Fermilab

Particle Physics Division

Mechanical Department Engineering Note

Number: MD-ENG-535 Date: 11/06/2014

Project:---------- G-2 MUON

Project Internal Reference:

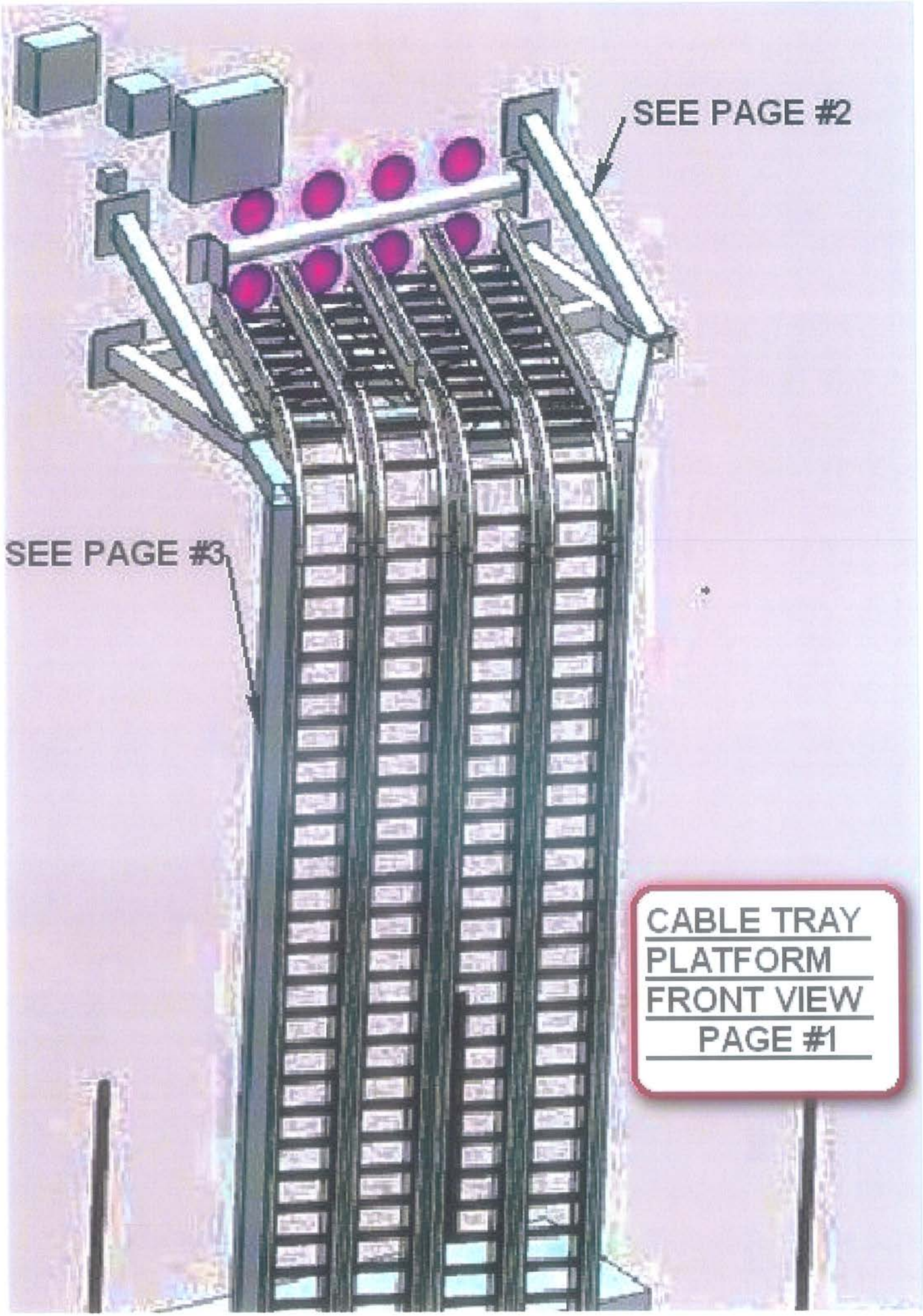
Title: ----------CABLE TRAY SUPPORT PLATFORM

