


گزارش CALCULATION CABLE TRAY SUPPORT-ALT01		 Toplink
صفحه 1 از 8	تاریخ تهیه: 1397/09/18 ویرایش: 00	



Toplink

کارفرما: شرکت کاربرد کار

پروژه: همیلا

گزارش

**CALCULATION CABLE TRAY
SUPPORT-ALT01**

1- Loading

This document has been prepared to show for support analysis under dead loads and seismic loads.

Table 1- Load Cases

#	Load Case Type	Name in Model
1	Dead Load	DEAD
2	Live Load	LIVE
3	Earthquake Load (X)	EX
4	Earthquake Load (Y)	EY
5	Earthquake Load (Z)	EZ

Table 2- Load Combinations

#	Load Combination
1	1.4 DEAD
2	1.2 DEAD + 1.6 LIVE
3	1.2 DEAD + 1.0 LIVE + EX + EZ
4	1.2 DEAD + 1.0 LIVE + EX - EZ
5	1.2 DEAD + 1.0 LIVE - EX + EZ
6	1.2 DEAD + 1.0 LIVE - EX - EZ
7	1.2 DEAD + 1.0 LIVE + EY + EZ
8	1.2 DEAD + 1.0 LIVE + EY - EZ
9	1.2 DEAD + 1.0 LIVE - EY + EZ
10	1.2 DEAD + 1.0 LIVE - EY -EZ
11	0.9 DEAD + EX + EZ
12	0.9 DEAD + EX - EZ
13	0.9 DEAD - EX + EZ
14	0.9 DEAD - EX - EZ
15	0.9 DEAD + EY + EZ
16	0.9 DEAD + EY - EZ
17	0.9 DEAD - EY + EZ
18	0.9 DEAD - EY - EZ
19	1.2 DEAD + 1.0 LIVE + 0.3 EX + EY+EZ
20	1.2 DEAD + 1.0 LIVE + 0.3 EX - EY+EZ
21	1.2 DEAD + 1.0 LIVE - 0.3 EX + EY+EZ
22	1.2 DEAD + 1.0 LIVE - 0.3 EX - EY+EZ
23	1.2 DEAD + 1.0 LIVE + EX + 0.3 EY+EZ
24	1.2 DEAD + 1.0 LIVE + EX - 0.3 EY+EZ
25	1.2 DEAD + 1.0 LIVE - EX + 0.3 EY+EZ
26	1.2 DEAD + 1.0 LIVE - EX - 0.3 EY+EZ
27	1.2 DEAD + 1.0 LIVE + 0.3 EX + EY-EZ
28	1.2 DEAD + 1.0 LIVE + 0.3 EX - EY-EZ
29	1.2 DEAD + 1.0 LIVE - 0.3 EX + EY-EZ

30	1.2 DEAD + 1.0 LIVE - 0.3 EX - EY-EZ
31	1.2 DEAD + 1.0 LIVE + EX + 0.3 EY-EZ
32	1.2 DEAD + 1.0 LIVE + EX - 0.3 EY-EZ
33	1.2 DEAD + 1.0 LIVE - EX + 0.3 EY-EZ
34	1.2 DEAD + 1.0 LIVE - EX - 0.3 EY-EZ

