

PATTERSON-KELLEY CO.

SC-1500/SC-2000 P-K SONIC BOILER

DES. **J. ROBERSON**

JOB NO. **11-1535**

DATE **12/4/15**

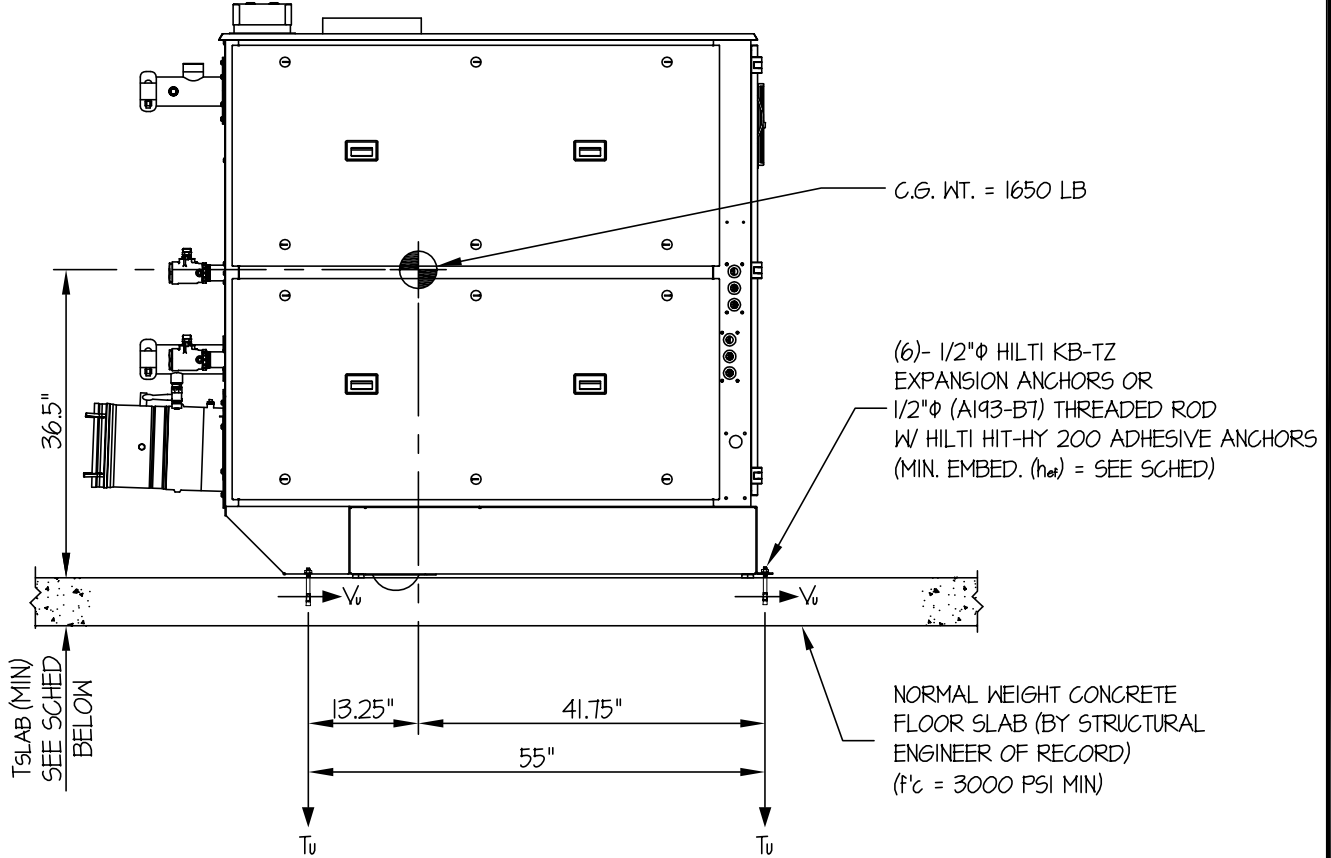
SHEET

1

OF **4** SHEETS

SEISMIC ANCHORAGE

SLAB ON GRADE



SIDE ELEVATION

ANCHORS							
MAX Sds	TYPE	DIAM	EFF EMBED	QTY	T _{SLAB}	T _u (lb)	V _u (lb)
135	HILTI KB-TZ	1/2"	3.25"	6	6"	2399	635
175	HILTI HIT-HY	1/2"	6"	6	8"	3205	823
220	HILTI HIT-HY	1/2"	8"	6	10"	4117	1035

