

## PENTAIR

## TWO POST RACK

DES. **J. ROBERSON**

JOB NO. **11-1461**

DATE **6/17/15**

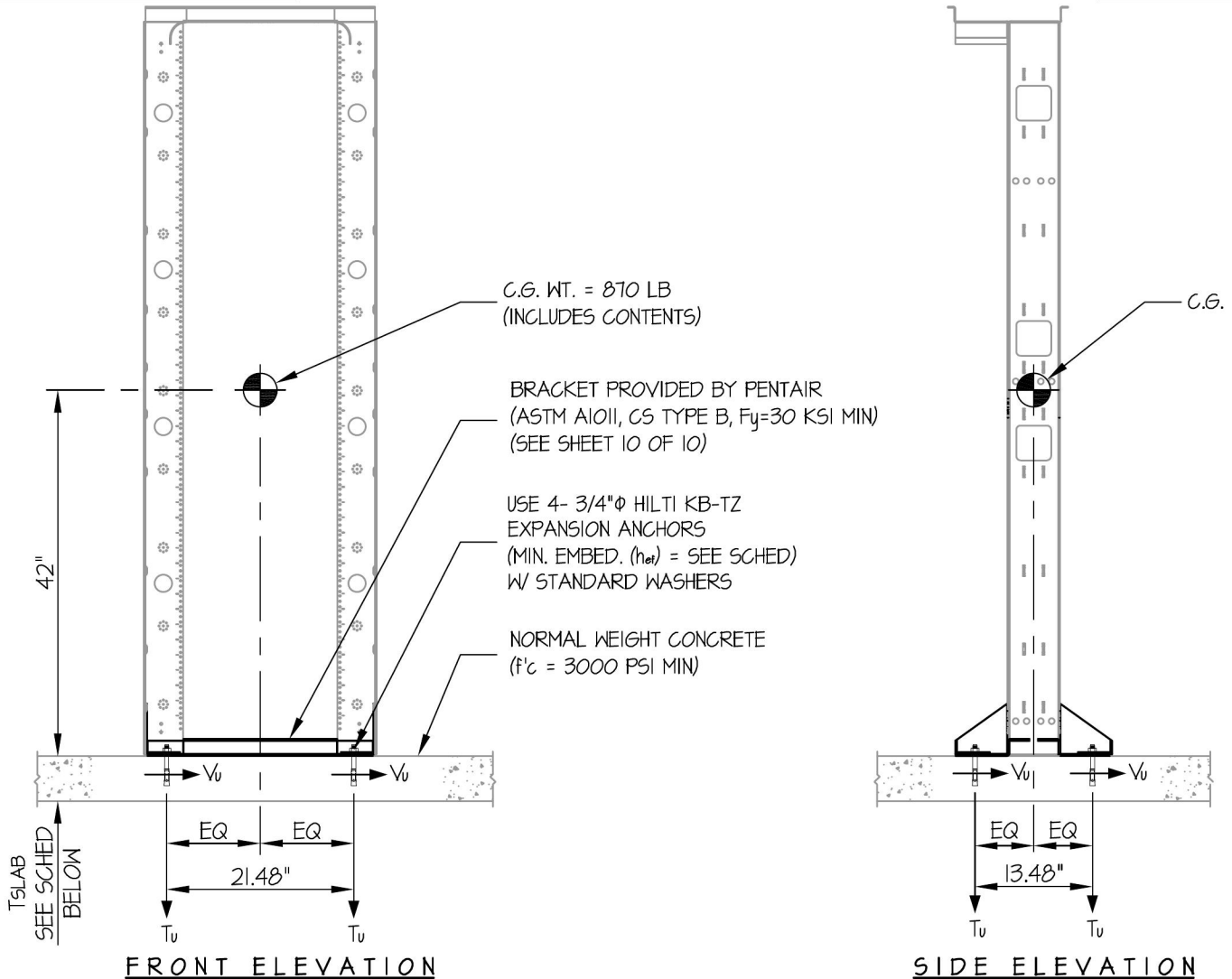
SHEET

**4**

OF **10** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

CONCRETE SLAB



		ANCHORS					
MAX Sds	TYPE	DIAM	EFF EMBED	QTY	T <sub>SLAB</sub>	* T <sub>u</sub>	* V <sub>u</sub>
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  $\Omega_0$

