



Particle Physics Division

Mechanical Department Engineering Note

Number: MD-ENG-546

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Project: Seaquest

Project Internal Reference:

Title: Station I Cantilever Support Beam Extension

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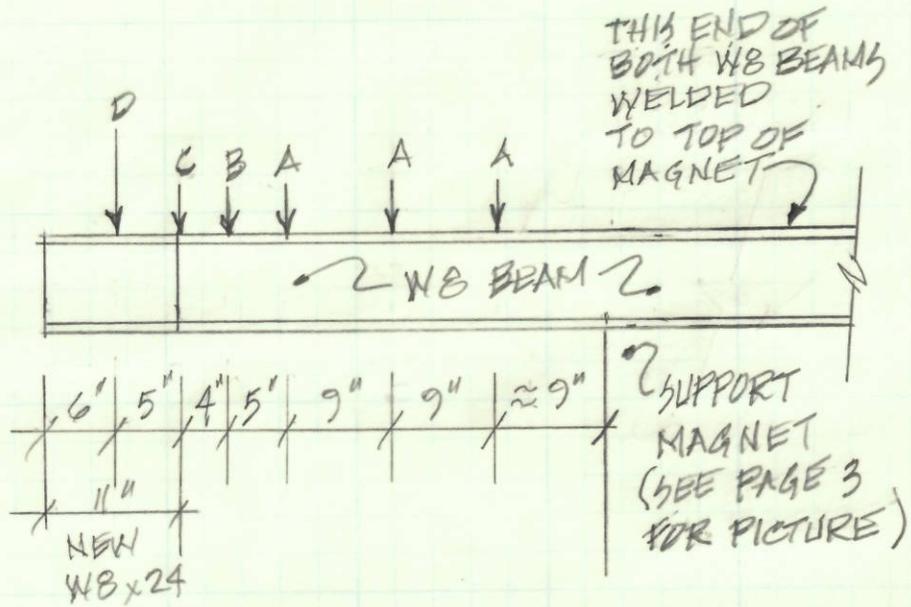
Reviewer(s): *Giuseppe Sola*

Key Words:

Abstract/Summary:

Station I wire chamber needs to be removed for repair. Old Station I wire chamber will be going back in while New Station I wire chamber is being repaired. The existing cantilever support beams need to be extended to support both chambers at the same time.

Applicable Codes: *Manual of Steel Construction, ASD*, Ninth Edition, American Institute of Steel Construction, Inc. 1989



LOADS:

$$A = 50\# \text{ CHAMBER} + 20\# \text{ CABLES} = 70\#$$

$$B = 50\# \text{ CHAMBER} + 20\# \text{ CABLES} = 70\#$$

$$C = 50\# \text{ CHAMBER} + 26\# \text{ CABLES} = 76\#$$

$$D = 1000\# \text{ CHAMBER} + \text{CABLES} = 1000\#$$

TOTAL BEAM MOMENT WITH 11" EXTENSION:

$$M = 9" \times (70)\# + 18" \times (70)\# + 27" \times (70)\# + 32" \times (70)\# + 36" \times (76)\# + 41" \times (1000)\#$$

$$= 49,756 \#-IN$$

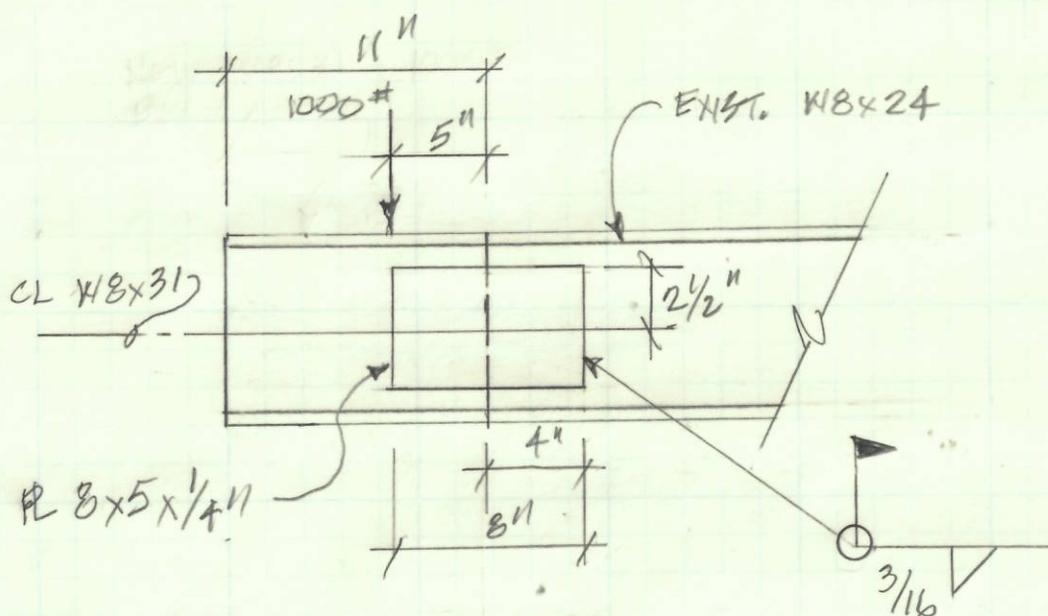
$$s_x = 20.9" \quad \therefore f_b = \frac{49,756}{20.9} = 2381 \text{ PSI}$$

$$f_b = \frac{12 \times 10^3 \text{ G}}{2d/A_F} = \frac{12 \times 10^3 (1.0)}{47 (3.05)} = 83.7 \quad (\text{AISC F1-8 P 547})$$

$$\therefore \text{USE } 0.60 (36) = 21.6 \text{ KSI} = 21,200 \text{ PSI} > 2381$$

OK

BEAM EXTENSION:



SHEAR:

$$P = 1000 + 31 = 1031 \#$$

$$1031 / 5(0.25) = 825 \# / \text{IN}^2$$

$$h/t_w = 5 / 0.25 = 20 < 380 / \sqrt{36} \quad (\text{AISC F4-1 p 5-49})$$

$$\therefore F_v = 0.40 F_y = 0.40(36) = 14.4 \text{ KSI}$$

$$= 14,400 \text{ psi} > 825$$

OK

WELD:

$$\text{TENSION} = \text{COMPRESSION} = M / 5 = 1031(5) / 5 = 1031 \#$$

$$\text{FOR } 3/16 \text{ WELD, } F_v = 0.3(0.707)(3/16)(70) = 2.78 \text{ K/IN}$$

$$\text{FOR } 4 \text{ LONG WELD } F_v = 4(2.78) = 11.1 \text{ K} = 11,100 \#$$

$$71031 \# \text{ OK}$$



WELD ANCHORING OPPOSITE END
OF W8 BEAM TO TOP OF
SUPPORTING MAGNET