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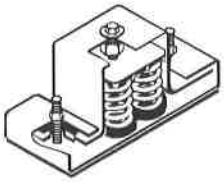
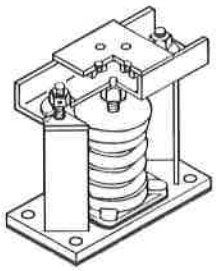
Reply to - P.O. Box 410, Smithtown, NY 11787 — Representatives in the U.S.A. & throughout the World

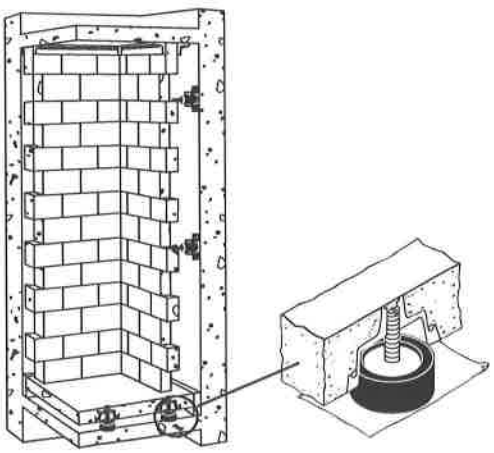
NEOPRENE MOUNTINGS

SPRING MOUNTS

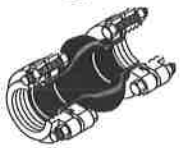




FLOATING FLOORS, CEILINGS & WALLS



SAFEFLEX CONNECTORS

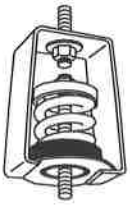


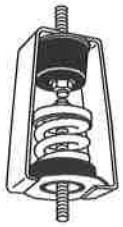
SUBMITTAL DATA

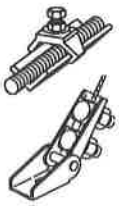
PROJECT	: AIRTRUNK DATA CENTRE WESTERN SYDNEY
ARCHITECT	:
ENGINEER	:
CONTRACTOR	:
P.O. NUMBER	: NSW
COMMENTS	:

DATE	: 03/08/18
M.I. No.	: 634928

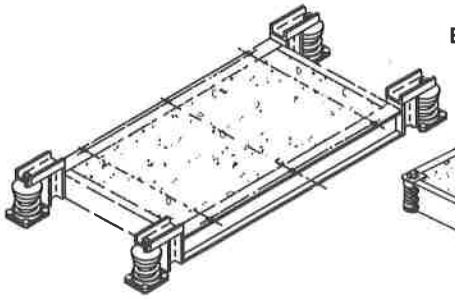
HANGERS

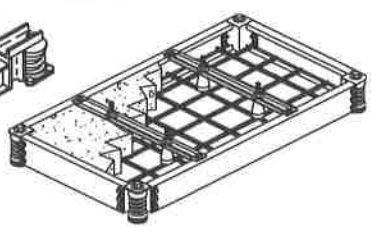


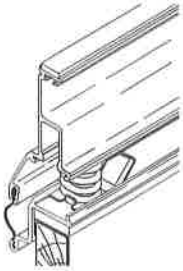




BASES







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JOB NAME AIRTRUNK DATA CENTRE
CUSTOMER MASON-MERCER AUSTRALIA
CUSTOMER P.O. NSW
MASON M.I. 634928
DWG. NO. F-507841

DRAWING CERTIFICATION INDEX

EQUIPMENT TAG(S)	MANUFACTURER	ISOLATION TYPE	ISOLATION DEFL.	SEISMIC MATERIAL	MASON IND. DWG. NO.
PIPING (T1)	N/A			SCB, SCBH, SRC, SAS	F-507061 ~ 061C
ROOF PIPING	N/A			SAS	F-506062 ~ 062C, F-506842~ 843C
PIPE BRACING LAYOUT					E-62940
PIPE BRACING DETAIL					E-62657
Ref. Dwg.(s)					
				SCB	S-102
				SCBH	S-108
				SRC	S-104
				CCB	S-109
				SAS	S-106

Material to be provided by Mason Industries has been selected and designed to withstand seismic and wind loadings as required per building code and job specifications.
I hereby certify that these documents listed above were prepared or approved by me, and I am a duly licensed professional engineer under the laws of the state of the project.
No other responsibility is taken or implied by this engineer.

11/2014	DWN: IB	CHKD:	DATE: 03/06/18	DWG No: F-507841

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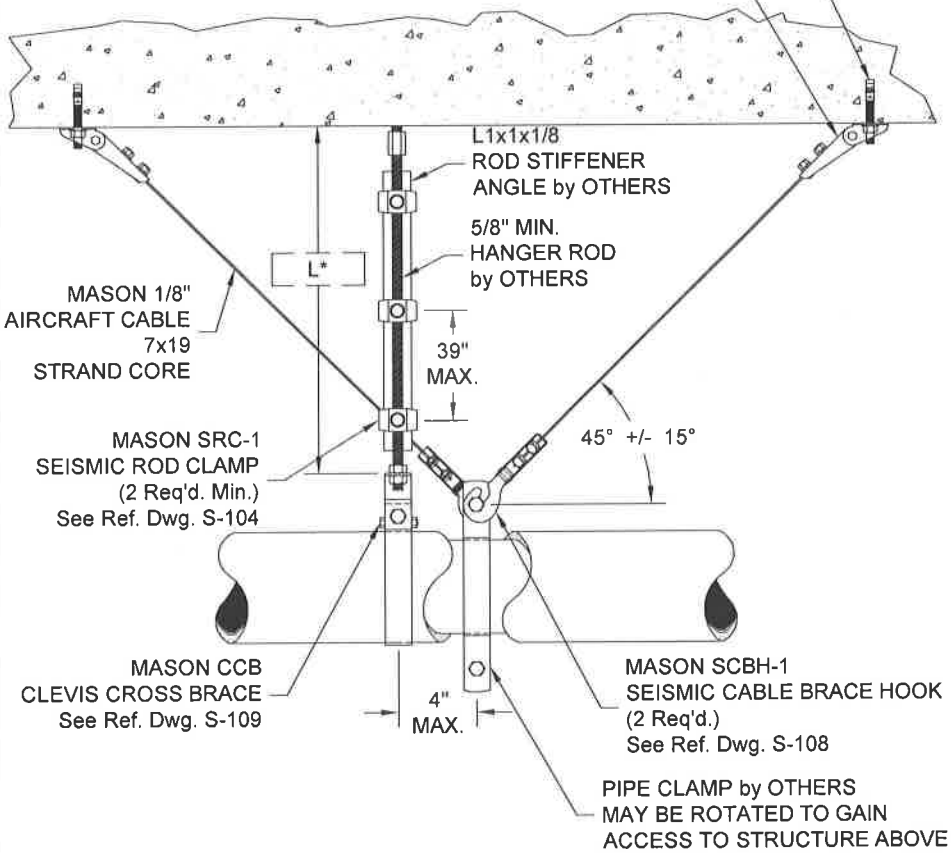
CUSTOMER P.O. NSW
MASON M.I. 634928
DWG. NO. F-507061

SEISMIC DETAIL
SUSPENDED PIPING

TAG(S) 140 mm CW (PVC) PIPING @ 13.5 #/FT.
40 FT. [12 m] MAX. NO. REQ'D. N/A
UNIT N/A

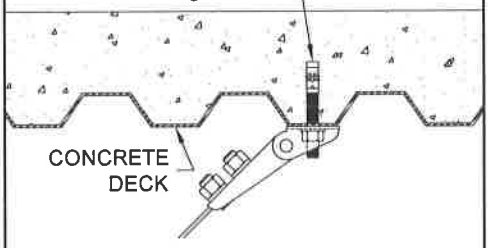


* MASON SRC SEISMIC ROD CLAMPS ARE REQUIRED FOR ROD LENGTH "L" GREATER THAN 60" [1525 mm].

