HNTB	The HNTB Companies Engineers Architects Planners	Made	KDG	Date	10/19/2011	Job Number	49633
		Checked	DSB	Date	10/19/2011		
For	Cleveland Innerbelt	Backchk'd	KDG	Date	10/19/2011	Sheet No.	

RFI 00121

There is a conflict between the drip plates on the Delta Legs and the walk ways that run down the delta leg.

The WT 4x24 members that support the walk way on the Delta Leg were originally designed with a maximum spacing of 12.125', and a maximum space of 2" for the edge of the flange to the walk way.

The actual maximum spacing of the supports is 10.125', and to clear the drip plates the walk way will need to be 3.5" from the edge of the flange.

Wt. of Grip Strut. =		7	PLF
P_DL =	=7 * 10.125=	70.875	LB
LL =		85	PSF
P_LL =	=85 * 10.125=	860.625	LB
Pu =	=1.25*P_DL+1.75* P_LL=	1594.688	LB
Mu =	=(3.5"+11.75"/2)*Pu =	14950	in-lb

Mu Required = 14950 in-lb < Mu used in design = 15750 in-lb

Therefore it is OK to move the walk way along the Delta Leg to clear the drip plate.

For DELTA GIRDER GRIP STRUTS	Job no. 49633	Sheet no.
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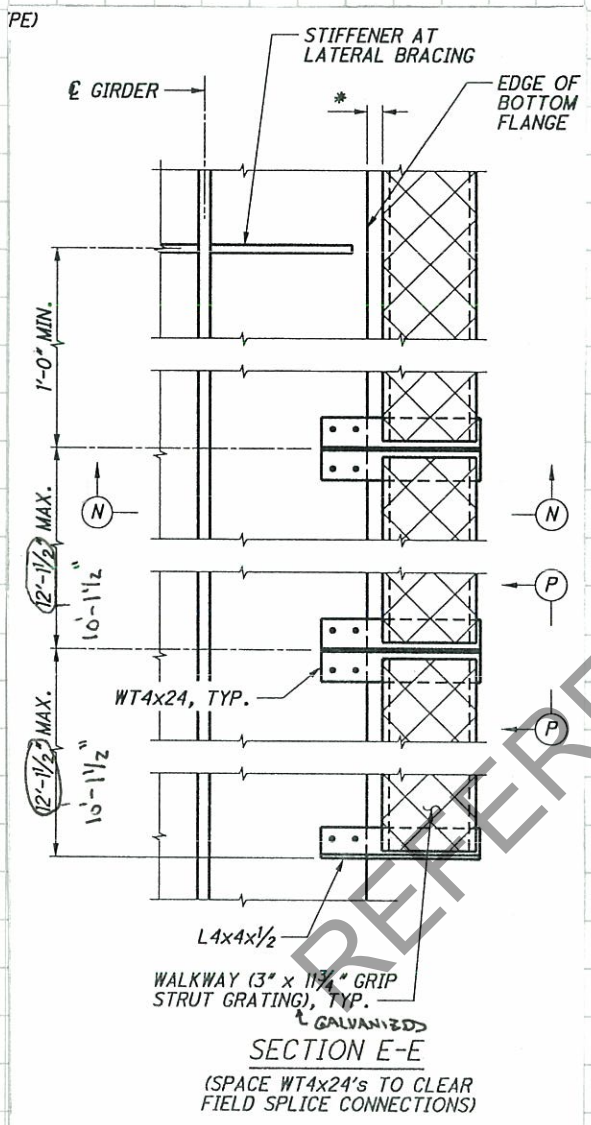
Date 4/15/11	Date 4/18/11	Date 5/1/11

HNTB

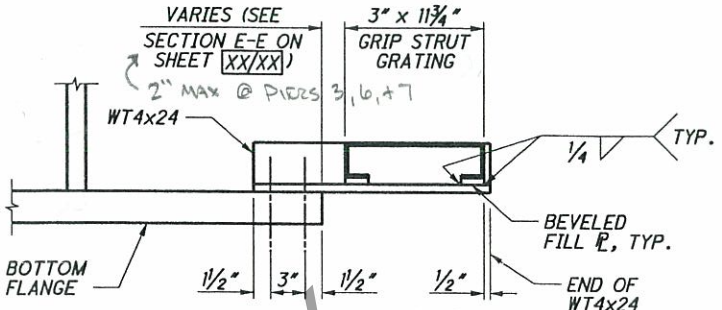
DESCRIPTION

CHECK GRIP STRUTS ALONG DELTA GIRDER BOTTOM FLANGE.

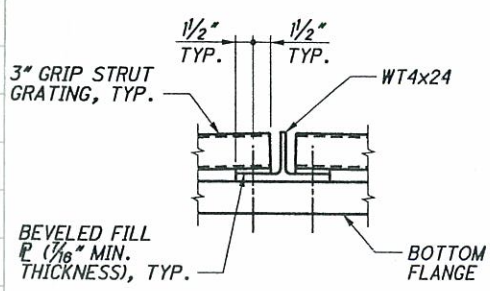


SECTION E-E

(SPACE WT4x24's TO CLEAR FIELD SPLICE CONNECTIONS)



SECTION N-N



VIEW P-P

DETERMINE LOADS TO WT4x24 SUPPORTS

MAX SPACING OF WT IS 12'-1½".

