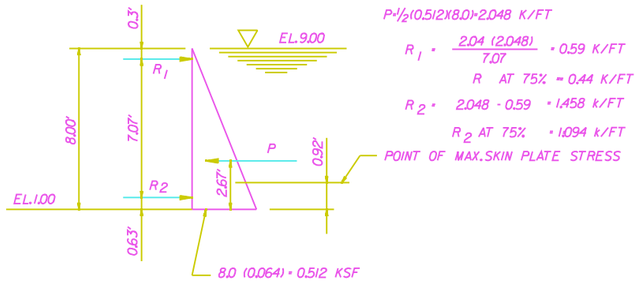
LOADING

LOAD CASE = SW + 2" (133% LAOD CASE)



P = 1/2 (0.512 x 8.0) = 2.048 K/FT

$R_1 = \frac{2.04\ (2.048)}{7.07} = 0.59$ K/FT

R AT 75% = 0.44 K/FT

R_2 = 2.048 - 0.59 = 1.458 k/FT

R_2 AT 75% = 1.094 k/FT

POINT OF MAX. SKIN PLATE STRESS

SKIN PLATE

LOAD, w = 0.064 (4.0 - 0.93) = 0.196 K/FT

USE 5/16" MINIMUM THICKNESS OF SKIN PLATE

$S = \frac{bt^2}{6} = 0.1953\ in^3/FT$

MAXIMUM ALLOWABLE MOMENT = SF_b =

0.1953 (20.0) = 3.91 IN-K/FT = 0.3255 I-K/FT

INTERIOR SPAN, $M = \frac{1}{12} w\ell^2$

$\frac{1}{12} w\ell^2 = 0.3255$

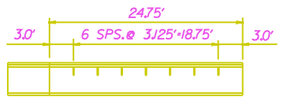
$\frac{1}{12} (0.196)\ell^2 = 0.3255$

ℓ = 4.46 FT (ALLOW. SPAN), USE 3.25 FT

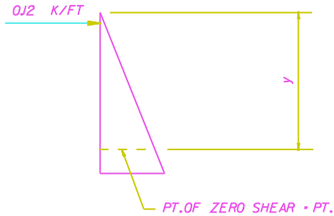
EXTERIOR SPAN, $M = \frac{1}{10} w\ell^2$

$\frac{1}{10} w\ell^2 = 0.3255$

ℓ = 4.08 FT (ALLOW. SPAN), USE 3.00 FT



VERTICAL STIFFENERS

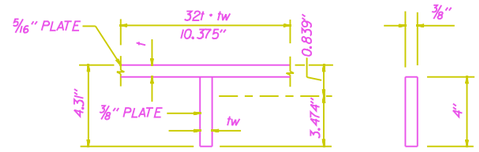


1/2 (0.064) y^2 = 0.12 K/FT

y = 1.94

MOMENT = 0.12 (1.94 - 0.30) - 1/6 (0.064) (1.94)

= 0.12 K/FT



EFFECTIVE FLANGE WIDTH

AISC 1.9.1.2

$\frac{95^k}{\sqrt{36{,}000}} = 16$

32 x 0.3125" = 0.375 = 10.375"

ITEM	AREA	y	Ay	Ay^2	Io
PLATE 10.375" x 5/16"	3.242	0.156	0.506	0.079	—
PLATE 4" x 3/8"	1.50	2.313	3.470	8.026	2
	4.742	(0.838)	3.976	8.105	2

$y = \frac{\Sigma Ay}{\Sigma A} = \frac{3.976}{4.742} = 0.839$

$I = I - \Sigma Ay^2 - (Ay \times y)$

$2 = 8.105 - (3.976 \times 0.839)$

$= 6.769\ in^4$

$S_{TOP} = \frac{I}{C_{TOP}} = \frac{6.769}{0.839} = 8.068^3$

$S_{BOT} = \frac{I}{C_{BOT}} = \frac{6.769}{3.474} = 1.949^3$

$f_s = \frac{M}{S_{BOT}} = \frac{(0.12)(3.125)(12)}{1.949} = 2.309$ ksi << allow = 20 ksi

GIRDERS

Span = Opening	Column Face to c/l Hinge	Column Face to c/l 1 1/2" Bearing Bar
Span = 24.0	1.08	0.60 = 24.68 '

TOP GIRDER

Try W14 x 34 (5/16" min thickness requirement)