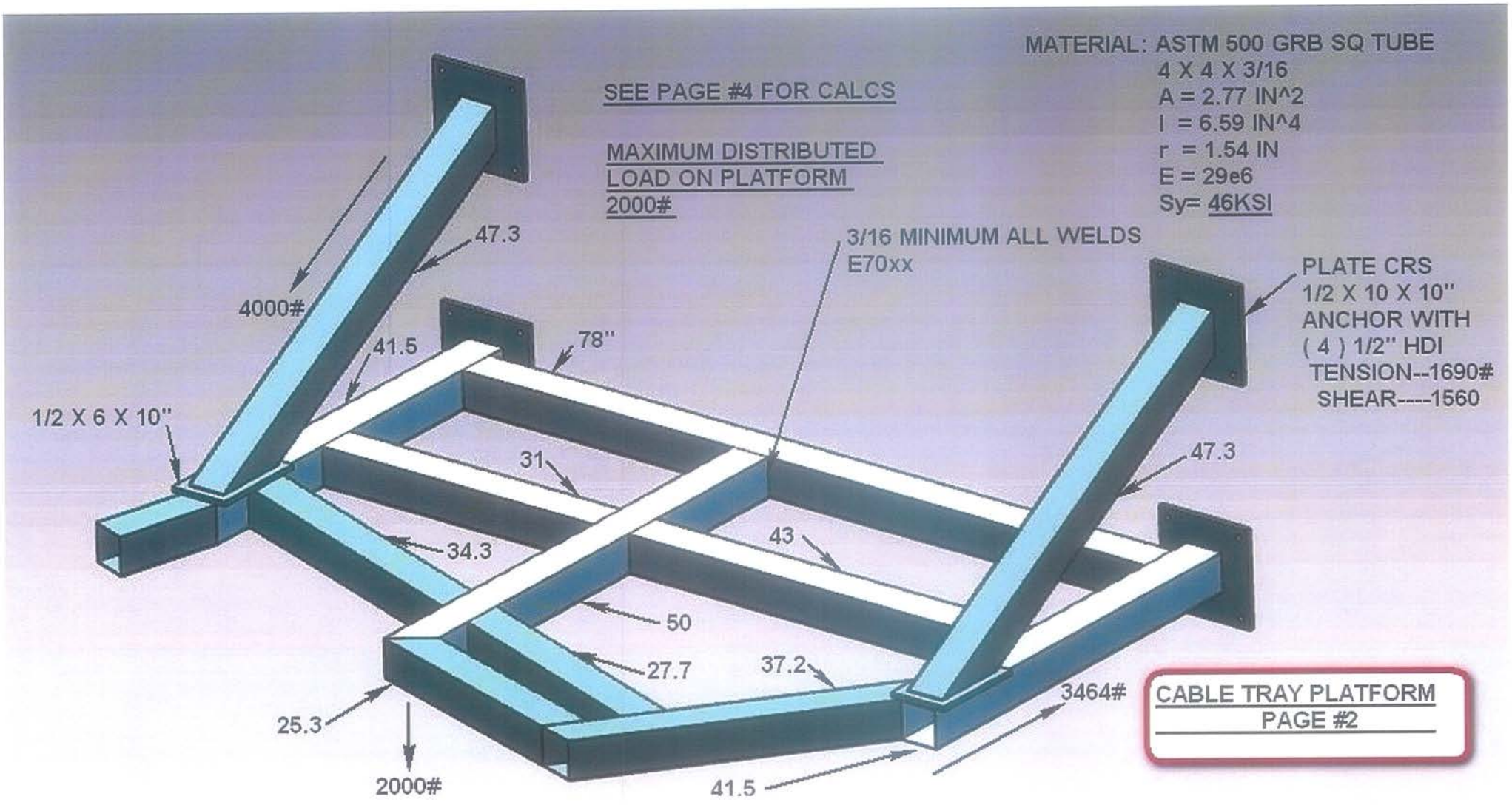
Author(s): ----------VILLEGAS

Reviewer(s): Bob Wands

Abstract/Summary:---------CABLE TRAY PLATFORM IS DESIGNED TO SUPPORT TRAY AND CABLES AS THEY EXIT FROM THE WEST WALL TOWARD THE CENTER OF THE MAGNET

