

PENTAIR

TWO POST RACK

DES. **J. ROBERSON**

JOB NO. **11-1461**

DATE **6/17/15**

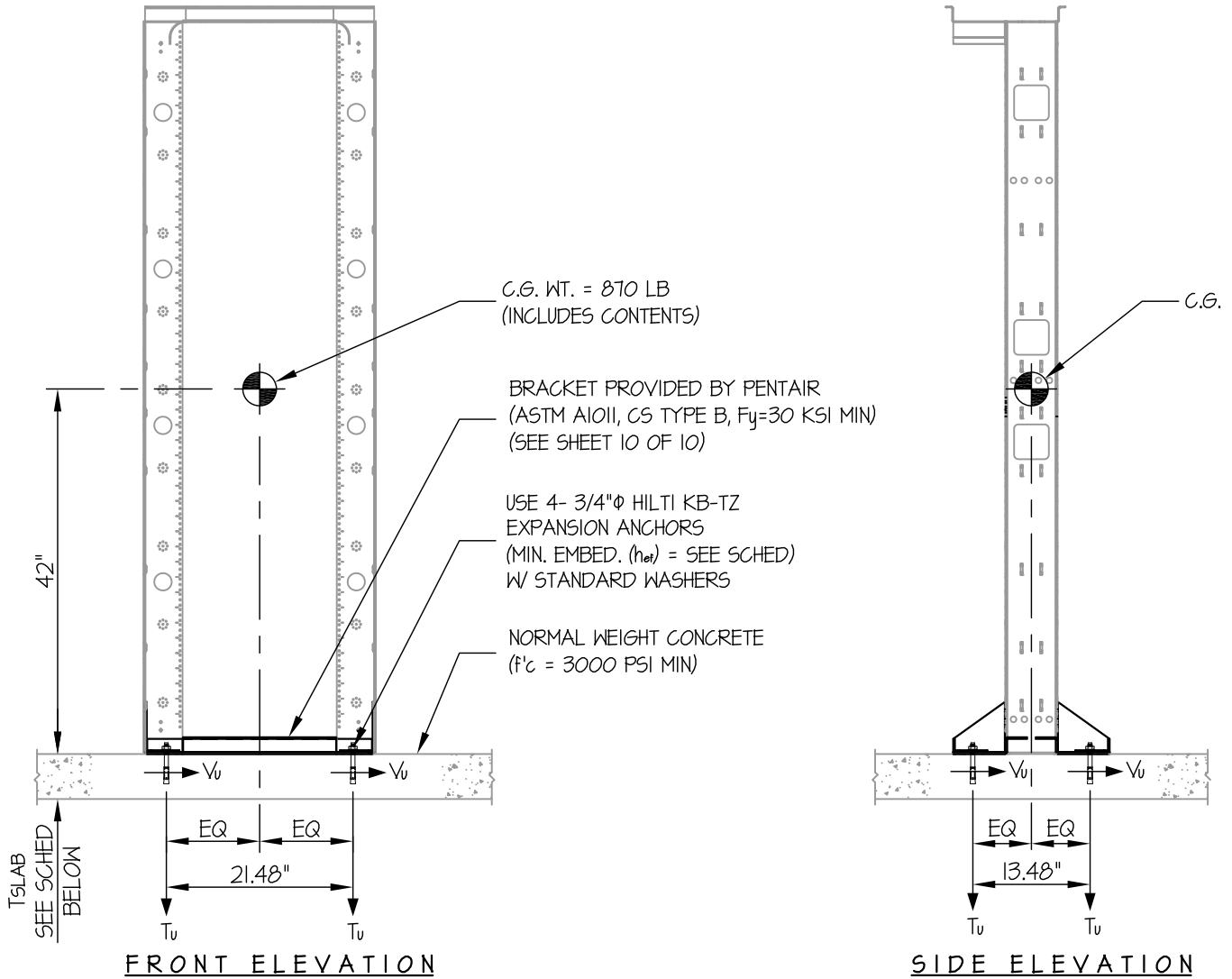
SHEET

4

OF **10** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

CONCRETE SLAB

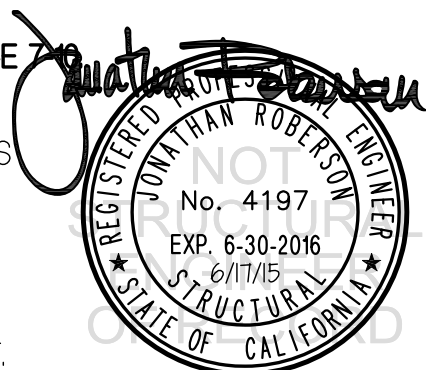


ANCHORS							
MAX Sds	TYPE	DIAM	EFF EMBED	QTY	TSLAB	* Tu	* Vu
170	HILTI KB-TZ	3/4"	3.75"	4	6"	2954	415
220	HILTI KB-TZ	3/4"	4.75"	4	8"	3894	539

* VALUES INCLUDE Ω_o

NOTES:

- FORCES ARE DETERMINED PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10. STRENGTH DESIGN IS USED. ($\alpha_p = 2.5, I_p = 1.5, R_p = 6.0, \Omega_o = 2.5, z/h = 0$)
- CENTER OF GRAVITY (C.G.) AND WEIGHT ARE THE GOVERNING PARAMETERS FOR DESIGN. THIS PREAPPROVAL ENCOMPASSES ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.
