



February 21, 2019

STRUCTURAL DESIGN CALCULATIONS

Arrowhead Regional Medical Center Ambulatory Clinic

Spire Job #: 19SHA11
400 North Pepper Avenue
Colton, CA 92324

TI-2019-00049

County of San Bernardino
BUILDING AND SAFETY

THESE PLANS AND DETAILS ARE
APPROVED

THE APPROVAL OF THESE PLANS SHALL NOT
BE CONSTRUED TO BE A PERMIT FOR ANY
VIOLATION OF ANY CODE OR ORDINANCE OF
THIS COUNTY

By Eric Rodriguez
Date 06/13/2019

THESE PLANS SHALL BE ON THE JOB FOR
ALL REQUESTED INSPECTIONS

Project Description:

Provide structural engineering services for the anchorage of miscellaneous equipment on the 2nd Floor of an existing 3-story building.



02.21.19

--- REVIEWED ---
This review is intended only to verify conformity to the 2016 edition of the California Building Standards. It does not relieve Contractor and Applicant of responsibility for requirements of Project drawings and specifications. No responsibility is assumed for fabrication or construction techniques, correctness of quantities or dimensions, or coordination of work with other trades. Omissions or errors on documents shall not be validated if codes and laws must be complied with.

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Reason: Reviewed for
Code Compliance.
Date: 2019.06.12
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Job:	18SHA11 ARMC Ambulatory Clinic		1
Calc By:	ISG	Date: 02/21/19	

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Calc By:	ISG	Date: 02/21/19	



Arrowhead Regional Ambulatory Clinic

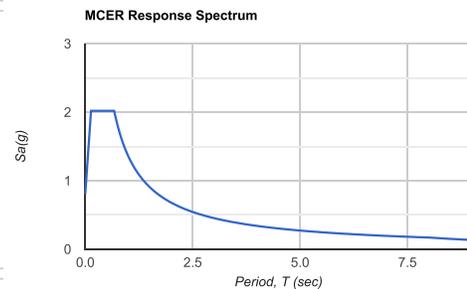
400 N Pepper Ave, Colton, CA 92324, USA

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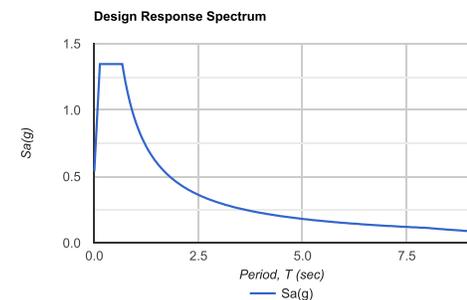


Date	2/13/2019, 4:21:21 PM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	2.02	MCE_R ground motion. (for 0.2 second period)
S_1	0.905	MCE_R ground motion. (for 1.0s period)
S_{MS}	2.02	Site-modified spectral acceleration value
S_{M1}	1.358	Site-modified spectral acceleration value
S_{DS}	1.347	Numeric seismic design value at 0.2 second SA
S_{D1}	0.905	Numeric seismic design value at 1.0 second SA



Type	Value	Description
SDC	F	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	1.5	Site amplification factor at 1.0 second
PGA	0.784	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	0.784	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.779	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.693	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.02	Factored deterministic acceleration value. (0.2 second)
S1RT	1.139	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	1.154	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.905	Factored deterministic acceleration value. (1.0 second)
PGAd	0.784	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	1.032	Mapped value of the risk coefficient at short periods
Type	Value	Description
C_{R1}	0.987	Mapped value of the risk coefficient at a period of 1 s

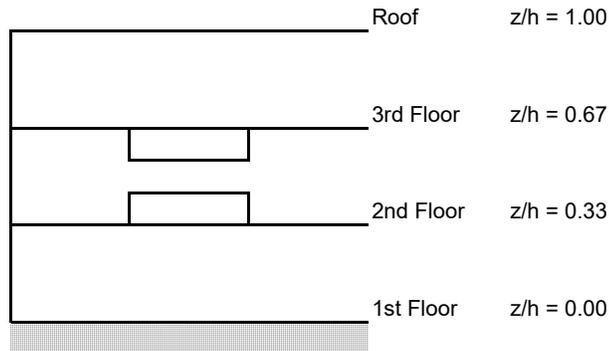


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Non-Structural Component Seismic Design - Height Ratio (z/h)

n _{top} =	3
Level ₁ =	2nd Floor
Level ₀ =	1st Floor
Bsmt. =	No
Floor =	2nd Floor
Susp. =	Yes
Roof =	No

Top floor number
 First level above grade floor name?
 Ground level floor name?
 Basement?
 What floor is the project on?
 Suspended equipment?
 Rooftop equipment?



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Date:	02/21/19	

Suspended Ceiling Equipment - Single Procedure Light	DETAIL 1/S301
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Design =	City
S _{DS} =	1.35
I _p =	1.0

See USGS Sheet
ASCE 7 Table 11.5-1

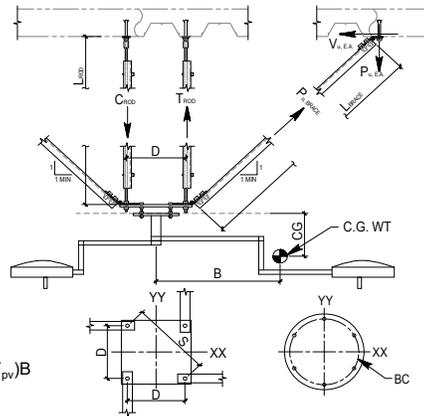
$$F_{pv} = 0.27 W_p(ult) = 0.2 S_{DS} W_p$$

$$F_{ph(MIN)} = 0.41 W_p(ult) = 0.3 S_{DS} I_p W_p$$

Mark =	1	
a _p =	2.5	
R _p =	2.5	
Ω _o =	2.5	
z/h =	0.67	
F _{ph} =	1.26	
W _p =	47	Lbs
CG =	30.2	in
B =	24.0	in
D =	12.0	in (min)
S =	17.0	in
n _{RODS} =	4	
L _{BOLT} =	3.0	in (max)
BC =	8.0	in
I _{xx,RODS} =	144	in ²
I _{yy,RODS} =	144	in ²
I _{zz,RODS} =	288	in ²
F _{ph} =	59	Lbs (ULT)
F _{pv} =	13	Lbs (ULT)

ASCE 7 Table 13.5-1
ASCE 7 Table 13.5-1
ASCE 7 Table 13.5-1
z = height of attachment, h = roof height

$$F_{ph} = \frac{0.4 S_{DS} a_p}{(R_p/I_p)} \left(1 + 2 \frac{z}{h}\right) W_p$$



Vertical Hanger Rod Design (See Unistrut Catalog, page 70)

M _{yy} =	2,812	Lbs (ASD)
Diameter =	1/2	in
s _{clip} =	12	in oc
% =	100%	
T =	110	Lbs (ASD)
T' =	3,750	Lbs (ASD)
DCR _T =	0.03	< 1.0 OK
C =	88	Lbs (ASD)
C' =	3,750	Lbs (ASD)
DCR _C =	0.02	< 1.0 OK

$$M_{yy} = 0.7 F_{ph}(CG + L_{bolt}) + (W_p + 0.7 F_{pv})B$$

Rod diameter
Spacing of stiffener cradle clips

Percentage of tensile capacity for compression

$$T = \frac{(W_p + 0.7 F_{pv})}{n_{RODS}} + \frac{M_{yy}(D/2)}{I_{yy,RODS}} - \frac{0.7 F_{ph}}{2}$$

Rod Tension

Rod Tensile Capacity

$$C = \frac{(0.7 F_{pv} - 0.9 W_p)}{n_{RODS}} + \frac{M_{yy}(D/2)}{I_{yy,RODS}} - \frac{0.7 F_{ph}}{2}$$

Rod Compression

Rod Compressive Capacity

Vertical Hanger Anchorage (Hilti KB-TZ, ICC ESR-1917)

M _{uyy} =	6,583	Lb-in (ULT)
α =	0.75	
Stl Deck =	Below	
h _{conc} =	4 3/4	in
f _c =	4,000	psi
Conc =	NWC	
λ =	1.00	
Steel =	Carbon	
Dia =	1/2	in
h _{ef} =	2	in
h _{min} =	4	in
s =	12.0	in
s _{min} =	2.75	in
A _{no} =	36.0	in ²
A _n =	36.0	in ²
A _{se} =	0.101	in ²
F _u =	106,000	psi
k _{cr} =	17	
k _{cp} =	1.0	
N _{p,cr} =	1,847	Lbs
N _b =	3,041	Lbs
Ω _o · P _u =	217	Lbs (ULT)
φP _{n,conc} =	900	Lbs (ULT)
φP _{n,steel} =	8,030	Lbs (ULT)
DCR _p =	0.24	< 1.0 OK
DCR _p =	0.03	< 1.0 OK

$$M_{uyy} = \Omega_o \cdot F_{ph}(CG + L_{bolt}) + (1.2 W_p + F_{pv})B$$

Seismic reduction per ACI Ch. 17

Concrete thickness
Concrete strength (2,500 psi min)

Reduction for LWC
Carbon or stainless

φ _{t,conc} =	0.65
φ _{v,conc} =	0.70
φ _{t,steel} =	0.75
φ _{v,steel} =	0.65

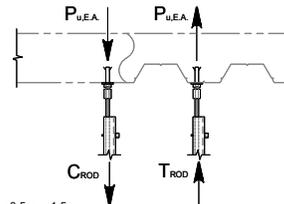
Anchor diameter
Effective embedment
Minimum concrete thickness

Anchor spacing
Minimum anchor spacing

$$A_n = \min[(3 \cdot h_{ef})(1.5 \cdot h_{ef} + s/2), A_{no}]$$

(assuming no close edges)

Anchor effective area
Anchor tensile strength



Concrete breakout strength

Tension Demand
= 0.75 · λ · φ_{t,conc} · min(N_b, N_{p,cr}) (A_n/A_{no})

= φ_{t,steel} · A_{se} · f_u
= Ω_o · P_u / φP_{n,conc}
= Ω_o · P_u / φP_{n,steel}

$$N_b = k_{cr} \cdot (f_c)^{0.5} \cdot h_{ef}^{1.5}$$

$$P_u = \frac{(1.2 W_p + F_{pv})}{n_{RODS}} + \frac{M_{uyy}(S/2)}{I_{yy,RODS}} - \frac{\Omega_o \cdot F_{ph}}{2}$$

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DETAIL
Suspended Ceiling Equipment - Single Procedure Light
1/S301
Bracing Design (Unistrut P1000, Lmax = 9'-6", rmin = 0.577, KL/r = 198, load applied at slotted face, 4 total)

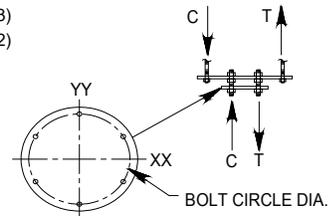
M _{zz} = 998		Lb-in (ASD)	M _{zz} = 0.7 · F _{ph} · B	$C = \left(\frac{0.7 F_{ph}}{2} + \frac{M_{zz}(D/2)}{I_{zz,RODS}} \right) \sqrt{2}$ Brace compression capacity, based on 10'-0" length Unistrut Catalog, pg 20
C = 59		Lbs (ASD)		
C' = 1,380		Lbs (ASD)		
DCR = 0.04		< 1.0 OK		

Brace Anchorage (Same anchor parameters as vertical anchor)

Ω _o · P _u = 148		Lbs (ULT)	Tension Demand	$P_u = V_u = \frac{\Omega_o F_{ph}}{2} + \frac{\Omega_o F_{ph} B (D/2)}{I_{zz,RODS}}$ = λ · φ _{v,conc} · k _{cp} · N _b (A _n /A _{no}) = φ _{v,steel} · V _{seis} = Ω _o P _u / φ P _{n,conc} = Ω _o V _u / φ V _{n,conc} = Ω _o P _u / φ P _{n,steel} = Ω _o V _u / φ V _{n,steel} (DCR _{P,max}) ^{5/3} + (DCR _{V,max}) ^{5/3} ≤ 1.0
Ω _o · V _u = 148		Lbs (ULT)	Shear Demand	
V _s = 3,000		Lbs		
φV _{n,conc} = 2,129		Lbs (ULT)		
φV _{n,steel} = 1,950		Lbs (ULT)		
DCR _P = 0.16		< 1.0 OK		
DCR _V = 0.07		< 1.0 OK		
DCR _P = 0.02		< 1.0 OK		
DCR _V = 0.08		< 1.0 OK		
DCR = 0.06		< 1.0 OK		

Bolt/Rod Design (Between Mounting Plates):

Type = A325-X				
Diameter d = 3/8		in	Bolt diameter	
n _{BOLTS} = 3			Number of bolts	
A _{BOLT} = 0.110		in ²	Bolt Area	
S _{BOLT} = 0.005		in ³	S _{BOLT} = π · (d/2) ³ / 4	
I _{yy, BOLTS} = 24.0		in ²		
I _{zz, BOLTS} = 48.0		in ²		
x = 4.0		in	Max distance from center of bolt circle - XX axis	
y = 3.5		in	Max distance from center of bolt circle - YY axis	
M _{zz} = 998		Lb-in (ASD)	M _{zz} = 0.7 · F _{ph} · B	
M _{yy} = 2,812		Lb-in (ASD)	M _{yy} = 0.7 F _{ph} (CG + L _{bolt}) + (W _p + 0.7 F _{pv}) B	
V = 121		Lbs (ASD)	$V = \sqrt{\left(\frac{0.7 \cdot F_{ph}}{n_{BOLTS}} + \frac{M_{zz} x}{I_{zz, BOLTS}} \right)^2 + \left(\frac{M_{yy} y}{I_{yy, BOLTS}} \right)^2}$	
M _{BOLT} = 181		Lb-in (ASD)		M _{BOLT} = V · (L _{BOLT} / 2)
T = 487		Lbs (ASD)	T = (M _{yy} · x) / I _{yy, BOLTS} + (W _p + 0.7 · F _{pv}) / n _{bolts}	
f _t = 39.4		ksi	f _t = M _{BOLT} / S _{BOLT} + T / A _{BOLT}	
f _v = 1.1		ksi	f _v = V / A _{BOLT}	
F _u = 150		ksi		
F _t = 56.3		ksi	F _t = F _n / Ω (AISC 13 Ed., Pg. 7-23)	
F _v = 30.0		ksi	F _v = F _v / Ω (AISC 13 Ed., Pg. 7-22)	
DCR = 0.74		< 1.0 OK	f _t / F _t + f _v / F _v < 1.0	


Mounting Plate Design:

t = 1/4		in (min)	Plate thickness	b = 12 t Z = b · t ² / 4
b = 3.0		in		
Z = 0.05		in ³		
I _{yy, BOLTS} = 24		in ²		
M _{yy} = 2,595		Lb-in (ASD)	M _{yy} = 0.7 F _{ph} · CG + (W _p + 0.7 F _{pv}) · B	
T = 325		Lbs	T = M _{yy} (BC · 2 ^{1/2}) / (2 · I _{yy, BOLTS}) + (W _p + 0.7 F _{pv}) / n _{BOLTS}	
C = 287		Lbs	C = M _{yy} (BC · 2 ^{1/2}) / (2 · I _{yy, BOLTS}) - (W _p + 0.7 F _{pv}) / n _{BOLTS}	
M = 0.34		k-in (ASD)	M = T · (D - BC / 2) - C · [(D - BC) / (2D)] · (D - BC) / 2	
M _n / Ω = 1.01		k-in (ASD)	M _n / Ω = F _y · Z / Ω F _y = 36 ksi	
DCR = 0.33		< 1.0 OK		

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DETAIL

Wall Mounted Monitor - 29" TV on Peerless Bracket SA730P

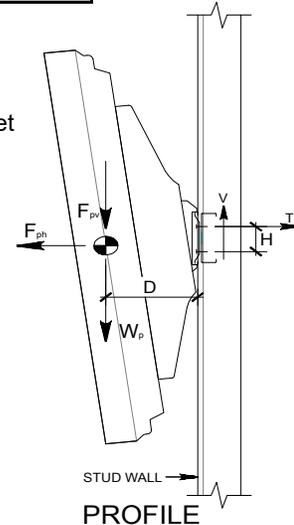
3/S301

GENERAL INPUT

OPM: 0212-13

(ASD)

Design =	City		
$W_p =$	29 Lbs (max)		Equip weight (including bracket)
$H =$	6.5 in (min)		Vert distance between anchors
$B =$	1.6 in (min)		Distance between anchors and edge of bracket
$D =$	23.2 in (max)		Distance to centroid
	Equip	Wall	
$a_p =$	1.0	1.0	ASCE 7 Tables 13.5-1
$R_p =$	1.5	2.5	and 13.6-1
$S_{DS} =$	1.35		See USGS sheet
$I_p =$	1.00		ASCE 7 Table 1.5-2
$z_1/h =$	0.33		2nd Floor
$z_2/h =$	0.67		3rd Floor


SEISMIC FORCES

$F_{ph,min} =$	0.28	W_p	$F_{ph,min} = 0.7 \cdot 0.3 S_{DS} \cdot I_p \cdot W_p$
$F_{ph,1} =$	0.42	0.25 W_p	
$F_{ph,2} =$	0.59	0.35 W_p	
$F_{ph} =$	0.50	0.32 W_p	$F_{ph} = 0.7 \frac{0.4 S_{DS} a_p}{R_p / I_p} \left(1 + 2 \frac{z}{h} \right) W_p$
$F_{pv} =$	0.19	W_p	$F_{pv} = 0.7 \cdot 0.2 S_{DS} \cdot W_p$
$F_{ph} =$	14	lbs	
$F_{pv} =$	6	lbs	

PROFILE

FRONT-TO-BACK

$V =$	34	Lbs	$= W_p + F_{pv}$
$P =$	129	Lbs	$= [(W_p + F_{pv}) \cdot CG + F_{ph} \cdot (H/2)] / H$

SIDE-TO-SIDE

$V =$	37	Lbs	$= [(W_p + F_{pv})^2 + F_{ph}^2]^{0.5}$
$P =$	336	Lbs	$= [(W_p + F_{pv}) \cdot CG] / H + (F_{ph} \cdot CG) / B$

PLAN

Screws into Backing Plate

$n_{wall} =$	2	No. of screws into backing (min)	
SMS =	1/4" ϕ (min)		Metal = 16 ga backing
$V =$	18	Lbs/screw	Shear demand (in-plane)
$P =$	336	Lbs/screw	Pull-out
$V' =$	613	Lbs	Screw shear capacity per SSMA allowable loads table, p.60
$P' =$	261	Lbs	Screw pull-out capacity per SSMA allowable loads table, p.60
DCR =	1.32	(NG)	$DCR = V/V' + P/P' \leq 1.0$

A307 Bolts at Bracket to Backing

$n_{bkg} =$	2	No. of bolts into backing	$(F_u = 45 \text{ ksi}, \Omega = 2.5)$
Metal =	16 ga	backing	$t = 0.0566$ in Backing thickness
$d =$	1/4	in (min)	Bolt diameter
$m_f =$	0.75		Modification factor per AISI Table E3.3.1-2
$C =$	3.0		Bearing factor per AISI Table E3.3.1-1
$P =$	168	Lbs/bolt	Pull-out per bolt
$V =$	18	Lbs/bolt	Shear per bolt
$P' =$	573	Lbs	Bearing capacity (AISI Eqn. E3.3.1-1)
$V' =$	509	Lbs	Shear capacity (AISI Eqn. E4.3.1-1)
DCR =	0.33	≤ 1.0 (OK)	$= [m_f \cdot C \cdot d \cdot t \cdot F_u] / \Omega$ $= [4.2 \cdot (t^3 \cdot d)^{1/2} \cdot F_u] / \Omega$ $= \max[P_{F-B} / P', (P_{S-S} / P' + \nu)$

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DETAIL

Wall Mounted Monitor - 29" TV on Peerless Bracket SA730P
3/S301
Screws into Metal Studs

SMS =	#10	(min)
V =	3	Lbs
P =	56	Lbs
V' =	613	Lbs
P' =	261	Lbs
DCR =	0.22	(OK)

$n_{wall} = 12$ No. of screws into metal studs
 Metal = 16 ga studs (min)
 Shear demand (in-plane)
 Pull-out
 Screw shear capacity per SSMA allowable loads table, p.60
 Screw pull-out capacity per SSMA allowable loads table, p.60

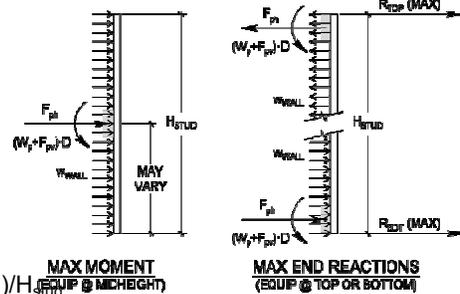
STUD DESIGN

$n_{stud} =$	2
$H_{partial} =$	4.0 ft
$W_{p,wall} =$	8.0 psf
$s_{stud} =$	16 in
$F_{ph} =$	5.0 psf
$W_{wall} =$	6.7 plf/stud
$M =$	0.6 kip-in
$R_{TOP} =$	29 lbs
$R_{BOT} =$	29 lbs
Stud =	400S125-54 (min)
$S_e =$	0.361 in ³
$I_e =$	0.830 in ⁴
$M' =$	10.8 kip-in
$\Delta =$	0.00 in (L/16146)

Number of studs engaged
 Height of stud (maximum)
 Unit wt of partition wall
 Stud spacing
 $= \text{Max}[(F_{ph})(W_{p,wall}), 5\text{psf min}]$
 $= F_{ph} \cdot (s_{stud}/12)$

Max Moment (per stud)
 $= W_{wall} \cdot H_{stud}/2 + F_{ph} + (W_p + F_{pv}) \cdot (D/12)/H_{stud}$
 $= W_{wall} \cdot H_{stud}/2 + F_{ph} + (W_p + F_{pv}) \cdot (D/12)/H_{stud}$

$= S_e F_y / \Omega_b, \Omega_b = 1.67$
 Maximum Deflection (Limit to L/120)


Stud Wall Top & Bot Track Connections (ASD)

- Connected to a top and bottom track with 2- #10 SMS. Loads are minimal therefore ok by inspection.
- See A7/S601 for additional information.

