RMJ

Structural Engineers

Robinson
Meier
Juilly & Associates

Principals
Peter Robinson, S.E.
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10-Series Unit

Structural Calculations
For Seismic Anchorage

Prepared for:

Crenlo
April 06, 2016
Updated June 25, 2018
RMJ Job No. 14273 & 18183
Valid Thru December 31, 2019

241 Joaquin Avenue
San Leandro, CA 94577
(510) 991-0977

RMJ

10-Series Units

Table of Contents

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10-Series Unit Anchorage
Nationwide
RMJ Job# 14273

Project Description:

This project involves providing server anchorage support for units located throughout the United States. Calculations have been assembled according to two distinct seismic regions low & moderate, and high. A map has been created based on Figures 3.3-1 & 3.3-2 of ASCE 7-10 to define the two different seismic regions. Please note our seismic map shows three distinct regions low, moderate, and high, but for simplicity of our calculations low and moderate were combined into one region. The map also shows a solid line near the New Madrid Fault where the value of S_s exceeds 2.75. In this area of extreme seismic potential, all anchorage is site specific. The other seismic regions have been determined according to the table included below;

Seismic Design Data			
Seismic design region	**Short period spectral response acceleration S_s**	**Short-period site coefficient F_a**	**Design spectral response acceleration at short periods S_{DS}**
Low	0.4	1.5	0.4
Moderate	1.5	1.0	1.0
High	2.75	1.0	2.0

Anchorage

Calculations are based ½" diameter Hilti Kwik Bolt KB-TZ Carbon Steel expansion bolts, with the assumptions that anchors are not located within any boundary edges, 4" thick concrete minimum thickness, 2" minimum embedment, and 3,000 psi concrete strength. See table below for allow cabinet + content weight.

Allowable Values

MAX CABINET WT. WITH CONTENTS	LOW & MODERATE SEISMIC				HIGH SEISMIC			
	GROUND		UPPER		GROUND		UPPER	
	ON FLOOR	RAISED	ON FLOOR	RAISED	ON FLOOR	RAISED	ON FLOOR	RAISED
SINGLE UNIT	1,500	1,500	1,500	1,500	800	SS[1]	800	SS[1]
GANGED UNIT	1,500	1,200	1,300	1,300	1,200	SS[1]	1,100	SS[1]

SS[1]- Site Specific Calculations Required

Anchor Capacities

Please see the table below for a quick review of our results.

Bolt Alignment	**Max Tension (lbf.)**	**Max Shear (lbf.)**	**% Capacity**
Ground Level	1,275	1,490	99
50% Bld. Ht.	1,275	1,490	99

I have included the Hilti output files along with my hand calculations in the appendix section of this calculation packet. Site specific engineering is required where S_S is greater than 2.75. Design is in accordance with the 2012 International Building Code along with the 2013 California Building Code.

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10-Series Units by Cenlo
Scope, Assumptions, and Limitations
RMJ Job #14273
April 4, 2015

Special Note:
Server rack anchorage calculations are valid under the 2012 International Building Code thru date noted on cover sheet. After valid thru date, contact Crenlo for updates.

- Special Inspection shall be provided for expansion bolt installation.
- Existing concrete shall have a minimum compressive strength of 3,000 psi.
- Importance factor is assumed to be 1.0.
- Raised Units not to exceed 18".
- Soil class is assumed to be D.
- Calculations and anchorage are done in accordance with the 2012 IBC and ASCE7-10.
- Maximum S_s value is 2.75. Where value of S_s exceeds 2.75, site specific calculations are required for all anchorages. S_s values can exceed 2.75 near the New Madrid fault.
- The minimum slab on grade thickness is assumed to be 4".
- The minimum concrete fill over metal deck thickness is 3½" (with 1 ½" metal deck).
- Enclosure is assumed to stay rigid during seismic loading (design by others).
- Computer access floor shall have strength to support compression and lateral loads.
- Floor slab and concrete filled metal deck shall have strength to resist uplift caused by overturning moment of cabinets.
- Any installation located in a high seismic region above the upper half of building shall be site specific. The second floor of a 2 story building is not considered the upper half of the building.
- Ganged Units based on a Minimum of 3 Units.
- Calculations are for Crenlo 10-Series units.

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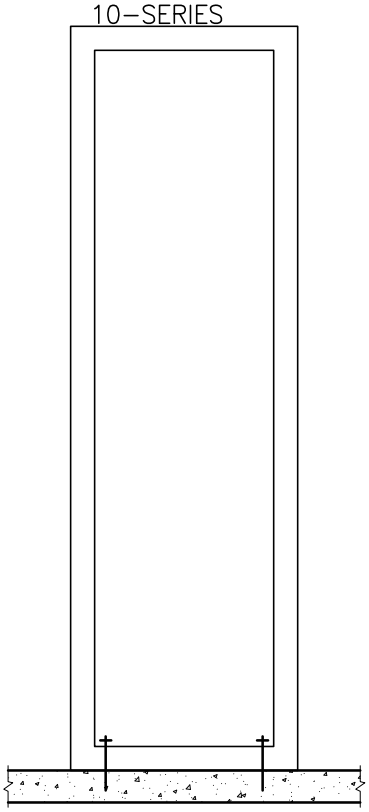
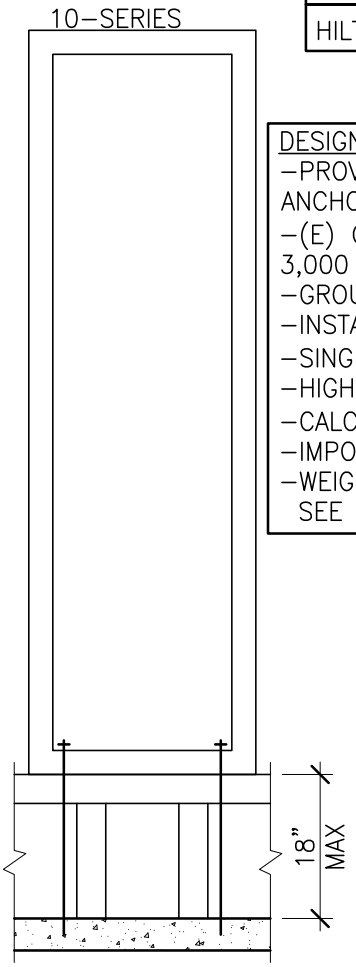
DESIGN SCENARIOS AND CONDITIONS

FASTENER SELECTION
HILTI KB–TZ $^{1}/_{2}$" ø BOLT



CONC. SLAB OR CONC. OVER METAL DECK (DIRECT FRAME TO FLOOR) REFER TO DRAWINGS SK3, SK4, SK5, SK6, SK9



RAISED COMP. FLOOR (ANCHOR FRAME TO SUB–FLOOR) REFER TO DRAWINGS SK3, SK4, SK5, SK7, SK8

DESIGN CRITERIA
- –PROVIDE SPECIAL INSPECTION FOR EXPANSION ANCHOR
- –(E) CONC. MIN COMPRESSIVE STRENGTH 3,000 psi
- –GROUND FLOOR
- –INSTALLATION AT <50% OF BUILDING HEIGHT
- –SINGLE & GANGED UNITS (3 OR MORE)
- –HIGH, MODERATE & LOW SEISMIC REGIONS
- –CALCULATION PER IBC 2012/CBC 2013
- –IMPORTANCE FACTOR 1.0
- –WEIGHT OF ENCLOSURE AND CONTENTS: SEE TABLE

ALLOWABLE CABINET ADDED WEIGHT *ALL WEIGHTS GIVEN IN (LB) TABLE 1

MAX CABINET WT. WITH CONTENTS	LOW & MODERATE SEISMIC				HIGH SEISMIC			
	GROUND		UPPER		GROUND		UPPER	
	ON FLOOR	RAISED	ON FLOOR	RAISED	ON FLOOR	RAISED	ON FLOOR	RAISED
SINGLE UNIT	1,500	1,500	1,500	1,500	800	SS[1]	800	SS[1]
GANGED UNIT	1,500	1,200	1,500	1,500	1,200	SS[1]	1,200	800

SS[1] – SITE SPECIFIC ENGINEERING REQUIRED

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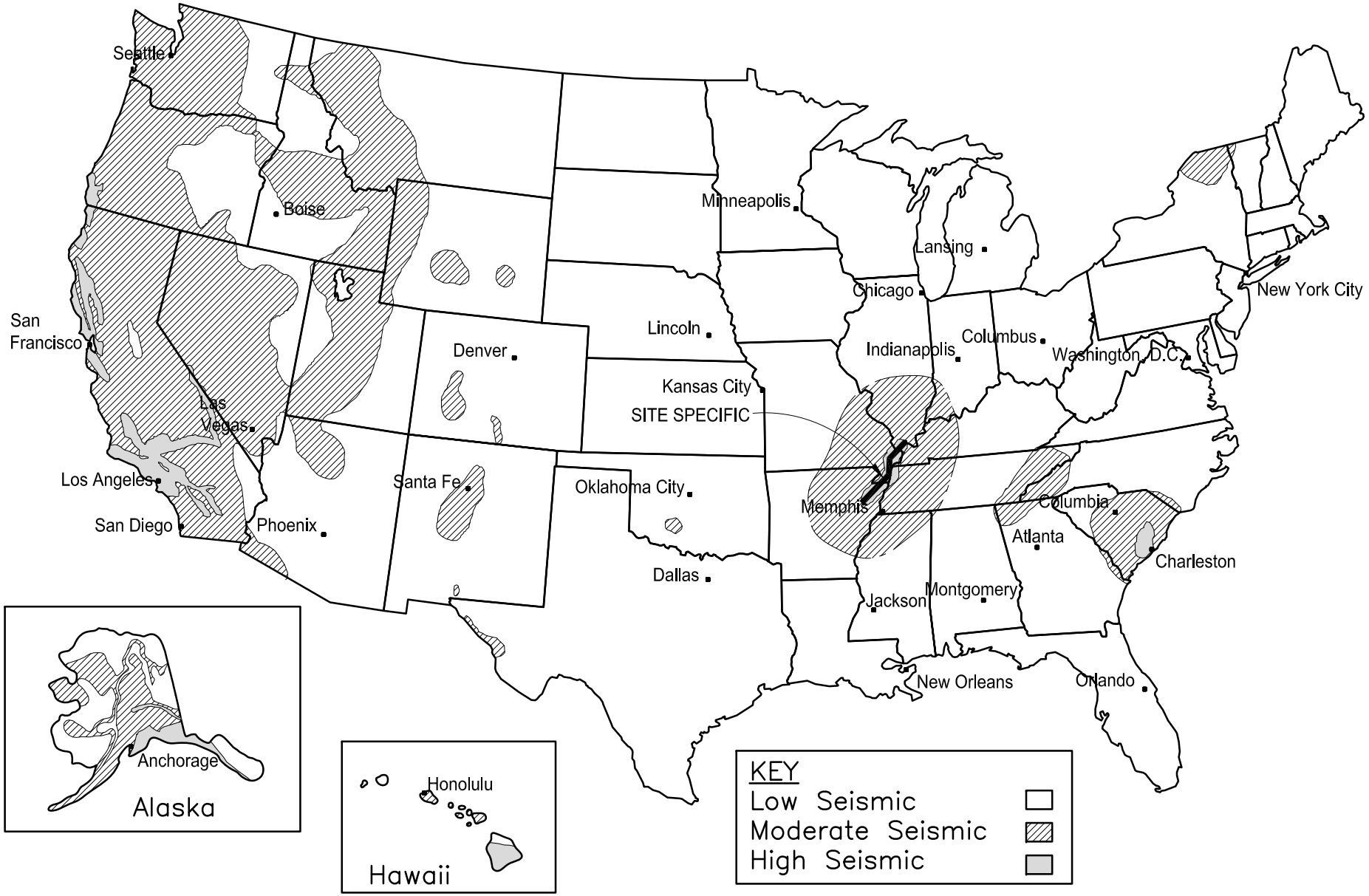
CRENLO
10 SERIES

LOW, MODERATE, AND HIGH SEISMIC REGIONS

Signed by MAS Date 04/2015

Job No. 14273

Sheet No. SK2



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Seismic Risk Location Map
Crenlo 10–Series Unit

