



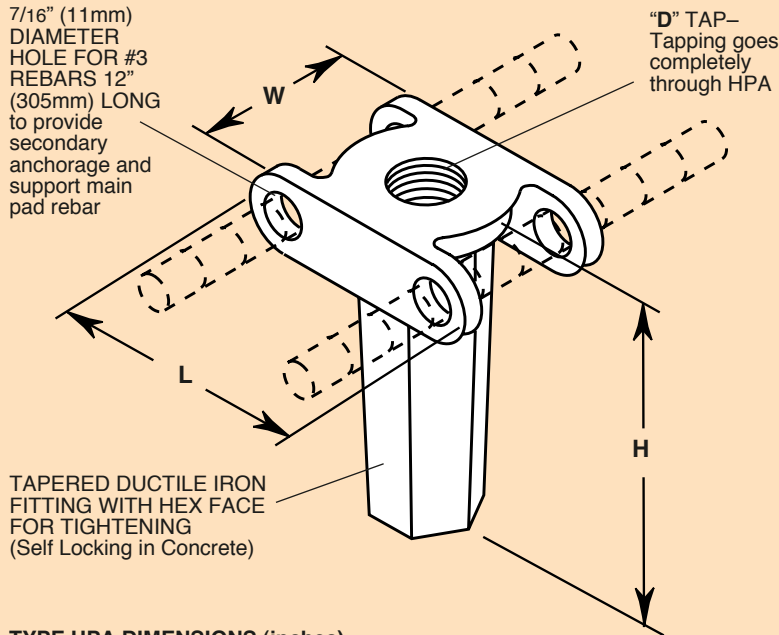
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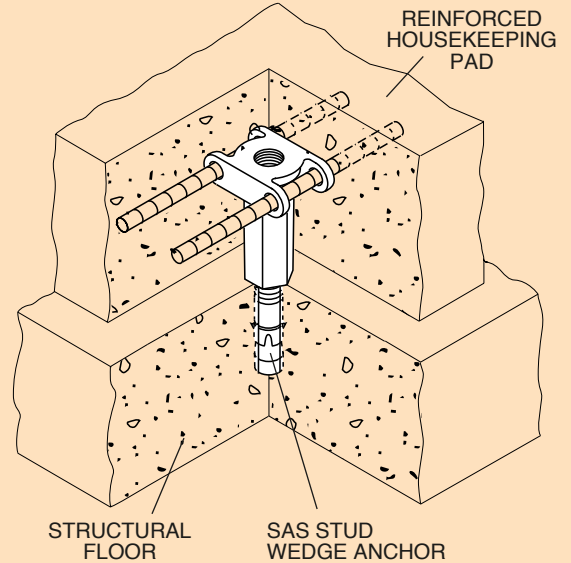
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**SEISMIC HOUSE-KEEPING PAD ANCHOR, SEISMIC ADHESIVE ANCHOR, SEISMIC WEDGE ANCHOR & SEISMIC ANCHOR STUD**