- STRUCTURAL ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT STRUCTURE DESIGNED TO SUPPORT WEIGHTS AND FORCES SHOWN IN COMBINATION WITH ALL OTHER LOADS THAT MAY BE PRESENT.



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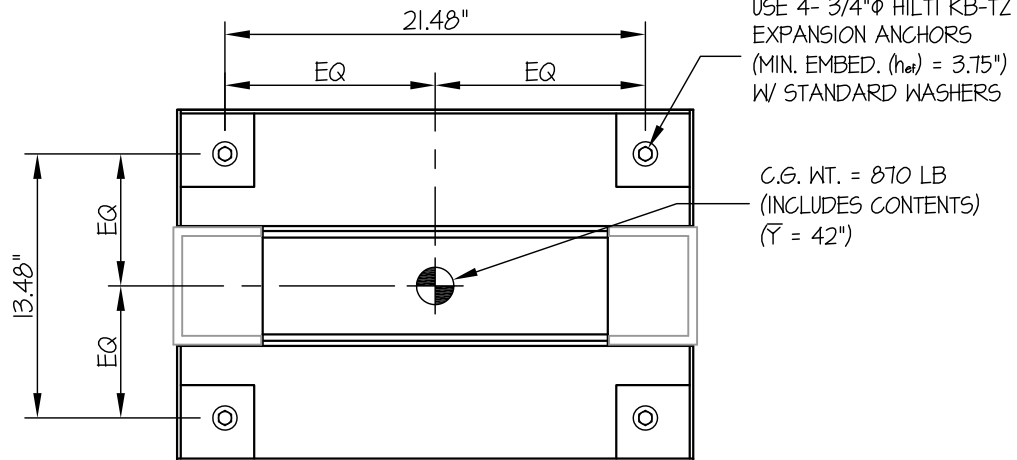
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SEISMIC SUPPORTS & ATTACHMENTS

MAX $S_{Ds} \leq 1.70$

CONCRETE SLAB



USE 4- 3/4" ϕ HILTI KB-TZ EXPANSION ANCHORS (MIN. EMBED. (h_{ef}) = 3.75") W/ STANDARD WASHERS

C.G. WT. = 870 LB (INCLUDES CONTENTS) ($\bar{Y} = 42"$)

PLAN AT BASE

LOADS: PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10.