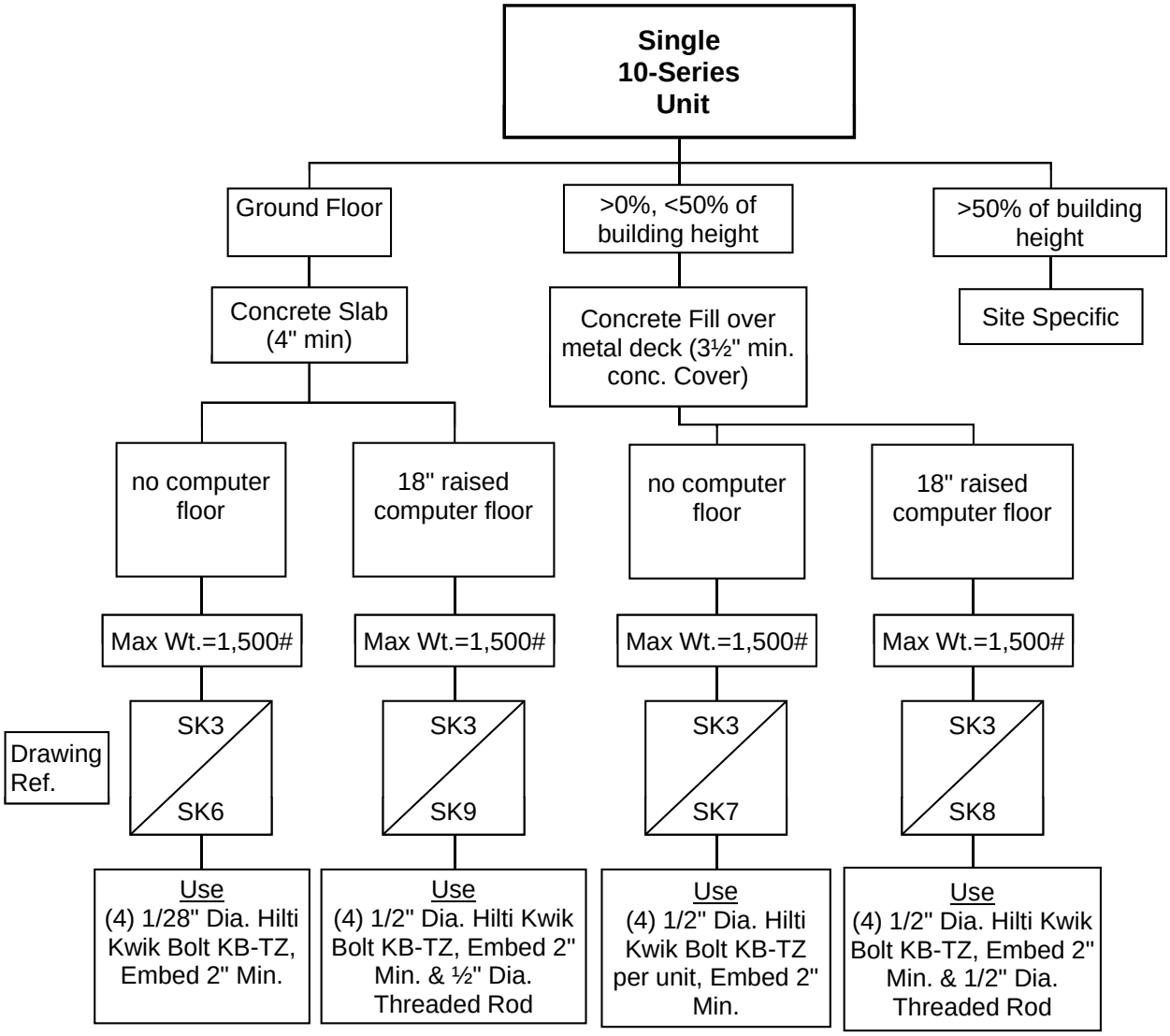
USA

Date 06–15

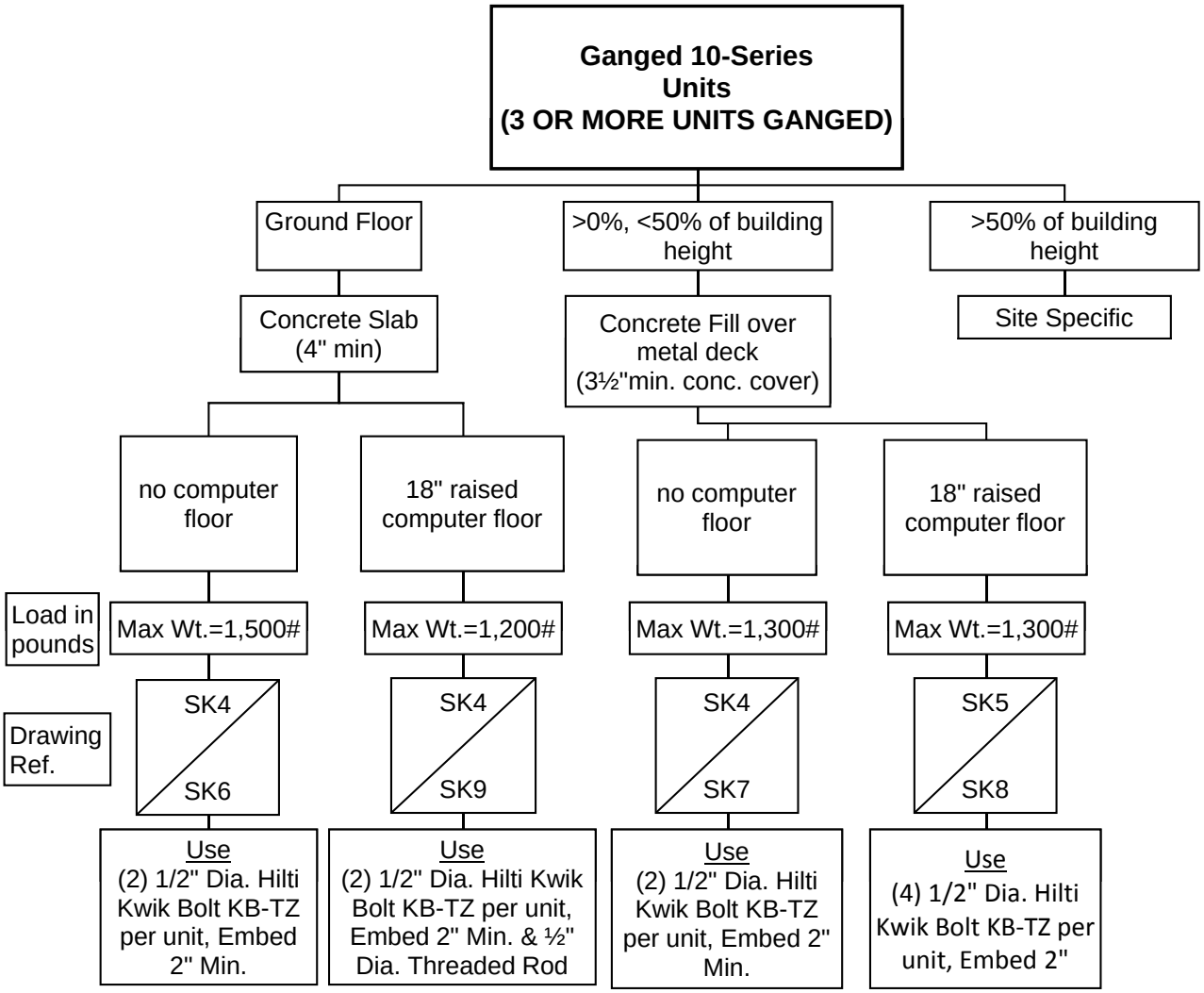
Job No. 14273

Sheet No. 1 OF 1

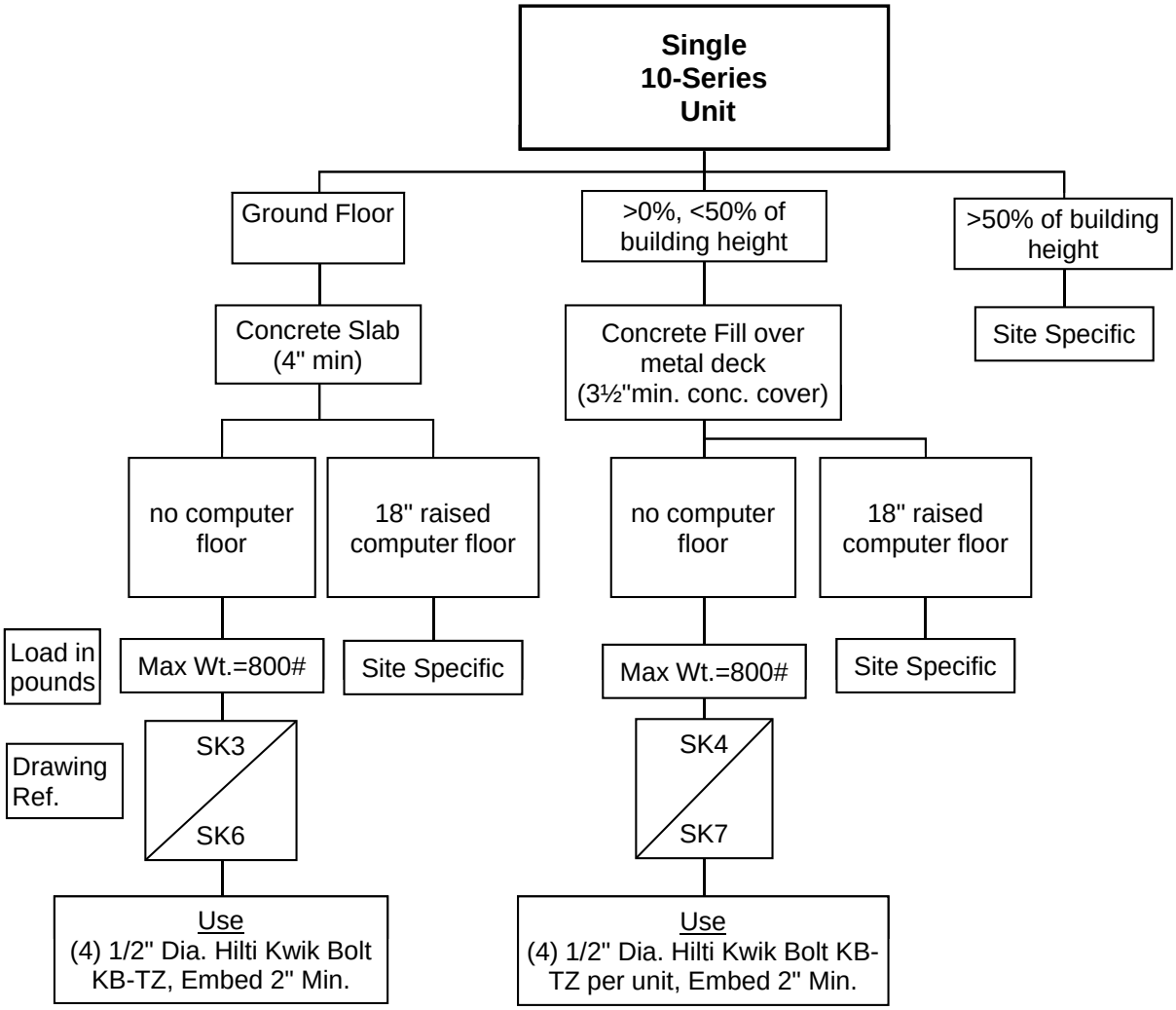
Summary: 10-Series - Low & Moderate Seismic



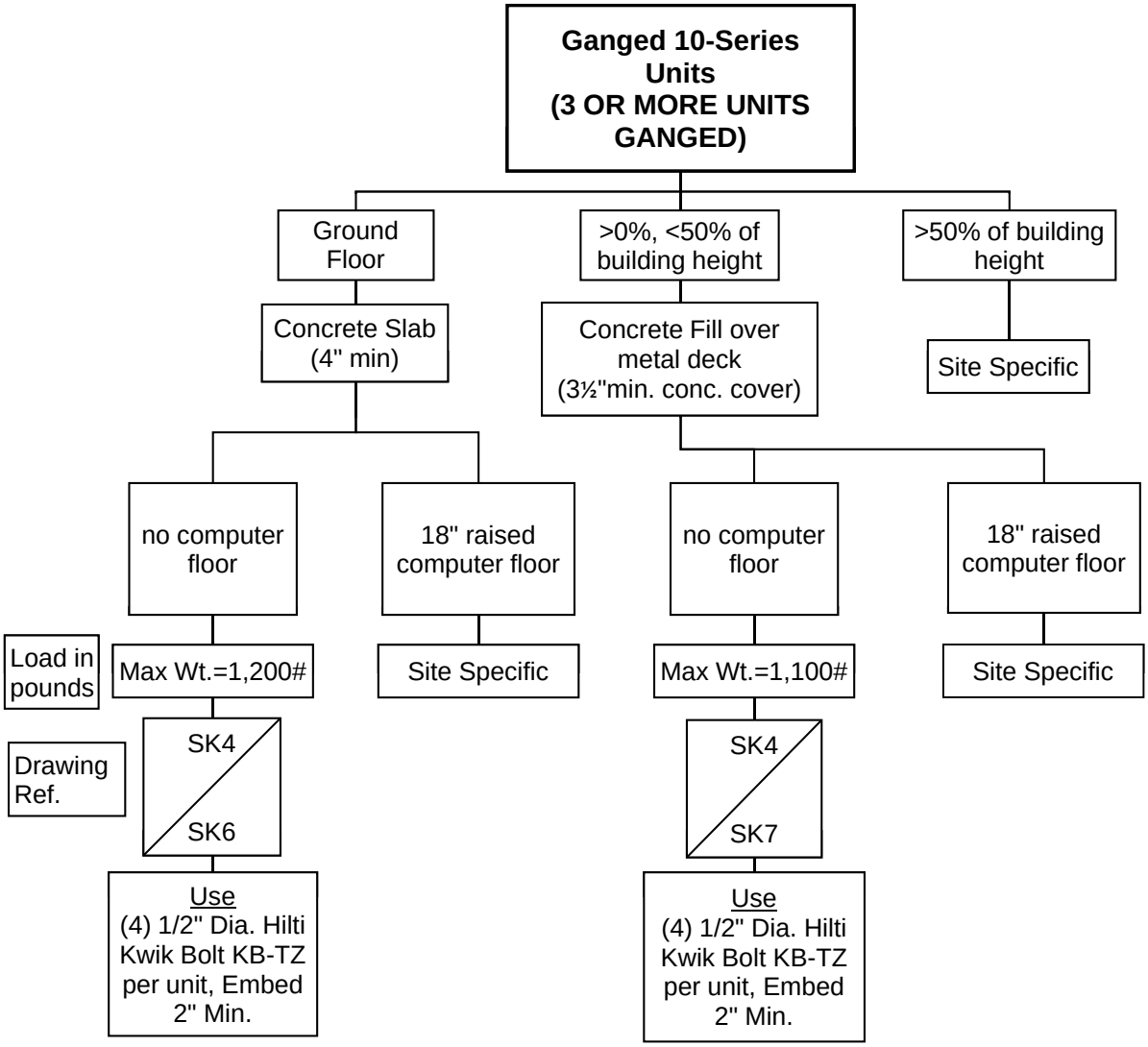
Summary: 10-Series - Low & Moderate Seismic



Summary: 10-Series - High Seismic



Summary: 10-Series - High Seismic



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Low Seismic Calculations

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Find the Seismic Design Category (SDC) **Unit : 10-Series**

Project Location: Low & Moderate Seismic
Latitude: Varies Longitude: Varies

Soil Classification: D Table 1613.5.2 & Section 1613.5.2
Occupancy Category: II Table 1604.5

Information from U.S. Geological Survey Website
http://earthquake.usgs.gov/research/hazmaps/

S_S=	1.500	g	
S_1=	1.070	g	
F_a=	1.000		Table 1613.5.3(1)
F_v=	1.500		Table 1613.5.3(2)
S_{MS}=	1.50	g	(Equation 16-37)
S_{M1}=	1.61	g	(Equation 16-38)
S_{DS}=	1.000	g	(Equation 16-39)
S_{D1}=	1.070	g	(Equation 16-40)

Seismic Design Category (SDC): Varies

Load Case: Single Unit (Ground floor)

Unit Dimensions

Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Unit Weight (lb.) =	1,500

Unit	Part	Weight (lbs)	Center of Gravity Location X (in)	Y (in)	Z (in)
10-Series	Frame+Contents	1,500	8.5	10.375	41.1875

Longitudinal Anchorage Spacing (in) = 20.75

Transverse Anchorage Spacing (in) = 17

Seismic Force

S_{DS} =	1.0	Low & Moderate Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.0	(Ground Floor)
F_p =	0.160	W
$F_{p,min}$ =	0.30	W
$F_{p,max}$ =	1.60	W
Use F_p =	**0.30**	**W**
Ω =	2.5	Overstrength

Longitudinal Overturning

Overturning Moment = 0.30 (41.1875 in. x 1500lbs.) = 18,534 lb-in

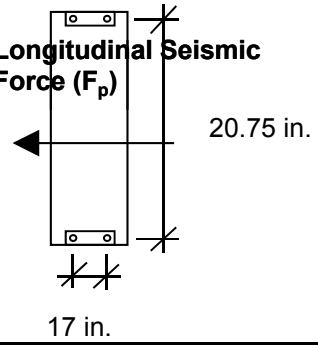
0.9xResisting Moment = 0.9 [1500 lbs. x (8.5in)]= 11,475 lb-in

Total # of Bolts = 4

Anchorage Force = 519 lbs/per bolt
Shear Force = 563 lbs/per bolt

Anchorage and Shear Force Increased by Overstrength Factor

10-Series unit Plan



Design Bolts for 519 lbs tension, 563 lbs. shear, longitudinal direction

Transverse Overturning

Overturning Moment = 0.30 (41.1875 in. x 1500lbs.) = 18,534 lb-in

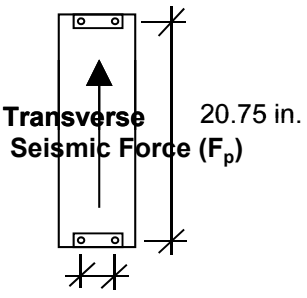
0.9xResisting Moment = 0.9 [1500 lbs. x (10.375in.)]= 14,006 lb-in

Total # of Bolts = 4

Anchorage Force = 273 lbs/per bolt
Shear Force = 563 lbs/per bolt

Anchorage and Shear Force Increased by Overstrength Factor

10-Series unit Plan



Design Bolts for 0 lbs tension, 563 lbs. shear, transverse direction

Drawing Reference See: SK3 & SK6

Load Case: <u>Single Units on 18in raised computer floor (Ground floor)</u>

Unit Dimensions	
Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Unit Weight (lb) =	1,500

Raised Floor = 18 in

Unit	Part	Weight (lbs)	Center of Gravity Location X (in)	Y (in)	Z (in)
10-Series	Frame+Contents	1,500	8.50	10.38	59.1875

Longitudinal Anchorage Spacing (in) = 20.75
Transverse Anchorage Spacing (in) = 17

Seismic Force		
S_{DS} =	1.0	Low & Moderate Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.0	(Ground Floor)
F_p =	0.160	W
$F_{p,min}$ =	0.30	W
$F_{p,max}$ =	1.60	W
Use F_p =	**0.30**	**W**
Ω =	2.5	Overstrength

<u>Longitudinal Overturning</u>

Overturning Moment = 0.30 (59.1875 in. x 1500lbs.) = 26,634 lb-in

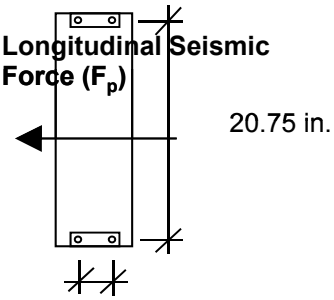
0.9xResisting Moment = 0.9 [1500 lbs. x (8.5in.)]= 11,475 lb-in

Total # of Bolts = 4

Anchorage Force = 1,115 lbs/per bolt
Shear Force = 563 lbs/per bolt

Anchorage and Shear Force Increased by Overstrength Factor

<u>10-Series unit Plan</u>



Design Bolts for 1,115 lbs tension, 563 lbs. shear, longitudinal direction

<u>Transverse Overturning</u>

Overturning Moment = 0.30 (59.1875 in. x 1500lbs.) = 26,634 lb-in

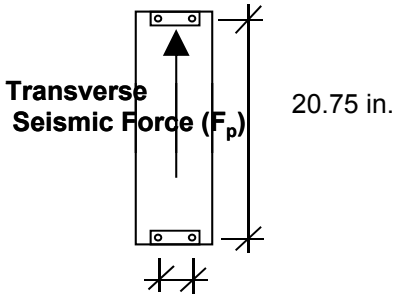
0.9xResisting Moment = 0.9 [1500 lbs. x (10.375in)]= 14,006 lb-in