**HPA, SAA, SAB & SAS**  
DATA SHEET DS-212-1.1



**Primary Function Housekeeping Pad Anchor**



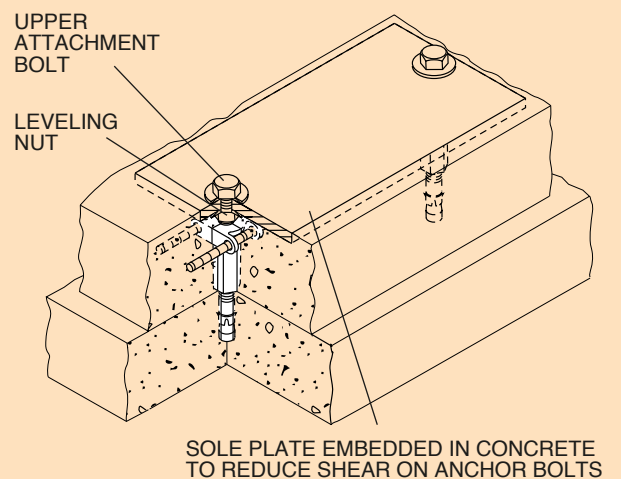
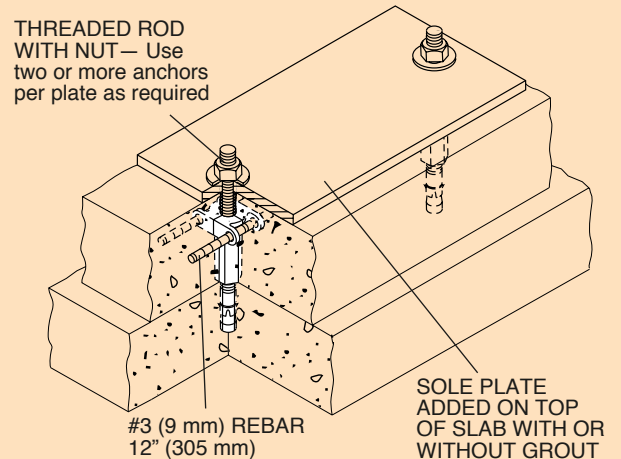
**TYPE HPA DIMENSIONS (inches)**

Size	L	W	H	D	SAS Stud Anchor Capacity in 3000 lb Concrete	
					Tension (lbs)	Shear (lbs)
HPA-1/2	21/8	11/4	3	1/2UNC	820	1540
HPA-5/8	23/8	11/2	3	5/8UNC	1210	2260
HPA-3/4	23/4	13/4	3	3/4UNC	1545	3675

**TYPE HPA DIMENSIONS (mm)**

Size	L	W	H	D	SAS Stud Anchor Capacity in 1361 kg Concrete	
					Tension (kgs)	Shear (kgs)
HPA-1/2	54	32	75	1/2UNC	372	699
HPA-5/8	60	38	75	5/8UNC	549	1025
HPA-3/4	70	44	75	3/4UNC	701	1667

**Housekeeping Pad and (Secondary Function) Sole Plate Anchor**



A major cause of equipment restraint failure is the breaking up of housekeeping pads. Virtually all housekeeping pads are poured independently after completion of the structure. In many cases there is no mechanical attachment to the structural floor and the pad itself may not be reinforced.

The floor diaphragm vibrates vertically and under resonant conditions generates more than 1g. This tosses the pad and the machine attached to it. As the pad crashes back it breaks up and the equipment loses all anchorage.

Since housekeeping pad sizes and locations are not established until after a machine room floor is poured there is no way to cast in rebar pad stirrups. There is an undefined engineering area as to who should design and what type of cast in restraints should be used. In designing the HPA anchor system we have assumed the responsibility as part of our system certification.

The HPA anchor is manufactured in three sizes and has three anchoring capacities. The inverted hexagonal pyramid is self-locking in the housekeeping pad and has provision for passing 2 #3 rebars through the holes on top for positioning the pad reinforcement system. The number of anchors that are needed depend on the HPA size and the vertical rating of the SAS stud anchor as listed.

If there are no overturning moments and we assume an upward force of 2g, the combined anchorage would equal the weight of the equipment plus the housekeeping pad. If there are vertical snubbers attached to the pad, HPA anchors should be clustered near that snubber.

**Typical Pump Foundation**

Housekeeping Pad 6' x 6' x 4" (1829 mm x 1829 mm x 102 mm)	= 1800 lbs. (816 kg.)
Pump & Motor	= 4000 lbs. (1814 kg.)
Concrete Inertia Base	= 2000 lbs. (907 kg.)
	<u>7800 lbs. (3537 kg.)</u>

