PENTAIR

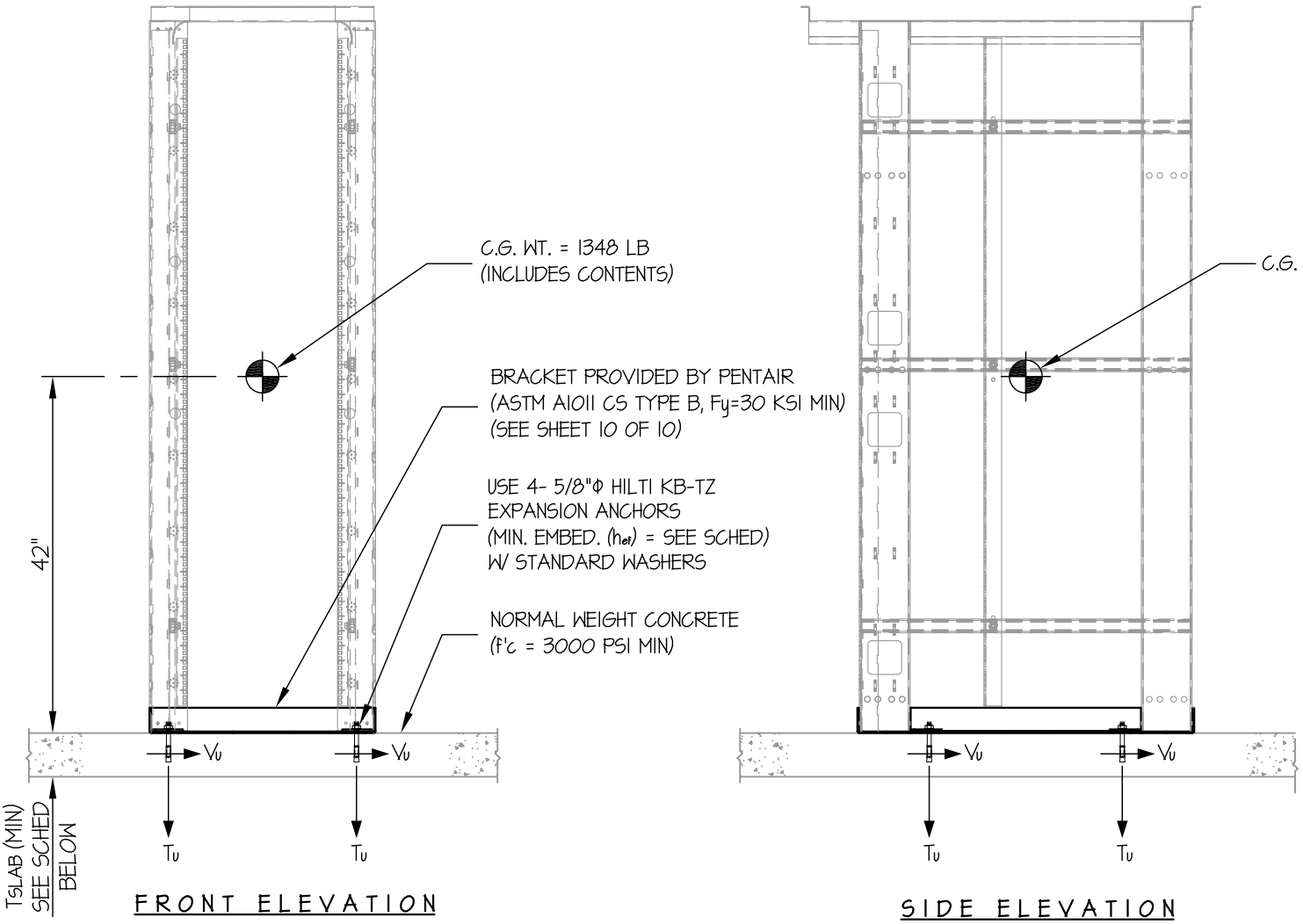
4-POST RACK

DES. J. ROBERSON
JOB NO. 11-1461
DATE 6/24/15

SHEET 4 OF 10 SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

CONCRETE SLAB



FRONT ELEVATION

SIDE ELEVATION

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

* VALUES INCLUDE Ω_o

NOTES:

1. **FORCES ARE DETERMINED PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10.** STRENGTH DESIGN IS USED. (a_p = 2.5, I_p = 1.5, R_p = 6.0, Ω_o = 2.5, z/h = 0)
2. CENTER OF GRAVITY (C.G.) AND WEIGHT ARE THE GOVERNING PARAMETERS FOR DESIGN. THIS PREAPPROVAL ENCOMPASSES 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.

