JOB: Arching - Masonry

SHEET NO.: 1 OF

CALCULATED BY: DATE:

CHECKED BY: DATE:

SCALE: Per BIA Tech Note 31A

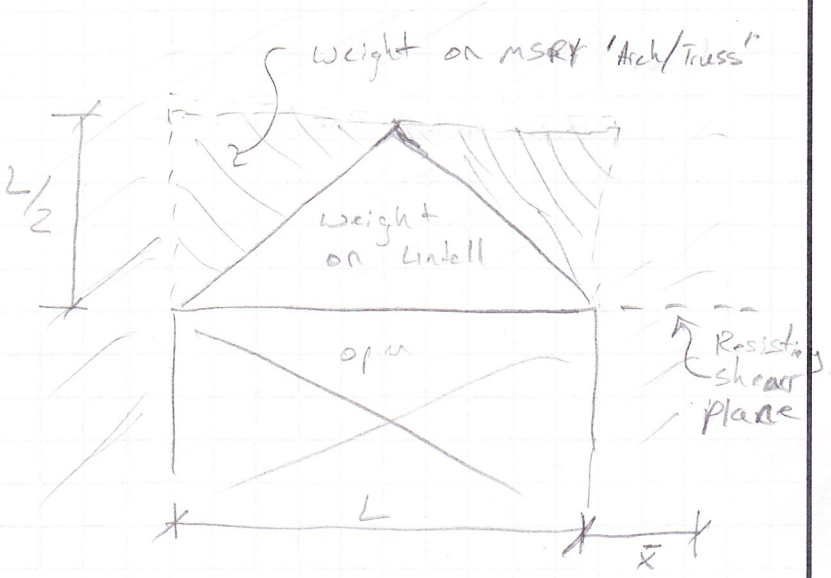
Thrust

$$H = \frac{3WL}{8d}$$

W = Total Load (in Pounds) on Arch

L = span length

d = depth of arch



Resistance to Thrust

$$H_R = f_v \cdot n \cdot t$$

f_v = Allowable shear stress

n = # of shear planes

t = effective wall thickness (fully grouted or face shell)

- Dead & Live loads should be Added to weight on Arch

γ = masonry wt psf

- use 45° deg "Arch" (In design use 60° For Point Load Above & Arch height/depth = 30°)

$$W = \gamma \frac{L}{2} \times L \times \frac{1}{2} = \frac{\gamma L^2}{4}$$

$$H = \frac{3\gamma L^3}{32 d} \Rightarrow \left(d = \frac{L}{2}\right) \Rightarrow \frac{6\gamma L^2}{32} = \frac{3\gamma L^2}{16}$$

$$\frac{3\gamma L^2}{16} = f_v \cdot n \cdot t \quad \text{say } n = 1$$

$$\frac{3\gamma L^2}{16 f_v n t} = \bar{x} \quad \text{Compare to previous approx, ...}$$

Say $t = 2 \times t_f \Rightarrow \frac{3\gamma L^2}{32 f_v t_f}$

$n = 1$ ↑ Face shell

JOB: _____

SHEET NO.: 2 OF _____

CALCULATED BY: _____ DATE: _____

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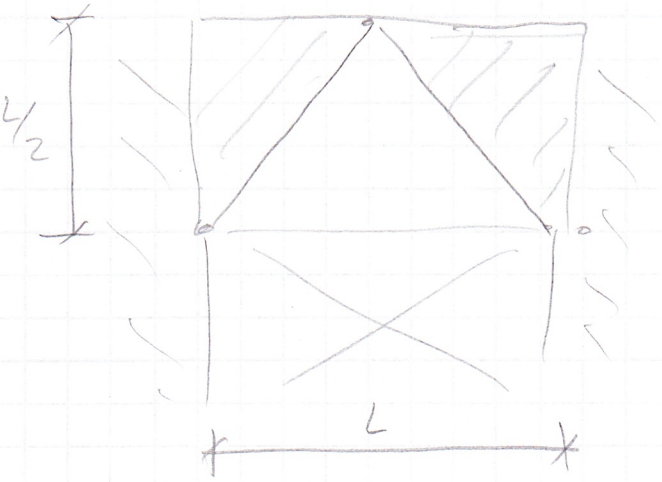
SCALE: Approx Compare



Reaction @ Base of Arch/Truss

Truss analogy $\Rightarrow T = C = \frac{M}{d}$

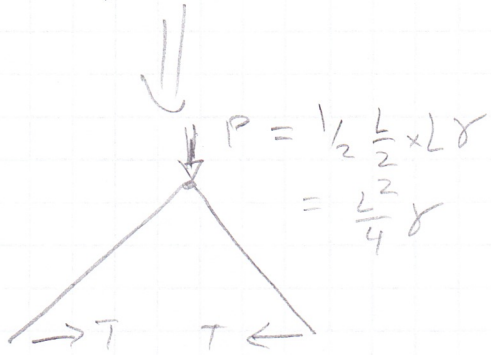
$$M = \frac{PL}{4} = \frac{L^3\gamma}{16}$$

$$T = C = \frac{L^3\gamma}{16} \times \frac{1}{L/2} \Rightarrow \frac{L^2\gamma}{8}$$

$$f_v = \frac{T}{\bar{x} * t_{eff}} \Rightarrow \bar{x} = \frac{T}{f_v t_{eff}}$$

$$\bar{x} = \frac{L^2\gamma}{8 f_v t_{eff}} = \frac{L^2\gamma}{16 f_v t_f}$$

$t_{eff} = 2t_f$ ← Face shell thickness



$$P = \frac{1}{2}\frac{L}{2} \times L\gamma = \frac{L^2}{4}\gamma$$

$\frac{1}{16}$ Compare to $\frac{3}{32}$

0.0625 0.09375

33% error