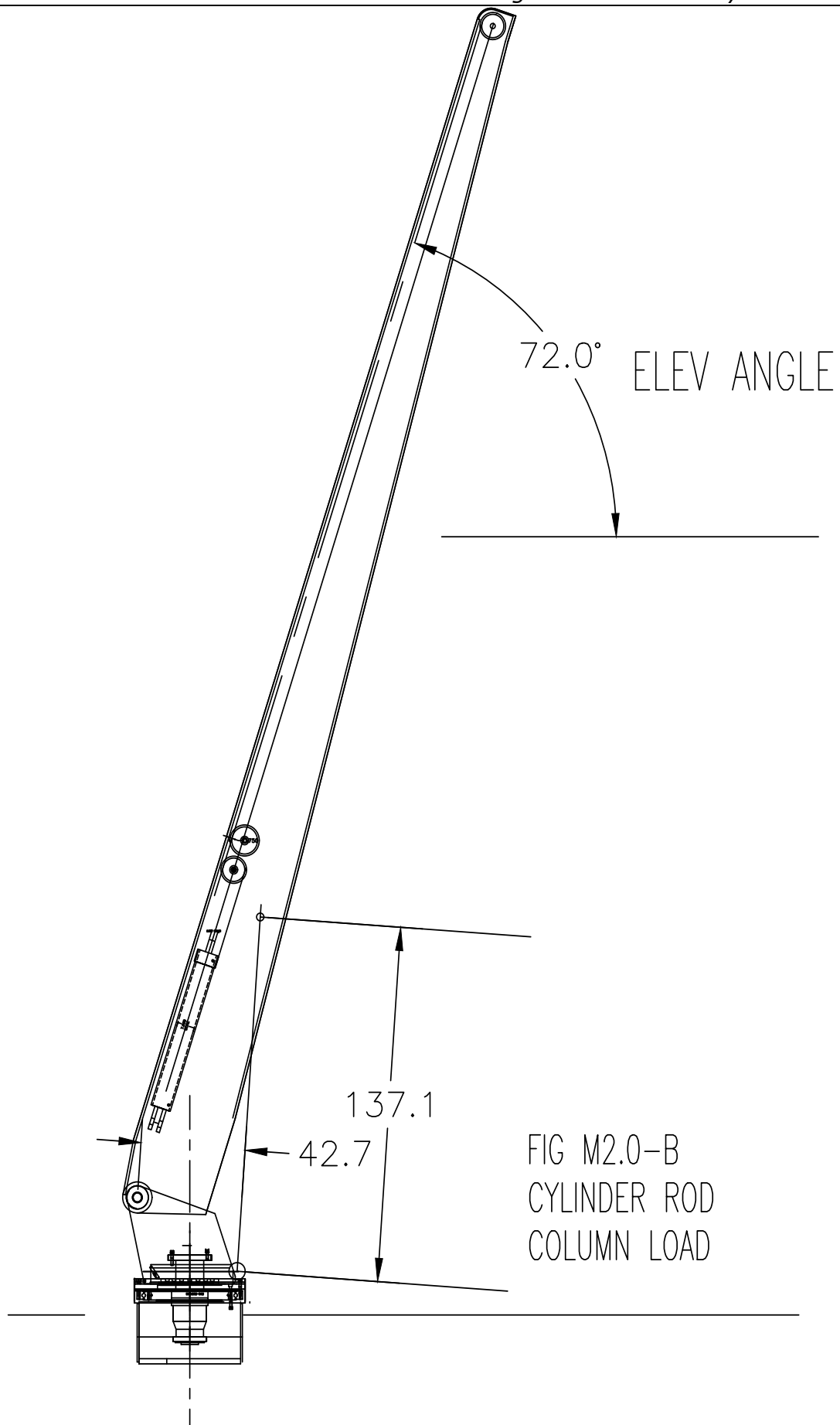
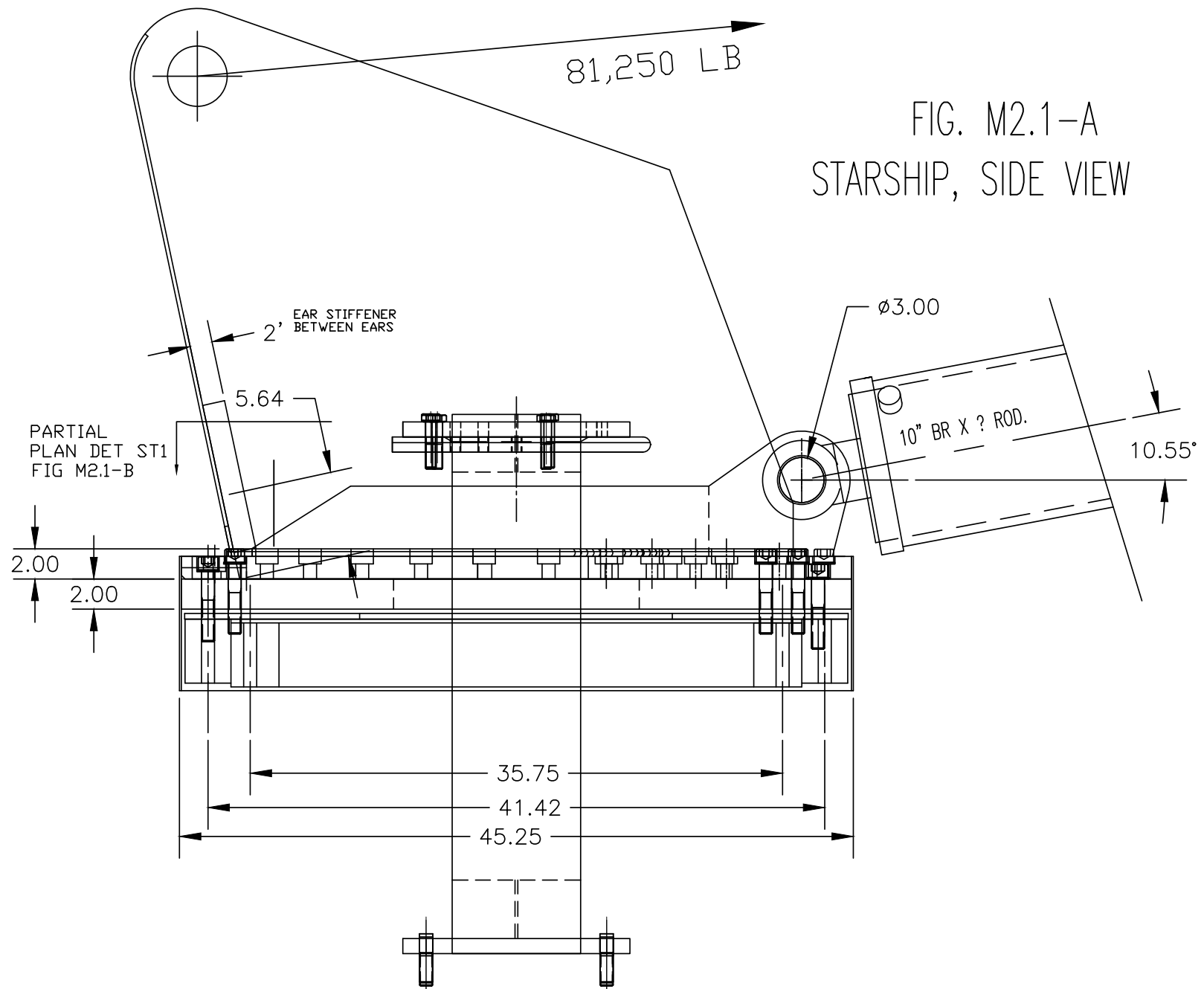


FIG M2.0—A BOOM and CABLE CYLINDER





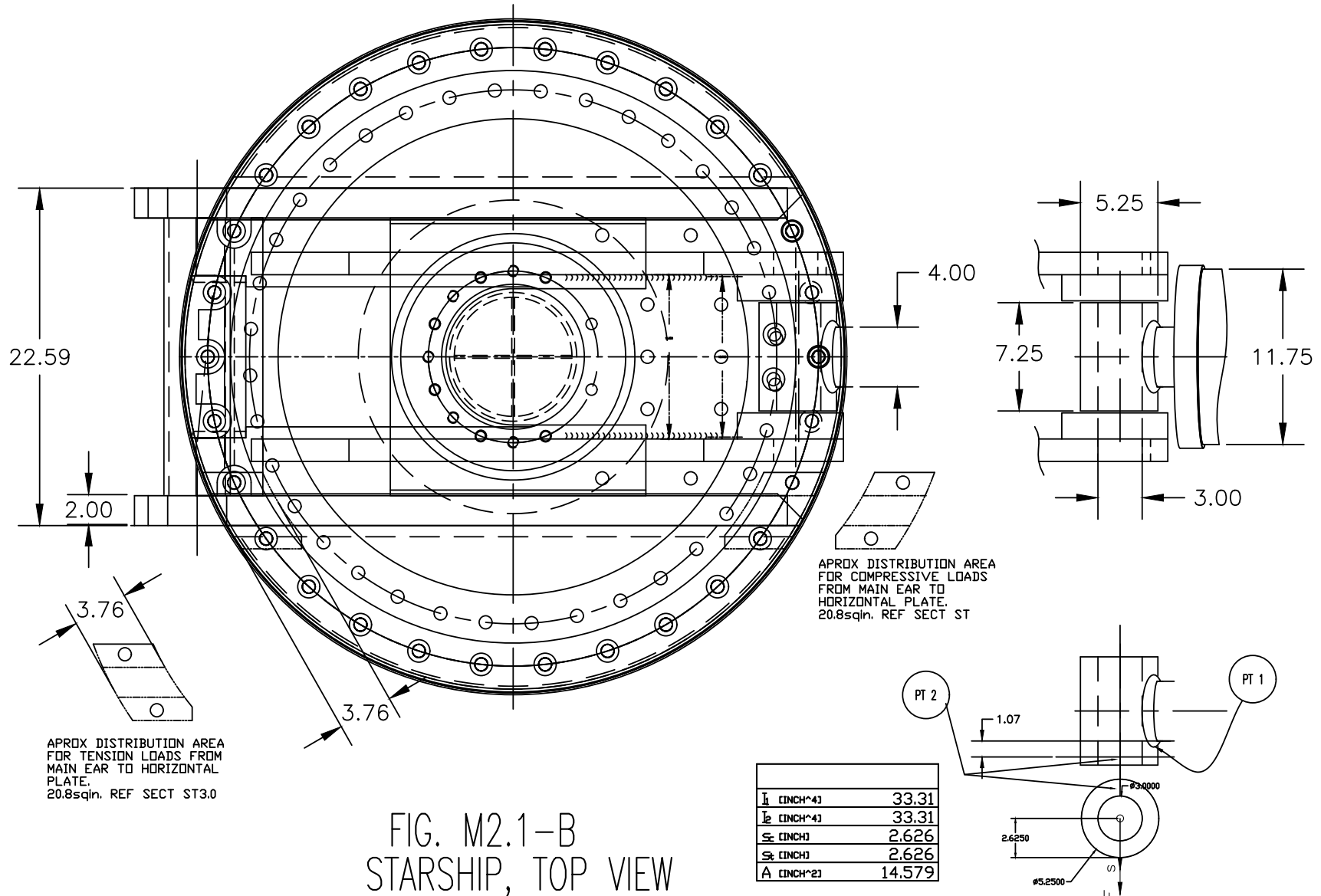


FIG M2.1—C  
BOOM CYLD TUBE ROD END

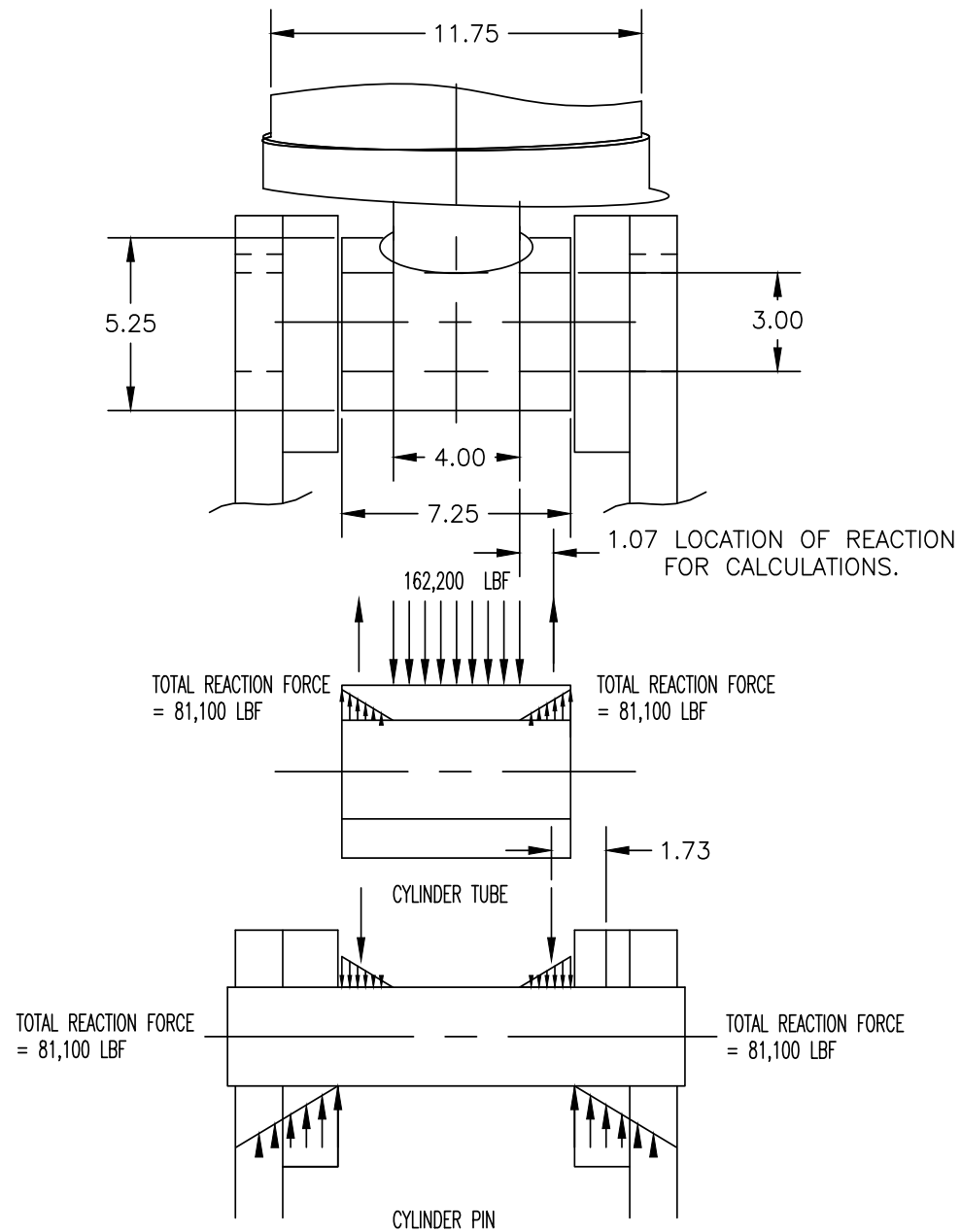


FIG M2.1—D  
BOOM CYLD CAP END & PIN

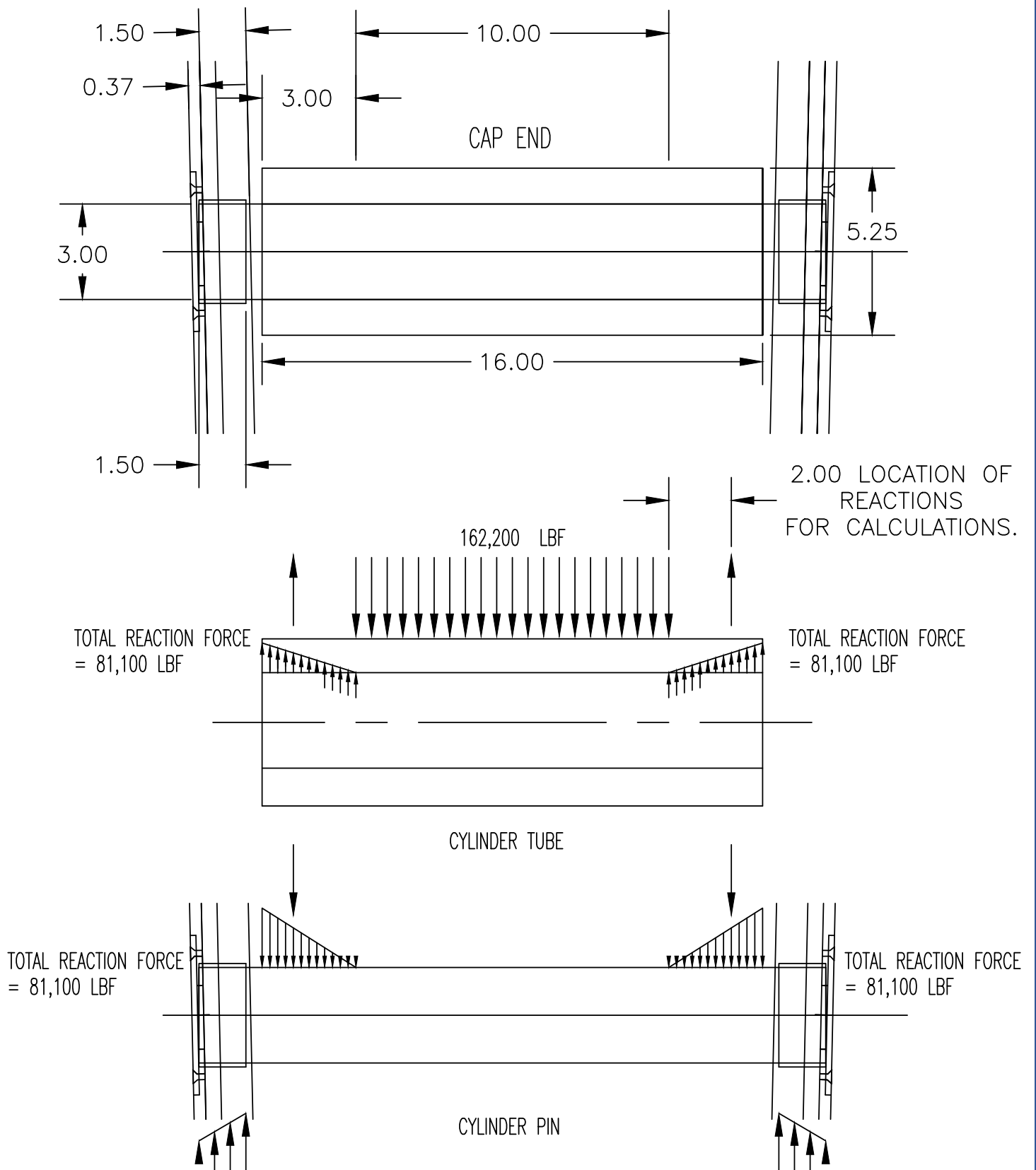
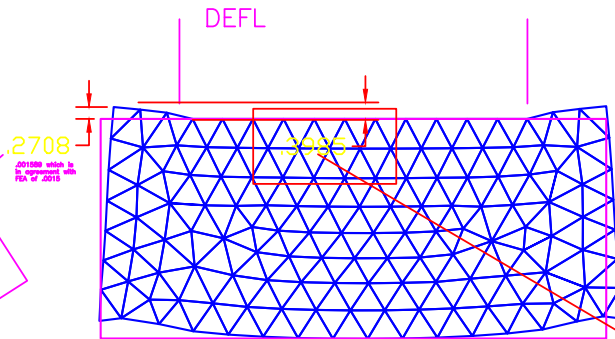