Seismic Laods: Code 2800 – Chapter4

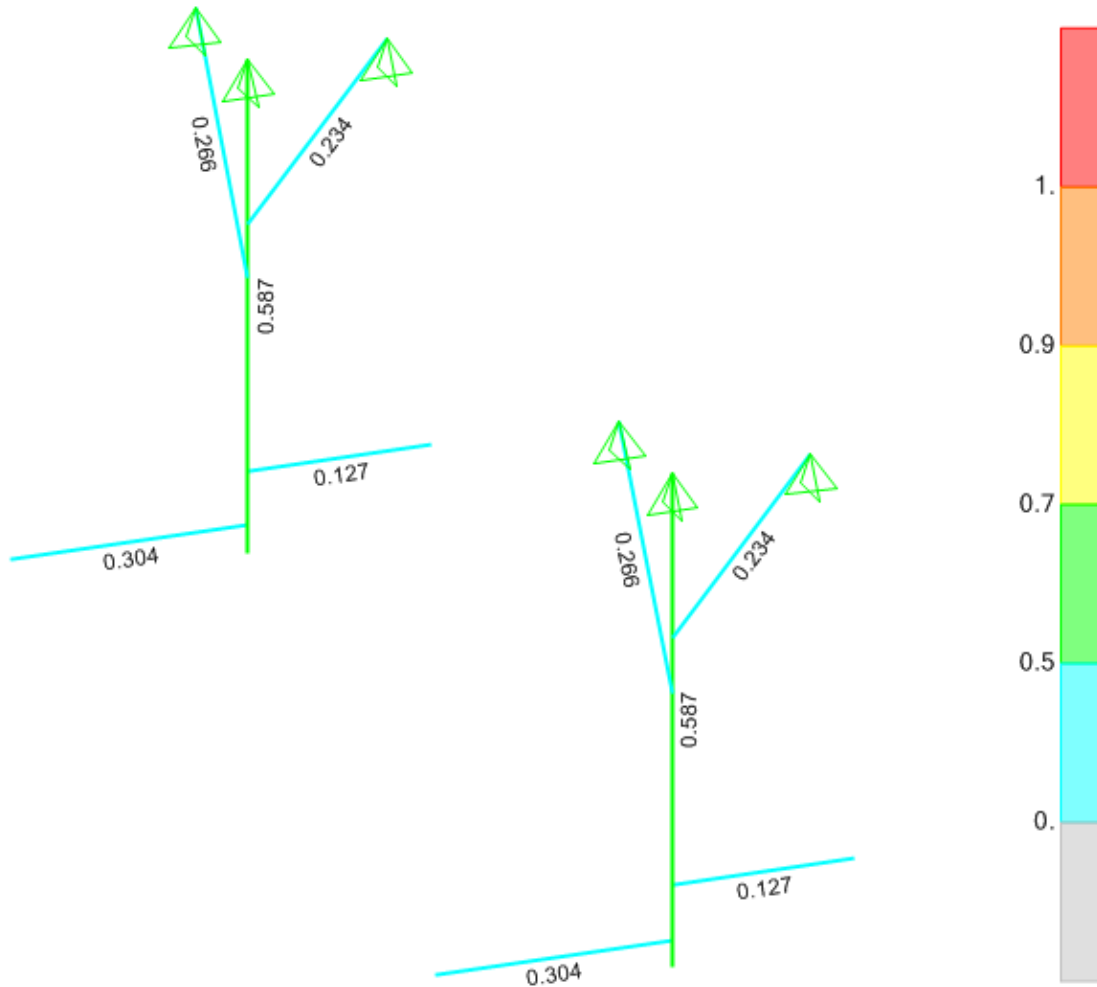
$$0.3(1 + S)I_P W_P \leq V_{Pu} = \frac{0.4a_p(1 + S)I_P W_P}{R_p} \left(1 + 2 \left(\frac{Z}{H} \right) \right) = 0.6125 \leq 1.6(1 + S)I_P W_P$$

$$F_{Pu} = 0.2A(1 + S)I_P W_P = 0.245$$

Equipment		1	1
Type	Str	Tray	Tray
SPECIFICATION			
Name	Str	T-50	T-50
Width (cm)	-	30	40
DEAD LOAD			
Unit Weight (kg/m)	-	6	11
Frame Spacing (m)		2.0	2.0
Loading Width (cm)	-	30	40
Weight (kg)	10	12	22
Distributed Dead Load (kg/cm)	-	0.40	0.55
Point Dead Load (kg)	0	0	0
LIVE LOAD			
Point Live Load (kg)	-	-	-
SEISMIC LOADS			
Z (m)	68.8	68.8	68.8
H (m)	68.8	68.8	68.8
I _p	1.4	1.4	1.4
a _p	2.5	2.5	2.5
S	1.5	1.5	1.5
R _p	6	6	6
C _{min}	0.3675	0.3675	0.3675
C _{max}	5.6	5.6	5.6
C _{calc}	0.6125	0.6125	0.6125
C _x =C _y	0.6125	0.6125	0.6125
C _z	0.245	0.245	0.245


2- Modeling & Design According to AISI-LRFD96 (SAP2000)

The structure was modeled in SAP2000 V20.



Stress Ration, According to AISI-LRFD96

3- Manual Design of Support According to AISI-2012

گزارش		
CALCULATION CABLE TRAY SUPPORT-ALT01		
صفحه 5 از 8	تاریخ تهیه: 1397/09/18	ویرایش: 00

Design Basis:

Design basis is based on Load and Resistance Factor Design (LRFD) principles. The design shall be performed in accordance with following Equation:

$$R_u \leq \Phi R_n$$

- R_u =Required strength
- Φ =Resistance factor
- R_n =Nominal strength
- ΦR_n =Design strength

Abbreviations for Nominal Strength and Ultimate Applied Load:

- P_u : Applied factored compression
- P_n : Nominal axial compression strength
- T_u : Applied factored tension
- T_n : Nominal axial tensile strength
- V_u : Applied factored shear
- V_n : Nominal shear strength
- T_{Qu} : Applied factored torsion
- T_{Qn} : Nominal torsional strength
- M_u : Flexural applied factored moments
- M_n : Nominal flexural strength

Header	Description	Unit	
Section Specification	Member ID	-	Beam
	Section Name	-	
	Width	cm	3.50
	Height	cm	3.50
	Thickness	cm	0.12
	Hole Diameter Web 1	cm	1.1
	Hole Diameter Web 2	cm	3.50
	Iz	cm ⁴	2.92
	Iy	cm ⁴	2.52
	F _y	kg/cm ²	2350.00
	F _u	kg/cm ²	3750.00
	E	kg/cm ²	2000000.00
(T) TE Yiel din g in Cro SS	A _g	cm ²	1.44