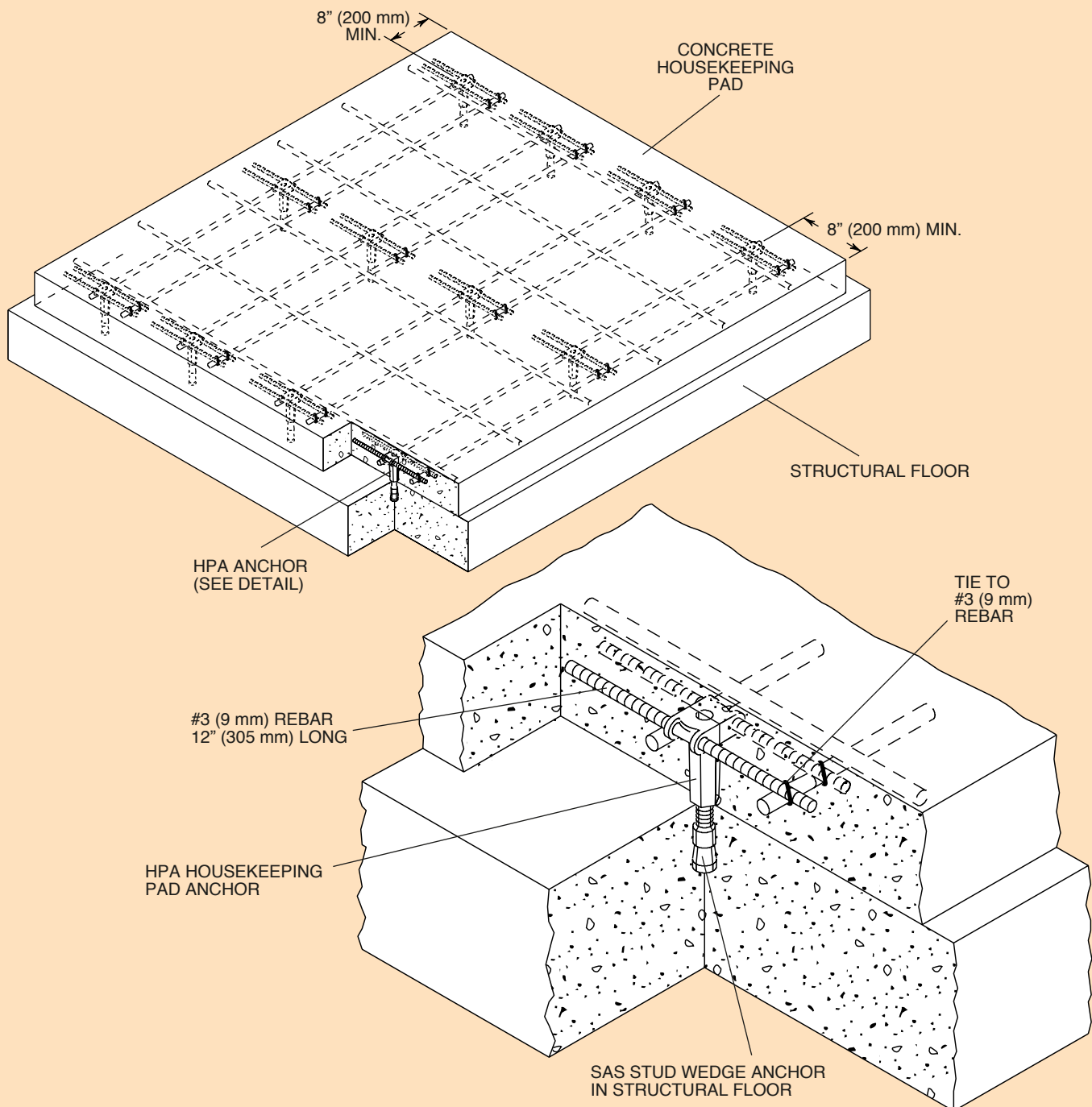
Assume 4 - 1500 lb. (680 kg.) equipment snubbers

Use 8 - 1/2" (13 mm) HPA

Use 4 - Additional 1/2"(13 mm) HPA down center of pad.

**Installation Procedure**

1. Lay out perimeter of housekeeping pad.
2. Drill 12- 1/2" (13 mm) holes in the structural floor 3" (76 mm) deep in the HPA locations shown on the drawing. If you hit rebar, shift the location.
3. Insert the 12- SAS 1/2" (13 mm) anchors and place a 1/2" (13 mm) standard washer over the stud.
4. Screw the small end of the HPA anchor on to the stud and tighten it hard with an adjustable or pipe wrench.
5. Insert the 12" (305 mm) long #3 (9 mm) rebars through the tops.
6. Tie the reinforcing bars in place as shown on the drawing.
7. Complete the forms and pour the housekeeping pad, preferably with isolator, snubber or equipment anchor bolts in place to avoid the need to drill in anchors.