Total # of Bolts = 4

Anchorage Force = 761 lbs/per bolt
Shear Force = 563 lbs/per bolt

Anchorage and Shear Force Increased by Overstrength Factor

<u>10-Series unit Plan</u>



Design Bolts for 761 lbs tension, 563 lbs. shear, transverse direction

Drawing Reference See: <u>SK3 & SK9</u>

Load Case: Ganged Unit (Ground floor)

# of Units ganged (min.)= 3

Single Unit Dimension	
Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Frame Weight (lb.) =	1,500

			Center of Gravity Location		
Unit	**Part**	**Weight (lbs)**	**X (in)**	**Y (in)**	**Z (in)**
3 - 10-Series	Frame+Contents	4,500	28.5	10.375	41.19

Longitudinal Anchorage Spacing (in) = 62.25
Transverse Anchorage Spacing (in) = 20.75

Seismic Force		
S_{DS} =	1.0	Low & Moderate Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.0	(Ground Floor)
F_p =	0.160	W
$F_{p,min}$ =	0.30	W
$F_{p,max}$ =	1.60	W
Use F_p =	**0.30**	**W**
Ω =	2.5	Overstrength

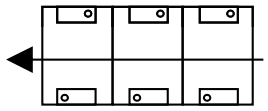
Longitudinal Overturning

Overturning Moment = 0.30 (41.1875 in. x 4500lbs.) = 55,603 lb-in

0.9xResisting Moment = 0.9 (4500 lbs. x28.5 in.)= 115,425 lb-in

10-Series unit Plan

Longitudinal Seismic Force



Anchorage Force =	0	lbs
Shear Force =	1,125	lbs/per bolt

3 ganged units
Total # of bolts/Unit = 2

Anchorage and Shear Force Increased by Overstrength Factor

Design Bolts for 0 lbs tension, 1,125 lbs. shear, transverse direction

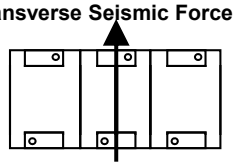
Transverse Overturning

Overturning Moment = 0.30 (41.1875 in. x 4500lbs.) = 55,603 lb-in

0.9xResisting Moment = 0.9 (4500 lbs x10.375 in.) = 42,019 lb-in

Ganged 10-Series unit Plan

Transverse Seismic Force



Anchorage Force =	546	lbs/per bolt
Shear Force =	1,125	lbs/per bolt

3 ganged units
Total # of bolts/Unit = 2

Anchorage and Shear Force Increased by Overstrength Factor

Design Bolts for 1 lbs tension, 1,125 lbs. shear, transverse direction

Drawing Reference See: SK4 & SK6

Load Case: <u>Ganged units on 18in raised computer floor (Ground Floor)</u>

# of Units ganged (min.)= 3

Single Unit Dimension	
Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Frame Weight (lb.) =	1,200

Raised Floor = 18 in

Unit	Part	Weight (lbs)	Center of Gravity Location X (in)	Y (in)	Z (in)
3 - 10-Series	Frame+Contents	3,600	28.5	10.375	59.1875

Longitudinal Anchorage Spacing (in) = 62.25
Transverse Anchorage Spacing (in) = 20.75

Seismic Force		
S_{DS} =	1.0	Low & Moderate Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.0	(Ground Floor)
F_p =	0.160	W
$F_{p,min}$ =	0.30	W
$F_{p,max}$ =	1.60	W
Use F_p =	**0.30**	**W**
Ω =	2.5	Overstrength

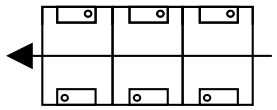
Longitudinal Overturning

Overturning Moment = 0.3 (59.1875 in. x 3600lbs.) = 63,923 lb-in

0.9xResisting Moment = 0.9 (3600 lbs. x28.5 in.)= 92,340 lb-in

<u>Ganged 10-Series unit Plan</u>

Longitudinal Seismic Force



Anchorage Force =	0	lbs/per bolt
Shear Force =	900	lbs/per bolt

3 ganged units
Total # of bolts/Unit = 2

Anchorage and Shear Force Increased by Overstrength Factor

Design Bolts for 0 lbs tension, 900 lbs. shear, longitudinal direction

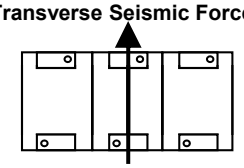
Transverse Overturning

Overturning Moment = 0.3 (59.1875in. x 3600lbs.) = 63,923 lb-in

0.9xResisting Moment = 0.9 (3600 lbs x10.375 in.) = 33,615 lb-in

<u>Ganged 10-Series unit Plan</u>

Transverse Seismic Force



Anchorage Force =	1,217	lbs/per bolt
Shear Force =	900	lbs/per bolt

3 ganged units
Total # of bolts/Unit = 2

Anchorage and Shear Force Increased by Overstrength Factor

Design Bolts for 1,217 lbs tension, 900 lbs. shear, transverse direction

Drawing Reference See: <u>SK4 & SK9</u>

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Crenlo
Low & Moderate Seismic
Job No. : 14273 Date: 04/06/15
By: MAS Page: 17

Load Case: ***Single Unit (≤ 50% of Bldg. Ht.)***
(i.e. 2nd floor of a 4 story building or 4th floor of an 8 story building)

Unit Dimensions	
Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Unit Weight (lb) =	1,500

			Center of Gravity Location		
Unit	**Part**	**Weight (lbs)**	**X (in)**	**Y (in)**	**Z (in)**
10-Series	Frame+Contents	1,500	8.5	10.375	41.1875

Longitudinal Anchorage Spacing (in) = 20.75
Transverse Anchorage Spacing (in) = 17

Seismic Force

S_{DS} =	1.0	Low & Moderate Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.5	(50% of bldg ht.)
F_p =	0.320	W
$F_{p,min}$ =	0.30	W
$F_{p,max}$ =	1.60	W
Use F_p =	**0.320**	**W**
Ω =	2.5	Overstrength

Longitudinal Overturning

Overturning Moment = 0.32 (41.1875 in. x 1500lbs.) = 19,770 lb-in

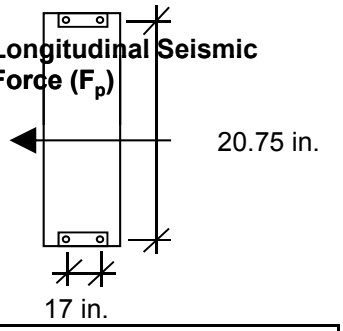
0.9xResisting Moment = 0.9 [1500 lbs. x (8.5in.)]= 11,475 lb-in

Total # of Bolts = 4

Anchorage Force = 610 lbs/per bolt
Shear Force = 600 lbs/per bolt

Anchorage and Shear Force Increased by Overstrength Factor

10-Series unit Plan



Design Bolts for 610 lbs tension, 600 lbs. shear, longitudinal direction

Transverse Overturning

Overturning Moment = 0.32 (41.1875 in. x 1500lbs.) = 19,770 lb-in

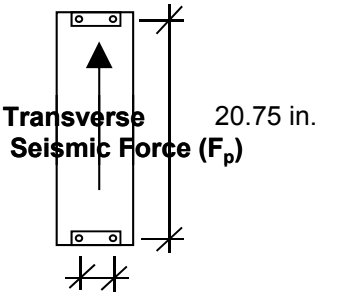
0.9xResisting Moment = 0.9 [1500 lbs. x (10.375in)]= 14,006 lb-in

Total # of Bolts = 4

Anchorage Force = 347 lbs/per bolt
Shear Force = 600 lbs/per bolt

Anchorage and Shear Force Increased by Overstrength Factor

10-Series unit Plan



Design Bolts for 347 lbs tension, 600 lbs. shear, transverse direction

Drawing Reference See: SK3 & SK7

Load Case: ***Single Units on 18in Raised Comp. floor (≤50% of Bldg. Ht.)***
(i.e. 2nd floor of a 4 story building or 4th floor of an 8 story building)

Unit Dimensions	
Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Unit Weight (lb) =	1,500

Raised Floor = 18 in

Unit	Part	Weight (lbs)	Center of Gravity Location X (in)	Y (in)	Z (in)
10-Series	Frame+Contents	1,500	8.5	10.375	59.1875

Longitudinal Anchorage Spacing (in) = 20.75
Transverse Anchorage Spacing (in) = 17

Seismic Force		
S_{DS} =	1.0	Low & Moderate Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.5	(50% of bldg ht.)
F_p =	0.320	W
$F_{p,min}$ =	0.30	W
$F_{p,max}$ =	1.60	W
Use F_p =	**0.320**	**W**
Ω =	2.5	Overstrength

Longitudinal Overturning

Overturning Moment = 0.32 (59.1875 in. x 1500lbs.) = 28,410 lb-in

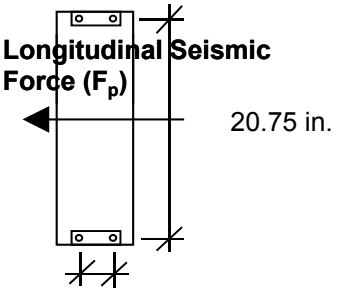
0.9xResisting Moment = 0.9 [1500 lbs. x (8.5in)]= 11,475 lb-in

Total # of Bolts = 4

Anchorage Force = 1,245 lbs/per bolt
Shear Force = 600 lbs/per bolt

Anchorage and Shear Force Increased by Overstrength Factor

10-Series unit Plan



Design Bolts for 1,245 lbs tension, 600 lbs. shear, longitudinal direction

Transverse Overturning

Overturning Moment = 0.32 (59.1875 in. x 1500lbs.) = 28,410 lb-in

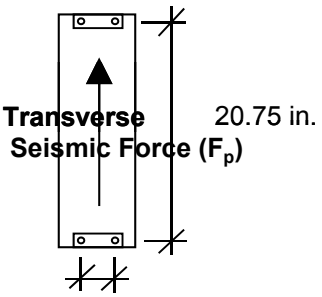
0.9xResisting Moment = 0.9 [1500 lbs. x (10.375in.)]= 14,006 lb-in

Total # of Bolts = 4

Anchorage Force = 868 lbs/per bolt
Shear Force = 600 lbs/per bolt

Anchorage and Shear Force Increased by Overstrength Factor

10-Series unit Plan



Design Bolts for 868 lbs tension, 600 lbs. shear, transverse direction

Drawing Reference See: SK3 & SK8

Load Case: Ganged Unit (≤ 50% of Bldg. Ht.)

# of Units ganged (max)= 3

Single Unit Dimension	
Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Frame Weight (lb.) =	1,300

			Center of Gravity Location		
Unit	**Part**	**Weight (lbs)**	**X (in)**	**Y (in)**	**Z (in)**
3 - 10-Series	Frame+Contents	3,900	28.5	10.375	41.1875

Longitudinal Anchorage Spacing (in) = 62.25
Transverse Anchorage Spacing (in) = 20.75

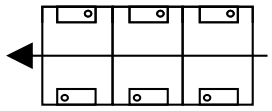
Seismic Force		
S_{DS} =	1.0	Low & Moderate Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.5	(50% of bldg ht.)
F_p =	0.320	W
$F_{p,min}$ =	0.30	W
$F_{p,max}$ =	1.60	W
Use F_p =	**0.320**	**W**
Ω =	2.5	Overstrength

Longitudinal Overturning

Overturning Moment = 0.32 (82.375/2 in. x 3900lbs.) = 51,402 lb-in

0.9xResisting Moment = 0.9 (3900 lbs. x28.5 in.)= 100,035 lb-in

Ganged 10-Series unit Plan
Longitudinal Seismic Force



Anchorage Force =	0	lbs
Shear Force =	1,040	lbs/per bolt

3 ganged units
Total # of bolts/Unit = 2

Anchorage and Shear Force Increased by Overstrength Factor

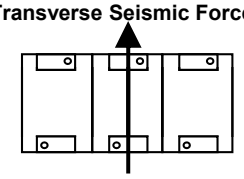
Design Bolts for 0 lbs tension, 1,040 lbs. shear, longitudinal direction

Transverse Overturning

Overturning Moment = 0.32 (82.375/2 in. x 3900lbs.) = 51,402 lb-in

0.9xResisting Moment = 0.9 (3900 lbs x10.375 in.) = 36,416 lb-in

Ganged 10-Series unit Plan
Transverse Seismic Force



Anchorage Force =	602	lbs/per bolt
Shear Force =	1,040	lbs/per bolt

3 ganged units
Total # of bolts/Unit = 2

Anchorage and Shear Force Increased by Overstrength Factor

Design Bolts for 602 lbs tension, 1,040 lbs. shear, transverse direction

Drawing Reference See: SK4 & SK7

Load Case: <u>Ganged units on 18in raised computer floor (≤50% of Bldg. Ht.)</u>

# of Units ganged (max)= 3

Single Unit Dimension	
Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Frame Weight (lb.) =	1,300

Raised Floor = 18 in

			Center of Gravity Location		
Unit	**Part**	**Weight (lbs)**	**X (in)**	**Y (in)**	**Z (in)**
3 - 10-Series	Frame+Contents	3,900	23	10.375	59.1875

Longitudinal Anchorage Spacing (in) = 45
Transverse Anchorage Spacing (in) = 20.75

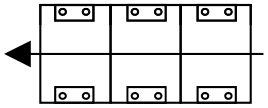
Seismic Force		
S_{DS} =	1.0	Low & Moderate Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.5	(50% of bldg ht.)
F_p =	0.320	W
$F_{p,min}$ =	0.30	W
$F_{p,max}$ =	1.60	W
Use F_p =	**0.320**	**W**
Ω =	2.5	Overstrength

Longitudinal Overturning

Overturning Moment = 0.32 (59.1875 in. x 3900lbs.) = 73,866 lb-in

0.9xResisting Moment = 0.9 (3900 lbs. x22.5 in.)= 78,975 lb-in

<u>Ganged 10-Series unit Plan</u>
Longitudinal Seismic Force



3 ganged units

Anchorage Force =	0	lbs/per bolt
Shear Force =	260	lbs/per bolt

Total # of bolts/Unit = 4

Anchorage and Shear Force Increased by Overstrength Factor

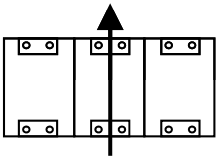
Design Bolts for 0 lbs tension, 260 lbs. shear, longitudinal direction

Transverse Overturning

Overturning Moment = 0.3 (59.1875in. x 3900lbs.) = 73,866 lb-in

0.9xResisting Moment = 0.9 (3900 lbs x10.375 in.) = 36,416 lb-in

<u>Ganged 10-Series unit Plan</u>
Transverse Seismic Force



Anchorage Force =	1,128	lbs/per bolt
Shear Force =	260	lbs/per bolt

3 ganged units
Total # of bolts/Unit = 4

Anchorage and Shear Force Increased by Overstrength Factor

Design Bolts for 1,128 lbs tension, 260 lbs. shear, transverse direction

Drawing Reference See: <u>SK5 & SK8</u>

RMJ

Structural Engineers

Robinson
Meier
Juilly & Associates

Principals
Peter Robinson, S.E.
Jayson E. Haines, S.E.