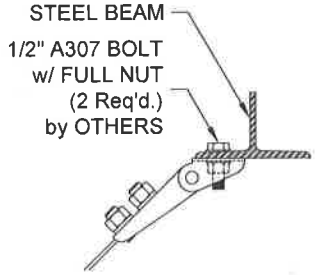
ELEVATION VIEW OF PIPING

SINGLE EXPANSION ANCHOR TO MINIMUM 3000 PSI CONCRETE

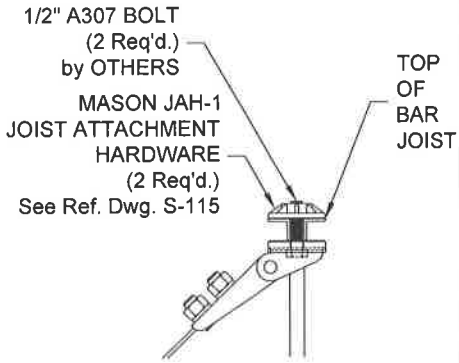
ALTERNATE ATTACHMENT DETAILS



SINGLE EXPANSION ANCHOR
TO MINIMUM 3000 PSI
LIGHTWEIGHT CONCRETE DECK



SINGLE BOLT
TO STRUCTURAL STEEL BEAM



SINGLE BOLT
TO STRUCTURAL BAR JOIST

10/2010	DWN: IB	CHKD:	DATE: 02/05/18	DWG. NO. F-507061

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JOB NAME AIRTRUNK DATA CENTRE
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CUSTOMER P.O. NSW
MASON M.I. 634928
DWG. NO. F-507061A

STATIC ANALYSIS
SUSPENDED PIPING

TAG(S) 140 mm CW (PVC) PIPING @ 13.5 #/FT.
40 FT. [12 m] MAX. NO. REQ'D. N/A
UNIT N/A

SYSTEM INFORMATION

Wc, Equipment weight = 540 lbs.

Fp, Horizontal force established by earthquake = 270 lbs.

Fpv, Vertical force established by earthquake = 135 lbs.

Fca, Force established in cable due to earthquake = 382 lbs.

t, Tension in one cable anchor to structure = 373 lbs.

v, Shear in one cable anchor to structure = 270 lbs.

AUSTRALIAN STANDARD AS 1170.4-2007 SEC. 8.3

a_{floor}: Effective floor acceleration = $k_p Z C_h(0)$ = 0.158

k_p: Probability Factor = 1.80

Z: Hazard Factor = 0.08

$C_h(0)$: Bracketed value of the spectral shape for the period of 0 sec. = 1.1 (D_e)

a_x: Height amplification factor at height h_x = $(1 + k_c h_x)$ = 3.0

h_x: Height at which component is attached = 75 m.

h_n: Total height of structure = 75 m.

k_c: $2/h_n$ for $h_n \geq 12$ m.
: 0.17 for $h_n < 12$ m.

I_c: Component importance factor = 1.5

a_c: Component amplification factor = 1.0

R_c: Component ductility factor = 1.0

$Fp = Fc = a_{floor}\, a_x [I_c a_c / R_c] Wc \leq 0.50Wc$
= 0.50 x Wc
= 270 lbs.

Fpv = Fcv = 0.50 x Fc
= 135 lbs.

10/2010	DWN: IB	CHKD:	DATE: 02/05/18	DWG. NO. F-507061A

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JOB NAME AIRTRUNK DATA CENTRE
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CUSTOMER P.O. NSW
MASON M.I. 634928
DWG. NO. F-507061B

STATIC ANALYSIS
SUSPENDED PIPING

TAG(S) 140 mm CW (PVC) PIPING @ 13.5 #/FT.
40 FT. [12 m] MAX. NO. REQ'D. N/A
UNIT N/A

Compressive Force established in one hanger rod due to earthquake

References

$W_{supp} = W_{p/ft.} \times 10 \text{ ft.} = 135 \text{ lbs.}$

$F_{pc} = F_p \times \tan 45° = 270 \text{ lbs.}$

$F_c = F_{pc} - W_{supp} + F_{pv}$

Therefore, $F_c = 270$ lbs.

NOTE: If $F_c < 0$, assume $F_c = 0$.

Allowable Compressive Force established in one hanger rod

$$\frac{Kl}{r} = \frac{(1.0) \times (60 \text{ in.})}{0.156 \text{ in.}} = 385$$

$$F_a = \frac{12\pi^2 E}{23 (Kl/r)^2} = 1007 \text{ lbs./in}^2$$

$E = 29 \times 10^6$ lbs./in.^{2}

$F_{call} = F_a \times A_k \times 1.33$*

$A_k = 0.202$ in.^{2}

Therefore, $F_{call} = 271$ lbs.

Since F_{call} is greater than or equal to F_c the hanger rod is adequate unbraced up to a length of 60 in.

Manual of STEEL CONSTRUCTION 9TH EDITION 5-42 Sec. E2

*5-30 Sec. A5

10/2010	DWN: IB	CHKD:	DATE: 02/05/18	DWG. NO. F-507061B

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MASON M.I. 634928
DWG. NO. F-507061C

STATIC ANALYSIS
SUSPENDED PIPING

TAG(S) 140 mm CW (PVC) PIPING @ 13.5 #/FT.
40 FT. [12 m] MAX. NO. REQ'D. N/A
UNIT N/A

Force established in cable assembly due to earthquake

References

$$Fca = Fp / \cos 45°$$

Therefore, Fca = 382 lbs.

Therefore, a 1/8 " SCBH cable assembly rated at 975 lbs.

(Based on a 2:1 safety factor) is adequate.

Reference Dwg. S-108

Force transmitted to anchor

$$v = Fca \times \cos 45°$$

Therefore, v = 270 lbs.

$$t = Fca \times \sin 45° \times 1.38^{*}$$

Therefore, t = 373 lbs.

*Increase due to prying effect on anchor bolt.

The allowable loads for anchors subjected to combined shear and tension forces are determined by the ratio of actual shear to allowable shear plus the ratio of the actual tension to the allowable tension not to exceed 1.2

The above can be satisfied by the expression:

$$\frac{v}{Vallow.} + \frac{t}{Tallow.} \leq 1.2$$

Using SAS-1/2 with 2-3/4" minimum embedment into 3000 psi concrete we get:

Reference Dwg. S-106

Vallow.= 1155 lbs. and Tallow.= 1070 lbs.