FIG M2.1—E  
BOOM CAP END & PIN

BOOM CYLD CAP END  
DEFL

|                  |
|------------------|
| MATERIAL:        |
| STEEL, SAE 1330  |
| THICKN.D = 2.55  |
| DEF.IN Z ENABLED |
| DISPLACEMENT     |
| [INCH]           |
| MAXX: 2.2985 E-3 |
| MAXY: 2.9614 E-3 |
| CDEFF: 170.42    |



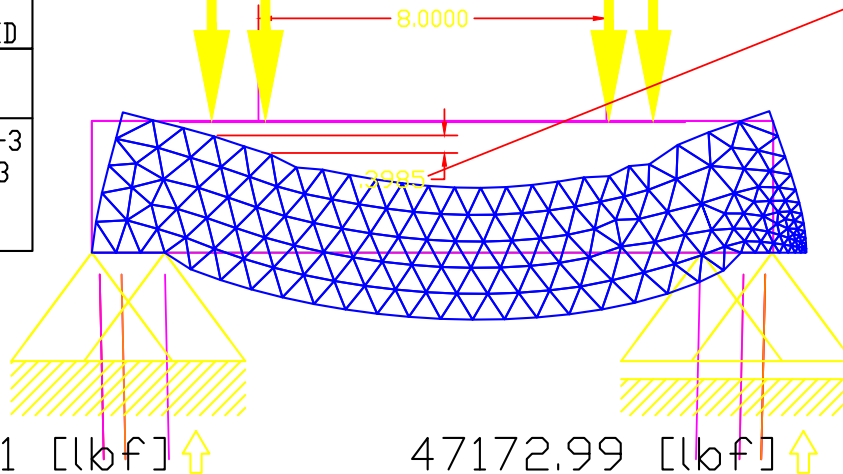
BOOM CYLD PIN CAP END  
DEFL

SOME AGREEMENT

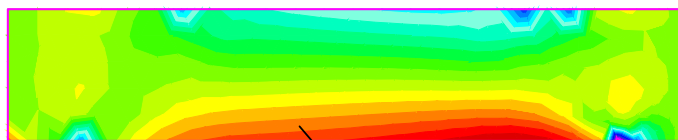
BOOM CYLD PIN CAP END  
DEFL

|                  |
|------------------|
| MATERIAL:        |
| STEEL, SAE 1330  |
| THICKN.D = 1.76  |
| DEF.IN Z ENABLED |
| DISPLACEMENT     |
| [INCH]           |
| MAXX: 5.4413 E-3 |
| MAXY: -9.087 E-3 |
| CDEFF: 170.00    |

30000 [lbf] 30000 [lbf]  
20000 [lbf] 20000 [lbf]

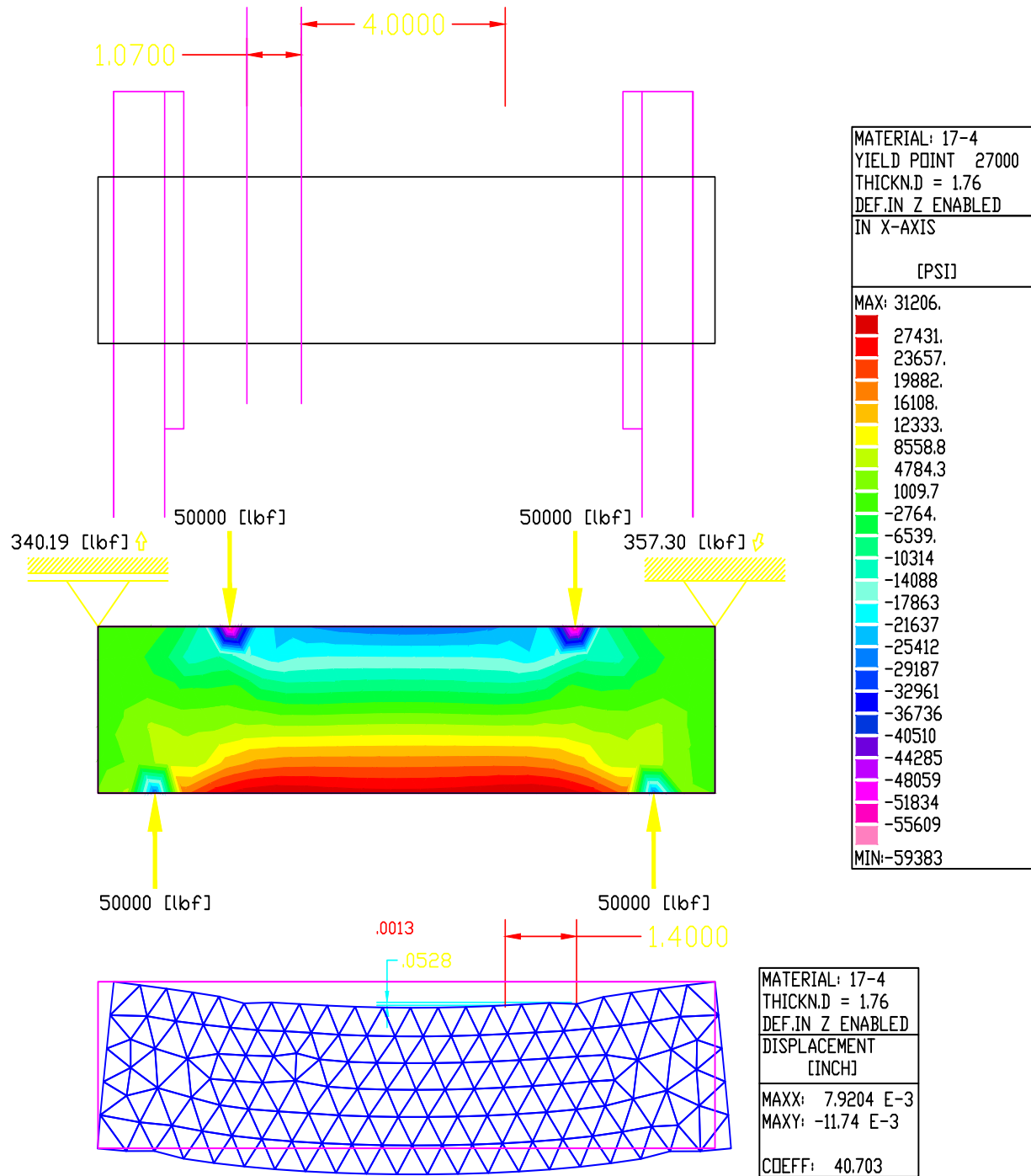


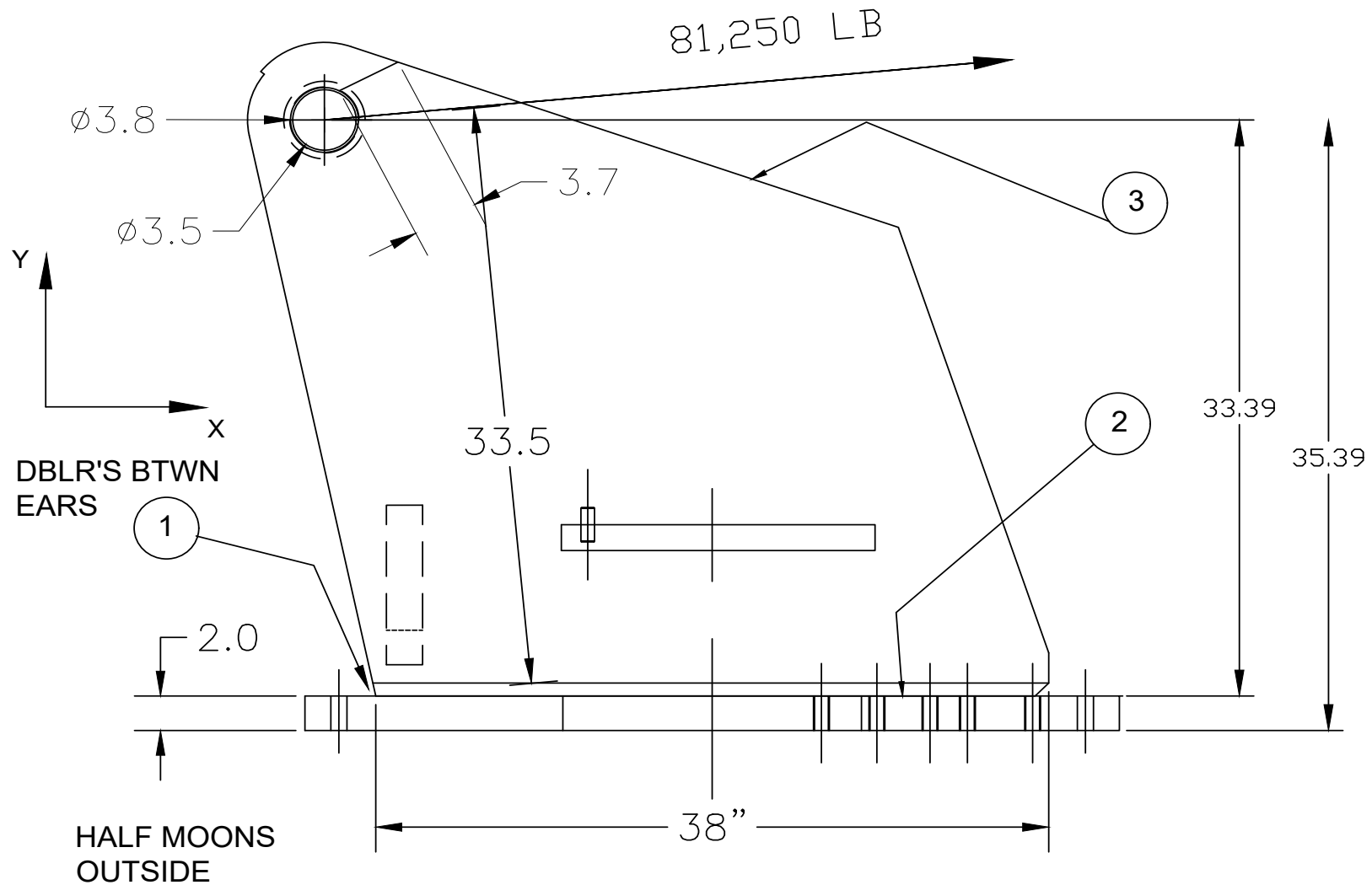
|                   |
|-------------------|
| MATERIAL:         |
| STEEL, SAE 1330   |
| YIELD POINT 27000 |
| THICKN.D = 1.76   |
| DEF.IN Z ENABLED  |
| IN X-AXIS         |
| [PSI]             |
| MAX: 21811.       |
| 18870.            |
| 15929.            |
| 12987.            |
| 10046.            |
| 7105.6            |
| 4164.5            |
| 1223.4            |
| -1717.            |
| -4658.            |
| -7599.            |
| -10541            |
| -13482            |
| -16423            |
| -19364            |
| -22305            |
| -25246            |
| -28187            |
| -31129            |
| -34070            |
| -37011            |
| -39952            |
| -42893            |
| -45834            |
| MIN:-48775        |



BOOM CYLD PIN CAP END  
STRESS

FIG M2.1—F  
BOOM PIN, ROD END

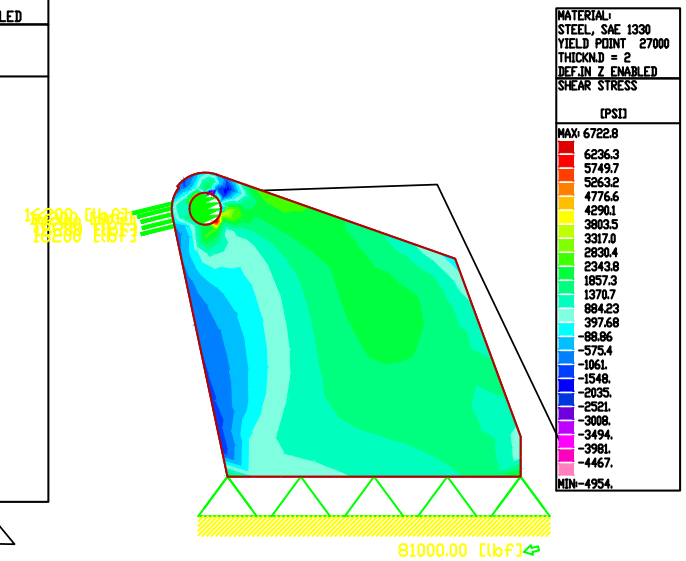
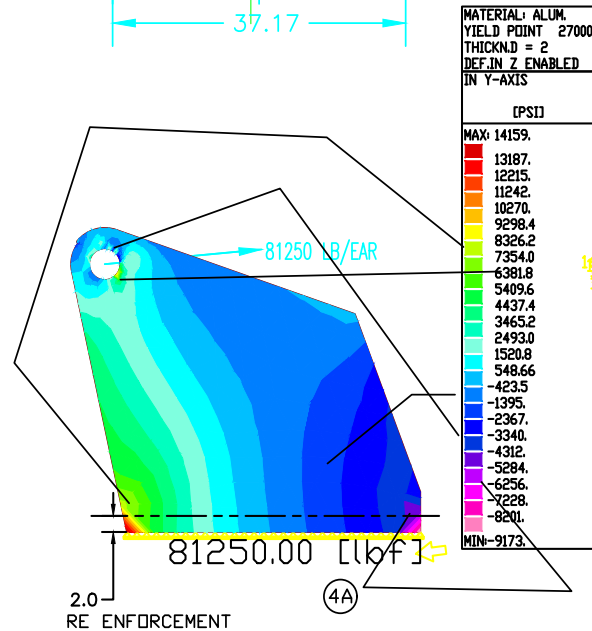
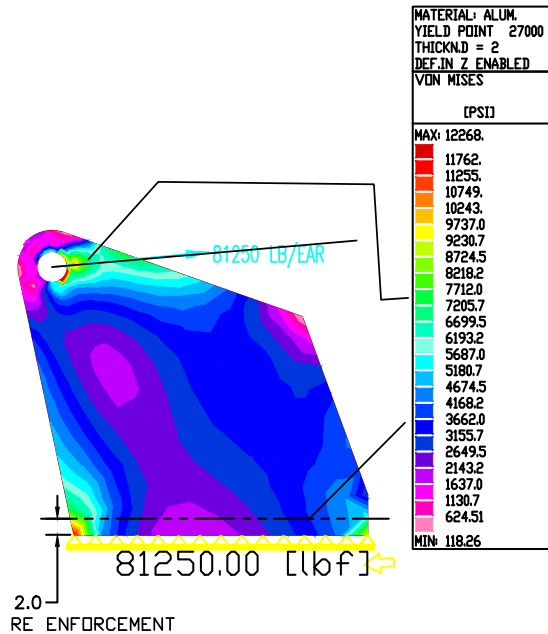
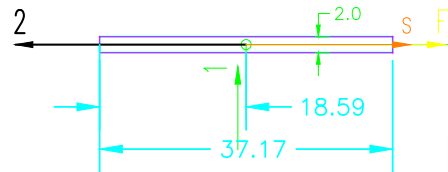