NOTES:

- FORCES ARE DETERMINED PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10. STRENGTH DESIGN IS USED. ( $\alpha_p = 2.5, I_p = 1.5, R_p = 6.0, \Omega_0 = 2.5, z/h = 0$ )
- 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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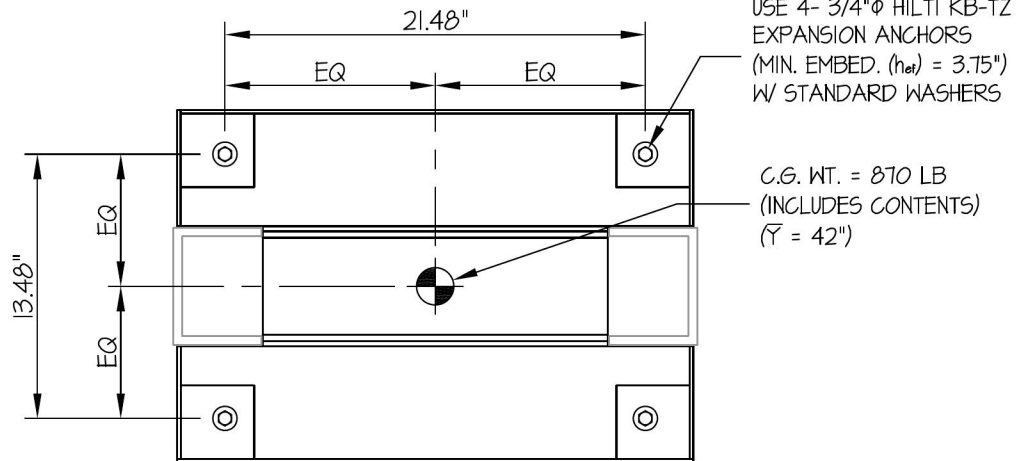
**5**

OF **10** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

MAX  $S_{Ds} \leq 1.70$

CONCRETE SLAB



USE 4- 3/4"  $\phi$  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"  $\phi$  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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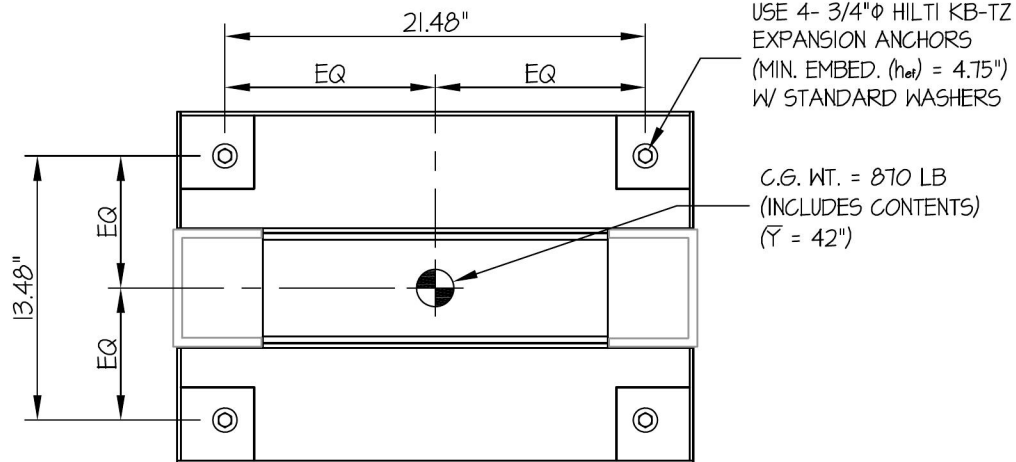
DATE **6/17/15**