Inserting these values we have:

ICC-ES Report ESR-1771/3037

$$\frac{270}{1155} + \frac{373}{1070} = 0.59 \leq 1.2$$

Therefore the above anchors are adequate.

"In order to insure the integrity of the seismic restraint system, these calculations are based on using Mason style SAS anchor bolts. If other bolts are furnished, these calculations may require revision by the new anchor bolt manufacturer. This manufacturer must furnish the appropriate anchors based on the shear and tension forces calculated."

10/2010	DWN: IB	CHKD:	DATE: 02/05/18	DWG. NO. F-507061C

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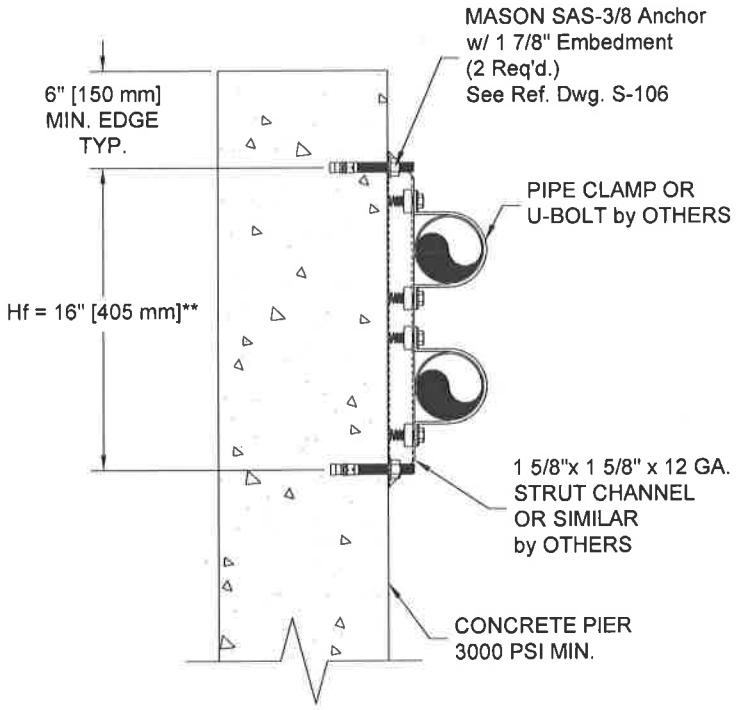
CUSTOMER MASON MERCER AUSTRALIA
CUSTOMER P.O. NSW
MASON M.I. 634928
DWG. NO. F-507062

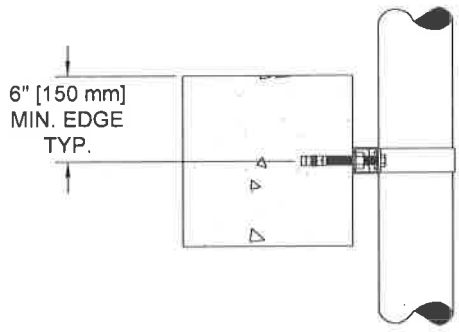
SEISMIC DETAIL
OUTDOOR APPLICATION

TAG(S) 4" (100 mm) CW H/L ROOF PIPING @ 36.0 #/FT. TOTAL
12 FT. [3.7 m] MAX. NO. REQ'D. N/A
UNIT N/A



**APPROXIMATE

ELEVATION VIEW OF SYSTEM



PLAN VIEW OF SYSTEM

10/2010	DWN: IB	CHKD:	DATE: 02/05/18	DWG. NO. F-507062

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CUSTOMER P.O. NSW
MASON M.I. 634928
DWG. NO. F-507062A

STATIC ANALYSIS
OUTDOOR APPLICATION

TAG(S) 4" (100 mm) CW H/L ROOF PIPING @ 36.0 #/FT. TOTAL
12 FT. [3.7 m] MAX. NO. REQ'D. N/A
UNIT N/A

SYSTEM INFORMATION

Wc, Equipment weight = 440 lbs.

Fp, Horizontal force established by earthquake = 128 lbs.

Fpv, Vertical force established by earthquake = 64 lbs.

Fw, Horizontal force established by wind = 274 lbs.

Hc.g., Center of gravity in vertical direction = 8.0 in.

d, Depth of system = 5.75 in.

Hb, Height between bolts of the system = 16.0 in.

Nb, Total number of bolts = 2

AUSTRALIAN STANDARD AS 1170.4-2007 SEC. 8.3

a_{floor}: Effective floor acceleration = $k_p Z C_h(0)$ = 0.158

k_p: Probability Factor = 1.80

Z: Hazard Factor = 0.08

$C_h(0)$: Bracketed value of the spectral shape for the period of 0 sec. = 1.1 (D_e)

a_x: Height amplification factor at height h_x = $(1 + k_c h_x)$ = 3.0

h_x: Height at which component is attached = 75 m.

h_n: Total height of structure = 75 m.

k_c: $2/h_n$ for $h_n \geq 12$ m.
: 0.17 for $h_n < 12$ m.

I_c: Component importance factor = 1.5

a_c: Component amplification factor = 1.0

R_c: Component ductility factor = 2.5

$Fp = Fc = a_{floor}\, a_x [I_c a_c / R_c] Wc \leq 0.50Wc$
= 0.29 x Wc
= 128 lbs.

Fpv = Fcv = 0.50 x Fc
= 64 lbs.

10/2010	DWN: IB	CHKD:	DATE: 02/05/18	DWG. NO. F-507062A

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CUSTOMER P.O. NSW
MASON M.I. 634928
DWG. NO. F-507062B

STATIC ANALYSIS
OUTDOOR APPLICATION

TAG(S) 4" (100 mm) CW H/L ROOF PIPING @ 36.0 #/FT. TOTAL
12 FT. [3.7 m] MAX. NO. REQ'D. N/A
UNIT N/A

AUSTRALIAN/NEW ZEALAND STANDARD AS/NZS 1170.2 STRUCTURAL DESIGN ACTIONS PART 2: WIND ACTIONS

References

p_z = Design Wind Pressure = $(0.5 \times \rho_{air}) \times [V_{des,\Theta}]^2 \times C_{fig} \times C_{dyn}$ (Equation 2.4-1)

ρ_{air} = Density of air = 1.2 kg/m^2 (Sec. 2.4.1 p.12)

$V_{des,\Theta} = V_R \times M_d \times (M_{z,cat} \times M_s \times M_t)$ = 50.4 m/s (Sec. 2.3 p.9)

V_R = Regional wind speed = 45.0 m/s (Region A2) (Table 3.1 p.14)

M_d = Wind direction multiplier = 1.0 (Table 3.2 p.15)

$M_{z,cat}$ = Terrain/Height multiplier = 1.12 (z = 75 m, Cat. 3) (Table 4.1 (A) p.19)

M_s = Shielding multiplier = 1.0 (Sec. 4.3.1 4.3 p.21)

M_t = Topographic multiplier = 1.0 (Sec. 4.4.1 p.22)

C_{fig} = Aerodynamic shape factor = 0.80 (Sec. 5.2 p.27)

C_{dyn} = Dynamic Response factor = 1.0 (Sec. 6.1 p.39)

= 1220 Pa

A_z = Projected area normal to wind = 1.0 m^2

$Fw = p_z \times A_z$ (Equation 2.5-1)

= 1220 N [274 lbs.]

