EASE

EQUIPMENT **ANCHORAGE** & SEISMIC ENGINEERING
www.EquipmentAnchorage.com

PATTERSON-KELLEY CO.

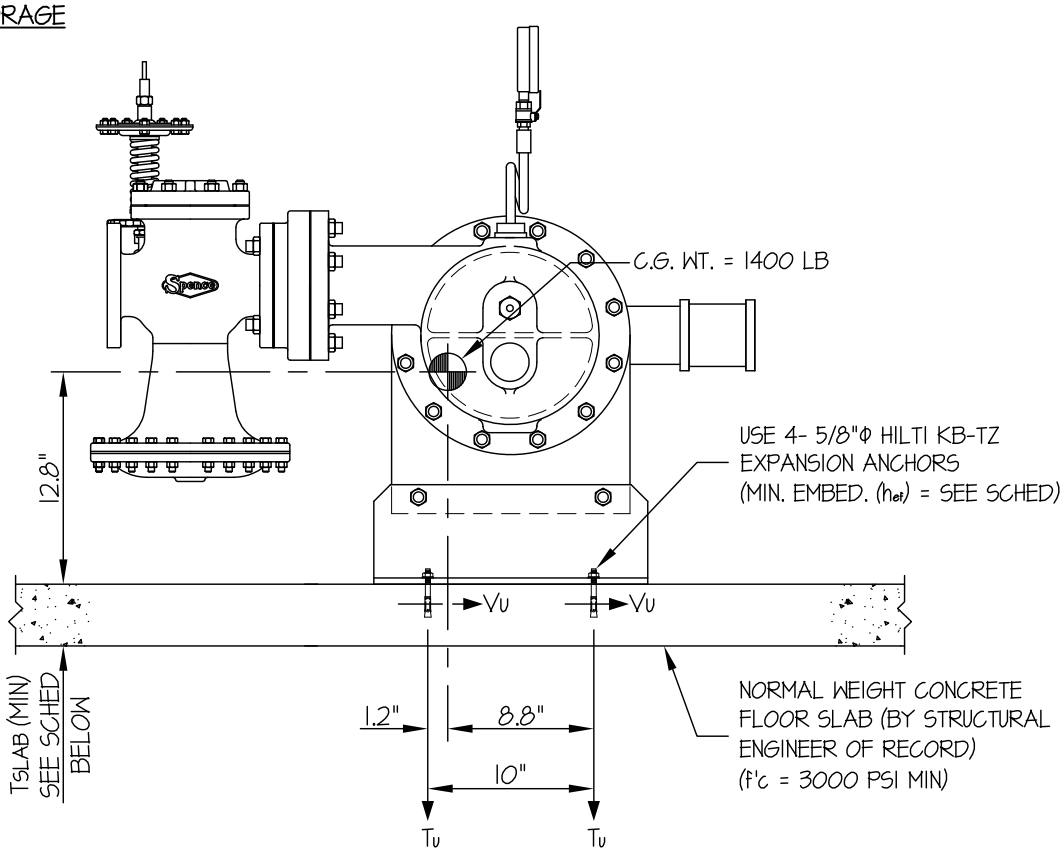
P-K COMPACT WATER HEATER (PK10DH)

DES.	J. ROBERSON
JOB NO.	11-1520
DATE	6/29/15

SHEET 1 OF 3 SHEETS

SEISMIC ANCHORAGE

SLAB ON GRADE



FRONT ELEVATION

	ANCHORS						
MAX S_{DS}	TYPE	DIAM	EFF EMBED	QTY	T_{SLAB}	Tu (lb)	Vu (lb)
1.45	HILTI KB-TZ	5/8"	3.125"	4	5"	2267	1004
1.90	HILTI KB-TZ	5/8"	4"	4	6"	3013	1318

NOTES:

1. **FORCES ARE DETERMINED PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10.** STRENGTH DESIGN IS USED. (a_p = 1.0, I_p = 1.5, R_p = 2.5, 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
STRUCTURAL
STATE OF CALIFORNIA
6/29/15