NOTES:

- FORCES ARE DETERMINED PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10 STRENGTH DESIGN IS USED. ($\alpha_p = 1.0$, $l_p = 1.5$, $R_p = 2.5$, $\Omega_o = 2.5$, $z/h = 0$)
- 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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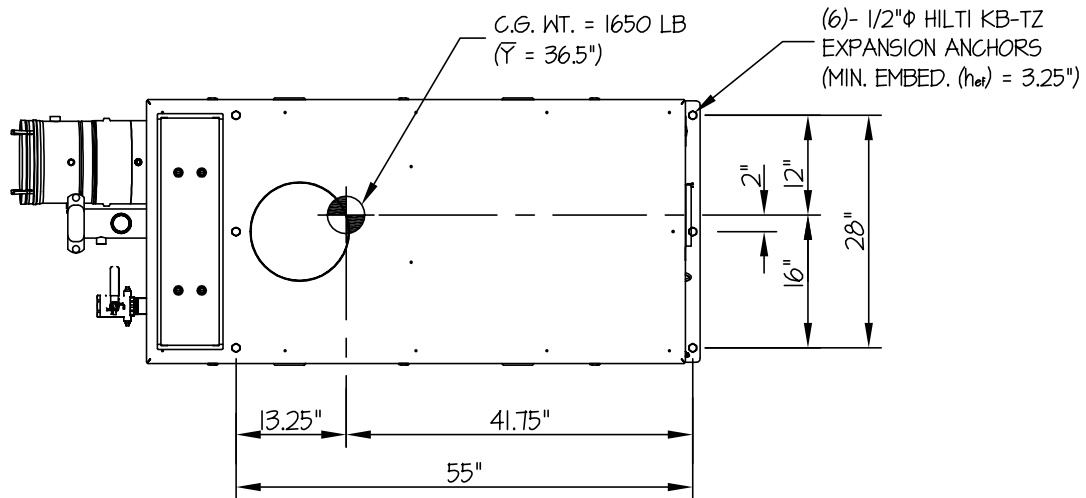
DATE **12/4/15**

OF **4** SHEETS

SEISMIC ANCHORAGE

MAX $S_{Ds} \leq 1.35$

SLAB ON GRADE



PLAN AT BASE

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

STRENGTH DESIGN IS USED ($S_{Ds} = 1.35$, $a_p = 1.0$, $I_p = 1.5$, $R_p = 2.5$, $\Omega_0 = 2.5$, $z/h = 0$)

WEIGHT = 1650 LB

HORIZONTAL FORCE (E_{mh}) = 152 $W_p = 2508$ LB

VERTICAL FORCE (E_v) = $0.27W_p = 446$ LB

BOLT FORCES:

BOLT SPECS: 1/2" ϕ HILTI KB-TZ

$\phi T = 0.75 = \phi N_h = 2625$ LB/BOLT (TENSION)

$\phi V = \phi V_h = 3572$ LB/BOLT (SHEAR)

TENSION (T)

$$T_{u \text{ MAXIMUM}} = \left[\frac{2508\#(36.5'')(16'')}{2 \text{ BOLTS } (55'')(28'')} \times (0.3) \right] + \frac{2508\#(36.5'')(41.75'')}{1 \text{ BOLT } (28'')(55'')} - \frac{(1650\#(0.9) - 446\#)(41.75'')(16'')}{2 \text{ BOLTS } (55'')(28'')} = 2399 \text{ LB/BOLT (MAX)}$$

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

SHEAR (V)

$$V_{u \text{ MAXIMUM}} = \frac{2508\#(41.75'')}{3 \text{ BOLTS } (55'')} = 635 \text{ LB/BOLT (MAX)}$$

