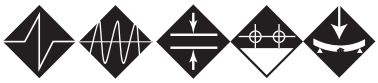
53.1 GENERAL INFORMATION

PERFORMANCE RELATED	MATERIAL SPECIFICATION	INSTALLATION RELATED
		

Product

Reo 502™ SA is an extra heavy duty pure epoxy anchoring adhesive for use in Seismic & cracked concrete conditions.

ETA CE

ICC EVALUATION SERVICE

Benefits, Advantages and Features

ICC-ES Evaluation Report certification for use in cracked and non-cracked concrete with Category 1 Seismic Performance - ESR-3614.
European Technical Approval option 1 for use in cracked and non-cracked concrete with Category 1 Seismic Performance - ETA-14/0174:

- Variable embedment depths available
- Approved for flooded holes
- Approved for all directions (floor, wall, overhead)
- Approved for Seismic Load Conditions

Greater productivity:

- Anchors in dry, damp, wet or flooded holes – no weather delays
- No damage/leaks - less wastage
- Easy dispensing - more efficient

Greater security:

- Highest performance in Seismic & cracked concrete

Versatile:

- Anchors in dry, damp, wet and flooded holes
- Anchors in carbide drilled and diamond cored holes
- For tropical and temperate climates
- Available in 600ml side by side cartridge

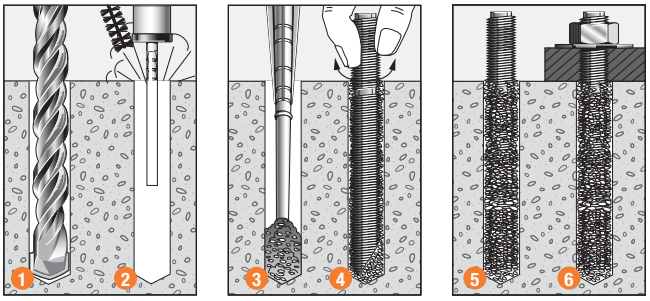
Greater safety:

- Low odour
- Non-flammable

Principal Applications

- Threaded studs
- Starter bars
- Reinforcing bar
- Threaded inserts
- Over-head installation
- Steel columns
- Base plates
- Seismic strengthening

Installation



1. Drill recommended diameter and depth hole.
2. **Important:** Use **Ramset™** Dustless Drilling System to ensure holes are clean. Alternatively, clean dust and debris from hole with stiff wire or nylon brush and blower in the following sequence: blow x 4, brush x 3, blow x 4, brush x 3, blow x 4.
3. Insert mixing nozzle to bottom of hole. Fill hole to 3/4 the hole depth slowly, ensuring no air pockets form.
4. Insert **Ramset™** ChemSet™ Anchor Stud/rebar to bottom of hole while turning.
5. Allow Reo 502™ SA to cure as per setting times.
6. Attach fixture.

Recommended Installation Temperatures

	Minimum	Maximum
Substrate	0°C	40°C
Adhesive	5°C	40°C

Service Temperature Limits

-40°C to 80°C

Setting Times

Substrate Temperature (°C)	Gel Time (mins.)	Cure Time (hours)
5 - 10	20	24
10 - 15	20	12
15 - 20	15	8
20 - 25	11	7
25 - 30	8	6
30 - 35	6	5
35 - 40	4	4
+40	3	3

Installation and seismic performance details:

Anchor size, d_b (mm)	Drilled hole diameter, d_h (mm)	Fixture hole diameter, d_f (mm)	Anchor effective depth, h (mm)	Tightening torque, T_r (Nm)	Optimum dimensions*			Seismic Cracked Concrete reduced characteristic tensile capacity, 0.75ØN_{uc} (kN) **		
					Anchor spacing, a_c (mm)	Edge distance, e_c (mm)	Concrete substrate thickness, b_m (mm)	Concrete Compressive Strength, f'$_c$		
								20 MPa	30 MPa	40 MPa
M10	12	12	90	20	270	135	135	11.2	12.4	12.4
M12	14	15	110	40	330	165	165	15.1	17.4	17.4
M16	18	20	125	80	375	188	188	18.3	23.2	24.6
M20	22	24	150	135	450	225	225	24.1	30.4	34.2
			170		510	255	255	29.0	36.7	38.8
M24	26	28	160	200	480	240	240	26.5	33.5	37.5
			210		630	315	315	39.9	50.4	52.9
M30	35	33	270	270	810	405	405	58.1	73.5	73.5