OF **10** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

1.70 < MAX S<sub>DS</sub> ≤ 2.20

CONCRETE SLAB



USE 4- 3/4"Ø HILTI KB-TZ  
EXPANSION ANCHORS  
(MIN. EMBED. (h<sub>ef</sub>) = 4.75")  
W/ STANDARD WASHERS

C.G. WT. = 870 LB  
(INCLUDES CONTENTS)  
(Y = 42")

PLAN AT BASE

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

STRENGTH DESIGN IS USED (S<sub>DS</sub> = 2.20, a<sub>p</sub> = 2.5, I<sub>p</sub> = 1.5, R<sub>p</sub> = 6.0, Ω<sub>0</sub> = 2.5, z/h = 0)

WEIGHT = 870 LB

HORIZONTAL FORCE (E<sub>mh</sub>) = 2.48W<sub>p</sub> = 2158 LB

VERTICAL FORCE (E<sub>v</sub>) = 0.44W<sub>p</sub> = 383 LB

BOLT FORCES:

BOLT SPECS: 3/4"Ø HILTI KB-TZ (h<sub>ef</sub> = 4.75")

φ<sub>T</sub> = 0.75φ<sub>N</sub>h = 4328 LB/BOLT (TENSION)

φ<sub>V</sub> = φ<sub>V</sub>h = 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<sub>v</sub> )

SHEAR (V)

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

UNITY CHECK:

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

## PENTAIR TWO POST RACK

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SHEET

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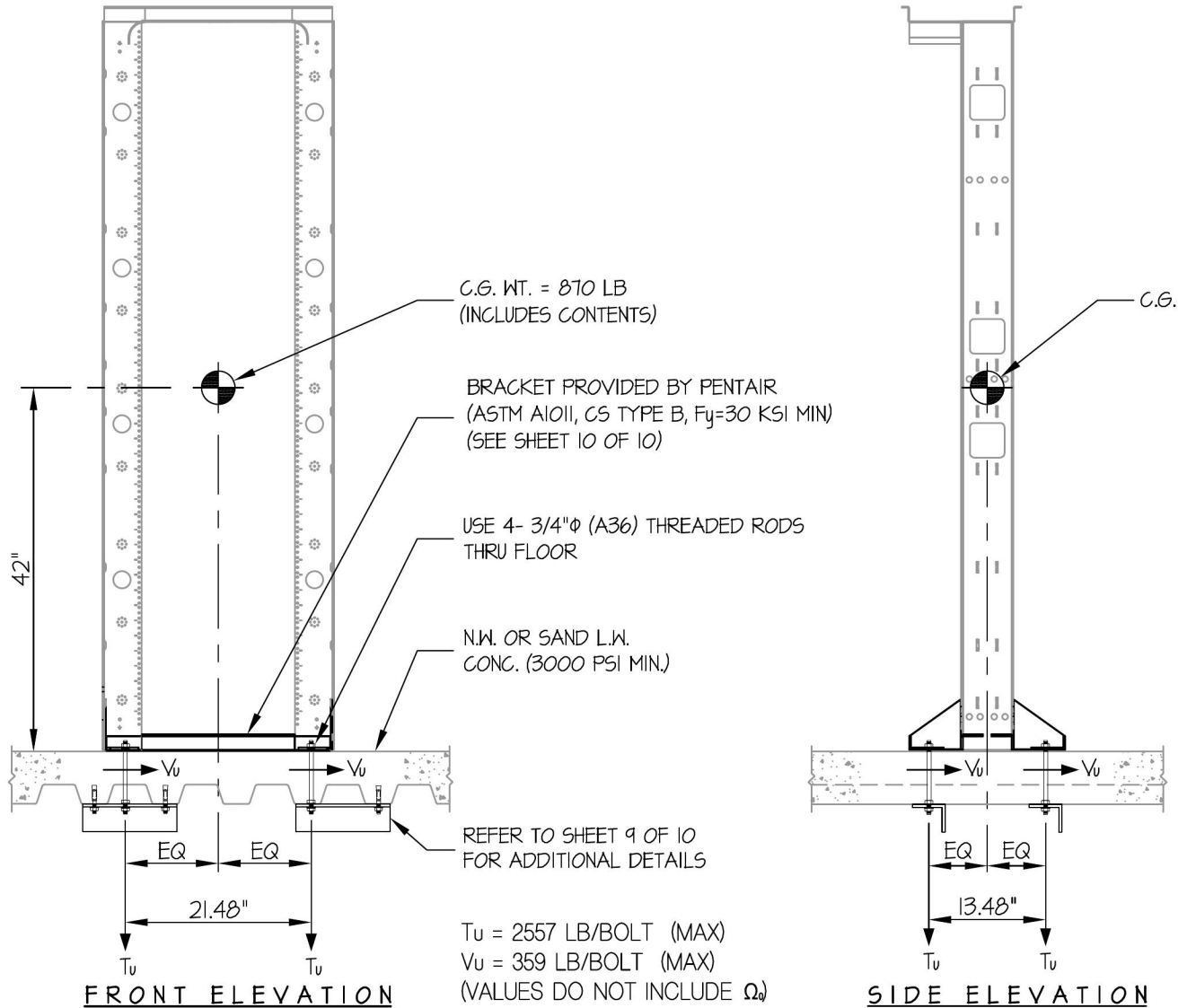
JOB NO. **11-1461**

