

PENTAIR 4-POST RACK

DES. **J. ROBERSON**

JOB NO. **11-1461**

DATE **6/24/15**

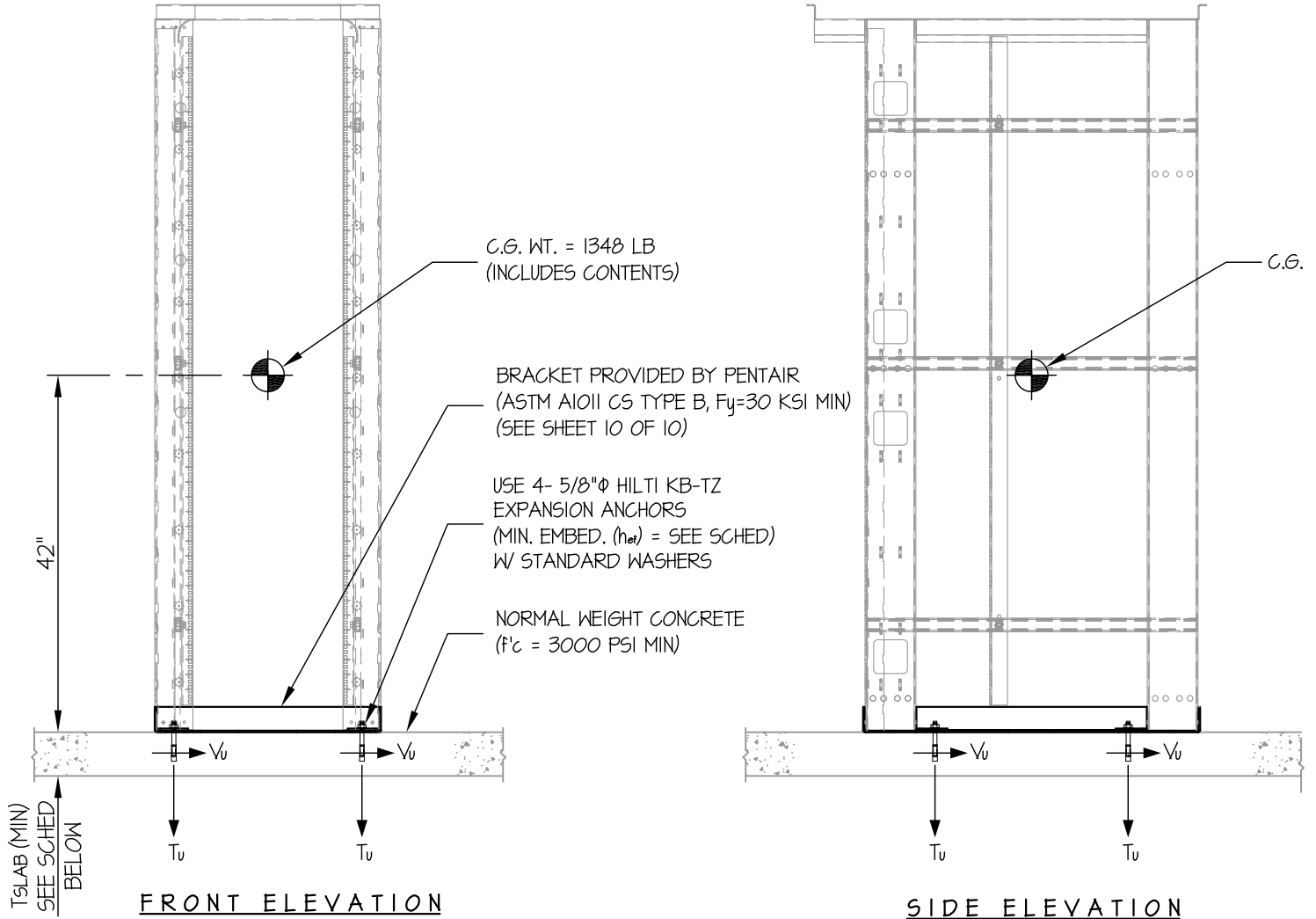
SHEET

4

OF **10** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

CONCRETE SLAB



MAX Sds	ANCHORS			QTY	TSLAB	* Tu	* Vu	DETAIL
	TYPE	DIAM	EFF EMBED					
150	HILTI KB-TZ	5/8"	3.125"	4	5"	2208	570	SHEET 5 OF 10
220	HILTI KB-TZ	5/8"	4"	4	6"	3382	836	SHEET 6 OF 10