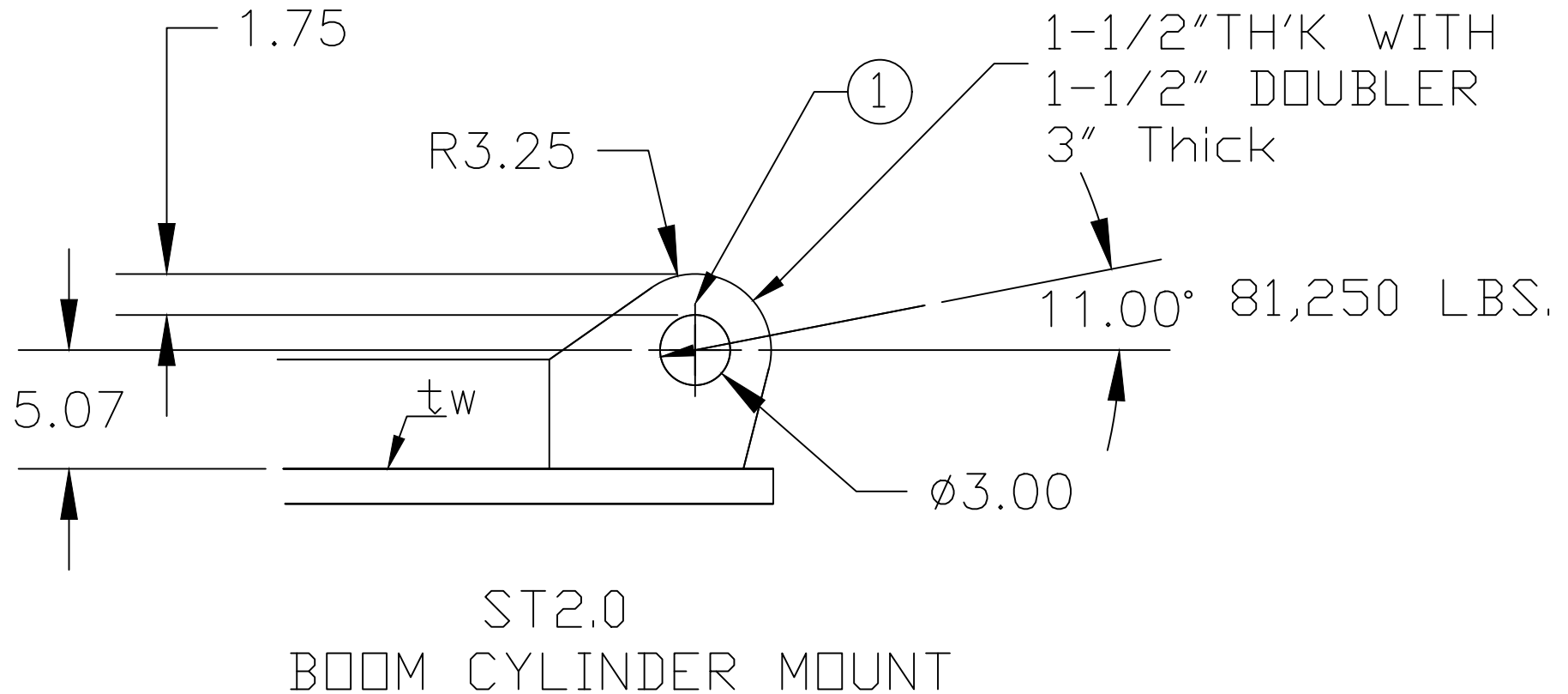


ST1.0  
STARSHIP, MAIN EAR (PROFILE)

|                            |        |
|----------------------------|--------|
| $I_1$ [INCH <sup>4</sup> ] | 8562   |
| $I_2$ [INCH <sup>4</sup> ] | 24.78  |
| $S_x$ [INCH]               | 18.588 |
| $S_y$ [INCH]               | 18.588 |
| $A$ [INCH <sup>2</sup> ]   | 74.34  |

FIG ST1.0-A  
STARSHIP MAIN EARS





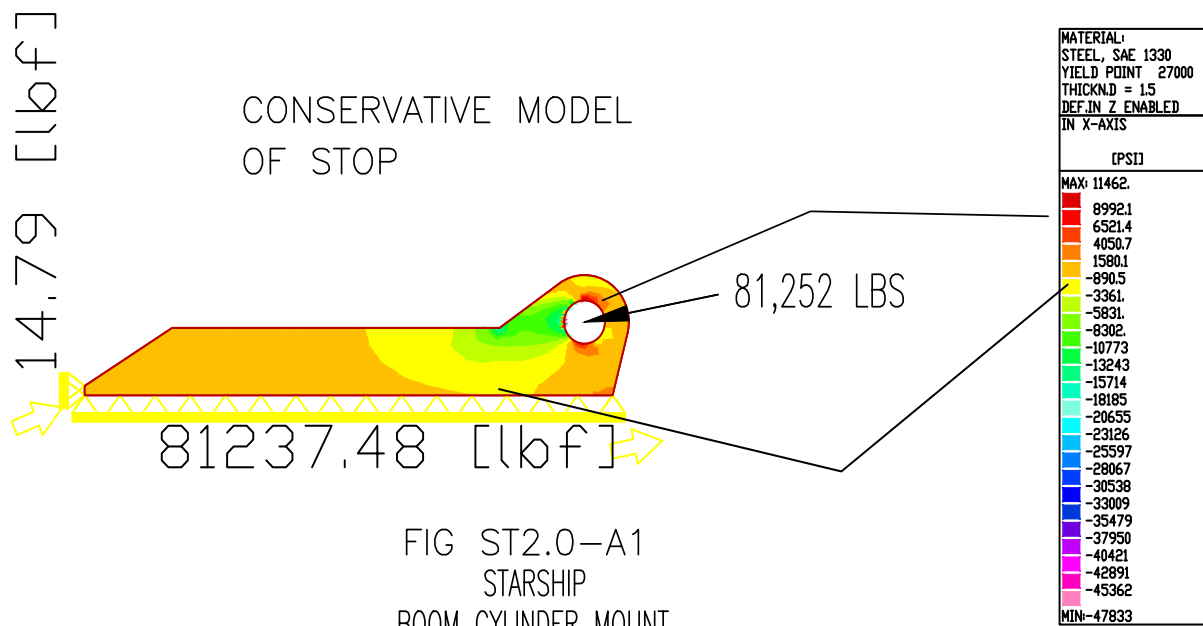
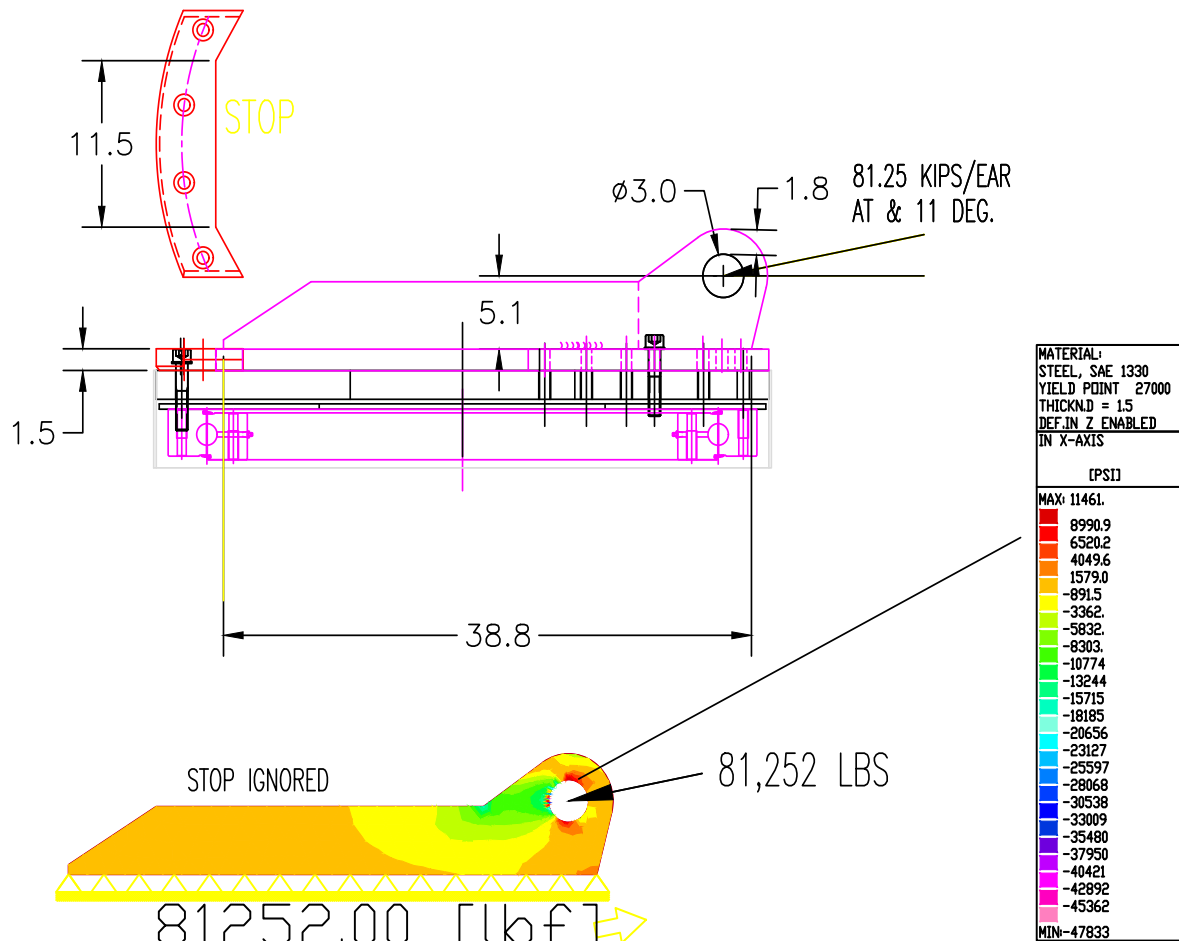
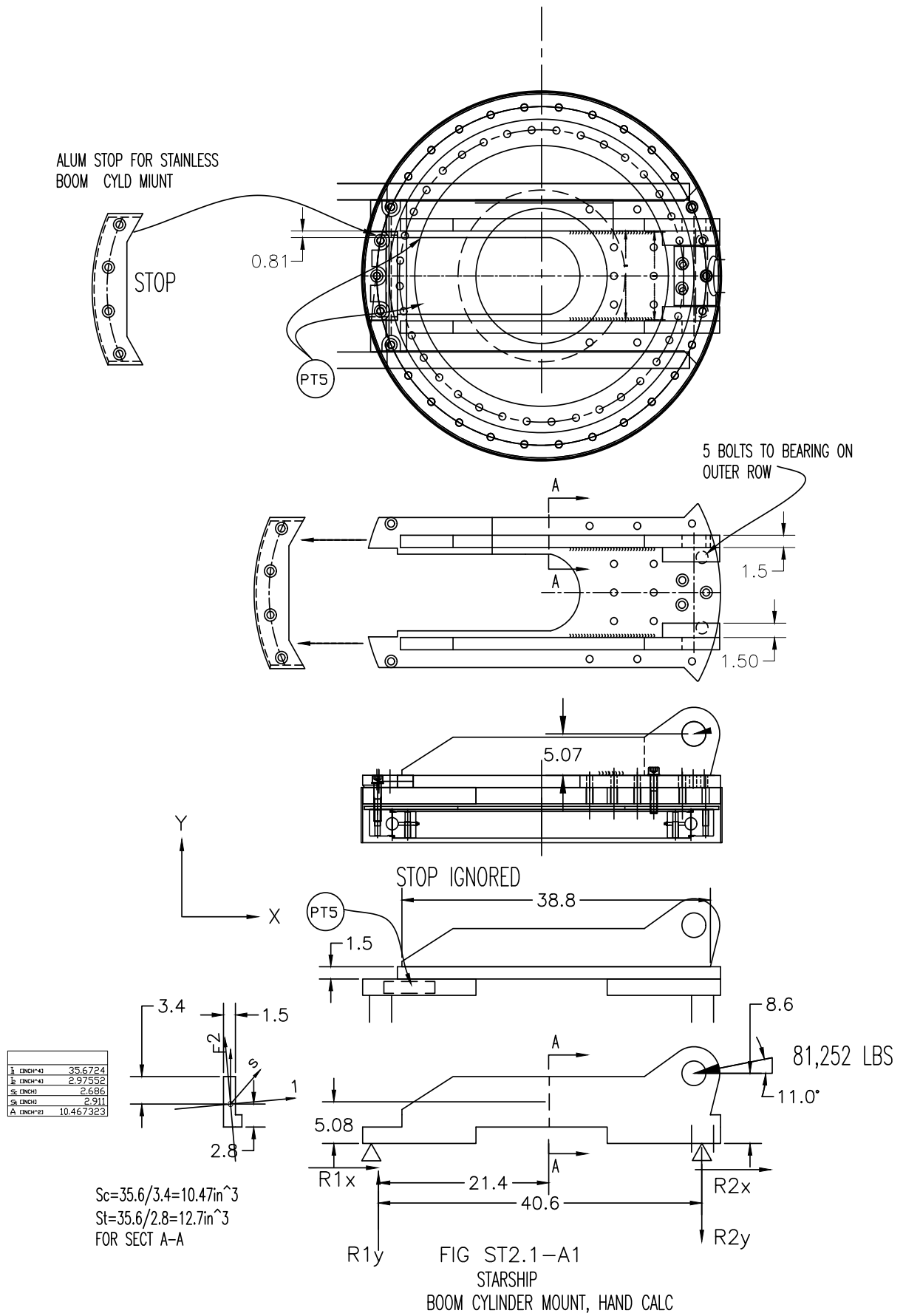


FIG ST2.0-A1  
STARSHIP  
BOOM CYLINDER MOUNT  
(Near pin hole only)