*Note: For anchor spacings or edge distances less than the optimum, please refer to the simplified strength limit state design process to verify capacity.
** Note: Tension values are based on service temperature limits -40˚C to +43˚C only. If service temperature limits is beyond this range please contact Ramset Engineer.
For max. short term temp. of 72ºC multiply 0.75ØN_{uc} * 0.4. For WET HOLES multiply 0.75ØN_{uc} * 0.7

53.2 DESCRIPTION AND PART NUMBERS

Description	Cartridge Size	Part No.
Reo 502™ Seismic Anchor (Reo502SA)	600 ml	**REO502M600**
Applicator Tool for Reo502SA	-	**CRA**

53.3 ENGINEERING PROPERTIES
Chemset™ Anchor Studs and Threaded Rod

Anchor Size, d_b	Grade 8.8 Threaded Rod				Stainless Steel High Corrosion Resistance HCR Grade 1.4529/1.4565 Threaded Rod				Section modulus Z (mm^2)
	Shank diameter, d_s (mm)	Stressed Area (mm^2)	Yield Strength f_y MPa	UTS f_u MPa	Shank diameter, d_s (mm)	Stressed Area (mm^2)	Yield Strength f_y MPa	UTS f_u MPa	
M10	8.6	58	640	800	8.2	52.8	450	650	62.3
M12	10.4	84.3	640	800	10	78.5	450	650	109.2
M16	14.1	157	640	800	14	153.9	450	650	277.5
M20	17.7	245	640	800	17.2	232.4	450	650	540.9
M24	21.2	353	640	800	20.7	336.5	450	650	935.5
M30	26.7	561	640	800	-	-	-	-	-

Refer to "Engineering Properties" for ChemSet™ Anchor Studs Grade 5.8 and AISI 316 Stainless Steel on page 43.

