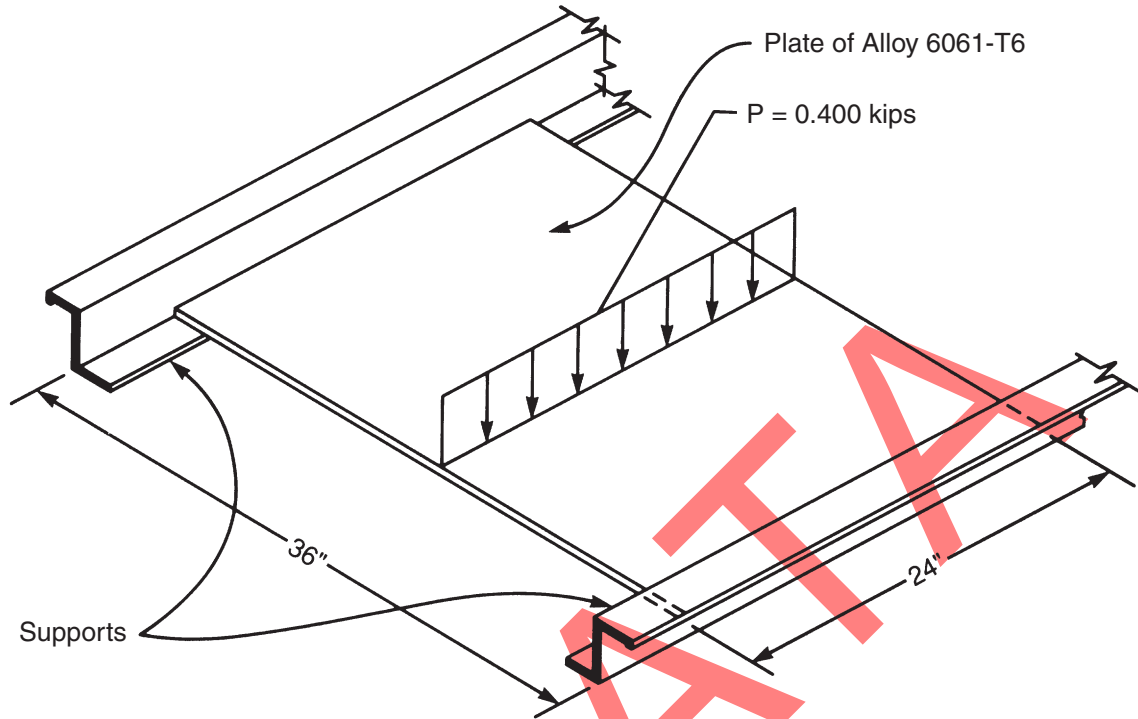


**Example 6**  
**PLATE IN FLEXURE**  
**Illustrating Section F.2**



**Figure 6**

**GIVEN:**

1. Load 0.400 k, along a line at the center of a plate.
2. Plate: 24 in. wide, spanning 36 in.
3. Alloy: 6061-T6
4. Structure type: building

**REQUIRED:**

Minimum standard thickness to support the load safely without deflecting more than  $3/8$  in.

**SOLUTION:**

From Part VI, Beam Formulas Case 1, simply supported beam, concentrated load  $P$  at center

$$M = PL/4 = (0.4)(36)/4 = 3.60 \text{ in-k}$$

The allowable yield moment  $M_{ny}/\Omega$  given in Section F.2 is the lesser of  $1.5SF_y/\Omega$  and  $ZF_y/\Omega$ ; using  $F_y = 35$  ksi (see Table A.3.3),  $\Omega = 1.65$ , and setting the allowable yield moment equal to the required moment:

$$ZF_y/\Omega = Z(35 \text{ k/in}^2)/1.65 = 3.60 \text{ in-k}$$

gives  $Z = 0.170 \text{ in}^3$ .

and

$$1.5SF_y/\Omega = 1.5S(35 \text{ k/in}^2)/1.65 = 3.60 \text{ in-k}$$

gives  $S = 0.113 \text{ in}^3$ .

The allowable moment for the limit state of rupture given in Section F.2 is  $M_{nr}/\Omega = ZF_{tu}/k_t/\Omega$ ; using  $F_{tu} = 38$  ksi and  $k_t = 1.0$  (see Table A.3.3),  $\Omega = 1.95$ , and setting the allowable moment equal to the required moment:

$$ZF_{tu}/k_t/\Omega = Z(38 \text{ k/in}^2)/1.0/1.95 = 3.60 \text{ in-k}$$

gives  $Z = 0.185 \text{ in}^3$ .

For building-type structures, Section F.1 gives a safety factor of 1.95 for the rupture limit state and 1.65 for all other limit states.