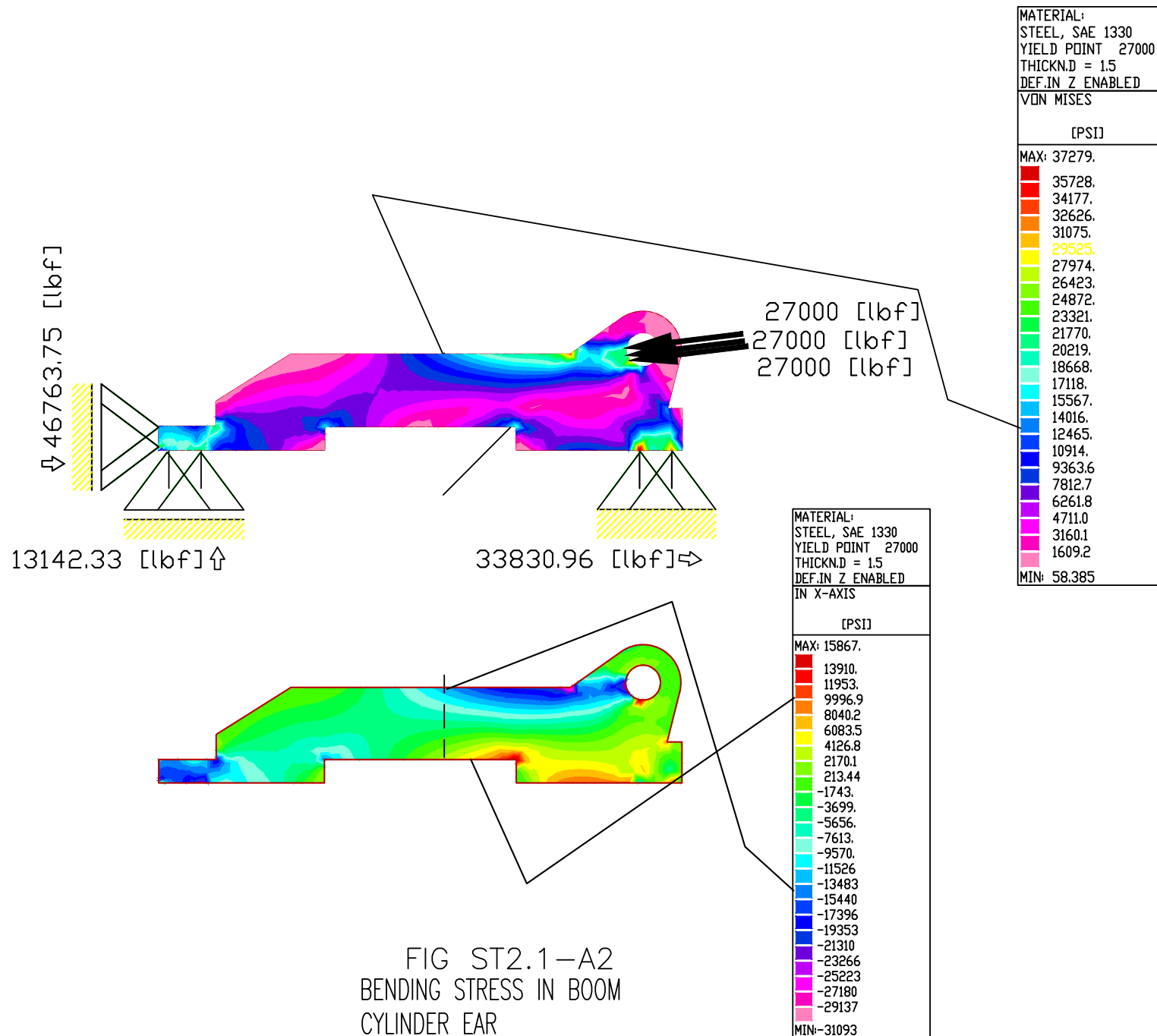


FIG ST2.1-A2  
BENDING STRESS IN BOOM  
CYLINDER EAR

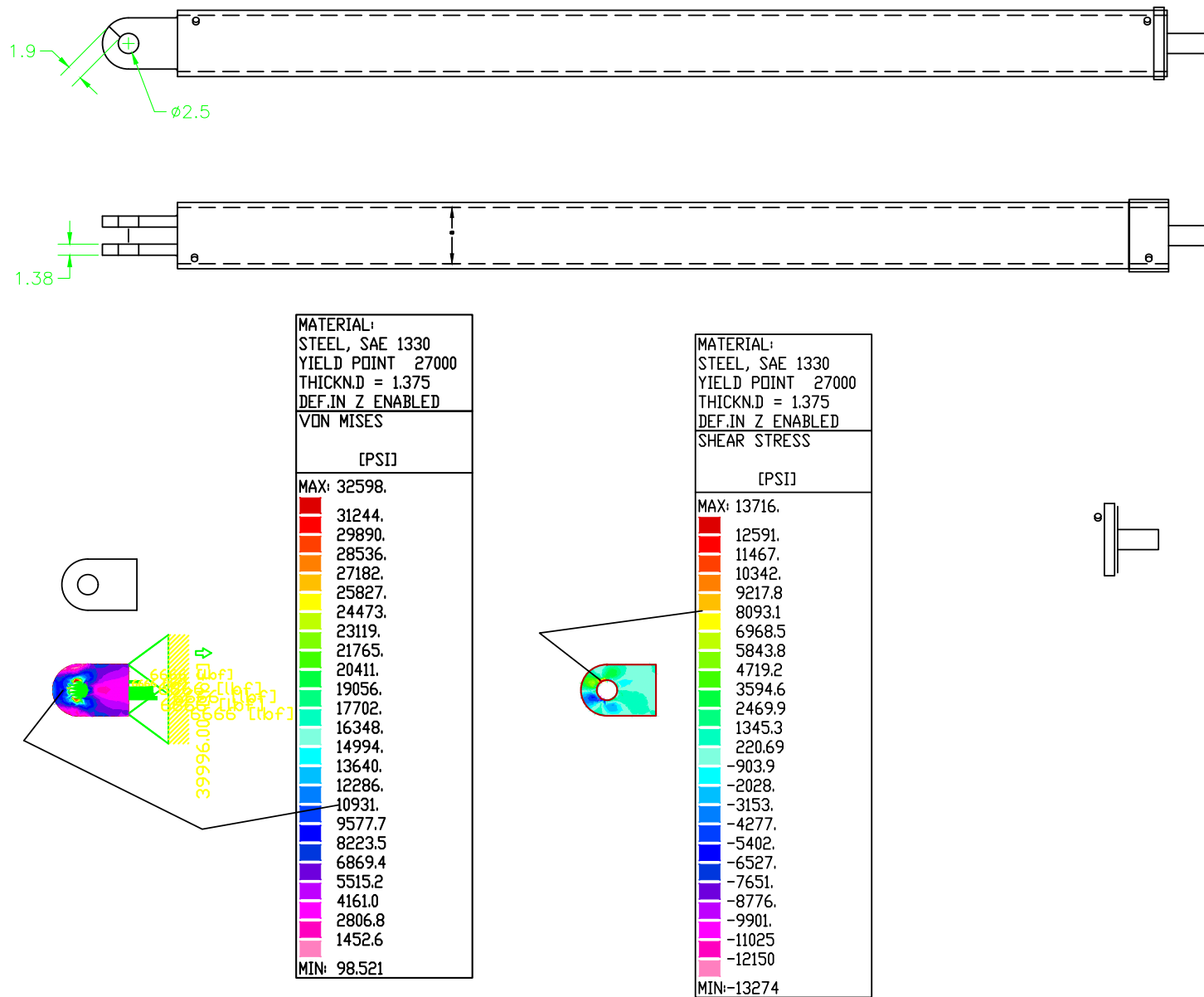


FIG M3.2–A CABLE CYLINDER

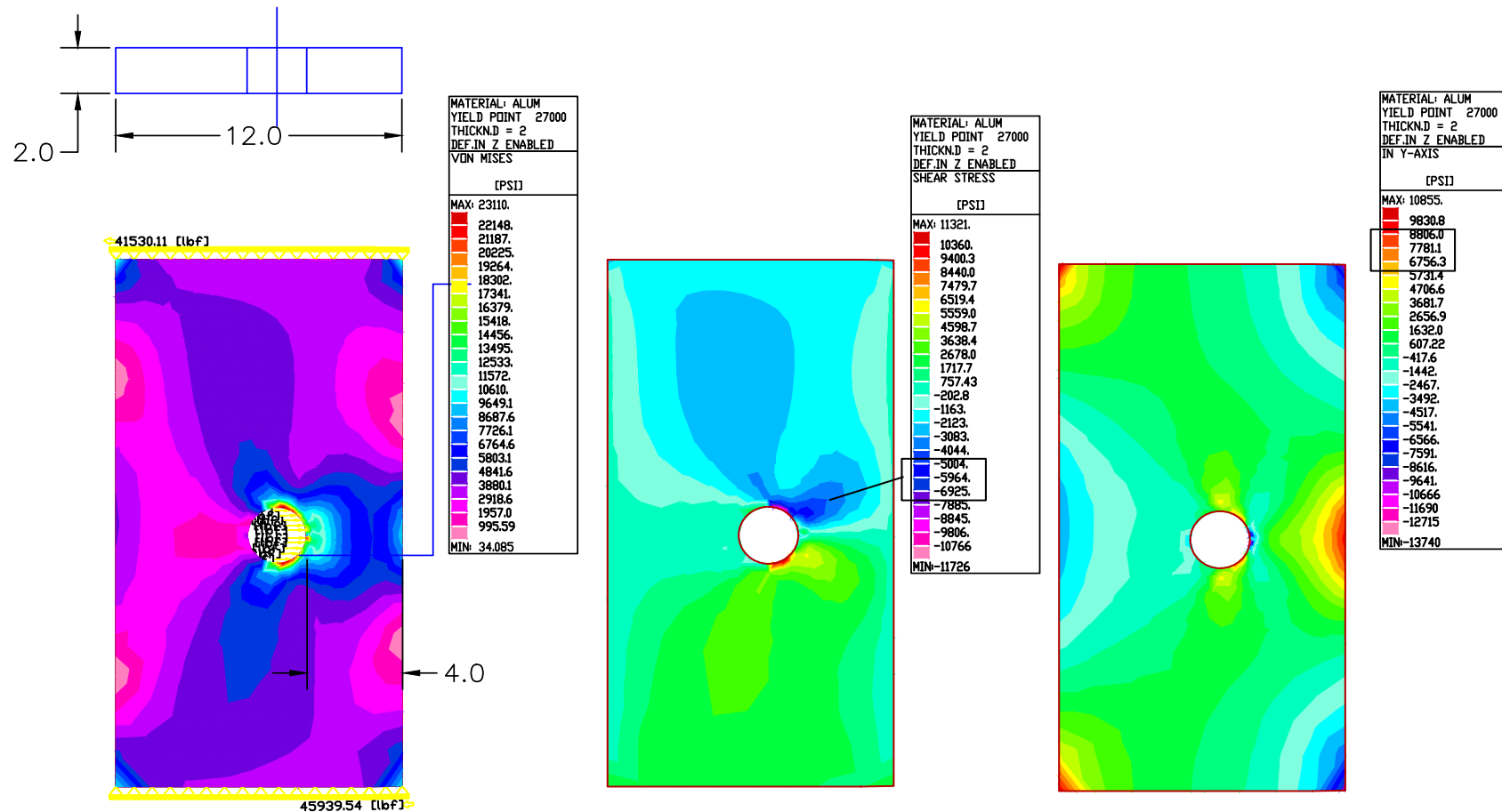
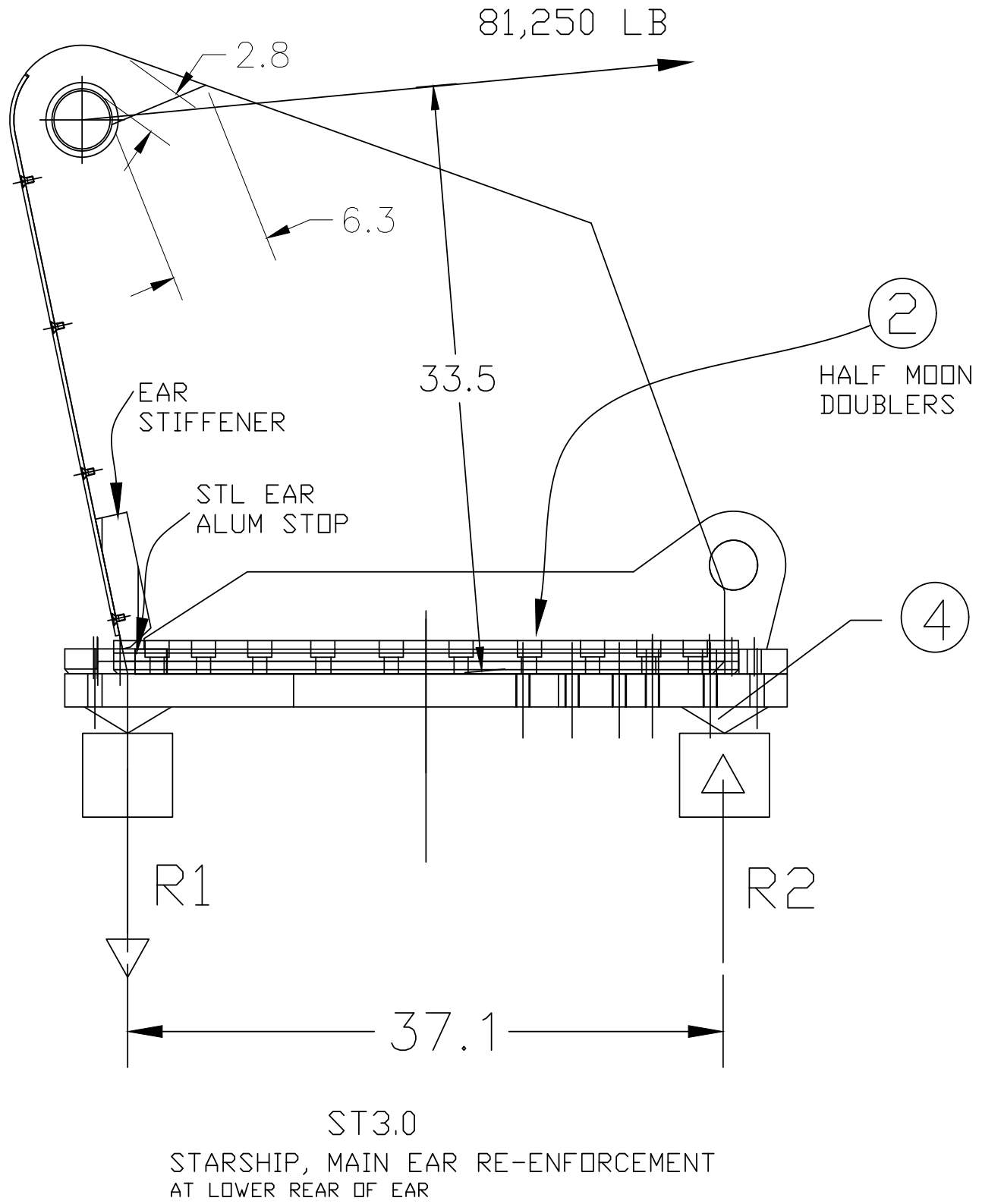


FIG M3.2-B  
CABLE CYLINDER MOUNT



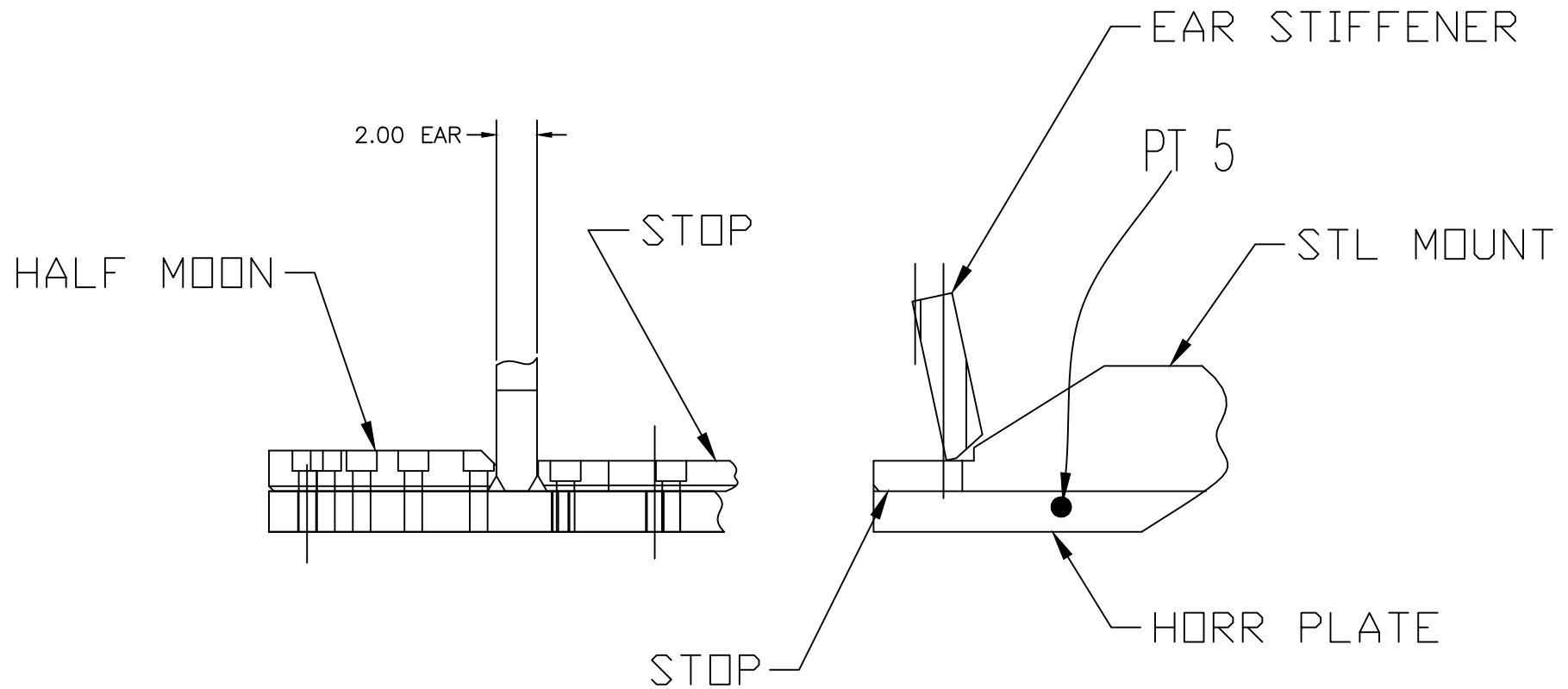
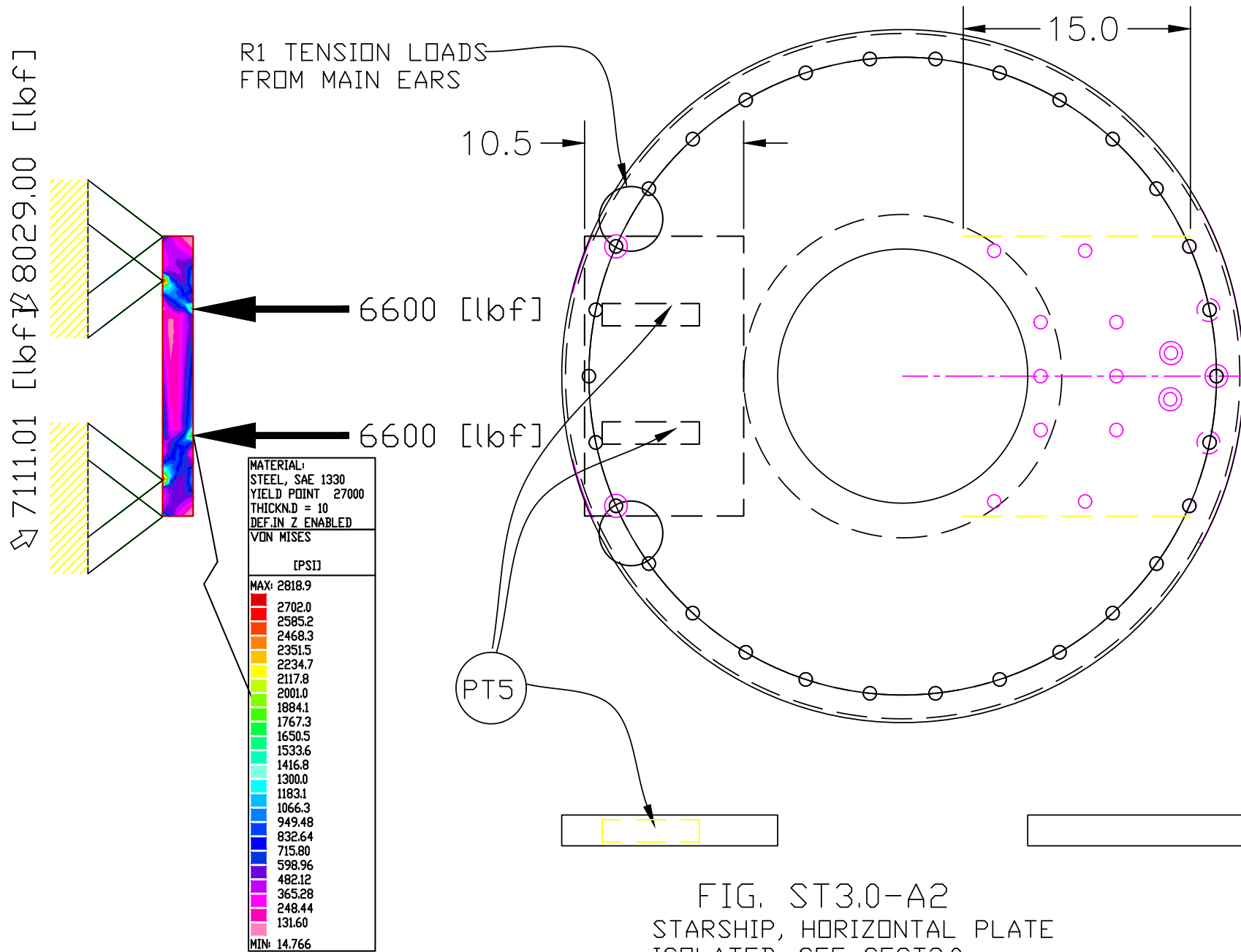