High Seismic Calculations

241 Joaquin Avenue
San Leandro, CA 94577
(510) 991-0977

Find the Seismic Design Category (SDC) **Unit : 10-Series**

Project Location: High Seismic
Latitude: Varies Longitude: Varies

Soil Classification: D Table 1613.5.2 & Section 1613.5.2
Occupancy Category: II Table 1604.5

Information from U.S. Geological Survey Website
http://earthquake.usgs.gov/research/hazmaps/

S_S=	2.750	g	
S_1=	1.070	g	
F_a=	1.000		Table 1613.5.3(1)
F_v=	1.500		Table 1613.5.3(2)
S_{MS}=	2.75	g	(Equation 16-37)
S_{M1}=	1.61	g	(Equation 16-38)
S_{DS}=	1.833	g	(Equation 16-39)
S_{D1}=	1.070	g	(Equation 16-40)

Seismic Design Category (SDC): Varies

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Crenlo
High Seismic

Job No. : 14273 Date: 04/06/15
By: MAS Page: 23

Load Case: <u>Single unit (Ground floor)</u>

Unit Dimensions	
Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Max Weight (lb.) =	800

			Center of Gravity Location		
Unit	**Part**	**Weight (lbs)**	**X (in)**	**Y (in)**	**Z (in)**
10-Series	Frame+Contents	800	8.5	10.375	41.1875

Seismic Force		
S_{DS} =	1.83	High Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.0	(Ground Floor)
F_p =	0.293	W
$F_{p,min}$ =	0.55	W
$F_{p,max}$ =	2.93	W
Use F_p =	**0.550**	**W**
Ω =	2.5	Overstrength

Longitudinal Anchorage Spacing (in) = 20.75
Transverse Anchorage Spacing (in) = 17

Longitudinal Overturning

Overturning Moment = 0.55 (41.1875 in. x 800lbs.) = 18,123 lb-in

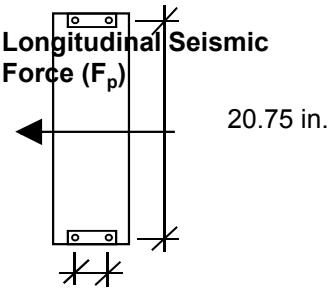
0.9xResisting Moment = 0.9 [(800 lbs. - Vert. Comp.) x 8.5in.]= 3,876 lb-in
Vertical Component (0.2*SDS*Wp) = 293 lbs

Total # of Bolts = 4

Anchorage Force =	1,048	lbs/per bolt
Shear Force =	550	lbs/per bolt

Anchorage and Shear Force Increased by Overstrength Factor

10-Series unit Plan



Design Bolts for 1,048 lbs tension, 550 lbs. shear, longitudinal direction

Transverse Overturning

Overturning Moment = 0.55 (41.1875 in. x 800lbs.) = 18,123 lb-in

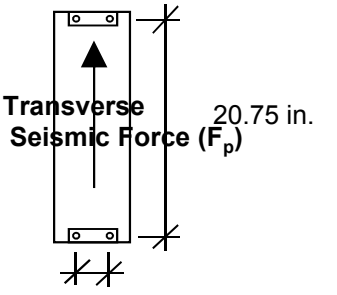
0.9xResisting Moment = 0.9 [(800 lbs. - Vert. Comp.) x (10.375in.)]= 4,731 lb-in
Vertical Component (0.2*SDS*Wp) = 293 lbs

Total # of Bolts = 4

Anchorage Force =	807	lbs/per bolt
Shear Force =	550	lbs/per bolt

Anchorage and Shear Force Increased by Overstrength Factor

10-Series unit Plan



Design Bolts for 807 lbs tension, 550 lbs. shear, longitudinal direction

Drawing Reference See: <u>SK3 & SK6</u>

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Crenlo
High Seismic

Job No. : 14273 Date: 04/06/15
By: MAS Page: 24

Load Case: Single units on 18in raised computer floor (Ground floor)

Unit Dimensions	
Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Max Weight (lb.) =	800

Raised Floor = 18 in

Unit	Part	Weight (lbs)	Center of Gravity Location X (in)	Y (in)	Z (in)
10-Series	Frame+Contents	800	8.5	10.375	59.1875

Longitudinal Anchorage Spacing (in) = 20.75
Transverse Anchorage Spacing (in) = 17

Seismic Force		
S_{DS} =	1.83	High Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.0	(Ground Floor)
F_p =	0.293	W
$F_{p,min}$ =	0.55	W
$F_{p,max}$ =	2.93	W
Use F_p =	**0.550**	**W**
Ω =	2.5	Overstrength

Longitudinal Overturning

Overturning Moment = 0.55 (59.1875 in. x 800lbs.) = 26,043 lb-in

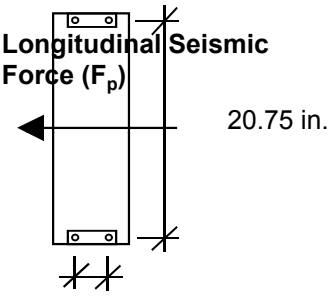
0.9xResisting Moment = 0.9 [(800 lbs. - Vert. Comp.) x (8.5in.)]= 3,876 lb-in
Vertical Component (0.2*SDS*Wp) = 293 lbs

Total # of Bolts = 4

Anchorage Force =	1,630	lbs/per bolt
Shear Force =	550	lbs./per bolt

Anchorage and Shear Force Increased by Overstrength Factor

10-Series unit Plan



Design Bolts for 1,630 lbs tension, 550 lbs. shear, longitudinal direction

Transverse Overturning

Overturning Moment = 0.55 (59.1875 in. x 800lbs.) = 26,043 lb-in

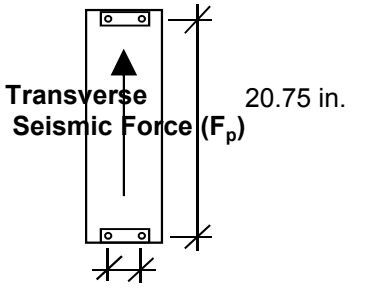
0.9xResisting Moment = 0.9 [(800 lbs. - Vert. Comp.) x (10.375in)]= 4,731 lb-in
Vertical Component (0.2*SDS*Wp) = 293 lbs

Total # of Bolts = 4

Anchorage Force =	1,284	lbs/per bolt
Shear Force =	550	lbs/per bolt

Anchorage and Shear Force Increased by Overstrength Factor

10-Series unit Plan



Design Bolts for 1,284 lbs tension, 550 lbs. shear, longitudinal direction

Site Specific Engineering Required

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Crenlo
High Seismic

Job No. : 14273 Date: 04/06/15
By: MAS Page: 25

Load Case: <u>Ganged Unit (Ground floor)</u>

# of Units ganged (min)= 3

Single Unit Dimension

Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Max Weight (lb.) =	1,200

Unit	Part	Weight (lbs)	Center of Gravity Location X (in)	Y (in)	Z (in)
3 - 10-Series	Frame+Contents	3,600	29	10.375	41.1875

Seismic Force		
S_{DS} =	1.83	High Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.0	(Ground Floor)
F_p =	0.293	W
$F_{p,min}$ =	0.55	W
$F_{p,max}$ =	2.93	W
Use F_p =	**0.550**	**W**
Ω =	2.5	Overstrength

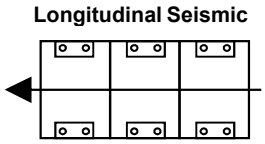
Longitudinal Anchorage Spacing (in) = 45
Transverse Anchorage Spacing (in) = 20.75

Longitudinal Overturning

Overturning Moment = 0.55 (41.1875 in. x 3600lbs.) = 81,551 lb-in

0.9xResisting Moment = 0.9 [(3600 lbs. - Vert. Comp.) x28.5 in.]= 58,482 lb-in
Vertical Component (0.2*SDS*Wp) = 1,320 lbs

<u>Ganged 10-Series unit Plan</u>



Anchorage Force =	320	lbs/per bolt
Shear Force =	825	lbs/per bolt

3 ganged units
Total # of bolts/Unit = 4

Anchorage and Shear Force Increased by Overstrength Factor

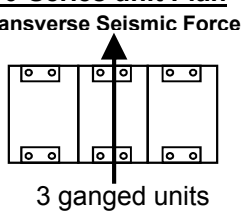
Design Bolts for 320 lbs tension, 825 lbs. shear, longitudinal direction

Transverse Overturning

Overturning Moment = 0.55 (41.1875 in. x 3600lbs.) = 81,551 lb-in

0.9xResisting Moment = 0.9 [(3600 lbs - Vert. Comp.) x10.375 in.] = 21,290 lb-in
Vertical Component (0.2*SDS*Wp) = 1,320 lbs

<u>Ganged 10-Series unit Plan</u>



3 ganged units

Anchorage Force =	1,210	lbs/per bolt
Shear Force =	825	lbs/per bolt

Total # of bolts/Unit = 4

Anchorage and Shear Force Increased by Overstrength Factor

Design Bolts for 1,210 lbs tension, 825 lbs. shear, transverse direction

Drawing Reference See: <u>SK5 & SK6</u>

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High Seismic

Job No. : 14273 Date: 04/06/15
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Load Case: ***Ganged units on 18in raised computer floor (Ground floor)***

# of Units ganged (min)= 3

Single Unit Dimension	
Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Max Weight (lb.) =	800

Raised Floor = 18 in

			Center of Gravity Location		
Unit	**Part**	**Weight (lbs)**	**X (in)**	**Y (in)**	**Z (in)**
3 - 10-Series	Frame+Contents	2,400	29	10.375	59.1875

Longitudinal Anchorage Spacing (in) = 45

Transverse Anchorage Spacing (in) = 20.75

Seismic Force		
S_{DS} =	1.83	High Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.0	(Ground Floor)
F_p =	0.293	W
$F_{p,min}$ =	0.55	W
$F_{p,max}$ =	2.93	W
Use F_p =	**0.550**	**W**
Ω =	2.5	Overstrength

Longitudinal Overturning

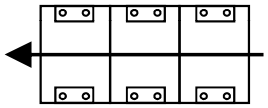
Overturning Moment = 0.55 (59.1875 in. x 2400lbs.) = 78,128 lb-in

0.9xResisting Moment = 0.9 [(2400 lbs. - Vert. Comp.) x28.5 in.]= 38,988 lb-in

Vertical Component (0.2*SDS*Wp) = 880 lbs

Ganged 10-Series unit Plan

Longitudinal Seismic Force



3 ganged units

Anchorage Force =	544	lbs/per bolt
Shear Force =	550	lbs/per bolt

Total # of bolts/Unit = 4

Anchorage and Shear Force Increased by Overstrength Factor

Design Bolts for 544 lbs tension, 550 lbs. shear, longitudinal direction

Transverse Overturning

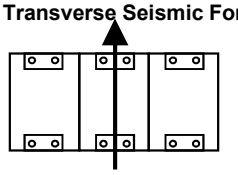
Overturning Moment = 0.55 (59.1875in. x 2400lbs.) = 78,128 lb-in

0.9xResisting Moment = 0.9 [(2400 lbs - Vert. Comp.) x10.375 in.] = 14,193 lb-in

Vertical Component (0.2*SDS*Wp) = 880 lbs

Ganged 10-Series unit Plan

Transverse Seismic Force



3 ganged units

Anchorage Force =	1,284	lbs/per bolt
Shear Force =	550	lbs/per bolt

Total # of bolts/Unit = 4

Anchorage and Shear Force Increased by Overstrength Factor

Design Bolts for 1,284 lbs tension, 550 lbs. shear, longitudinal direction

Site Specific Engineering Required

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High Seismic

Job No. : 14273 Date: 04/06/15
By: MAS Page: 27

Load Case: ***Single Unit (≤ 50% of Bldg. Ht.)***
(i.e. 2nd floor of a 4 story building or 4th floor of an 8 story building)

Unit Dimensions	
Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Max Weight (lb.) =	800

			Center of Gravity Location		
Unit	**Part**	**Weight (lbs)**	**X (in)**	**Y (in)**	**Z (in)**
10-Series	Frame+Contents	800	8.5	10.375	41.1875

Longitudinal Anchorage Spacing (in) =	20.75
Transverse Anchorage Spacing (in) =	17

Seismic Force		
S_{DS} =	1.83	High Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.5	(50% of bldg ht.)
F_p =	0.587	W
$F_{p,min}$ =	0.55	W
$F_{p,max}$ =	2.93	W
Use F_p =	**0.587**	**W**
Ω =	2.5	Overstrength

Longitudinal Overturning

Overturning Moment = 0.59 (41.1875 in. x 800lbs.) = 19,331 lb-in

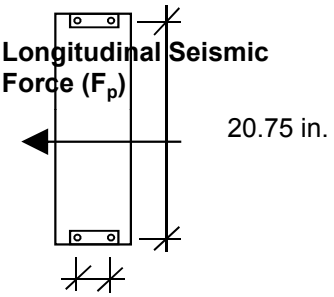
0.9xResisting Moment = 0.9 [(800 lbs. - Vert. Comp.) x (8.5in.)]= 3,876 lb-in
Vertical Component (0.2*SDS*Wp) = 293 lbs

Total # of Bolts = 4

Anchorage Force =	1,136	lbs/per bolt
Shear Force =	587	lbs/per bolt

Anchorage and Shear Force Increased by Overstrength Factor

10-Series unit Plan



Design Bolts for 1,136 lbs tension, 587 lbs. shear, longitudinal direction

Transverse Overturning

Overturning Moment = 0.59 (41.1875 in. x 800lbs.) = 19,331 lb-in

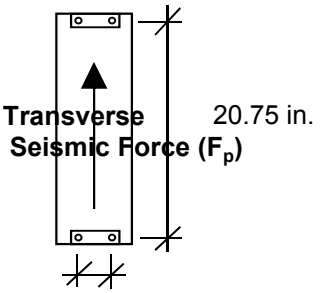
0.9xResisting Moment = 0.9 [(800 lbs. - Vert. Comp.) x (10.375in)]= 4,731 lb-in
Vertical Component (0.2*SDS*Wp) = 293 lb-in

Total # of Bolts = 4

Anchorage Force =	880	lbs/per bolt
Shear Force =	587	lbs/per bolt

Anchorage and Shear Force Increased by Overstrength Factor

10-Series unit Plan



Design Bolts for 880 lbs tension, 587 lbs. shear, longitudinal direction

Drawing Reference See: SK5 & SK9

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Crenlo
High Seismic

Job No. : 14273 Date: 04/06/15
By: MAS Page: 28

Load Case: ***Single unit on 18in raised computer floor (≤ 50% of Bldg. Ht.)***
(i.e. 2nd floor of a 4 story building or 4th floor of an 8 story building)

Unit Dimensions	
Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Max Weight (lb.) =	800

Raised Floor = 18 in

			Center of Gravity Location		
Unit	**Part**	**Weight (lbs)**	**X (in)**	**Y (in)**	**Z (in)**
10-Series	Frame+Contents	800	8.5	10.375	59.1875

Longitudinal Anchorage Spacing (in) = 20.75
Transverse Anchorage Spacing (in) = 17

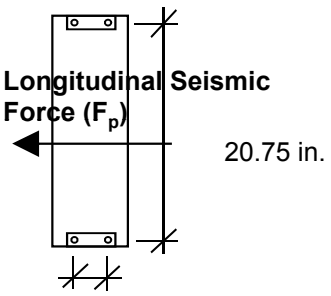
Seismic Force		
S_{DS} =	1.83	High Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.5	(50% of bldg ht.)
F_p =	0.587	W
$F_{p,min}$ =	0.55	W
$F_{p,max}$ =	2.93	W
Use F_p =	**0.587**	**W**
Ω =	2.5	Overstrength

Longitudinal Overturning

10-Series unit Plan

Overturning Moment = 0.59 (59.1875 in. x 800lbs.) = 27,779 lb-in

0.9xResisting Moment = 0.9 [(800 lbs. - Vert. Comp.) x (8.5in)]= 3,876 lb-in
Vertical Component (0.2*SDS*Wp) = 293 lbs



Total # of Bolts = 4

Anchorage Force =	1,758	lbs/per bolt
Shear Force =	587	lbs/per bolt

Anchorage and Shear Force Increased by Overstrength Factor

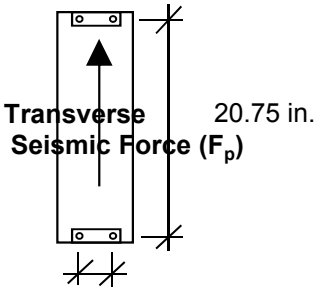
Design Bolts for 1,758 lbs tension, 587 lbs. shear, longitudinal direction

Transverse Overturning

10-Series unit Plan

Overturning Moment = 0.59 (59.1875 in. x 800lbs.) = 27,779 lb-in

0.9xResisting Moment = 0.9 [(800 lbs. - Vert. Comp.) x (10.375in.)]= 4,731 lb-in
Vertical Component (0.2*SDS*Wp*10.375in) = 293 lb-in



Total # of Bolts = 4

Anchorage Force =	1,388	lbs/per bolt
Shear Force =	587	lbs/per bolt

Anchorage and Shear Force Increased by Overstrength Factor

Design Bolts for 1,388 lbs tension, 587 lbs. shear, longitudinal direction

Site Specific Engineering Required

RMJ
241 Joaquin Ave.
San Leandro, CA 94577
510.991.0977

Crenlo
High Seismic

Job No. : 14273 Date: 04/06/15
By: MAS Page: 29

Load Case: <u>Ganged Unit (≤ 50% of Bldg. Ht.)</u>

# of Units ganged (min)= 3

Single Unit Dimension	
Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Max Weight (lb.) =	1,100