DATE **6/17/15**

OF **10** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

CONCRETE SLAB ON METAL DECK



**NOTES:**

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

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

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

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

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

2. CENTER OF GRAVITY (C.G.) AND WEIGHT ARE THE GOVERNING PARAMETERS FOR DESIGN. THESE CALCULATIONS ENCOMPASS ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.

3. 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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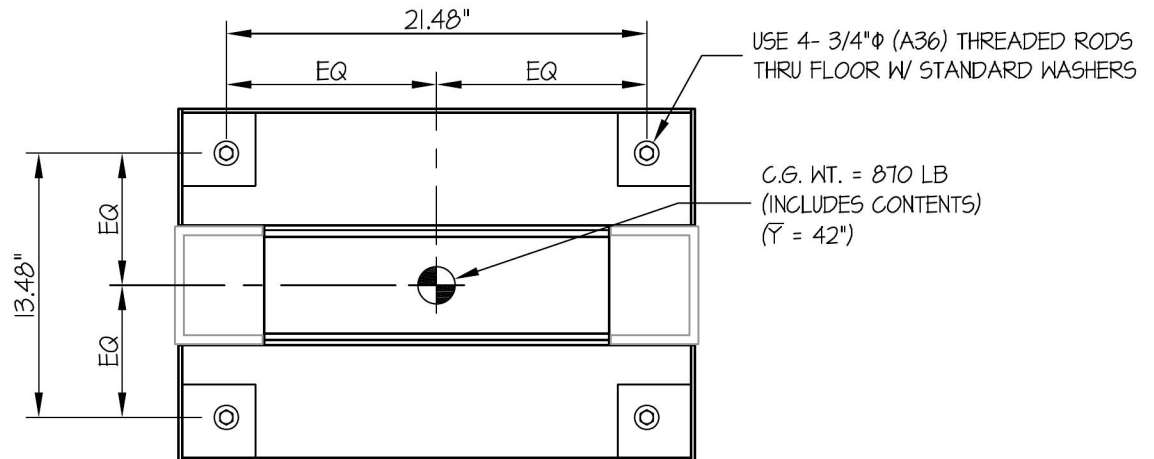
SHEET

**8**

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:

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)

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

BOLT SPECS: 3/4"φ (A36) THREADED ROD

$\phi T = 14,420$  LB/BOLT (TENSION)

$\phi V = 7691$  LB/BOLT (SHEAR)