STRENGTH DESIGN IS USED ($S_{Ds} = 1.70$, $a_p = 2.5$, $I_p = 15$, $R_p = 6.0$, $\Omega_0 = 2.5$, $z/h = 0$)

WEIGHT = 870 LB

HORIZONTAL FORCE (E_{mh}) = $1.91W_p = 1662$ LB

VERTICAL FORCE (E_v) = $0.34W_p = 296$ LB

BOLT FORCES:

BOLT SPECS: 3/4" ϕ HILTI KB-TZ ($h_{ef} = 3.75"$)

$\phi T = 0.75 \phi N_n = 3296$ LB/BOLT (TENSION)

$\phi V = \phi v_n = 7634$ LB/BOLT (SHEAR)

TENSION (T)

$$T_{u \text{ MAXIMUM}} = \left[\frac{1662\#(42")}{2 \text{ BOLTS } (21.48")} \times (0.3) \right] + \frac{1662\#(42")}{2 \text{ BOLTS } (13.48")} - \frac{870\#(0.9) - 296\#}{4 \text{ BOLTS}} = 2954 \text{ LB/BOLT (MAX)}$$

(HORIZ - SIDE TO SIDE) (HORIZ - FRONT TO BACK) (WEIGHT(0.9) - E_v)

SHEAR (V)

$$V_{u \text{ MAXIMUM}} = \frac{1662\#}{4 \text{ BOLTS}} = 415 \text{ LB/BOLT (MAX)}$$

UNITY CHECK:

$$\left(\frac{T_u}{\phi T} \right) + \left(\frac{V_u}{\phi V} \right) \leq 1.2 \left(\frac{2954}{3296} \right) + \left(\frac{415}{7634} \right) = 0.95 \leq 1.2 \therefore \text{O.K.}$$

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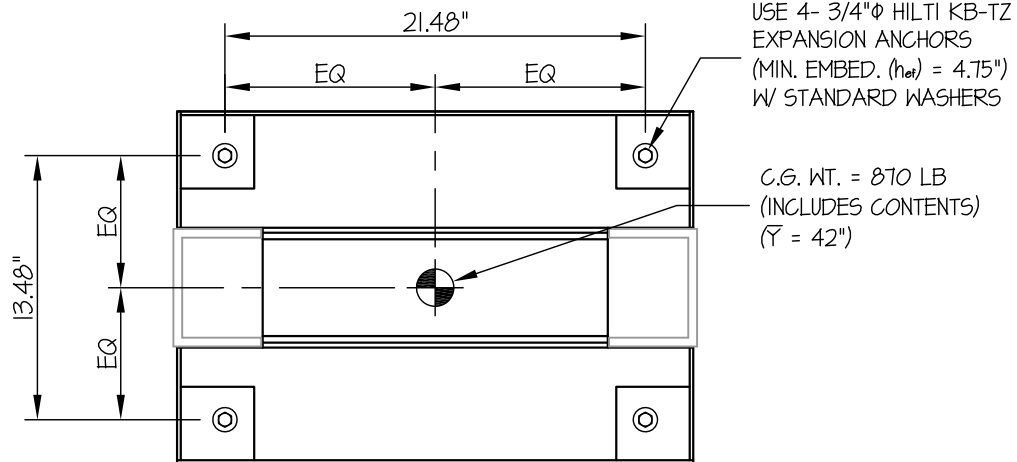
6

OF **10** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

1.70 < MAX S_{Ds} ≤ 2.20

CONCRETE SLAB



PLAN AT BASE

LOADS: PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10.

STRENGTH DESIGN IS USED ($S_{Ds} = 2.20$, $a_p = 2.5$, $I_p = 1.5$, $R_p = 6.0$, $\Omega_o = 2.5$, $z/h = 0$)

WEIGHT = 870 LB

HORIZONTAL FORCE (E_{mh}) = $2.48W_p = 2158$ LB

VERTICAL FORCE (E_v) = $0.44W_p = 383$ LB

BOLT FORCES:

BOLT SPECS: 3/4" ϕ HILTI KB-TZ ($h_{ef} = 4.75"$)

$\phi T = 0.75 \phi N_n = 4328$ LB/BOLT (TENSION)

