



Particle Physics Division

Mechanical Department Engineering Note

Number: MD-ENG-315

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Project: LAR TPC

Project Internal Reference:

Title: 500# Capacity Trolley Lift

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Key Words: LAr, TPC, Trolley Lift, Support, 500#

Abstract/Summary:

An existing trolley lift for the LArTPC was supported from the existing building roof beams in PC4. This note includes calculations that prove that the structural members, chosen in the preliminary design, will safely support the intended load of 500 pounds or less. The Facilities Engineering Services Section (FESS) was consulted concerning the additional load applied to the existing roof beams and approval was given to attach to the building as designed.

From the unistrut catalog, page 123, trolley capacity is determined from wheel rpm. The maximum speed of travel for the trolley with a 500 pound load is limited to 31 feet per minute as calculated in this note.

One minor change from the preliminary design was required. The unistrut angles that attached the trolley rail to the P1001 unistrut supports were not approved in the unistrut catalog for the direction of the applied load. They were changed from P1068 brackets to P1026 brackets as shown in this note.

Applicable Codes:

Manual of Steel Construction, Allowable Stress Design, Ninth Edition, American Institute of Steel Construction, Chicago, Illinois 1989.

General Engineering Catalog, North American Edition No. 12, Unistrut Corporation, Wayne, Michigan, 1995.

FLARE LAR TANK
WORK PLATFORM

500# CAPACITY
TROLLEY LIFT

R. J. WOODY
JAN. 26, 2011

UNISTRUT TROLLEY = P2950 (PAGE 123)
CAPACITY = 600# @ 100 RPM > 500# LIFTED LOAD

$$\text{WHEEL } \phi = 1\frac{3}{16}''$$

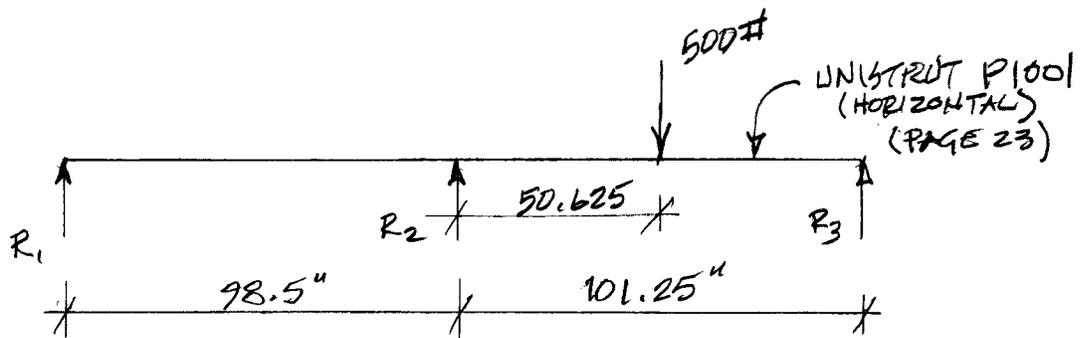
$$\text{1 REVLUTION} = \pi(1.1875) = 3.73''$$

$$100 R = 100(3.73) = 373'' = 31'$$

$$\text{MAX. SPEED} = 31 \text{ FT/MIN}$$

OK

RAIL :



$$R_{MAX} = 500\# = R_1, R_2, \text{ \& } R_3$$

$$M_{MAX} = \frac{13}{64} PL = \frac{13}{64}(500)(101.25) \quad (\text{AISC P. 2-306})$$
$$= 10,283 \#-IN$$

$$M_{MAX \text{ ALLOWABLE}} = 14,390 \#-IN > 10,283 \#-IN \quad \underline{\underline{OK}}$$

RAIL SUPPORT BEAMS :

$$\text{SPAN} = 101'' \quad P = 500\#$$

BEAM = UNISTRUT P1001 (PAGE 23)

$$M_{MAX} = \frac{PL}{4} = \frac{500(101)}{4} = 12,625 \#-IN < 14,390 \#-IN$$

OK

CONNECTION - RAIL TO SUPPORT BEAMS :

FROM FIELD INSPECTION, P1008 ANGLE BRACKETS ARE USED FOR THIS CONNECTION. THESE BRACKETS MUST BE CHANGED TO P1026 BRACKETS.