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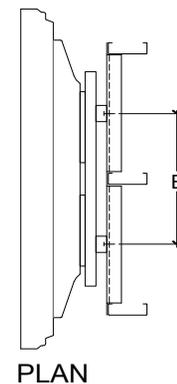
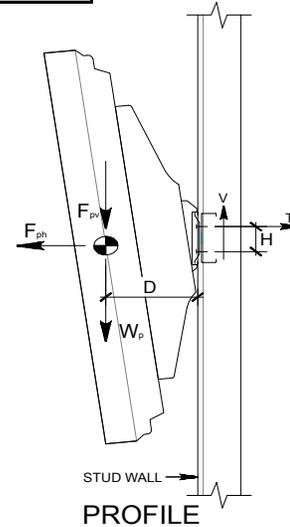
DETAIL

Wall Mounted Monitor - 42" TV on Peerless Bracket ST640
4/S301
GENERAL INPUT

Design =	City	
W_p =	50 Lbs (max)	Equip weight (including bracket)
H =	5.0 in (min)	Vert distance between anchors
B =	16.0 in (min)	Horiz distance between anchors
D =	6.0 in	Distance to centroid
	Equip	Wall
a_p =	1.0	1.0 ASCE 7 Tables 13.5-1
R_p =	1.5	2.5 and 13.6-1
S_{DS} =	1.35	See USGS sheet
I_p =	1.00	ASCE 7 Table 1.5-2
z_1/h =	0.33	2nd Floor
z_2/h =	0.67	3rd Floor

OPM: 0211-13

(ASD)


SEISMIC FORCES

$F_{ph,min}$ =	0.28 W_p	$F_{ph,min} = 0.7 \cdot 0.3 S_{DS} \cdot I_p \cdot W_p$
$F_{ph,1}$ =	0.42 0.25 W_p	
$F_{ph,2}$ =	0.59 0.35 W_p	
F_{ph} =	0.50 0.32 W_p	$F_{ph} = 0.7 \frac{0.4 S_{DS} a_p}{R_p / I_p} \left(1 + 2 \frac{z}{h} \right) W_p$
F_{pv} =	0.19 W_p	$F_{pv} = 0.7 \cdot 0.2 S_{DS} \cdot W_p$
F_{ph} =	25 lbs	
F_{pv} =	10 lbs	

FRONT-TO-BACK

V =	60 Lbs	= $W_p + F_{pv}$
P =	84 Lbs	= $[(W_p + F_{pv}) \cdot CG + F_{ph} \cdot (H/2)]/H$

SIDE-TO-SIDE

V =	65 Lbs	= $[(W_p + F_{pv})^2 + F_{ph}^2]^{0.5}$
P =	81 Lbs	= $[(W_p + F_{pv}) \cdot CG]/H + (F_{ph} \cdot CG)/B$

Screws into Backing Plate

SMS =	1/4" ϕ (min)	n_{wall} =	4 No. of screws into backing (min)
V =	16 Lbs/screw	Metal =	16 ga backing
P =	42 Lbs/screw		Shear demand (in-plane)
V' =	613 Lbs		Pull-out
P' =	261 Lbs		Screw shear capacity per SSMA allowable loads table, p.60
DCR =	0.19 (OK)		Screw pull-out capacity per SSMA allowable loads table, p.60
			DCR = $V/V' + P/P' \leq 1.0$

Screws into Metal Studs

SMS =	#10 (min)	n_{wall} =	18 No. of screws into metal studs
V =	4 Lbs	Metal =	16 ga studs (min)
P =	9 Lbs		Shear demand (in-plane)
V' =	613 Lbs		Pull-out
P' =	261 Lbs		Screw shear capacity per SSMA allowable loads table, p.60
DCR =	0.04 (OK)		Screw pull-out capacity per SSMA allowable loads table, p.60

Job:	18SHA11 ARMC Ambulatory Clinic	10
Calc By:	ISG Date: 02/21/19	

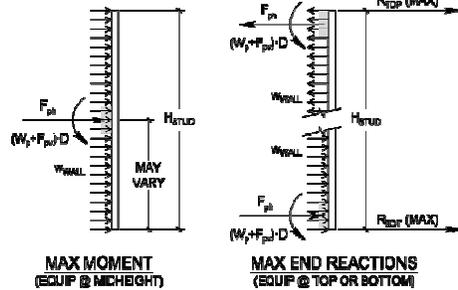
DETAIL

Wall Mounted Monitor - 42" TV on Peerless Bracket ST640

4/S301

STUD DESIGN

$n_{stud} =$	3	Number of studs engaged
$H_{stud} =$	13.7 ft	Height of stud (maximum)
$H_{partial} =$	9.5 ft	Height of stud (partial height wall)
$W_{p,wall} =$	8.0 psf	Unit wt of partition wall
$s_{stud} =$	16 in	Stud spacing
$F_{ph} =$	5.0 psf	= $\text{Max}[(F_{ph})(W_{p,wall}), 5\text{psf min}]$
$w_{wall} =$	6.7 plf/stud	
$M =$	2.3 kip-in	Max Moment (per stud)
$R_{TOP} =$	55 lbs	= $w_{wall} \cdot H_{stud} / 2 + F_{ph} + (W_p + F_{pv}) \cdot (D/12) / H_{stud}$
$R_{BOT} =$	55 lbs	
Stud =	400S125-54	(min)
$S_e =$	0.361 in ³	
$I_e =$	0.830 in ⁴	
$M' =$	10.8 kip-in	= $S_e F_y / \Omega_b, \Omega_b = 1.67$
$\Delta =$	0.31 in (L/522)	Maximum Deflection (Limit to L/120)


Stud Wall Top & Bot Track Connections (ASD)

Top Connection: 0.157"φ Hilti X-U w/ 1" Embed (ICC ESR-2269)

 Above: NWC o/ Mtl Deck

$s_{top} =$	24 in	Anchor spacing at top of wall
$n_{top} =$	2	Total number of anchors engaged at top of wall
$V =$	82 Lbs/anchor	= $R_{TOP} \cdot (n_{stud} / n_{top})$
$V' =$	90 Lbs/anchor	Shear capacity (ASD)

Top Connection: Braced

$s_{top} =$	48 in	Brace spacing at top of wall
$n_{braces} =$	2	Total number of braces engaged at top of wall
$V =$	51 Lbs/brace	= $[w_{wall} \cdot H_{partial} / 2 + 0.7F_{ph} + (W_p + 0.7F_{pv}) \cdot (D/12) / H_{partial}] \cdot (n_{stud} / n_{top})$

Bottom Connection: 0.157"φ Hilti X-U w/ 1" Embed (ICC ESR-2269)

 Below: NWC o/ Mtl Deck

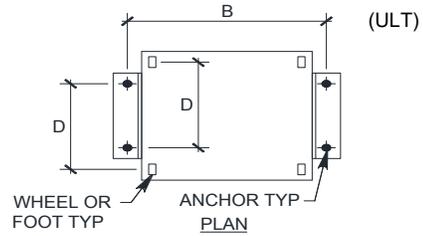
$s_{bot} =$	24 in	Anchors spacing at bottom of wall
$n_{bot} =$	2	Total number of anchors engaged at bottom of wall
$V =$	82 Lbs/anchor	= $R_{BOT} \cdot (n_{stud} / n_{bot})$
$V' =$	90 Lbs/anchor	Shear capacity (ASD)

Job:	18SHA11 ARMC Ambulatory Clinic	11
Calc By:	ISG Date: 02/21/19	

Floor Mounted Equipment - Refrigerator (GE)	DETAIL 7/S301
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Design =	City
$a_p =$	1.0
$R_p =$	2.5
$\Omega_o =$	2.5
$S_{DS} =$	1.35 g
$I_p =$	1.00
$z/h =$	0.33

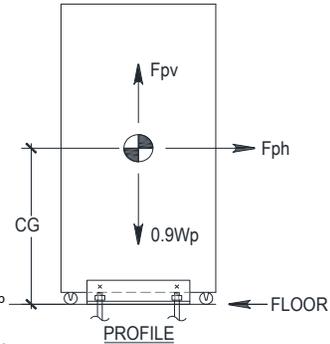
ASCE 7 Table 13.5-1 & Table 13.6-1
 ASCE 7 Table 13.5-1 & Table 13.6-1
 ASCE 7 Table 13.5-1 & Table 13.6-1
 See USGS sheet
 ASCE 7 Table 11.5-1
 2nd Floor



Dimensions

$W_p =$	800	Lbs*	Equip weight
$B =$	39.0	in	Dist between anchors (36" + 2·1.5")
$D =$	22.0	in (min)	Dist between anchors & edge of unit (28"/2+8")
$CG =$	36.0	in	Dist to centroid
$n =$	6	(min)	No. of anchors
$n_t =$	3	(min)	No. of anchors in tension

* W_p includes 480 Lbs of contents
 *2 middle anchors count as one anchor



Forces

$F_{ph,min} =$	0.41	W_p	(Governs)
$F_{ph} =$	0.36	W_p	
$F_{ph} =$	324	Lbs	
$\Omega_o \cdot F_{ph} =$	810	Lbs	
$F_{pv} =$	0.27	W_p	
$F_{pv} =$	216	Lbs	
$V_u =$	54	Lbs	Shear per anchor
$\Omega_o \cdot V_u =$	135	Lbs	Shear per anchor w/ Ω_o
$P_u =$	93	Lbs	Tension per anchor
$\Omega_o \cdot P_u =$	358	Lbs	Tension per anchor w/ Ω_o

$$F_{ph,min} = 0.3 \cdot S_{DS} \cdot I_p \cdot W_p$$

$$F_{ph} = \frac{0.4 S_{DS} a_p}{(R_p / I_p)} \left(1 + 2 \frac{z}{h} \right) W_p$$

$$F_{pv} = 0.2 \cdot S_{DS} \cdot W_p$$

$$V_u = F_{ph} / n$$

$$\Omega_o \cdot V_u = \Omega_o \cdot F_{ph} / n$$

$$P_{u,1} = (F_{ph} \cdot CG) / [\min(B,D) \cdot n_t] - (0.9W_p - F_{pv}) / n$$

$$\Omega_o \cdot P_{u,1} = (\Omega_o \cdot F_{ph} \cdot CG) / [\min(B,D) \cdot n_t] - (0.9W_p - F_{pv}) / n$$

Connection of Angle Brackets to Equipment Frame:

Fastener =	Screw	Type of fastener (Screw or Bolt)
$n_{conn} =$	1 (min)	No. of screws per anchorage point
SMS =	1/4" ϕ	Size of sheet metal screw
Metal =	20 ga (min)	Equipment frame gauge
$t =$	0.0346 in	Equipment frame thickness
$F_u =$	45 ksi	Ultimate strength of steel (min)
$V_{u,conn} =$	107 Lbs	Shear demand per screw
$\phi V_{n,conn} =$	305 Lbs	Screw shear capacity (per SSMA p.60, converted to ULT)
DCR =	0.35 (OK)	$V_{u,conn} / \phi V_{n,conn} \leq 1.0$

($\Omega = 3.0, \phi = 0.5$)

$$V_{u,conn} = (P_u^2 + V_u^2)^{1/2} \div n_{conn}$$

Angle Bracket Design

$P_u =$	0.1	kips	Tension per angle
$d =$	4.0	in (max)	Distance from bottom of angle to SMS conn.
$b =$	1.5	in	Distance from centerline of anchor to angle leg
$p =$	3.0	in	Tributary angle width
$d_{anchor} =$	3/8	in	Anchor diameter
$b' =$	1.13	in	Distance from edge of hole to center of angle leg
$t_{min} =$	0.07	in	Min thickness for no prying action (AISC Section 9-10)
$t =$	1/4	in (min)	Thickness
$M_{u,angle} =$	0.10	kip-in	Moment demand
$Z =$	0.047	in ³	Plastic section modulus
$F_y =$	36	ksi	Yield stress
$\phi M_{n,angle} =$	1.52	kip-in	Moment capacity
DCR =	0.07 (OK)		$M_{u,angle} / \phi M_{n,angle} \leq 1.0$

($\phi = 0.90$)



Job:	18SHA11 ARMC Ambulatory Clinic		12
Calc By:	ISG	Date: 02/21/19	

DETAIL

Floor Mounted Equipment - Refrigerator (GE)	7/S301
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Hilti KB-TZ Expansion Anchors: (ICC ESR-1917) Anchor Mark = *

* See "Anchorage to Topside of Concrete - Hilti KB-TZ (ESR-1917)" calculation sheet for additional info.

Anchor =	CS 3/8 (1 1/2)		3/8"φ Hilti KB-TZ (Carbon Steel) w/ 1 1/2" Embedment										
	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; border: 1px solid black;">Concrete</th> <th style="width: 50%; border: 1px solid black;">Steel</th> </tr> </thead> <tbody> <tr> <td style="border: 1px solid black;">φP_n = 815</td> <td style="border: 1px solid black;">4,875 Lbs</td> </tr> <tr> <td style="border: 1px solid black;">φV_n = 1,383</td> <td style="border: 1px solid black;">1,417 Lbs</td> </tr> <tr> <td style="border: 1px solid black;">DCR_p = 0.44</td> <td style="border: 1px solid black;">0.07</td> </tr> <tr> <td style="border: 1px solid black;">DCR_v = 0.10</td> <td style="border: 1px solid black;">0.10</td> </tr> </tbody> </table>	Concrete	Steel	φP _n = 815	4,875 Lbs	φV _n = 1,383	1,417 Lbs	DCR _p = 0.44	0.07	DCR _v = 0.10	0.10		(Concrete tension capacity has been multiplied by 0.75 for seismic)
Concrete	Steel												
φP _n = 815	4,875 Lbs												
φV _n = 1,383	1,417 Lbs												
DCR _p = 0.44	0.07												
DCR _v = 0.10	0.10												
			Ω _o P _u /φP _n ≤ 1.0										
			Ω _o V _u /φV _n ≤ 1.0										
			DCR _{p+v} = <input type="text" value="0.27"/> (DCR _{p,max}) ^{5/3} + (DCR _{v,max}) ^{5/3} ≤ 1.0										

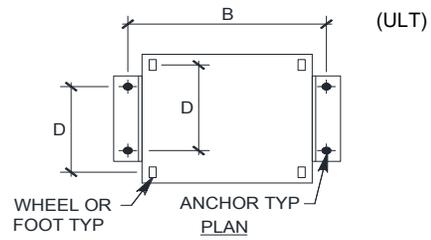
Job:	18SHA11 ARMC Ambulatory Clinic	13
Calc By:	ISG Date: 02/21/19	

Floor Mounted Equipment - Warming Cabinet (Steris)	DETAIL 8/S301
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Design = City

$a_p =$	1.0
$R_p =$	2.5
$\Omega_o =$	2.5
$S_{DS} =$	1.35 g
$I_p =$	1.00
$z/h =$	0.00

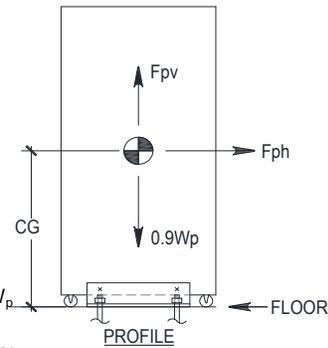
ASCE 7 Table 13.5-1 & Table 13.6-1
 ASCE 7 Table 13.5-1 & Table 13.6-1
 ASCE 7 Table 13.5-1 & Table 13.6-1
 See USGS sheet
 ASCE 7 Table 11.5-1



Dimensions

$W_p =$	691	Lbs*	Equip weight
$B =$	33.0	in	Dist between anchors (30" + 2·1.5")
$D =$	20.0	in (min)	Dist between anchors & edge of unit (24"/2+8")
$CG =$	37.4	in	Dist to centroid
$n =$	6	(min)	No. of anchors
$n_t =$	3	(min)	No. of anchors in tension

* W_p includes 158 Lbs of contents
 *2 middle anchors count as one anchor



Forces

$F_{ph,min} =$	0.41	W_p	(Governs)
$F_{ph} =$	0.22	W_p	
$F_{ph} =$	280	Lbs	
$\Omega_o \cdot F_{ph} =$	700	Lbs	
$F_{pv} =$	0.27	W_p	
$F_{pv} =$	187	Lbs	
$V_u =$	47	Lbs	Shear per anchor
$\Omega_o \cdot V_u =$	117	Lbs	Shear per anchor w/ Ω_o
$P_u =$	102	Lbs	Tension per anchor
$\Omega_o \cdot P_u =$	363	Lbs	Tension per anchor w/ Ω_o

$$F_{ph,min} = 0.3 \cdot S_{DS} \cdot I_p \cdot W_p$$

$$F_{ph} = \frac{0.4 S_{DS} a_p}{(R_p / I_p)} \left(1 + 2 \frac{z}{h} \right) W_p$$

$$F_{pv} = 0.2 \cdot S_{DS} \cdot W_p$$

$$V_u = F_{ph} / n$$

$$\Omega_o \cdot V_u = \Omega_o \cdot F_{ph} / n$$

$$P_{u,1} = (F_{ph} \cdot CG) / [\min(B,D) \cdot n_t] - (0.9W_p - F_{pv}) / n$$

$$\Omega_o \cdot P_{u,1} = (\Omega_o \cdot F_{ph} \cdot CG) / [\min(B,D) \cdot n_t] - (0.9W_p - F_{pv}) / n$$

Connection of Angle Brackets to Equipment Frame:

Fastener =	Screw	Type of fastener (Screw or Bolt)
$n_{conn} =$	1 (min)	No. of screws per anchorage point
SMS =	1/4" ϕ	Size of sheet metal screw
Metal =	20 ga (min)	Equipment frame gauge
$t =$	0.0346 in	Equipment frame thickness
$F_u =$	45 ksi	Ultimate strength of steel (min)
$V_{u,conn} =$	112 Lbs	Shear demand per screw
$\phi V_{n,conn} =$	305 Lbs	Screw shear capacity (per SSMA p.60, converted to ULT)
DCR =	0.37 (OK)	$V_{u,conn} / \phi V_{n,conn} \leq 1.0$

($\Omega = 3.0, \phi = 0.5$)

$$V_{u,conn} = (P_u^2 + V_u^2)^{1/2} \div n_{conn}$$

Angle Bracket Design

$P_u =$	0.1	kips	Tension per angle
$d =$	4.0	in (max)	Distance from bottom of angle to SMS conn.
$b =$	1.5	in	Distance from centerline of anchor to angle leg
$p =$	3.0	in	Tributary angle width
$d_{anchor} =$	3/8	in	Anchor diameter
$b' =$	1.13	in	Distance from edge of hole to center of angle leg
$t_{min} =$	0.07	in	Min thickness for no prying action (AISC Section 9-10)
$t =$	1/4	in (min)	Thickness
$M_{u,angle} =$	0.11	kip-in	Moment demand
$Z =$	0.047	in ³	Plastic section modulus
$F_y =$	36	ksi	Yield stress
$\phi M_{n,angle} =$	1.52	kip-in	Moment capacity
DCR =	0.08 (OK)		$M_{u,angle} / \phi M_{n,angle} \leq 1.0$

($\phi = 0.90$)

Job:	18SHA11 ARMC Ambulatory Clinic		14
Calc By:	ISG	Date: 02/21/19	

DETAIL

Floor Mounted Equipment - Warming Cabinet (Steris)

8/S301

Hilti KB-TZ Expansion Anchors: (ICC ESR-1917) Anchor Mark = *

* See "Anchorage to Topside of Concrete - Hilti KB-TZ (ESR-1917)" calculation sheet for additional info.