APPLICABLE CODE:------MANUAL OF STEEL CONSTRUCTION

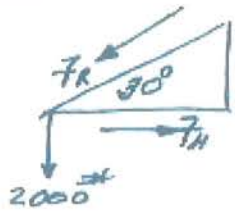

SEE PAGE #2
SEE PAGE #3
CABLE TRAY
PLATFORM
FRONT VIEW
PAGE #1


MATERIAL: ASTM 500 GRB SQ TUBE
4 X 4 X 3/16
A = 2.77 IN^2
I = 6.59 IN^4
r = 1.54 IN
E = 29e6
Sy= 46KSI
SEE PAGE #4 FOR CALCS
MAXIMUM DISTRIBUTED
LOAD ON PLATFORM
2000#
3/16 MINIMUM ALL WELDS
E70xx
PLATE CRS
1/2 X 10 X 10"
ANCHOR WITH
(4) 1/2" HDI
TENSION--1690#
SHEAR----1560
47.3
4000#
41.5
78"
1/2 X 6 X 10"
31
47.3
43
34.3
50
27.7
37.2
3464#
25.3
2000#
41.5
CABLE TRAY PLATFORM
PAGE #2

60.5"
CABLE TRAY PLATFORM
VERTICAL COLUMNS
PAGE #3

FERMILAB ENGINEERING NOTE	SECTION	PROJECT g-2 MUON	SERIAL-CATEGORY	PAGE 4
SUBJECT CABLE TRAY PLATFORM SQ TUBING, ASTM 500 GRB		NAME VILLEGAS	DATE 11/06/2014	REVISION DATE

TENSION ON 47.3" BRACE



$$T_R = \frac{2000^{\#}}{\sin 30^\circ} = 4000^{\#}$$ {ASSUMES MAX. LOAD ON SINGLE MEMBER

$$\sigma = \frac{4000^{\#}}{(4^2 - 3.625^2)} = \underline{1{,}399 \text{ psi}} < S_Y$$

COMPRESSION ON 41.5" MEMBER

$$T_H = \frac{2000^{\#}}{\tan 30} = 3{,}464^{\#}$$

$$\sigma = \frac{3{,}464^{\#}}{(4^2 - 3.625^2)} = \underline{1{,}211 \text{ psi}}$$ ON 41.5" LG. MEMBER.

$$\sigma = \frac{2000^{\#}}{(4^2 - 3.625^2)} = 699 \text{ psi}$$ ON 60.5" MEMBER

COMPRESSION ON LONGEST UNBRACED VERTICAL COLUMN

USE MANUAL OF STEEL CONSTRUCTION

COLUMN LENGTH = 60.5" (UNBRACED)

$$\frac{b}{t} = \frac{4}{.188} = 21.3 < \frac{238}{\sqrt{46}} = 35.1 \text{ (NON-COMPACT)}$$

$$\frac{Kl}{12r} = \frac{2 \times 60.5}{12 \times 1.54} = 6.5 < C_c = \sqrt{\frac{2\pi^2 29 \times 10^6}{46 \times 10^3}} = 112$$

$$\sigma_A = \frac{\left[1 - \frac{(Kl/r)^2}{2C_c^2}\right] S_Y}{5/3 + \frac{3(Kl/r)}{8C_c} - \frac{(Kl/r)^3}{8C_c^3}} = 27{,}199 \text{ psi} >$$ STRESSES SHOWN ABOVE

MAX. LOAD ON 3/16 WELDS

$$f_w = \sin 45^\circ (.188)\, 4000^{\#} / 2 \times 4 = \underline{66.5^{\#}/\text{IN}}$$

ALLOWED LOAD ON 3/16 WELD

$$F_w = .3 \times 72{,}000 \times \sin 45^\circ \times .188 = \underline{2{,}871^{\#}/\text{IN}}$$