$\phi V = \phi V_n = 7634$ LB/BOLT (SHEAR)

TENSION (T)

$$T_{u \text{ MAXIMUM}} = \left[\frac{2158\#(42")}{2 \text{ BOLTS } (21.48")} \times (0.3) \right] + \frac{2158\#(42")}{2 \text{ BOLTS } (13.48")} - \frac{870\#(0.9) - 383\#}{4 \text{ BOLTS}} = 3894 \text{ LB/BOLT (MAX)}$$

(HORIZ - SIDE TO SIDE) (HORIZ - FRONT TO BACK) (WEIGHT(0.9) - E_v)

SHEAR (V)

$$V_{u \text{ MAXIMUM}} = \frac{2158\#}{4 \text{ BOLTS}} = 539 \text{ LB/BOLT (MAX)}$$

UNITY CHECK:

$$\left(\frac{T_u}{\phi T} \right) + \left(\frac{V_u}{\phi V} \right) \leq 1.2 \left(\frac{3894}{4328} \right) + \left(\frac{539}{7634} \right) = 0.97 \leq 1.2 \therefore \text{O.K.}$$

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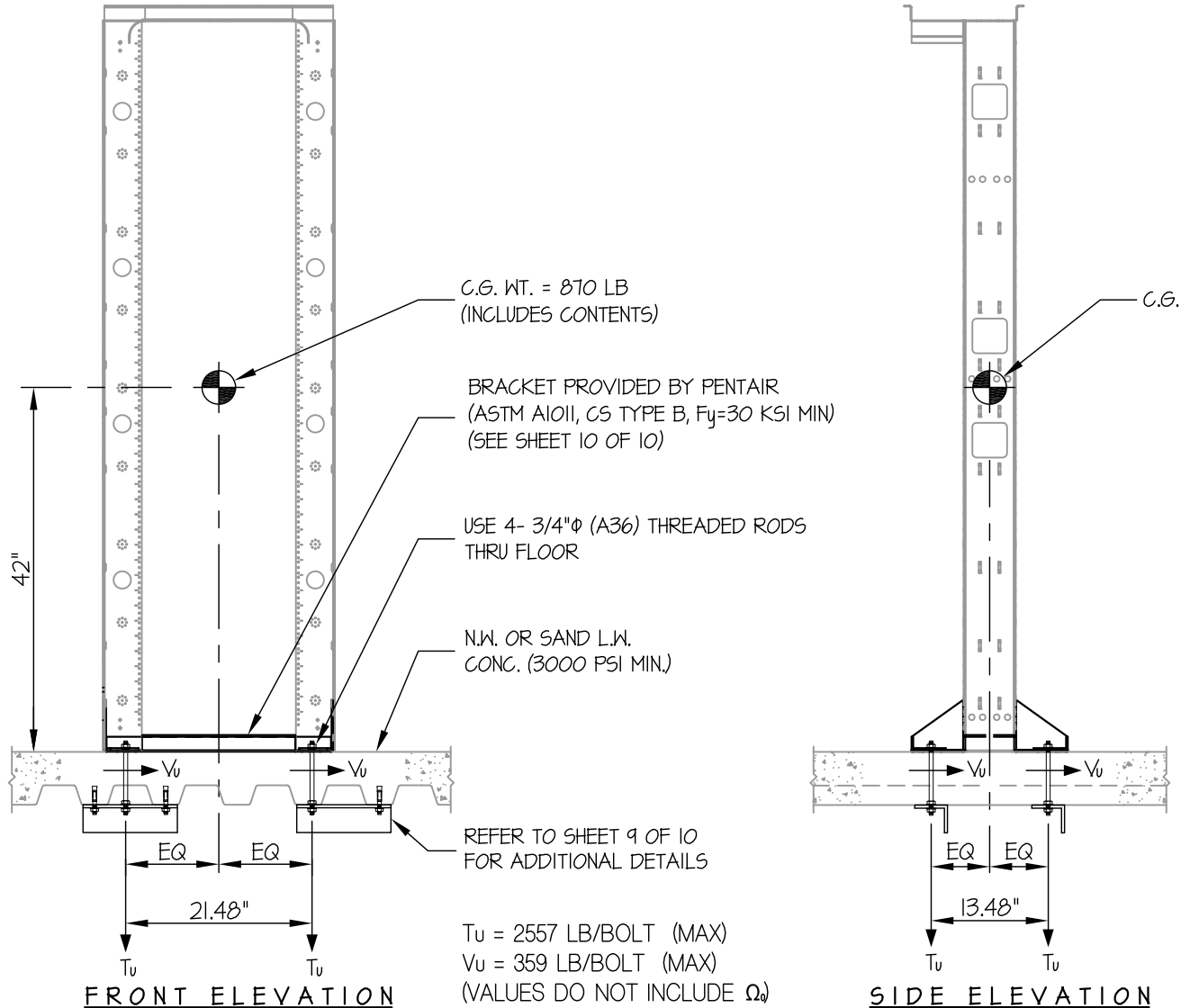
SHEET