* 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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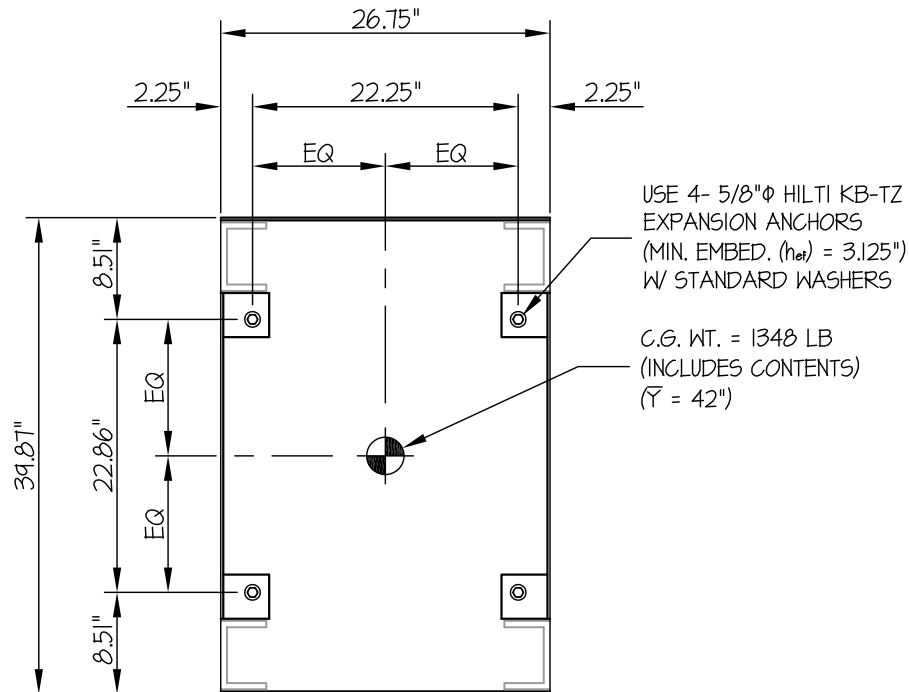
5

OF **10** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

MAX Sds ≤ 150

CONCRETE SLAB



PLAN AT BASE

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

STRENGTH DESIGN IS USED (Sds = 150, a_p = 2.5, I_p = 15, R_p = 6.0, Ω₀ = 2.5, z/h = 0)

WEIGHT = 1348 LB

HORIZONTAL FORCE (E_{mh}) = 169W_p = 2278 LB

VERTICAL FORCE (E_v) = 0.30W_p = 404 LB

BOLT FORCES:

BOLT SPECS: 5/8"φ HILTI KB-TZ (h_{ef} = 3.125")

φT = 0.75φN_n = 2508 LB/BOLT (TENSION)

φV = φV_n = 4940 LB/BOLT (SHEAR)

TENSION (T)

$$T_{u \text{ MAXIMUM}} = \left[\frac{2278\#(42")}{2 \text{ BOLTS } (31.37")} \times (0.3) \right] + \frac{2278\#(42")}{2 \text{ BOLTS } (24.5")} - \frac{1348\#(0.9) - 404\#}{4 \text{ BOLTS}} = 2208 \text{ LB/BOLT (MAX)}$$

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

SHEAR (V)

$$V_{u \text{ MAXIMUM}} = \frac{2278\#}{4 \text{ BOLTS}} = 570 \text{ LB/BOLT (MAX)}$$

UNITY CHECK:

$$\left(\frac{T_u}{\phi T} \right) + \left(\frac{V_u}{\phi V} \right) \leq 1.2 \left(\frac{2208}{2508} \right) + \left(\frac{570}{4940} \right) = 1.00 \leq 1.2 \therefore \text{O.K.}$$