REGISTERED PROFESSIONAL ENGINEER
JONATHAN ROBERSON
No. 4197
EXP. 6-30-2016
6/24/15
STRUCTURAL
STATE OF CALIFORNIA

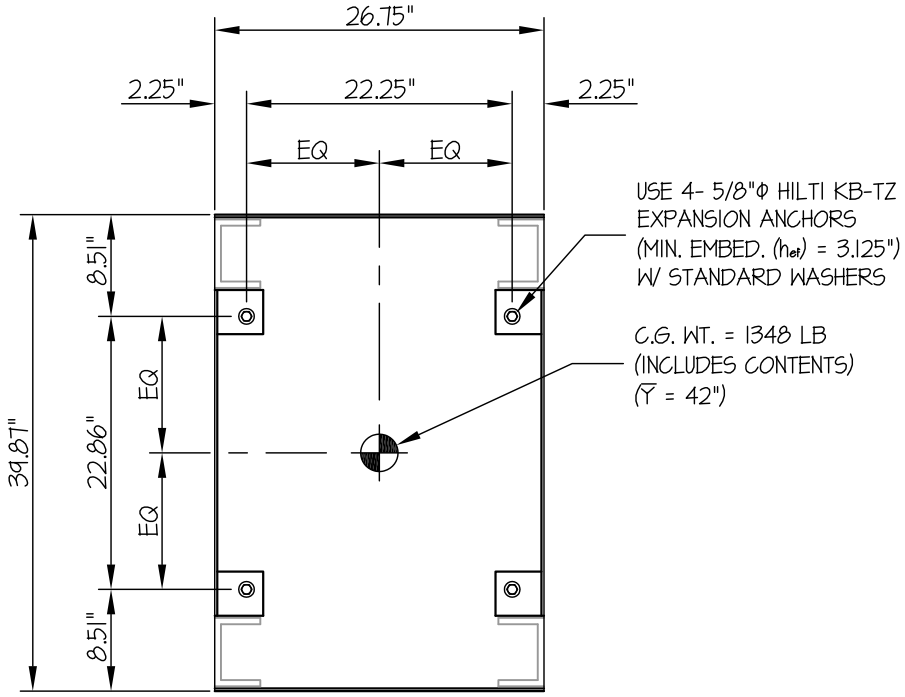
NOT STRUCTURAL ENGINEERED

PENTAIR

4-POST RACK

DES. J. ROBERSON
JOB NO. 11-1461
DATE 6/24/15
SHEET 5 OF 10 SHEETS

SEISMIC SUPPORTS & ATTACHMENTS | MAX $S_{DS} \leq 1.50$ | CONCRETE SLAB



PLAN AT BASE

LOADS: PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10.
STRENGTH DESIGN IS USED (S_{DS} = 1.50, a_p = 2.5, I_p = 1.5, R_p = 6.0, Ω_0 = 2.5, z/h = 0)
WEIGHT = 1348 LB
HORIZONTAL FORCE (E_{mh}) = $1.69W_p$ = 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")
$\phi T = 0.75\phi N_n$ = 2508 LB/BOLT (TENSION)
$\phi V = \phi V_n$ = 4940 LB/BOLT (SHEAR)

TENSION (T)

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

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

SHEAR (V)

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

UNITY CHECK:

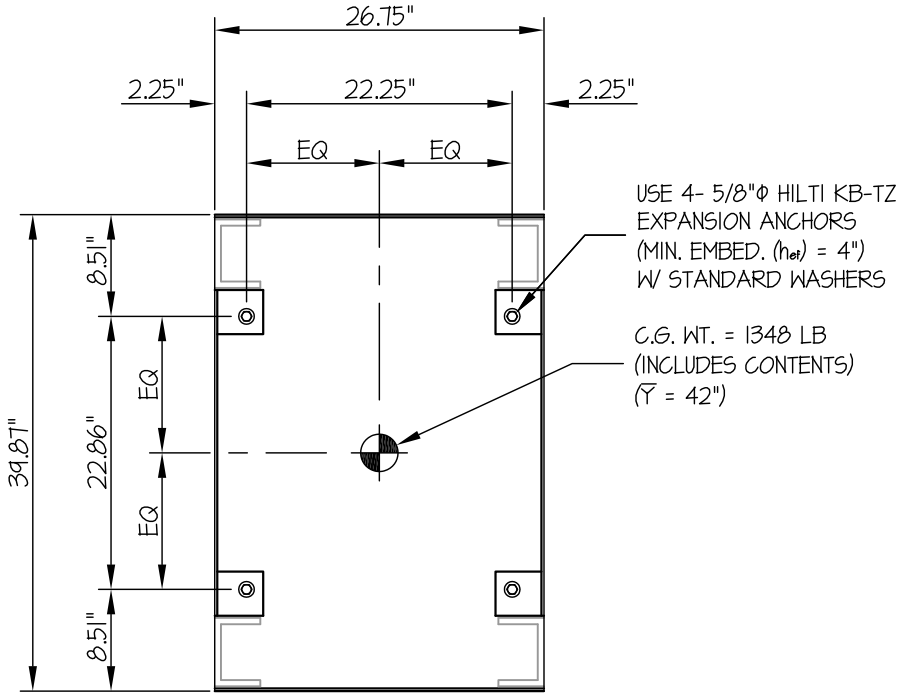
$$\left(\frac{T_u}{\phi T}\right) + \left(\frac{V_u}{\phi V}\right) \leq 1.2 \quad \left(\frac{2208}{2508}\right) + \left(\frac{570}{4940}\right) = 1.00 \leq 1.2 \quad \therefore \text{ O.K.}$$

PENTAIR

4-POST RACK

DES. J. ROBERSON
JOB NO. 11-1461
DATE 6/24/15
SHEET 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 = 1.5, R_p = 6.0, Ω_0 = 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= 0.75φNn = 3632 LB/BOLT (TENSION)
φV= φVn = 4940 LB/BOLT (SHEAR)

TENSION (T)

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

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

SHEAR (V)

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

UNITY CHECK:

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

PENTAIR

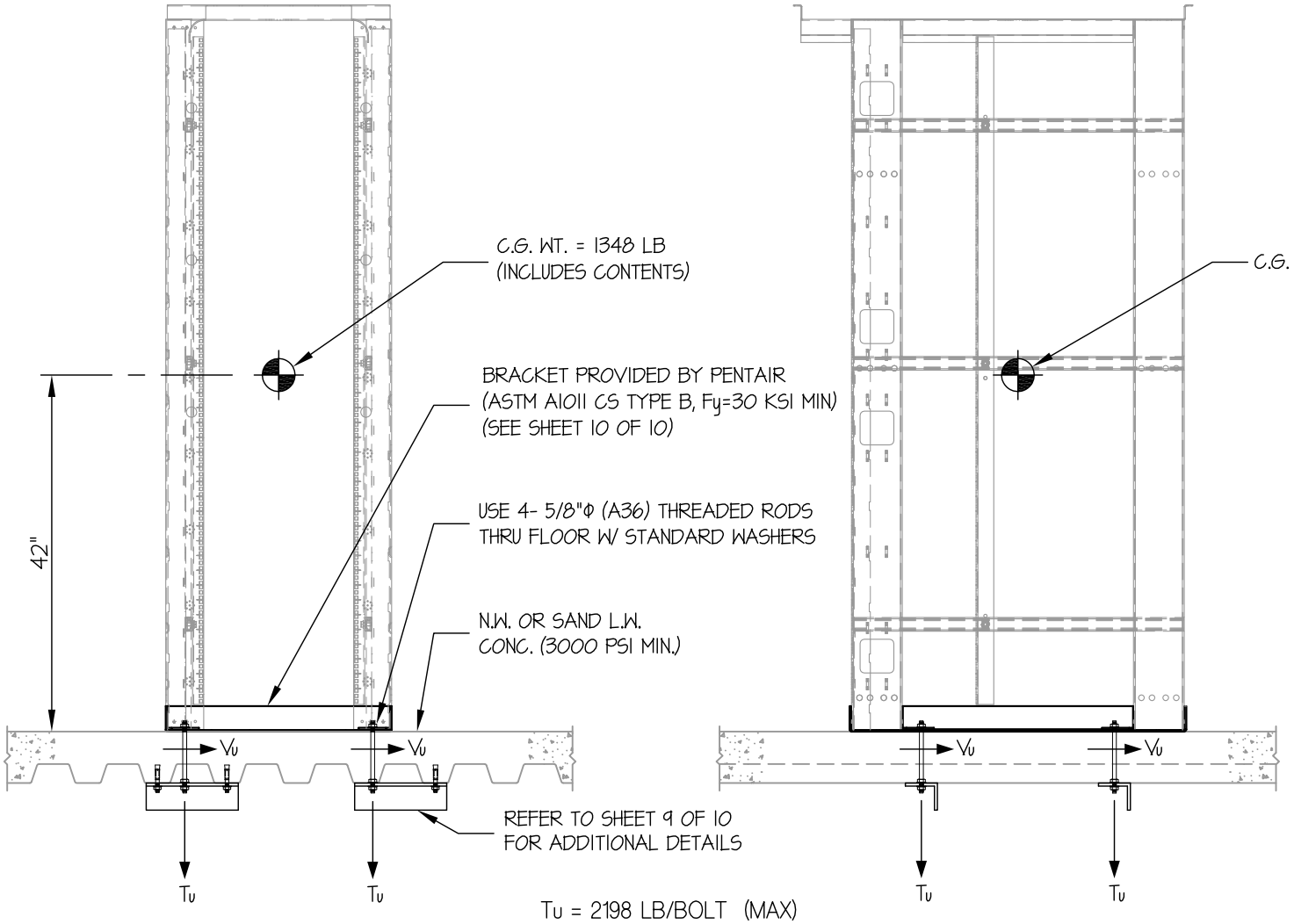
4-POST RACK

DES. J. ROBERSON
JOB NO. 11-1461
DATE 6/24/15

SHEET 7 OF 10 SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

CONCRETE SLAB ON METAL DECK



FRONT ELEVATION

Tu = 2198 LB/BOLT (MAX)
Vu = 556 LB/BOLT (MAX)
(VALUES DO NOT INCLUDE Ω_0)

SIDE ELEVATION

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, Ω_0 = 2.5, z/h ≤ 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. THIS PREAPPROVAL ENCOMPASSES 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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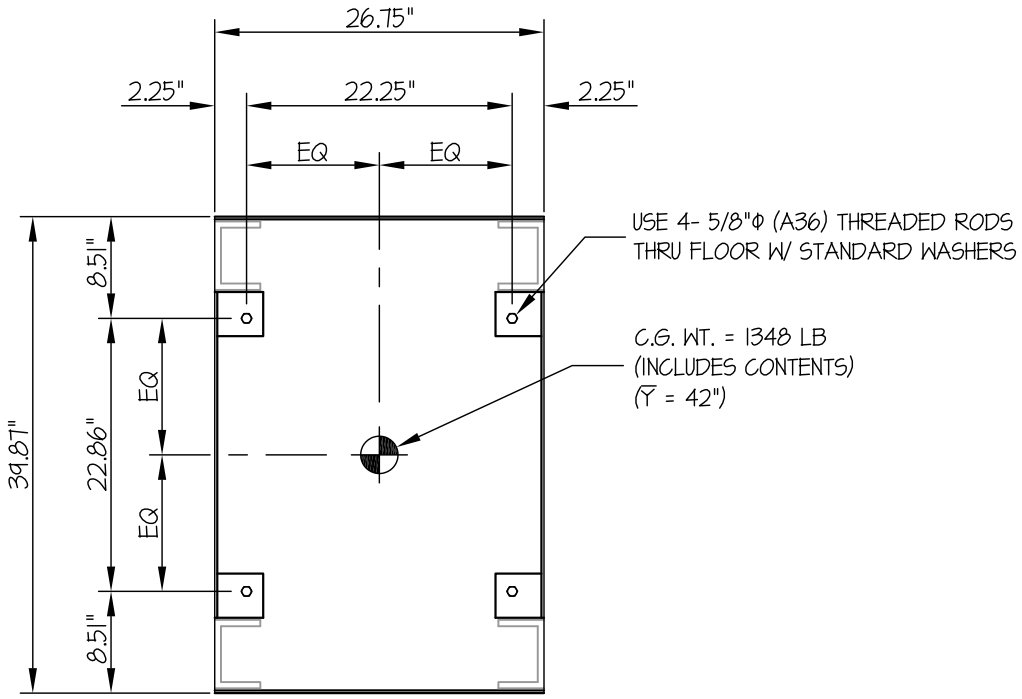
4-POST RACK