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OF **10** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

CONCRETE SLAB ON METAL DECK



NOTES:

- FORCES ARE DETERMINED PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10.

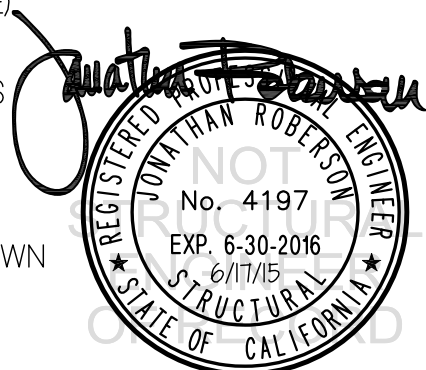
STRENGTH DESIGN IS USED. ($S_{Ds} = 2.20$, $a_p = 2.5$, $l_p = 1.5$, $R_p = 6.0$, $\Omega_o = 2.5$, $z/h \leq 1$)

HORIZONTAL FORCE (E_h) = $1.65 W_p$

HORIZONTAL FORCE (E_{mh}) = $4.13 W_p$ (FOR CONCRETE ANCHORAGE)

VERTICAL FORCE (E_v) = $0.44 W_p$

- CENTER OF GRAVITY (C.G.) AND WEIGHT ARE THE GOVERNING PARAMETERS FOR DESIGN. THESE CALCULATIONS ENCOMPASS ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.
- STRUCTURAL ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT STRUCTURE DESIGNED TO SUPPORT WEIGHTS AND FORCES SHOWN IN COMBINATION WITH ALL OTHER LOADS THAT MAY BE PRESENT.



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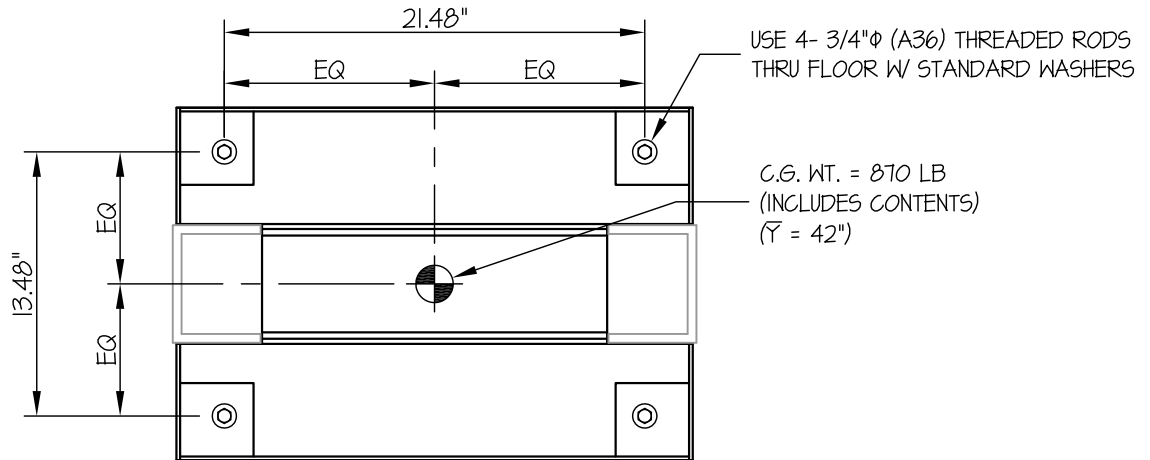
SHEET