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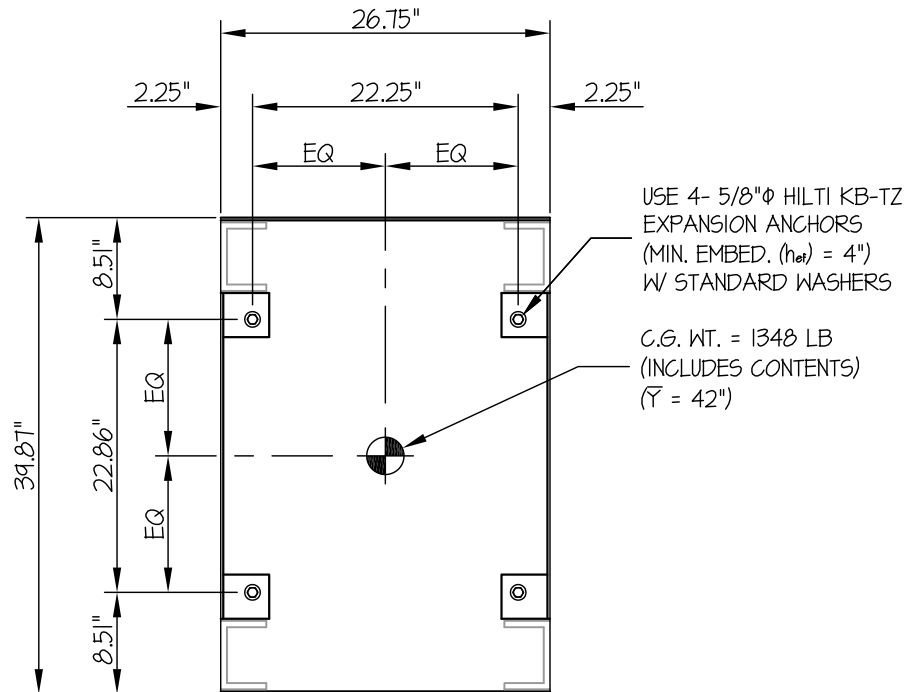
6

OF **10** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

1.50 < 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 = 15, R_p = 6.0, Ω_o = 2.5, z/h = 0)

WEIGHT = 1348 LB

HORIZONTAL FORCE (E_{mh}) = 2.48W_p = 3343 LB

VERTICAL FORCE (E_v) = 0.44W_p = 593 LB

BOLT FORCES:

BOLT SPECS: 5/8"φ HILTI KB-TZ (h_{ef} = 4")

φT = 0.75φN_n = 3632 LB/BOLT (TENSION)

φV = φV_n = 4940 LB/BOLT (SHEAR)

TENSION (T)

$$T_{u \text{ MAXIMUM}} = \left[\frac{3343\#(42")}{2 \text{ BOLTS } (31.37")} \times (0.3) \right] + \frac{3343\#(42")}{2 \text{ BOLTS } (24.5")} - \frac{1348\#(0.9) - 593\#}{4 \text{ BOLTS}} = 3382 \text{ LB/BOLT (MAX)}$$

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

SHEAR (V)

$$V_{u \text{ MAXIMUM}} = \frac{3343\#}{4 \text{ BOLTS}} = 836 \text{ LB/BOLT (MAX)}$$

UNITY CHECK:

$$\left(\frac{T_u}{\phi T} \right) + \left(\frac{V_u}{\phi V} \right) \leq 1.2 \left(\frac{3382}{3632} \right) + \left(\frac{836}{4940} \right) = 1.10 \leq 1.2 \therefore \text{O.K.}$$