Load, w = 0.12 k/ft

$M = \frac{1}{8} w\ell^2 = \frac{1}{8}(0.12 \times 24.68)^2 = 9.14$ ft-k

per AISC 1.5.1.4.1 and EM 1110 - 1 - 2101

$f_b = \frac{M}{S} = \frac{9.14(12)}{48.6} = 2.26$ ksi < 20.0 ksi, ok use W14 x 34

BOTTOM GIRDER:

Load, w = 0.39 k/ft

$M = \frac{1}{8} w\ell^2 = \frac{1}{8}(0.39 \times 24.68) = 29.69$ ft-k

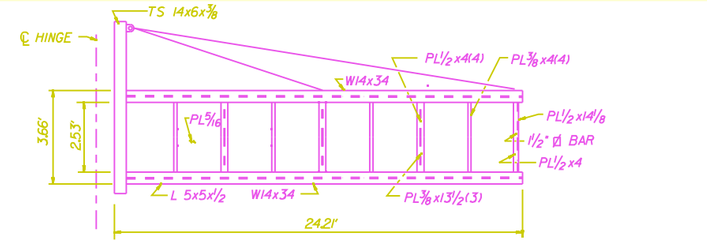
$S_{req'd} = \frac{M}{S} = \frac{29.69(12)}{20.0} = 17.81\ in^3$

DEFLECTION:

$\Delta_{max} = \frac{5w\ell^4}{384EI}$

$= \frac{5(0.39 \times 24.69 \times 24.69 \times 12)^3}{384(29 \times 10^3 \times 340)} = 0.33"$

$\Delta_{allow} = \frac{\ell}{360} = 0.82" < 0.33"$ OK USE WF14X34



ITEM	COMPUTATION	WEIGHT (LB)	x (FT)	wx (FT - LB)
5/16 PL	3.66x24.21x12.8	1134	12.77	14,481
W14x34	2x34x25.12	1708	12.77	21,811
PL 1/2 x14 1/2	3.1x24.65	76	24.88	1,891
PL 3/8 x13 1/2	3x3.1x17.21	160	12.77	2,043
PL 3/8 x4 (4)	4x3.1x5.10	63	12.77	805
PL 1/2 x4 (3)	3x2.53x6.8	52	12.77	664
PL 1/2 x4	2.53x6.8	17	24.88	423
L 5x5x1/2	24.21x16.2	392	12.77	5,006
1 1/2 in² Bar	3.66x7.65	28	24.88	697
WELD 1 1/4	0.21x(4x24.2+15x3.66)	32	12.77	409
SEAL		60	12.77	766
TS 14x6x3/8	10x47.9	479	1.0	479
			4.201	49,475

GATE DEAD WEIGHT

TUBING POST

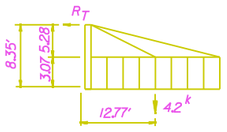
F_Y = 46ksi FS = 0.6xF_Y = 0.6x46 = 27.6 ksi

Try TS 14 x 6 x 3/8, S_X = 48.1 in^3 S_Y = 29.7 in^3

A.I.S.C. 1.9.2.2

$\frac{b}{t} = \frac{13.25}{0.375} = 35.3 < \frac{238}{\sqrt{Fy}} = \frac{238}{\sqrt{46}} = 36$

GATE WEIGHT FORCE



$R_T = \frac{4.2 \times 12.77}{8.35} = 6.4^k$

$M_Y = 6.4 \times 5.28 = 38.8^k$

$f_y = \frac{33.8 \times 12}{29.7} = 13.7$ ksi

WATER FORCE

F = 0.53 k

$M_x = 0.53 \times 5.28 = 2.8$ ft-k

$f_x = \frac{2.8 \times 12}{48.1} = 0.7$ ksi

COMBINED STRESS

$f = \frac{0.7}{27.6} + \frac{13.7}{27.6} = 0.03 \quad 0.5 + 0.53 < 1.0$

C·A·D

LAKE PONTCHARTRAIN, LA. AND VICINITY
HIGH LEVEL PLAN
DESIGN MEMORANDUM NO. 20 GENERAL DESIGN
ORLEANS PARISH - JEFFERSON PARISH
17TH. STREET OUTFALL CANAL
(METAIRIE RELIEF)

SWING GATE DESIGN

U. S. ARMY ENGINEER DISTRICT, NEW ORLE
CORPS OF ENGINEERS

DATE MARCH 1990 FILE NO. H-2-30300

PLATE DD 1