# SAA, SAB & SAS

Anchorage of equipment in seismic zones is an important part of system restraint. When anchoring to concrete there are a variety of methods available. One excellent method is an Adhesive Anchor. It can be used in all non-overhead applications. An advantage is the lower reduction factors for closer spacings and edge distances. The style SAA Seismic Adhesive Anchor is a female anchor utilizing a cap screw to fasten to equipment. As with our style SAB anchor, equipment or restraints do not need to be lifted up and over studs for installation or removal. The SAA anchor is weather resistant and can even be installed in water filled holes.

Another excellent device is the wedge type expansion anchor. It provides the highest design load for the smallest hole size. Since it is load assisted, it provides excellent resistance to

vibration and shock loads. Its slip potential is actually a positive feature in seismic applications, giving early warning of potential failure whereas other anchors just fail catastrophically.

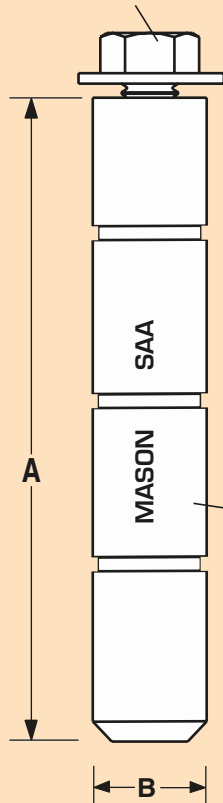
Mason offers two types of wedge anchors. Our SAB seismic anchor is a female wedge utilizing a cap screw to fasten to equipment. This design is for use with restrained mounts where periodic removal and inspection of the mounts may be required. The benefit is that it does not require lifting of mounts or equipment over a stud.

Mason's SAS seismic anchor stud is the same wedge design as the SAB seismic anchor. We offer this for suspension applications such as our SCB, seismic cable brace system, for use on piping and suspended equipment.

## SAA-

### Female Adhesive Seismic Anchor

"CS" CAP SCREW WITH STANDARD WASHER



### TYPE SAA FEMALE SEISMIC ANCHOR RATINGS (In normal weight concrete $F_c = 2500$ psi (17Mpa) min.)

Type & Size	Embedment (in) (mm)	Tension		Tension with 33% Increase*		Shear		Shear with 33% Increase*		Drill Bit Diameter (in)(mm)	Number of Anchors that can be installed per 22 oz Cartridge of Adhesive	
		(lbs)	(kgs) <sup>†</sup>	(lbs)	(kgs) <sup>†</sup>	(lbs)	(kgs) <sup>†</sup>	(lbs)	(kgs) <sup>†</sup>			
SAA-3/8	4	102	1560	708	2075	941	1100	499	1465	665	7/8 22	28
SAA-1/2	5	127	2840	1288	3775	1712	1960	889	2605	1182	1 25	19
SAA-5/8	6	152	4520	2050	6010	2726	3070	1393	4085	1853	1 1/8 29	13
SAA-3/4	7	175	5820	2645	7760	3527	4420	2009	5880	2672	1 1/8 29	11

### TYPE SAA FEMALE SEISMIC ANCHOR DIMENSIONS

Type & Size	A (in) (mm)	B (in) (mm)	CS Capscrew (in) (mm)
SAA-3/8	4 102	3/4 19	3/8-16 UNC x 1 3/4 x44
SAA-1/2	5 127	7/8 22	1/2-13 UNC x 2 x51
SAA-5/8	6 152	1 25	5/8-11 UNC x 2 x51
SAA-3/4	7 175	1 25	3/4-10 UNC x 2 x51

### CURE TIME FOR SAA ADHESIVE

Temperature (°F) (°C)	Cure Time (hours)	Bolt Up Time (hours)
40	4	48
65	18	36
70	21	24
80	26	12
100	37	6