Since the earthquake load demand is less than the wind load demand, the wind load demand will be used for determining support forces.

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CUSTOMER P.O. NSW
MASON M.I. 634928
DWG. NO. F-507062C

STATIC ANALYSIS
OUTDOOR APPLICATION

TAG(S) 4" (100 mm) CW H/L ROOF PIPING @ 36.0 #/FT. TOTAL
12 FT. [3.7 m] MAX. NO. REQ'D. N/A
UNIT N/A

References

Actual Tension on one anchor bolt, T

$T = \{Fw \times Hc.g. + Wc \times d\} / Hb$

Therefore, T = 295 lbs.

NOTE: If $t < 0$, assume $t = 0$.

Actual Shear on one anchor bolt, V

$V_1 = Wc / Nb = 220$ lbs. $V_2 = Fw / Nb = 137$ lbs.

$$V = \sqrt{V_1^2 + V_2^2}$$

Therefore, V = 259 lbs.

The allowable loads for anchors subjected to combined shear and tension forces are determined by the ratio of actual shear to allowable shear plus the ratio of the actual tension to the allowable tension not to exceed 1.2

The above can be satisfied by the expression:

$$\frac{V}{Vallow.} + \frac{T}{Tallow.} \leq 1.2$$

Reference Dwg. S-106

Using SAS-3/8 with 1 7/8" minimum embedment into 3000 psi lightweight concrete we get:

Vallow.= 630 lbs. and Tallow.= 485 lbs.

ICC-ES Report ESR-1771/3037

Inserting these values we have:

$$\frac{259}{630} + \frac{295}{485} = 1.02 \leq 1.2$$

Therefore the above anchors are adequate.

"In order to insure the integrity of the seismic restraint system, these calculations are based on using Mason style SAS anchor bolts. If other bolts are furnished, these calculations may require revision by the new anchor bolt manufacturer. This manufacturer must furnish the appropriate anchors based on the shear and tension forces calculated."

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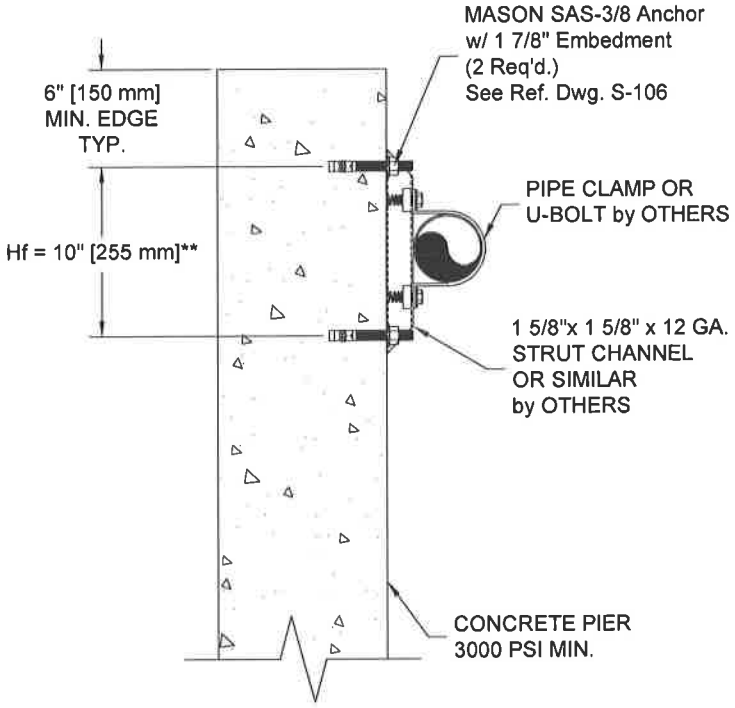
DWG. NO. F-507842

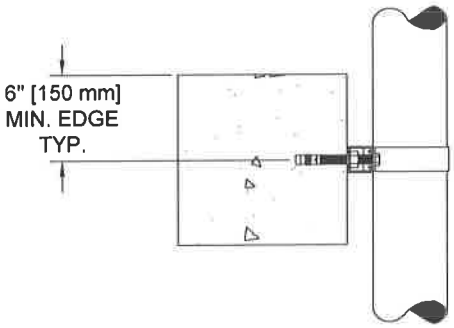
SEISMIC DETAIL
OUTDOOR APPLICATION

TAG(S) 4" (110 mm) CW ROOF PIPING @ 18.0 #/FT. TOTAL
12 FT. [3.7 m] MAX. NO. REQ'D. N/A
UNIT N/A



**APPROXIMATE

ELEVATION VIEW OF SYSTEM



PLAN VIEW OF SYSTEM

10/2010	DWN: IB	CHKD:	DATE: 03/06/18	DWG. NO. F-507842

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JOB NAME AIRTRUNK DATA CENTRE
CUSTOMER MASON MERCER AUSTRALIA
CUSTOMER P.O. NSW
MASON M.I. 634928
DWG. NO. F-507843A

STATIC ANALYSIS
OUTDOOR APPLICATION

TAG(S) 4" (110 mm) CW ROOF PIPING @ 18.0 #/FT. TOTAL
12 FT. [3.7 m] MAX. NO. REQ'D. N/A
UNIT N/A

SYSTEM INFORMATION

Wc, Equipment weight = 220 lbs.

Fp, Horizontal force established by earthquake = 64 lbs.

Fpv, Vertical force established by earthquake = 32 lbs.

Fw, Horizontal force established by wind = 137 lbs.

Hc.g., Center of gravity in vertical direction = 5.0 in.

d, Depth of system = 6.0 in.

Hb, Height between bolts of the system = 10.0 in.

Nb, Total number of bolts = 2

AUSTRALIAN STANDARD AS 1170.4-2007 SEC. 8.3

a_{floor}: Effective floor acceleration = $k_p Z C_h(0)$ = 0.158

k_p: Probability Factor = 1.80

Z: Hazard Factor = 0.08

$C_h(0)$: Bracketed value of the spectral shape for the period of 0 sec. = 1.1 (D_e)

a_x: Height amplification factor at height h_x = $(1 + k_c h_x)$ = 3.0

h_x: Height at which component is attached = 75 m.

h_n: Total height of structure = 75 m.

k_c: $2/h_n$ for $h_n \geq$ 12 m.
: 0.17 for $h_n <$ 12 m.

I_c: Component importance factor = 1.5

a_c: Component amplification factor = 1.0

R_c: Component ductility factor = 2.5

$Fp = Fc = a_{floor}\, a_x [I_c a_c / R_c] Wc \leq 0.50Wc$
$= 0.29 \times Wc$
$= 64$ lbs.

$Fpv = Fcv = 0.50 \times Fc$
$= 32$ lbs.