Anchor =	CS 3/8 (1 1/2)		3/8"φ Hilti KB-TZ (Carbon Steel) w/ 1 1/2" Embedment
	Concrete	Steel	
φP _n =	815	4,875	Lbs (Concrete tension capacity has been multiplied by 0.75 for seismic)
φV _n =	1,383	1,417	Lbs
DCR _p =	0.45	0.07	Ω _o P _u /φP _n ≤ 1.0
DCR _v =	0.08	0.08	Ω _o V _u /φV _n ≤ 1.0
DCR _{p+v} =	0.28 (DCR _{p,max}) ^{5/3} + (DCR _{v,max}) ^{5/3} ≤ 1.0		

Job:	18SHA11 ARMC Ambulatory Clinic	15
Calc By:	ISG Date: 02/21/19	

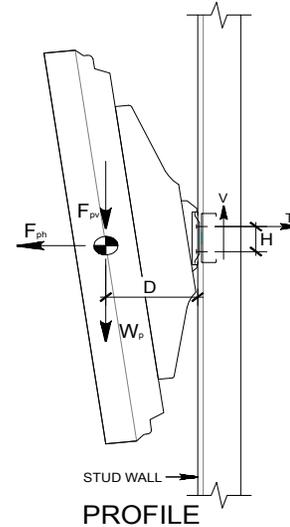
DETAIL

Wall Mounted Monitor - TV on Ergotron Bracket

9/S301
GENERAL INPUT

Design =	City		
W_p =	34	Lbs (max)	Equip weight (including bracket)
H =	27.8	in (min)	Vert distance between anchors
B =	7.8	in (min)	Horiz distance between anchors
D =	11.9	in (max)	Distance to centroid
	Equip	Wall	
a_p =	1.0	1.0	ASCE 7 Tables 13.5-1
R_p =	2.5	2.5	and 13.6-1
S_{DS} =	1.35		See USGS sheet
I_p =	1.00		ASCE 7 Table 1.5-2
z_1/h =	0.33		2nd Floor
z_2/h =	0.67		3rd Floor

(ASD)


SEISMIC FORCES

$F_{ph,min}$ =	0.28	W_p	$F_{ph,min} = 0.7 \cdot 0.3 S_{DS} \cdot I_p \cdot W_p$
$F_{ph,1}$ =	0.25	0.25	W_p
$F_{ph,2}$ =	0.35	0.35	W_p
F_{ph} =	0.32	0.32	W_p
F_{pv} =	0.19	W_p	$F_{pv} = 0.7 \cdot 0.2 S_{DS} \cdot W_p$
F_{ph} =	11	lbs	
F_{pv} =	7	lbs	

$$F_{ph} = 0.7 \frac{0.4 S_{DS} a_p}{R_p / I_p} \left(1 + 2 \frac{z}{h} \right) W_p$$
FRONT-TO-BACK

V =	41	Lbs	= $W_p + F_{pv}$
P =	23	Lbs	= $[(W_p + F_{pv}) \cdot CG + F_{ph} \cdot (H/2)]/H$

SIDE-TO-SIDE

V =	42	Lbs	= $[(W_p + F_{pv})^2 + F_{ph}^2]^{0.5}$
P =	34	Lbs	= $[(W_p + F_{pv}) \cdot CG]/H + (F_{ph} \cdot CG)/B$

PROFILE
PLAN
Screws into Backing Plate

SMS =	1/4"φ	(min)	No. of screws into backing (min)
V =	10	Lbs/screw	Shear demand (in-plane)
P =	17	Lbs/screw	Pull-out
V' =	613	Lbs	Screw shear capacity per SSMA allowable loads table, p.60
P' =	261	Lbs	Screw pull-out capacity per SSMA allowable loads table, p.60
DCR =	0.08	(OK)	DCR = $V/V' + P/P' \leq 1.0$

Screws into Metal Studs

SMS =	#10	(min)	No. of screws into metal studs
V =	3	Lbs	Shear demand (in-plane)
P =	6	Lbs	Pull-out
V' =	613	Lbs	Screw shear capacity per SSMA allowable loads table, p.60
P' =	261	Lbs	Screw pull-out capacity per SSMA allowable loads table, p.60
DCR =	0.03	(OK)	

Job:	18SHA11 ARMC Ambulatory Clinic	16
Calc By:	ISG Date: 02/21/19	

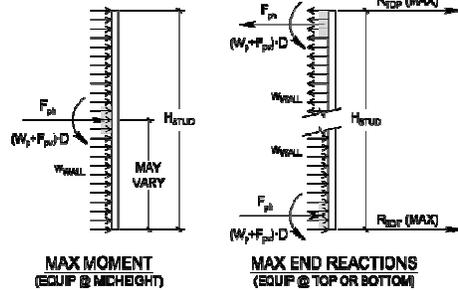
DETAIL

Wall Mounted Monitor - TV on Ergotron Bracket

9/S301

STUD DESIGN

$n_{stud} =$	2	Number of studs engaged
$H_{stud} =$	13.7 ft	Height of stud (maximum)
$H_{partial} =$	9.5 ft	Height of stud (partial height wall)
$W_{p,wall} =$	8.0 psf	Unit wt of partition wall
$s_{stud} =$	16 in	Stud spacing
$F_{ph} =$	5.0 psf	= $\text{Max}[(F_{ph})(W_{p,wall}), 5\text{psf min}]$
$w_{wall} =$	6.7 plf/stud	
$M =$	2.3 kip-in	Max Moment (per stud)
$R_{TOP} =$	52 lbs	= $w_{wall} \cdot H_{stud} / 2 + F_{ph} + (W_p + F_{pv}) \cdot (D/12) / H_{stud}$
$R_{BOT} =$	52 lbs	
Stud =	400S125-54	(min)
$S_e =$	0.361 in ³	
$I_e =$	0.830 in ⁴	
$M' =$	10.8 kip-in	= $S_e F_y / \Omega_b, \Omega_b = 1.67$
$\Delta =$	0.26 in (L/633)	Maximum Deflection (Limit to L/120)


Stud Wall Top & Bot Track Connections (ASD)

Top Connection: 0.157"φ Hilti X-U w/ 1" Embed (ICC ESR-2269)

 Above: NWC o/ Mtl Deck

$s_{top} =$	24 in	Anchor spacing at top of wall
$n_{top} =$	2	Total number of anchors engaged at top of wall
$V =$	52 Lbs/anchor	= $R_{TOP} \cdot (n_{stud} / n_{top})$
$V' =$	90 Lbs/anchor	Shear capacity (ASD)

Top Connection: Braced

$s_{top} =$	48 in	Brace spacing at top of wall
$n_{braces} =$	2	Total number of braces engaged at top of wall
$V =$	34 Lbs/brace	= $[w_{wall} \cdot H_{partial} / 2 + 0.7F_{ph} + (W_p + 0.7F_{pv}) \cdot (D/12) / H_{partial}] \cdot (n_{stud} / n_{top})$

Bottom Connection: 0.157"φ Hilti X-U w/ 1" Embed (ICC ESR-2269)

 Below: NWC o/ Mtl Deck

$s_{bot} =$	24 in	Anchors spacing at bottom of wall
$n_{bot} =$	2	Total number of anchors engaged at bottom of wall
$V =$	52 Lbs/anchor	= $R_{BOT} \cdot (n_{stud} / n_{bot})$
$V' =$	90 Lbs/anchor	Shear capacity (ASD)

Job:	18SHA11 ARMC Ambulatory Clinic	17
Calc By:	ISG Date: 02/21/19	

DETAIL

Suspended Ceiling Equipment- (EF-1 & RF-1)	See Mech Dwgs
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Design = City
 $S_{DS} = 1.35$ See USGS sheet
 $I_p = 1.0$ ASCE 7 Table 11.5-1

$$F_{pv} = 0.27 W_p (ULT) = 0.2 S_{DS} \cdot W_p$$

$$F_{ph (MIN)} = 0.41 W_p (ULT) = 0.3 S_{DS} \cdot I_p \cdot W_p$$

$$= \frac{0.4 S_{DS} a_p}{(R_p / I_p)} \left(1 + 2 \frac{z}{h} \right) W_p$$

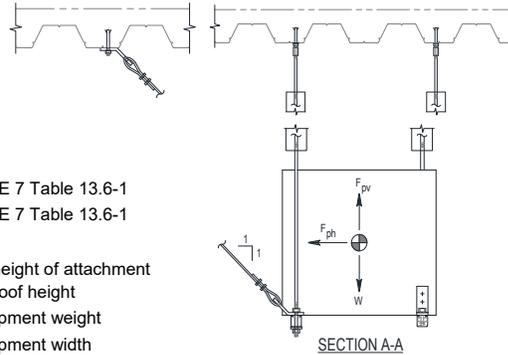
Mark	Description
EF-1	Exhaust Fan (Cook SQL-B)
RF-1	Exhaust Fan (Cook SQL-B)

Assumptions & Dimensions:

Mark	EF-1	RF-1		
Equipment	Flexible	Flexible		
Isolators	Yes	Yes		
a_p	2.5	2.5		
R_p	2.5	2.5		
Ω_o	2.5	2.5		
z/h	0.67	0.67		
F_{ph}	1.26	1.26	$W_p (ULT)$	
W_p	208	431	Lbs	
B	24.8	47.4	in	
D	32.9	52.5	in	
H	26.9	46.5	in	
CG	13.5	23.3	in	
F_{ph}	263	545	Lbs (ULT)	
$\Omega_o \cdot F_{ph}$	657	1,362	Lbs (ULT)	
F_{pv}	56	116	Lbs (ULT)	

ASCE 7 Table 13.6-1
 ASCE 7 Table 13.6-1

z = height of attachment
 h = roof height
 Equipment weight
 Equipment width
 Equipment depth
 Equipment height
 Center of gravity (CG) height
 Lateral seismic force
 Lateral seismic force (w/ overstrength factor)
 Vertical seismic force



Equipment Screw Conn to P1538A (Unistrut Angle) on Trapeze

Screws	#12	#12		
Stl. Gage	18 ga	18 ga		
n_{conn}	8	8		
V	23	48	Lbs (ASD)	
V'	124	124	Lbs (ASD)	
T	14	25	Lbs (ASD)	
T'	263	263	Lbs (ASD)	
DCR	0.24	0.48		

Sheet metal screws (SMS)
 Base material thickness
 Number of screws to equipment (total)
 $= 0.7 F_{ph} / n_{conn}$
 Screw shear capacity (SSMA Catalog pg. 60)
 $= [0.7 F_{ph} \cdot CG - (0.6 W_p - 0.7 F_{pv}) \cdot (\min(B,D)/2)] / (\min(B,D) \cdot n_{conn}/2)$
 Screw Pullout Capacity (SSMA Catalog pg. 60)
 $= V/V' + T/T' < 1.0$

Equipment Spring Nut Conn to Trapeze

Diameter	1/4	1/4	in	
n_{HHCS}	4	4		
P	29	49	Lbs (ASD)	
V	46	95	Lbs (ASD)	
P'	600	600	Lbs (ASD)	
V'	300	300	Lbs (ASD)	
DCR	0.20	0.40		

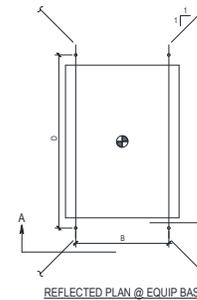
HHCS diameter
 Number of HHCS to unistrut (total)
 $= [0.7 F_{ph} \cdot CG - (0.6 W_p - 0.7 F_{pv}) \cdot (\min(B,D)/2)] / (\min(B,D) \cdot n_{conn}/2)$
 $= 0.7 F_{ph} / n_{conn}$
 Spring nut pull-out capacity
 Spring nut shear capacity
 $= V/V' + T/T' < 1.0$

Unistrut Trapeze

Unistrut	P1000	P1000		
$n_{trapeze}$	2	2		
L	36	48	in (min)	
w	41	64	plf	
M	556	1,537	Lb-in (ASD)	
M'	5,080	5,080	Lb-in (ASD)	
I	0.185	0.185	in ⁴	
Δ	0.014	0.069	in	
	L/2571	L/698		(L/240 Max)

Total number of trapeze
 Total length of trapeze
 $w = (W_p + 0.7 F_{pv}) / (n_{trapeze} \times L)$

Total load deflection



Job:	18SHA11 ARMC Ambulatory Clinic	18
Calc By:	ISG Date: 02/21/19	

DETAIL

Suspended Ceiling Equipment- (EF-1 & RF-1)	See Mech Dwgs
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Vertical Hanger Rod Design (See Unistrut Catalog, page 70)

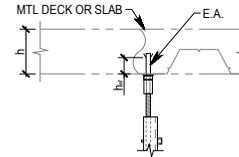
Diameter =	1/2	1/2	in
s _{clip} =	12	12	in oc
%	100%	100%	
n _{rods} =	4	4	
M =	2,478	8,864	Lb-in
T =	296	603	Lbs (ASD)
T' =	1,350	1,350	Lbs (ASD)
DCR _T =	0.22	0.45	
C =	213	430	Lbs (ASD)
C' =	1,350	1,350	Lbs (ASD)
DCR _C =	0.16	0.32	

Rod diameter
 Spacing of stiffener cradle clips
 Percentage of tensile capacity for compression
 Number of rods per trapeze
 Overturning moment = $0.7F_{ph} \cdot CG$
 Rod tension = $M / (2 \cdot \min[B,D]) + (W_p + 0.7F_{pv}) / n_{rods} + 0.7F_{ph}$
 Rod tensile capacity
 Rod compression = $M / (2 \cdot \min[B,D]) + (0.7F_{pv} - 0.6W_p) / n_{rods} + 0.7F_{ph}$
 Rod compressive capacity

Anchorage to Underside of Concrete - Hilti KB-TZ (ICC ESR-1917)

Conc =	NWC	NWC	
Metal deck =	W2 Deck	W2 Deck	
f _c =	4,000	4,000	psi
Anchor =	CS 1/2 (3 1/4)	CS 1/2 (3 1/4)	
Steel Type =	Carbon	Carbon	
d _a =	1/2	1/2	in
h _{ef} =	3 1/4	3 1/4	in
h =	4 3/4	4 3/4	in
h _{min} =	4 5/8	4 5/8	in
φ _s =	0.75	0.75	
λ =	N/A	N/A	
k _{cr} =	17	17	
k _{cp} =	2	2	
N _{p,cr} ¹ =	3,025	3,025	Lbs
N _b =	6,299	6,299	Lbs
s _{min} =	9 3/4	9 3/4	in
c _{min} =	7 1/2	7 1/2	in
A _n =	95	95	in ²
A _{no} =	95	95	in ²
N _{sa} =	10,705	10,705	lbs
V _{sa,eq} ² =	4,945	4,945	lbs
φP _{n,conc} =	1,475	1,475	Lbs
φV _{n,conc} =	N/A	N/A	Lbs
φP _{n,steel} =	8,029	8,029	Lbs
φV _{n,steel} =	3,214	3,214	Lbs

Normal or lightweight concrete
 Concrete over metal deck?
 Concrete compressive strength
 Hilti KB-TZ anchor
 Carbon steel or Stainless steel
 Anchor O.D.
 Effective min anchor embedment
 Concrete thickness
 Min member thickness
 Seismic reduction per ACI App. D
 LWC reduction per ACI App. D
 Effectiveness factor
 Coefficient for pryout strength



$$= k_{cr} \cdot (f'_c)^{0.5} \cdot h_{ef}^{1.5}$$

Min anchor spacing
 Min. edge distance
 $= 3h_{ef} \cdot (\min(1.5h_{ef}/s/2) + \min(1.5h_{ef}/c))$
 $= 9 \cdot h_{ef}^2$
 Steel strength in tension
 Steel strength in shear
 $= \phi_s \lambda \phi_{t,conc} \cdot \min(N_{p,cr}, N_b) \cdot (A_n/A_{no})$
 $= \lambda \phi_{v,conc} \cdot k_{cp} \cdot N_b \cdot (A_n/A_{no})$
 $= \phi_{t,steel} \cdot N_{sa}$
 $= \phi_{v,steel} \cdot V_{sa}$

φ _{t,conc} =	0.65
φ _{v,conc} =	0.70
φ _{t,steel} =	0.75
φ _{v,steel} =	0.65

¹ If anchor is into concrete over metal deck this value refers to "N_{p,deck,cr}"
² If anchor is into concrete over metal deck this value refers to "V_{sa,deck,eq}"

Vertical Hanger Anchorage (Hilti KB-TZ, ICC ESR-1917)

n =	1	2	(min)
Ω _o · P _u =	778	802	Lbs (ULT)
DCR _{P,conc} =	0.53	0.54	
DCR _{P,steel} =	0.10	0.10	

Total number of anchors
 Tension = $(\Omega_o \cdot F_{ph} \cdot CG / (2 \cdot \min[B,D]) + 1.2W_p + F_{pv}) / n_{rods} + \Omega_o \cdot F_{ph}$
 $\Omega_o \cdot P_u / \phi P_{n,conc} \leq 1.0$
 $\Omega_o \cdot P_u / \phi P_{n,steel} \leq 1.0$

Cable Bracing Design

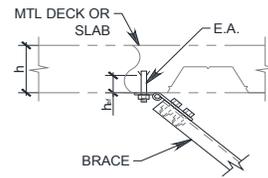
Diameter =	1/8	1/8	in
T =	260	539	Lbs (ASD)
T' =	1,000	1,000	Lbs (ASD)
DCR =	0.26	0.54	

Prestretched Aircraft cable diameter
 Tension per cable = $(0.7F_{ph}) \cdot 2^{0.5}$
 Per ASHRAE

Brace Anchorage (Same anchor parameters as vertical anchor)

n =	1	2	(min)
Ω _o · P _u =	657	681	Lbs (ULT)
Ω _o · V _u =	657	340	Lbs (ULT)
DCR _{P,conc} =	0.45	0.46	
DCR _{V,conc} =	N/A	N/A	
DCR _{P,steel} =	0.08	0.08	
DCR _{V,steel} =	0.20	0.11	
DCR _{P+V} =	0.33	0.30	

Total number of anchors
 Tension Demand = $\Omega_o \cdot F_{ph} / n$
 Shear Demand = $\Omega_o \cdot F_{ph} / n$
 $\Omega_o \cdot P_u / \phi P_{n,conc} \leq 1.0$
 $\Omega_o \cdot V_u / \phi V_{n,conc} \leq 1.0$
 $\Omega_o \cdot P_u / \phi P_{n,steel} \leq 1.0$
 $\Omega_o \cdot V_u / \phi V_{n,steel} \leq 1.0$
 $\max[DCR_{P,conc}, DCR_{P,steel}]^{5/3} + \max[DCR_{V,conc}, DCR_{V,steel}]^{5/3} \leq 1.0$



Job:	18SHA11 ARMC Ambulatory Clinic	19
Calc By:	ISG	
Date:	02/21/19	

DETAIL

Typical Suspended Single Pipe/Conduit Support Under Concrete over Steel Deck	4/S101
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Design =	City	
S _{DS} =	1.35 g	See USGS sheet
a _p =	2.5	ASCE 7 Table 13.6-1
R _p =	6.0	ASCE 7 Table 13.6-1
Ω _o =	2.5	ASCE 7 Table 13.6-1

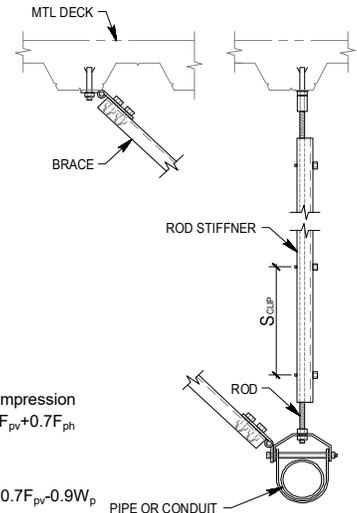
I _p =	1.00	(1.5 for essential or hazardous)
F _{pv} =	0.27	W _p (ULT) = 0.2S _{DS} · W _p
F _{ph} (MIN) =	0.41	W _p (ULT) = 0.3S _{DS} · I _p · W _p

$$F_{ph} = \frac{0.4S_{DS}a_p}{(R_p/I_p)} \left(1 + 2\frac{z}{h}\right) W_p$$

z/h =	0.67	
F _{ph} (calc) =	0.53	
F _{ph} =	0.53	
Ω _o · F _{ph} =	1.32	
φ _{PIPE} =	4	
W _{PIPE} =	16.3	
S _{HGR} =	10.0	
S _{TRANS} =	20.0	
S _{LONG} =	40.0	
W _{PIPE} =	163	
F _{ph} =	172	
Ω _o · F _{ph} =	429	
F _{pv} =	44	

z = height of attachment, h = roof height
 ASCE 7 (13.3-1)
 Governing F_{ph} coefficient