PENTAIR 4-POST RACK

DES. **J. ROBERSON**

SHEET

7

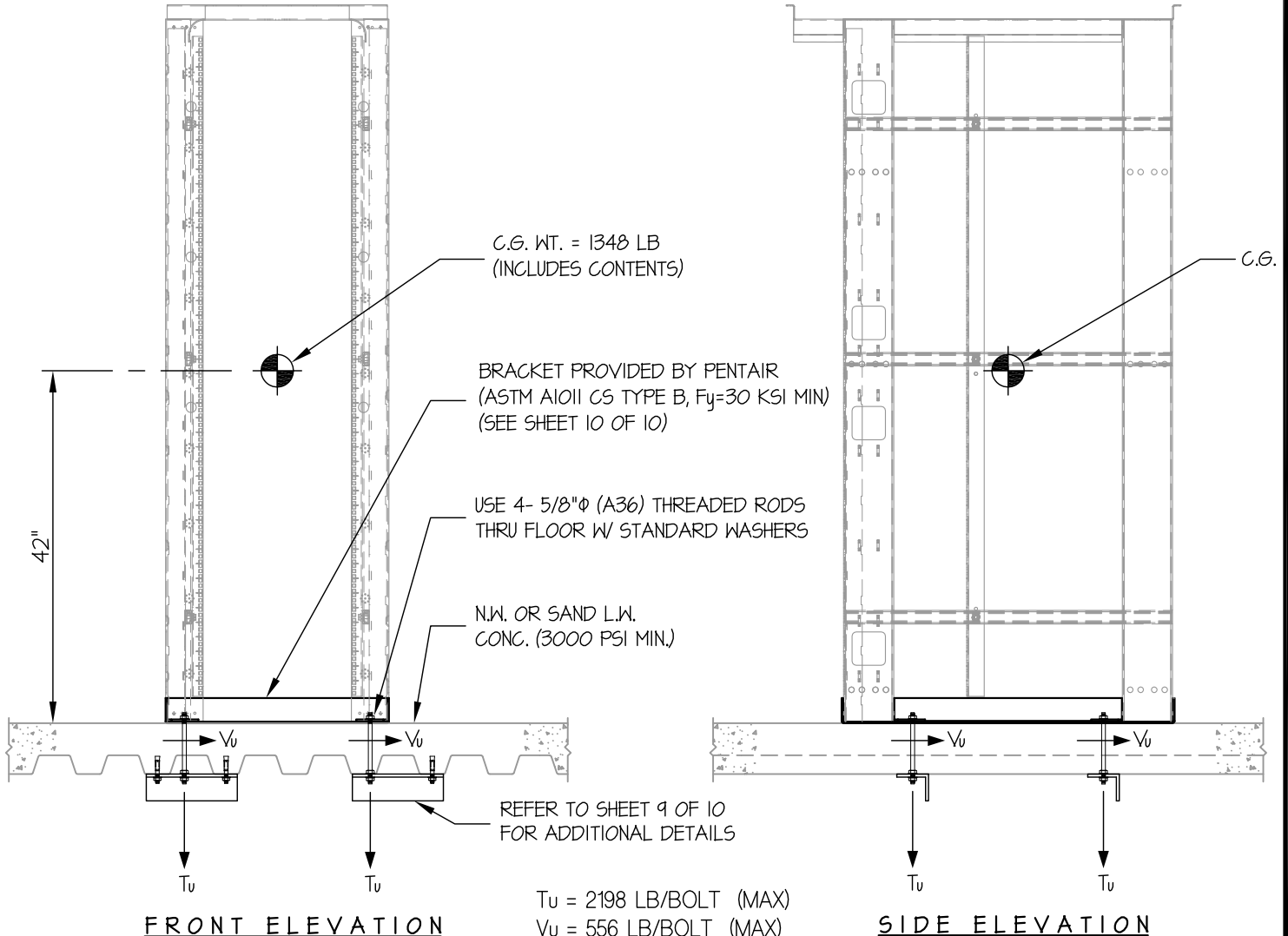
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OF **10** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

CONCRETE SLAB ON METAL DECK



FRONT ELEVATION

SIDE ELEVATION

$T_u = 2198 \text{ LB/BOLT (MAX)}$
 $V_u = 556 \text{ LB/BOLT (MAX)}$
(VALUES DO NOT INCLUDE Ω)

NOTES:

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

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

HORIZONTAL FORCE (E_h) = $1.65 W_p$

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

VERTICAL FORCE (E_v) = $0.44 W_p$

- 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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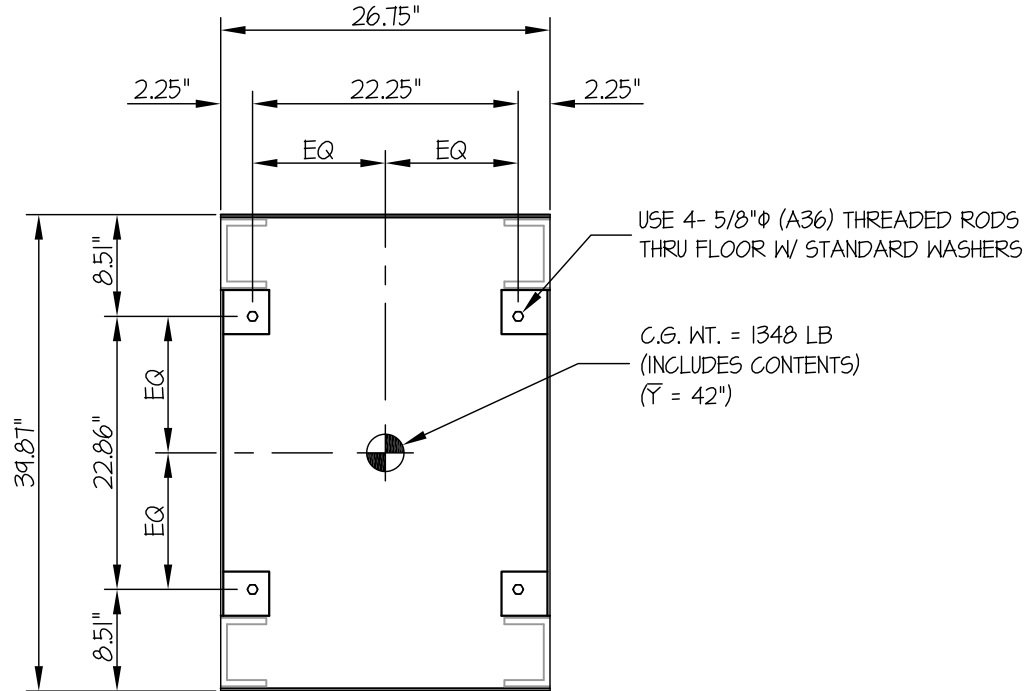
SHEET

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 = 1348 LB

HORIZONTAL FORCE (E_h) = $1.65W_p = 2224$ LB

HORIZONTAL FORCE (E_{mh}) = $4.13W_p = 5567$ LB

VERTICAL FORCE (E_v) = $0.44W_p = 593$ LB

BOLT FORCES:

BOLT SPECS: 5/8"φ (A36) THREADED ROD

$\phi T = 10,016$ LB/BOLT (TENSION)

$\phi V = 5342$ LB/BOLT (SHEAR)

TENSION (T)

$$T_{u \text{ MAXIMUM}} = \left[\frac{2224\#(42")}{2 \text{ BOLTS } (31.37")} \times (0.3) \right] + \frac{2224\#(42")}{2 \text{ BOLTS } (24.5")} - \frac{1348\#(0.9) - 593\#}{4 \text{ BOLTS}} = 2198 \text{ LB/BOLT (MAX)}$$

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

SHEAR (V)

$$V_{u \text{ MAXIMUM}} = \frac{2224\#}{4 \text{ BOLTS}} = 556 \text{ LB/BOLT (MAX) (PER AISC J3.7, LESS THAN 20% STRESS)}$$