10/2010	DWN: IB	CHKD:	DATE: 03/06/18	DWG. NO. F-507843A

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JOB NAME AIRTRUNK DATA CENTRE
CUSTOMER MASON MERCER AUSTRALIA
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MASON M.I. 634928
DWG. NO. F-507843B

STATIC ANALYSIS
OUTDOOR APPLICATION

TAG(S) 4" (110 mm) CW ROOF PIPING @ 18.0 #/FT. TOTAL
12 FT. [3.7 m] MAX. NO. REQ'D. N/A
UNIT N/A

AUSTRALIAN/NEW ZEALAND STANDARD AS/NZS 1170.2 STRUCTURAL DESIGN ACTIONS PART 2: WIND ACTIONS

References

p_z = Design Wind Pressure = $(0.5 \times \rho_{air}) \times [V_{des,\Theta}]^2 \times C_{fig} \times C_{dyn}$ (Equation 2.4-1)

ρ_{air} = Density of air = 1.2 kg/m^2 (Sec. 2.4.1 p.12)

$V_{des,\Theta} = V_R \times M_d \times (M_{z,cat} \times M_s \times M_t)$ = 50.4 m/s (Sec. 2.3 p.9)

V_R = Regional wind speed = 45.0 m/s (Region A2) (Table 3.1 p.14)

M_d = Wind direction multiplier = 1.0 (Table 3.2 p.15)

$M_{z,cat}$ = Terrain/Height multiplier = 1.12 (z = 75 m, Cat. 3) (Table 4.1 (A) p.19)

M_s = Shielding multiplier = 1.0 (Sec. 4.3.1 4.3 p.21)

M_t = Topographic multiplier = 1.0 (Sec. 4.4.1 p.22)

C_{flg} = Aerodynamic shape factor = 0.80 (Sec. 5.2 p.27)

C_{dyn} = Dynamic Response factor = 1.0 (Sec. 6.1 p.39)

= 1220 Pa

A_z = Projected area normal to wind = 0.5 m^2

$Fw = p_z \times A_z$ (Equation 2.5-1)

= 610 N [137 lbs.]

Since the earthquake load demand is less than the wind load demand, the wind load demand will be used for determining support forces.

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DWG. NO. F-507843C

STATIC ANALYSIS
OUTDOOR APPLICATION

TAG(S) 4" (110 mm) CW ROOF PIPING @ 18.0 #/FT. TOTAL
12 FT. [3.7 m] MAX. NO. REQ'D. N/A
UNIT N/A

References

Actual Tension on one anchor bolt, T

$T = \{Fw \times Hc.g. + Wc \times d\} / Hb$

Therefore, t = 201 lbs.

NOTE: If t < 0, assume t = 0.

Actual Shear on one anchor bolt, V

$V_1 = Wc / Nb = 110$ lbs. $V_2 = Fw / Nb = 69$ lbs.

$$v = \sqrt{V_1^2 + V_2^2}$$

Therefore, v = 130 lbs.

The allowable loads for anchors subjected to combined shear and tension forces are determined by the ratio of actual shear to allowable shear plus the ratio of the actual tension to the allowable tension not to exceed 1.2

The above can be satisfied by the expression:

$$\frac{v}{Vallow.} + \frac{t}{Tallow.} \leq 1.2$$

Reference Dwg. S-106

Using SAS-3/8 with 1 7/8" minimum embedment into 3000 psi lightweight concrete we get:

Vallow.= 630 lbs. and Tallow.= 485 lbs.

ICC-ES Report ESR-1771/3037

Inserting these values we have:

$$\frac{130}{630} + \frac{201}{485} = 0.62 \leq 1.2$$

Therefore the above anchors are adequate.

"In order to insure the integrity of the seismic restraint system, these calculations are based on using Mason style SAS anchor bolts. If other bolts are furnished, these calculations may require revision by the new anchor bolt manufacturer. This manufacturer must furnish the appropriate anchors based on the shear and tension forces calculated."

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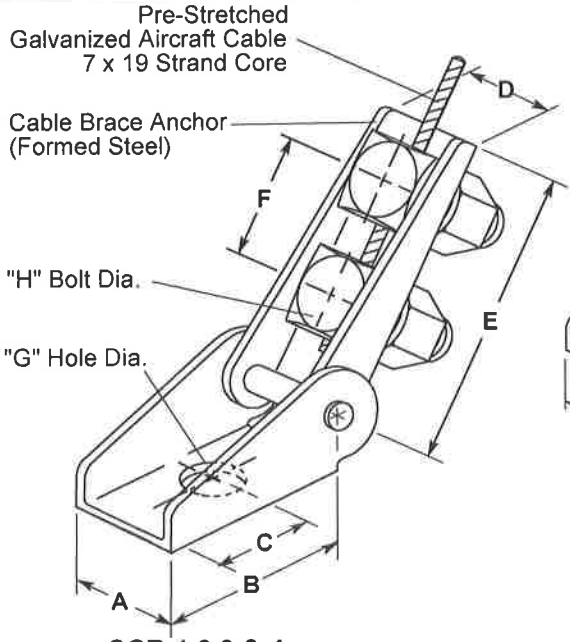
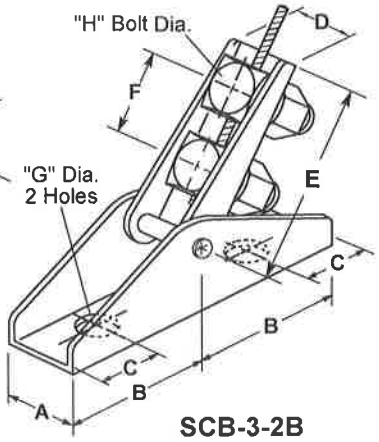
DWG. NO. S-102

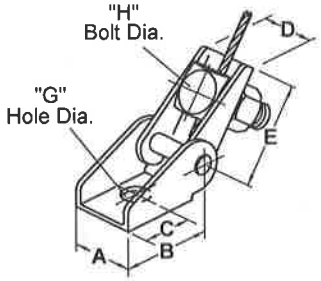
SCB
SEISMIC CABLE BRACE ANCHOR & ASSEMBLY



SCB-1,2,3 & 4



SCB-3-2B



SCB-0

Ratings are from test data and calculations used to obtain California OSHPD Preapproval Number OPA-0349.
Testing was supervised and certified by an independent engineer registered in the State of California.
Ratings are based on attachment to steel.
Preferred installation angle is 45°. Maximum variation ±15°.
NOTE: Not to be used as a vertical hanger for equipment, ductwork or piping. To be used as a seismic restraint only.