Pipe diameter
 Std pipe full of water used
 Hanger spacing
 Transverse brace spacing
 Longitudinal brace spacing (pairs)
 = W_{PIPE} (S_{HGR})
 = F_{ph} W_{PIPE} (S_{TRANS}/S_{HGR})
 = Ω_o · F_{ph} W_{PIPE} (S_{TRANS}/S_{HGR})
 = F_{pv} W_{PIPE}



Vertical Hanger Rod Design (See Unistrut Catalog, page 70)

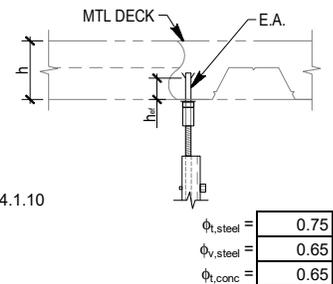
Diameter =	1/2	in
S _{clip} =	12	in oc
% =	100%	
T =	314	Lbs (ASD)
T' =	1,350	Lbs (ASD)
DCR _T =	0.23	
C =	4	Lbs (ASD)
C' =	1,350	Lbs (ASD)
DCR _C =	0.00	

Rod diameter
 Spacing of stiffener cradle clips
 Percentage of tensile capacity for compression
 Rod tension T = W_p + 0.7F_{pv} + 0.7F_{ph}
 Rod tensile capacity
 Rod compression C = 0.7F_{ph} + 0.7F_{pv} - 0.9W_p
 Rod compression capacity

Vertical Hanger Anchorage (Hilti KB-TZ, ICC ESR-1917, Table 5)

Conc =	NWC	
Metal deck =	W2 Deck	
f _c =	4,000	psi
Anchor =	CS 1/2 (3 1/4)	
Steel Type =	Carbon	
d _o =	1/2	in
h _{ef} =	3 1/4	in
h =	2 3/4	in
h _{min,top} =	2 5/8	in
φ _s =	0.75	
N _{p,deck,cr} =	3,025	Lbs
S _{min} =	2 3/8	in
C _{min} =	2 3/8	in
N _{sa} =	10,705	lbs
V _{sa,deck,eq} =	4,945	lbs
φ _{P_{n,conc}} =	1,475	Lbs
φ _{P_{n,steel}} =	8,029	Lbs
φ _{V_{n,steel}} =	3,214	Lbs
Ω _o · P _u =	669	Lbs
DCR _{P_{n,conc}} =	0.45	
DCR _{P_{n,steel}} =	0.08	

Normal or lightweight concrete
 Figure 5A
 Concrete compressive strength
 Hilti KB-TZ anchor
 Carbon steel or Stainless steel
 Anchor O.D.
 Effective min anchor embedment
 Concrete thickness o/ deck
 Min concrete thickness o/ deck per section 4.1.10
 Seismic reduction per ACI Ch.17
 = N_{p,cr}(f_c/3000)
 Min anchor spacing per sections
 Min. edge distance
 Steel strength in tension (table 3 or 4)
 Steel strength in shear
 = φ_sλφ_{t,conc} · N_{p,deck,cr}
 = φ_{t,steel} · N_{sa}
 = φ_{v,steel} · V_{sa,deck,eq}
 Tension demand Ω_o · P_u = 1.2W_p + F_{pv} + Ω_o · F_{ph}
 Ω_o · P_u / φ_{P_{n,conc}} ≤ 1.0
 Ω_o · P_u / φ_{P_{n,steel}} ≤ 1.0



Note: All values are calculated based on tabulated values found in ICC-ESR 1917. Based on this report, concrete breakout and shear are not applicable. See Table 5, footnote 8 for additional information. No reduction for LWC required per section 4.1.12, last paragraph.

Bracing Design (Unistrut P1000, Lmax = 9'-6", r_{min} = 0.577, KL/r = 198, load applied at slotted face)

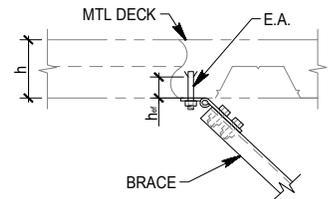
C =	170	Lbs (ASD)
C' =	1,200	Lbs (ASD)
DCR =	0.14	

Brace compression C = (0.7F_{ph}) · 2^{0.5}
 Brace compression capacity, based on 10'-0" length, pg 4-6

Brace Anchorage (Same anchor parameters as vertical anchor)

Ω _o · P _u =	429	Lbs
Ω _o · V _u =	429	Lbs
DCR _{P_{n,conc}} =	0.29	
DCR _{P_{n,steel}} =	0.05	
DCR _{V_{n,steel}} =	0.13	
DCR _{P_{n,v,steel}} =	0.04	

Tension demand Ω_o · P_u = Ω_o · F_{ph}
 Shear Demand Ω_o · V_u = Ω_o · F_{ph}
 Ω_o · P_u / φ_{P_{n,conc}} ≤ 1.0
 Ω_o · P_u / φ_{P_{n,steel}} ≤ 1.0
 Ω_o · V_u / φ_{V_{n,steel}} ≤ 1.0
 (Ω_o · P_u / φ_{P_{n,steel}})^{5/3} + (Ω_o · V_u / φ_{V_{n,steel}})^{5/3} ≤ 1.0



Job:	18SHA11 ARMC Ambulatory Clinic	20
Calc By:	ISG	
Date:	02/21/19	

DETAIL

Typical Suspended Pipe/Conduit Trapeze Support Under Concrete over Steel Deck 5/S101

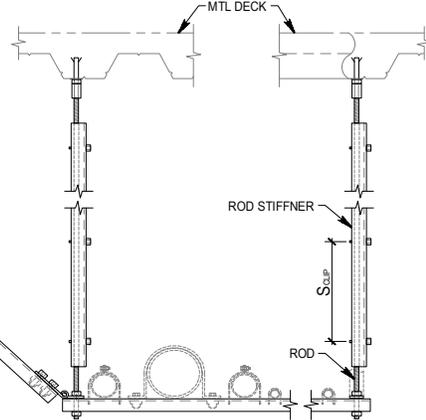
Design =	City	
S _{DS} =	1.35	See USGS sheet
a _p =	2.5	ASCE 7 Tables 13.6-1
R _p =	6.0	ASCE 7 Tables 13.6-1
Ω _o =	2.0	ASCE 7 Table 13.6-1

I _p =	1.00	ASCE 7 Table 11.5-1
F _{pv} =	0.27	W _p (ULT) = 0.2S _{DS} ·W _p
F _{ph} (MIN) =	0.41	W _p (ULT) = 0.3S _{DS} ·I _p ·W _p

z/h =	0.67	
F _{ph} (calc) =	0.53	W _p (ULT)
F _{ph} =	0.53	W _p (ULT)
Ω _o ·F _{ph} =	1.05	W _p (ULT)
W _{PIPES} =	35	plf
S _{TRAPEZE} =	10	ft
S _{TRANS} =	20	ft
S _{LONG} =	40	ft
W _{PIPES} =	350	Lbs
W _{TRAPEZE} =	5	Lbs
W _{TOTAL} =	355	Lbs
F _{ph} =	374	Lbs (ULT)
Ω _o ·F _{ph} =	748	Lbs (ULT)
F _{pv} =	96	Lbs (ULT)

z = height of attachment, h = roof height
 ASCE 7 (13.3-1)
 Governing F_{ph} coefficient $F_{ph} = \frac{0.4S_{DS}a_p}{(R_p/I_p)} \left(1 + 2\frac{z}{h}\right) W_p$

Total Linear Weight of Pipes
 Trapeze Linear Spacing (in Plan)
 Transverse brace spacing
 Longitudinal brace spacing (pairs)
 Weight of Pipes on Horiz. Unistrut
 Weight of Unistrut Framing & Misc
 = W_{PIPES} + W_{TRAPEZE}
 = F_{ph} W_{TOTAL} (S_{TRANS}/S_{TRAPEZE})
 = Ω_o·F_{ph} W_{TOTAL} (S_{TRANS}/S_{TRAPEZE})
 = F_{pv} W_{TOTAL}



Unistrut Trapeze (ASD)

Unistrut	P1000	
L =	4.0	ft (max)
w =	106	plf
M =	2,533	Lb-in (ASD)
M' =	5,080	Lb-in (ASD)
I =	0.185	in ⁴
Δ _{DL} =	0.10	in
	L/504	(L/240 Max)

$= (W_{TOTAL} + 0.7F_{pv})/L$
 $= (w/12) \cdot L^2/8$
 (Per Unistrut Catalog p. 24)

Dead load deflection
 (L/240 Max)

Vertical Hanger Rod Design (See Unistrut Catalog, page 70)

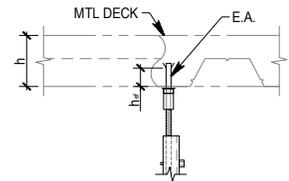
Diameter =	1/2	in
S _{clip} =	12	in oc
% =	100%	
T =	473	Lbs (ASD)
T' =	1,350	Lbs (ASD)
DCR _T =	0.35	
C =	335	Lbs (ASD)
C' =	1,350	Lbs (ASD)
DCR _C =	0.25	

Rod diameter
 Spacing of stiffener cradle clips
 Percentage of tensile capacity for compression
 Rod Tension $T = (W_p + 0.7F_{pv})/2 + 0.7F_{ph}$
 Rod Tensile Capacity
 Rod Compression $C = 0.7F_{ph} + (0.6W_p - 0.7F_{pv})/2$
 Rod Compressive Capacity

Vertical Hanger Anchorage (Hilti KB-TZ, ICC ESR-1917)

Conc =	NWC	
Metal deck =	W2 Deck	
f _c =	4,000	psi
Anchor =	CS 1/2 (3 1/4)	
Steel Type =	Carbon	
d _a =	1/2	in
h _{el} =	3 1/4	in
h =	2 3/4	in
h _{min,top} =	2 5/8	in
φ _s =	0.75	
N _{p,deck,cr} =	3,025	Lbs
S _{min} =	2 3/8	in
C _{min} =	2 3/8	in
N _{sa} =	10,705	lbs
V _{sa,deck,eq} =	4,945	lbs
φ _{P_{n,conc}} =	1,475	Lbs
φ _{P_{n,steel}} =	8,029	Lbs
φ _{V_{n,steel}} =	3,214	Lbs
Ω _o ·P _u =	1,009	Lbs
DCR _{P,conc} =	0.68	
DCR _{P,steel} =	0.13	

Normal or lightweight concrete
 Figure 5A
 Concrete compressive strength
 Hilti KB-TZ anchor
 Carbon steel or Stainless steel
 Anchor O.D.
 Effective min anchor embedment
 Concrete thickness o/ deck
 Min concrete thickness o/ deck per section 4.1.10
 Seismic reduction per ACI Ch.17
 $= N_{p,cr} (f_c/3000)$
 Min anchor spacing per sections
 Min. edge distance
 Steel strength in tension (table 3 or 4)
 Steel strength in shear
 $= \phi_s \lambda \phi_{L,conc} N_{p,deck,cr}$
 $= \phi_{L,steel} N_{sa}$
 $= \phi_{V,steel} V_{sa,deck,eq}$
 Tension Demand $\Omega_o \cdot P_u = (1.2W_p + F_{pv})/2 + \Omega_o \cdot F_{ph}$
 $\Omega_o P_u / \phi P_{n,conc} \leq 1.0$
 $\Omega_o P_u / \phi P_{n,steel} \leq 1.0$



φ _{L,steel} =	0.75
φ _{V,steel} =	0.65
φ _{L,conc} =	0.65

Note: All values are calculated based on tabulated values found in ICC-ESR 1917. Based on this report, concrete breakout and shear are not applicable. See Table 5, footnote 8 for additional information. No reduction for LWC required per section 4.1.12, last paragraph.

Bracing Design (Unistrut P1000, Lmax = 9'-6", rmin = 0.577, KL/r = 198, load applied at slotted face)

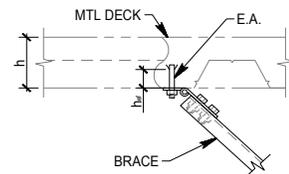
C =	370	Lbs (ASD)
C' =	1,380	Lbs (ASD)
DCR =	0.27	

$C = (0.7F_{ph}) \cdot 2^{0.5}$
 Brace compression capacity, based on 10'-0" length
 Unistrut Catalog, pg 20

Brace Anchorage (Same anchor parameters as vertical anchor)

Ω _o ·P _u =	748	Lbs
Ω _o ·V _u =	748	Lbs
DCR _{P,conc} =	0.51	
DCR _{P,steel} =	0.09	
DCR _{V,steel} =	0.23	
DCR _{P+V,steel} =	0.11	

Tension demand $\Omega_o \cdot P_u = \Omega_o \cdot F_{ph}$
 Shear Demand $\Omega_o \cdot V_u = \Omega_o \cdot F_{ph}$
 $\Omega_o P_u / \phi P_{n,conc} \leq 1.0$
 $\Omega_o P_u / \phi P_{n,steel} \leq 1.0$
 $\Omega_o V_u / \phi V_{n,steel} \leq 1.0$
 $(\Omega_o P_u / \phi P_{n,steel})^{5/3} + (\Omega_o V_u / \phi V_{n,steel})^{5/3} \leq 1.0$



Job:	18SHA11 ARMC Ambulatory Clinic	21
Calc By:	ISG	
Date:	02/21/19	

Typical Wall-Mounted Pipe/Conduit Unistrut Support	DETAIL 10/S101
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Seismic Input

Design =	City	
a_p =	2.5	ASCE 7 Tables 13.5-1 and 13.6-1
R_p =	6.0	See USGS sheet
S_{DS} =	1.35	ASCE 7 Table 11.5-1
I_p =	1.00	Floor below (2nd Floor)
z_1/h =	0.33	Floor above (3rd Floor)
z_2/h =	0.67	

Weight & Dimensions

W_{pipes} =	100	Lbs (max)	Total weight of pipes/conduit @ strut support
W_{strut} =	5	Lbs (max)	Weight of strut support
W_p =	105	Lbs (max)	Total weight ($W_{pipes} + W_{strut}$)
H =	24	in (min)	Distance between top & bottom screws
D =	5	in (max)	Distance from face of wall to center of pipe/conduit

Seismic Forces

$F_{ph,min}$ =	0.41	W_p	= $0.3S_{DS} \cdot I_p \cdot W_p$
$F_{ph,1}$ =	0.37	W_p	F_{ph} at floor below (z_1/h)
$F_{ph,2}$ =	0.53	W_p	F_{ph} at floor above (z_2/h)
$F_{ph,avg}$ =	0.45	W_p	Average of $F_{ph,1}$ & $F_{ph,2}$
F_{ph} =	0.45	W_p	Max of $F_{ph,min}$ & $F_{ph,avg}$
F_{pv} =	0.27	W_p	= $0.2S_{DS} \cdot W_p$
F_{ph} =	47	Lbs	Horizontal seismic force
F_{pv} =	28	Lbs	Vertical seismic force

Screws into Stud

SMS =	1/4" ϕ	
V_{VERT} =	42	Lbs
V_{HORIZ} =	11	Lbs
P_{F-B} =	37	Lbs
P_{S-S} =	26	Lbs
V'_{VERT} =	613	Lbs
V'_{HORIZ} =	613	Lbs
P' =	261	Lbs
DCR =	0.21	(OK)

n =	3	No. of screws at strut to stud (min)
Metal =	16 ga	studs (min)
Shear per screw (vertical, gravity loads)	= $(W_p + 0.7F_{pv}) \div n$	
Shear per screw (horizontal, side-to-side)	= $0.7F_{ph} \div n$	
Tension per screw (front-to-back)	= $(W_p + 0.7F_{pv}) \cdot D/H + 0.7F_{ph}/n$	
Tension per screw (side-to-side)	= $(W_p + 0.7F_{pv}) \cdot D/H$	

Stud Design

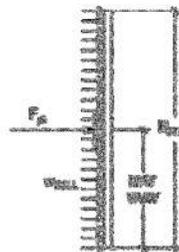
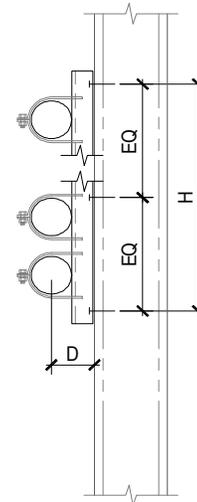
H_{stud} =	13.7	ft	Height of stud (maximum)
$H_{partial}$ =	9.5	ft	Height of stud (partial height wall)
$W_{p,wall}$ =	8.0	psf	Unit wt of partition wall
s_{stud} =	16	in	Stud spacing
Stud =	400S125-54	(min)	
S_e =	0.361	in^3	
I_e =	0.830	in^4	
M' =	10.8	kip-in	= $S_e F_y / \Omega_b$, $\Omega_b = 1.67$
$0.7F_{ph,wall}$ =	2.5	psf	= $0.7(0.45) W_{p,wall}$
Live =	5.0	psf	

Load Case 1: (D+0.7E)

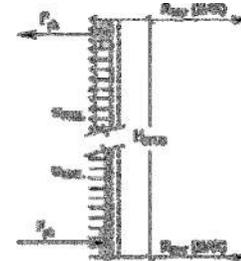
W_{wall} =	3.4	plf / stud	= $0.7F_{ph,wall} \cdot (s_{stud}/12)$
R_{TOP} =	60	Lbs / stud	= $W_{wall} \cdot H_{stud}/2 + 0.7F_{ph} + (W_p + 0.7F_{pv}) \cdot (D/12)/H_{stud}$
$R_{PARTIAL}$ =	55	Lbs / stud	= $W_{wall} \cdot H_{partial}/2 + 0.7F_{ph} + (W_p + 0.7F_{pv}) \cdot (D/12)/H_{partial}$
R_{BOT} =	60	Lbs / stud	= $W_{wall} \cdot H_{stud}/2 + 0.7F_{ph} + (W_p + 0.7F_{pv}) \cdot (D/12)/H_{stud}$
M =	2.6	kip-in	= $W_{wall} \cdot H_{stud}^2/8 + 0.7F_{ph} \cdot H_{stud}/4 + (W_p + 0.7F_{pv}) \cdot (D/12)/2$
DCR _M =	0.24	≤ 1.0 (OK)	= $M/M' \leq 1.0$
Δ =	0.24	in (L/694)	Maximum Deflection (Limit to L/120)

Load Case 2: (D+L)

W_{wall} =	6.7	plf / stud	= $Live \cdot (s_{stud}/12)$
R_{TOP} =	49	Lbs / stud	= $W_{wall} \cdot H_{stud}/2 + W_p \cdot (D/12)/H_{stud}$
$R_{PARTIAL}$ =	36	Lbs / stud	= $W_{wall} \cdot H_{partial}/2 + W_p \cdot (D/12)/H_{partial}$
R_{BOT} =	49	Lbs / stud	= $W_{wall} \cdot H_{stud}/2 + W_p \cdot (D/12)/H_{stud}$
M =	2.1	kip-in	= $W_{wall} \cdot H_{stud}^2/8 + W_p \cdot (D/12)/2$
DCR _M =	0.20	≤ 1.0 (OK)	= $M/M' \leq 1.0$
Δ =	0.22	in (L/754)	Maximum Deflection (Limit to L/120)



MAX MOMENT DISTRIBUTION



MAX END REACTIONS SET UP ON STUD

Job:	18SHA11 ARMC Ambulatory Clinic		22
Calc By:	ISG	Date: 02/21/19	

Typical Wall-Mounted Pipe/Conduit Unistrut Support	10/S101
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Connections at Top Track of Full-Height Wall - Load Case 1: (D+0.7E) Governs

NWC o/ Mtl Deck		Type of existing floor/roof structure above
Conn _(E) =	PAF	Existing connections at top track are power-actuated fasteners (PAF)
S _(E) =	24 in	Spacing of existing PAF along top track of full-height wall (max)
n _(E) =	1	Number of existing PAF resisting out-of-plane reaction from pipe/conduit loads
V _(5 psf) =	68 Lbs / PAF	Existing shear demand at top of wall (based on 5 psf out-of-plane live load)
V _{wall} =	34 Lbs / PAF	Shear demand at top of wall from uniform wall loads (based on 2.5 psf out-of-plane seismic load)
V _{pipe} =	37 Lbs / PAF	Additional shear demand from pipe/conduit only (based on Load Case 1)
V _(E) =	71 Lbs / PAF	= V _{wall} + V _{pipe}
V' _(E) =	90 Lbs	0.157"φ Hilti X-U w/ 1" Embed (ICC ESR-2269)
DCR =	0.79 ≤ 1.0 (OK)	= V _(E) /V' _(E) ≤ 1.0