STEP 1 Select anchor to be evaluated

Table 1a - Indicative combined loading - interaction diagram

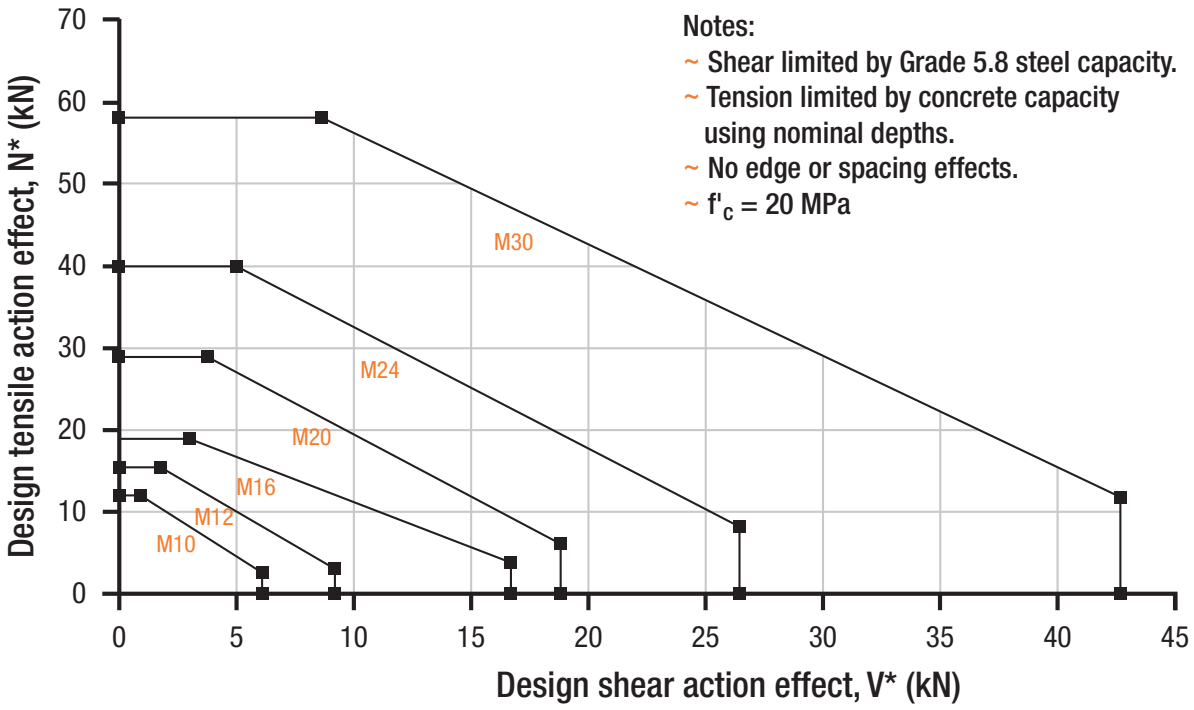


Table 1b - Absolute minimum edge distance and anchor spacing values, e_m and a_m (mm) for cracked concrete

Anchor size, d_b	M10	M12	M16	M20	M24	M30
Min. Anchor spacing - a_m	40	40	45	50	55	65
Min. Edge Distance - e_m	40	40	45	50	55	65

Step 1c Calculate anchor effective depth, h (mm)

Refer to “Description and Part Numbers” table for ChemSet™ Anchor Studs on page 43.

Effective depth, h (mm)

Preferred h = h_n otherwise,

$$h = L_e - t$$

$$h \geq 6 * d_h$$

t = total thickness of material(s) being fastened.

Checkpoint 1 **Anchor size determined, absolute minima compliance achieved, effective depth (h) calculated.**

STEP 2 Verify seismic cracked concrete tensile resistance - per anchor

Table 2a Seismic cracked concrete tensile resistance, 0.75ØN$_{uc}$ (kN), Ø$_c$ = 0.55, f'c = 20 MPa

Seismic cracked conrete pull-out bond resistance - 0.75ØN$_{ucp}$							Seismic Cracked Concrete Cone Resistance - 0.75ØN$_{ucc}$
Anchor size, d$_b$	M10	M12	M16	M20	M24	M30	
Drill hole dia, d$_h$ (mm)	12	14	18	22	26	35	
Effective depth, h (mm)							
70	9.6						7.7
80	11.0						9.4
90	**12.4**	14.3					**11.2**
100	13.7	15.9					13.1
110	15.1	**17.4**	21.7				**15.1**
120	16.5	19.0	23.6				17.2
125	17.2	19.8	**24.6**				**18.3**
140	19.2	22.2	27.6	31.9			21.7
150	20.6	23.8	29.5	34.2			24.1
160	22.0	25.4	31.5	36.5	40.3		26.5
170	23.4	27.0	33.5	**38.8**	42.8		**29.0**
180	24.7	28.6	35.5	41.1	45.3		31.6
190	26.1	30.1	37.4	43.3	47.9		34.3
200	27.5	31.7	39.4	45.6	50.4		37.0
210		33.3	41.4	47.9	**52.9**	57.1	**39.9**
240		38.1	47.3	54.7	60.5	65.3	48.7
270			53.2	61.6	68.0	**73.5**	**58.1**
320			63.0	73.0	80.6	87.1	75.0
350				79.8	88.2	95.2	85.8
400				91.2	100.8	108.9	104.8
450					113.4	122.5	125.0
480					120.9	130.6	137.7
550						149.7	168.9
600						163.3	192.5

Bold values are at ChemSet Anchors Stud nominal depths

Note: Effective depth, h must be ≥ 6 x drilled hole diameter, dh for anchor to achieve tabled shear capacities.