### ALLOWABLE SPACING AND EDGE DISTANCE

Parameter		Critical Distance for Full Anchor Capacity	Minimum Distance for Reduced Anchor Capacity (in) (mm)	Reduction Factor
Distance Between Anchors		24D	8D	0.9
Edge Distances	Tension	12D	SAA-3/8 1 3/4 44 SAA-1/2 3 1/2 89 SAA-5/8 4 102 SAA-5/8 4 102	0.7
	Shear	12D	4D	0.21

### Anchor is ASTM A36, Capscrew is ASTM A307

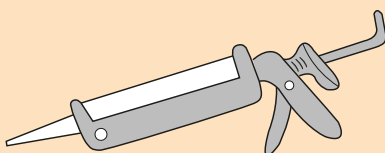
<sup>†</sup>For Kn divide Kg by 102.

The load values above are multiplied by the reduction factor, when anchors are installed at the minimum distance listed. Use linear interpolation for spacing between critical and minimum distances.

\*Loads may be increased 33% as allowed by code for seismic and wind loads. Tabulated loads are the lowest of either the bond strength, allowable steel strength for the anchor, or allowable steel strength of the capscrew. Anchors are to be installed in locations with an ambient temperature of 70°F(21°C). Contact Mason Industries if service temperature will vary ±35°F(±20°C) for reduction factor. Special inspection must be provided as described in the code. Anchor adhesive has ICBO report ER-5000.

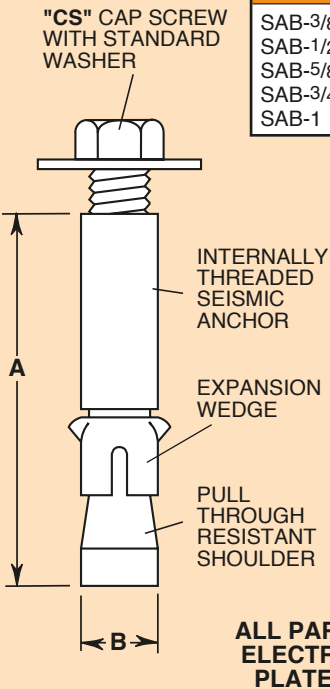
For combined tension and shear forces on anchors, use the following equations:  
 $(P_s/P_t)^{5/3} + (V_s/V_t)^{5/3} \leq 1.0$ , where:  $P_s$  and  $V_s$  are Applied Forces  
 and  $P_t$  and  $V_t$  are Allowable Forces

SAA anchor adhesive is easily applied with a special caulk gun.



**SAB-**

**Female Wedge Seismic Anchor**



**TYPE SAB FEMALE SEISMIC ANCHOR RATINGS Installed into 3000 psi (20 Mpa) concrete**

Type & Size	Minimum Anchor Embedment (in) (mm)	Minimum Edge Distance (in) (mm)	Minimum Anchor Spacing (in) (mm)	Stone Aggregate Concrete						Lightweight Concrete	
				Tension* (lbs) (kg) <sup>†</sup>	Tension with 33% Increase** (lbs) (kg) <sup>†</sup>	Shear (lbs) (kg) <sup>†</sup>	Shear with 33% Increase** (lbs) (kg) <sup>†</sup>	Tension* (lbs) (kg) <sup>†</sup>	Shear (lbs) (kg) <sup>†</sup>		
SAB-3/8	25/8 <b>67</b>	5 1/4 <b>133</b>	7 7/8 <b>200</b>	720 <b>327</b>	958 <b>435</b>	1050 <b>476</b>	1396 <b>633</b>	-	-	-	-
SAB-1/2	3 1/2 <b>89</b>	7 <b>178</b>	10 1/2 <b>267</b>	1010 <b>458</b>	1343 <b>609</b>	1830 <b>830</b>	2434 <b>1104</b>	800 <b>363</b>	1500 <b>680</b>	-	-
SAB-5/8	4 3/8 <b>111</b>	8 3/4 <b>222</b>	13 1/8 <b>333</b>	2220 <b>1007</b>	2953 <b>1339</b>	2970 <b>1347</b>	3950 <b>1792</b>	1625 <b>737</b>	2720 <b>1234</b>	-	-
SAB-3/4	5 1/4 <b>133</b>	10 1/2 <b>267</b>	15 3/4 <b>400</b>	2330 <b>1057</b>	3099 <b>1406</b>	3340 <b>1515</b>	4442 <b>2015</b>	-	-	-	-
SAB-1	5 3/4 <b>146</b>	11 1/2 <b>292</b>	17 1/4 <b>438</b>	3660 <b>1524</b>	4868 <b>2027</b>	6610 <b>2998</b>	8791 <b>3987</b>	-	-	-	-