UNITY CHECK:

$$\left(\frac{T_u}{\phi T} \right) + \left(\frac{V_u}{\phi V} \right) \leq 1.2 \quad \left(\frac{2399}{2625} \right) + \left(\frac{635}{3572} \right) = 1.10 \leq 1.2 \quad \therefore \text{OK}$$

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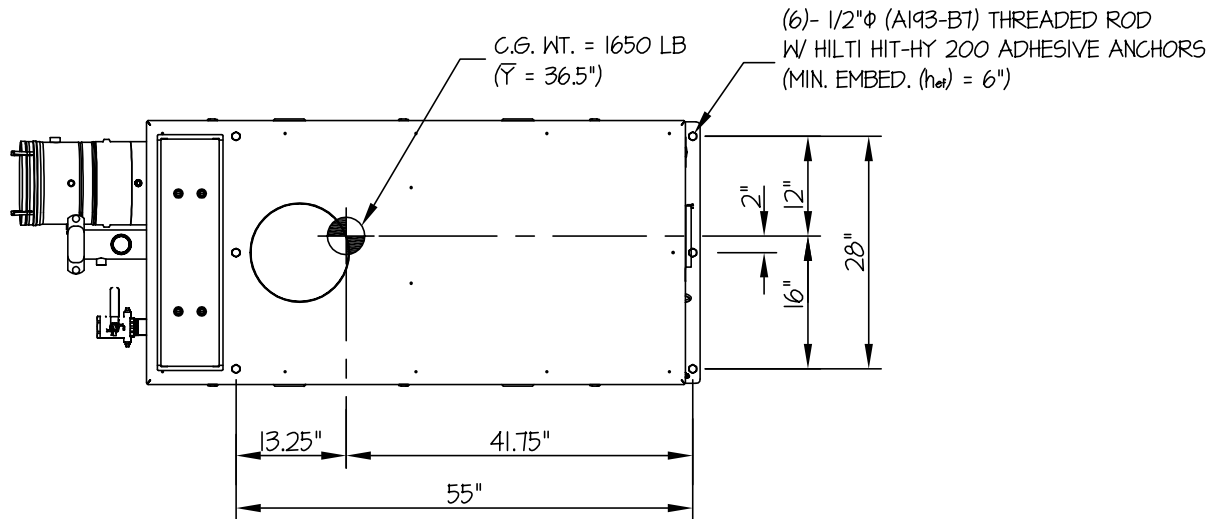
DATE **12/4/15**

OF **4** SHEETS

SEISMIC ANCHORAGE

MAX $S_{Ds} \leq 1.75$

SLAB ON GRADE



PLAN AT BASE

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

STRENGTH DESIGN IS USED ($S_{Ds} = 1.75$, $a_p = 1.0$, $I_p = 15$, $R_p = 2.5$, $\Omega_0 = 2.5$, $z/h = 0$)

WEIGHT = 1650 LB

HORIZONTAL FORCE (E_{mh}) = 197 $W_p = 3251$ LB

VERTICAL FORCE (E_v) = 0.35 $W_p = 578$ LB

BOLT FORCES:

BOLT SPECS: 1/2" ϕ (A193-B7) THREADED ROD
W/ HILTI HIT-HY 200 ADHESIVE ANCHORS:

$\phi T = 0.75 \phi N_n = 3500$ LB/BOLT (TENSION)

$\phi V = \phi V_n = 4842$ LB/BOLT (SHEAR)

TENSION (T)

$$T_{u \text{ MAXIMUM}} = \left[\frac{3251\#(36.5")(16")}{2 \text{ BOLTS } (55")(28")} \times (0.3) \right] + \frac{3251\#(36.5")(41.75")}{1 \text{ BOLT } (28")(55")} - \frac{(1650\#(0.9) - 578\#(41.75")(16"))}{2 \text{ BOLTS } (55")(28")} = 3205 \text{ LB/BOLT (MAX)}$$

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

SHEAR (V)

$$V_{u \text{ MAXIMUM}} = \frac{3251\#(41.75")}{3 \text{ BOLTS } (55")} = 823 \text{ LB/BOLT (MAX)}$$