Ø = 0.55 is based on using load combinations of ACI 318 Appendix C

Wet Holes in cracked concrete: Multiply N$^0_{Rd,p,sis}$*0.7

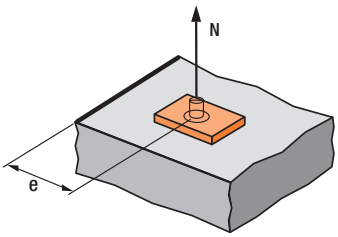
If Service temperature limit is -40°C to +72°C then	If Service temperature limit is -40°C to +43°C then
ØN$_{uc}$ = ØN$_{ucp}$ Calculate as per Checkpoint 2a only	**Proceed to calculate the design tensile resistance for both Pullout Bond and Concrete Cone Resistance. Calculate as per Checkpoint 2a and Checkpont 2b**

Table 2b-1 Seismic Cracked concrete service temperature limits effect, tension, X$_{ns}$

Anchor size, d$_b$	Service temperature limits effect, tension, X$_{ns}$ where ØN$_{uc}$ = ØN$_{ucp}$ (from Table 2a)						X$_{ns}$ where ØN$_{uc}$ = ØN$_{ucc}$ (from Table 2a)
	M10	M12	M16	M20	M24	M30	
Service temperature (°C)							
-40°C to +43°C	1.00	1.00	1.00	1.00	1.00	1.00	1.00
-40°C to +72°C	0.41	0.40	0.40	0.40	0.41	0.40	1.00

Table 2b-2 Seismic Cracked concrete compressive strength effect, tension, X$_{nc}$

Anchor size, d$_b$	Concrete compressive strength effect, tension, X$_{nc}$ where ØN$_{uc}$ = ØN$_{ucp}$ (from Table 2a)						X$_{nc}$ where ØN$_{uc}$ = ØN$_{ucc}$ (from Table 2a)
	M10	M12	M16	M20	M24	M30	
f'c (MPa)							
20	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25	1.00	1.00	1.00	1.00	1.00	1.00	1.12
32	1.00	1.00	1.00	1.00	1.00	1.00	1.26
40	1.00	1.00	1.00	1.00	1.00	1.00	1.41
50	1.00	1.00	1.00	1.00	1.00	1.00	1.58



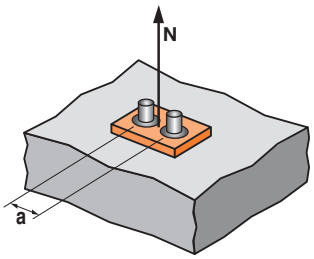
Pull-out Bond Resistance
$X_{ne} = 0.7 + 0.3*e/C_{Na}$
Where $e_m \le e \le C_{Na}$
$C_{Na} = 12.8*d_b$

Concrete Cone Resistance
$X_{ne} = 0.7 + 0.3*e/1.5*h$
Where $e_m \le e \le e_c$
$e_c = 1.5*h$

Note: Tabled values are based on the nominal effective depth, h shown in the installation details. For other values of X_{ne}, please use equation shown above.

Table 2c - Seismic cracked concrete Edge distance effect, tension, X_{ne}

Anchor size, d_b	M10	M12	M16	M20	M20	M24	M24	M30
Effective depth, h (mm)	90	110	125	150	170	160	210	270
Absolute min. e_m (mm)	40	40	45	50	50	55	55	65
Edge distance, e (mm)								
40	0.79	0.77	0.76	0.75	0.75	0.75	0.74	0.73
65	0.84	0.82	0.80	0.79	0.78	0.78	0.76	0.75
85	0.89	0.85	0.84	0.81	0.80	0.81	0.78	0.76
90	0.90	0.86	0.84	0.82	0.81	0.81	0.79	0.77
105	0.93	0.89	0.87	0.84	0.82	0.83	0.80	0.78
110	0.94	0.90	0.88	0.85	0.83	0.84	0.80	0.78
120	0.97	0.92	0.89	0.86	0.84	0.85	0.81	0.79
135	1.00	0.95	0.92	0.88	0.86	0.87	0.83	0.80
165		1.00	0.96	0.92	0.89	0.91	0.86	0.82
190			1.00	0.95	0.92	0.94	0.88	0.84
225				1.00	0.96	0.98	0.91	0.87
255					1.00	1.00	0.94	0.89
320							1.00	0.94
380								0.98
410								1.00



Pull-out Bond Resistance
$X_{na} = 1 + [a*(n-1)/2C_{Na}]$
Where $a_m \le a \le 2C_{Na}$ and $e \ge C_{Na}$
$C_{Na} = 12.8*d_b$

