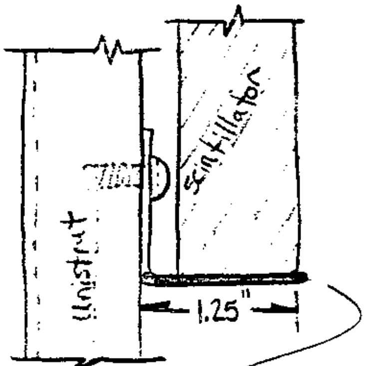
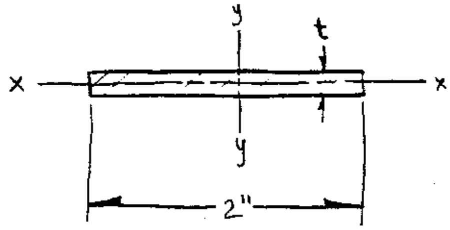
SUPPORT CLIP THICKNESS CALCULATIONS

The calculations on the next page were from an earlier design. The results indicate that with a maximum 50 lb load, the support clip will undergo a 16,622 psi stress. This design was based on a 14 gage (.07") sheetmetal clip. Even though this stress is below the allowable and the actual load is much less than 50 lbs, it was decided to increase the clip thickness to 11 gage (.12") for safety, reliability, and to help minimize deflections.

CDF: Muon Wall Scintillator Mounts	Scintillator Support Clip Material Thickness Analysis	Don Mitchell 6-30-92	x4710 P547	P1/1



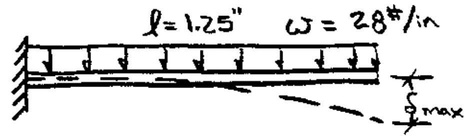


$I_x = \frac{1}{12}(2)(t^3)$

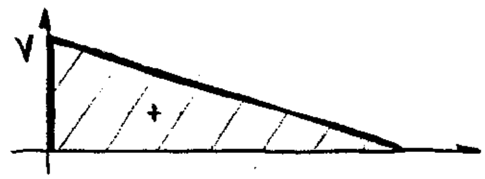
$I_x = \frac{t^3}{6}$

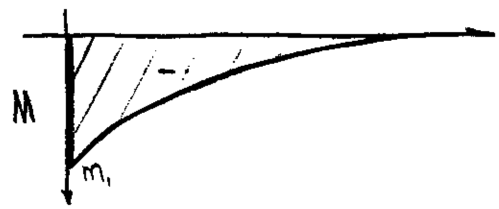
$c = \frac{t}{2}$

Find the proper design thickness of this clip.



30# Load on clip.





Find Minimum Thickness:

$$M_1 = \frac{-\omega l^2}{2} = \frac{-(28\,\#/in)(1.25 in)^2}{2} = -21.875 \text{ in-lb}$$

$$\sigma_{max} = \frac{Mc}{I} = \frac{M\left(\frac{t}{2}\right)}{t^3/6} = \frac{3M}{t^2}$$

let $\sigma_{max} = 21{,}600$ psi $= .6 F_y$

$$t_{min} = \sqrt{\frac{3M}{\sigma_{max}}} \qquad t_{min} = \sqrt{\frac{(3)(21.875)}{21{,}600}} = .055 \text{ in}$$

(use 14 Ga sheet metal, t = .0751")

Using 14 Gage Sheet Metal; Calculate σ_{max}, δ_{max}

$$\sigma_{max} = \frac{Mc}{I} = \frac{(21.875)\left(\frac{.0751}{2}\right)}{(.0751)^3/6} = 11{,}636 \text{ psi}$$ OK

$$\delta_{max} = \frac{-\omega l}{8 \cdot E I} = \frac{-(28)(1.25)}{8(2.9E7)(.000071)} = .0021 \text{ in}$$ OK

σ_{max} for a 50 lb Load is: $\sigma_{max} = 16{,}622$ psi OK

[the clip may see this load during installation]