\*These tension values are applicable when the anchors are installed without special inspection as set forth in Section 1701.1 of UBC. When anchors are installed with special inspection as set forth in Section 1701.1 of the UBC, the tabulated values may be increased by 100%.

<sup>†</sup>For kN divide kg by 102

Notes: The tabulated values are for anchors installed at the specified spacings and edge distance. Spacings may be reduced by 67% provided the tension values are reduced to 50% (65% for SAB-1) and the shear values are reduced by 60%. Edge distances may be reduced by 50% provided the tension values are reduced by 30% and the shear values are reduced by 50%. Linear interpolation may be used for intermediate spacings.

For combined tension and shear forces on anchors, use the following equations:  
 $(P_s/P_t)^{5/3} + (V_s/V_t)^{5/3} < 1.0$ , where:  $P_s$  and  $V_s$  are Applied Forces  
 and  $P_t$  and  $V_t$  are Allowable Forces

\*\*Ratings may be increased 33 1/3% to accommodate periodic forces such as wind or seismic loads. Tabulated values include a safety factor of 8 to 1 for tension forces and 4 to 1 for shear forces.

For Stone Aggregate Concrete, refer to ICBO Report #ER-5063.

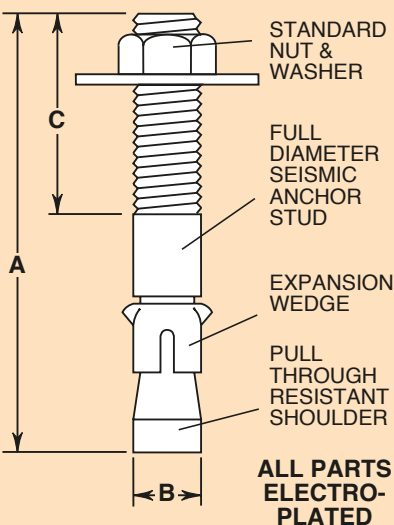
For Lightweight Concrete, refer to Techmar report #TR-1193.

**TYPE SAB FEMALE SEISMIC ANCHOR DIMENSIONS**

Size	A		B		CS	
	(in)	(mm)	(in)	(mm)	(in)	(mm)
SAB-3/8	25/16	<b>67</b>	1/2	<b>13</b>	3/8"-16 UNC x 1 1/4	<b>3/8"-16 UNC x 32</b>
SAB-1/2	3 1/16	<b>89</b>	5/8	<b>16</b>	1/2"-13 UNC x 1 1/2	<b>1/2"-13 UNC x 38</b>
SAB-5/8	3 13/16	<b>111</b>	7/8	<b>22</b>	5/8"-11 UNC x 1 3/4	<b>5/8"-11 UNC x 44</b>
SAB-3/4	4 5/8	<b>133</b>	1	<b>25</b>	3/4"-10 UNC x 2 1/4	<b>3/4"-10 UNC x 57</b>
SAB-1	5	<b>146</b>	1 1/4	<b>32</b>	1"- 8 UNC x 2 1/2	<b>1"- 8 UNC x 64</b>