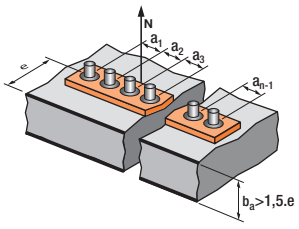
Concrete Cone Resistance
$X_{na} = [9*h^2 + 3*h*a*(n-1)]/9*h^2$
Where $a_m \le a \le a_c$ and $e \ge 1.5*h$
$a_c = 3*h$

Note: Tabled values are based on the nominal effective depth, h shown in the installation details. For other values of X_{ne}, please use equation shown above.

Table 2d - Seismic cracked concrete anchor spacing effect, tension, X_{na}
For Single Anchor - X_{na} = 1.00
For Pull-out bond resistance - edge distance $e \ge C_{Na}$ and $C_{Na} = 12.8*d_b$
For Concrete Cone Resistance - edge distance $e \ge 1.5*h$

For 2 anchors only where edge distance $e \ge C_{Na}$ and $e \ge 1.5*h$

Anchor size, d_b	M10	M12	M16	M20	M20	M24	M24	M30
Effective depth, h (mm)	90	110	125	150	170	160	210	270
Anchor Spacing a (mm)								
40	1.15	1.12						
45	1.17	1.14	1.12					
50	1.19	1.15	1.13	1.11	1.10			
55	1.20	1.17	1.15	1.12	1.11	1.11	1.09	
65	1.24	1.20	1.17	1.14	1.13	1.14	1.10	1.08
100	1.37	1.30	1.27	1.22	1.20	1.21	1.16	1.12
150	1.56	1.45	1.40	1.33	1.29	1.31	1.24	1.19
175	1.65	1.53	1.47	1.39	1.34	1.36	1.28	1.22
270	2.00	1.82	1.72	1.60	1.53	1.56	1.43	1.33
330		2.00	1.88	1.73	1.65	1.69	1.52	1.41
375			2.00	1.83	1.74	1.78	1.60	1.46
450				2.00	1.88	1.94	1.71	1.56
510					2.00	2.06	1.81	1.63
630							2.00	1.78
810								2.00



For all cases including multiple anchor fastenings

Pull-out Bond Resistance
$X_{na} = [2C_{Na} + a*(n-1)]*[C_{Na} + e]/(2C_{Na})^2$
Where $a_m \le a \le 2C_{Na}$
and $e_m \le e \le C_{Na}$
$C_{Na} = 12.8*d_b$

Concrete Cone Resistance
$X_{na} = [(1.5*h + e) * (3*h + a*(n-1))] / 9*h^2$
Where $a_m \le a \le a_c$
$a_c = 3*h$
and where $e_m \le e \le e_c$
$e_c = 1.5*h$

Table 2e - Seismic cracked concrete multiple anchors effect, tension, X_{nn}

Number of Anchors, n	1	2	3	4	6	8	10	20
X_{nn}	1.00	0.50	0.33	0.25	0.17	0.13	0.10	0.05

Checkpoint 2a

Design seismic cracked concrete pull-out bond tensile resistance, $0.75ØN_{urcp}$

$$0.75ØN_{urcp} = 0.75ØN_{ucp} * X_{ns} * X_{nc} * X_{ne} * X_{na} * X_{nn}$$

Checkpoint 2b

Design seismic cracked concrete cone tensile resistance, $0.75ØN_{urcc}$

$$0.75ØN_{urcc} = 0.75ØN_{ucc} * X_{ns} * X_{nc} * X_{ne} * X_{na} * X_{nn}$$

Checkpoint 2c

Design seismic reduced ultimate cracked concrete tensile resistance, $0.75ØN_{urc}$

$$0.75ØN_{urc} = \text{minimum of } 0.75ØN_{urcp} \text{ and } 0.75ØN_{urcc}$$

STEP 3 Verify seismic cracked concrete steel tensile resistance - per anchor

Table 3a - Seismic Cracked Concrete steel resistance, tensile, $\alpha_{N,sis}ØN_{us}$ (kN) where α_{Nsis} = 1 and Ø = 0.65