Braces at Top Track of Partial-Height Wall - Load Case 1: (D+0.7E) Governs

S _{brace} =	48 in	Spacing of existing braces along top track of partial-height wall (max)
n _{brace} =	1	Number of existing braces resisting out-of-plane reaction at top track (min)
V _(5 psf) =	95 Lbs / brace	Existing horizontal reaction force at brace (based on 5 psf out-of-plane live load)
V _{wall} =	48 Lbs / brace	Horizontal reaction force at brace from uniform wall loads (based on 2.5 psf out-of-plane seismic load)
V _{pipe} =	39 Lbs / brace	Additional horizontal reaction force at brace from pipe/conduit only (based on Load Case 1)
V _{brace} =	87 Lbs / brace	= V _{wall} + V _{pipe} 87 Lbs ≤ 95 Lbs (from 5 psf live), therefore braces are adequate by inspection

Connections at Bottom Track - Load Case 1: (D+0.7E) Governs

NWC o/ Mtl Deck		Type of existing floor structure below
Conn _(E) =	PAF	Existing connections at bottom track are power-actuated fasteners (PAF)
S _(E) =	24 in	Spacing of existing PAF along bottom track (max)
n _(E) =	1	Number of existing PAF resisting out-of-plane reaction from pipe/conduit loads
V _(5 psf) =	68 Lbs / PAF	Existing shear demand at bottom of wall (based on 5 psf out-of-plane live load)
V _{wall} =	34 Lbs / PAF	Shear demand at bottom of wall from uniform wall loads (based on 2.5 psf out-of-plane seismic load)
V _{pipe} =	37 Lbs / PAF	Additional shear demand from pipe/conduit only (based on Load Case 1)
V _(E) =	71 Lbs / PAF	= V _{wall} + V _{pipe}
V' _(E) =	90 Lbs	0.157"φ Hilti X-U w/ 1" Embed (ICC ESR-2269)
DCR =	0.79 ≤ 1.0 (OK)	= V _(E) /V' _(E) ≤ 1.0

Job:	18SHA11 ARMC Ambulatory Clinic	23
Calc By:	ISG Date: 02/21/19	

Typical Wall-Mounted Equipment (150 Lbs max)	DETAIL
	12/S101

Seismic Input

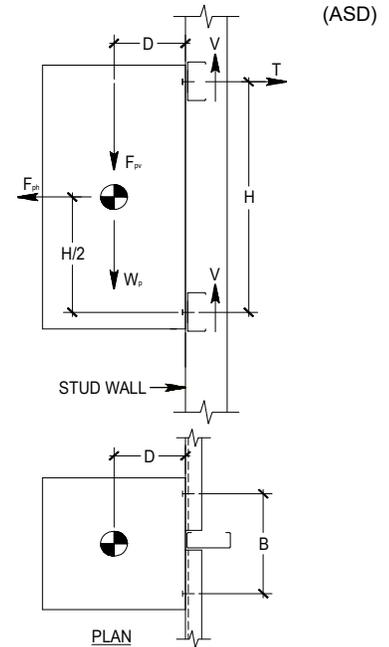
Design = City	
$a_p = 2.5$	ASCE 7 Tables 13.5-1 and 13.6-1
$R_p = 6.0$	See USGS sheet
$S_{DS} = 1.35$	ASCE 7 Table 11.5-1
$I_p = 1.00$	Floor below (2nd Floor)
$z_1/h = 0.33$	Floor above (3rd Floor)
$z_2/h = 0.67$	

Weight & Dimensions

$W_p = 150$ Lbs (max)	Equipment weight	
$H = 8.0$ in (min)	Height between top & bottom connections to backing	
$B = 6.0$ in (min)	Width between left and right connections to backing	
$D = 8.0$ in (max)	Depth to centroid	

Seismic Forces

$F_{ph,min} = 0.41 W_p$	$= 0.3 S_{DS} \cdot I_p \cdot W_p$	
$F_{ph,1} = 0.37 W_p$	F_{ph} at floor below (z_1/h)	$F_{ph} = \frac{0.4 S_{DS} a_p}{R_p / I_p} \left(1 + 2 \frac{z}{h} \right) W_p$
$F_{ph,2} = 0.53 W_p$	F_{ph} at floor above (z_2/h)	
$F_{ph,avg} = 0.45 W_p$	Average of $F_{ph,1}$ & $F_{ph,2}$	
$F_{ph} = 0.45 W_p$	Max of $F_{ph,min}$ & $F_{ph,avg}$	
$F_{pv} = 0.27 W_p$	$= 0.2 S_{DS} \cdot W_p$	
$F_{ph} = 68$ Lbs	Horizontal seismic force	
$F_{pv} = 41$ Lbs	Vertical seismic force	



Screws into Backing

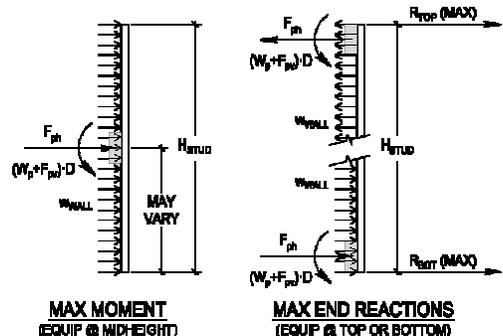
$SMS = 1/4" \phi$	$n_{bkg} = 4$ No. of screws into backing (min)	
$V_{F-B} = 45$ Lbs	Metal = 16 ga backing (min)	
$V_{S-S} = 46$ Lbs	Shear per screw (front-to-back)	$= (W_p + 0.7 F_{pv}) \div n_{bkg}$
$P_{F-B} = 101$ Lbs	Shear per screw (side-to-side)	$= [(W_p + 0.7 F_{pv})^2 + 0.7 F_{ph}^{2 \cdot 0.5}] \div n_{bkg}$
$P_{S-S} = 121$ Lbs	Tension per screw (front-to-back)	$= [(W_p + 0.7 F_{pv}) \cdot D/H + 0.7 F_{ph}/2] \div (n_{bkg}/2)$
$V' = 613$ Lbs	Tension per screw (side-to-side)	$= [(W_p + 0.7 F_{pv}) \cdot D/H + 0.7 F_{ph} \cdot D/B] \div (n_{bkg}/2)$
$P' = 261$ Lbs	Screw shear capacity per SSMA allowable loads table, p.90	
$DCR = 0.54 \leq 1.0$ (OK)	Screw pull-out capacity per SSMA allowable loads table, p.90	
	$= \max[V_{F-B}/V' + P_{F-B}/P', V_{S-S}/V' + P_{S-S}/P'] \leq 1.0$	

Screws into Metal Studs

$SMS = \#10$	$n_{wall} = 18$ No. of screws into metal studs (min)	
$V_{F-B} = 10$ Lbs	Metal = 16 ga studs (min)	
$V_{S-S} = 10$ Lbs	Shear per screw (front-to-back)	$= (W_p + 0.7 F_{pv}) \div n_{wall}$
$P_{F-B} = 22$ Lbs	Shear per screw (side-to-side)	$= [(W_p + 0.7 F_{pv})^2 + 0.7 F_{ph}^{2 \cdot 0.5}] \div n_{wall}$
$P_{S-S} = 27$ Lbs	Tension per screw (front-to-back)	$= [(W_p + 0.7 F_{pv}) \cdot D/H + 0.7 F_{ph}/2] \div (n_{wall}/2)$
$V' = 534$ Lbs	Tension per screw (side-to-side)	$= [(W_p + 0.7 F_{pv}) \cdot D/H + 0.7 F_{ph} \cdot D/B] \div (n_{wall}/2)$
$P' = 198$ Lbs	Screw shear capacity per SSMA allowable loads table, p.90	
$DCR = 0.15 \leq 1.0$ (OK)	Screw pull-out capacity per SSMA allowable loads table, p.90	
	$= \max[V_{F-B}/V' + P_{F-B}/P', V_{S-S}/V' + P_{S-S}/P'] \leq 1.0$	

Stud Design

$n_{stud} = 3$	Number of studs engaged	
$H_{stud} = 13.7$ ft	Height of stud (maximum)	
$H_{partial} = 9.5$ ft	Height of stud (partial height wall)	
$W_{p,wall} = 8.0$ psf	Unit weight of partition wall	
$s_{stud} = 16$ in	Stud spacing	
Stud = 400S125-54	(min)	
$S_e = 0.361$ in ³		
$I_e = 0.830$ in ⁴		
$M' = 10.8$ kip-in	$= S_e F_y / \Omega_b, \Omega_b = 1.67$	
$0.7 F_{ph,wall} = 2.5$ psf	$= 0.7(0.45) W_{p,wall}$	
Live = 5.0 psf	Uniform live load on wall (CBC 1607.14)	



Job:	18SHA11 ARMC Ambulatory Clinic		24
Calc By:	ISG	Date: 02/21/19	

DETAIL

Typical Wall-Mounted Equipment (150 Lbs max)	12/S101
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Load Case 1: (D+0.7E)

w_{wall} =	3.4 plf / stud	= $0.7F_{ph,wall} \cdot (s_{stud}/12)$
R_{TOP} =	42 Lbs / stud	= $w_{wall} \cdot H_{stud}/2 + [0.7F_{ph} + (W_p + 0.7F_{pv}) \cdot (D/12)/H_{stud}] / n_{stud}$
$R_{PARTIAL}$ =	36 Lbs / stud	= $w_{wall} \cdot H_{partial}/2 + [0.7F_{ph} + (W_p + 0.7F_{pv}) \cdot (D/12)/H_{partial}] / n_{stud}$
R_{BOT} =	42 Lbs / stud	= $w_{wall} \cdot H_{stud}/2 + [0.7F_{ph} + (W_p + 0.7F_{pv}) \cdot (D/12)/H_{stud}] / n_{stud}$
M =	1.8 kip-in	= $w_{wall} \cdot H_{stud}^2/8 + [0.7F_{ph} \cdot H_{stud}/4 + (W_p + 0.7F_{pv}) \cdot (D/12)/2] / n_{stud}$
DCR_M =	0.17 ≤ 1.0 (OK)	= $M/M' ≤ 1.0$
Δ =	0.17 in (L/966)	Maximum Deflection (Limit to L/120)

Load Case 2: (D+L)

w_{wall} =	6.7 plf / stud	= Live $\cdot (s_{stud}/12)$
R_{TOP} =	48 Lbs / stud	= $w_{wall} \cdot H_{stud}/2 + W_p \cdot (D/12)/(H_{stud} \cdot n_{stud})$
$R_{PARTIAL}$ =	35 Lbs / stud	= $w_{wall} \cdot H_{partial}/2 + W_p \cdot (D/12)/(H_{partial} \cdot n_{stud})$
R_{BOT} =	48 Lbs / stud	= $w_{wall} \cdot H_{stud}/2 + W_p \cdot (D/12)/(H_{stud} \cdot n_{stud})$
M =	2.1 kip-in	= $w_{wall} \cdot H_{stud}^2/8 + W_p \cdot (D/12)/(2 \cdot n_{stud})$
DCR_M =	0.19 ≤ 1.0 (OK)	= $M/M' ≤ 1.0$
Δ =	0.22 in (L/754)	Maximum Deflection (Limit to L/120)

Connections at Top Track of Full-Height Wall - Load Case 2: (D+L) Governs

NWC o/ Mtl Deck	Type of existing floor/roof structure above	
$Conn_{(E)}$ =	PAF	Existing connections at top track are power-actuated fasteners (PAF)
$s_{(E)}$ =	24 in	Spacing of existing PAF along top track of full-height wall (max)
$n_{(E)}$ =	2	Number of existing PAF resisting reaction from equipment loads (distributed by backing & top track)
$V_{(5\ psf)}$ =	68 Lbs / PAF	Existing shear demand at top of wall (based on 5 psf out-of-plane live load)
V_{wall} =	68 Lbs / PAF	Shear demand at top of wall from uniform wall loads (based on 5 psf out-of-plane live load)
V_{equip} =	4 Lbs / PAF	Additional shear demand from equipment only (based on Load Case 2)
$V_{(E)}$ =	72 Lbs / PAF	= $V_{wall} + V_{equip}$
$V'_{(E)}$ =	90 Lbs	0.157"φ Hilti X-U w/ 1" Embed (ICC ESR-2269)
DCR =	0.80 ≤ 1.0 (OK)	= $V_{(E)}/V'_{(E)} ≤ 1.0$

Braces at Top Track of Partial-Height Wall - Load Case 2: (D+L) Governs

s_{brace} =	48 in	Spacing of existing braces along top track of partial-height wall (max)
n_{brace} =	2	Number of existing braces supporting section of top track at equipment (min)
$V_{(5\ psf)}$ =	95 Lbs / brace	Existing horizontal reaction force at brace (based on 5 psf out-of-plane live load)
V_{wall} =	48 Lbs / brace	Horizontal reaction force at brace from uniform wall loads (based on 5 psf out-of-plane live load)
V_{equip} =	30 Lbs / brace	Additional horizontal reaction force at brace from equipment only (based on Load Case 2)
V_{brace} =	78 Lbs / brace	= $V_{wall} + V_{equip}$ 78 Lbs ≤ 95 Lbs (from 5 psf live), therefore braces are adequate by inspection

Connections at Bottom Track - Load Case 2: (D+L) Governs

NWC o/ Mtl Deck	Type of existing floor structure below	
$Conn_{(E)}$ =	PAF	Existing connections at bottom track are power-actuated fasteners (PAF)
$s_{(E)}$ =	24 in	Spacing of existing PAF along bottom track (max)
$n_{(E)}$ =	2	Number of existing PAF resisting reaction from equipment loads (distributed by backing & bottom track)
$V_{(5\ psf)}$ =	68 Lbs / PAF	Existing shear demand at bottom of wall (based on 5 psf out-of-plane live load)
V_{wall} =	68 Lbs / PAF	Shear demand at bottom of wall from uniform wall loads (based on 5 psf out-of-plane live load)
V_{equip} =	4 Lbs / PAF	Additional shear demand from equipment only (based on Load Case 2)
$V_{(E)}$ =	72 Lbs / PAF	= $V_{wall} + V_{equip}$
$V'_{(E)}$ =	90 Lbs	0.157"φ Hilti X-U w/ 1" Embed (ICC ESR-2269)
DCR =	0.80 ≤ 1.0 (OK)	= $V_{(E)}/V'_{(E)} ≤ 1.0$

Job:	18SHA11 ARMC Ambulatory Clinic	25
Calc By:	ISG Date: 02/21/19	

Typical Unistrut Wall-Mounted Equipment (150 Lbs max)	DETAIL 13/S101
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Seismic Input

Design =	City	
a_p =	2.5	ASCE 7 Tables 13.5-1 and 13.6-1
R_p =	6.0	See USGS sheet
S_{DS} =	1.35	ASCE 7 Table 11.5-1
I_p =	1.00	Floor below (2nd Floor)
z_1/h =	0.33	Floor above (3rd Floor)
z_2/h =	0.67	

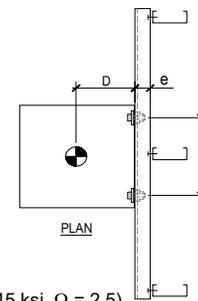
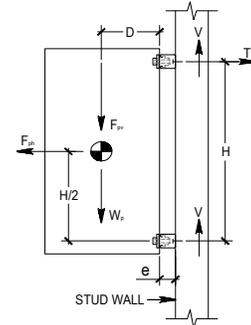
Weight & Dimensions

W_p =	150	Lbs (max)	Equipment weight
H =	8.0	in (min)	Height between top & bottom connections to backing
B =	6.0	in (min)	Width between left and right connections to backing
D =	8.0	in (max)	Depth to centroid
e =	1.6	in	Eccentricity from Unistrut

Seismic Forces

$F_{ph,min}$ =	0.41	W_p	= $0.3S_{DS} \cdot I_p \cdot W_p$
$F_{ph,1}$ =	0.37	W_p	F_{ph} at floor below (z_1/h)
$F_{ph,2}$ =	0.53	W_p	F_{ph} at floor above (z_2/h)
$F_{ph,avg}$ =	0.45	W_p	Average of $F_{ph,1}$ & $F_{ph,2}$
F_{ph} =	0.45	W_p	Max of $F_{ph,min}$ & $F_{ph,avg}$
F_{pv} =	0.27	W_p	= $0.2S_{DS} \cdot W_p$
F_{ph} =	68	Lbs	Horizontal seismic force
F_{pv} =	41	Lbs	Vertical seismic force

$$F_{ph} = \frac{0.4S_{DS}a_p}{R_p/I_p} \left(1 + 2 \frac{z}{h}\right) W_p$$



HHCS Equip Conn to Unistrut

Metal =	18 ga	(min)
d =	1/4	in
m_f =	0.75	
C =	3.0	
V_{F-B} =	45	Lbs
V_{S-S} =	46	Lbs
P_{F-B} =	101	Lbs
P_{S-S} =	121	Lbs
V'_b =	362	Lbs
V'_s =	300	Lbs
P'_b =	457	Lbs
P'_s =	600	Lbs
DCR =	0.60	≤ 1.0 (OK)

n_{HHCS} =	4	No. of HHCS to Unistrut	($F_u = 45$ ksi, $\Omega = 2.5$)
t =	0.0451	in	Equipment metal thickness (min)

- Bolt diameter
- Modification factor per AISI Table E3.3.1-2
- Bearing factor per AISI Table E3.3.1-1
- Shear per HHCS (front-to-back) = $(W_p + 0.7F_{pv}) \div n_{HHCS}$
- Shear per HHCS (side-to-side) = $[(W_p + 0.7F_{pv})^2 + 0.7F_{ph}^{2.0.5} \div n_{HHCS}] \div n_{HHCS}$
- Tension per HHCS (front-to-back) = $[(W_p + 0.7F_{pv}) \cdot D/H + 0.7F_{ph}/2] \div (n_{HHCS}/2)$
- Tension per HHCS (side-to-side) = $[(W_p + 0.7F_{pv}) \cdot D/H + 0.7F_{ph} \cdot D/B] \div (n_{HHCS}/2)$
- Shear capacity of metal (AISI Eqn. E4.3.1-1) = $[4.2(t^3 \cdot d)^{1/2} \cdot F_u] / \Omega$
- Slip resistance capacity of spring nut connection to strut per Unistrut catalog
- Bearing capacity of metal (AISI Eqn. E3.3.1-1) = $[m_f \cdot C \cdot d \cdot t \cdot F_u] / \Omega$
- Pullout capacity of spring nut connection to strut per Unistrut catalog
- $= \max[V_{F-B}/\min(V'_b, V'_s) + P_{F-B}/P'_b, V_{S-S}/\min(V'_b, V'_s) + P_{S-S}/P'_s] \leq 1.0$

Screws into Metal Studs

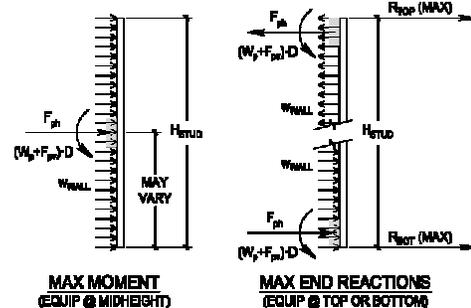
SMS =	1/4"φ	
V_{F-B} =	15	Lbs
V_{S-S} =	15	Lbs
P_{F-B} =	40	Lbs
P_{S-S} =	46	Lbs
V' =	613	Lbs
P' =	261	Lbs
DCR =	0.20	≤ 1.0 (OK)

n_{wall} =	12	No. of screws into metal studs (2 screws into each stud at each Unistrut)
Metal =	16 ga	studs (min)

- Shear per screw (front-to-back) = $(W_p + 0.7F_{pv}) \div n_{wall}$
- Shear per screw (side-to-side) = $[(W_p + 0.7F_{pv})^2 + 0.7F_{ph}^{2.0.5} \div n_{wall}] \div n_{wall}$
- Tension per screw (front-to-back) = $[(W_p + 0.7F_{pv}) \cdot (D+e)/H + 0.7F_{ph}/2] \div (n_{wall}/2)$
- Tension per screw (side-to-side) = $[(W_p + 0.7F_{pv}) \cdot (D+e)/H + 0.7F_{ph} \cdot (D+e)/B] \div (n_{wall}/2)$
- Screw shear capacity per SSMA allowable loads table, p.90
- Screw pull-out capacity per SSMA allowable loads table, p.90
- $= \max[V_{F-B}/V' + P_{F-B}/P', V_{S-S}/V' + P_{S-S}/P'] \leq 1.0$

Stud Design

n_{stud} =	3	Number of studs engaged	
H_{stud} =	13.7	ft	Height of stud (maximum)
$H_{partial}$ =	9.5	ft	Height of stud (partial height wall)
$W_{p,wall}$ =	8.0	psf	Unit weight of partition wall
S_{stud} =	16	in	Stud spacing
Stud =	400S125-54	(min)	
S_e =	0.361	in ³	
I_e =	0.830	in ⁴	
M' =	10.8	kip-in	= $S_e F_y / \Omega_b$, $\Omega_b = 1.67$
$0.7F_{ph,wall}$ =	2.5	psf	= $0.7(0.45) W_{p,wall}$
Live =	5.0	psf	Uniform live load on wall (CBC 1607.14)