TYPE SCB DIMENSION (in mm)

Size	A		B		C		D		E		F		G		H	
SCB-0	15/16	33	1 1/2	38	3/4	19	15/16	24	1 3/4	44	-	-	7/16	11	1/2	13
SCB-1	1 3/8	35	2	51	1	25	15/16	24	3 3/8	86	1 1/2	38	9/16	14	1/2	13
SCB-2	1 5/8	41	2 3/4	70	1 3/8	35	1 3/16	30	4 3/8	111	1 3/4	44	11/16	17	5/8	16
SCB-3	2	51	3 1/2	89	1 3/4	44	1 7/16	37	4 3/4	121	2	51	13/16	21	3/4	19
SCB-3-2B	2	51	4 3/4	121	1	25	1 7/16	37	4 3/4	121	2	51	13/16	21	3/4	19
SCB-4	3 1/8	79	5	127	2 1/2	64	1 15/16	49	5 3/4	146	2 1/4	57	1 5/16	33	1	25

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 December 22, 2006
Anthony R. Pike (916) 654-3362

TYPE SCB ASSEMBLY RATINGS AS CONTROLLED BY CABLE BREAKING STRENGTH

Size	Cable Diameter in	mm	OSHPD Max. Ratings lbs	kN	kg	Torque on Bolts ft-lbs	N-m	kg-m
SCB-0	1/16*	1.6	235	1.0	106	30	41	4.2
SCB-0	3/32*	2.4	460	2.1	208	30	41	4.2
SCB-0	3/32	2.4	500	2.2	227	30	41	4.2
SCB-1	1/8	3	975	4.3	442	25	34	3.5
SCB-2	3/16	5	2050	9.1	930	45	61	6.2
SCB-3 & -3-2B	1/4	6	3150	14.0	1429	55	75	7.6
SCB-4	3/8	10	6875	30.5	3119	200	271	27.6

* 7 x 7 STRAND CORE

REF. DWG. S-102

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JOB NAME AIRTRUNK DATA CENTRE
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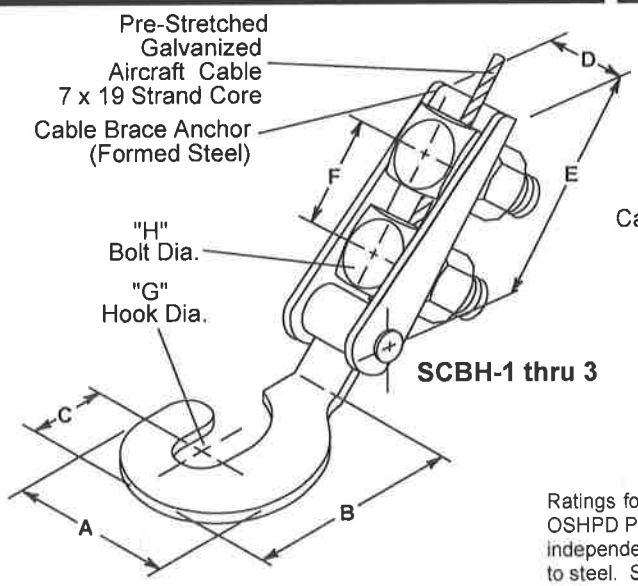
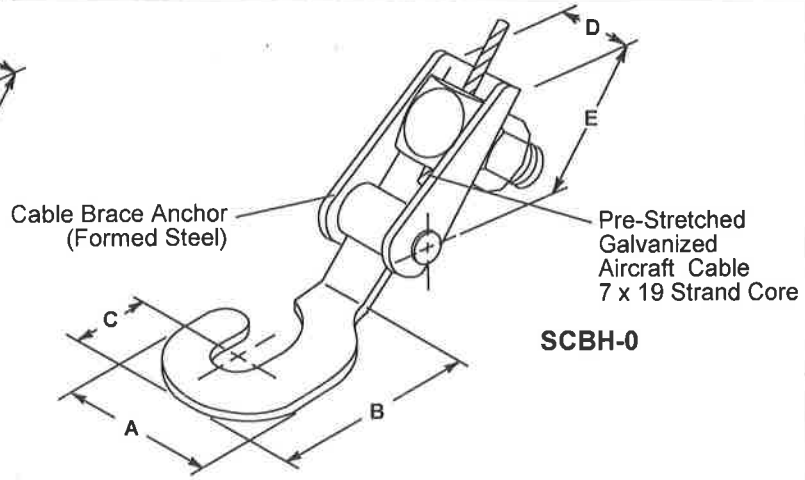
CUSTOMER P.O. NSW
MASON M.I. 634928
DWG. NO. S-108

SCBH
SEISMIC CABLE BRACE HOOK ANCHOR & ASSEMBLY



SCBH-1 thru 3



SCBH-0

Ratings for SCBH-1 thru -3 are from test data and calculations used to obtain California OSHPD Preapproval Number OPA-0349. Testing was supervised and certified by an independent engineer registered in the State of California. Ratings are based on attachment to steel. SCBH assemblies will fit rod sizes as tabulated. Preferred installation angle is 45°. Maximum variation is ± 15°.

TYPE SCBH DIMENSIONS (inches **mm**)

Size	For use with Rod Sizes		A		B		C		D		E		F		G		H	
SCBH-0	3/8	**10**	1 3/8	**35**	2 1/16	**52**	11/16	**17**	15/16	**24**	1 3/4	**44**	--	--	3/8	**10**	1/2	**13**
SCBH-1	1/2, 5/8	**13, 16**	1 7/8	**48**	2 3/8	**60**	1	**25**	1	**25**	3 3/8	**86**	1 1/2	**38**	5/8	**16**	1/2	**13**
SCBH-2	3/4, 7/8	**19, 22**	2 7/8	**73**	3 3/4	**95**	1 3/8	**35**	1 3/16	**30**	4 3/8	**111**	1 3/4	**44**	7/8	**22**	5/8	**16**
SCBH-3	1, 1 1/8	**25, 29**	3 1/2	**89**	4 3/4	**121**	1 3/4	**44**	1 7/16	**37**	4 3/4	**121**	2	**51**	1 1/8	**29**	3/4	**19**

APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 AUGUST 5, 2002
Bill Staehlin (916) 654-3362

TYPE SCBH ASSEMBLY RATINGS
AS CONTROLLED BY CABLE BREAKING STRENGTH

Size	Cable Diameter		OSHPD Max. Ratings			Torque on Bolts		
	in	**mm**	lbs	**kN**	**kg**	ft-lbs	**N-m**	**kg-m**
SCBH-0	1/16*	**1.6**	235	**1.0**	**106**	30	**41**	**4.2**
SCBH-0	3/32*	**2.4**	460	**2.1**	**208**	30	**41**	**4.2**
SCBH-0	3/32	**2.4**	500	**2.2**	**227**	30	**41**	**4.2**
SCBH-1	1/8	**3**	975	**4.3**	**442**	25	**34**	**3.5**
SCBH-2	3/16	**5**	2050	**9.1**	**930**	45	**61**	**6.2**
SCBH-3	1/4	**6**	3150	**14.0**	**1429**	55	**75**	**7.6**

* 7 x 7 STRAND CORE

REF. DWG. S-108

CERTIFICATION FORM S-108 09/2008	DWN: IB	CHKD:	DATE: 02/05/18	DWG. No. S-108

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SRC
Seismic Rod Clamps

TYPE SRC DIMENSIONS - Inches (mm)