UNITY CHECK:

$$\left(\frac{T_u}{\phi T} \right) + \left(\frac{V_u}{\phi V} \right) \leq 1.2 \quad \left(\frac{3205}{3500} \right) + \left(\frac{823}{4842} \right) = 1.09 \leq 1.2 \quad \therefore \text{O.K.}$$

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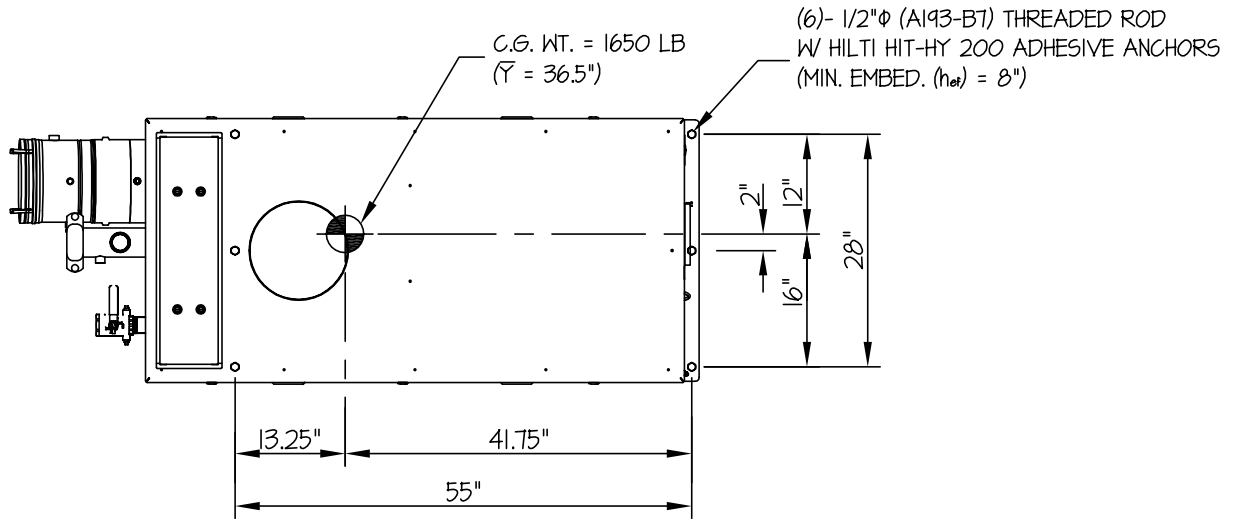
DATE **12/4/15**

OF **4** SHEETS

SEISMIC ANCHORAGE

1.75 < MAX S_{DS} ≤ 2.20

SLAB ON GRADE



PLAN AT BASE

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

STRENGTH DESIGN IS USED ($S_{DS} = 2.20$, $a_p = 1.0$, $I_p = 15$, $R_p = 2.5$, $\Omega_0 = 2.5$, $z/h = 0$)

WEIGHT = 1650 LB

HORIZONTAL FORCE (E_{mh}) = $2.48 W_p = 4092$ LB

VERTICAL FORCE (E_v) = $0.44 W_p = 726$ LB

BOLT FORCES:

TENSION (T)

$$T_{u \text{ MAXIMUM}} = \left[\frac{4092\#(36.5')(16")}{2 \text{ BOLTS } (55')(28")} \times (0.3) \right] + \frac{4092\#(36.5')(41.75")}{1 \text{ BOLT } (28')(55")} - \frac{(1650\#(0.9) - 726\#)(41.75')(16")}{2 \text{ BOLTS } (55')(28")} = 4117 \text{ LB/BOLT (MAX)}$$

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

SHEAR (V)

$$V_{u \text{ MAXIMUM}} = \frac{4092\#(41.75")}{3 \text{ BOLTS } (55")} = 1035 \text{ LB/BOLT (MAX)}$$