			Center of Gravity Location		
Unit	**Part**	**Weight (lbs)**	**X (in)**	**Y (in)**	**Z (in)**
3 - 10-Series	Frame+Contents	3,300	29	10.375	41.1875

Longitudinal Anchorage Spacing (in) =	45
Transverse Anchorage Spacing (in) =	20.75

Seismic Force		
S_{DS} =	1.83	High Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.5	(50% of bldg ht.)
F_p =	0.587	W
$F_{p,min}$ =	0.55	W
$F_{p,max}$ =	2.93	W
Use F_p =	**0.587**	**W**
Ω =	2.5	Overstrength

Longitudinal Overturning

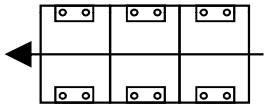
Overturning Moment = 0.59 (41.1875 in. x 3300lbs.) = 79,739 lb-in

0.9xResisting Moment = 0.9 [(3300 lbs. - Vert. Comp.) x28.5 in.]= 53,609 lb-in

Vertical Component (0.2*SDS*Wp) = 1,210 lbs

<u>Ganged 10-Series unit Plan</u>

Longitudinal Seismic Force



3 ganged units

Anchorage Force =	363	lbs
Shear Force =	807	lbs/per bolt

Total # of bolts/Unit = 4

Anchorage and Shear Force Increased by Overstrength Factor

Design Bolts for 363 lbs tension, 807 lbs. shear, longitudinal direction

Transverse Overturning

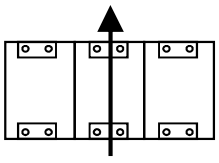
Overturning Moment = 0.59 (41.1875 in. x 3300lbs.) = 79,739 lb-in

0.9xResisting Moment = 0.9 [(3300 lbs - Vert. Comp.) x10.375 in.] = 19,515 lb-in

Vertical Component (0.2*SDS*Wp) = 1,210 lbs

<u>Ganged 10-Series unit Plan</u>

Transverse Seismic Force



3 ganged units

Anchorage Force =	1,209	lbs/per bolt
Shear Force =	807	lbs/per bolt

Total # of bolts/Unit = 4

Anchorage and Shear Force Increased by Overstrength Factor

Design Bolts for 1,209 lbs tension, 807 lbs. shear, longitudinal direction

Drawing Reference See: <u>SK5 & SK7</u>

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Crenlo
High Seismic

Job No. : 14273 Date: 04/06/15
By: MAS Page: 30

Load Case: ***<u>Ganged unit on 18in raised computer floor (≤ 50% of Bldg. Ht.)</u>***

# of Units ganged (min)= 3

Single Unit Dimension	
Width(w) (in) =	20.75
Depth(D) (in) =	17
Frame Height (in) =	82.375
Max Weight (lb.) =	800

Raised Floor = 18 in

			Center of Gravity Location		
Unit	**Part**	**Weight (lbs)**	**X (in)**	**Y (in)**	**Z (in)**
3 - 10-Series	Frame+Contents	2,400	29	10.375	59.1875

Longitudinal Anchorage Spacing (in) = 45

Transverse Anchorage Spacing (in) = 20.75

Seismic Force		
S_{DS} =	1.83	High Seismic
I_p =	1.0	(Importance)
a_p =	1.0	(Cabinets)
R_p =	2.5	(Cabinets)
z/h =	0.5	(50% of bldg ht.)
F_p =	0.587	W
$F_{p,min}$ =	0.55	W
$F_{p,max}$ =	2.93	W
Use F_p =	**0.587**	**W**
Ω =	2.5	Overstrength

Longitudinal Overturning

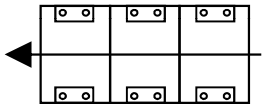
Overturning Moment = 0.59 (59.1875 in. x 2400lbs.) = 83,336 lb-in

0.9xResisting Moment = 0.9 (2400 lbs. x28.5 in.)= 38,988 lb-in

Vert. Comp. (0.2*SDS*Wp)= 880 lbs

<u>Ganged 10-Series unit Plan</u>

Longitudinal Seismic Force



3 ganged units

Anchorage Force =	616	lbs/per bolt
Shear Force =	587	lbs/per bolt

Total # of bolts/Unit = 4

Anchorage and Shear Force Increased by Overstrength Factor

Design Bolts for 616 lbs tension, 587 lbs. shear, longitudinal direction

Transverse Overturning

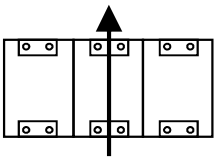
Overturning Moment = 0.59 (59.1875in. x 2400lbs.) = 83,336 lb-in

0.9xResisting Moment = 0.9 [(2400 lbs - Vert. Comp.) x10.375 in.] = 14,193 lb-in

Vertical Component (0.2*SDS*Wp) = 880 lb-in

<u>Ganged 10-Series unit Plan</u>

Transverse Seismic Force



3 ganged units

Anchorage Force =	1,388	lbs/per bolt
Shear Force =	587	lbs/per bolt

Total # of bolts/Unit = 4

Anchorage and Shear Force Increased by Overstrength Factor

Design Bolts for 1,388 lbs tension, 587 lbs. shear, longitudinal direction

****Site Specific Engineering Required****

RMJ

Structural Engineers

Robinson
Meier
Juilly & Associates

Principals
Peter Robinson, S.E.
Jayson E. Haines, S.E.

Drawing Details

241 Joaquin Ave.
San Leandro, CA 94577
(510) 991-0977

GENERAL NOTES

DESIGN

Design conforms to the International Building Code, 2012 Edition, & the California Building Code, 2013 Edition.

Design live loads:
Importance Factor 1.0
Seismic Design Category (SDC)....VARIES
Maximum Value of Ss.....2.75

Typical Details: and notes on these sheets shall apply unless specifically shown or noted otherwise. Construction details not fully shown or noted shall be similar to details for similar conditions. All work and construction shall comply with all applicable building codes, regulations, and safety requirements.

Discrepancies: The Contractor shall inform the Architect in writing, during the bidding period, of any discrepancies or omissions noted on the drawings or in the specifications, or of any variations needed in order to conform to codes, rules, and regulations. Upon receipt of such information, the Architect will send written instructions to all concerned. Any such discrepancy, omission, or variation not reported shall be the responsibility of the Contractor, and work shall be performed in a manner as directed by the Architect.

EXISTING CONSTRUCTION

The Contractor shall verify all existing conditions and shall notify the Architect of all exceptions before proceeding with the work. The removal, cutting, drilling, etc. of existing work shall be performed with great care and small tools in order not to jeopardize the structural integrity of the building. If existing structural members, not indicated for removal, interfere with the new work, the Structural Engineer shall be notified immediately, and approval obtained, before removal of the existing members.

FASTENERS

Wedge Anchors: Hilti Kwik Bolt Wedge Anchor, types as indicated per ICBO evaluation report No. 1917 or by manufacture having current ICBO evaluation report with values in shear and tension) equal or greater.

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CRENLO
10 SERIES

LOW, MODERATE, AND HIGH SEISMIC REGIONS

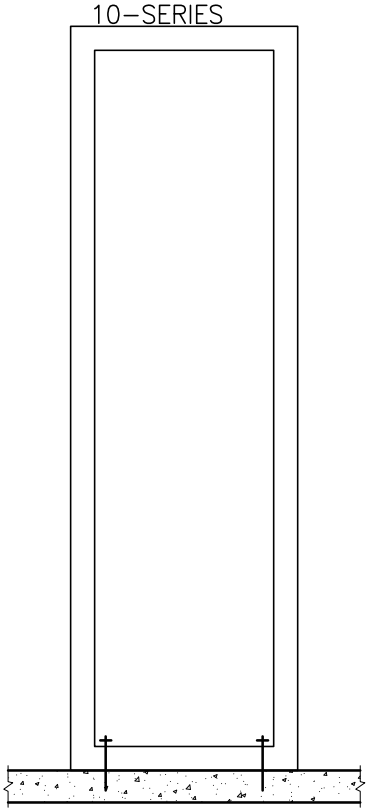
Signed by MAS Date 04/2015

Job No. 14273

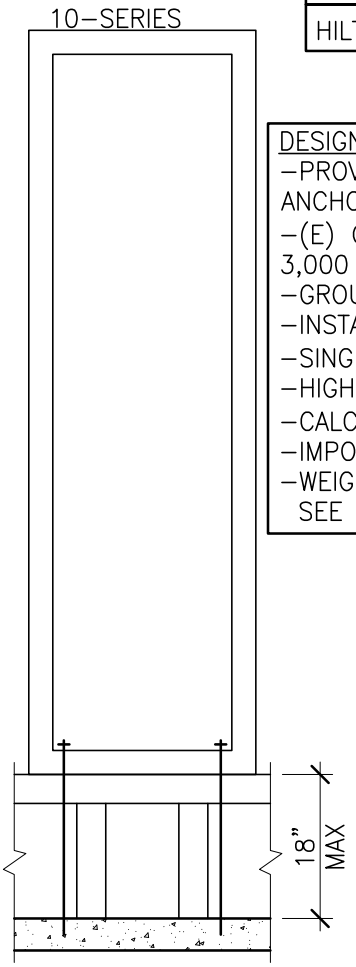
Sheet No. SK1

DESIGN SCENARIOS AND CONDITIONS

FASTENER SELECTION
HILTI KB–TZ $^{1}/_{2}$" ø BOLT



CONC. SLAB OR CONC. OVER METAL DECK (DIRECT FRAME TO FLOOR) REFER TO DRAWINGS SK3, SK4, SK5, SK6, SK9



RAISED COMP. FLOOR (ANCHOR FRAME TO SUB–FLOOR) REFER TO DRAWINGS SK3, SK4, SK5, SK7, SK8

DESIGN CRITERIA
- –PROVIDE SPECIAL INSPECTION FOR EXPANSION ANCHOR
- –(E) CONC. MIN COMPRESSIVE STRENGTH 3,000 psi
- –GROUND FLOOR
- –INSTALLATION AT <50% OF BUILDING HEIGHT
- –SINGLE & GANGED UNITS (3 OR MORE)
- –HIGH, MODERATE & LOW SEISMIC REGIONS
- –CALCULATION PER IBC 2012/CBC 2013
- –IMPORTANCE FACTOR 1.0
- –WEIGHT OF ENCLOSURE AND CONTENTS: SEE TABLE

ALLOWABLE CABINET ADDED WEIGHT *ALL WEIGHTS GIVEN IN (LB) TABLE 1

MAX CABINET WT. WITH CONTENTS	LOW & MODERATE SEISMIC				HIGH SEISMIC			
	GROUND		UPPER		GROUND		UPPER	
	ON FLOOR	RAISED	ON FLOOR	RAISED	ON FLOOR	RAISED	ON FLOOR	RAISED
SINGLE UNIT	1,500	1,500	1,500	1,500	800	SS[1]	800	SS[1]
GANGED UNIT	1,500	1,200	1,500	1,500	1,200	SS[1]	1,200	800

SS[1] – SITE SPECIFIC ENGINEERING REQUIRED

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10 SERIES

LOW, MODERATE, AND HIGH SEISMIC REGIONS

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Job No. 14273

Sheet No. SK2

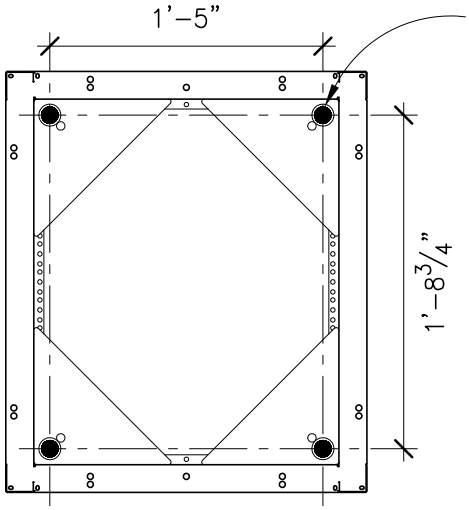
NOTES:
*POSITION BOLTS IN OUTER OR UPPER HALF OF SLOTTED BOLT HOLES WHERE APPLICABLE
*SEE MANUFACTURE DRAWINGS FOR EXACT DIMENSIONS AND SIZE OF 10–SERIES UNITS

INSTALLATION FOR THE FOLLOWING CONDITIONS:

1. ALL (EXCEPT SUBBASE)

CONDITION SCHEDULE

CONDITION	SEE
CONCRETE SLAB	SK6
CONCRETE FILL OVER METAL DECK	SK7
RAISED COMP. FLOOR CONC. FILL METAL DECK	SK8
RAISED COMP. FLOOR CONC. SLAB	SK9



SINGLE UNIT BOTTOM PLAN VIEW

PLAN 1
1"=1'–0" SK3

REGISTERED PROFESSIONAL ENGINEER
JAYSON E. HAINES
No. 4801
Exp. 12/31/2019
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CRENLO
10 SERIES

LOW, MODERATE, AND HIGH SEISMIC REGIONS

Signed by MAS Date 04/2015

Job No. 14273

Sheet No. SK3

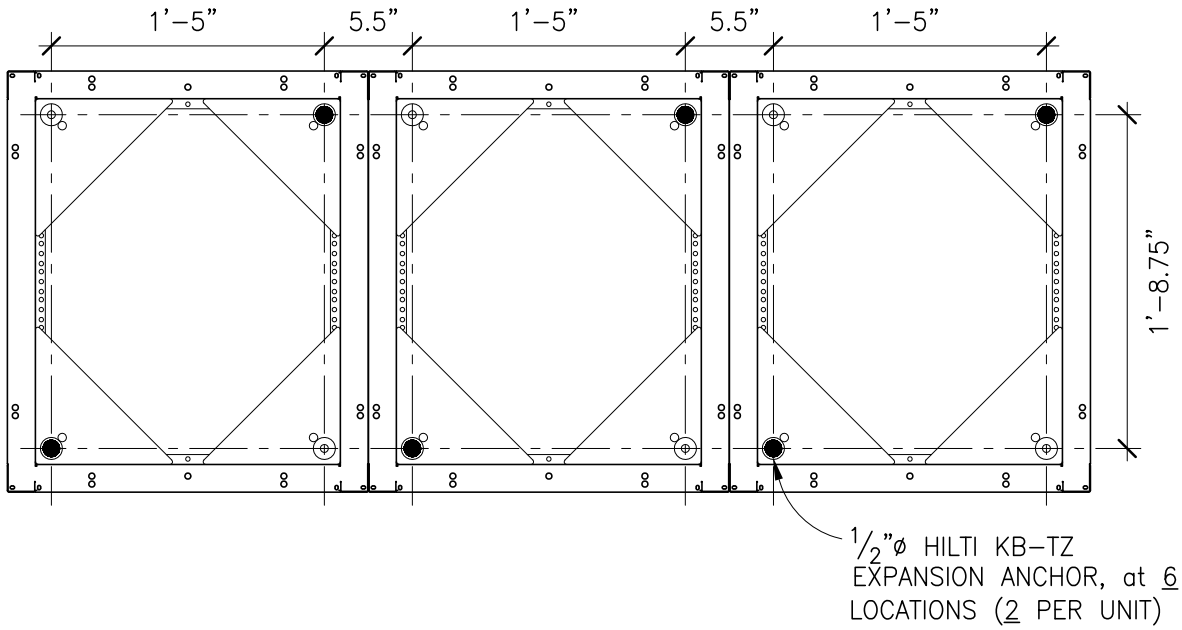
NOTES:
*POSITION BOLTS IN OUTER OR UPPER HALF OF SLOTTED BOLT HOLES WHERE APPLICABLE
*SEE MANUFACTURE DRAWINGS FOR EXACT DIMENSIONS AND SIZE OF 10-SERIES UNITS

INSTALLATION FOR THE FOLLOWING CONDITIONS:

1. ALL (EXCEPT SUBBASE)

CONDITION SCHEDULE

CONDITION	SEE
CONCRETE SLAB	SK6
CONCRETE FILL OVER METAL DECK	SK7
RAISED COMP. FLOOR CONC. FILL METAL DECK	SK8
RAISED COMP. FLOOR CONC. SLAB	SK9



GANG UNIT BOTTOM PLAN VIEW
(3 UNITS OR MORE GANGED TOGETHER)

PLAN 1
1"=1'-0" SK4

REGISTERED PROFESSIONAL ENGINEER
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Exp. 12/31/2019
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CRENLO
10 SERIES