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OF **10** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

CONCRETE SLAB ON METAL DECK



PLAN AT BASE

LOADS: PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10.

STRENGTH DESIGN IS USED ($S_{Ds} = 2.20$, $a_p = 2.5$, $I_p = 1.5$, $R_p = 6.0$, $\Omega_o = 2.5$, $z/h \leq 1$)

WEIGHT = 870 LB

HORIZONTAL FORCE (E_h) = $1.65W_p = 1436$ LB

HORIZONTAL FORCE (E_{mh}) = $4.13W_p = 3593$ LB

VERTICAL FORCE (E_v) = $0.44W_p = 383$ LB

BOLT FORCES:

BOLT SPECS: 3/4"φ (A36) THREADED ROD

φT = 14,420 LB/BOLT (TENSION)

φV = 7691 LB/BOLT (SHEAR)

TENSION (T)

$$T_{u \text{ MAXIMUM}} = \left[\frac{1436\#(42")}{2 \text{ BOLTS } (21.48")} \times (0.3) \right] + \frac{1436\#(42")}{2 \text{ BOLTS } (13.48")} - \frac{870\#(0.9) - 383\#}{4 \text{ BOLTS}} = 2557 \text{ LB/BOLT (MAX)}$$

(HORIZ - SIDE TO SIDE) (HORIZ - FRONT TO BACK) (WEIGHT(0.9) - E_v)

SHEAR (V)

$$V_{u \text{ MAXIMUM}} = \frac{1436\#}{4 \text{ BOLTS}} = 359 \text{ LB/BOLT (MAX) (PER AISC J3.7, LESS THAN 20% STRESS)}$$

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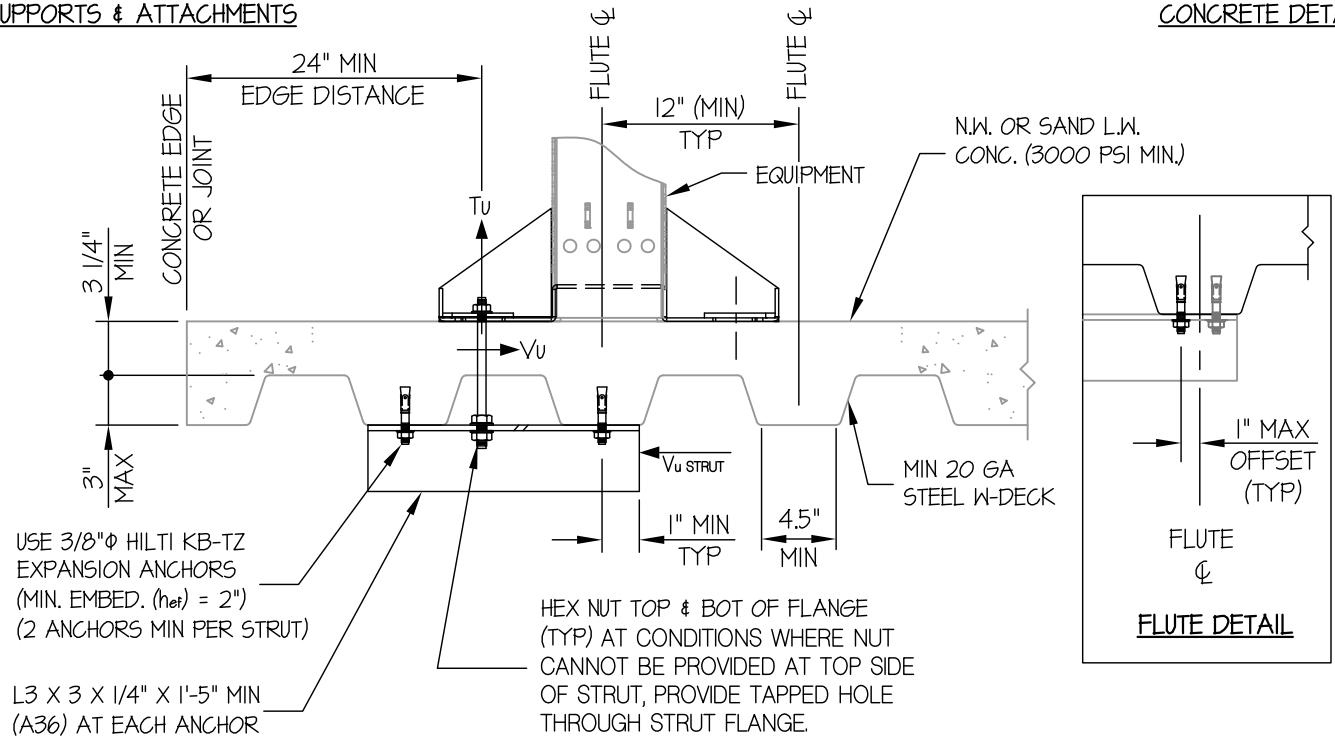
SHEET