Anchor size, d_b	M10	M12	M16	M20	M24	M30
Grade 5.8 Carbon Steel	18.9	27.4	51.0	79.6	114.7	182.3
Grade 8.8 Carbon Steel	30.2	43.8	81.6	127.4	183.6	291.7
A4 316 Stainless Steel	23.8	35.3	69.3	104.6	151.4	255.3

Checkpoint 3

Design seismic cracked tensile resistance, $ØN_{ur,sis}$

$$ØN_{ur,sis} = \text{minimum of } 0.75ØN_{urc}, \alpha_{N,sis}ØN_{us}$$

Check $N^*/ØN_{ur,sis} \leq 1$,
if not satisfied return to step 1

STEP 4 Step 4 - Verify seismic cracked concrete edge shear resistance - per anchor

Table 4a - Seismic cracked concrete edge resistance, $ØV_{uc,sis}$ (kN) where Ø = 0.70, f'_c = 20 MPa

Anchor size, d_b	M10	M12	M16	M20	M20	M24	M24	M30
Effective depth, h (mm)	90	110	125	150	170	160	210	270
Edge distance, e								
40	2.2	2.4	2.8	3.1	3.1	3.3	3.4	3.8
50	3.1	3.4	3.9	4.3	4.4	4.6	4.8	5.3
60	4.1	4.4	5.1	5.7	5.7	6.1	6.3	7.0
75	5.7	6.2	7.1	7.9	8.0	8.5	8.8	9.8
100	8.7	9.6	11.0	12.2	12.3	13.0	13.5	15.1
125	12.2	13.4	15.3	17.0	17.2	18.2	18.9	21.1
150	16.0	17.6	20.2	22.4	22.7	23.9	24.8	27.8
200	24.7	27.0	31.1	34.4	34.9	36.8	38.2	42.7
300	45.3	49.6	57.1	63.3	64.1	67.7	70.2	78.5
400	69.8	76.4	87.8	97.4	98.7	104.2	108.1	120.8
500	97.5	106.8	122.8	136.1	137.9	145.7	151.1	168.9
600	128.2	140.4	161.4	178.9	181.3	191.5	198.6	222.0
750	179.1	196.2	225.5	250.1	253.3	267.6	277.5	310.3
900	235.5	258.0	296.5	328.7	333.0	351.7	364.8	407.9

Table 4b - Cracked concrete compressive strength effect, shear, X_{vc}

f'_c (MPa)	20	25	32	40	50
X_{vc}	1.00	1.12	1.26	1.41	1.58

Table 4c - Cracked concrete load direction effect, concrete edge shear, X_{vd}

Angle, α °	0	10	20	30	40	50	60	71	80	90-180
X_{vd}	1.00	1.04	1.16	1.32	1.50	1.66	1.80	1.91	1.98	2.00

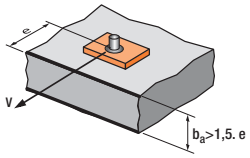
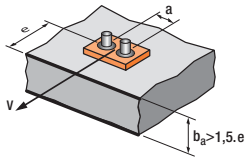


Table 4d-1 - Seismic Anchor spacing and edge distance area effect, X_{ve}

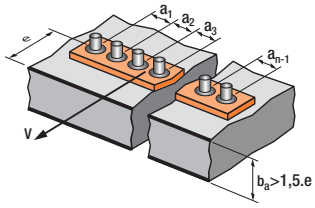
For single anchor fastening, X_{ve}

$$X_{ve} = b_a*(3*e)/4.5*e^2 \text{ where } b_a < 1.5*e$$
$$X_{ve} = 1 \text{ where } b_a > 1.5*e$$

For 2 anchor fastening based on listed substrate thickness, anchor spacing and edge distance, X_{ve}