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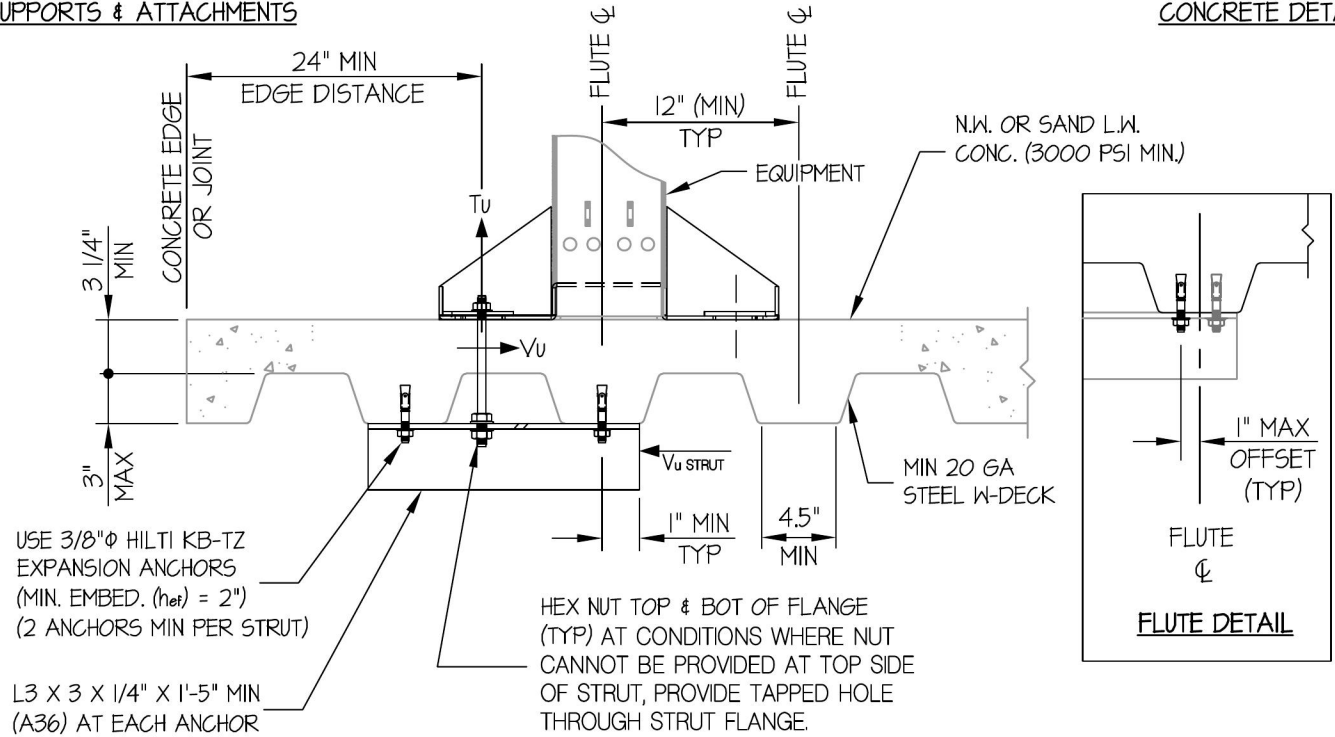
SHEET

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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

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

USE 2 BOLTS MIN

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

BOLT SPEC: 3/8"  $\phi$  HILTI KB-TZ: ( $h_{ef} = 2"$  MIN)

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

STRUT DESIGN (L3 X 3 X 1/4" : S = 0.569 in<sup>3</sup>, A36)