NOT STRUCTURE ENGINEER OF RECORD

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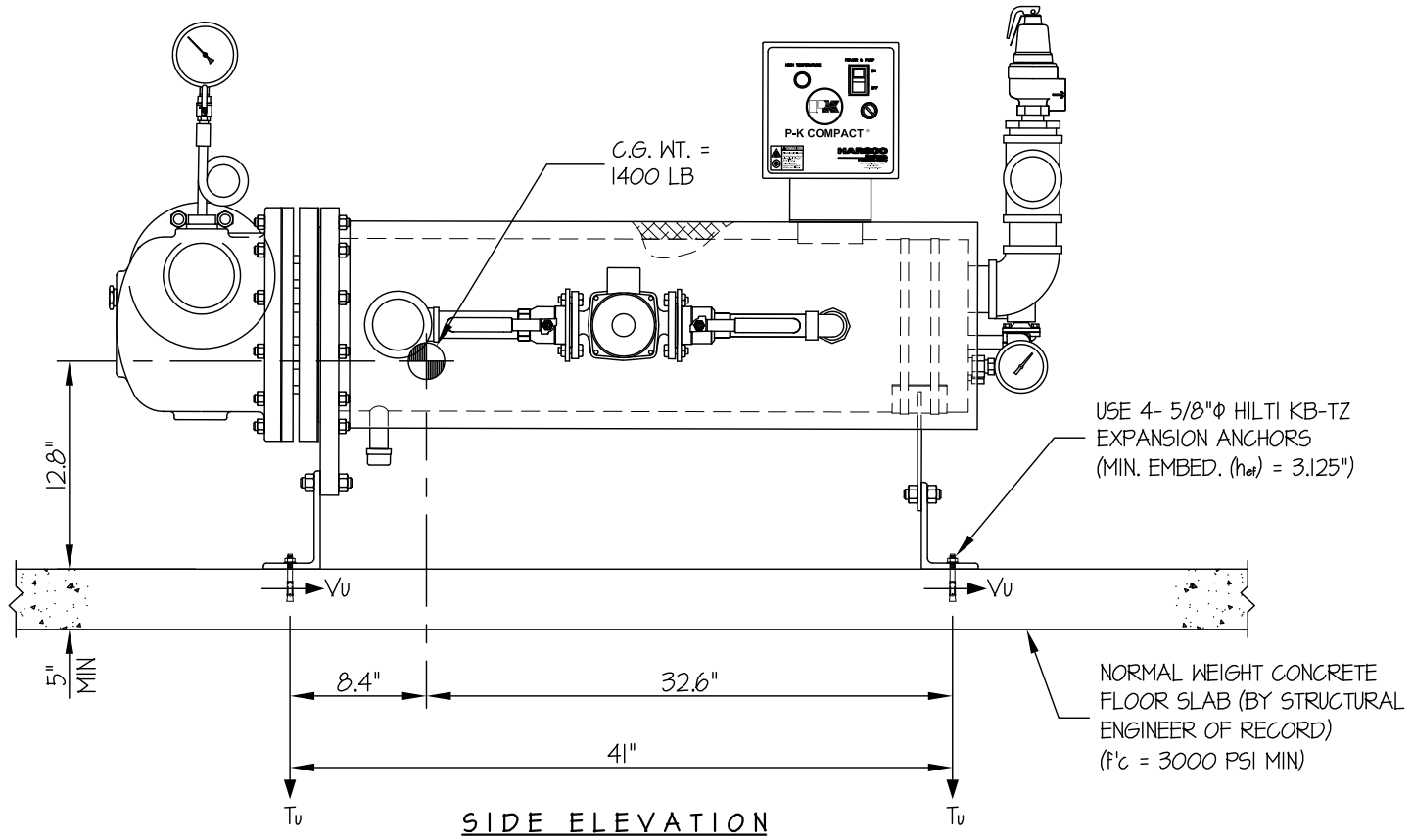
SHEET 2 OF 3 SHEETS