LOW, MODERATE, AND HIGH SEISMIC REGIONS

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Job No. 14273

Sheet No. SK4

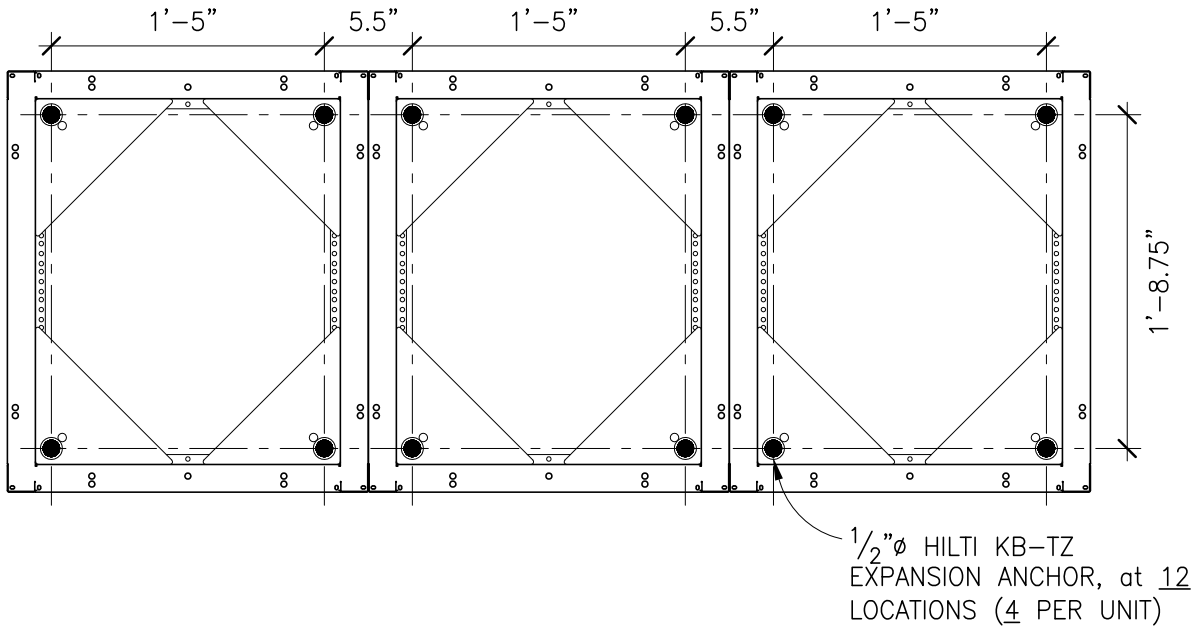
NOTES:
*POSITION BOLTS IN OUTER OR UPPER HALF OF SLOTTED BOLT HOLES WHERE APPLICABLE
*SEE MANUFACTURE DRAWINGS FOR EXACT DIMENSIONS AND SIZE OF 10-SERIES UNITS

INSTALLATION FOR THE FOLLOWING CONDITIONS:

1. ALL (EXCEPT SUBBASE)

CONDITION SCHEDULE

CONDITION	SEE
CONCRETE SLAB	SK6
CONCRETE FILL OVER METAL DECK	SK7
RAISED COMP. FLOOR CONC. FILL METAL DECK	SK8
RAISED COMP. FLOOR CONC. SLAB	SK9



GANG UNIT BOTTOM PLAN VIEW
(3 UNITS OR MORE GANGED TOGETHER)

PLAN 1
1"=1'-0" SK5

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CRENLO
10 SERIES

LOW, MODERATE, AND HIGH SEISMIC REGIONS

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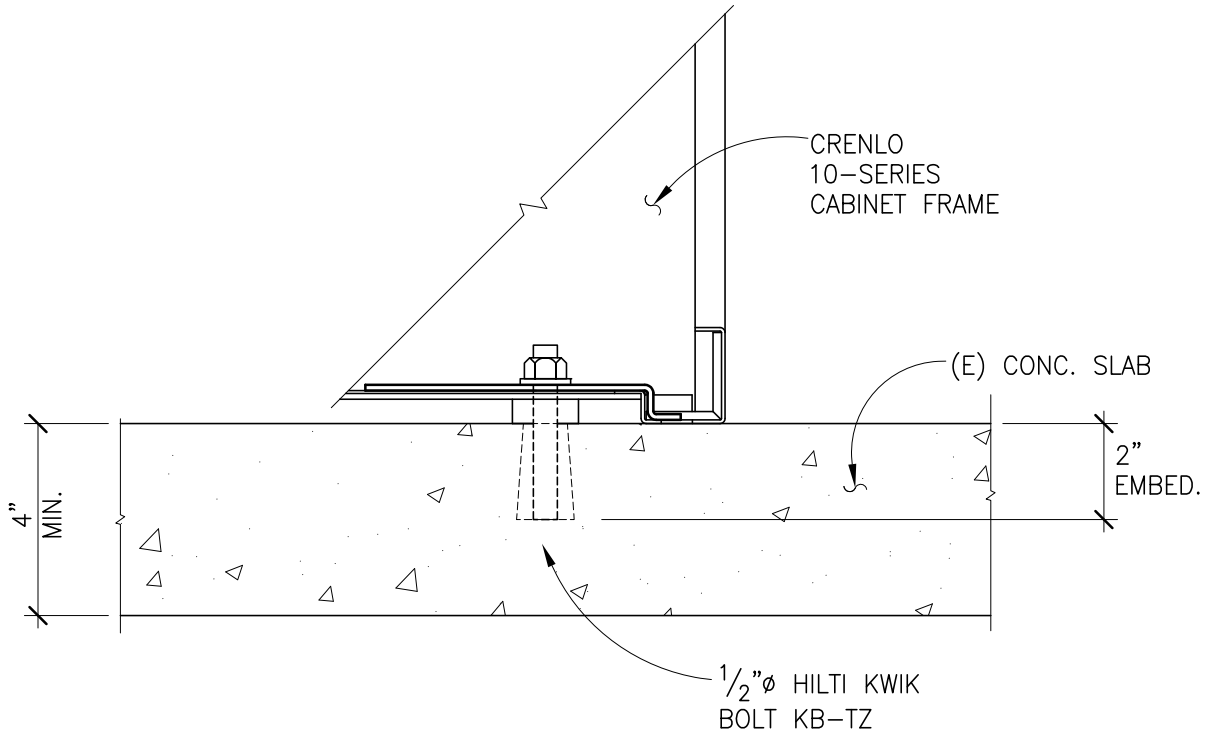
Job No. 14273

Sheet No. SK5



CONCRETE SLAB INSTALLATION

DETAIL 1 / SK6

3"=1'–0"

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CRENLO 10 SERIES	Job No. 14273
LOW, MODERATE, AND HIGH SEISMIC REGIONS	Sheet No. SK6
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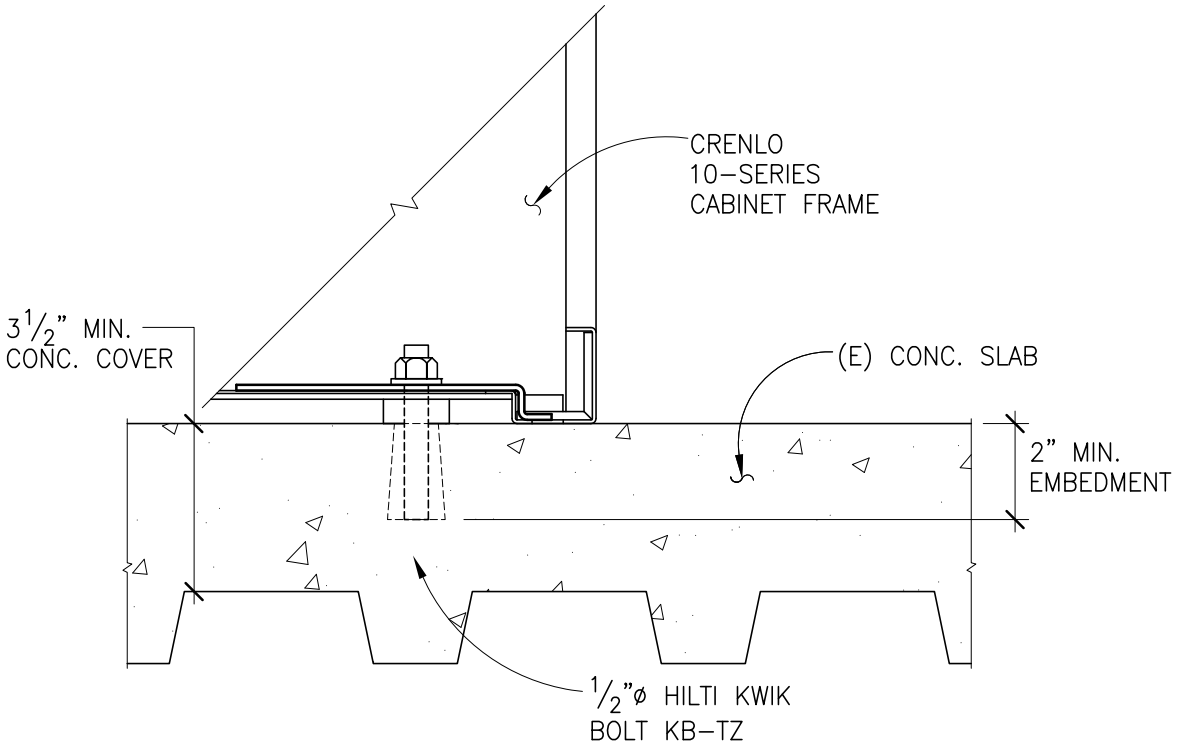

CONCRETE FILL OVER METAL DECK INSTALLATION

DETAIL 1/SK7

3"=1'–0"

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LOW, MODERATE, AND HIGH SEISMIC REGIONS	Sheet No. SK7
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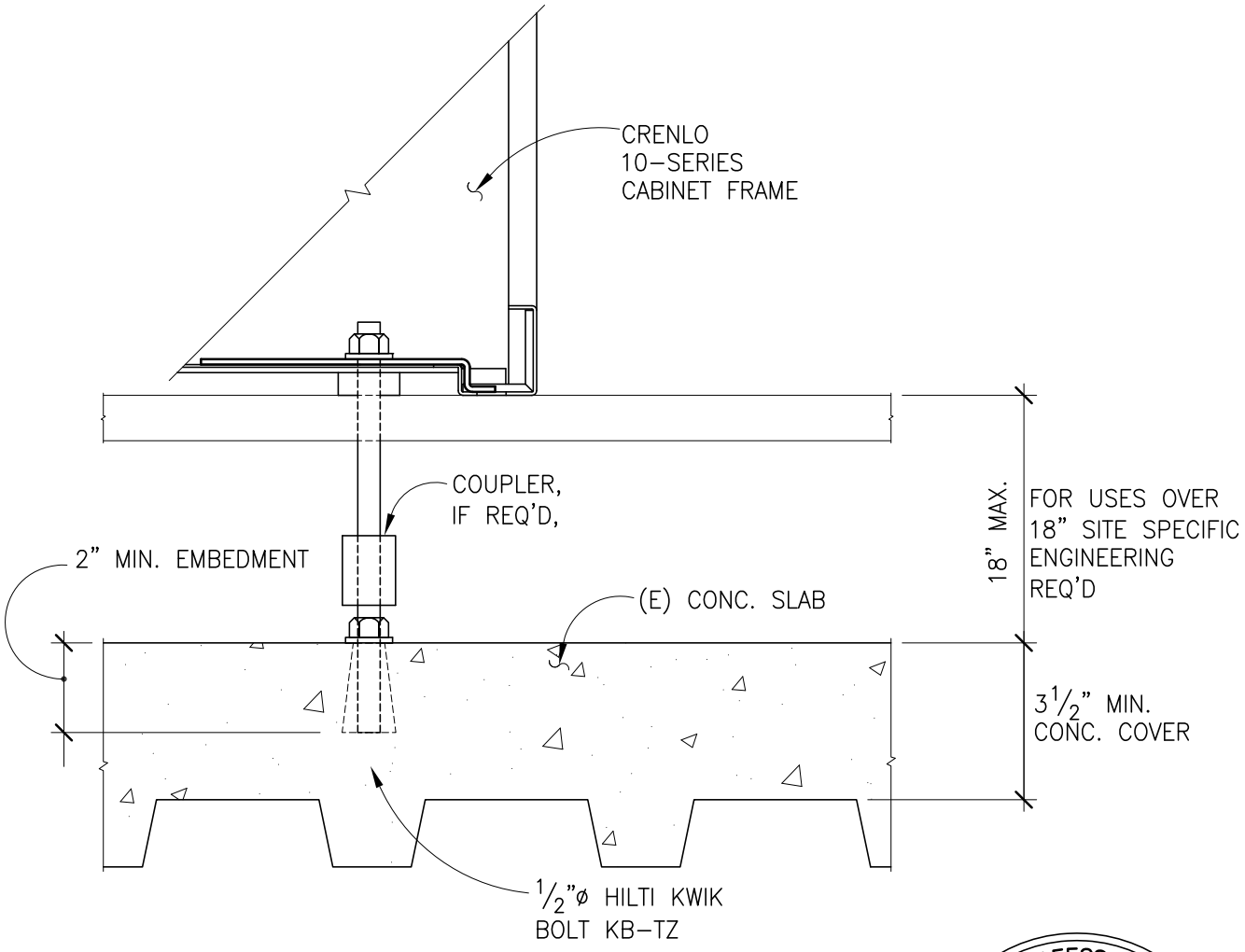

RAISED COMPUTER OVER CONC. FILLED METAL DECK INSTALLATION

DETAIL 1/SK8

3"=1'–0"

REGISTERED PROFESSIONAL ENGINEER
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Exp. 12/31/2019
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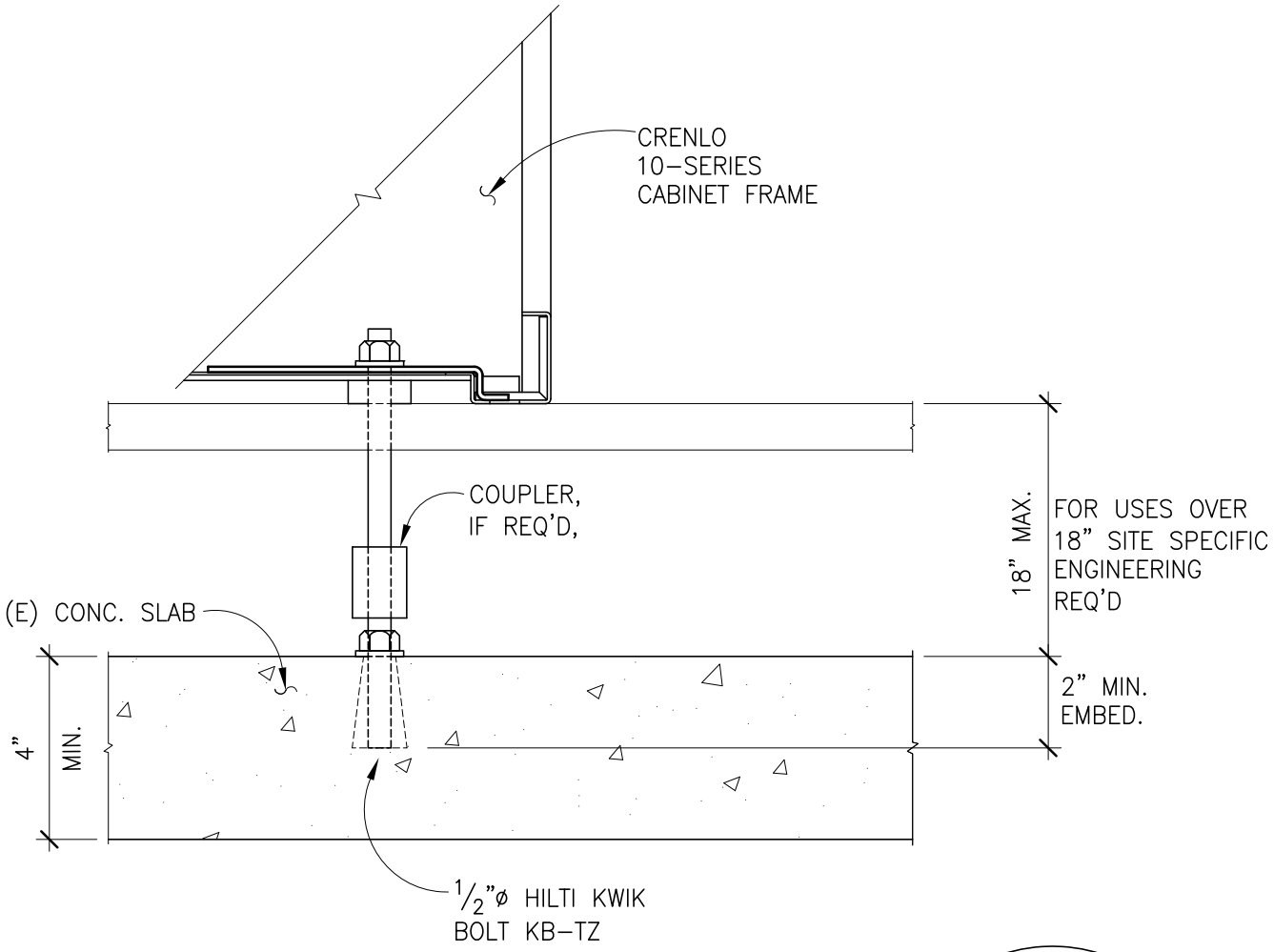
CRENLO
10 SERIES

LOW, MODERATE, AND HIGH SEISMIC REGIONS

Signed by MAS Date 04/2015

Job No. 14273

Sheet No. SK8



RAISED COMPUTER OVER CONC. SLAB INSTALLATION

DETAIL 1/SK9

3"=1'–0"

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Exp. 12/31/2019
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CRENLO 10 SERIES	Job No. 14273
LOW, MODERATE, AND HIGH SEISMIC REGIONS	Sheet No. SK9
Signed by MAS Date 04/2015	

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Principals
Peter Robinson, S.E.
Jayson E. Haines, S.E.