	Rupture in Net Section (Away from Connection)	Φ_t	-	0.90	
		$T_n=A_gF_y$	kg	3384	
		$\Phi_t T_n$	kg	3045.6	
		A_n	cm ²	1.18	
		Φ_t	-	0.75	
		$T_n=A_nF_u$	kg	4425	
		$\Phi_t T_n$	kg	3318.8	
		Total	$\Phi_t T_n$	kg	3045.6
			T_u	kg	163.09
$R=T_u/\Phi_t T_n$	≤ 1		0.05		
(M) BENDING	Z-Axis-22	S_{eZ}	cm ³	1.67	
		Φ_b	-	0.90	
		$M_{nz}=S_{eZ}F_y$	kg.cm	3924.50	
		$\Phi_b M_{nz}$	kg.cm	3532.05	
		M_{uz}	kg.cm	924.87	
		$R=M_{uz}/\Phi_b M_{nz}$	≤ 1	0.26	
	Y-Axis-33	S_{eY}	cm ³	1.32	
		Φ_b	-	0.90	
		$M_{ny}=S_{eY}F_y$	kg.cm	3102.00	
		$\Phi_b M_{ny}$	kg.cm	2791.80	
		M_{uy}	kg.cm	1591.81	
		$R=M_{uy}/\Phi_b M_{ny}$	≤ 1	0.57	
(V) SHEAR	Z-Axis	A_v	cm ²	0.3432	
		Φ_v	-	0.95	
		h/t	-	29.16	
		F_v	kg/cm ²	1410.82	
		$V_{nz}=A_v F_v$	kg	483.92	
		$\Phi_v V_{nz}$	kg	435.53	
		V_{uz}	kg	32.37	
		$R=V_{uz}/\Phi_v V_{nz}$	≤ 1	0.07	
	Y-Axis	A_v	cm ²	0.6864	
		Φ_v	-	0.90	

		h/t	-	29.16
		F_v	kg/cm ²	1410.82
		$V_{ny}=A_v F_v$	kg	967.82
		$\Phi_v V_{ny}$	kg	967.82
		V_{uy}	kg	22.57
		$R=V_{uy}/\Phi_v V_{ny}$	≤ 1	0.02
(C) COMPRESSION	Spec.	A_g	cm ²	1.44
		Φ_c	-	0.85
	Elastic Flexural Stress	L	cm	40.00
		r_z	cm	1.42
		r_y	cm	1.32
		K	-	1.00
		$\lambda=KL/r_{min}$	-	64.39
		$F_{eF}=\pi^2 E/\lambda^2$	kg/cm ²	4760.94
		Torsional Buckling	A	cm ²
	L_t		cm	40.0
	r_0		cm	1.93
	C_w		cm ⁶	4.69
	G		kg/cm ²	769231.00
	K_t		-	1.00
	J		cm ⁴	6.897E-3
	ν		-	0.30
	$\lambda=KL/r$		-	36.33
	F_{eT}		kg/cm ²	8322.4
	Flexural-Torsional Buckling	$F_{FT}=F_{eF}.F_{eT}/(F_{eF}+F_{eT})$	kg/cm ²	3028.5
	Total	$F_e=\min\{F_{eF},F_{eT},F_{FT}\}$	kg/cm ²	3028.5
		$\lambda_c=(F_y/F_e)^{0.5}$	-	0.88
		F_n	kg/cm ²	1698
		$P_n=A_g F_n$	kg	2445
		$\Phi_c P_n$	kg	2078



		P_u	kg	101.36
			$R=P_u/\Phi_c P_n$	≤ 1
INTERACTION	V + M	$R=((M_{uy}/\Phi_b M_{ny})^2+(V_{uz}/\Phi_v V_{nz})^2)^{0.5}$	≤ 1	0.59
	T + M	$R=(M_{uy}/\Phi_b M_{ny})+(M_{uz}/\Phi_b M_{nz})+(T_u/\Phi_t T_n)$	≤ 1	0.62
	C + M	$R=(M_{uy}/\Phi_b M_{ny})+(M_{uz}/\Phi_b M_{nz})+(P_u/\Phi_c P_n)$	≤ 1	0.62
	V + M	$R=((M_{uz}/\Phi_b M_{nz})^2+(V_{uy}/\Phi_v V_{ny})^2)^{0.5}$	≤ 1	0.33

Connection Point (Horizontal to Vertical Profile) Loads		
Bolt Strength (Profile to Profile) Loads		
Shear Load	1	KN
Bolt Type	M10	-
Bolt No.	1	-
Shear Load on Single Bolt	0.31	KN
Recommended Load	12.81	KN
Safety Factor	41.3	OK
Tension Load on Single Bolt	1.56	KN
Recommended Load	17.59	KN
Safety Factor	11.27	OK
Connection Point (Bevel Profile to Vertical Profile) Loads		
Surface Lock Strength		
Slipping Load	1.6	KN
Bolt Type	M10	-
Bolt No.	2	-
Slipping Load on Single Surface Lock	0.8	KN
Recommended Slip Resistance	7	KN
Safety Factor	8.75	OK