ARCH 324 - Structures 2, Winter 2009

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<http://hdl.handle.net/2027.42/64938>
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GIVEN: 4 boards each 1" x 6" glued and nailed as a column section.

A) Determine arrangement for the strongest section.

B) Determine allowable axial load for:
   \( L = 10' - 0" \), \( 20' - 8" \), \( 30' - 0" \)
   Braced at ends only

\[
E = 1760000 \text{ psi} \\
f_c = 1800 \text{ psi} \\
f_c = \frac{3.60 E}{(\frac{f_c}{E})^2} \\
f_c \leq 170
\]

Placing the material as far as possible from the N.A.

Results in a 7" x 7" square

\[
A = 4(7) = 28 \\
I_x = I_y = \frac{7(7)^3}{12} - \frac{5(5)^3}{12} = 148.0 \\
I = \frac{148}{24} = 6.167
\]

\[
F = \frac{3.6 E}{(\frac{f_c}{E})^2} = \frac{3.6(1760000)}{1800^2/2.48} = \frac{1}{28} (3907200) = \frac{P}{A}
\]

\[
P = \frac{1}{28} (937728000) \text{ lbs}
\]

For \( L = 10' - 0" \):

\[
\frac{P}{f_c} = \frac{120}{2.48} = 48.4 < 170 \quad \text{OK}
\]

\[
P_{cr} = \frac{1}{120} (937728000) = 65120 \text{ lbs} \\
f_{y} = 1800(24) = 43200 \text{ lbs}
\]

For \( L = 20' - 8" \):

\[
\frac{P}{f_c} = \frac{248}{2.48} = 100 < 170 \quad \text{OK}
\]

\[
P_{cr} = \frac{1}{248^2} (937728000) = 15246 \text{ lbs} < 43200
\]

For \( L = 30' - 0" \):

\[
\frac{P}{f_c} = \frac{360}{2.48} = 145.2 < 170 \quad \text{OK}
\]

\[
P_{cr} = \frac{1}{360^2} (937728000) = 7235 \text{ lbs} < 43200
\]