Edge distance, e (mm)	40	45	50	55	60	75	125	200	300	400	600	900
1.5 x e (mm)	60	67.5	75	82.5	90	112.5	187.5	300	450	600	900	1350
Substrate Thickness, b_a (mm)	100	100	100	100	100	150	190	150	200	200	300	400
Anchor spacing, a (mm)												
40	1.33	1.30	1.27	1.24	1.22	1.18	1.11	0.53	0.46	0.34	0.34	0.30
45	1.38	1.33	1.30	1.27	1.25	1.20	1.12	0.54	0.47	0.35	0.34	0.30
50	1.42	1.37	1.33	1.30	1.28	1.22	1.13	0.54	0.47	0.35	0.34	0.30
60	1.50	1.44	1.40	1.36	1.33	1.27	1.16	0.55	0.47	0.35	0.34	0.30
75	1.63	1.56	1.50	1.45	1.42	1.33	1.20	0.56	0.48	0.35	0.35	0.30
150	2.25	2.11	2.00	1.91	1.83	1.67	1.40	0.63	0.52	0.38	0.36	0.31
200	2.67	2.48	2.33	2.21	2.11	1.89	1.53	0.67	0.54	0.39	0.37	0.32
300	3.50	3.22	3.00	2.82	2.67	2.33	1.80	0.75	0.59	0.42	0.39	0.33
400	4.33	3.96	3.67	3.42	3.22	2.78	2.07	0.83	0.64	0.44	0.41	0.34
500	5.17	4.70	4.33	4.03	3.78	3.22	2.33	0.92	0.69	0.47	0.43	0.35
625	6.21	5.63	5.17	4.79	4.47	3.78	2.67	1.02	0.75	0.51	0.45	0.36
750	7.25	6.56	6.00	5.55	5.17	4.33	3.00	1.13	0.81	0.54	0.47	0.38
875	8.29	7.48	6.83	6.30	5.86	4.89	3.33	1.23	0.88	0.58	0.50	0.39
1000	9.33	8.41	7.67	7.06	6.56	5.44	3.67	1.33	0.94	0.61	0.52	0.41
1250	11.42	10.26	9.33	8.58	7.94	6.56	4.33	1.54	1.06	0.68	0.56	0.43
1500	13.50	12.11	11.00	10.09	9.33	7.67	5.00	1.75	1.19	0.75	0.61	0.46
2250	19.75	17.67	16.00	14.64	13.50	11.00	7.00	2.38	1.56	0.96	0.75	0.54



For 2 & 3 anchor fastenings and more X_{ve}

$$X_{ve} = [(3*e) + a*(n-1)]*k/4.5*e^2$$
$$\text{where } k = \text{min. of } b_a, 1.5*e$$

Table 4d-2 - Seismic Anchor substrate thickness effect, X_{vb}

$$X_{vb} = SQRT(1.5*e/b_a)$$
$$\text{where } X_{vb} \text{ shall not be taken less than 1}$$

Edge distance, e (mm)	40	45	50	55	60	75	125	200	300	400	600	900
Substrate Thickness, b_a (mm)												
100	1.00	1.00	1.00	1.00	1.00	1.06	1.37	1.73	2.12	2.45	3.00	3.67
125	1.00	1.00	1.00	1.00	1.00	1.00	1.22	1.55	1.90	2.19	2.68	3.29
150	1.00	1.00	1.00	1.00	1.00	1.00	1.12	1.41	1.73	2.00	2.45	3.00
175	1.00	1.00	1.00	1.00	1.00	1.00	1.04	1.31	1.60	1.85	2.27	2.78
200	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.22	1.50	1.73	2.12	2.60
225	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.15	1.41	1.63	2.00	2.45
250	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.10	1.34	1.55	1.90	2.32
275	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.04	1.28	1.48	1.81	2.22
300	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.22	1.41	1.73	2.12
350	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.13	1.31	1.60	1.96
400	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.06	1.22	1.50	1.84

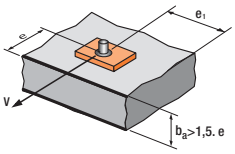


Table 4d-3 - Seismic Anchor Modification factor and Multiple anchors effect, concrete edge shear X_{vm}