FIG. ST3.0-A1  
STARSHIP MAIN HORIZONTAL PLATE &  
STARSHIP REINFORCEMENT DOUBLERS



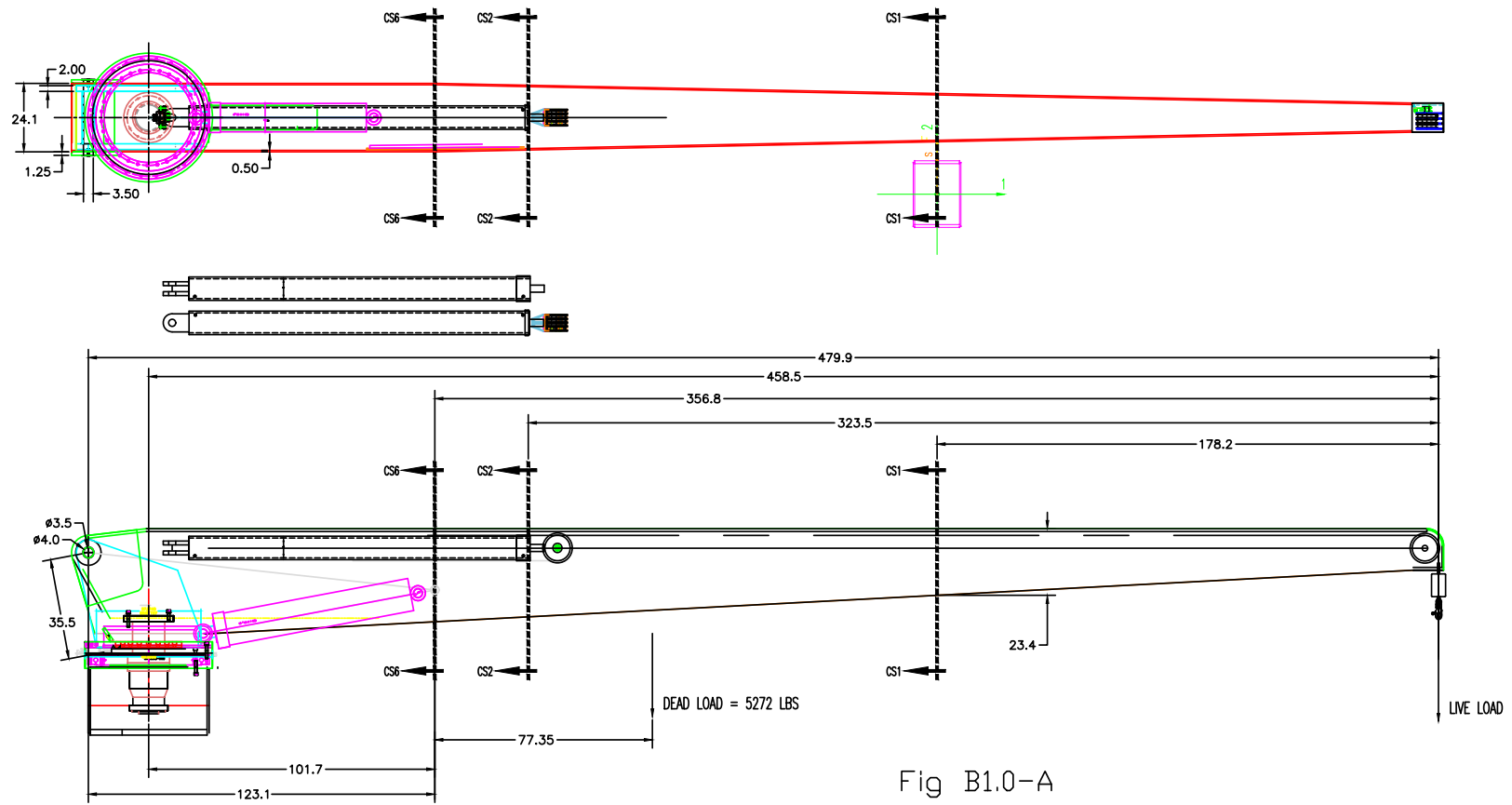


Fig B1.0-A  
BOOM CROSS SECTION LOCATIONS

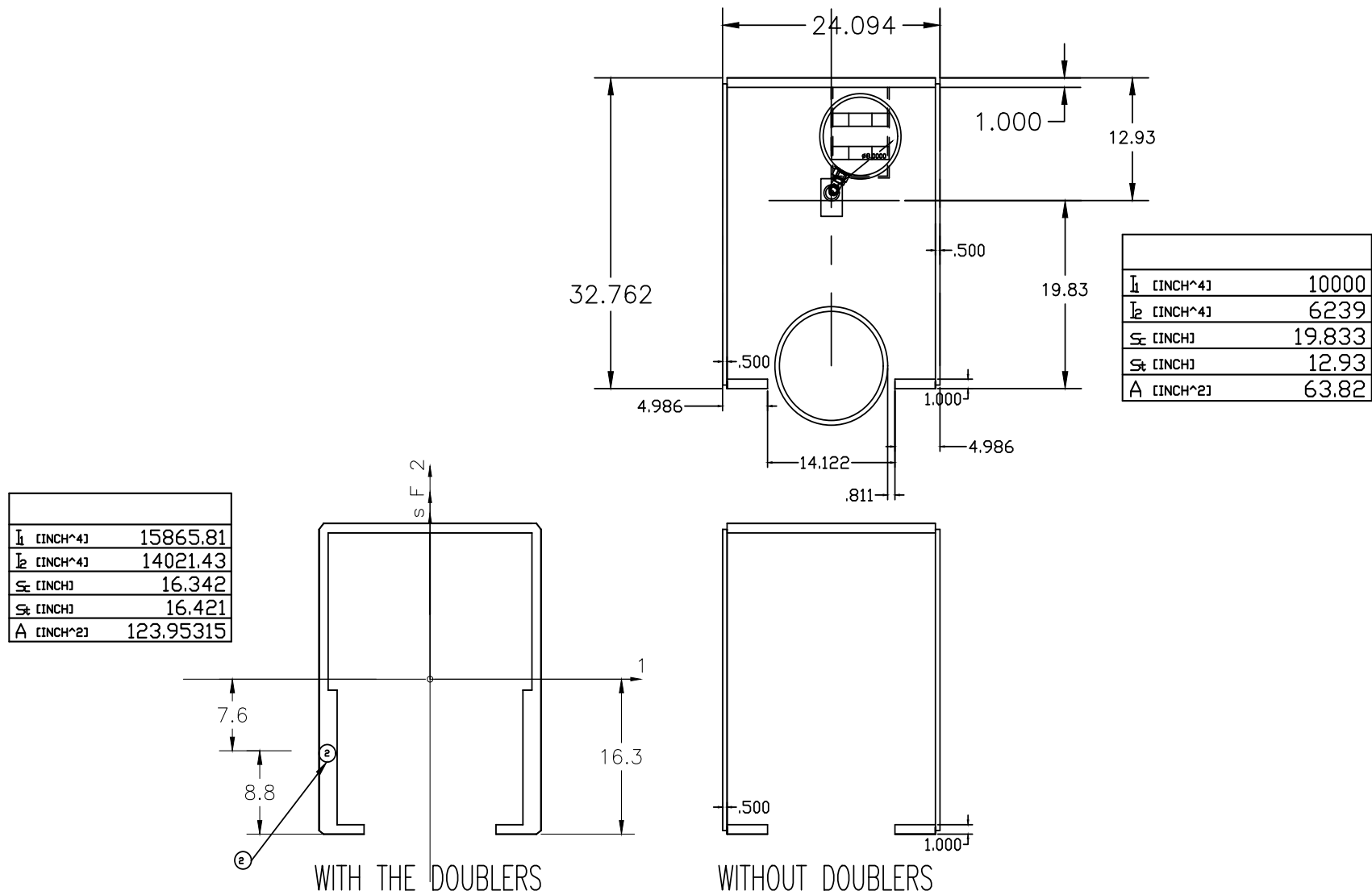
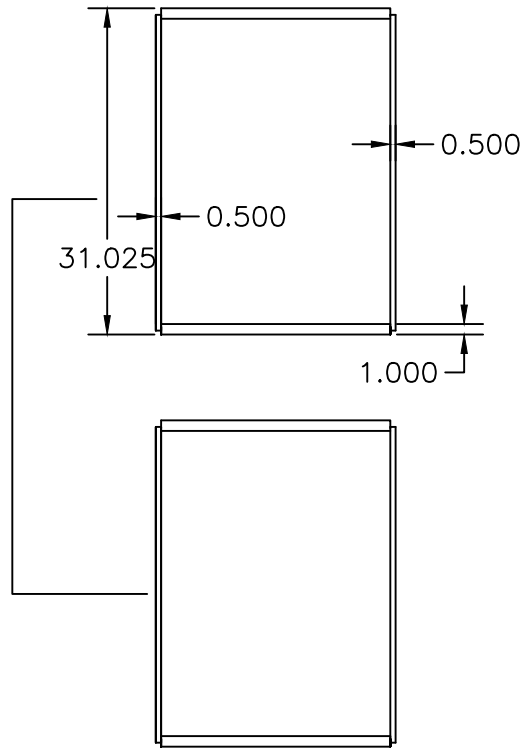


FIG B1.0-A1  
SECT "CS6"



|                            |        |
|----------------------------|--------|
| $I_1$ [INCH <sup>4</sup> ] | 12084  |
| $I_2$ [INCH <sup>4</sup> ] | 5458   |
| $S_x$ [INCH]               | 15.462 |
| $S_y$ [INCH]               | 15.564 |
| $A$ [INCH <sup>2</sup> ]   | 73.61  |

$$M_{cap} = 7000 \times 12084 / (15.46 \times 12) = 456 \text{ ftk}$$

$$F_b = M/S = 15.46 \times 325 \times 10000 / 12084 = 4157 \text{ PSI}$$

CONCL; DBLRS DO NOT NEED TO EXTEND ANY  
FURTHER, EXCEPT TO MAYBE REDUCE LOCAL PLATE BEND STRESSES  
TO BE CHECKED BY JL FEA

FIG B1.0–A2  
SECT "CS2"

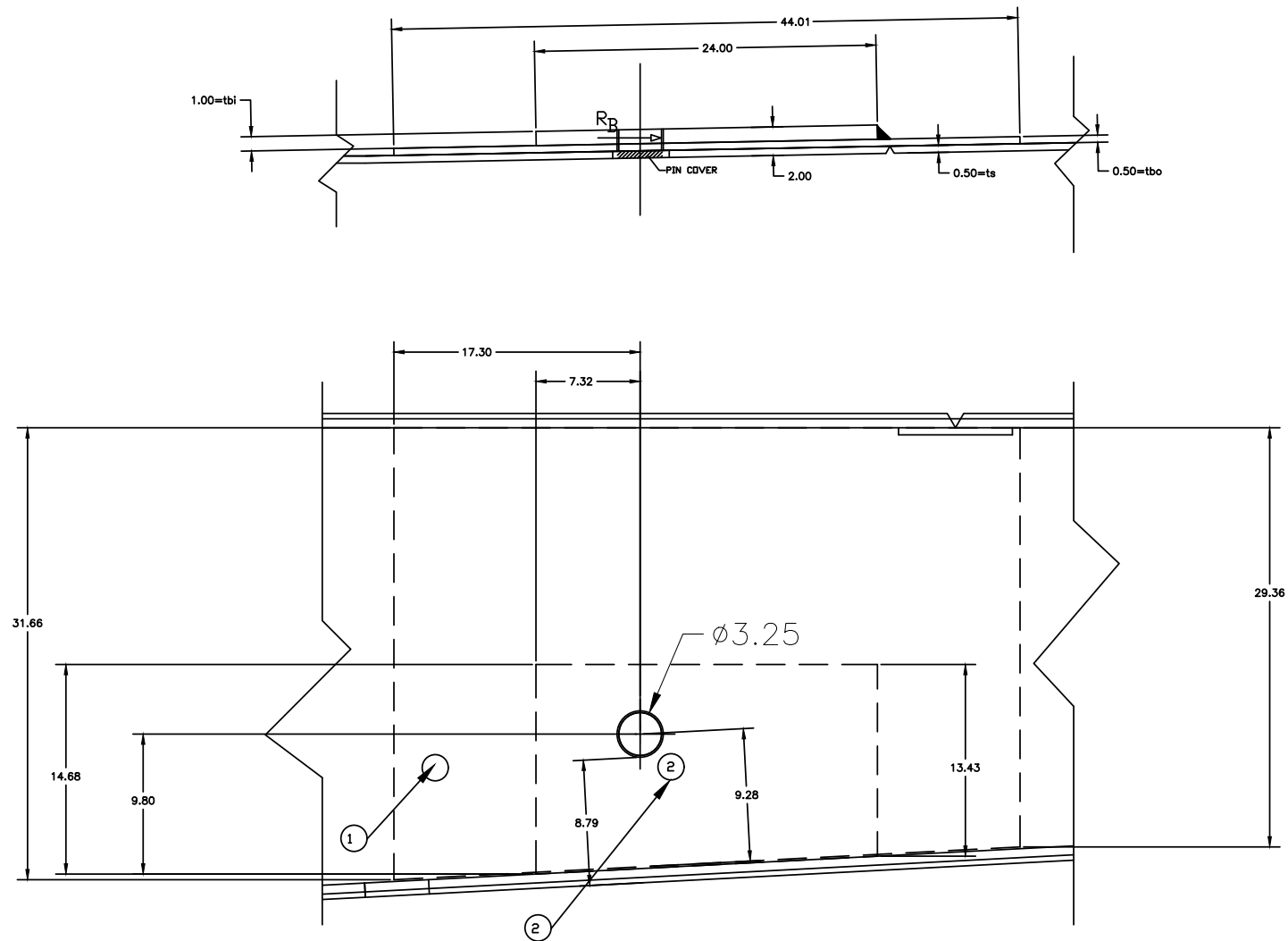
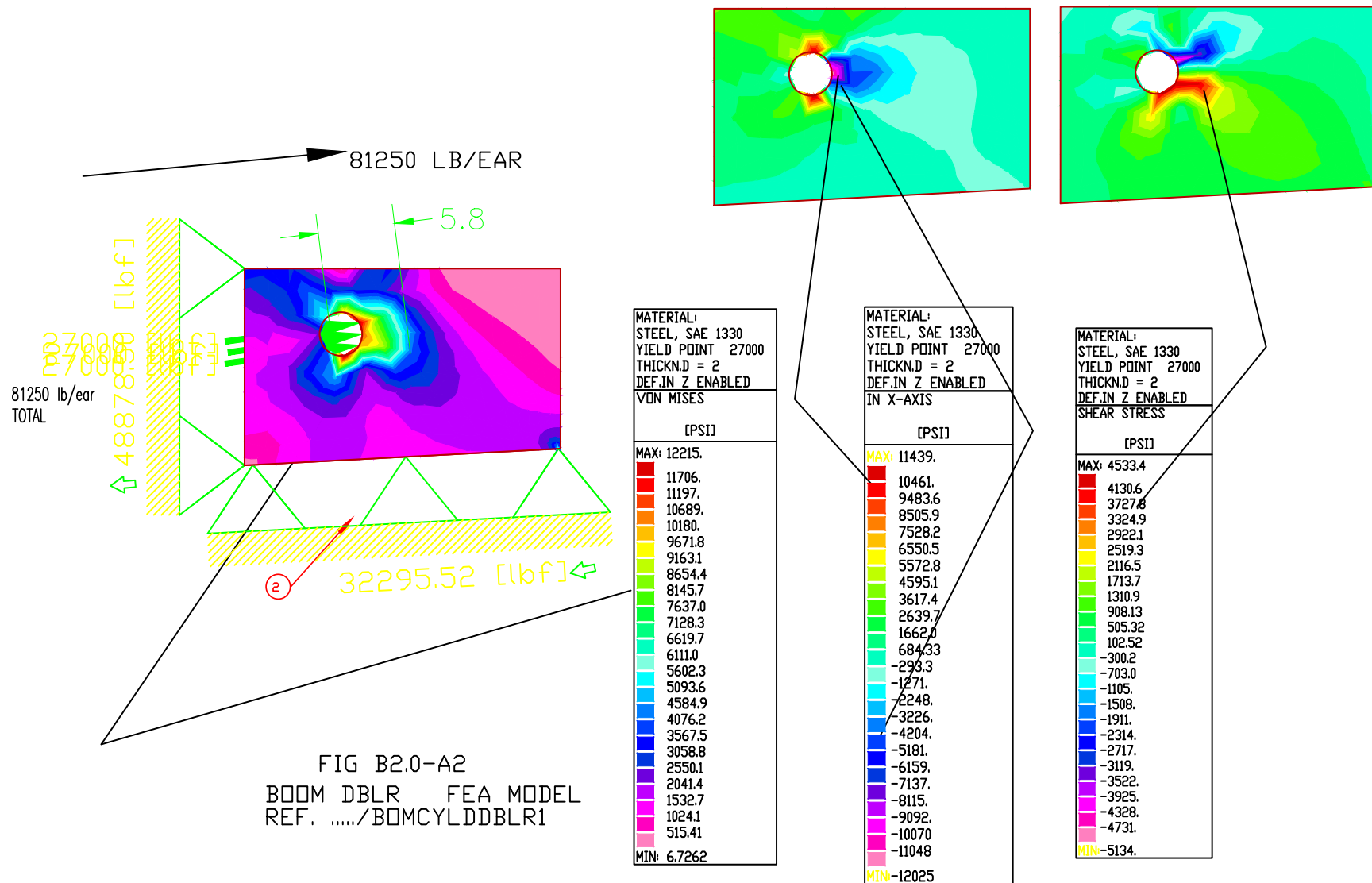


