

Fermilab

**Particle Physics Division
Mechanical Department Engineering Note**

Number: MD-ENG-527

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Project Internal Reference:

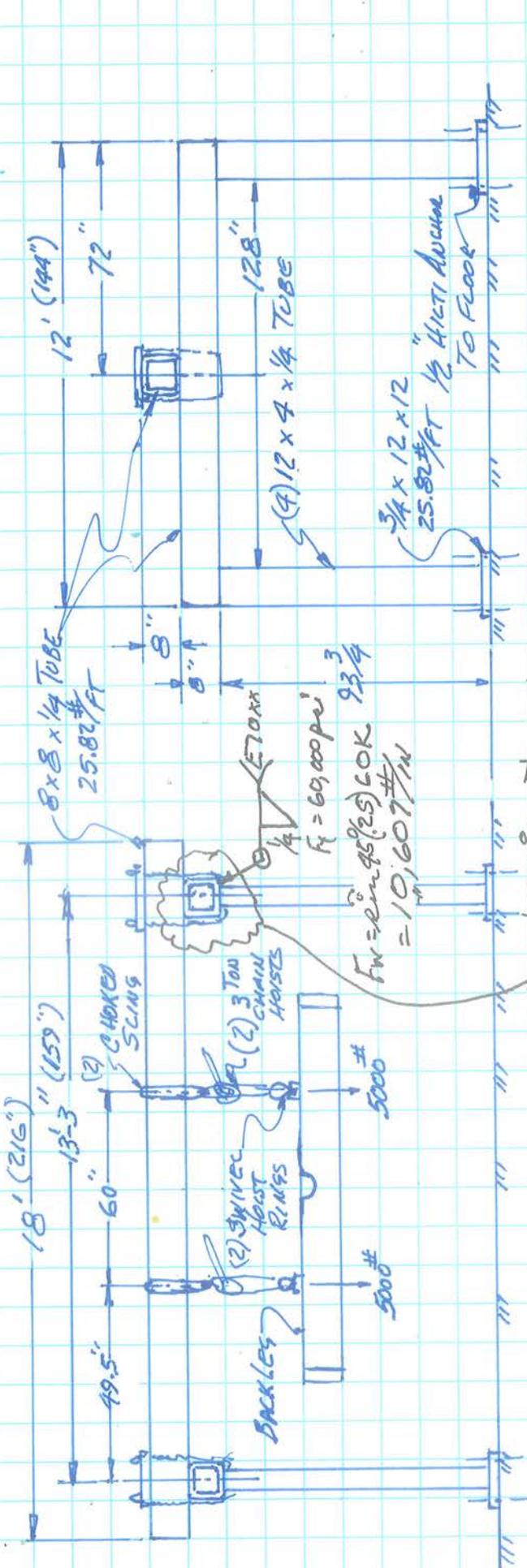
Project: G-2 MUON

Title: BACK LEG TEMPORARY SUPPORT

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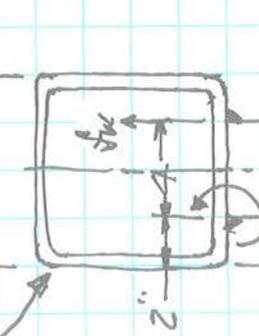
DESCRIPTION: STRUCTURE SUSPENDS BACK LEG WHILE
LOWER YOKE IS BEING MOVED AND
LOCATED BELOW.



12" x 4" x 1/4" TUBE (VERTICAL COLUMN)
 $I_x = 127$, $I_y = 22.3$, $A = 7.59$
 $Q = \frac{46,000 \times 93}{3 \times 7^2 \times 29 \times 10^6} = .963$ $f_y = 1.71$
 $\frac{Q}{k} = \frac{.963}{1.71} = .29 < 2 \Rightarrow$ USE JOHNSON

$P_{CR} = 7,59 \times 46 \times 10^3 \left(1 - \frac{.963}{9 \times 1.71^2}\right)$
 $= 335,319$ # TO FAILURE
 TOTAL FEASIBLE LOAD ON ONE COLUMN
 $P = \frac{18 \times 25.82}{2 \times 2} = 10,426$
 $F.S. = \frac{335,319}{10,426} = 32.2$

8" x 8" x 1/4" x 18' TUBE
 $I = 75.1$
 $Q_{@LOAD} = \frac{49.5 \times 5000 \times 4}{75.1} = 13,182$ psi
 $F.S. = \frac{46,000}{13,182} = 3.5$
 $Q_{MAX @ LOWS} = \frac{5000 \times 49.5^2 (3 \times 159 - 4 \times 49.5)}{6 \times 29 \times 10^6 \times 75.1} = 2.62$
8" x 8" x 1/4" x 12' TUBE
 $Q = \frac{5000 \times 128 \times 4}{4 \times 75.1} = 8522$ psi
 $F.S. = \frac{46,000}{8522} = 5.4$
 $Q_{@LOW} = \frac{5000 \times 128^2}{40 \times 29 \times 10^6 \times 75.1} = .100$



$F_w = 60,000$ psi
 $F_w = \frac{2 \times 10,426}{4 \times 12} = 434$ #/in
 $F.S. = \frac{F_w}{\sigma_w} = \frac{10,607}{434} = 24.4$

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