WT OF GRIP STRUT IS 7 PLF

$P_{DL\ STRUT} = (2)7(12.125)/2 = 84.8$ LB

LIVE LOAD ASSUME 85 PSF

$P_{LL} = 85(12.125) = 1030.6$ LB

$P_u = 1.25\,P_{DL} + 1.75\,P_{LL}$

$= 1.25(84.8) + 1.75(1030.6)$

$= 1909.55$ LB → SAY 2000 LB

$M_u = \left(2" + 11^{3/4}/2\right)(2000) = 15{,}750$ IN-LB

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WT 4×24 PROPERTIES

$A = 7.05\ in^2$ $\quad I_x = 6.85\ in^4$

$d = 4.25\ in$ $\quad S_x = 1.97\ in^3$

$t_w = 0.400\ in$ $\quad r_x = 0.986\ in$

$b_f = 8.11\ in$ $\quad Z_x = 3.94\ in^3$

$t_f = 0.685\ in$

FLANGE $\frac{b}{t} = \frac{\frac{8.11}{2} - \frac{0.400}{2}}{0.685} = \frac{3.855}{0.685} = 5.63$

$\lambda_p = 0.38\sqrt{E/F_y} = 0.38\sqrt{\frac{29000}{50}} = 9.15$

SINCE $b/t < \lambda_p$, FLANGE IS COMPACT

(AASHTO 6.12.2.2.4)

$M_n = M_p = F_y Z_x = 50(3.94) = 197^{\text{in-k}}$

LTB

$$M_n = \frac{\pi\sqrt{E I_y G J}}{L_b}\left[B + \sqrt{1+B^2}\right] \le M_p$$

$I_y = 30.5\ in^4$

$G = 0.385E = 0.385(29000) = 11165\ ksi$

$J = 0.977\ in^4$

$L_b = \text{USE } 2' + \frac{11\,3/4}{2} \approx 8'$

$B = \pm 2.3\frac{d}{L_b}\sqrt{\frac{I_y}{J}}$

* WHEN STEM OF TEE IS IN TENSION, USE (+) SIGN

$B = +(2.3)\frac{4.25}{8}\sqrt{\frac{30.5}{0.977}} = 6.827$

$$M_n = \frac{\pi\sqrt{29000(30.5)(11165)(0.977)}}{8}\left[6.827 + \sqrt{1+(6.827)^2}\right] \le 197^{\text{in}}$$

$= 529488 \not< 197 \quad \therefore \text{USE } M_n = M_p = 197^{\text{in-k}}$

$M_r = \phi_f M_n$

$= 1.00(197)$

$= 197^{\text{in-k}}$

$M_r = 197^{\text{in-k}} > M_u = 15.75^{\text{in-k}} \quad \therefore \text{OK}$

SHEAR (6.12.1.2.3)

$V_p = 0.58 F_{yw} D t_w$

$= 0.58(50)(4.25)(0.400)$

$= 49.3\ k$

$\frac{D}{t_w} = \frac{4.25}{0.40} = 10.625$

$1.12\sqrt{\frac{Ek}{F_{yw}}} = 1.12\sqrt{\frac{29000(5)}{50}} = 60.31$

$10.625 < 60.31 \rightarrow C = 1.0$

$V_n = V_{cr} = CV_p = 1.0(49.3) = 49.3$

$V_r = \phi_v V_n = 1.0(49.3) = 49.3\ k$

$V_r = 49.3\ k < V_u = 2.0\ k \quad \therefore \text{OK}$

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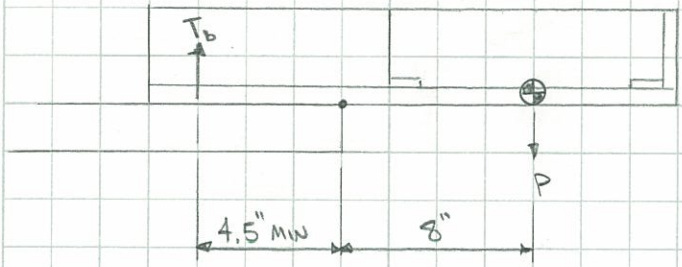
BOLTS

ASSUME INSIDE BOLTS RESIST ENTIRE MOMENT.



$$T_u = \frac{8"}{4.5"}(P) = \frac{8"}{4.5"}\left(\frac{24}{2\ \text{BOLTS}}\right)$$

$$= 1.8\ \text{K/BOLT}\ (T)$$

TRY USING 5/8" A325 FOR WT4X24 CONNECTION TO GIRDER BOTTOM FLANGE

TENSILE RESISTANCE (6.13.2.10)

$$T_n = 0.76\, A_b F_{ub}$$

$$= 0.76\,(0.31)(120)$$

$$= 27.98\ \text{K}$$

$$T_r = \phi_t T_n = 0.8(27.98) = 22.4\ \text{K/BOLT}$$

$$T_r = 22.4\ \text{K} > T_u = 2\ \text{K} \quad \therefore \text{OK}$$

USE 5/8" A325

USE MINIMUM GAGE PER MSC OF 5 1/2".

FOR GRIP STRUT, TRY 5 DIAMOND PLANK 11 3/4" WIDE. USE 12 GA. STEEL.

FROM MCNICHOLS PRODUCT LOAD TABLE, THIS SUPPORTS A UNIFORMLY DISTRIBUTED LOAD UP TO 2277 PSF.

2277 >> 85 PSF PEDESTRIAN LOAD

OK

USE 12 GA. 5 DIAMOND PLANK 11 3/4" WIDE. SEE MCNICHOLS CUT SHEET FOR DETAILS. THIS PRODUCT COMES IN 10' LENGTHS, SO SPACING OF WT SUPPORTS MUST ACCOMODATE THIS.

MATERIAL: MILL-GALV. ASTM A525

ITEM #: 2405301210