FIG B2.0-A1  
BOOM DBLR FEA MODEL  
REF. ..../BOMCYLDDBLR1



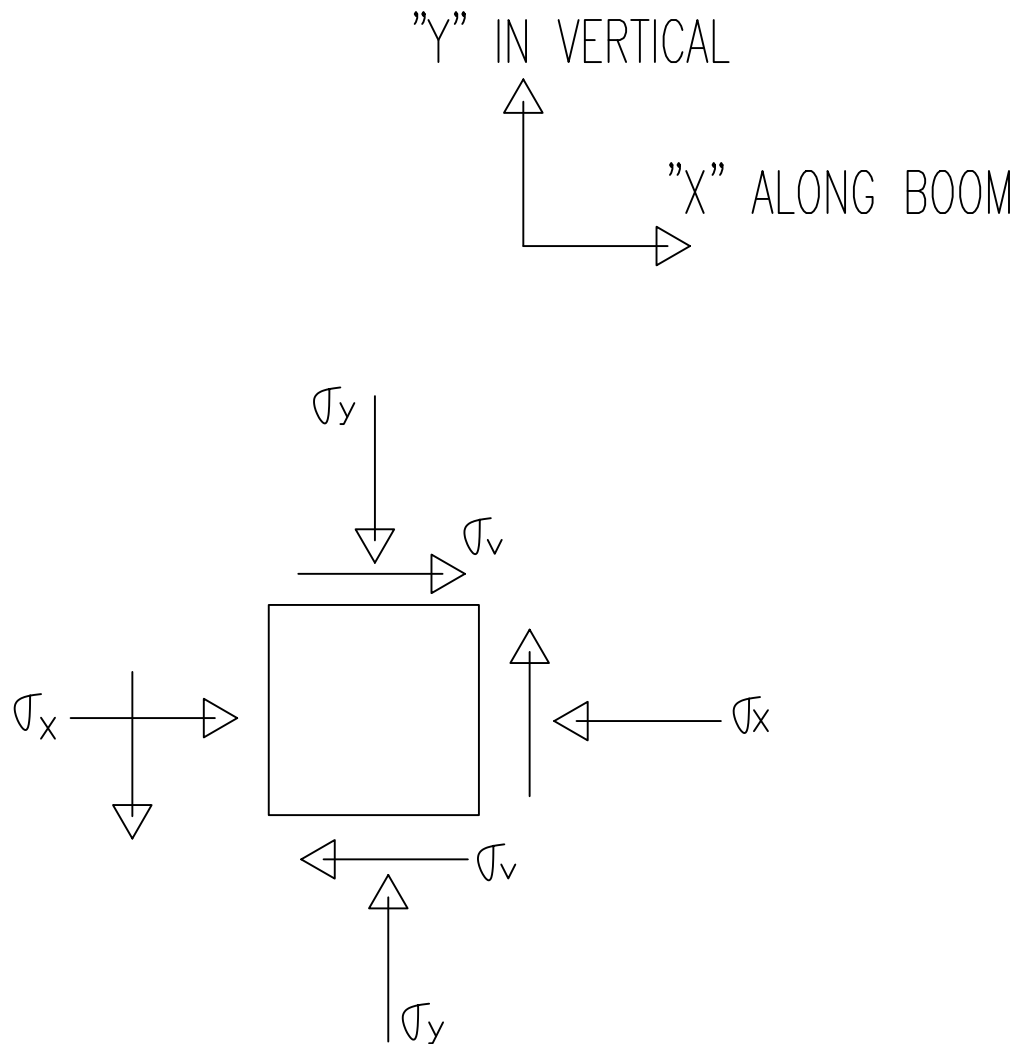


FIG. B4.0  
BOOM MAIN PIN  
DOUBLERS STRESSES

MAX: 9968.3

9156.2  
8344.0  
7531.9  
6719.8  
5907.6  
5095.5  
4283.4  
3471.2  
2659.1  
1847.0  
1034.8  
222.76  
-589.3  
-1401.  
-2213.  
-3025.  
-3837.  
-4650.  
-5462.  
-6274.  
-7086.  
-7898.  
-8710.  
MIN: -9522.