SEISMIC ANCHORAGE — MAX $S_{DS} \leq 1.45$ — SLAB ON GRADE



SIDE ELEVATION

LOADS: PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10.
STRENGTH DESIGN IS USED (S_{DS} = 1.45, a_p = 1.0, I_p = 1.5, R_p = 2.5, Ω_0 = 2.5, z/h = 0)
WEIGHT = 1400 LB
HORIZONTAL FORCE (E_{mh}) = 1.63 W_p = 2282 LB
VERTICAL FORCE (E_v) = 0.29 W_p = 406 LB

BOLT FORCES:

TENSION (T)

$$T_{u\ MAXIMUM} = \left[\frac{2282\#(12.8'')(1.20'')}{1\ BOLT\ (41'')(10'')} \times (0.3)\right] + \frac{2282\#(12.8'')(32.60'')}{1\ BOLT\ (10'')(41'')} - \frac{(1400\#(0.9) - 406\#)(1.2'')(32.6'')}{1\ BOLT\ (10'')(41'')} = 2267\ LB/BOLT\ (MAX)$$

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

SHEAR (V)

$$V_{u\ MAXIMUM} = \frac{2282\#(8.80'')}{2\ BOLTS\ (10'')} = 1004\ LB/BOLT\ (MAX)$$

BOLT SPECS: 5/8"φ HILTI KB-TZ (h_{ef} = 3.125")
φT = 0.75φNn = 2508 LB/BOLT (TENSION)
φV = φVn = 4940 LB/BOLT (SHEAR)

UNITY CHECK:

$$\left(\frac{T_u}{\phi T}\right) + \left(\frac{V_u}{\phi V}\right) \leq 1.2 \quad \left(\frac{2267}{2508}\right) + \left(\frac{1004}{4940}\right) = 1.11 \leq 1.2 \quad \therefore \text{ O.K.}$$

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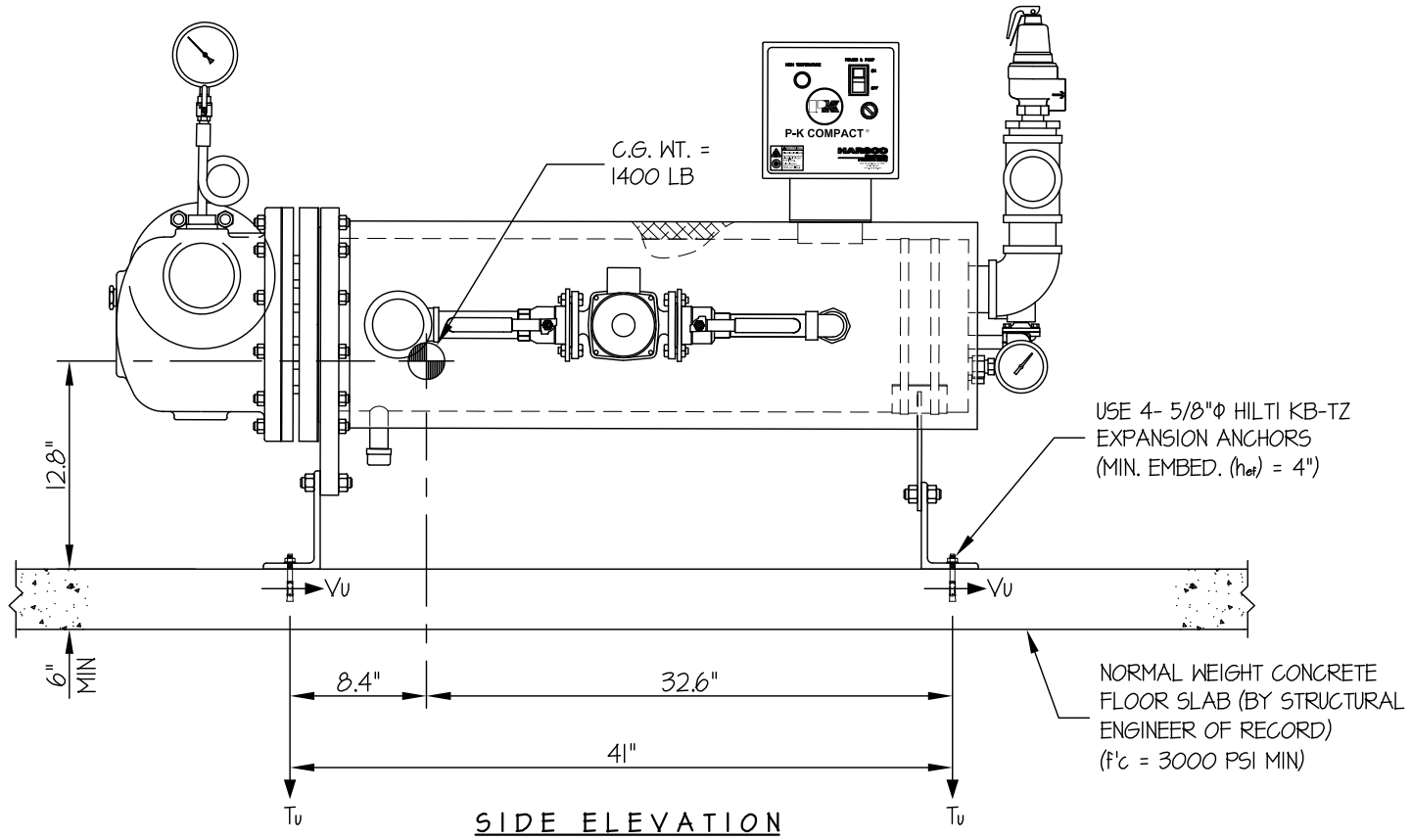
SHEET 3 OF 3 SHEETS