UNITY CHECK:

$$\left(\frac{T_u}{\Phi T} \right) + \left(\frac{V_u}{\Phi V} \right) \leq 1.2 \quad \left(\frac{4117}{4667} \right) + \left(\frac{1035}{4842} \right) = 1.10 \leq 1.2 \quad \therefore \text{O.K.}$$

BOLT SPECS: 1/2"φ (A193-B7) THREADED ROD
W/ HILTI HIT-HY 200 ADHESIVE ANCHORS:

$\Phi T = 0.75 \Phi n = 4667$ LB/BOLT (TENSION)

$\Phi V = \Phi v n = 4842$ LB/BOLT (SHEAR)

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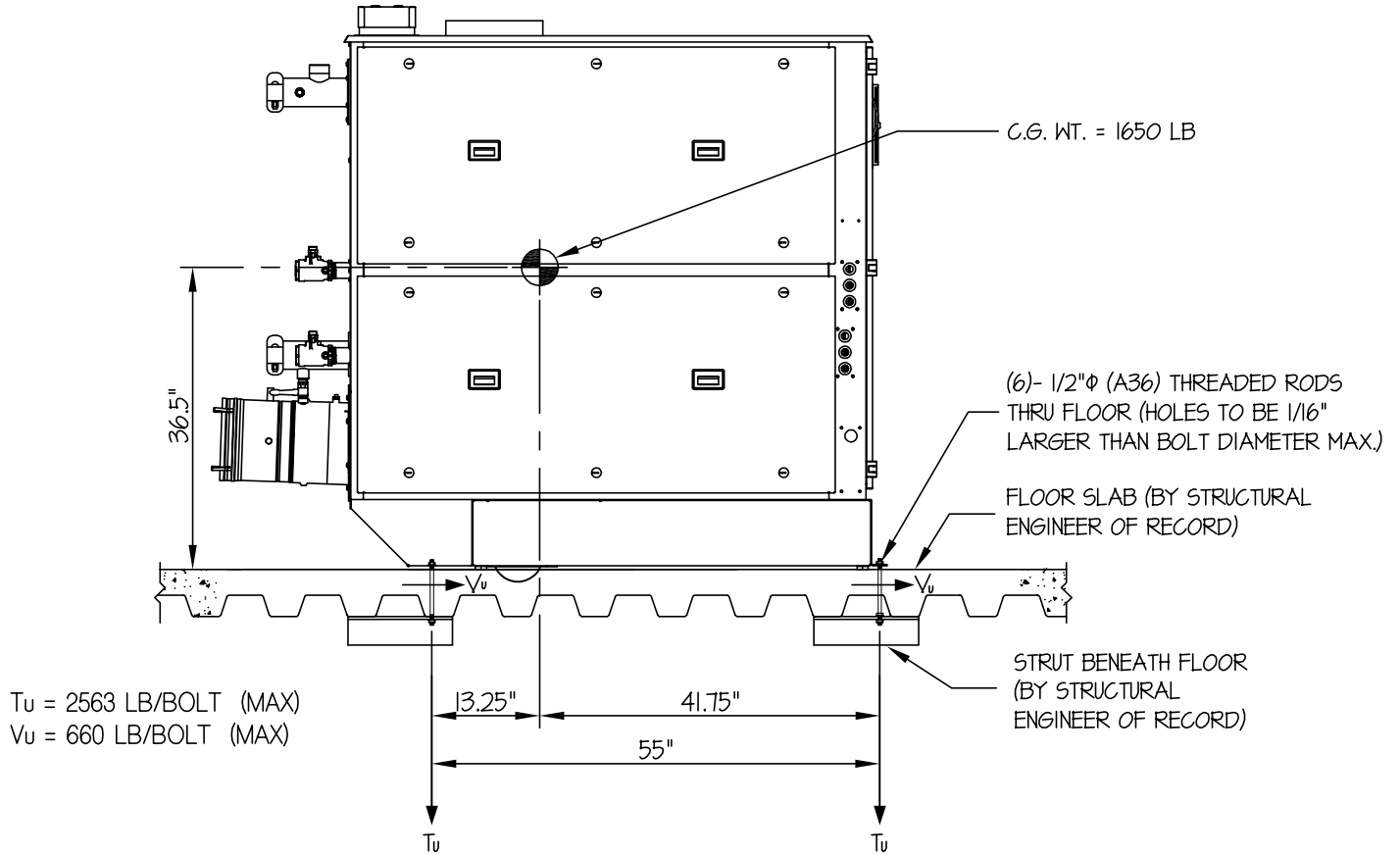
SHEET