Appendix

241 Joaquin Avenue
San Leandro, CA 94577
(510) 991-0977

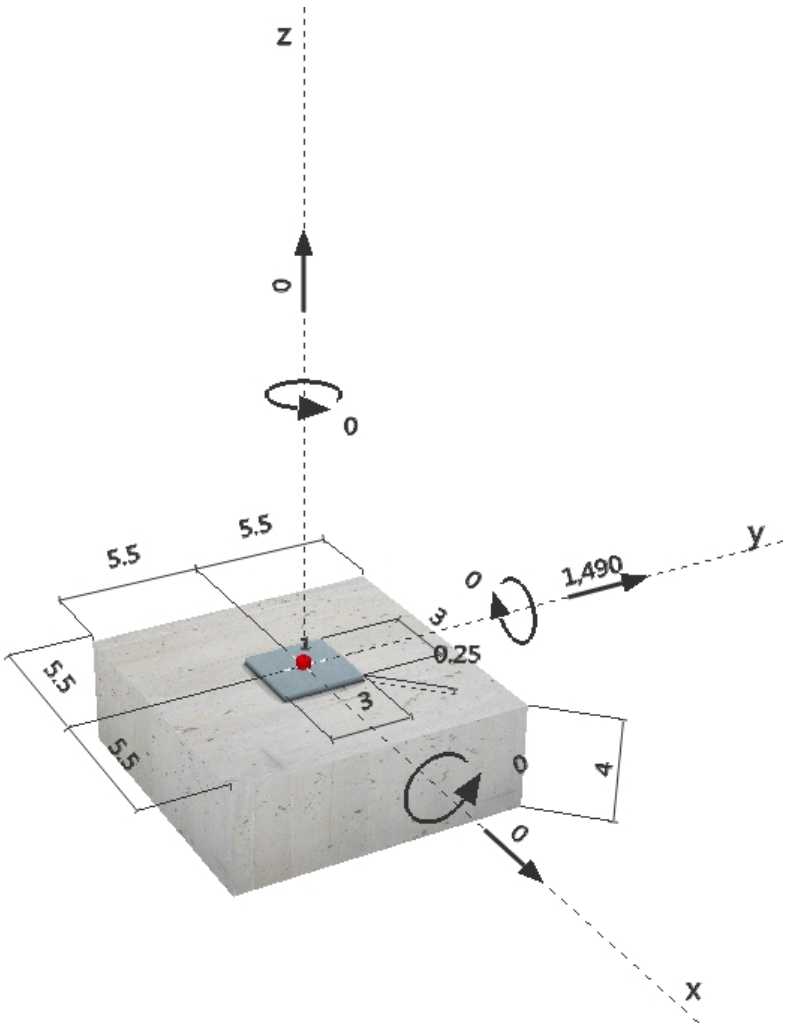
Company:	RMJ	Page:	1
Specifier:	Mario	Project:	Creno-10-Series
Address:	241 Joaquin Ave.	Sub-Project I Pos. No.:	14273
Phone I Fax:	510.991.0977 |	Date:	4/6/2015
E-Mail:	msigala@rmjse.com		

Specifier's comments: 10-Series: SINGLE ANCHOR, Maximum Shear 1,490# 100% Capacity

1 Input data

Anchor type and diameter:	**Kwik Bolt TZ - CS 1/2 (2)**
Effective embedment depth:	$h_{ef,act}$ = 2.000 in., h_{nom} = 2.375 in.
Material:	Carbon Steel
Evaluation Service Report:	ESR-1917
Issued I Valid:	5/1/2013 | 5/1/2015
Proof:	Design method ACI 318-11 / Mech.
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.250 in.
Anchor plate:	l_x x l_y x t = 3.000 in. x 3.000 in. x 0.250 in.; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, 3000, f_c' = 3000 psi; h = 4.000 in.
Installation:	hammer drilled hole, Installation condition: Dry
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (D.3.3.4.3 (d)) Shear load: yes (D.3.3.5.3 (c))

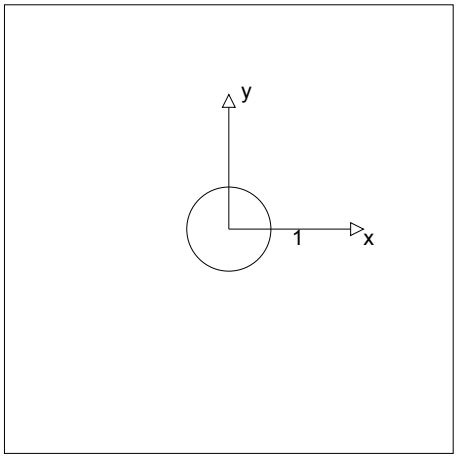
Geometry [in.] & Loading [lb, in.lb]



Company: RMJ
Specifier: Mario
Address: 241 Joaquin Ave.
Phone I Fax: 510.991.0977 |
E-Mail: msigala@rmjse.com

2 Load case/Resulting anchor forces

Load case: Design loads



Anchor reactions [lb]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	0	1490	0	1490

max. concrete compressive strain: - [‰]
max. concrete compressive stress: - [psi]
resulting tension force in (x/y)=(0.000/0.000): 0 [lb]
resulting compression force in (x/y)=(0.000/0.000): 0 [lb]

3 Tension load

	Load N_{ua} [lb]	Capacity ϕN_n [lb]	Utilization $\beta_N = N_{ua}/\phi N_n$	Status
Steel Strength*	N/A	N/A	N/A	N/A
Pullout Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Strength**	N/A	N/A	N/A	N/A

* anchor having the highest loading **anchor group (anchors in tension)

Company: RMJ
Specifier: Mario
Address: 241 Joaquin Ave.
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4 Shear load

	Load V_{ua} [lb]	Capacity ϕV_n [lb]	Utilization $\beta_V = V_{ua}/\phi V_n$	Status
Steel Strength*	1490	3572	42	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	1490	1844	81	OK
Concrete edge failure in direction y+**	1490	1499	100	OK

* anchor having the highest loading **anchor group (relevant anchors)

4.1 Steel Strength

$V_{sa,eq}$ = ESR value refer to ICC-ES ESR-1917
$\phi V_{steel} \geq V_{ua}$ ACI 318-11 Table D.4.1.1

Variables

n	$A_{se,V}$ [in.^{2}]	f_{uta} [psi]
1	0.10	106000

Calculations

$V_{sa,eq}$ [lb]
5495

Results

$V_{sa,eq}$ [lb]	ϕ_{steel}	ϕV_{sa} [lb]	V_{ua} [lb]
5495	0.650	3572	1490

4.2 Pryout Strength

$V_{cp} = k_{cp}\left[\left(\frac{A_{Nc}}{A_{Nc0}}\right)\psi_{ed,N}\,\psi_{c,N}\,\psi_{cp,N}\,N_b\right]$ ACI 318-11 Eq. (D-40)

$\phi V_{cp} \geq V_{ua}$ ACI 318-11 Table D.4.1.1

A_{Nc} see ACI 318-11, Part D.5.2.1, Fig. RD.5.2.1(b)

$A_{Nc0} = 9 h_{ef}^2$ ACI 318-11 Eq. (D-5)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2 e'_N}{3 h_{ef}}}\right) \leq 1.0$ ACI 318-11 Eq. (D-8)

$\psi_{ed,N} = 0.7 + 0.3\left(\frac{c_{a,min}}{1.5 h_{ef}}\right) \leq 1.0$ ACI 318-11 Eq. (D-10)

$\psi_{cp,N} = MAX\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}}\right) \leq 1.0$ ACI 318-11 Eq. (D-12)

$N_b = k_c \lambda_a \sqrt{f'_c}\, h_{ef}^{1.5}$ ACI 318-11 Eq. (D-6)

Variables

k_{cp}	h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]
1	2.000	0.000	0.000	5.500

$\psi_{c,N}$	c_{ac} [in.]	k_c	λ_a	f'_c [psi]
1.000	5.500	17	1.000	3000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
36.00	36.00	1.000	1.000	1.000	1.000	2634

Results

V_{cp} [lb]	$\phi_{concrete}$	$\phi_{seismic}$	$\phi_{nonductile}$	ϕV_{cp} [lb]	V_{ua} [lb]
2634	0.700	1.000	1.000	1844	1490

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E-Mail:	msigala@rmjse.com		

4.3 Concrete edge failure in direction y+

$V_{cb} = \left(\frac{A_{Vc}}{A_{Vc0}}\right) \psi_{ed,V}\ \psi_{c,V}\ \psi_{h,V}\ \psi_{parallel,V}\ V_b$ ACI 318-11 Eq. (D-30)

$\phi\ V_{cb} \geq V_{ua}$ ACI 318-11 Table D.4.1.1

A_{Vc} see ACI 318-11, Part D.6.2.1, Fig. RD.6.2.1(b)

$A_{Vc0} = 4.5\ c_{a1}^2$ ACI 318-11 Eq. (D-32)

$\psi_{ec,V} = \left(\frac{1}{1 + \frac{2e'_v}{3c_{a1}}}\right) \leq 1.0$ ACI 318-11 Eq. (D-36)

$\psi_{ed,V} = 0.7 + 0.3\left(\frac{c_{a2}}{1.5c_{a1}}\right) \leq 1.0$ ACI 318-11 Eq. (D-38)

$\psi_{h,V} = \sqrt{\frac{1.5c_{a1}}{h_a}} \geq 1.0$ ACI 318-11 Eq. (D-39)

$V_b = \left(7\left(\frac{l_e}{d_a}\right)^{0.2}\sqrt{d_a}\right)\lambda_a \sqrt{f'_c}\ c_{a1}^{1.5}$ ACI 318-11 Eq. (D-33)

Variables

c_{a1} [in.]	c_{a2} [in.]	e_{cV} [in.]	$\psi_{c,V}$	h_a [in.]
3.667	5.500	0.000	1.000	4.000

l_e [in.]	λ_a	d_a [in.]	f'_c [psi]	$\psi_{parallel,V}$
2.000	1.000	0.500	3000	1.000

Calculations

A_{Vc} [in.^{2}]	A_{Vc0} [in.^{2}]	$\psi_{ec,V}$	$\psi_{ed,V}$	$\psi_{h,V}$	V_b [lb]
44.00	60.50	1.000	1.000	1.173	2512

Results

V_{cb} [lb]	$\phi_{concrete}$	$\phi_{seismic}$	$\phi_{nonductile}$	$\phi\ V_{cb}$ [lb]	V_{ua} [lb]
2142	0.700	1.000	1.000	1499	1490

5 Warnings

- Load re-distributions on the anchors due to elastic deformations of the anchor plate are not considered. The anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the loading! Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies when supplementary reinforcement is used. The Φ factor is increased for non-steel Design Strengths except Pullout Strength and Pryout strength. Condition B applies when supplementary reinforcement is not used and for Pullout Strength and Pryout Strength. Refer to your local standard.
- Refer to the manufacturer's product literature for cleaning and installation instructions.
- Checking the transfer of loads into the base material and the shear resistance are required in accordance with ACI 318 or the relevant standard!
- An anchor design approach for structures assigned to Seismic Design Category C, D, E or F is given in ACI 318-11 Appendix D, Part D.3.3.4.3 (a) that requires the governing design strength of an anchor or group of anchors be limited by ductile steel failure. If this is NOT the case, the connection design (tension) shall satisfy the provisions of Part D.3.3.4.3 (b), Part D.3.3.4.3 (c), or Part D.3.3.4.3 (d). The connection design (shear) shall satisfy the provisions of Part D.3.3.5.3 (a), Part D.3.3.5.3 (b), or Part D.3.3.5.3 (c).
- Part D.3.3.4.3 (b) / part D.3.3.5.3 (a) requires that the attachment the anchors are connecting to the structure be designed to undergo ductile yielding at a load level corresponding to anchor forces no greater than the controlling design strength. Part D.3.3.4.3 (c) / part D.3.3.5.3 (b) waives the ductility requirements and requires that the anchors shall be designed for the maximum tension / shear that can be transmitted to the anchors by a non-yielding attachment. Part D.3.3.4.3 (d) / part D.3.3.5.3 (c) waives the ductility requirements and requires the design strength of the anchors to equal or exceed the maximum tension / shear obtained from design load combinations that include E, with E increased by Ω_0.
- Hilti post-installed anchors shall be installed in accordance with the Hilti Manufacturer's Printed Installation Instructions (MPII). Reference ACI 318-11, Part D.9.1

Fastening meets the design criteria!

Company: RMJ
Specifier: Mario
Address: 241 Joaquin Ave.
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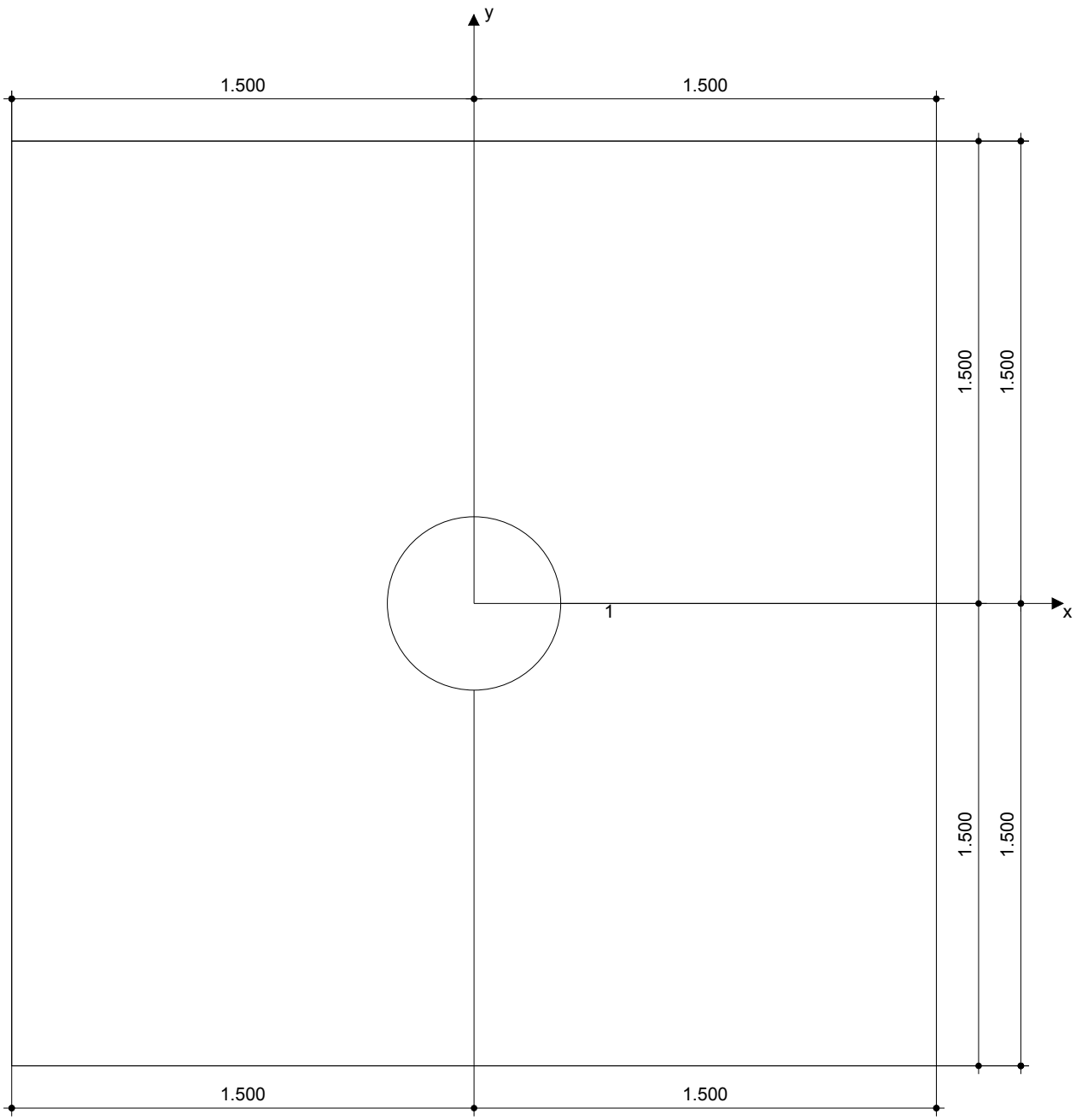
E-Mail: msigala@rmjse.com

6 Installation data

Anchor plate, steel: -
Profile: no profile; 0.000 x 0.000 x 0.000 in.
Hole diameter in the fixture: d_f = 0.563 in.
Plate thickness (input): 0.250 in.
Recommended plate thickness: not calculated
Cleaning: Manual cleaning of the drilled hole according to instructions for use is required.