Job:	18SHA11 ARMC Ambulatory Clinic		26
Calc By:	ISG	Date: 02/21/19	

DETAIL

Typical Unistrut Wall-Mounted Equipment (150 Lbs max)	13/S101
--	----------------

Load Case 1: (D+0.7E)

W_{wall} =	3.4	plf / stud	= $0.7F_{ph,wall} \cdot (s_{stud}/12)$
R_{TOP} =	42	Lbs / stud	= $W_{wall} \cdot H_{stud}/2 + [0.7F_{ph} + (W_p + 0.7F_{pv}) \cdot (D/12)/H_{stud}] / n_{stud}$
$R_{PARTIAL}$ =	36	Lbs / stud	= $W_{wall} \cdot H_{partial}/2 + [0.7F_{ph} + (W_p + 0.7F_{pv}) \cdot (D/12)/H_{partial}] / n_{stud}$
R_{BOT} =	42	Lbs / stud	= $W_{wall} \cdot H_{stud}/2 + [0.7F_{ph} + (W_p + 0.7F_{pv}) \cdot (D/12)/H_{stud}] / n_{stud}$
M =	1.8	kip-in	= $W_{wall} \cdot H_{stud}^2/8 + [0.7F_{ph} \cdot H_{stud}/4 + (W_p + 0.7F_{pv}) \cdot (D/12)/2] / n_{stud}$
DCR_M =	0.17		≤ 1.0 (OK) = $M/M' \leq 1.0$
Δ =	0.17	in (L/966)	Maximum Deflection (Limit to L/120)

Load Case 2: (D+L)

W_{wall} =	6.7	plf / stud	= Live $\cdot (s_{stud}/12)$
R_{TOP} =	48	Lbs / stud	= $W_{wall} \cdot H_{stud}/2 + W_p \cdot (D/12)/(H_{stud} \cdot n_{stud})$
$R_{PARTIAL}$ =	35	Lbs / stud	= $W_{wall} \cdot H_{partial}/2 + W_p \cdot (D/12)/(H_{partial} \cdot n_{stud})$
R_{BOT} =	48	Lbs / stud	= $W_{wall} \cdot H_{stud}/2 + W_p \cdot (D/12)/(H_{stud} \cdot n_{stud})$
M =	2.1	kip-in	= $W_{wall} \cdot H_{stud}^2/8 + W_p \cdot (D/12)/(2 \cdot n_{stud})$
DCR_M =	0.19		≤ 1.0 (OK) = $M/M' \leq 1.0$
Δ =	0.22	in (L/754)	Maximum Deflection (Limit to L/120)

Connections at Top Track of Full-Height Wall - Load Case 2: (D+L) Governs

NWC o/ Mtl Deck		Type of existing floor/roof structure above
$Conn_{(E)}$ =	PAF	Existing connections at top track are power-actuated fasteners (PAF)
$s_{(E)}$ =	24	in Spacing of existing PAF along top track of full-height wall (max)
$n_{(E)}$ =	2	Number of existing PAF resisting reaction from equipment loads (distributed by backing & top track)
$V_{(5\ psf)}$ =	68	Lbs / PAF Existing shear demand at top of wall (based on 5 psf out-of-plane live load)
V_{wall} =	68	Lbs / PAF Shear demand at top of wall from uniform wall loads (based on 5 psf out-of-plane live load)
V_{equip} =	4	Lbs / PAF Additional shear demand from equipment only (based on Load Case 2)
$V_{(E)}$ =	72	Lbs / PAF = $V_{wall} + V_{equip}$
$V'_{(E)}$ =	90	Lbs 0.157" ϕ Hilti X-U w/ 1" Embed (ICC ESR-2269)
DCR =	0.80	≤ 1.0 (OK) = $V_{(E)}/V'_{(E)} \leq 1.0$

Braces at Top Track of Partial-Height Wall - Load Case 2: (D+L) Governs

s_{brace} =	48	in Spacing of existing braces along top track of partial-height wall (max)
n_{brace} =	2	Number of existing braces supporting section of top track at equipment (min)
$V_{(5\ psf)}$ =	95	Lbs / brace Existing horizontal reaction force at brace (based on 5 psf out-of-plane live load)
V_{wall} =	48	Lbs / brace Horizontal reaction force at brace from uniform wall loads (based on 5 psf out-of-plane live load)
V_{equip} =	30	Lbs / brace Additional horizontal reaction force at brace from equipment only (based on Load Case 2)
V_{brace} =	78	Lbs / brace = $V_{wall} + V_{equip}$ 78 Lbs ≤ 95 Lbs (from 5 psf live), therefore braces are adequate by inspection

Connections at Bottom Track - Load Case 2: (D+L) Governs

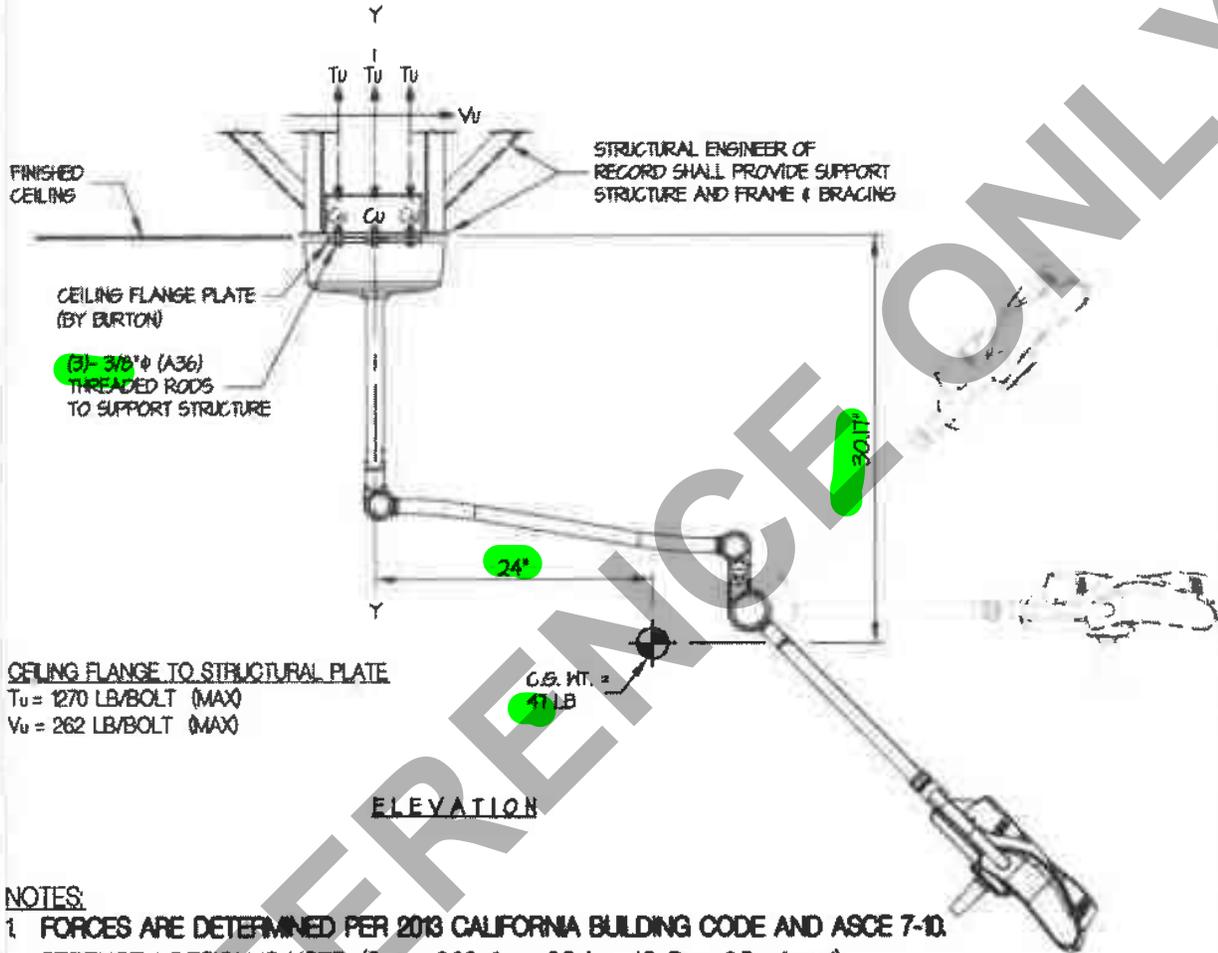
NWC o/ Mtl Deck		Type of existing floor structure below
$Conn_{(E)}$ =	PAF	Existing connections at bottom track are power-actuated fasteners (PAF)
$s_{(E)}$ =	24	in Spacing of existing PAF along bottom track (max)
$n_{(E)}$ =	2	Number of existing PAF resisting reaction from equipment loads (distributed by backing & bottom track)
$V_{(5\ psf)}$ =	68	Lbs / PAF Existing shear demand at bottom of wall (based on 5 psf out-of-plane live load)
V_{wall} =	68	Lbs / PAF Shear demand at bottom of wall from uniform wall loads (based on 5 psf out-of-plane live load)
V_{equip} =	4	Lbs / PAF Additional shear demand from equipment only (based on Load Case 2)
$V_{(E)}$ =	72	Lbs / PAF = $V_{wall} + V_{equip}$
$V'_{(E)}$ =	90	Lbs 0.157" ϕ Hilti X-U w/ 1" Embed (ICC ESR-2269)
DCR =	0.80	≤ 1.0 (OK) = $V_{(E)}/V'_{(E)} \leq 1.0$

Job:	18SHA11 ARMC Ambulatory Clinic		A1
Calc By:	ISG	Date: 02/21/19	

EASE	EQUIPMENT ANCHORAGE & SEISMIC ENGINEERING www.EquipmentAnchorage.com	
	PHILIPS BURTON	DESIGNER: J. ROBERSON
AIM SERIES SINGLE CEILING MOUNT		SHEET NO. 1
		OF 2 SHEETS
		DATE: 5/26/16

SEISMIC ANCHORAGE

CEILING MOUNTED



NOTES:

- FORCES ARE DETERMINED PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10. STRENGTH DESIGN IS USED. ($S_{DS} = 2.20$, $a_p = 25$, $l_p = 15$, $R_p = 2.5$, $z/h \leq 1$)
 HORIZONTAL FORCE (E_h) = $3.96 W_p$
 VERTICAL FORCE (E_v) = $0.44 W_p$
- 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.

PHILIPS BURTON
 11500 MELROSE AVE
 FRANKLIN PARK, IL 60131
 TEL: 800.444.9909
 FAX: 800.765.1770
 BURTONMEDICAL.COM
 LT-0096 REV 01



Job:	18SHA11 ARMC Ambulatory Clinic		A2
Calc By:	ISG	Date: 02/21/19	



PHILIPS BURTON

AIM SERIES SINGLE CEILING MOUNT

EQUIPMENT ANCHORAGE & SEISMIC ENGINEERING
www.EquipmentAnchorage.com

DES. J. ROBERSON

JOB NO. 13-1008

DATE 5/28/16

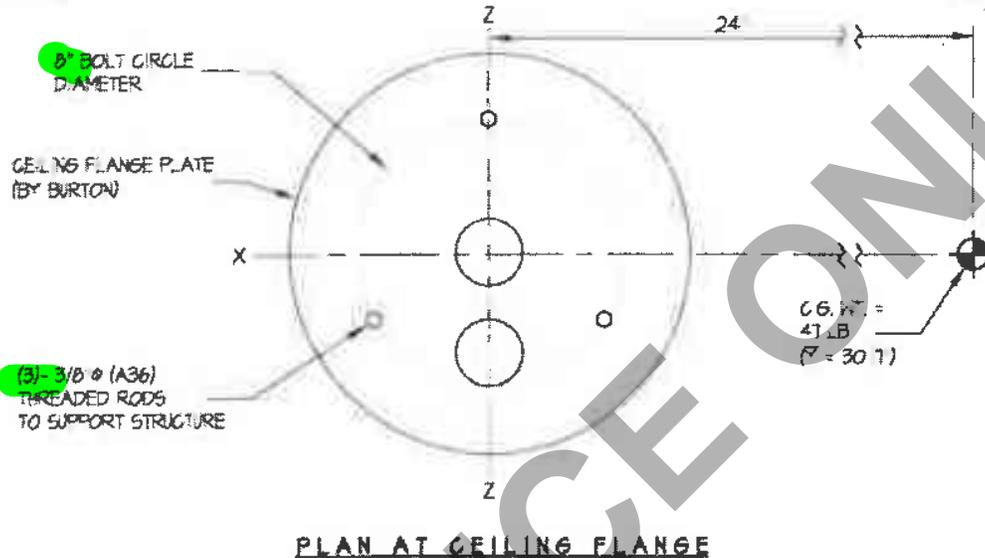
SHEET

2

OF 2 SHEETS

SEISMIC ANCHORAGE

CEILING MOUNTED



LOADS

WEIGHT = 47 LB
 HORIZONTAL FORCE (E) = 396 Wp = 186 LB
 VERTICAL FORCE (E) = 0.44 Wp = 21 LB

BOLT FORCES

BOLT GROUP PROPERTIES

$I_{xx} = 24 \text{ in}^4$
 $I_{zz} = 24 \text{ in}^4$
 $I_{yy} = 48 \text{ in}^4$

MOMENTS

$M_{xx} = 186\#(30.17') + (1/2)(47\#) + 21\#(23.97') = 7467'\#$
 $M_{zz} = 186\#(30.17') + (1/2)(47\#) + 21\#(23.97') = 7467'\#$
 $M_{yy} = 100\#(23.97') = 2397'\#$

BOLT SPEC. 3/8" (A36) THREADED ROD.

$\phi T = 3589 \text{ LB/BOLT}$
 $\phi V = 1914 \text{ LB/BOLT}$

NOTE: BRAKING SYSTEM RELEASES WITH APPLIED LOAD OF 25 LBS.
 AT C.G. LOCATION, CALCULATION USES 100 LBS. FOR A SAFETY FACTOR OF 4.

TENSION (T)

$$T_s = \frac{7467'\#(4')}{24} + \frac{47\#(12) + 21\#}{3 \text{ BOLTS}} = 1270 \text{ LB/ROD (MAX)}$$

SHEAR (V)

$$V_s = \frac{186\#}{3 \text{ BOLTS}} + \frac{2397'\#(4')}{48} = 262 \text{ LB/ROD (MAX)}$$

(PER AISC 337, LESS THAN 20% STRESS)

Figure 46: Anchorage & Seismic single ceiling model.

Job:	18SHA11 ARMC Ambulatory Clinic	A3
Calc By:	ISG	
Date:	02/21/19	

Model Numbers

WARRANTY: Limited 5-year

SA730P SmartMount® Articulating Wall Mount for 10" to 29" Displays

Product Specifications

	DIMENSIONS (W x H x D)	PRODUCT WEIGHT	LOAD CAPACITY	FINISH	AVAILABLE COLORS
SA730P	10.01" x 8.06" x 2.77"-16.99" (254 x 205 x 70-432mm)	3.55lb (1.61kg)	25lb (11kg)	Scratch Resistant Fused Epoxy	Semi-Gloss Black

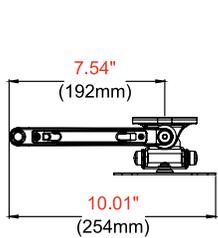
Package Specifications

	PACKAGE SIZE (W x H x D)	PACKAGE SHIP WEIGHT	PACKAGE UPC CODE	PACKAGE CONTENTS	UNITS IN PACKAGE
SA730P	14.13" x 3.75" x 10.38" (358 x 95 x 263mm)	4.75lb (2.15kg)	735029237389	Wall Mount, Wall and Display Installation Hardware, Installation Instructions	1

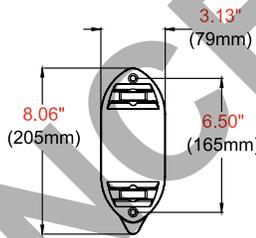
Accessories

- ACC918: Security Fasteners
- ACC2X1: VESA® 200 x 100mm Adaptor Plate
- ESHV models: AV Wall Shelves
- IBA4-W: Easy Mount Recessed Low Voltage Cable Plate
- IBA5-W: Recessed Low Voltage Media Plate with Duplex Surge Suppressor
- WSP700/WSP701: Metal Stud Wall Plates for 16"/24" Center Metal Studs

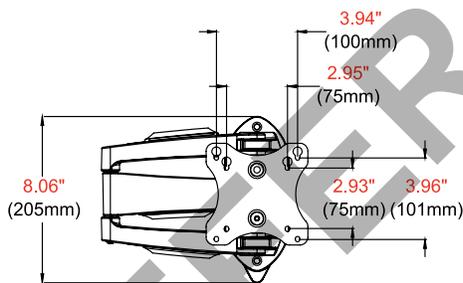
All dimensions = inch (mm)



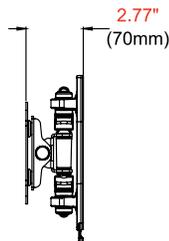
TOP VIEW



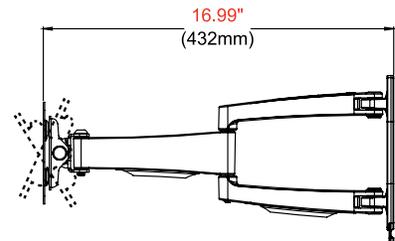
WALL PLATE DETAIL



FRONT VIEW



SIDE VIEW COLLAPSED



SIDE VIEW EXTENDED +/-35° TILT

Architect Specifications

The SmartMount® Articulating Wall Mount shall be a Peerless-AV model SA730P and shall be located where indicated on the plans. Assembly and installation shall be done according to instructions provided by the manufacturer.

Visit peerless-av.com to see the complete line of AV solutions from Peerless-AV, including outdoor displays, wireless, kiosks, digital audio, display mounts, projector mounts, carts/stands, and a full assortment of accessories.

Peerless-AV
2300 White Oak Circle
Aurora, IL 60502 USA
(800) 865-2112
(630) 375-5100
Fax: **(800) 359-6500**

Peerless-AV EMEA
Unit 3 Watford Interchange
Colonial Way, Watford
Herts, WD24 4WP
United Kingdom
+44 (0) 1923 200100
Fax: **+44 (0) 1923 200101**

Peerless-AV Latin America
Ave de las Industrias 413
Parque Industrial Escobedo
Escobedo, N.L.,
Mexico 66062
+52 (81) 8384-8300
Fax: **+52 (81) 8384-8360**



Job:	18SHA11 ARMC Ambulatory Clinic		A4
Calc By:	ISG	Date: 02/21/19	



**EQUIPMENT ANCHORAGE
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Office of Statewide Health Planning and Development
PREAPPROVAL OF MANUFACTURER'S CERTIFICATION
OPM-0212-13

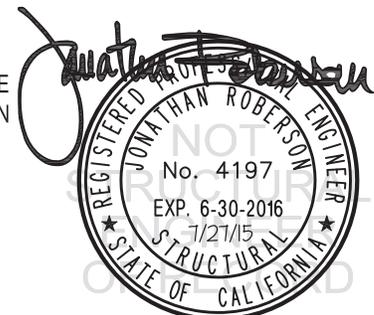
THIS PREAPPROVAL CONFORMS TO THE 2013 CALIFORNIA BUILDING CODE

MANUFACTURER: **PEERLESS INDUSTRIES, INC.**
EQUIPMENT NAME: **SMARTMOUNT ARTICULATING WALL ARM**

Sheet: 1 of 6
Date: 7/27/15

GENERAL NOTES

1. THIS OSHPD PREAPPROVAL OF MANUFACTURER'S CERTIFICATION (OPM) IS BASED ON THE 2013 CBC. THE DEMANDS (DESIGN FORCES) FOR USE WITH THIS OPM SHALL BE BASED ON THE 2013 CBC
2. THIS DOCUMENT MAY ONLY BE USED WITH THE EXPRESS WRITTEN CONSENT OF THE MANUFACTURER LISTED ABOVE FOR THE SPECIFIC PROJECT SITE AND INSTALLATION LOCATION. THIS DOCUMENT IS INVALID WITHOUT SUCH CONSENT.
3. THIS PREAPPROVAL CONFORMS TO THE 2013 CALIFORNIA BUILDING CODE WHERE S_{ds} IS NOT GREATER THAN 1.60, 2.20
4. FORCES PER ASCE 7-10 SECTION 13.3.1, EQUATIONS 13.3-1, 13.3-2 & 13.3-3,
WHERE $S_{ds} = 1.60$, $a_p = 1.0$, $I_p = 1.5$, $R_p = 1.5$, $z/h \leq 1$ CONCRETE WALL. SEE FOLLOWING SHEETS FOR Ω .
WHERE $S_{ds} = 2.20$, $a_p = 1.0$, $I_p = 1.5$, $R_p = 1.5$, $z/h \leq 1$ SEE FOLLOWING SHEETS FOR Ω .
5. THIS PREAPPROVAL COVERS ONLY THE SUPPORTS AND ATTACHMENTS OF THE EQUIPMENT TO THE STRUCTURE.
6. ALL DESIGN FORCES SHOWN ON THE DRAWINGS ARE FACTORED LOADS THAT SHALL BE USED FOR STRENGTH DESIGN.
7. CONCRETE WALL VALID FOR DEMANDS SHOWN AT ANY ELEVATION (i.e. $z/h \leq 1$)
8. **RESPONSIBILITIES OF THE STRUCTURAL ENGINEER OF RECORD OF THE BUILDING**
 - A. PROVIDE SUPPORTING STRUCTURE TO SUPPORT WEIGHTS AND FORCES SHOWN IN ADDITION TO ALL OTHER LOADS.
 - B. VERIFY THAT THE INSTALLATION IS IN CONFORMANCE WITH THE 2013 CBC AND WITH THE DETAILS, MATERIAL AND GAGE OF THE UNIT WHERE ATTACHMENTS ARE MADE AGREE WITH THE INFORMATION SHOWN ON THE PREAPPROVAL DOCUMENTS.
 - C. VERIFY THAT PROJECT SPECIFIC VALUES OF S_{ds} & z/h RESULT IN SEISMIC FORCES (E_h , E_v) THAT DO NOT EXCEED THE VALUES ON THE DETAILS.
 - D. VERIFY THAT THE CONCRETE WALL TO WHICH THE EQUIPMENT IS ANCHORED MEETS THE REQUIREMENTS OF THE APPLICABLE ICC ESR.
 - E. VERIFY THAT THE ANCHORS ARE AN ADEQUATE DISTANCE FROM ANY CONCRETE WALL EDGES OR OPENINGS (SEE TYPICAL DETAIL ON SHEET 2).
 - F. VERIFY THAT ALL NEW OR EXISTING ANCHORS ARE AN ADEQUATE DISTANCE FROM THE UNIT ATTACHMENTS AND CHECK FOR INTERACTION WHERE OTHER ANCHORS ARE WITHIN 18" OR $6h_{ef}$ FROM THIS UNIT'S ANCHORS.
 - G. DESIGN BACKING BARS, STUDS, ETC. WHICH THE UNITS ARE ATTACHED TO AS NOTED ON THE DRAWINGS.