SEISMIC ANCHORAGE — 1.45 < MAX S_{DS} ≤ 1.90 — SLAB ON GRADE



SIDE ELEVATION

LOADS: PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10.
STRENGTH DESIGN IS USED (S_{DS} = 1.90, a_p = 1.0, I_p = 1.5, R_p = 2.5, Ω_0 = 2.5, z/h = 0)
WEIGHT = 1400 LB
HORIZONTAL FORCE (E_{mh}) = 2.14 W_p = 2996 LB
VERTICAL FORCE (E_v) = 0.38 W_p = 532 LB

BOLT FORCES:

TENSION (T)

$$T_{u\ MAXIMUM} = \left[\frac{2996\#(12.8'')(1.20'')}{1\ BOLT\,(41'')(10'')} \times (0.3)\right] + \frac{2996\#(12.8'')(32.60'')}{1\ BOLT\,(10'')(41'')} - \frac{(1400\#(0.9) - 532\#)(1.2'')(32.6'')}{1\ BOLT\,(10'')(41'')} = 3013\ LB/BOLT\ (MAX)$$

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

SHEAR (V)

$$V_{u\ MAXIMUM} = \frac{2996\#(8.80'')}{2\ BOLTS\,(10'')} = 1318\ LB/BOLT\ (MAX)$$

BOLT SPECS: 5/8"ϕ HILTI KB-TZ (h_{ef} = 4")
ϕT = 0.75ϕNn = 3329 LB/BOLT (TENSION)
ϕV = ϕVn = 4940 LB/BOLT (SHEAR)

UNITY CHECK:

$$\left(\frac{T_u}{\phi T}\right) + \left(\frac{V_u}{\phi V}\right) \le 1.2 \quad \left(\frac{3013}{3329}\right) + \left(\frac{1318}{4940}\right) = 1.17 \le 1.2 \quad \therefore \text{ O.K.}$$

