

convergence
 $2 \left(\frac{|x_f - x_i|}{x_i + x_f} \right)$

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A7: FEA on Bracket

Design 1

mesh 1: SF = 1.6
 $\sigma_{max} = 12.8 \text{ ksi}$
 $\delta_{max} = 0.1142 \text{ in}$
 mass = 0.70 lb_m

mesh 2: SF = 1.6
 $\sigma_{max} = 12.8 \text{ ksi}$
 $\delta_{max} = 0.1163 \text{ in}$
 mass = 0.70 lb_m

Convergence: SF: $2 \left(\frac{|1.6 - 1.6|}{1.6 + 1.6} \right) = 0\%$
 σ_{max} : $2 \left(\frac{|12.8 - 12.8|}{12.8 + 12.8} \right) = 0\%$
 δ_{max} : $2 \left(\frac{|0.1163 - 0.1142|}{0.1163 + 0.1142} \right) = 1.8\%$
 mass: $2 \left(\frac{|0.70 - 0.70|}{0.70 + 0.70} \right) = 0\%$

~~$\delta_{max} > 7\%$~~

all < 7% ✓

~~mesh 3: SF = 1.1
 $\sigma_{max} = 18.2 \text{ ksi}$
 $\delta_{max} =$
 mass = 0.70 lb_m~~

Design 2:

mesh 1: SF = 1.5

$$\sigma_{max} = 13.35 \text{ ksi}$$

$$\delta_{max} = 0.1153 \text{ in}$$

$$\text{mass} = 0.37 \text{ lb}$$

mesh 2: SF = 1.5

$$\sigma_{max} = 13.55 \text{ ksi}$$

$$\delta_{max} = 0.1164$$

$$\text{mass} = 0.37 \text{ lb}$$

convergence: SF = 0%

$$\sigma_{max} = 2 \left(\frac{|13.55 - 13.35|}{(13.55 + 13.35)} \right) = 1.50\%$$

$$\delta_{max} = 2 \left(\frac{|0.1164 - 0.1153|}{(0.1164 + 0.1153)} \right) = 0.95\%$$

$$\text{mass} = 0\%$$

all < 7% ✓

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Design 3:

mesh 1: $SF = 4$

$$\begin{aligned}\sigma_{\max} &= 1.474 \text{ ksi} \\ \delta_{\max} &= 0.003492 \text{ in} \\ \text{mass} &= 0.89 \text{ lb}_m\end{aligned}$$

mesh 2: $SF = 4$

$$\begin{aligned}\sigma_{\max} &= 1.628 \text{ ksi} \\ \delta_{\max} &= 0.003567 \text{ in} \\ \text{mass} &= 0.89 \text{ lb}_m\end{aligned}$$

convergence: $SF = 0\%$

$$\begin{aligned}\sigma_{\max} &= 2(|1.628 - 1.474| / (1.628 + 1.474)) = 9.9\% \\ \delta_{\max} &= 2(|0.003567 - 0.003492| / (0.003567 + 0.003492)) = 2.1\% \\ \text{mass} &= 0\%\end{aligned}$$

$$\sigma_{\max} > 7\%$$

mesh 3: $SF = 4$

$$\begin{aligned}\sigma_{\max} &= 1.844 \text{ ksi} \\ \delta_{\max} &= 0.003609 \text{ in} \\ \text{mass} &= 0.89 \text{ lb}_m\end{aligned}$$

convergence: $SF = 0\%$

$$\begin{aligned}\sigma_{\max} &= 2(|1.844 - 1.628| / (1.844 + 1.628)) = 12.4\% \\ \delta_{\max} &= 2(|0.003609 - 0.003567| / (0.003609 + 0.003567)) = 1.17\% \\ \text{mass} &= 0\%\end{aligned}$$

$$\sigma_{\max} > 7\% \text{ still}$$