Job:	18SHA11 ARMC Ambulatory Clinic		A5
Calc By:	ISG	Date: 02/21/19	

EASE

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PEERLESS INDUSTRIES, INC.

DES. **J. ROBERSON**

SHEET

3

JOB NO. **11-1502**

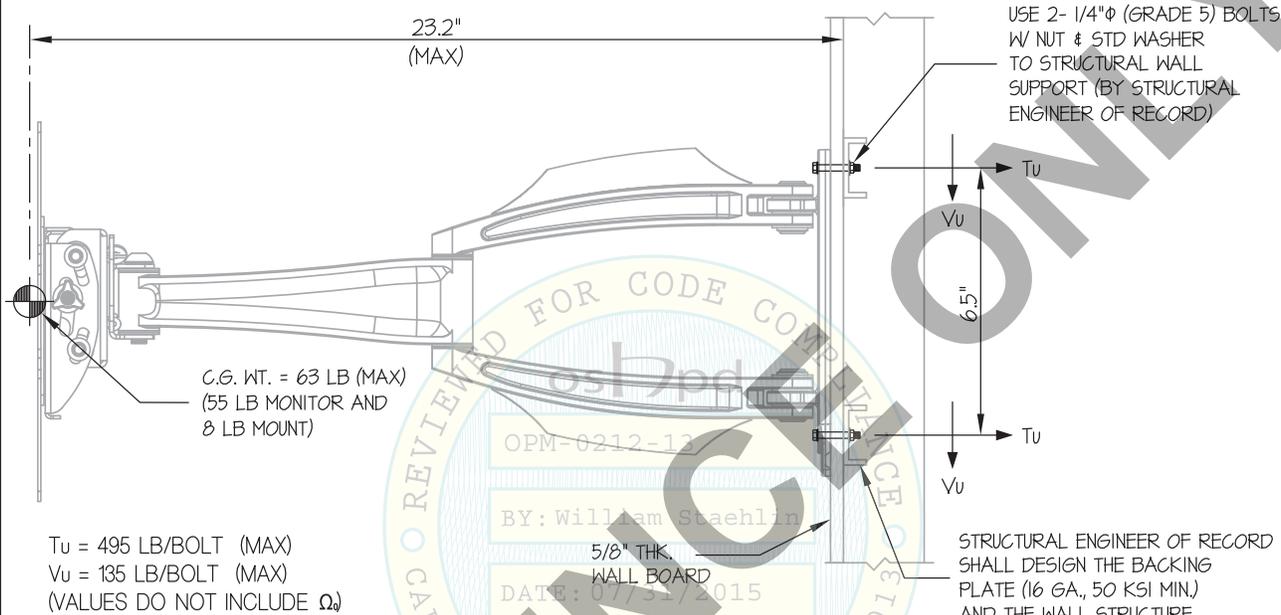
SMARTMOUNT ARTICULATING WALL ARM

DATE **7/27/15**

OF **6** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

WALL MOUNTED



STEEL STUD WALL SECTION

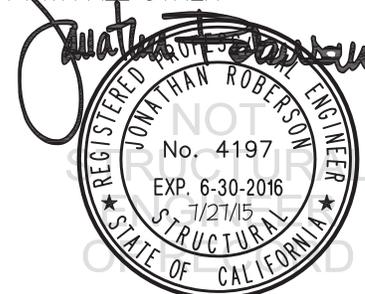
NOTES:

- FORCES ARE DETERMINED PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10. STRENGTH DESIGN IS USED. ($S_{ps} = 2.20$, $\alpha_p = 2.5$, $l_p = 15$, $R_p = 2.5$, $z/h \leq 1$)

HORIZONTAL FORCE (E_h) = $3.96 W_p$

VERTICAL FORCE (E_v) = $0.44 W_p$

- CENTER OF GRAVITY (C.G.) AND WEIGHT ARE THE GOVERNING PARAMETERS FOR DESIGN. THIS PREAPPROVAL ENCOMPASSES ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.
- STRUCTURAL ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT STRUCTURE DESIGNED TO SUPPORT WEIGHTS AND FORCES SHOWN IN COMBINATION WITH ALL OTHER LOADS THAT MAY BE PRESENT.
- SEE GENERAL NOTES: SHEETS 1 AND 2



Job:	18SHA11 ARMC Ambulatory Clinic	A6
Calc By:	ISG	
Date:	02/21/19	



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DES. **J. ROBERSON**

SHEET
4

JOB NO. **11-1502**

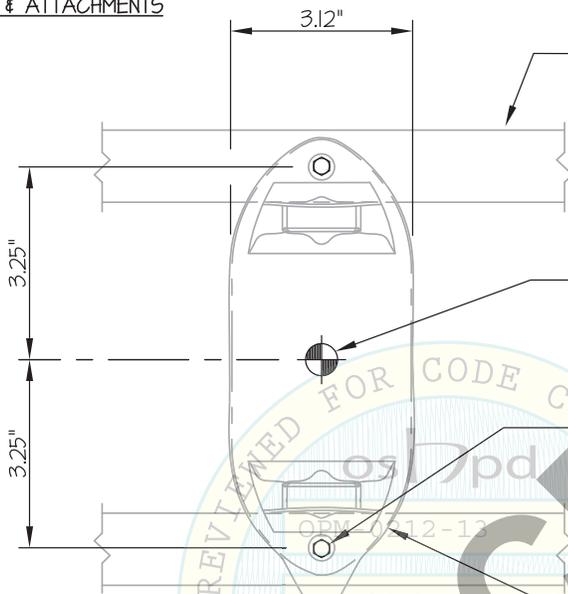
SMARTMOUNT ARTICULATING WALL ARM

DATE **7/27/15**

OF **6** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

WALL MOUNTED



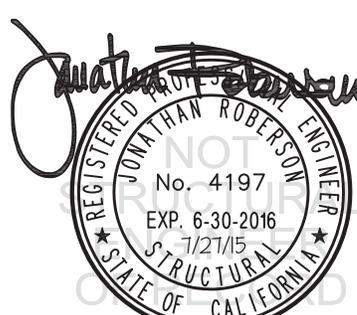
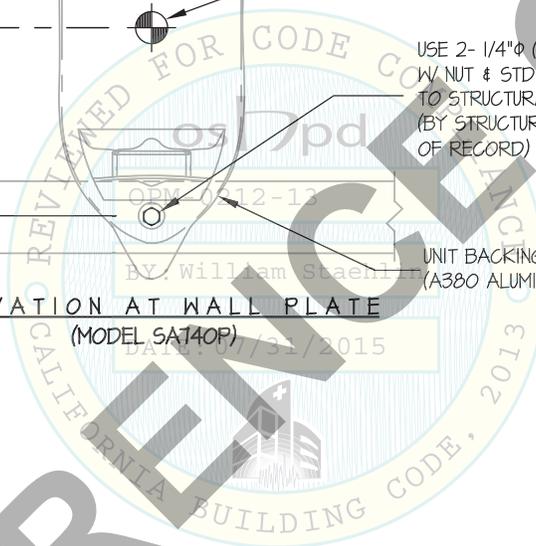
STRUCTURAL ENGINEER OF RECORD SHALL DESIGN THE BACKING PLATE (16 GA., 50 KSI MIN.) AND THE WALL STRUCTURE

C.G. WT. = 63 LB (MAX)
(55 LB MONITOR AND 8 LB MOUNT)
(\bar{X} = 23.2")

USE 2- 1/4"Ø (GRADE 5) BOLTS W/ NUT & STD WASHER TO STRUCTURAL WALL SUPPORT (BY STRUCTURAL ENGINEER OF RECORD)

UNIT BACKING (A380 ALUMINUM, Fy=23 KSI MIN)

ELEVATION AT WALL PLATE
(MODEL SA740P)



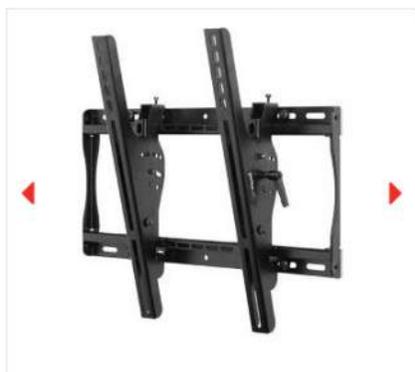
Job:	18SHA11 ARMC Ambulatory Clinic		A7
Calc By:	ISG	Date: 02/21/19	

SmartMount® Universal Tilt Wall Mount | Peerless-AV



B2B ([HTTPS://B2B.PEERLESS-](https://b2b.peerless-av.com/user/login.aspx?)

[AV.COM/USER/LOGIN.ASPX?](https://b2b.peerless-av.com/user/login.aspx?)



SmartMount® Universal Tilt Wall Mount

for 32" to 50" Displays

SKU: ST640

Price: \$180.00

1

Share:



Certifications:



California Residents:

WARNING: Cancer and reproductive harm- See www.P65Warnings.ca.gov for more information.

Name	Value
Minimum to Maximum Screen Size	32" to 50"
VESA Pattern	400 x 400
Weight Capacity	150lb (68.0kg)
Color	Black
Finish	Powder Coat
Distance from Wall	2.63 - 5.71" (67 - 145mm)
Increlock Increments	-5, 0, 5, 10, 15
Mounting Pattern	458 x 405mm (18.02 x 15.95")
Security Features	Security Hardware
Tilt	+15 / -5
Product Dimensions	21.69 X 10.71 X 2.95" (550 X 272 X 75mm)
Shipping Weight	7.82lb (7.82kg)
Ship Dimensions	10.71 x 2.95 x 21.69" (272.0 x 74.9 x 550.9mm)
UPC Code	735029235699

Job:	18SHA11 ARMC Ambulatory Clinic		A8
Calc By:	ISG	Date: 02/21/19	



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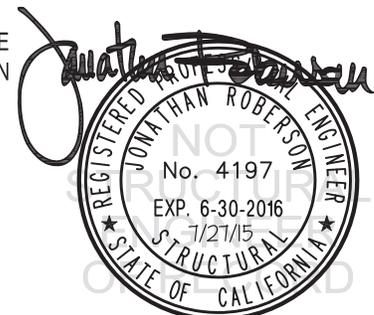
Office of Statewide Health Planning and Development
PREAPPROVAL OF MANUFACTURER'S CERTIFICATION
OPM-0211-13

THIS PREAPPROVAL CONFORMS TO THE 2013 CALIFORNIA BUILDING CODE

MANUFACTURER: **PEERLESS INDUSTRIES, INC.** Sheet: 1 of 8
EQUIPMENT NAME: **UNIVERSAL FLAT AND TILT WALL MOUNT FOR FLAT TV WEIGHT UP TO 175 LB** Date: 7/27/15

GENERAL NOTES

1. THIS OSHPD PREAPPROVAL OF MANUFACTURER'S CERTIFICATION (OPM) IS BASED ON THE 2013 CBC. THE DEMANDS (DESIGN FORCES) FOR USE WITH THIS OPM SHALL BE BASED ON THE 2013 CBC
2. THIS DOCUMENT MAY ONLY BE USED WITH THE EXPRESS WRITTEN CONSENT OF THE MANUFACTURER LISTED ABOVE FOR THE SPECIFIC PROJECT SITE AND INSTALLATION LOCATION. THIS DOCUMENT IS INVALID WITHOUT SUCH CONSENT.
3. THIS PREAPPROVAL CONFORMS TO THE 2013 CALIFORNIA BUILDING CODE WHERE S_{ds} IS NOT GREATER THAN 2.20.
4. FORCES PER ASCE 7-10 SECTION 13.3.1, EQUATIONS 13.3-1, 13.3-2 & 13.3-3,
WHERE $S_{ds} = 2.20$, $a_p = 1.0$, $I_p = 1.5$, $R_p = 1.5$, $z/h \leq 1$ CONCRETE WALL. SEE FOLLOWING SHEETS FOR Ω .
5. THIS PREAPPROVAL COVERS ONLY THE SUPPORTS AND ATTACHMENTS OF THE EQUIPMENT TO THE STRUCTURE.
6. ALL DESIGN FORCES SHOWN ON THE DRAWINGS ARE FACTORED LOADS THAT SHALL BE USED FOR STRENGTH DESIGN.
7. CONCRETE WALL DETAIL VALID FOR DEMANDS SHOWN AT ANY ELEVATION. (i.e. $z/h \leq 1$)
8. **RESPONSIBILITIES OF THE STRUCTURAL ENGINEER OF RECORD OF THE BUILDING**
 - A. PROVIDE SUPPORTING STRUCTURE TO SUPPORT WEIGHTS AND FORCES SHOWN IN ADDITION TO ALL OTHER LOADS.
 - B. VERIFY THAT THE INSTALLATION IS IN CONFORMANCE WITH THE 2013 CBC AND WITH THE DETAILS, MATERIAL AND GAGE OF THE UNIT WHERE ATTACHMENTS ARE MADE AGREE WITH THE INFORMATION SHOWN ON THE PREAPPROVAL DOCUMENTS.
 - C. VERIFY THAT PROJECT SPECIFIC VALUES OF S_{ds} & z/h RESULT IN SEISMIC FORCES (E_h , E_v) THAT DO NOT EXCEED THE VALUES ON THE DETAILS.
 - D. VERIFY THAT THE CONCRETE WALL TO WHICH THE EQUIPMENT IS ANCHORED MEETS THE REQUIREMENTS OF THE APPLICABLE ICC ESR.
 - E. VERIFY THAT THE ANCHORS ARE AN ADEQUATE DISTANCE FROM ANY CONCRETE WALL EDGES OR OPENINGS (SEE TYPICAL DETAIL ON SHEET 2).
 - F. VERIFY THAT ALL NEW OR EXISTING ANCHORS ARE AN ADEQUATE DISTANCE FROM THE UNIT ATTACHMENTS AND CHECK FOR INTERACTION WHERE OTHER ANCHORS ARE WITHIN 18" OR $6h_{ef}$ FROM THIS UNIT'S ANCHORS.
 - G. DESIGN BACKING BARS, STUDS, ETC. WHICH THE UNITS ARE ATTACHED TO AS NOTED ON THE DRAWINGS.



Job:	18SHA11 ARMC Ambulatory Clinic		A9
Calc By:	ISG	Date: 02/21/19	



EQUIPMENT ANCHORAGE & SEISMIC ENGINEERING
www.EquipmentAnchorage.com

PEERLESS INDUSTRIES, INC.

DES. **J. ROBERSON**

SHEET

3

JOB NO. **11-1502**

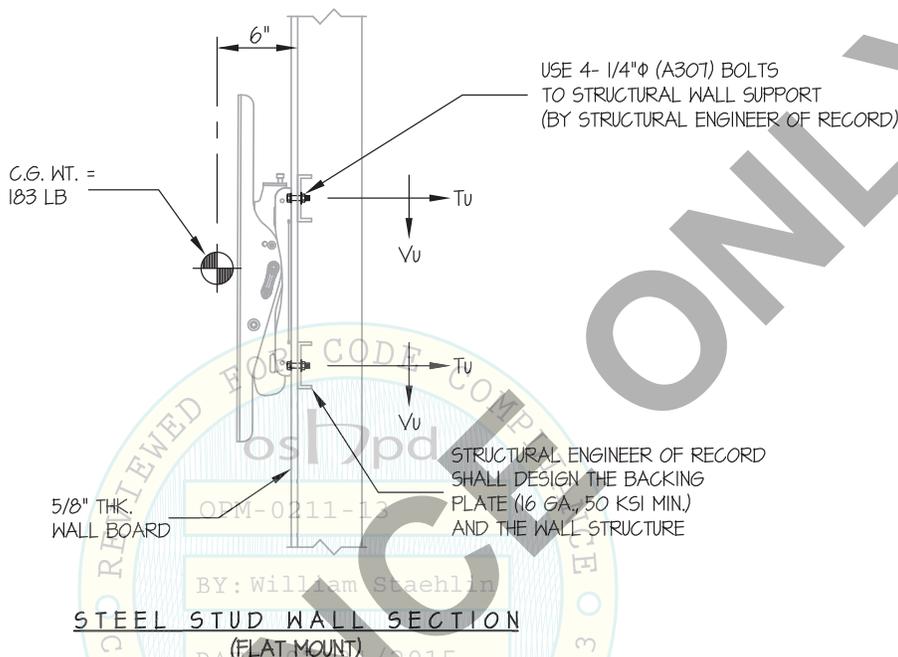
**UNIVERSAL FLAT AND TILT WALL MOUNT
FOR FLAT TV WEIGHT UP TO 175 LB**

DATE **7/27/15**

OF **8** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

WALL MOUNTED



**STEEL STUD WALL SECTION
(FLAT MOUNT)**

NOTES:

- FORCES ARE DETERMINED PER 2013 CALIFORNIA BUILDING CODE AND ASCE 7-10 STRENGTH DESIGN IS USED. ($S_{ds} = 2.20$, $a_p = 1.0$, $I_p = 1.5$, $R_p = 1.5$, $\Omega_0 = 1.5$, $z/h \leq 1$)

HORIZONTAL FORCE (E_h) = $2.64 W_p$

HORIZONTAL FORCE (E_{mh}) = $3.96 W_p$ (FOR CONCRETE ANCHORAGE)

VERTICAL FORCE (E_v) = $0.44 W_p$

- CENTER OF GRAVITY (C.G.) AND WEIGHT ARE THE GOVERNING PARAMETERS FOR DESIGN. THIS PREAPPROVAL ENCOMPASSES ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.
- STRUCTURAL ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT STRUCTURE DESIGNED TO SUPPORT WEIGHTS AND FORCES SHOWN, IN COMBINATION WITH ALL OTHER LOADS THAT MAY BE PRESENT.
- SEE GENERAL NOTES: SHEETS 1 AND 2



Job:	18SHA11 ARMC Ambulatory Clinic		A10
Calc By:	ISG	Date:	