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SEISMIC SUPPORTS & ATTACHMENTS

CONCRETE DETAIL



MIN STEEL DECK REQUIREMENTS AND STRUT DETAIL

DEMANDS: (BASED ON UPPER FLOOR)

$$T_u = 2557 \text{ LB/BOLT}$$

$$V_u = 359 \text{ LB/BOLT}$$

$$V_u \text{ STRUT} = 0.7V_u = 0.7(359\#) = 251 \text{ LB/STRUT}$$

CONCRETE ANCHORS AT STRUT

$$V'_u \text{ STRUT} = \Omega_0 V_u \text{ STRUT} = 2.5(251\#) = 628 \text{ LB/STRUT}$$

USE 2 BOLTS MIN

$$V'_u \text{ BOLT} = 628\# / (2 \text{ BOLTS}) = 314 \text{ LB/BOLT}$$

BOLT SPEC: 3/8" ϕ HILTI KB-TZ: (hef = 2" MIN)

$$\phi V = 938 \text{ LB/BOLT}$$

STRUT DESIGN (L3 X 3 X 1/4" : S = 0.569 in³, A36)

$$M_u \text{ STRUT} = \frac{2557\#(14")}{4} = 8,950\#\text{'}$$

$$\frac{b}{t} = \frac{3}{0.25} = 12 \leq 0.54 \sqrt{\frac{E}{F_y}} = 0.54 \sqrt{\frac{29000}{36}} = 15.3$$

$$\begin{aligned} \therefore M_n &= 1.5 F_y S_c \\ &= 1.5(36000)(0.8 \times 0.569) \\ &= 24580\#\text{'} \end{aligned}$$

$$\phi M_n = 0.9M_n = 0.9(24580\#) = 22123\#\text{'} > 8950\#\text{'} \therefore \text{OK}$$