## Appendix: Figures

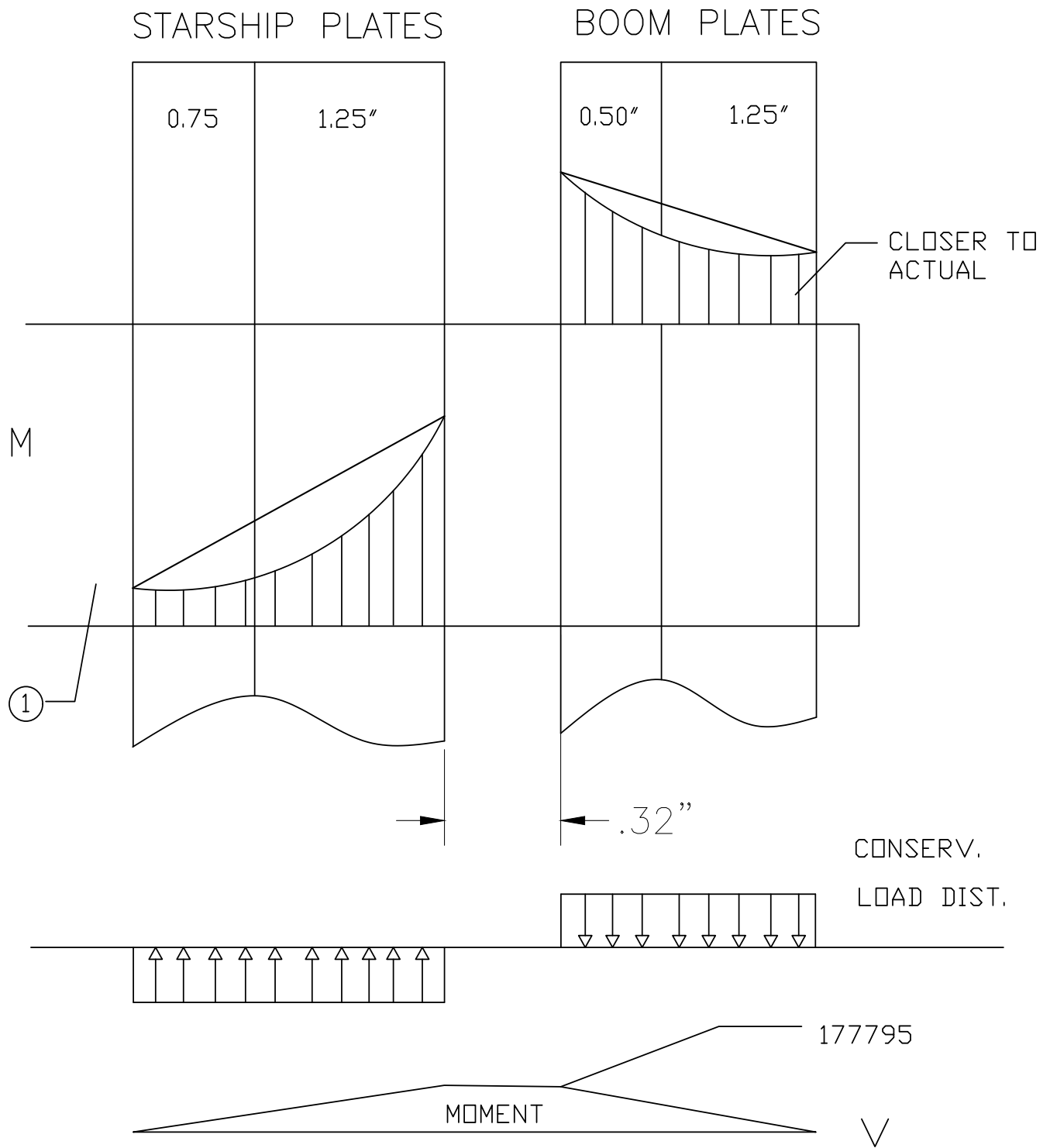


FIG P1.0  
MAIN BOOM / STARSHIP PIN

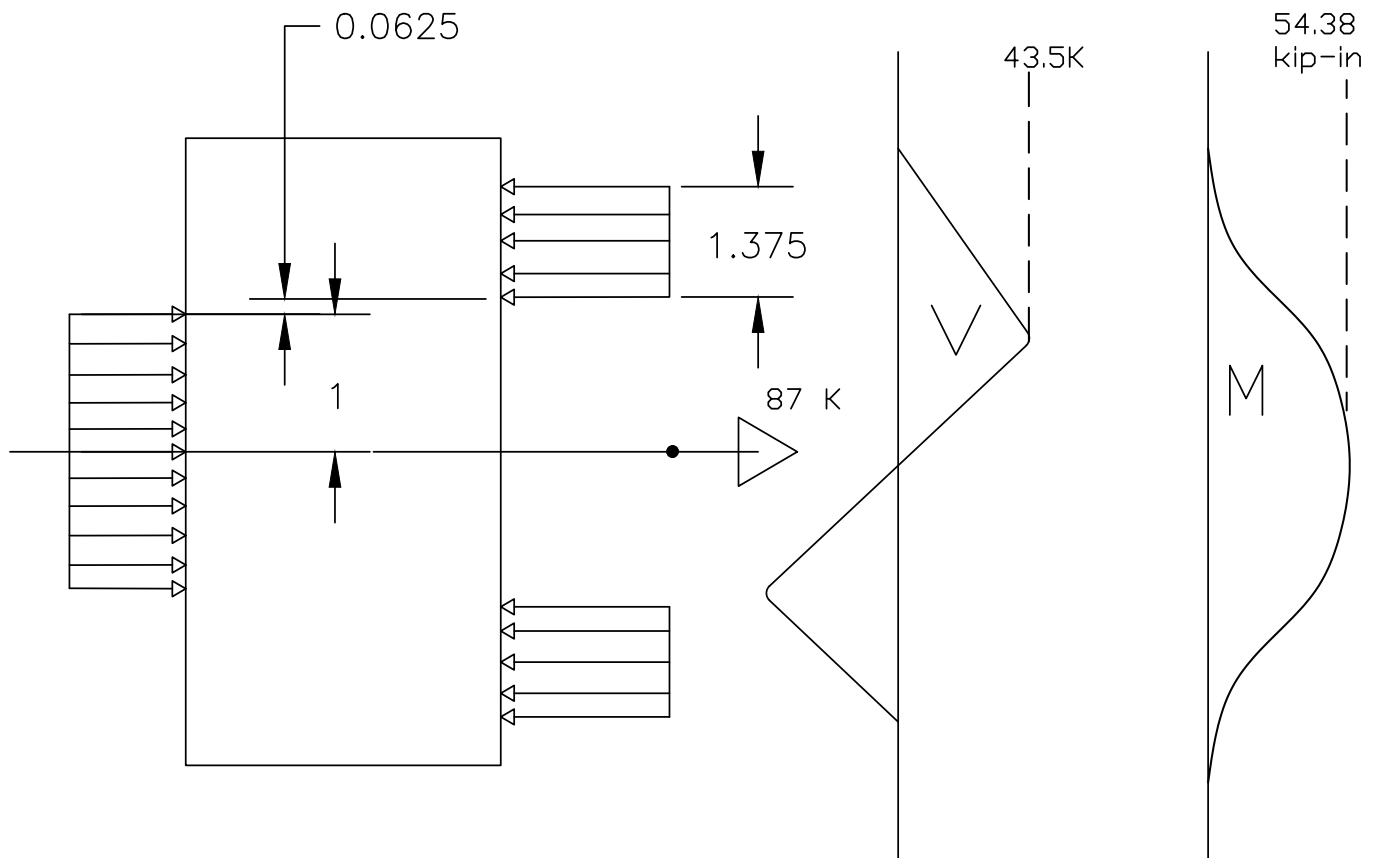


FIG P2.0  
CABLE CYLINDER PIN

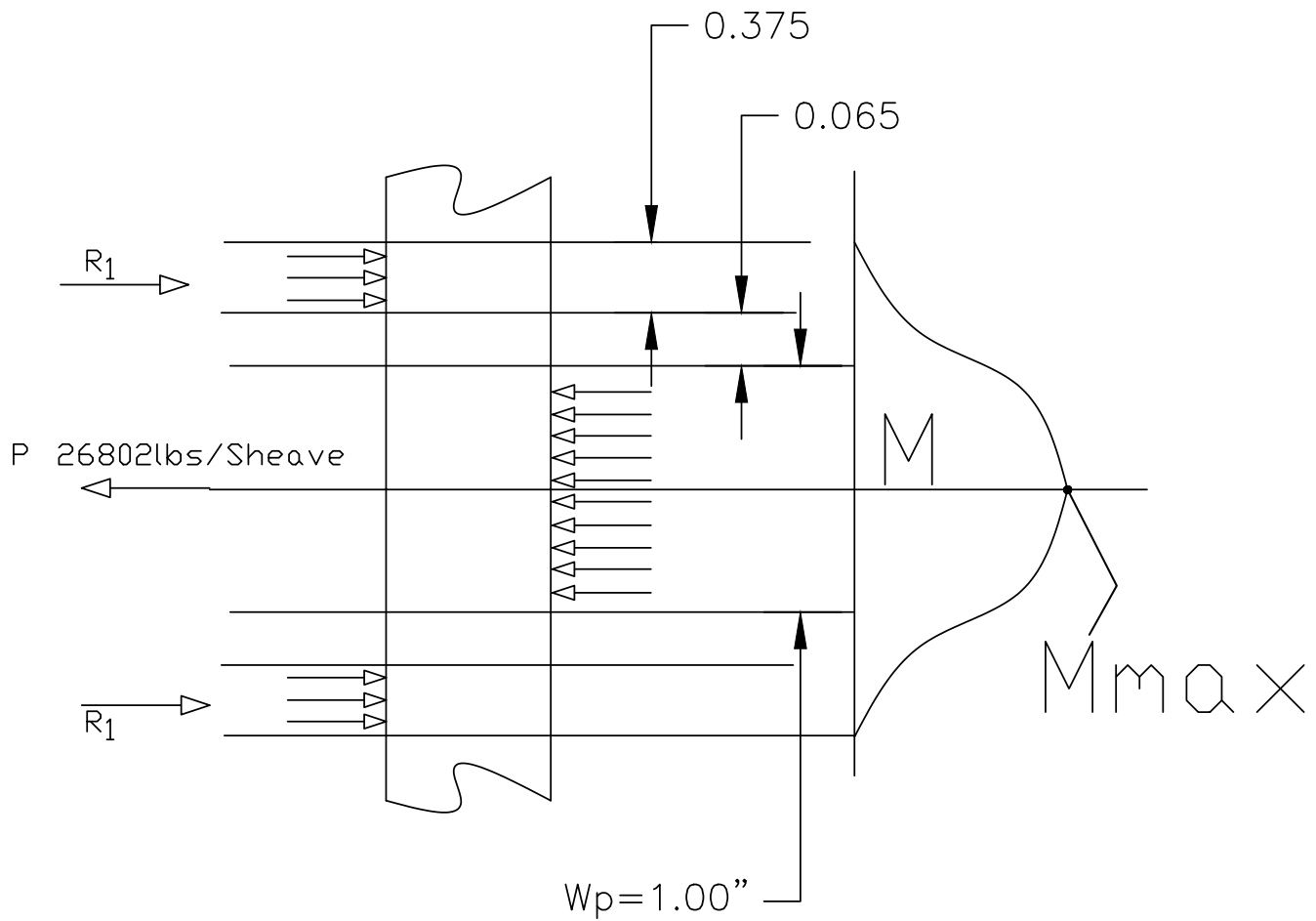


FIG P3.0  
BOOM HEAD PULLEY PIN

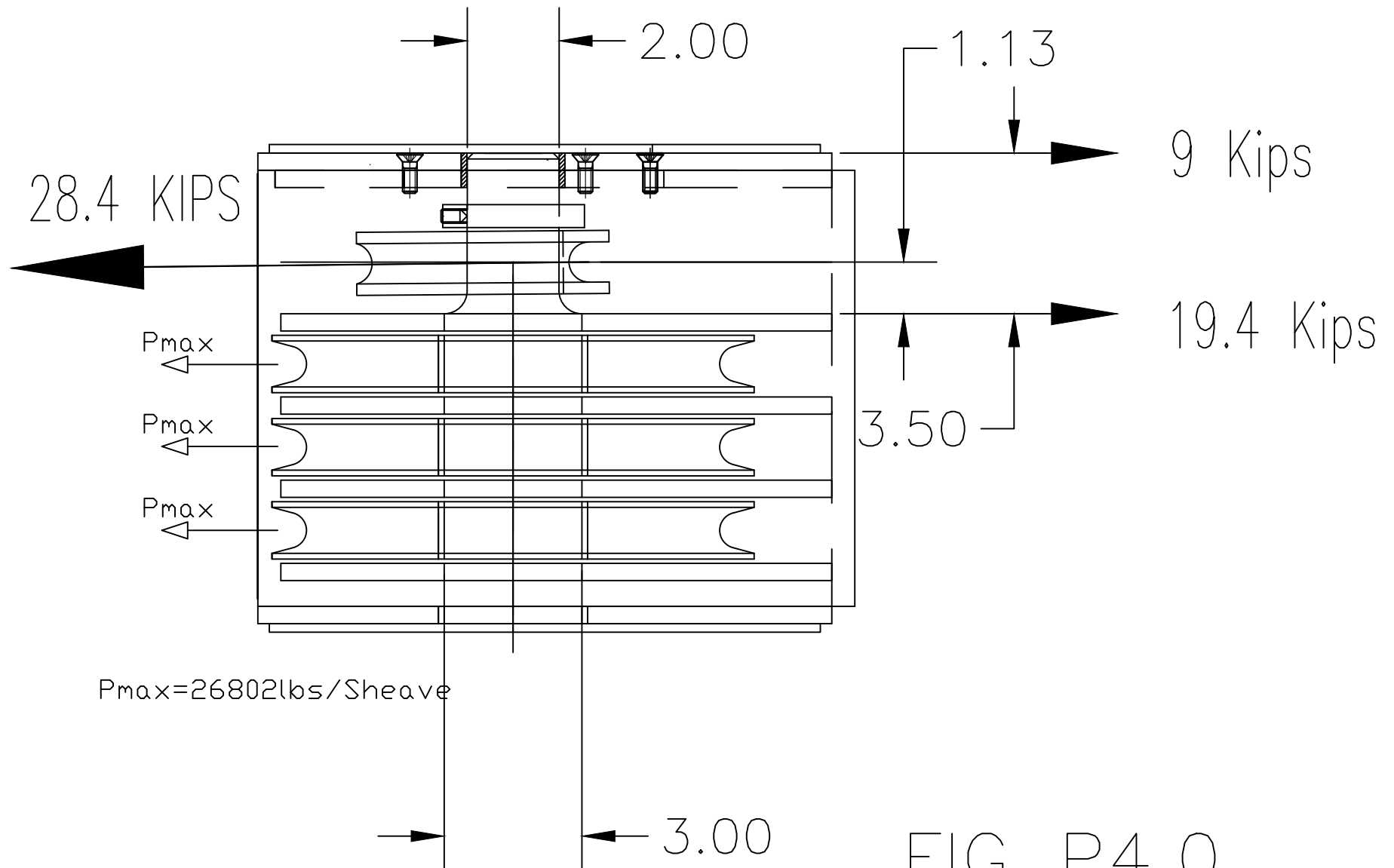


FIG P4.0  
BITTER END PIN

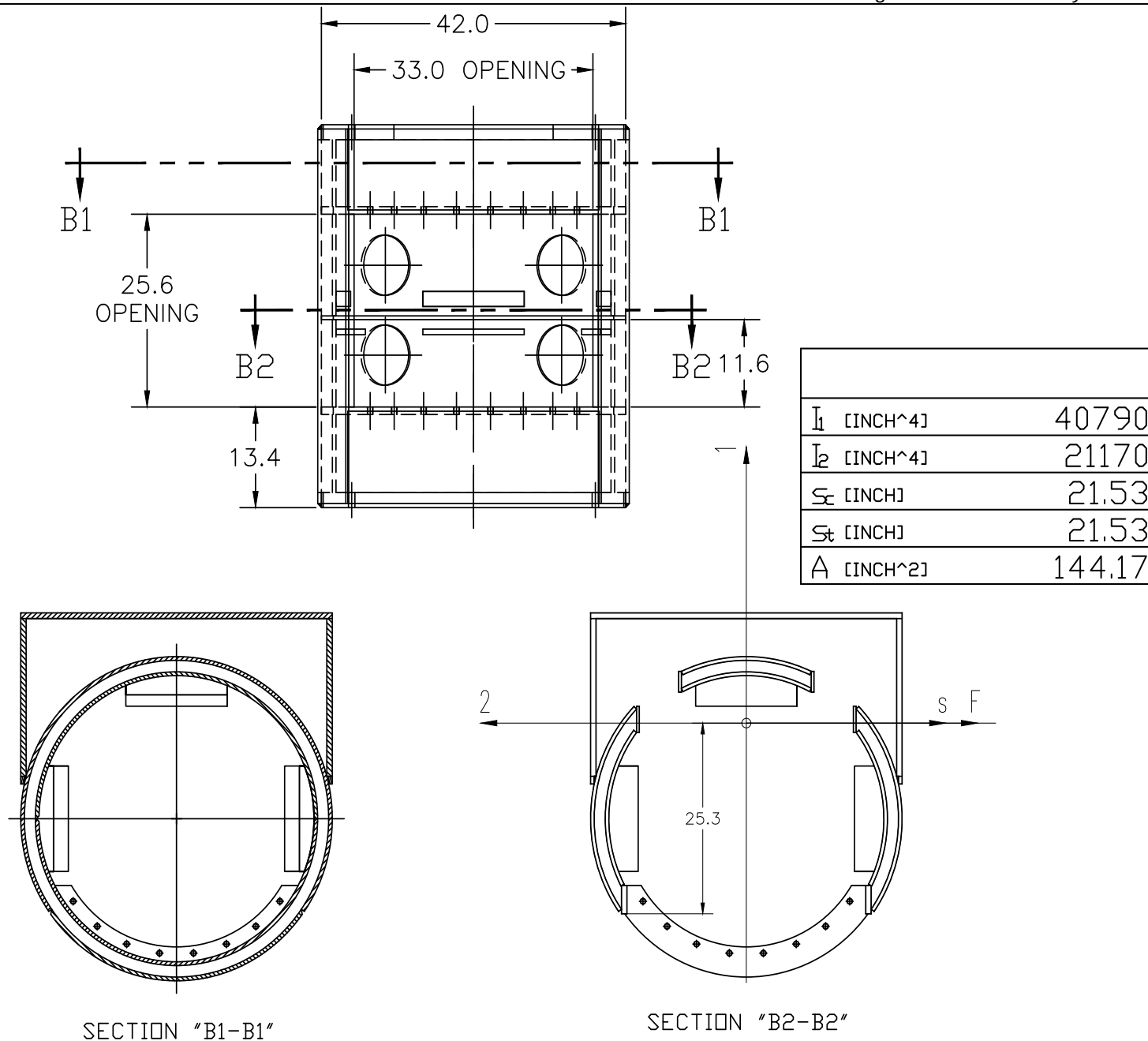


FIG BA1.0-A SECTION B2 PROPERTIES

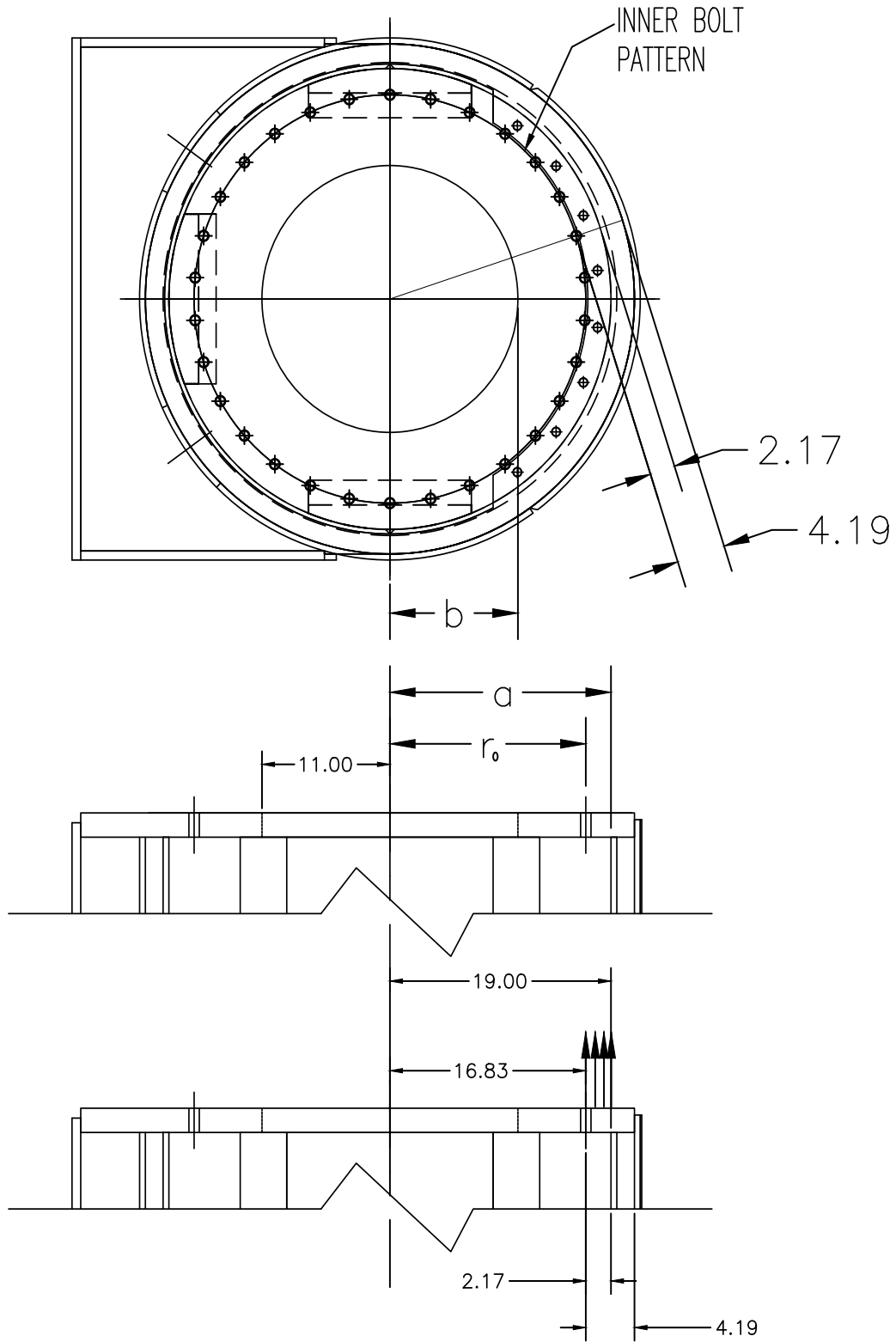


FIG BA2.0  
TOP PLATE BOLT LOADS SECT BA2.0

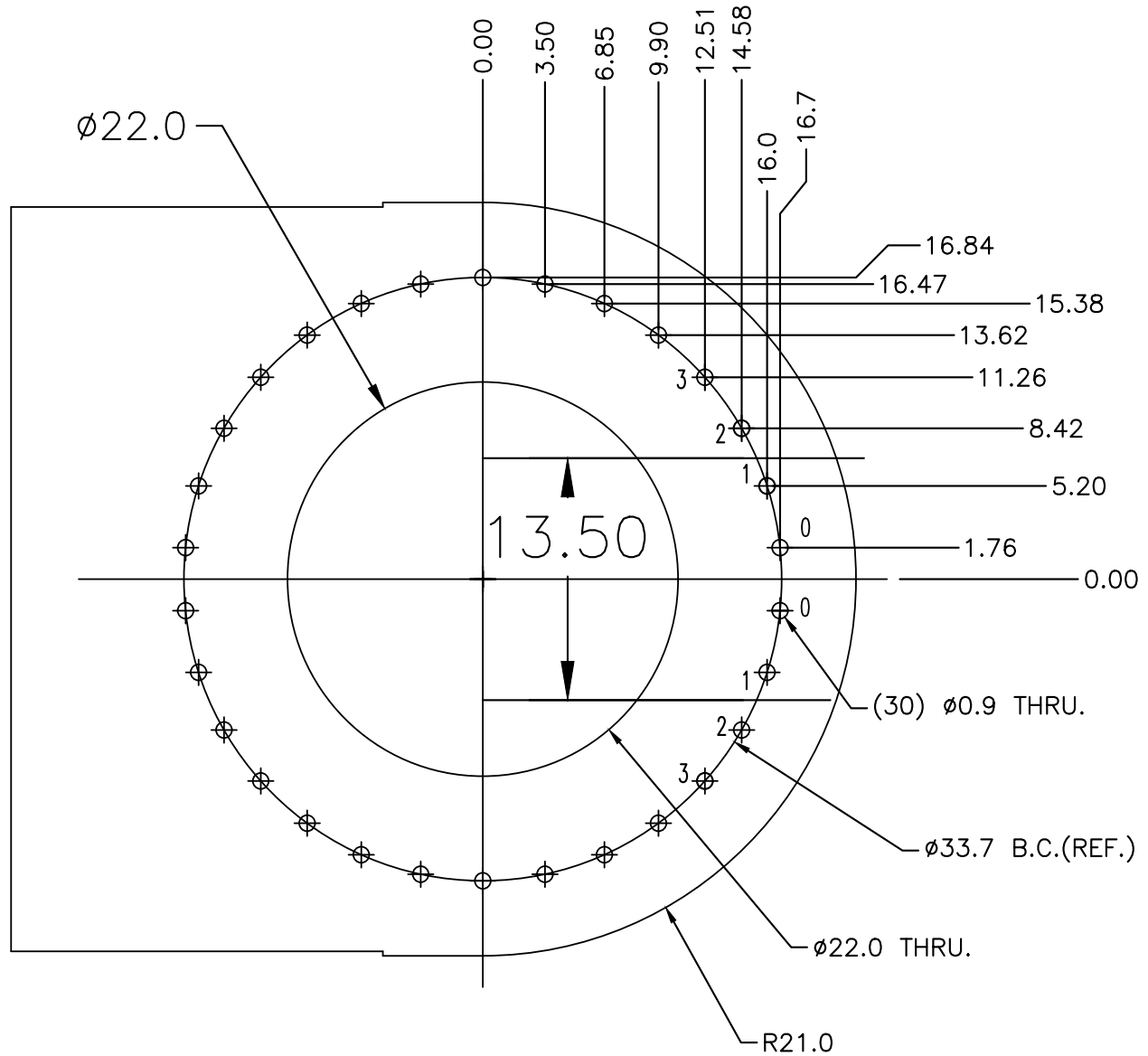