EASE

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DES. **J. ROBERSON**

SHEET
4

**UNIVERSAL FLAT AND TILT WALL MOUNT
FOR FLAT TV WEIGHT UP TO 175 LB**

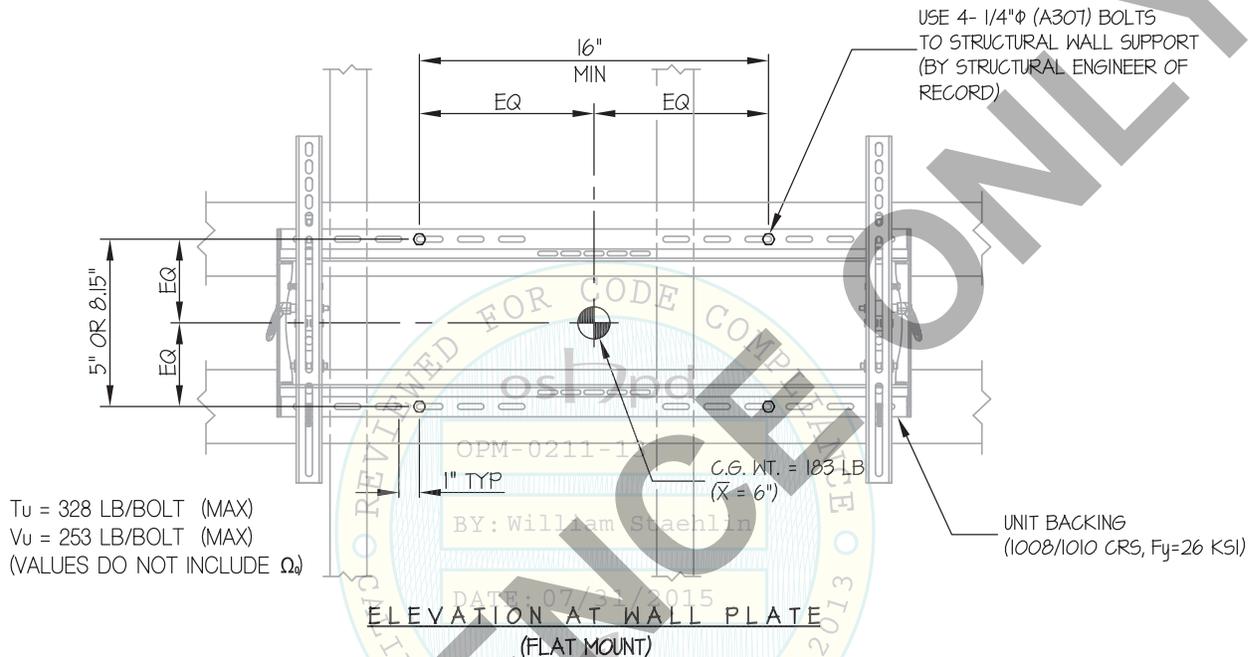
JOB NO. **11-1502**

DATE **7/27/15**

OF **8** SHEETS

SEISMIC SUPPORTS & ATTACHMENTS

WALL MOUNTED



$T_u = 328 \text{ LB/BOLT (MAX)}$
 $V_u = 253 \text{ LB/BOLT (MAX)}$
(VALUES DO NOT INCLUDE Ω)



Jonathan Roberson
REGISTERED PROFESSIONAL ENGINEER
No. 4197
EXP. 6-30-2016
7/27/15
STRUCTURAL
STATE OF CALIFORNIA

Job:	18SHA11 ARMC Ambulatory Clinic		
Calc By:	ISG	Date:	02/21/19

A11

Corners and intersections on the face of the cabinet and door are structurally formed for rigidity, cleanability and appearance. Both models are supported on a stainless-steel integral subbase. The cabinet doors are available in solid vinyl coated galvanized steel material with stainless steel inside and include optional tempered double pane glass window(s). Interior cabinet shelves (wire racks) are polyester powder coated steel. Interior air ducts and fan guards are flame retardant Acrylonitrile Butadiene Styrene (ABS) material. If a freestanding model, the cabinet top and side panels are vinyl coated galvanized steel.

Doors are of double-wall construction with 1-1/2" (38 mm) thick insulation between the walls. Right-hand door swing is provided; swing is reversible. Door closes against a heat-resistant, magnet-imbedded, vinyl gasket. Pivot type hinges are stainless steel.

Heating chamber compartment is insulated with 1" (25 mm) thick, fiberglass blanket. An impedance protected fan circulates air within the chamber to provide even heat distribution.

Lower chamber (dual-compartment model) includes two polyester powder coated steel wire rack shelves, adjustable in 3" (76 mm) increments. Door structure mounting, gasket and hinges are the same as the door on the upper chamber.

Chamber(s) is heated by an electric rod heater operating on 120 or 230 Volt, 50/60 Hz power.

The double cabinet control panel has control and temperature display functions for both cabinets. The upper cabinet control includes an on/standby key and digital temperature display. Also included is a °F/°C temperature display selection key and a SET temperature key with incremental raise/lower temperature set keys. LED lights indicate the on/standby status for cabinet heating, door ajar indication and SET selections have been made. The lower cabinet control includes an on/standby switch and digital temperature display. The lower cabinet also includes a SET temperature switch with incremental raise/lower temperature set keys. Temperature control lockout designates user adjustment.

The single cabinet control panel has control and temperature display functions including an on/standby switch, digital temperature display, °F/°C selection key and a SET temperature key with incremental raise/lower temperature set keys. LED lights indicate the on/standby status for cabinet heating, door ajar position and when SET selections have been made.

Upper compartment and single compartment controls include IV and IRR/Blanket mode setting switches, limiting temperature set ranges to 90-110°F (32.2-43.3°C) and 90-160°F (32.2-71.1°C), respectively. For lower compartment controls, the temperature selection range is 90-160°F (32.2-71.1°C).

Both controls monitor and regulate the heating of the interior compartment(s). The control for upper or single compartment ensures a temperature accuracy of ±3°F (±1.7°C) when warming IV/irrigation solution. The control for lower compartment ensures a temperature accuracy of ±5°F (±2.8°C) when warming irrigation solution.

An overtemperature alarm visually and audibly alerts operator should an overtemperature condition occur (chamber temperature greater than 10°F [5.5°C] above set temperature). In the event of an overtemperature condition, the overtemperature control automatically turns off the heater(s).

An optional USB peripheral connection allows Customer to plug a PC or laptop computer into the warming cabinet to retrieve stored temperature data from control memory. The data is stored or printed from the computer. Data capture software for use on PC is provided with the warming cabinet.

ENGINEERING DATA

Unit	Approx. Unit Wt. lb (kg)
Single-Compartment:*	
18" (457 mm) Wall/Counter Mounting	131 (60)
18" (457 mm) Recess Mounting	105 (48)
24" (610 mm) Wall/Counter Mounting	142 (65)
24" (610 mm) Recess Mounting	115 (52)
Dual-Compartment:†	
18" (457 mm) Open-Mounted	324 (147)
18" (457 mm) Recessed Mounting	288 (131)
24" (610 mm) Open-Mounted	375 (170)
24" (610 mm) Recessed Mounting	328 (149)
24" (610 mm) Mobile Base	483 (219)

* For glass door option, add 6 lb (2.7 kg).

† For all glass door options except 18" (457 mm), add 14 lb (6 kg); for 18" (457 mm) glass door option, add 48 lb (22 kg).

CONTROLS

Cabinet controls are digital and similar for single- and dual-compartment configurations. Both controls have a Main Power on/off switch.

MOUNTING ARRANGEMENT

Dual-compartment models may be installed as freestanding or recessing into a partition wall. If model is recess installed, a synthetic-rubber sealing gasket is provided to ensure close fit of cabinet front to the face of the wall partition. Recessed cabinet requires no supplementary supports behind the wall partition (except in seismic locations).

Single-compartment models may be installed freestanding on shelf or counter surfaces or recessed into a partition wall.

Job:	18SHA11 ARMC Ambulatory Clinic		A12
Calc By:	ISG	Date: 02/21/19	

OPTIONS

Mobile base with bumpers (for dual 24" [610 mm] deep cabinets only). Casters are used to allow warming cabinet mobility. Press foot lever down to lock; push foot lever in to unlock.

USB port for temperature recording.

Electrical numeric keypad door locks are available for keyless entry.

PREVENTIVE MAINTENANCE

A global network of skilled service specialists can provide periodic inspections and adjustments to help ensure cost-effective performance. STERIS representatives can provide information regarding annual maintenance agreements.

NOTES

1. Due to the variety of building constructions employed, fasteners for mounting cabinet to wall are not provided by STERIS. Wall(s) must be adequately reinforced to support operating weight of cabinet.
2. Customer must ensure warming cabinet is installed per applicable seismic requirements.

INTERNAL DIMENSIONS AND CAPACITY

Unit	Upper Chamber Single Chamber Unit (Height x Width x Depth)	Lower Chamber Double Chamber Unit (Height x Width x Depth)
18" Depth	13-1/2 x 24 x 16-7/8" = 3.1 cu. ft. (343 x 610 x 429 mm)	36-1/2 x 24 x 16-7/8" = 8.5 cu. ft. (927 x 610 x 429 mm)
24" Depth	13-1/2 x 24 x 22-7/8" = 4.2 cu. ft. (343 x 603 x 581 mm)	36-1/2 x 24 x 22-7/8" = 11.6 cu. ft. (927 x 603 x 581 mm)

UTILITY REQUIREMENTS – Single Compartment Model

Electricity (E)

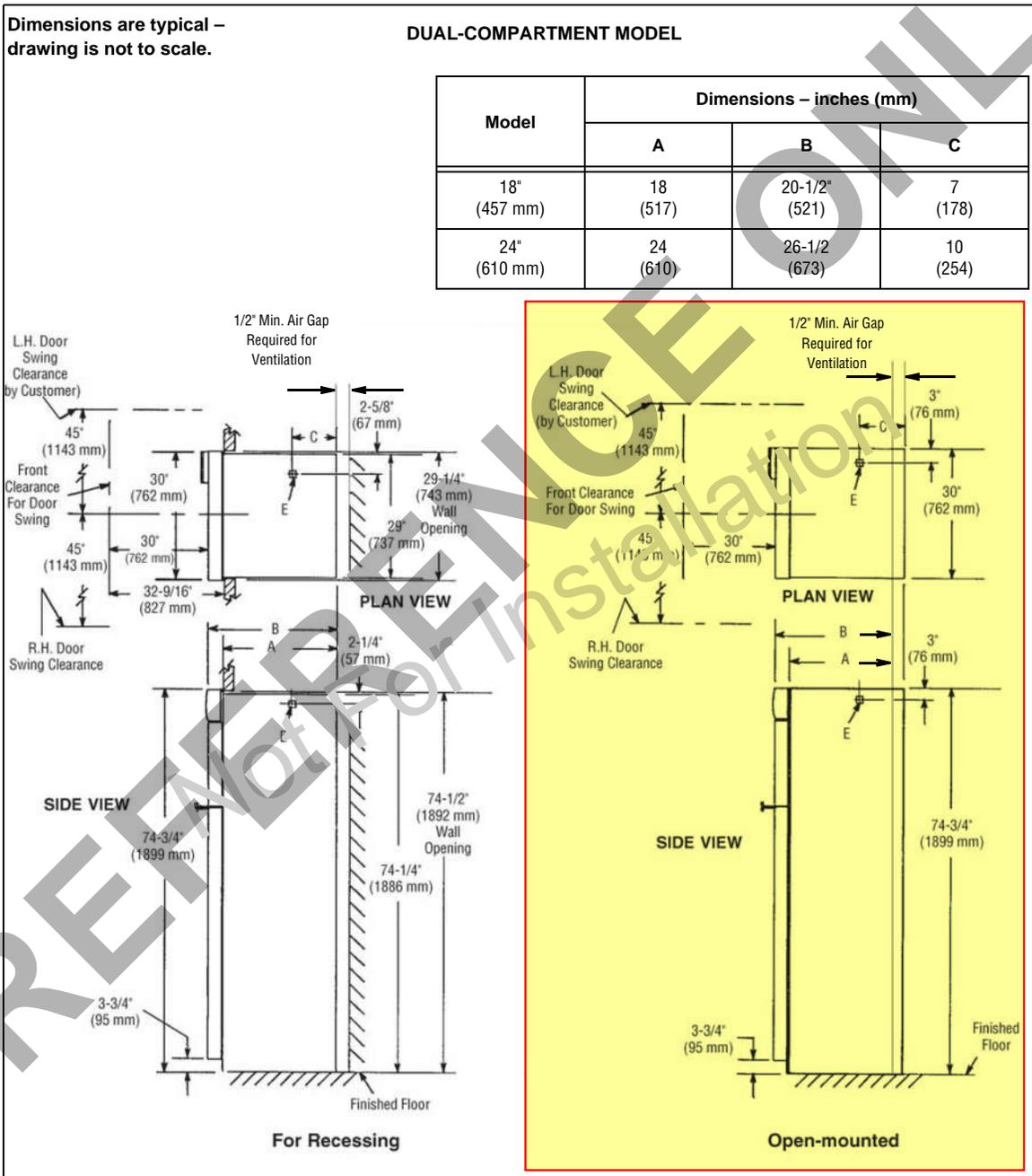
120 Volt, 50/60 Hz, 1-Phase, 7.0 Amps, 840 Watts; or
230 Volts, 50/60 Hz, 1-Phase, 3.6 Amps, 869 Watts

CUSTOMER IS RESPONSIBLE FOR COMPLIANCE WITH APPLICABLE LOCAL AND NATIONAL CODES AND REGULATIONS.

Job:	18SHA11 ARMC Ambulatory Clinic		A13
Calc By:	ISG	Date: 02/21/19	

**Reference listed equipment drawing for detailed installation specifications.
Obtain this drawing from your STERIS Representative.**

Equip. Dwg. No.	Equipment Drawing Title
413726-638	30 x 18 x 74" Warming Cabinet Electric, Freestanding or Recessed Dual Compartment
413726-640	30 x 24 x 74" Warming Cabinet Electric, Freestanding or Recessed Dual Compartment



Job:	18SHA11 ARMC Ambulatory Clinic			A14
Calc By:	ISG	Date:	02/21/19	



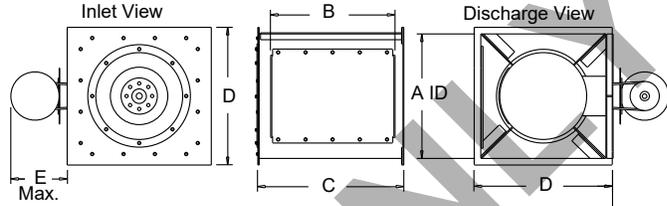
MARK: EF-1
PROJECT: COOK FANS
DATE: 1/10/2019

SQI-B

**Square Centrifugal
Inline
Belt Drive**

STANDARD CONSTRUCTION FEATURES:

All aluminum wheel - Minimum 18 gauge Lorenized steel housing - Hinged access door sizes 90 thru 180 - Removable access door sizes 195 thru 402 - Straightening vanes - Bearings rated at 200,000 hours average life - Adjustable pitch drives through 5 hp - All fans factory adjusted to specified fan RPM.



Motor and access door positions are designated from the discharge end.
3:00 motor & 9:00 access door positions shown.

Performance (*Bhp includes 7% drive loss)

Qty	Catalog Number	Flow (CFM)	SP (inwc)	Fan RPM	Power* (HP)	FEG
1	165SQIB	3700	1.00	1617	1.75	56

Altitude (ft): 0 Temperature (F): 70

Motor Information

HP	RPM	Volts/Ph/Hz	Enclosure	FLA	Position	Mounted
2	1725	208/1/60	ODP -SE	13.2	3:00	Yes

FLA based on NEC (2014) Table 430.248

Fan Information

Fan Mount	Access
Horz. Ceiling	9:00

Sound Data Inlet Sound Power by Octave Band

1	2	3	4	5	6	7	8	LwA	dBA	Sones
91	95	92	88	82	78	74	69	89	78	30

Accessories:

DRIVES (1.5 SF) @ 1617 RPM
GRAV DAMPER-165 SQI

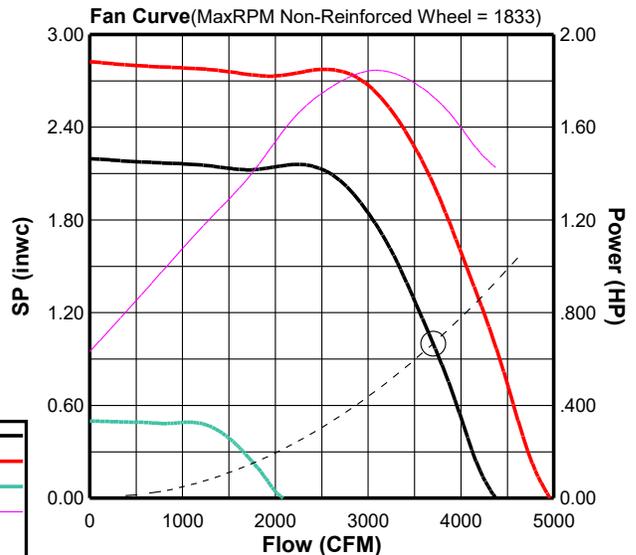
Dimensions (inches)

A	23-13/16
B	25-5/16
C	27-3/4
D	26-15/16
E	14-5/16

NOTE: Accessories may affect dimensions shown.

Weight(lbs)***	Shipping	Unit
310	208	

***Includes fan, motor & accessories.



Fan Curve Legend

CFM vs SP (1617)	—
MaxRPM(1833)	—
MinRPM(771)	—
CFM vs HP	—
Point of Operation	○
System Curve	—

Job:	18SHA11 ARMC Ambulatory Clinic			A15
Calc By:	ISG	Date:	02/21/19	



COOK



MARK: RF-1
PROJECT: COOK FANS
DATE: 1/10/2019

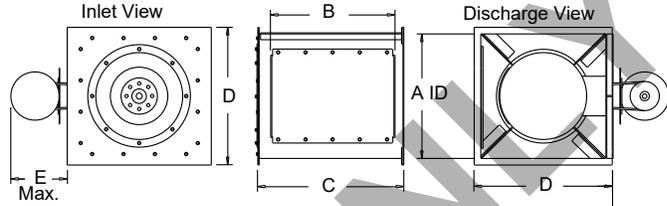


SQI-B

Square Centrifugal
Inline
Belt Drive

STANDARD CONSTRUCTION FEATURES:

All aluminum wheel - Minimum 18 gauge Lorenized steel housing - Hinged access door sizes 90 thru 180 - Removable access door sizes 195 thru 402 - Straightening vanes - Bearings rated at 200,000 hours average life - Adjustable pitch drives through 5 hp - All fans factory adjusted to specified fan RPM.



Motor and access door positions are designated from the discharge end.
3:00 motor & 9:00 access door positions shown.

Performance (*Bhp includes 5% drive loss)

Qty	Catalog Number	Flow (CFM)	SP (inwc)	Fan RPM	Power* (HP)	FEG
1	300SQIB	14500	1.50	949	7.37	63

Altitude (ft): 0 Temperature (F): 70

Motor Information

HP	RPM	Volts/Ph/Hz	Enclosure	FLA	Position	Mounted
7-1/2	1725	460/3/60	ODP -PE	11	3:00	Yes

NEMA Premium® efficiency motor per MG-1 (2014) Table 12-12
FLA based on NEC (2014) Table 430.250

Fan Information

Fan Mount	Access
Horz. Ceiling	9:00

Sound Data Inlet Sound Power by Octave Band

1	2	3	4	5	6	7	8	LwA	dBA	Sones
88	91	94	85	83	80	73	66	90	78	30

Accessories:

Premium Efficiency Motor (Min. 91.0%)
DRIVES (1.5 SF) @ 949 RPM
REINFORCED WHEEL

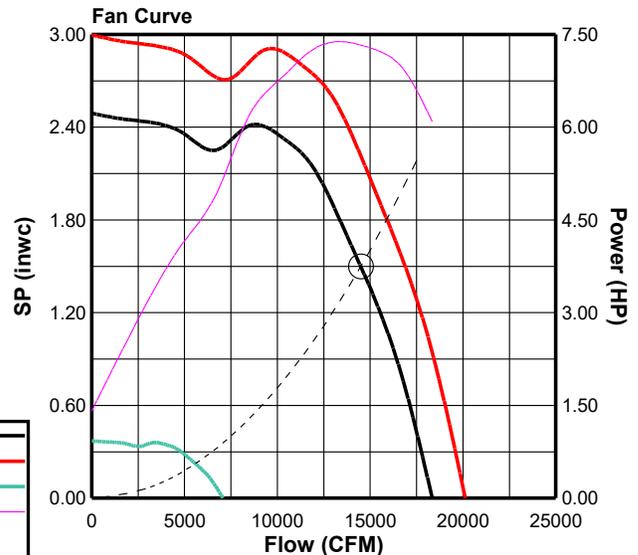
Dimensions (inches)

A	43-7/16
B	47-13/16
C	50-7/16
D	46-1/2
E	17-1/2

NOTE: Accessories may affect dimensions shown.

Weight(lbs)***	Shipping	615	Unit	431

***Includes fan, motor & accessories.



Fan Curve Legend

CFM vs SP (949)	—
MaxRPM(1041)	—
MinRPM(366)	—
CFM vs HP	—
Point of Operation	○
System Curve	---