FROM UNISTRUT CATALOG P.81, P1026 BRACK ALLOW. LOAD = 1000# W/P1001 UNISTRUT. THIS IS GREATER THAN THE APPLIED LOAD OF 250# EA. OK

FLARE WARE TANK
WORK PLATFORM

500# CAPACITY
TROLLEY LIFT

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CHECK $\frac{1}{2}$ " ϕ BOLTS:

$$A_{\text{BOLT}} = \frac{\pi (d)^2}{4} = \frac{\pi (0.5)^2}{4} \\ = 0.1963 \text{ IN}^2$$

FOR GRADE 2 OR A307 BOLTS:

$$F_V = 10 \text{ KSI} \quad (\text{P. 4-5 AISC})$$

$$P_{\text{ALLOW}} = 10,000 (0.1963) \\ = 1963 \# > 250 \# \text{ OK}$$

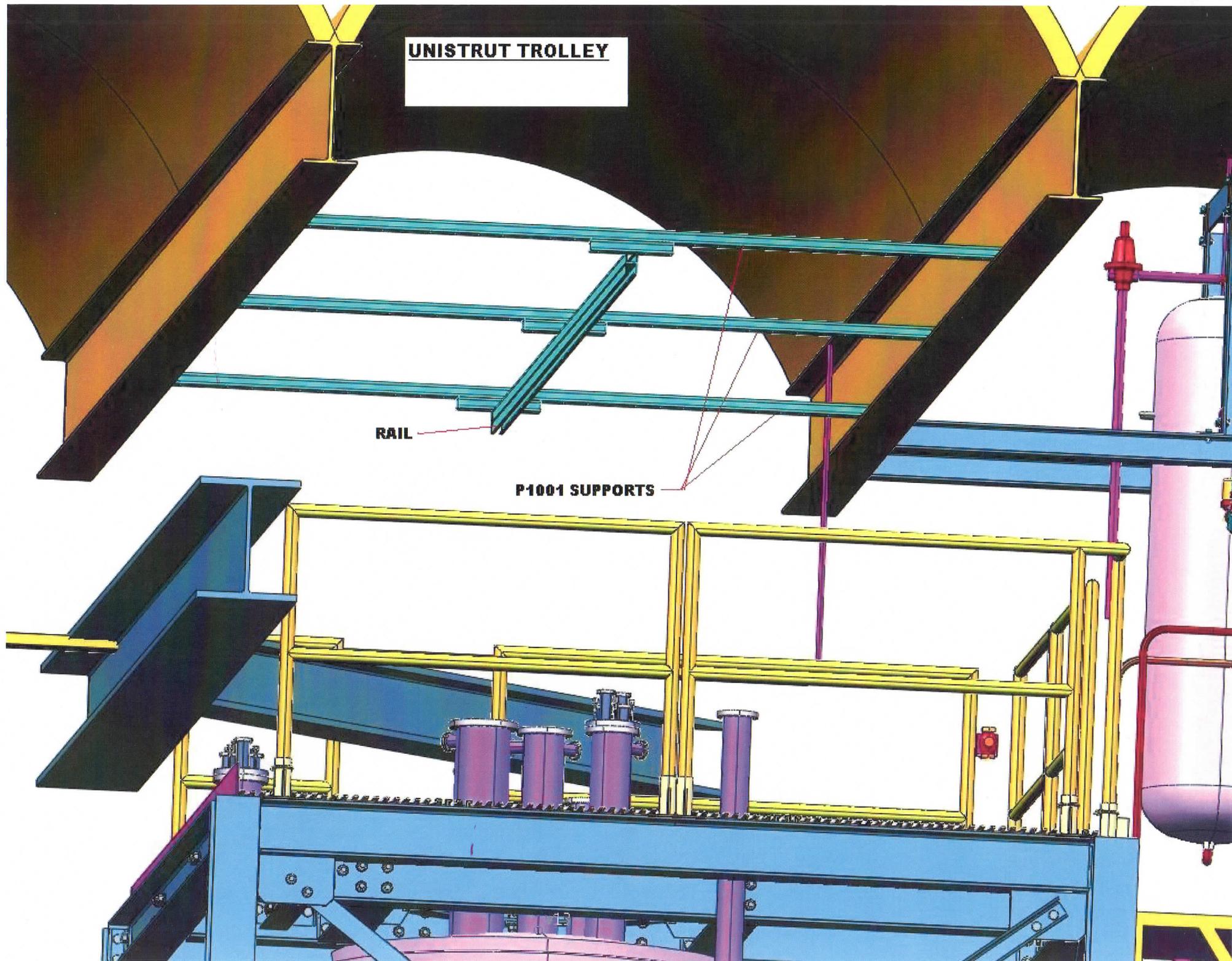
$$F_t = 20 \text{ KSI} \quad (\text{P. 4-3 AISC})$$