Anchor type and diameter: Kwik Bolt TZ - CS 1/2 (2)
Installation torque: 480.001 in.lb
Hole diameter in the base material: 0.500 in.
Hole depth in the base material: 2.625 in.
Minimum thickness of the base material: 4.000 in.



Coordinates Anchor in.

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	0.000	0.000	5.500	5.500	5.500	5.500

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Specifier:	Mario	Project:	Creno-10-Series
Address:	241 Joaquin Ave.	Sub-Project I Pos. No.:	14273
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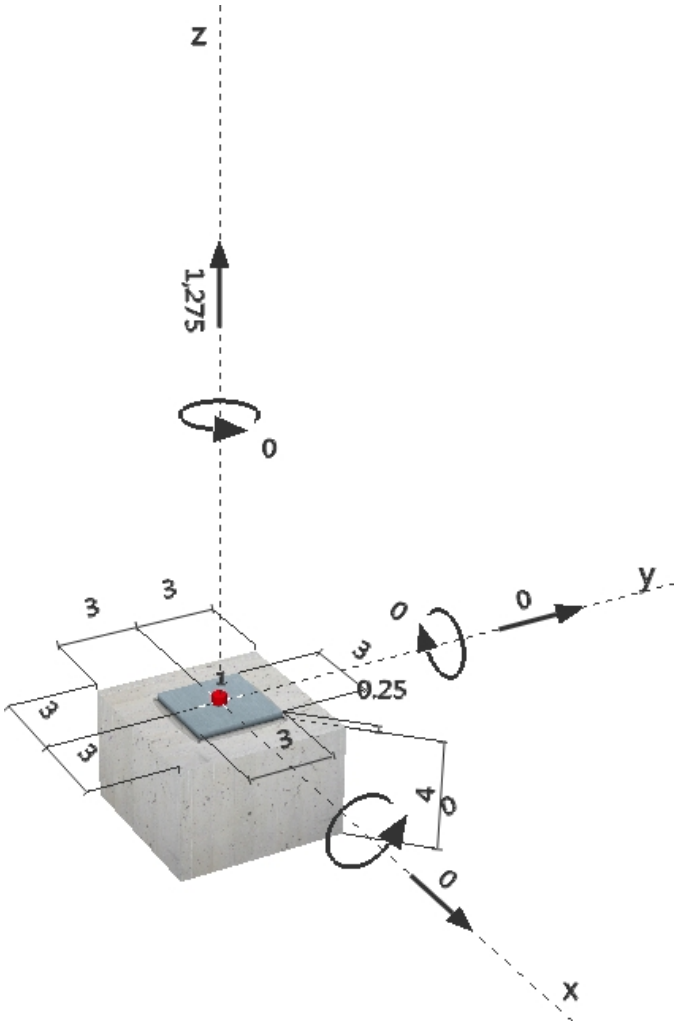
E-Mail:	msigala@rmjse.com		

Specifier's comments: 10-Series: SINGLE ANCHOR, Maximum Tension 1,275# 100% Capacity

1 Input data

Anchor type and diameter:	**Kwik Bolt TZ - CS 1/2 (2)**
Effective embedment depth:	$h_{ef,act}$ = 2.000 in., h_{nom} = 2.375 in.
Material:	Carbon Steel
Evaluation Service Report:	ESR-1917
Issued I Valid:	5/1/2013 | 5/1/2015
Proof:	Design method ACI 318-11 / Mech.
Stand-off installation:	e_b = 0.000 in. (no stand-off); t = 0.250 in.
Anchor plate:	l_x x l_y x t = 3.000 in. x 3.000 in. x 0.250 in.; (Recommended plate thickness: not calculated)
Profile:	no profile
Base material:	cracked concrete, 3000, f_c' = 3000 psi; h = 4.000 in.
Installation:	hammer drilled hole, Installation condition: Dry
Reinforcement:	tension: condition B, shear: condition B; no supplemental splitting reinforcement present edge reinforcement: none or < No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (D.3.3.4.3 (d)) Shear load: yes (D.3.3.5.3 (c))

Geometry [in.] & Loading [lb, in.lb]



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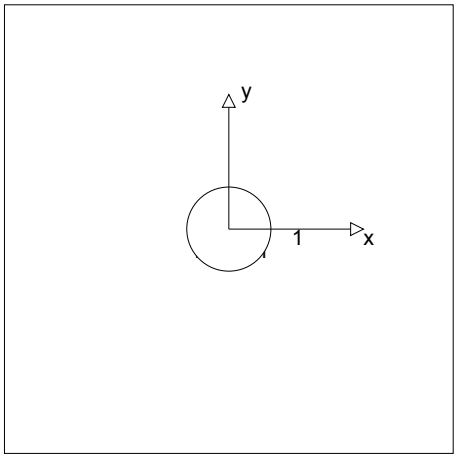
2 Load case/Resulting anchor forces

Load case: Design loads



Anchor reactions [lb]
Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	1275	0	0	0

max. concrete compressive strain: - [‰]
max. concrete compressive stress: - [psi]
resulting tension force in (x/y)=(0.000/0.000): 1275 [lb]
resulting compression force in (x/y)=(0.000/0.000): 0 [lb]

3 Tension load

	Load N_{ua} [lb]	Capacity ϕN_n [lb]	Utilization $\beta_N = N_{ua}/\phi N_n$	Status
Steel Strength*	1275	8029	16	OK
Pullout Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Strength**	1275	1284	100	OK

* anchor having the highest loading **anchor group (anchors in tension)

3.1 Steel Strength

N_{sa} = ESR value refer to ICC-ES ESR-1917
$\phi N_{steel} \geq N_{ua}$ ACI 318-11 Table D.4.1.1

Variables

n	$A_{se,N}$ [in.^{2}]	f_{uta} [psi]
1	0.10	106000

Calculations

N_{sa} [lb]
10705

Results

N_{sa} [lb]	ϕ_{steel}	ϕN_{sa} [lb]	N_{ua} [lb]
10705	0.750	8029	1275

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3.2 Concrete Breakout Strength

$N_{cb} = \left(\frac{A_{Nc}}{A_{Nc0}}\right) \psi_{ed,N}\, \psi_{c,N}\, \psi_{cp,N}\, N_b$ — ACI 318-11 Eq. (D-3)

$\phi\, N_{cb} \geq N_{ua}$ — ACI 318-11 Table D.4.1.1

A_{Nc} see ACI 318-11, Part D.5.2.1, Fig. RD.5.2.1(b)

$A_{Nc0} = 9\, h_{ef}^2$ — ACI 318-11 Eq. (D-5)

$\psi_{ec,N} = \left(\frac{1}{1 + \frac{2\, e'_N}{3\, h_{ef}}}\right) \leq 1.0$ — ACI 318-11 Eq. (D-8)

$\psi_{ed,N} = 0.7 + 0.3 \left(\frac{c_{a,min}}{1.5 h_{ef}}\right) \leq 1.0$ — ACI 318-11 Eq. (D-10)

$\psi_{cp,N} = \text{MAX}\left(\frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}}\right) \leq 1.0$ — ACI 318-11 Eq. (D-12)

$N_b = k_c\, \lambda_a \sqrt{f'_c}\, h_{ef}^{1.5}$ — ACI 318-11 Eq. (D-6)

Variables

h_{ef} [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]	$\psi_{c,N}$
2.000	0.000	0.000	3.000	1.000

c_{ac} [in.]	k_c	λ_a	f'_c [psi]
5.500	17	1.000	3000

Calculations

A_{Nc} [in.^{2}]	A_{Nc0} [in.^{2}]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	N_b [lb]
36.00	36.00	1.000	1.000	1.000	1.000	2634

Results

N_{cb} [lb]	$\phi_{concrete}$	$\phi_{seismic}$	$\phi_{nonductile}$	$\phi\, N_{cb}$ [lb]	N_{ua} [lb]
2634	0.650	0.750	1.000	1284	1275

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E-Mail:	msigala@rmjse.com		

4 Shear load

	Load V_{ua} [lb]	Capacity ϕV_n [lb]	Utilization $\beta_V = V_{ua}/\phi V_n$	Status
Steel Strength*	N/A	N/A	N/A	N/A
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength*	N/A	N/A	N/A	N/A
Concrete edge failure in direction **	N/A	N/A	N/A	N/A

* anchor having the highest loading **anchor group (relevant anchors)

5 Warnings

- Load re-distributions on the anchors due to elastic deformations of the anchor plate are not considered. The anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the loading! Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies when supplementary reinforcement is used. The Φ factor is increased for non-steel Design Strengths except Pullout Strength and Pryout strength. Condition B applies when supplementary reinforcement is not used and for Pullout Strength and Pryout Strength. Refer to your local standard.
- Refer to the manufacturer's product literature for cleaning and installation instructions.
- Checking the transfer of loads into the base material and the shear resistance are required in accordance with ACI 318 or the relevant standard!
- An anchor design approach for structures assigned to Seismic Design Category C, D, E or F is given in ACI 318-11 Appendix D, Part D.3.3.4.3 (a) that requires the governing design strength of an anchor or group of anchors be limited by ductile steel failure. If this is NOT the case, the connection design (tension) shall satisfy the provisions of Part D.3.3.4.3 (b), Part D.3.3.4.3 (c), or Part D.3.3.4.3 (d). The connection design (shear) shall satisfy the provisions of Part D.3.3.5.3 (a), Part D.3.3.5.3 (b), or Part D.3.3.5.3 (c).
- Part D.3.3.4.3 (b) / part D.3.3.5.3 (a) requires that the attachment the anchors are connecting to the structure be designed to undergo ductile yielding at a load level corresponding to anchor forces no greater than the controlling design strength. Part D.3.3.4.3 (c) / part D.3.3.5.3 (b) waives the ductility requirements and requires that the anchors shall be designed for the maximum tension / shear that can be transmitted to the anchors by a non-yielding attachment. Part D.3.3.4.3 (d) / part D.3.3.5.3 (c) waives the ductility requirements and requires the design strength of the anchors to equal or exceed the maximum tension / shear obtained from design load combinations that include E, with E increased by Ω_0.
- Hilti post-installed anchors shall be installed in accordance with the Hilti Manufacturer's Printed Installation Instructions (MPII). Reference ACI 318-11, Part D.9.1

Fastening meets the design criteria!

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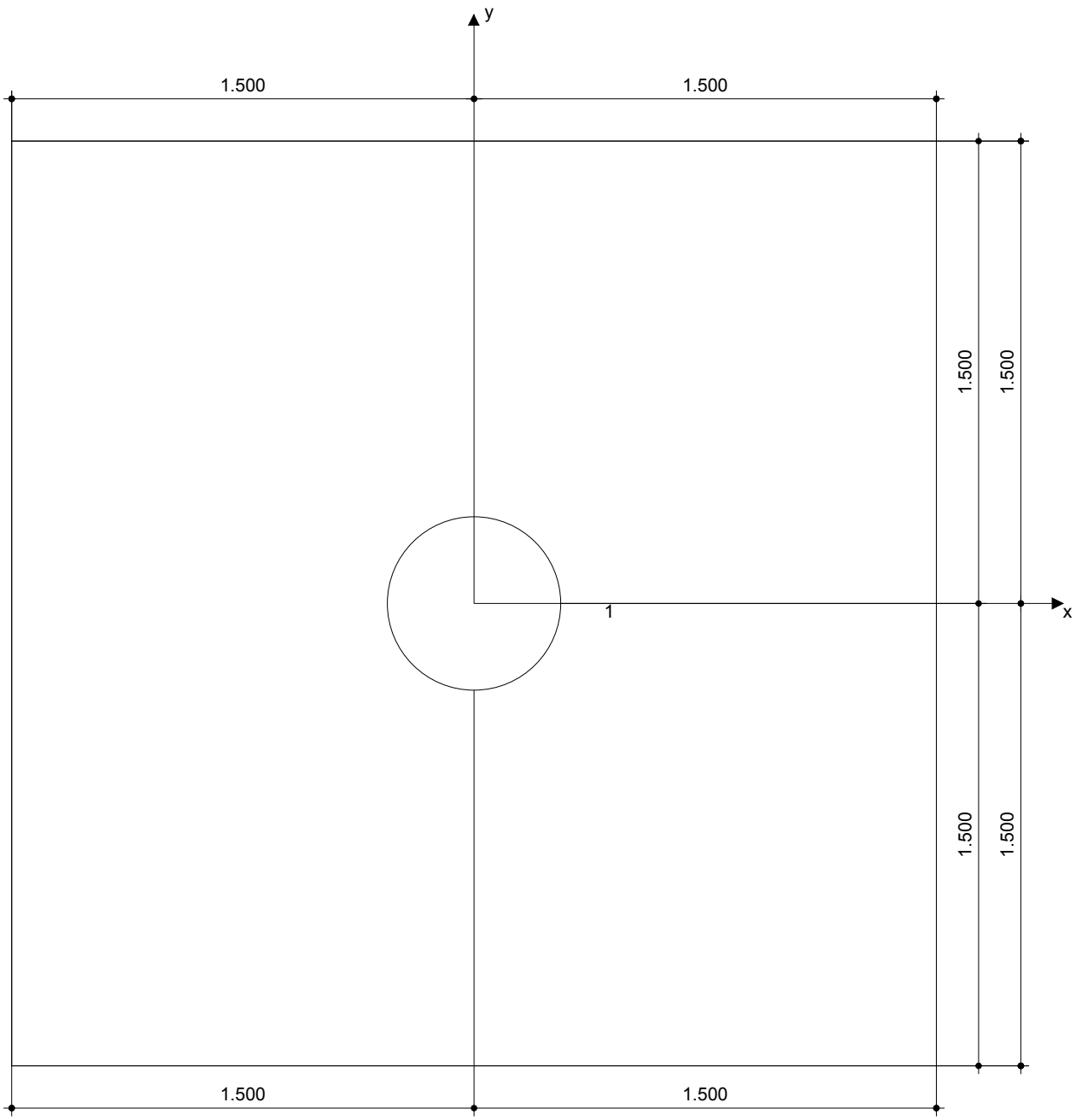
6 Installation data

Anchor plate, steel: -
Profile: no profile; 0.000 x 0.000 x 0.000 in.
Hole diameter in the fixture: d_f = 0.563 in.
Plate thickness (input): 0.250 in.
Recommended plate thickness: not calculated
Cleaning: Manual cleaning of the drilled hole according to instructions for use is required.

Anchor type and diameter: Kwik Bolt TZ - CS 1/2 (2)
Installation torque: 480.001 in.lb
Hole diameter in the base material: 0.500 in.
Hole depth in the base material: 2.625 in.
Minimum thickness of the base material: 4.000 in.



Coordinates Anchor in.

Anchor	x	y	c_{-x}	c_{+x}	c_{-y}	c_{+y}
1	0.000	0.000	3.000	3.000	3.000	3.000