DES. J. ROBERSON
JOB NO. 11-1461
DATE 6/24/15

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, Ω_0 = 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 SPECS: 5/8"ϕ (A36) THREADED ROD
ϕT= 10,016 LB/BOLT (TENSION)
ϕV= 5342 LB/BOLT (SHEAR)

BOLT FORCES:

TENSION (T)

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

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

SHEAR (V)

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

PENTAIR

4-POST RACK

DES. J. ROBERSON
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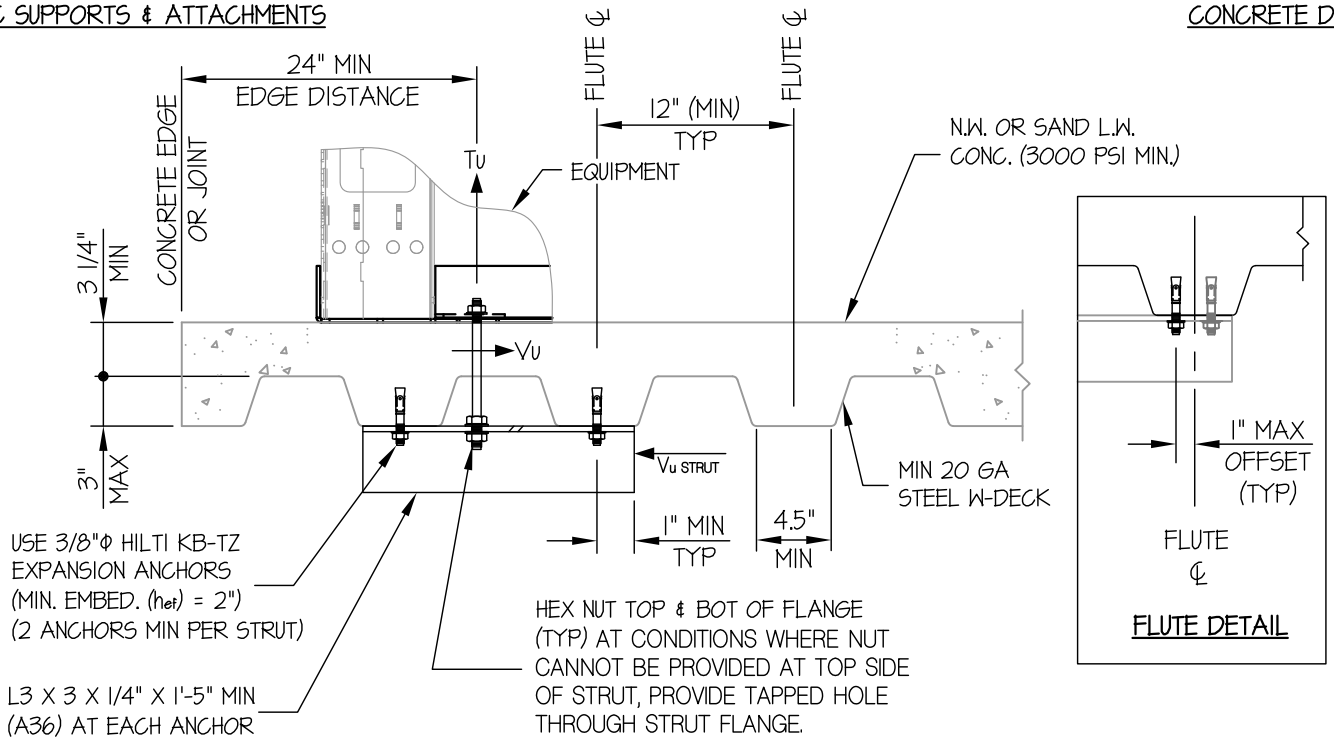
DATE 6/24/15

SHEET 9 OF 10 SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

CONCRETE DETAIL



MIN STEEL DECK REQUIREMENTS AND STRUT DETAIL

DEMANDS: (BASED ON UPPER FLOOR)