$$P_{\text{ALLOW}} = 20,000 (0.1963) \\ = 3926 \# > 250 \# \underline{\underline{\text{OK}}}$$

UNISTRUT TROLLEY

RAIL

P1001 SUPPORTS



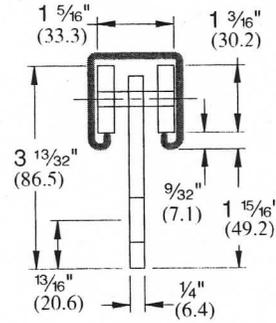
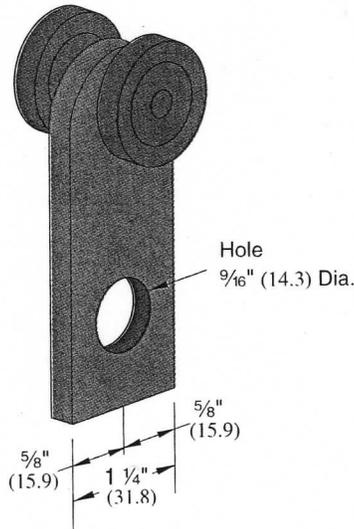
TROLLEY ASSEMBLIES

FOR 1-5/8" (41 MM) WIDTH SERIES CHANNEL



P2949

TROLLEY ASSEMBLY



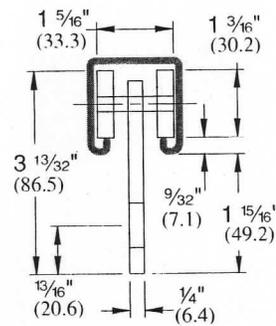
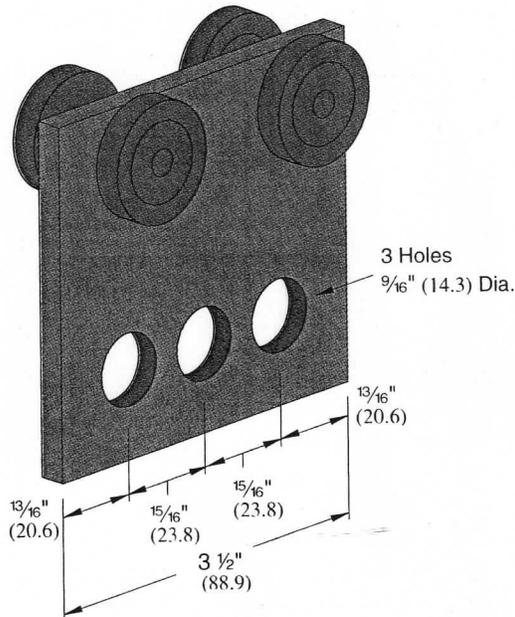
Wheel bearings are stainless steel. Do not lubricate.

Wt/C 46 Lbs (20.9 kg)

RPM	Design Load In P1000	
	Lbs	kN
600	150	.7
300	225	1.0
100	437	1.9

P2950

TROLLEY ASSEMBLY



Wheel bearings are stainless steel. Do not lubricate.

Wt/C 110 Lbs (49.9 kg)

RPM	Design Load In P1000	
	Lbs	kN
600	300	1.3
300	450	2.0
100	600	2.7

- 1-5/8" Channels
- Nuts & Hardware
- General Fittings
- Pipe/Conduit Supports
- Electrical Fittings
- Concrete Inserts
- 1-1/4" Framing System
- 13/16" Framing System
- Spec. Metals & Fiberglass
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