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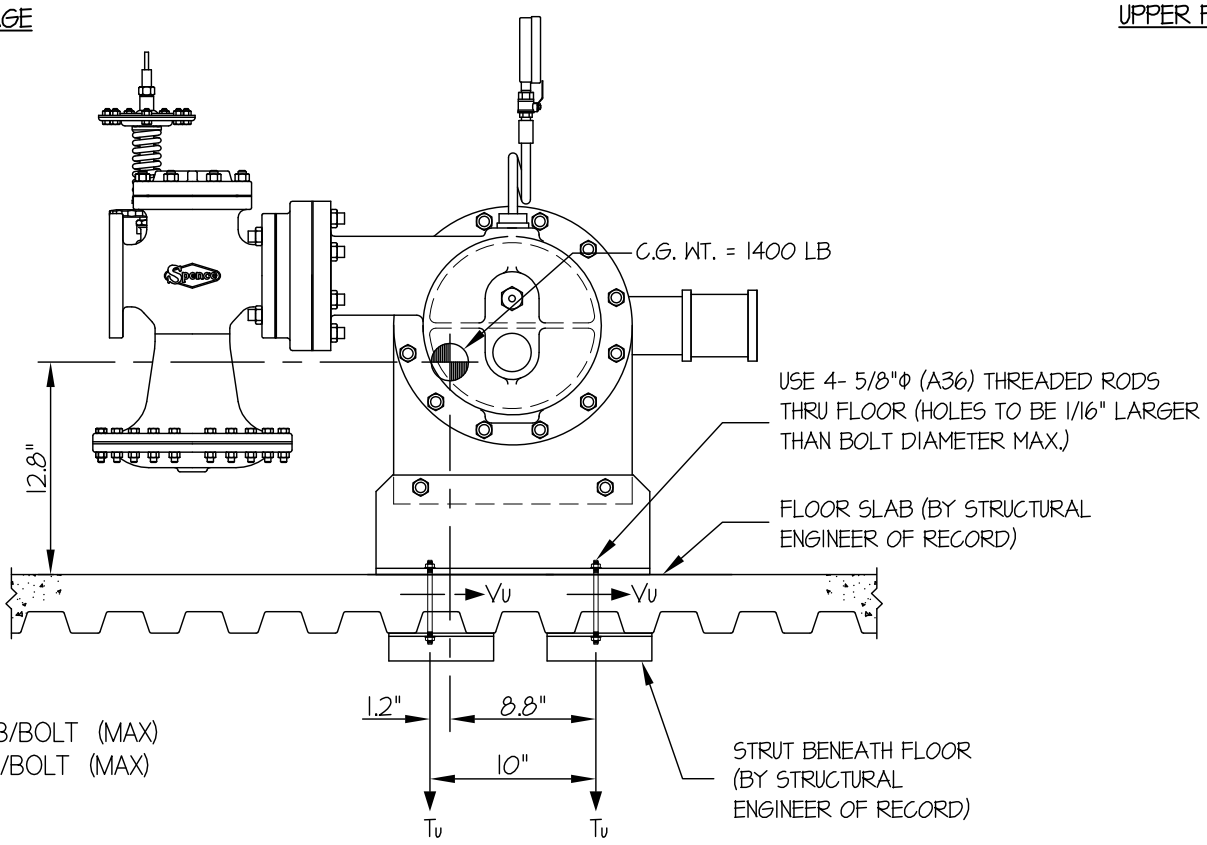
SHEET 1 OF 2 SHEETS

SEISMIC ANCHORAGE

UPPER FLOOR



Tu = 2215 LB/BOLT (MAX)
Vu = 973 LB/BOLT (MAX)

FRONT 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 = 1.0, I_p = 1.5, R_p = 2.5, $z/h \leq 1$)