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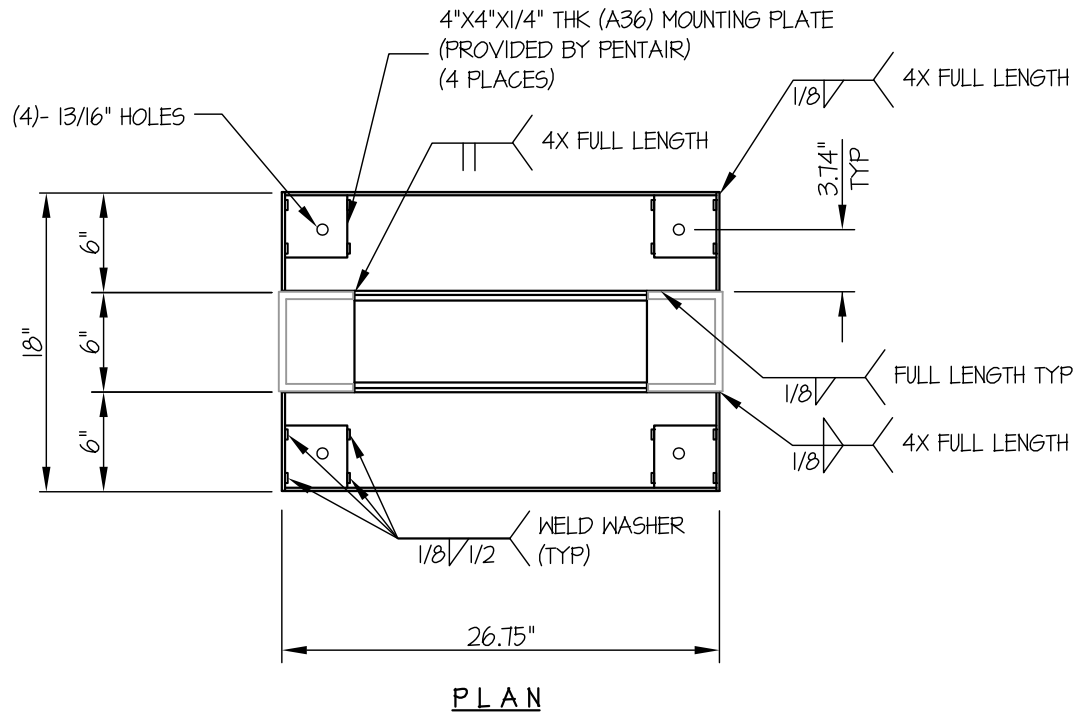
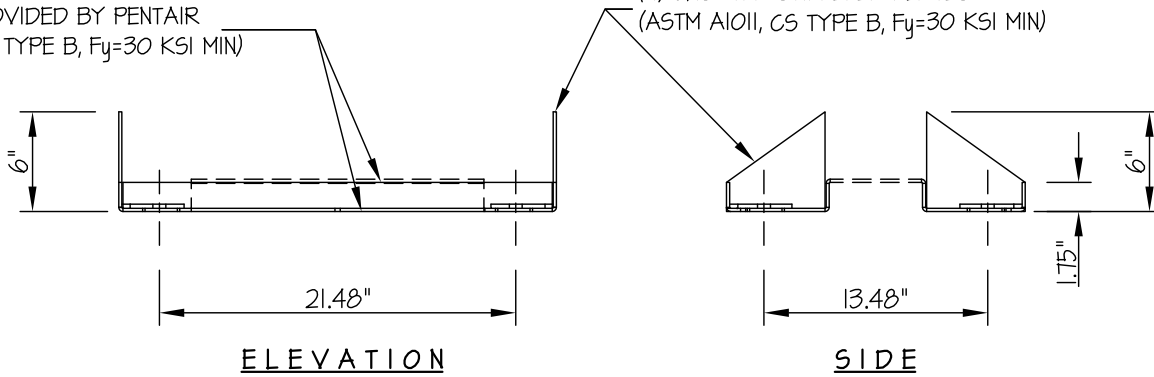
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SEISMIC SUPPORTS & ATTACHMENTS

BASE DETAIL

BRACKET PROVIDED BY PENTAIR
(3/16" THK, CS TYPE B, F_y=30 KSI MIN)

(4) 3/16" THK STIFFENER PLATES
(ASTM A1011, CS TYPE B, F_y=30 KSI MIN)



LOADS TO BASE: (BASED ON UPPER FLOOR DEMANDS)

T_u = 2557 LB/BOLT (NON-PRYING)

V_u = 359 LB/BOLT