**SAS-**

**Male Wedge Seismic Anchor Stud**



**TYPE SAS SEISMIC ANCHOR STUD RATINGS**

Type & Size	STONE AGGREGATE CONCRETE								LIGHTWEIGHT CONCRETE FILLED STEEL DECK	
	3000 psi (20 Mpa)				4000 psi (27 Mpa)				3000 psi (20 Mpa)	
	Tension* (lbs) (kg) <sup>†</sup>	Tension with 33% Increase** (lbs) (kg) <sup>†</sup>	Shear (lbs) (kg) <sup>†</sup>	Shear with 33% Increase** (lbs) (kg) <sup>†</sup>	Tension* (lbs) (kg) <sup>†</sup>	Tension with 33% Increase** (lbs) (kg) <sup>†</sup>	Shear (lbs) (kg) <sup>†</sup>	Shear with 33% Increase** (lbs) (kg) <sup>†</sup>	Tension* (lbs) (kg) <sup>†</sup>	Shear (lbs) (kg) <sup>†</sup>
SAS-3/8	325 <b>146</b>	435 <b>198</b>	765 <b>347</b>	1020 <b>465</b>	330 <b>150</b>	440 <b>200</b>	770 <b>350</b>	1027 <b>467</b>	300 <b>136</b>	1015 <b>461</b>
SAS-1/2	595 <b>270</b>	795 <b>361</b>	1540 <b>699</b>	2053 <b>935</b>	616 <b>280</b>	821 <b>373</b>	1565 <b>711</b>	2086 <b>948</b>	430 <b>195</b>	1260 <b>573</b>
SAS-5/8	885 <b>402</b>	1180 <b>536</b>	2260 <b>1025</b>	3013 <b>1370</b>	945 <b>430</b>	1260 <b>573</b>	2440 <b>1110</b>	3253 <b>1479</b>	525 <b>238</b>	1470 <b>668</b>
SAS-3/4	1095 <b>498</b>	1460 <b>664</b>	3650 <b>1660</b>	4866 <b>2212</b>	1095 <b>498</b>	1460 <b>664</b>	3650 <b>1660</b>	4866 <b>2212</b>	640 <b>291</b>	2010 <b>914</b>
SAS-1	-	-	-	-	4815 <b>2184</b>	-	9355 <b>4243</b>	-	-	-

\*These tension values are applicable when the anchors are installed without special inspection as set forth in Section 1701.1 of the UBC or Section 1704 of the IBC. When anchors are installed with special inspection as set forth in Section 1701.1 of the UBC or Section 1704 of the IBC, the tabulated values may be increased by 100%.

<sup>†</sup>For kN divide kg by 102

Notes: The tabulated values are for anchors installed at the specified spacings and edge distances. Spacings may be reduced by 50% provided the shear and tension values are reduced by 40%. Edge distances may be reduced by 50% provided the tension values are reduced by 40% and the shear values are reduced by 50%. Linear interpolation may be used for intermediate spacings.

For combined tension and shear forces on anchors, use the following equations:  
 $(P_s/P_t)^{5/3} + (V_s/V_t)^{5/3} < 1.0$ , where:  $P_s$  and  $V_s$  are Applied Forces  
 and  $P_t$  and  $V_t$  are Allowable Forces

\*\*Ratings may be increased 33 1/3% to accommodate periodic forces such as wind or seismic loads.

Ratings are from ICBO-ES Report 1821.

**TYPE SAS SEISMIC ANCHOR STUD DIMENSIONS**

Size	A		B		C		Minimum Anchor Embedment (in) (mm)	Minimum Edge Distance (in) (mm)	Minimum Anchor Spacing (in) (mm)			
	(in)	(mm)	(in)	(mm)	(in)	(mm)						
SAS-3/8	5	<b>127</b>	3/8	<b>10</b>	1 1/4	<b>32</b>	3	<b>76</b>	4 1/2	<b>114</b>	9	<b>229</b>
SAS-1/2	5 1/2	<b>140</b>	1/2	<b>13</b>	1 1/2	<b>38</b>	4	<b>102</b>	6	<b>152</b>	12	<b>305</b>
SAS-5/8	7	<b>178</b>	5/8	<b>16</b>	1 3/4	<b>44</b>	5	<b>127</b>	7 1/2	<b>190</b>	15	<b>381</b>
SAS-3/4	8 1/2	<b>216</b>	3/4	<b>19</b>	2	<b>51</b>	6	<b>152</b>	9	<b>229</b>	18	<b>457</b>
SAS-1	9	<b>229</b>	1	<b>25</b>	2 1/4	<b>57</b>	6 3/4	<b>171</b>	10	<b>254</b>	20	<b>508</b>