   HORIZONTAL FORCE (E_h) = 1.58 W_p
   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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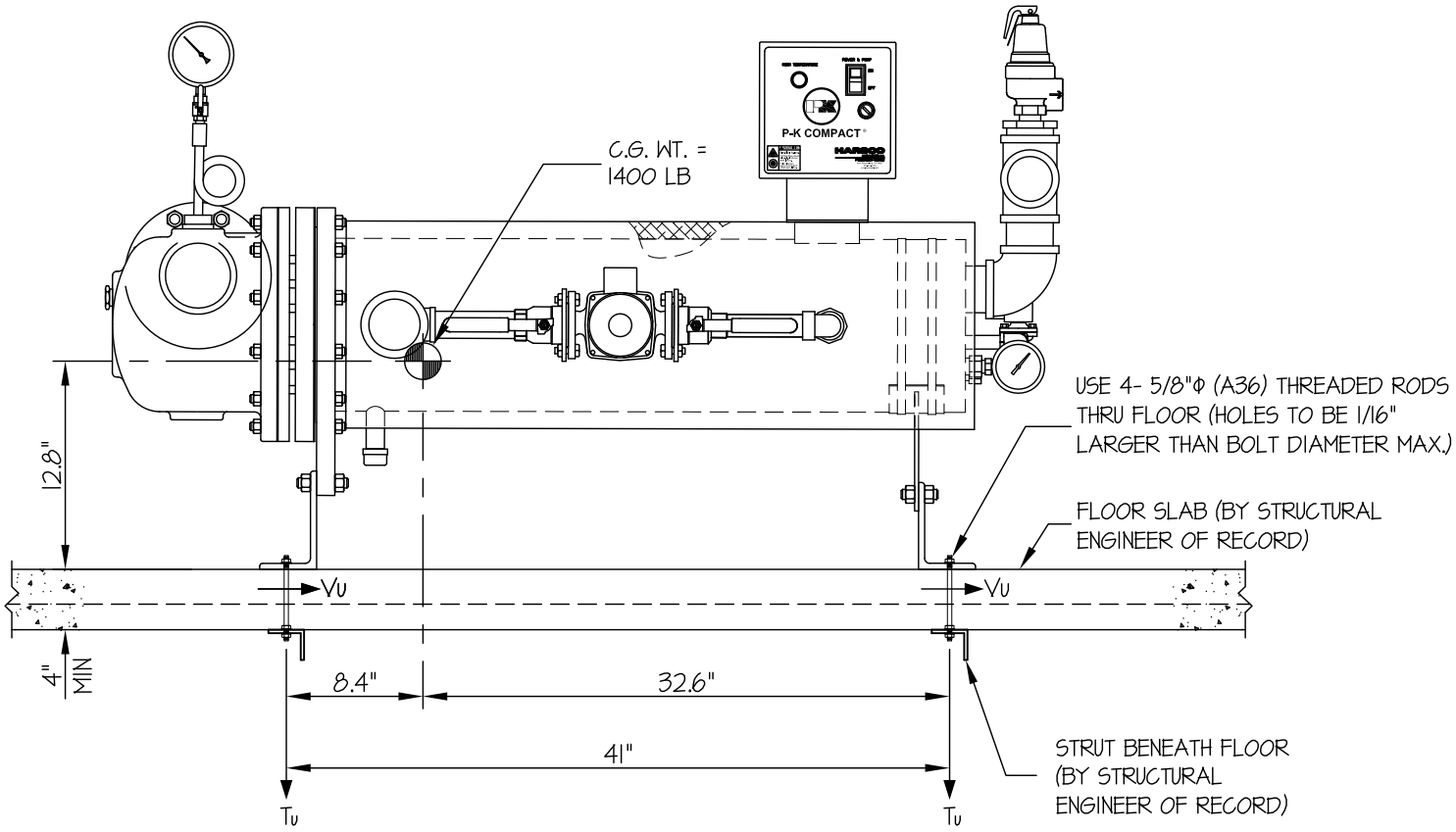

SIDE ELEVATION

LOADS: PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10.
STRENGTH DESIGN IS USED (S_{DS} = 2.20, a_p = 1.0, I_p = 1.5, R_p = 2.5, $z/h \leq 1$)

WEIGHT = 1400 LB

HORIZONTAL FORCE (E_h) = 1.58 W_p = 2212 LB

VERTICAL FORCE (E_v) = 0.44 W_p = 616 LB

BOLT FORCES:

BOLT SPECS: 5/8"ϕ (A36) THREADED ROD

ϕT= 10,016 LB/BOLT (TENSION)

ϕV= 5342 LB/BOLT (SHEAR)

TENSION (T)

$$T_{u\ MAXIMUM} = \left[\frac{2212\#(12.8'')(1.20'')}{1\ BOLT\ (41'')(10'')} \times (0.3) \right] + \frac{2212\#(12.8'')(32.60'')}{1\ BOLT\ (10'')(41'')} - \frac{(1400\#(0.9) - 616\#)(1.2'')(32.6'')}{1\ BOLT\ (10'')(41'')} = 2215\ LB/BOLT\ (MAX)$$

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

SHEAR (V)

$$V_{u\ MAXIMUM} = \frac{2212\#(8.80'')}{2\ BOLTS\ (10'')} = 973\ LB/BOLT\ (MAX)$$