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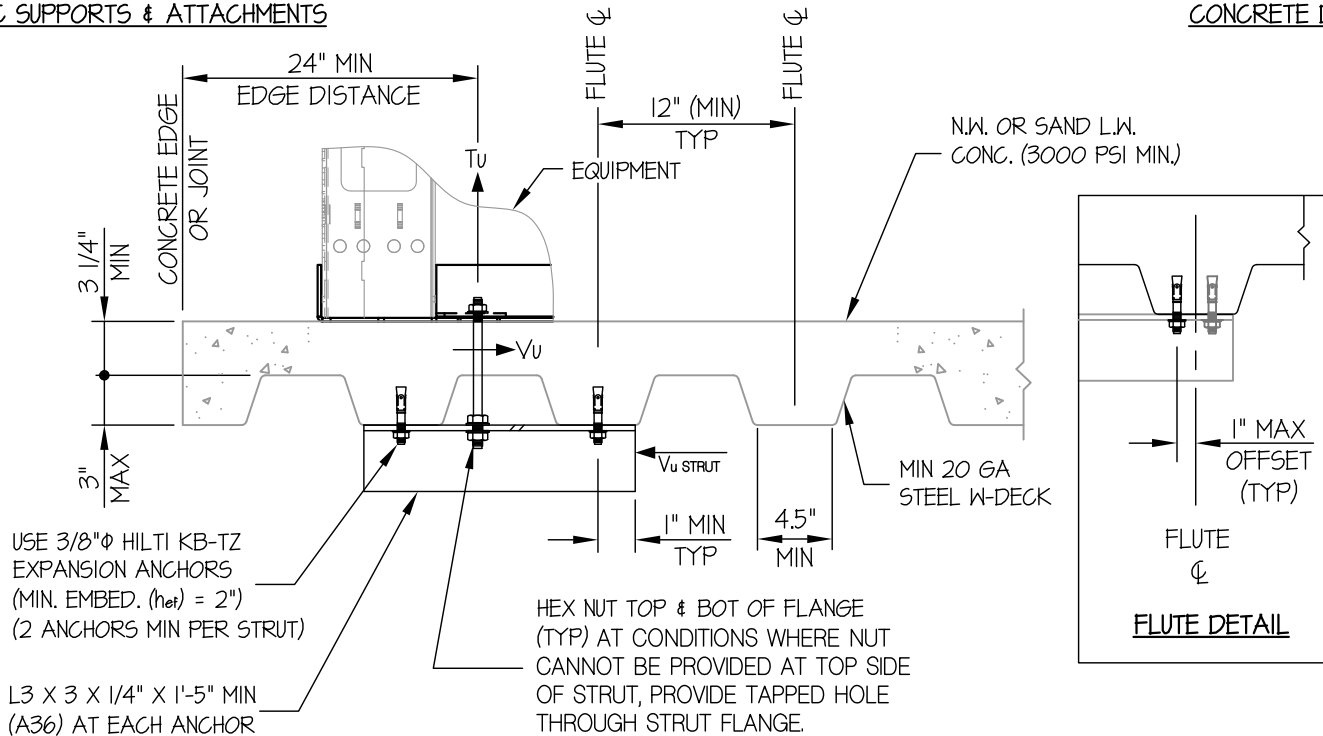
SHEET

9

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SEISMIC SUPPORTS & ATTACHMENTS

CONCRETE DETAIL



MIN STEEL DECK REQUIREMENTS AND STRUT DETAIL

DEMANDS: (BASED ON UPPER FLOOR)

$$T_u = 2198 \text{ LB/BOLT}$$

$$V_u = 556 \text{ LB/BOLT}$$

$$V_{u \text{ STRUT}} = 0.7V_u = 0.7(556\#) = 389 \text{ LB/STRUT}$$

CONCRETE ANCHORS AT STRUT

$$V'_u \text{ STRUT} = \Omega_0 V_{u \text{ STRUT}} = 2.5(389\#) = 973 \text{ LB/STRUT}$$

USE 2 BOLTS MIN

$$V'_u \text{ BOLT} = 973\# / (2 \text{ BOLTS}) = 487 \text{ LB/BOLT}$$

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

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

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

$$M_u \text{ STRUT} = \frac{2198\#(14")}{4} = 7693\#\text{'}$$

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

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

$$\phi M_n = 0.9 M_n = 0.9(24580\#) = 22123\#\text{'} > 7693\#\text{'}. \therefore \text{O.K.}$$