FIG BA2.1 TOP PLATE

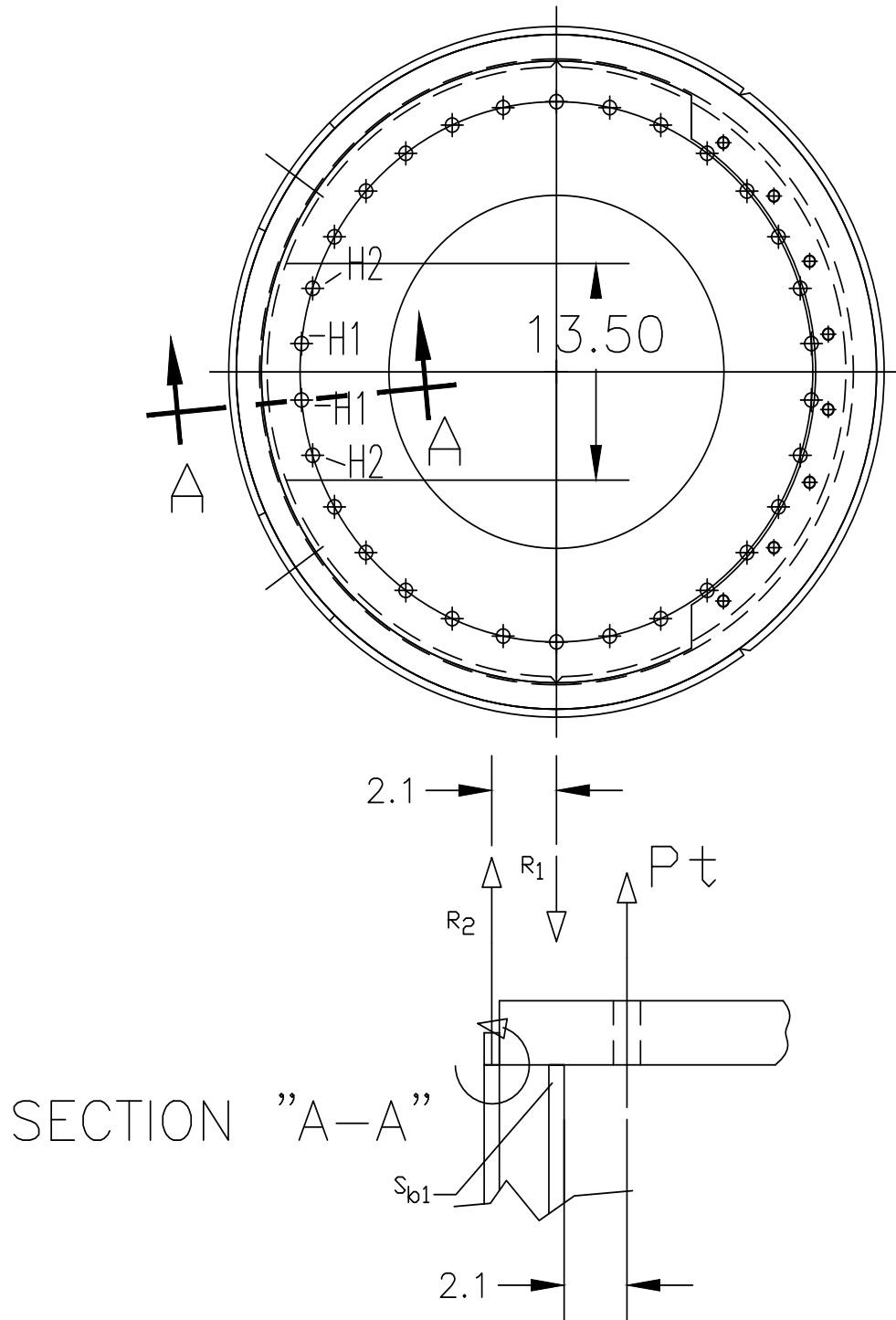


FIG BA3.1 GUSSET PLATE

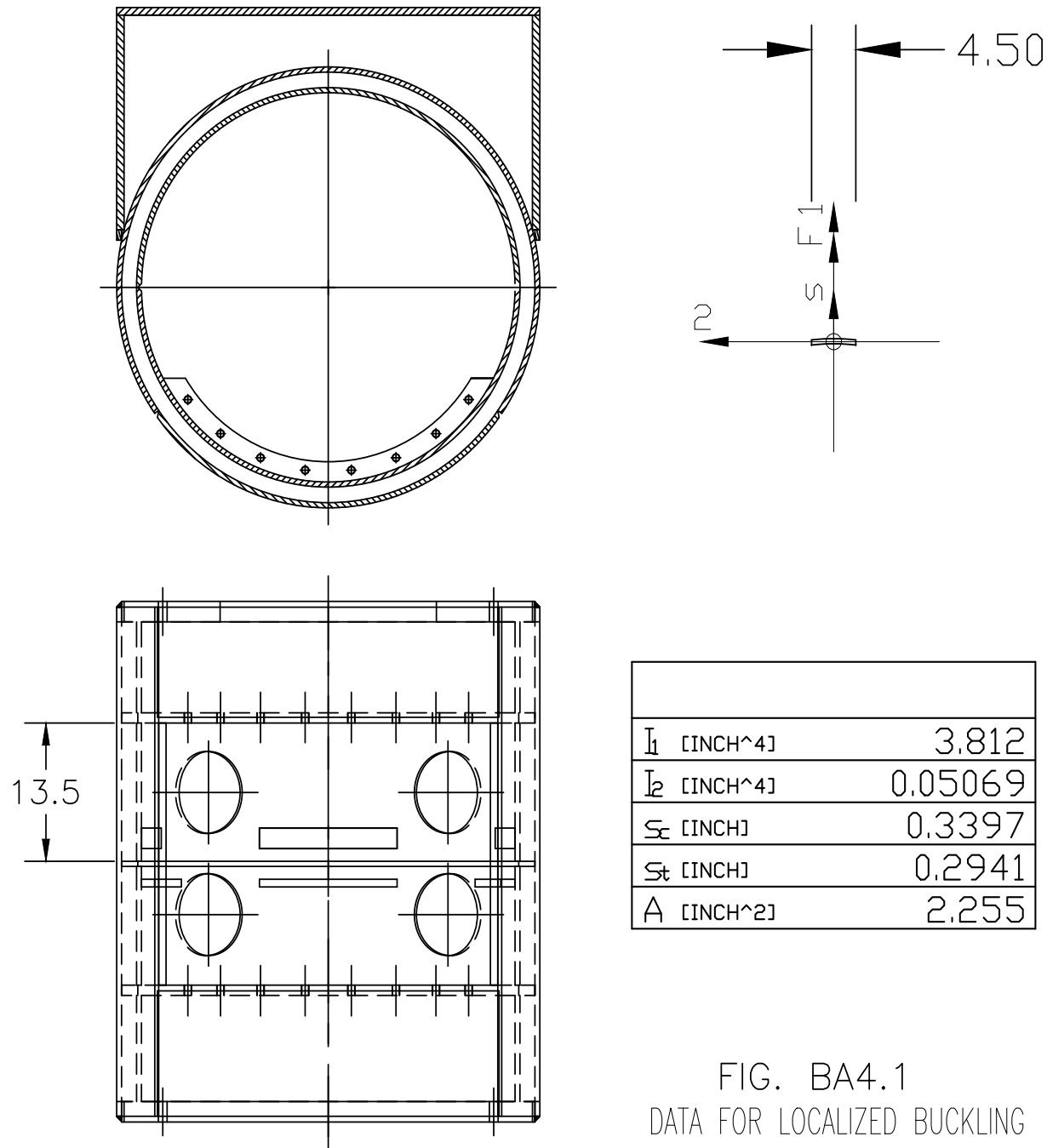


FIG. BA4.1  
DATA FOR LOCALIZED BUCKLING

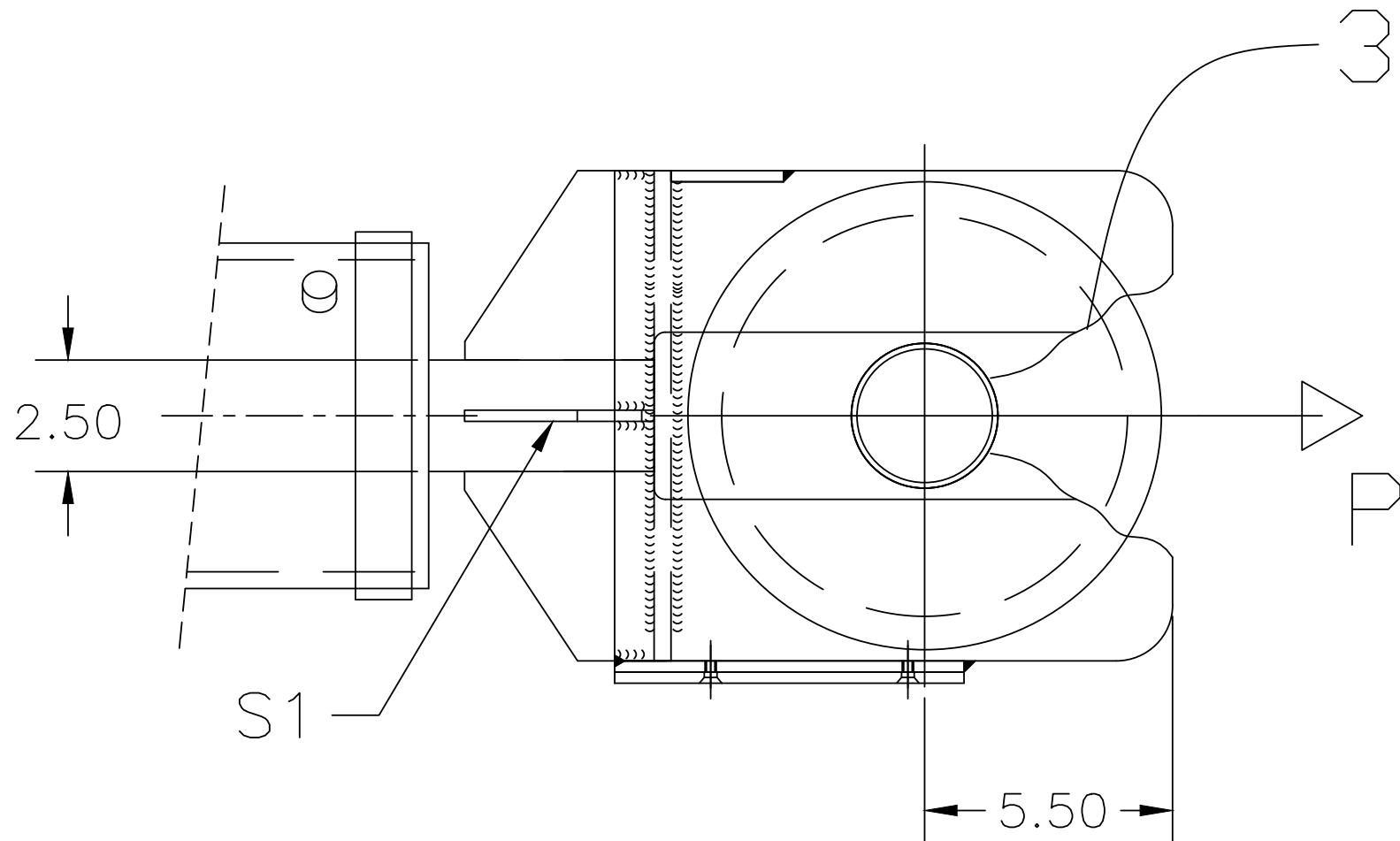
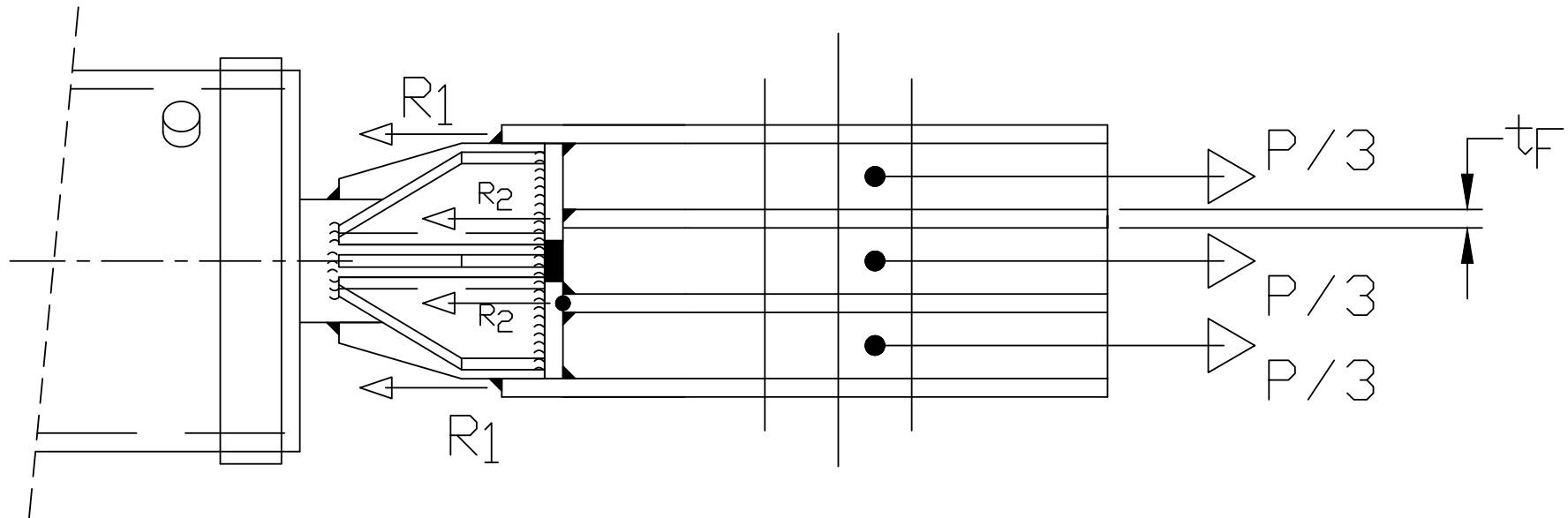
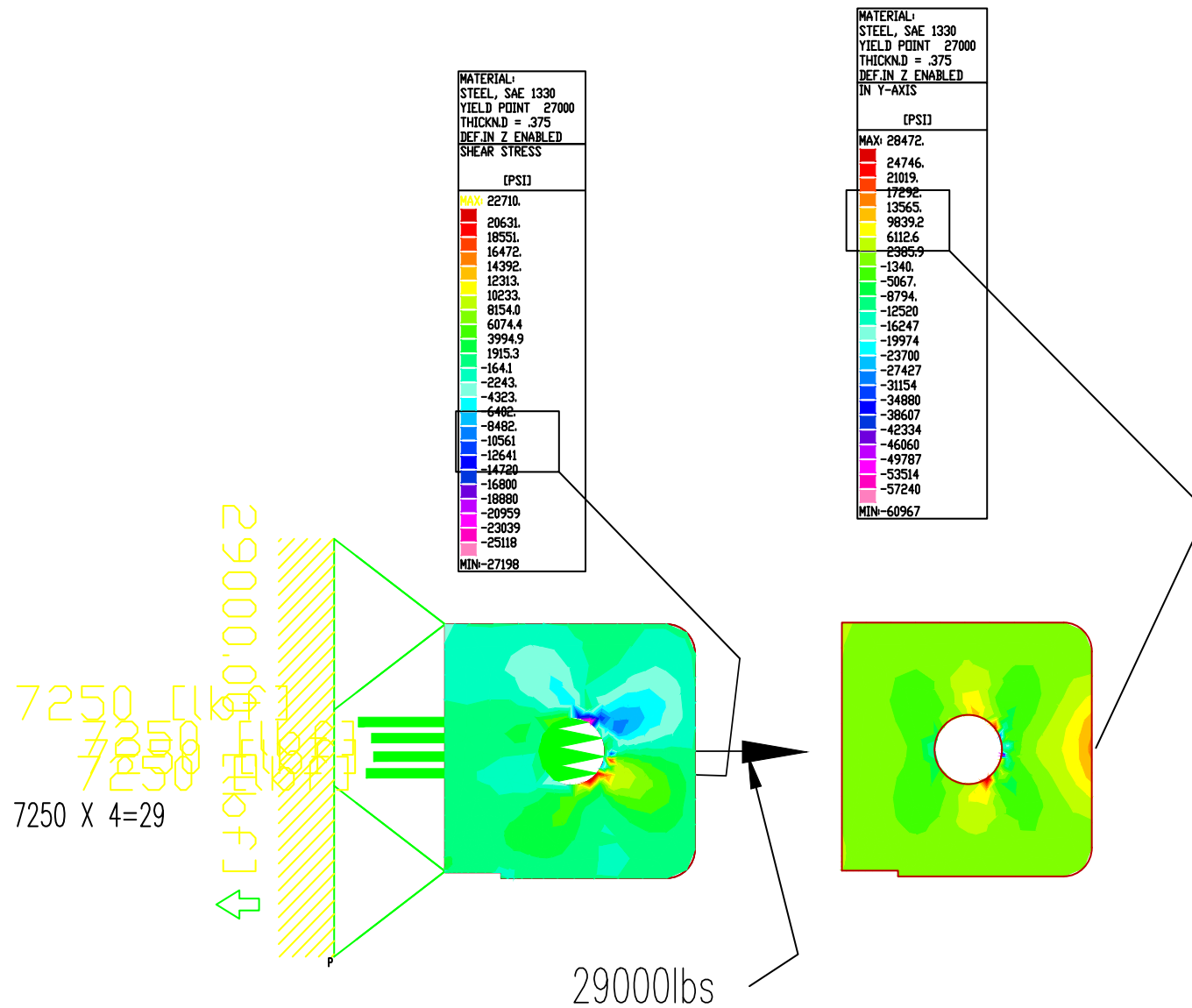


FIGURE H1.0  
CABLE HEAD  
SIDE VIEW



$$P/3 = 87000 / 3 = 29,000 \text{ LBS}$$

FIGURE H1.0-1  
CABLE HEAD  
TOP VIEW



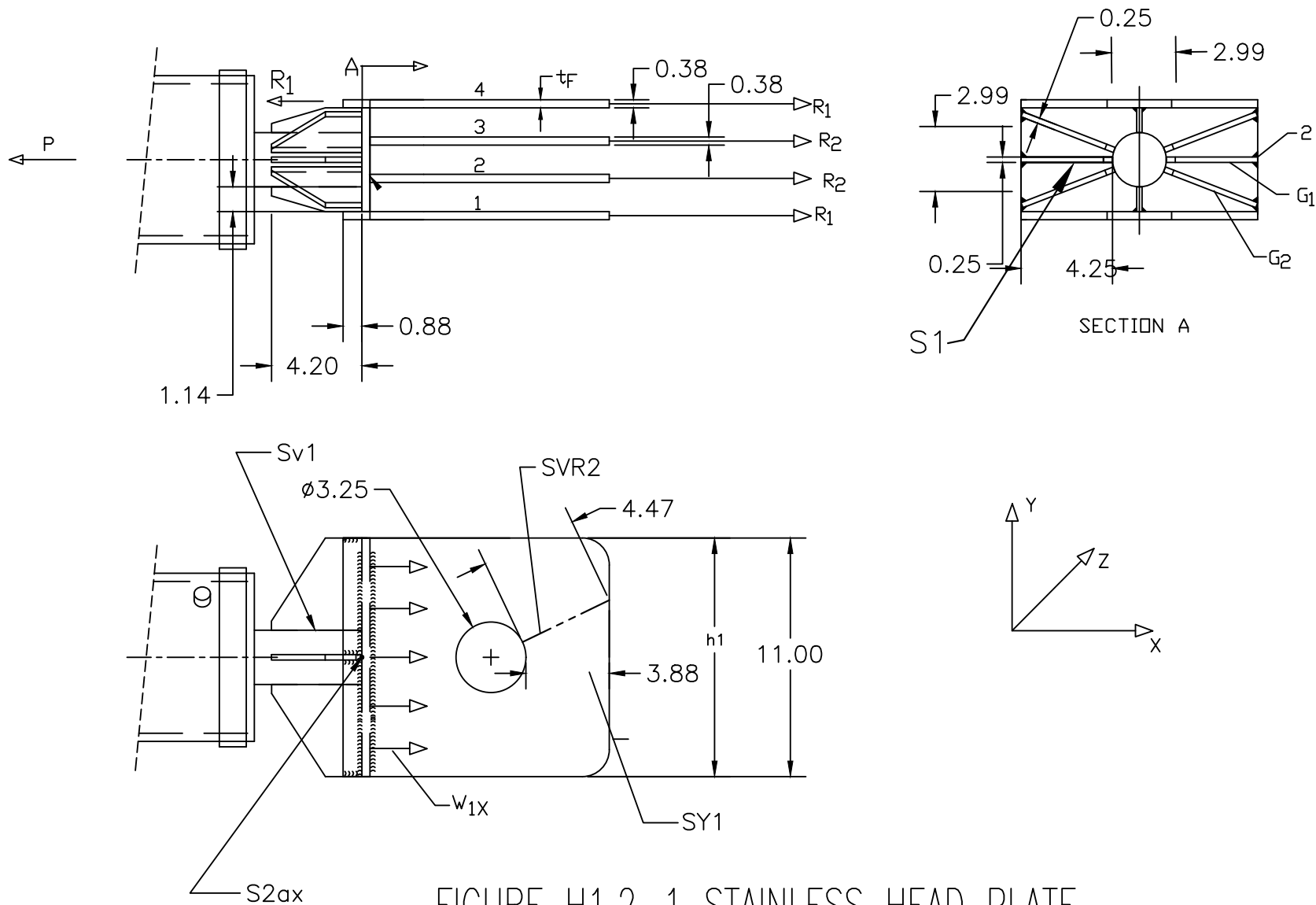


FIGURE H1.2-1 STAINLESS HEAD PLATE STRESSES