Size	A	B	C	D Acceptable Rod Size
SRC-1	1 3/8 (35)	1/2 x 1 3/4 Long (13 x 44 Long)	1 x 1 x 1/8 (25 x 25 x 3)	1/4 to 5/8 (6 to 16)
SRC-1 1/2	1 9/16 (40)	5/8 x 2 Long (16 x 51 Long)	1 1/2 x 1 1/2 x 1/4 (38 x 38 x 6)	1/2 to 1 (13 to 25)
SRC-2	1 3/4 (44)	5/8 x 3 Long (16 x 76 Long)	2 x 2 x 1/4 (51 x 51 x 6)	7/8 to 1 1/4 (22 to 32)

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California Office of Statewide Health Planning and Development
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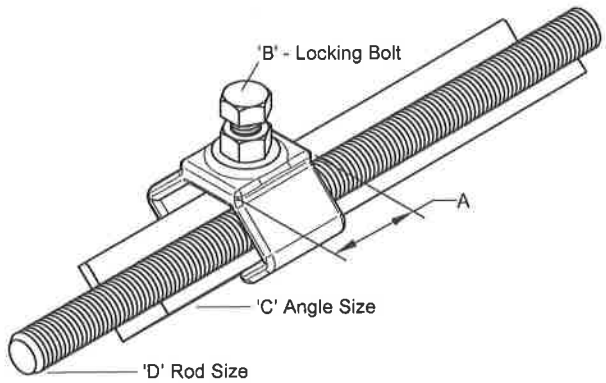
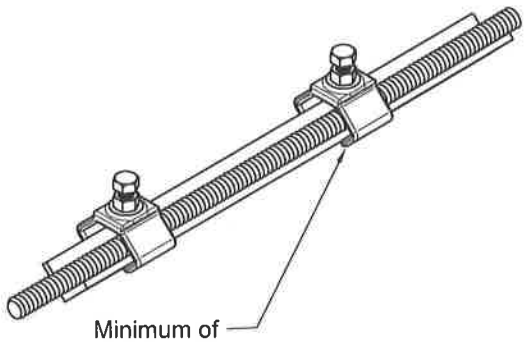
OPA-0349 AUGUST 5, 2002
Bill Staehlin (916) 654-3362

TYPE SRC WITH STEEL ANGLE ASSEMBLY RATINGS - inches (mm)

Rod Size in (mm)	Maximum Compr. Force lbs (kN)	Steel Angle Stiffener Min. Size In (mm)	Steel Angle Stiffener Max. Length in (mm)	Maximum SRC Spacing in (mm)
1/4 (6)	75 (0.3)	1 x 1 x 1/8 (25 x 25 x 3)	96 (2438)	14 (356)
3/8 (10)	425 (1.9)	1 x 1 x 1/8 (25 x 25 x 3)	96 (2438)	22 (559)
1/2 (13)	1275 (5.6)	1 x 1 x 1/8 (25 x 25 x 3)	96 (2438)	31 (787)
	1200 (5.3)	1 1/2 x 1 1/2 x 1/4 (38 x 38 x 6)	120 (3048)	31 (787)
5/8 (16)	1475 (6.5)	1 x 1 x 1/8 (25 x 25 x 3)	96 (2438)	39 (991)
	1325 (5.9)	1 1/2 x 1 1/2 x 1/4 (38 x 38 x 6)	120 (3048)	39 (991)
3/4 (19)	2500 (11.1)	1 1/2 x 1 1/2 x 1/4 (38 x 38 x 6)	144 (3658)	48 (1212)
7/8 (22)	4600 (20.4)	1 1/2 x 1 1/2 x 1/4 (38 x 38 x 6)	132 (3353)	56 (1422)
	4400 (19.5)	2 x 2 x 1/4 (51 x 51 x 6)	144 (3658)	56 (1422)
1 (25)	5800 (25.8)	1 1/2 x 1 1/2 x 1/4 (38 x 38 x 6)	132 (3353)	65 (1651)
	6900 (30.7)	2 x 2 x 1/4 (51 x 51 x 6)	144 (3658)	65 (1651)
1 1/8 (29)	9600 (42.7)	2 x 2 x 1/4 (51 x 51 x 6)	144 (3658)	73 (1854)
1 1/4 (32)	12000 (53.4)	2 x 2 x 1/4 (51 x 51 x 6)	144 (3658)	82 (2083)





REF. DWG. S-104

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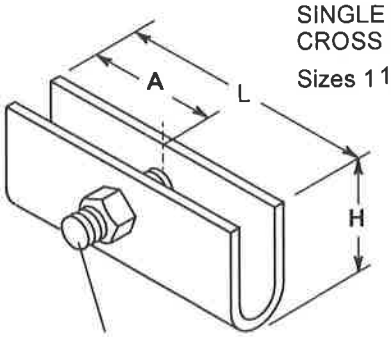
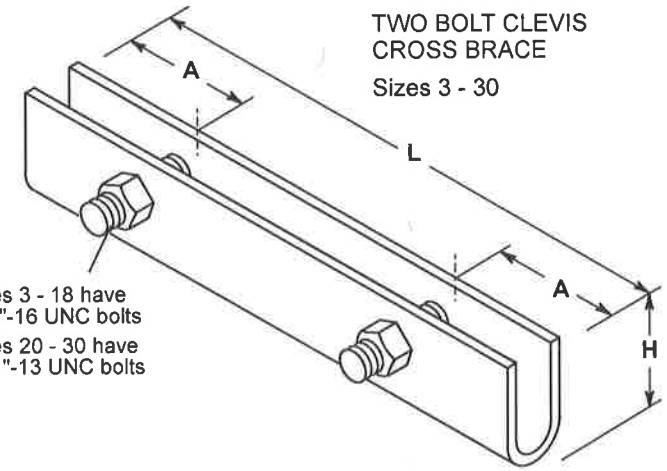
CCB
CLEVIS CROSS BRACE

SINGLE BOLT CLEVIS CROSS BRACE
Sizes 1 1/2 - 2 1/2



3/8"-16 UNC bolt

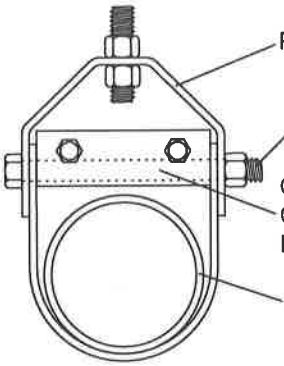
TWO BOLT CLEVIS CROSS BRACE
Sizes 3 - 30



Sizes 3 - 18 have 3/8"-16 UNC bolts
Sizes 20 - 30 have 1/2"-13 UNC bolts

TYPE CCB DIMENSIONS (inches)

Size	L	H	A
CCB-1 1/2	1 7/8	1	15/16
CCB-2	2 3/8	1	1 3/16
CCB-2 1/2	2 7/8	1 1/8	1 7/16
CCB-3	3 1/2	1 1/8	3/4
CCB-4	4 1/2	1 1/8	1
CCB-5	5 9/16	1 5/16	1
CCB-6	6 5/8	1 5/16	1 1/2
CCB-8	8 5/8	1 7/16	2
CCB-10	10 3/4	1 9/16	2 1/2
CCB-12	12 3/4	1 9/16	3
CCB-14	14	1 11/16	3 1/2
CCB-16	16	1 7/8	4
CCB-18	18	2	4 1/2
CCB-20	20	2 1/2	5
CCB-24	24	2 1/2	6
CCB-30	30	2 1/2	7 1/2