PENTAIR

4-POST RACK

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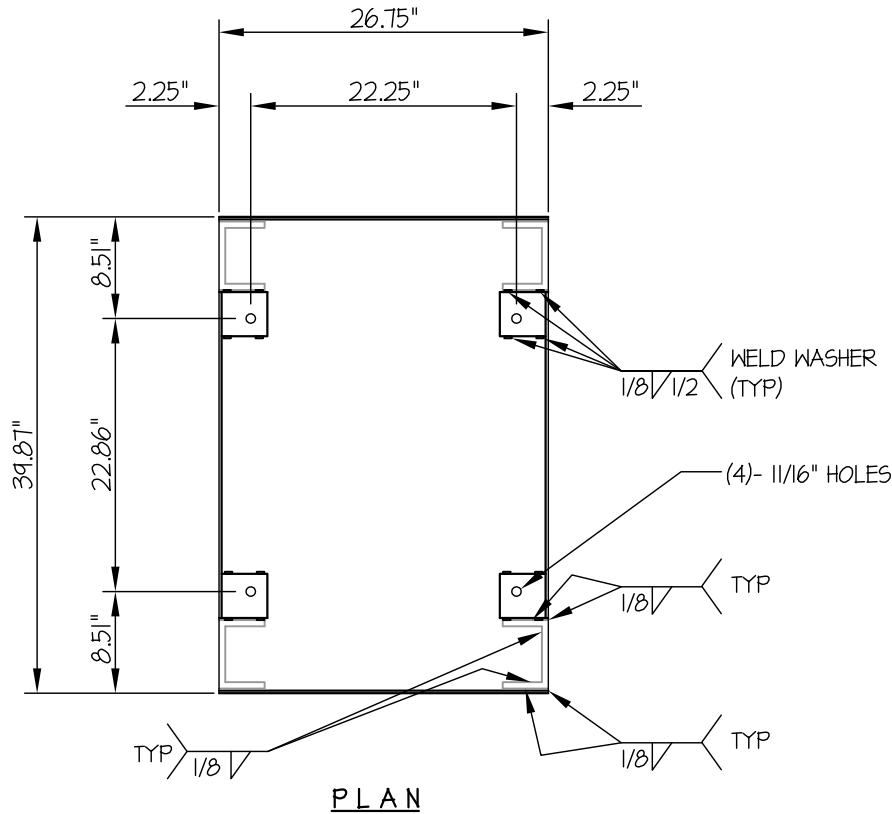
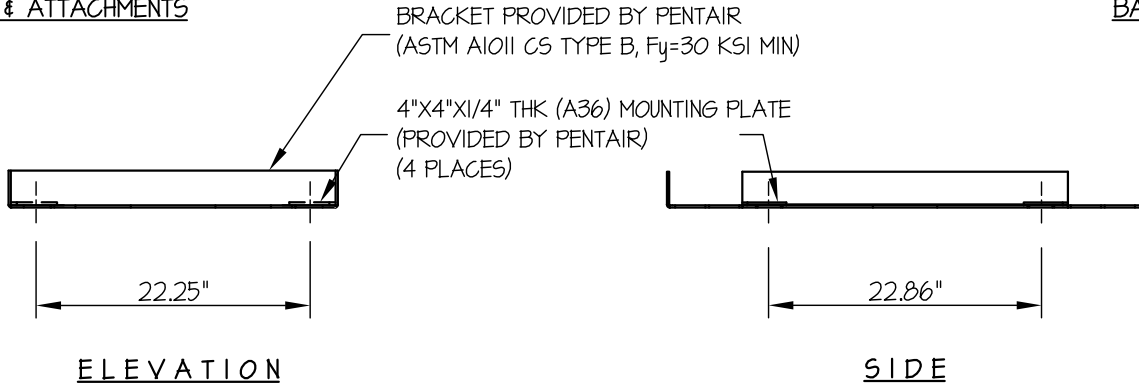
SHEET

10

OF **10** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

BASE DETAIL



LOADS TO BASE: (BASED ON UPPER FLOOR DEMANDS)

$T_u = 2198$ LB/BOLT (NON-PRYING)

$V_u = 556$ LB/BOLT