1

OF **2** SHEETS

SEISMIC ANCHORAGE

UPPER FLOOR



SIDE ELEVATION

NOTES:

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

STRENGTH DESIGN IS USED. ($S_{ds} = 2.20$, $a_p = 1.0$, $I_p = 1.5$, $R_p = 2.5$, $z/h \leq 1$)

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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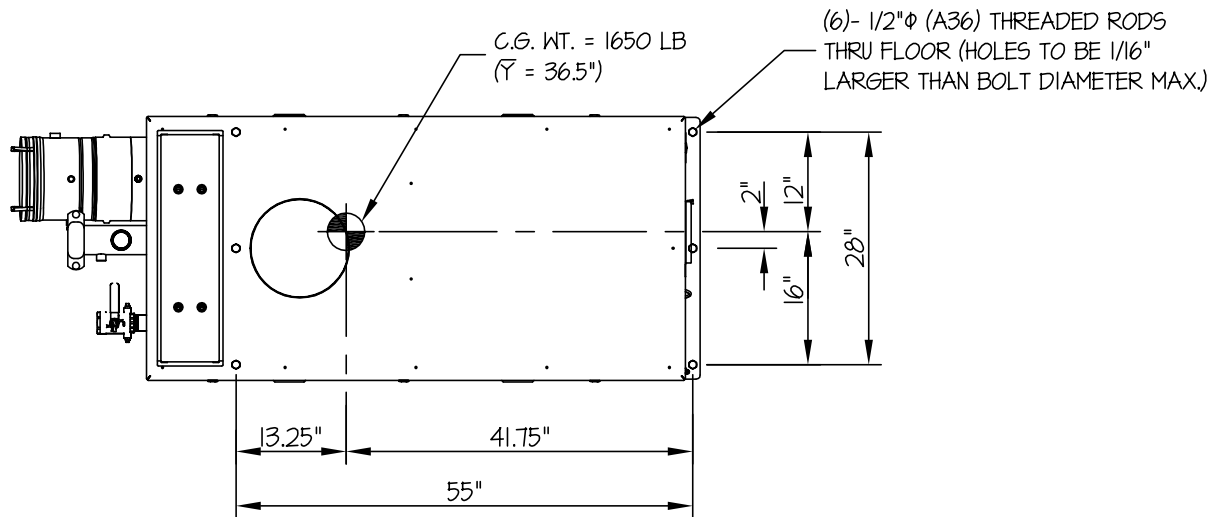
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OF **2** SHEETS

SEISMIC ANCHORAGE

UPPER FLOOR



PLAN AT BASE

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 = 1650 LB

HORIZONTAL FORCE (E_h) = $158W_p = 2607$ LB

VERTICAL FORCE (E_v) = $0.44W_p = 726$ LB

BOLT FORCES:

BOLT SPECS: 1/2"φ (A36) THREADED ROD

ΦT = 6395 LB/BOLT (TENSION)

ΦV = 3410 LB/BOLT (SHEAR)

TENSION (T)

$$T_{u \text{ MAXIMUM}} = \left[\frac{2607\#(36.5'')(16'')}{2 \text{ BOLTS } (55'')(28'')} \times (0.3) \right] + \frac{2607\#(36.5'')(41.75'')}{1 \text{ BOLT } (28'')(55'')} - \frac{(1650\#(0.9) - 726\#)(41.75'')(16'')}{2 \text{ BOLTS } (55'')(28'')} = 2563 \text{ LB/BOLT (MAX)}$$

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

SHEAR (V)

$$V_{u \text{ MAXIMUM}} = \frac{2607\#(41.75'')}{3 \text{ BOLTS } (55'')} = 660 \text{ LB/BOLT (MAX)}$$