APPROVED
California Office of Statewide Health Planning and Development
FIXED EQUIPMENT ANCHORAGE
OPA-0349 AUGUST 5, 2002
Bill Staehlin (916) 654-3362

REF. DWG. S-109

FORM S-109 09/2008	DWN: IB	CHKD:	DATE: 02/05/18	DWG. No. S-109

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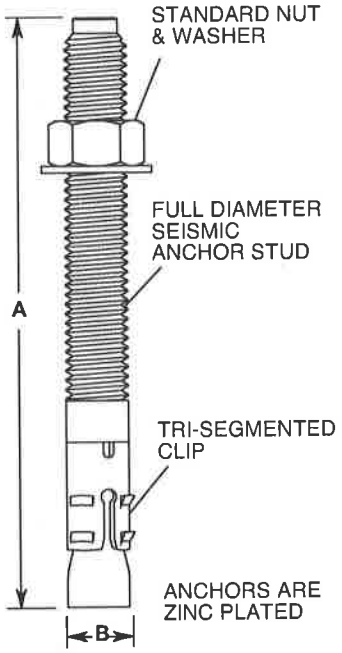
DWG No. S-106

SAS & SASE

ZINC PLATED CARBON STEEL SEISMIC ANCHOR STUD WITH NUT & WASHER (Standard & Extended Length)



TYPE SAS STANDARD LENGTH ANCHOR STUD RATINGS BASED ON ALLOWABLE STRESS DESIGN (ASD)* installed into 2500 psi (17.2 Mpa) Normal Weight or Sand– Lightweight Concrete

Type and Size	Embedment Depth (Nominal) (in)	*(mm)*	Normal Weight Concrete Tension† (lbs)	*(kg)*	Normal Weight Concrete Shear (lbs)	*(kg)*	Lightweight Concrete Tension† (lbs)	*(kg)*	Lightweight Concrete Shear (lbs)	*(kg)*
SAS-3/8	1 7/8	*48*	445	*200*	650	*295*	360	*165*	390	*175*
SAS-1/2	2 3/4	*70*	980	*445*	1055	*480*	590	*270*	635	*290*
SAS-5/8	3 3/8	*86*	1325	*600*	2845	*1290*	795	*360*	1710	*775*
SAS-3/4	4 1/8	*105*	1520	*690*	3870	*1755*	915	*415*	2325	*1055*
SAS-1	5 1/4	*133*	2220	*1005*	5960	*2705*	1335	*605*	3575	*1620*

TYPE SASE EXTENDED LENGTH ANCHOR STUD RATINGS BASED ON ALLOWABLE STRESS DESIGN (ASD)* installed into 2500 psi (17.2 Mpa) Normal Weight or Sand– Lightweight Concrete

Type and Size	Embedment Depth (Nominal) (in)	*(mm)*	Normal Weight Concrete Tension† (lbs)	*(kg)*	Normal Weight Concrete Shear (lbs)	*(kg)*	Lightweight Concrete Tension† (lbs)	*(kg)*	Lightweight Concrete Shear (lbs)	*(kg)*
SASE-3/8	2 7/8	*73*	950	*430*	820	*390*	690	*315*	820	*370*
SASE-1/2	3 7/8	*98*	1275	*580*	2960	*1340*	1080	*490*	2325	*1055*
SASE-5/8	5 1/8	*130*	2355	*1070*	4520	*2050*	1660	*755*	3580	*1625*
SASE-3/4	5 3/4	*146*	2740	*1245*	6980	*3165*	1645	*745*	4190	*1900*

TYPE SAS & SASE ANCHOR STUD RATINGS BASED ON ALLOWABLE STRESS DESIGN (ASD)* installed in the Soffit of 3000 psi (20.7 Mpa) Normal Weight or Sand-Lightweight Concrete-filled Profile Steel Deck Assemblies (minimum 20 gauge 3" *76mm* profile). Anchors must be installed in either the lower or upper flutes of the profile deck no more than 1" *25mm* from flute centerline.

Type and Size	Embedment Depth (Nominal) (in)	*(mm)*	Tension† (lbs)	*(kg)*	Shear (lbs)	*(kg)*
SAS-3/8	1 7/8	*48*	430	*195*	725	*330*
SASE-3/8	3 3/8	*86*	760	*345*	1590	*720*
SAS-1/2	2 3/4	*70*	695	*315*	970	*440*
SASE-1/2	4 1/2	*114*	930	*420*	2085	*945*
SAS-5/8	3 3/8	*86*	890	*405*	1200	*545*
SASE-5/8	5 5/8	*143*	1700	*770*	3185	*1445*

For combined allowable stress design tension and shear forces on anchors, use the following equation:

$$\frac{T_{Applied}}{T_{Allowable\ (ASD)}} + \frac{V_{Applied}}{V_{Allowable\ (ASD)}} \leq 1.2$$

TYPE SAS & SASE ANCHOR STUD DIMENSIONS

Type and Size	A (in)	*(mm)*	B (in)	*(mm)*	Maximum Tightening Torque (Ft-lbs)	*(N-m)*
SAS-3/8	3 1/2	*89*	3/8	*10*	30	*41*
SAS-1/2	4 3/4	*121*	1/2	*13*	60	*81*
SAS-5/8	5	*127*	5/8	*16*	90	*122*
SAS-3/4	6 1/4	*159*	3/4	*19*	150	*203*
SAS-1	7	*178*	1	*25*	230	*312*
SASE-3/8	5	*127*	3/8	*10*	30	*41*
SASE-1/2	5 1/2	*140*	1/2	*13*	60	*81*
SASE-5/8	7	*178*	5/8	*16*	90	*122*
SASE-3/4	8 1/2	*216*	3/4	*19*	150	*203*

Anchors have the following Code Reports:
- ICC-ES-ESR-3037 and City of Los Angeles RR25891 for cracked & uncracked concrete
- Florida Statewide Product Approval FL15731
- IAPMO ES ER 240 & City of Los Angeles RR25936 for CMU Walls
- Underwriter Laboratories file EX3605
- Factory Mutual #3043442

* These values are applicable when the anchors are installed with periodic special inspection as set forth in Section 1701.5.2 of the UBC, Section 1704.13 of the 2006/2003 IBC or Section 1704.15 of the 2009 IBC.

† The Tension values may be increased for greater compressive strength, up to 8000 psi (55.2 MPa), by multiplying the value by $(F'c/2500)^{0.5}$, where F'_c is the specified strength of concrete in psi.
For example: SAS-1/2 in 4000 psi normal weight concrete

$$T = \left(\frac{4000}{2500}\right)^{0.5} \times 980 \text{ lbs} = 1240 \text{ lbs}$$

NOTES:
1. All values are for single anchors with no edge distance or spacing reduction and assume supplementary reinforcement condition B. Shear values exclude consideration of the concrete breakout failure mode.
2. Anchorage must be designed in accordance with ACI 318-05 Appendix D.
3. Allowable loads are for the attachment of non-structural components.
4. Allowable loads are based on 100% seismic loading in seismic design categories C-F.

REF. DWG. S-106

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