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

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

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

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

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# 10

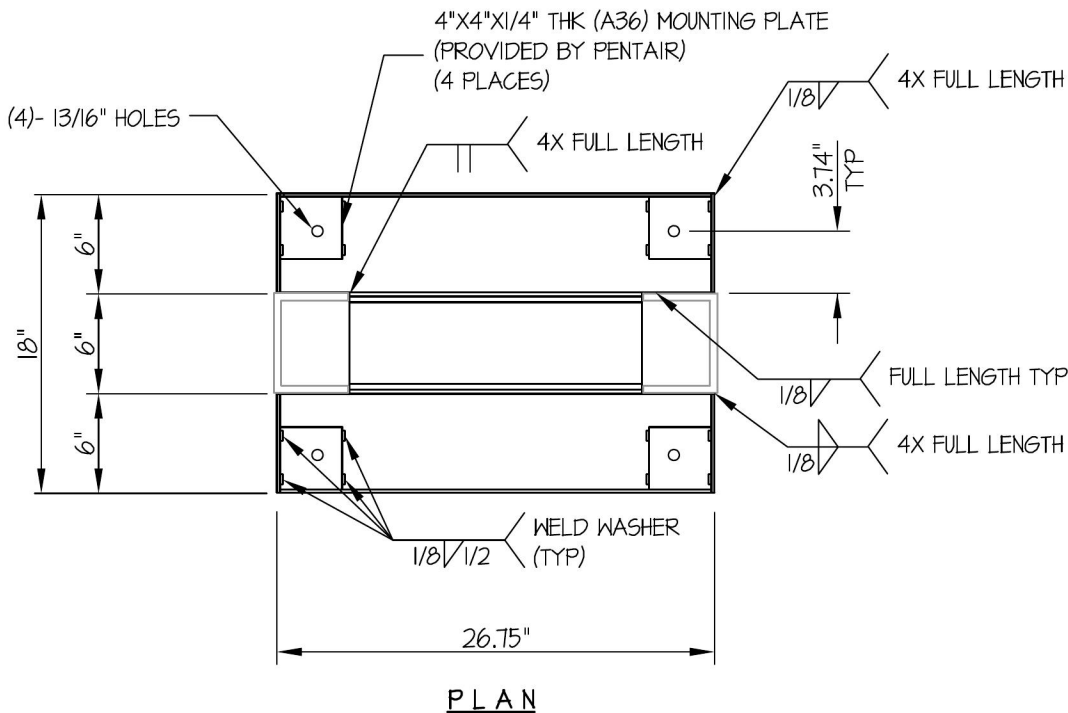
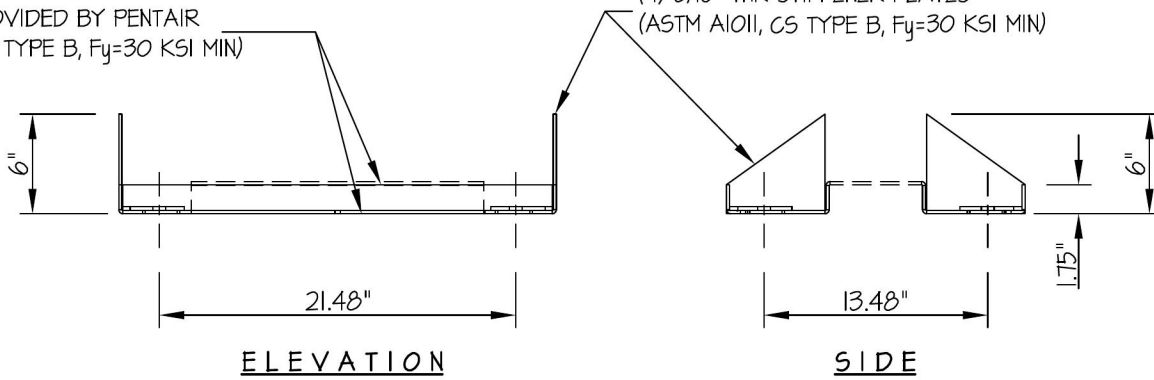
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SEISMIC SUPPORTS & ATTACHMENTS

BASE DETAIL

BRACKET PROVIDED BY PENTAIR  
(3/16" THK, CS TYPE B, F<sub>y</sub>=30 KSI MIN)

(4) 3/16" THK STIFFENER PLATES  
(ASTM A1011, CS TYPE B, F<sub>y</sub>=30 KSI MIN)



LOADS TO BASE: (BASED ON UPPER FLOOR DEMANDS)

T<sub>u</sub> = 2557 LB/BOLT (NON-PRYING)

V<sub>u</sub> = 359 LB/BOLT