Tu = 2198 LB/BOLT

Vu = 556 LB/BOLT

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

CONCRETE ANCHORS AT STRUT

$V'_{u\,STRUT} = \Omega_o V_{u\,STRUT}$ = 2.5(389#) = 973 LB/STRUT

USE 2 BOLTS MIN

$V'_{u\,BOLT}$ = 973#/(2 BOLTS) = 487 LB/BOLT

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

ϕV= 938 LB/BOLT

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

$$M_{u\,STRUT} = \frac{2198\#(14'')}{4} = 7693''\#$$

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

∴ Mn = 1.5 Fy Sc
= 1.5(36000)(0.8 X 0.569)
= 24580"#

ϕMn = 0.9Mn = 0.9(24580") = 22123"# > 7693"# ∴ O.K

PENTAIR

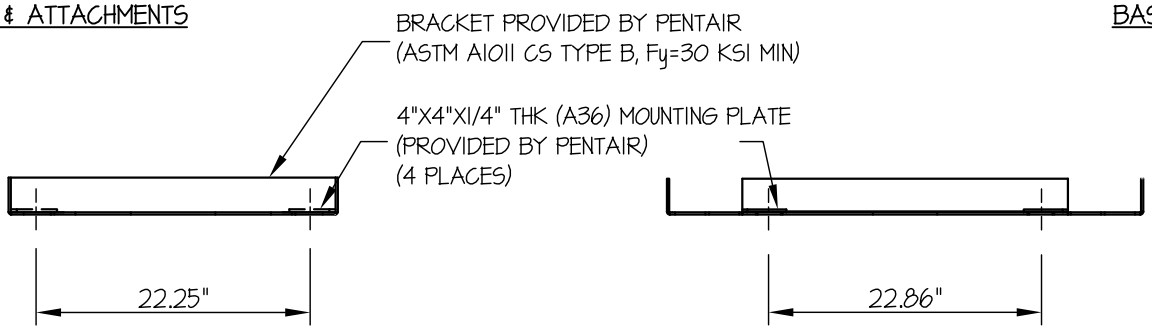
4-POST RACK

DES. J. ROBERSON
JOB NO. 11-1461
DATE 6/24/15

SHEET 10 OF 10 SHEETS

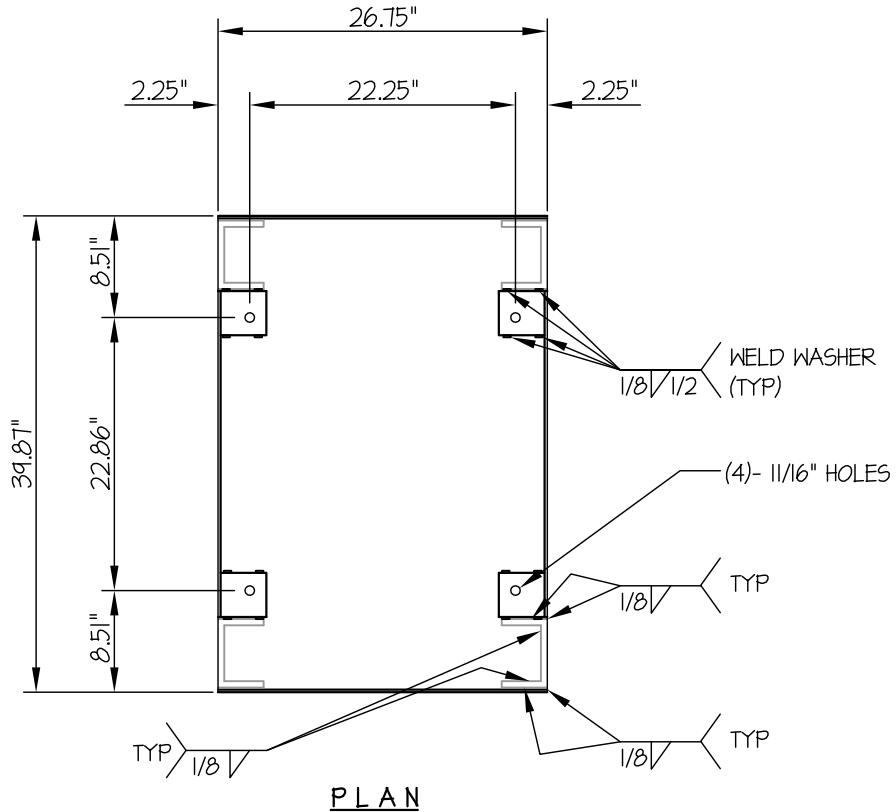
SEISMIC SUPPORTS & ATTACHMENTS

BASE DETAIL



ELEVATION

SIDE



PLAN

LOADS TO BASE: (BASED ON UPPER FLOOR DEMANDS)

T_u = 2198 LB/BOLT (NON-PRYING)

V_u = 556 LB/BOLT