Vertical Edge distance/Horizontal Edge distance, $e_1/e \leq 1.5$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.9	1	1.2	1.4	1.50
Number of anchors, n												
1	0.72	0.74	0.76	0.78	0.80	0.82	0.84	0.88	0.90	0.94	0.98	1.00
2	0.36	0.37	0.38	0.39	0.40	0.41	0.42	0.44	0.45	0.47	0.49	0.50
3	0.24	0.25	0.25	0.26	0.27	0.27	0.28	0.29	0.30	0.31	0.33	0.33
4	0.18	0.19	0.19	0.20	0.20	0.21	0.21	0.22	0.23	0.24	0.25	0.25
5	0.14	0.15	0.15	0.16	0.16	0.16	0.17	0.18	0.18	0.19	0.20	0.20
6	0.12	0.12	0.13	0.13	0.13	0.14	0.14	0.15	0.15	0.16	0.16	0.17
7	0.10	0.11	0.11	0.11	0.11	0.12	0.12	0.13	0.13	0.13	0.14	0.14
8	0.09	0.09	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.12	0.12	0.13
9	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.11	0.11
10	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.10	0.10
15	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.07	0.07
20	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05

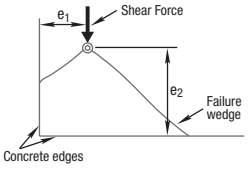
Table 4e - Cracked concrete Pryout failure, $\emptyset V_{cp,sis}$ (kN) $\emptyset$ = 0.55, f'_c = 20 MPa

Anchor size, d_b	M10	M12	M16	M20	M20	M24	M24	M30
Effective depth, h (mm)	90	110	125	150	170	160	210	270
-40˚C to +43˚C	29.8	40.3	48.8	64.2	77.4	70.7	106.3	155.0
-40˚C to +72˚C	13.4	18.7	26.3	36.3	41.1	43.8	57.5	78.4

Table 4f Anchor at a corner effect, concrete edge shear, X_{VS}

Note: For $e_1/e_2 > 1.25$, $X_{VS} = 1.0$

Edge distance, e_2 (mm)	25	30	35	50	60	75	125	200	300	400	600	900
Edge dustance, e_1 (mm)												
25	0.86	0.77	0.70	0.58	0.53	0.49	0.41	0.37	0.35	0.34	0.32	0.32
30	0.97	0.86	0.78	0.64	0.58	0.52	0.43	0.38	0.36	0.34	0.33	0.32
35	1.00	0.95	0.86	0.69	0.63	0.56	0.46	0.40	0.37	0.35	0.33	0.32
50	1.00	1.00	1.00	0.86	0.77	0.67	0.52	0.44	0.39	0.37	0.35	0.33
60	1.00	1.00	1.00	0.97	0.86	0.75	0.57	0.47	0.41	0.38	0.36	0.34
75	1.00	1.00	1.00	1.00	1.00	0.86	0.64	0.51	0.44	0.41	0.37	0.35
125	1.00	1.00	1.00	1.00	1.00	1.00	0.86	0.65	0.53	0.48	0.42	0.38
200	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.86	0.67	0.58	0.49	0.42
300	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.86	0.72	0.58	0.49
400	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.86	0.67	0.55
500	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.77	0.61
600	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.86	0.67
900	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.86



ANCHOR AT A CORNER

Checkpoint 4a

Design seismic cracked concrete edge shear resistance, $\emptyset V_{urc,sis}$

$$\emptyset V_{urc,sis} = \emptyset V_{uc,sis} * X_{vc} * X_{vd} * X_{ve} * X_{vb} * X_{vm} * X_{vs}$$

Checkpoint 4b

Design seismic cracked concrete Pryout failure, $\emptyset V_{crp,sis}$

$$\emptyset V_{crp,sis} = \emptyset V_{cp,sis} * X_{nc} * X_{ne} * X_{na} * X_{nn}$$

STEP 5

Table 5a - Seismic Cracked Concrete steel resistance, shear, $\alpha_{V,sis}ØV_{us}$ (kN) where Ø = 0.60

$\alpha_{V,sis}$ = 0.58 for M10
$\alpha_{V,sis}$ = 0.57 for M12 and M16
$\alpha_{V,sis}$ = 0.42 for M20, M24 and M30

Anchor size, d_b	M10	M12	M16	M20	M24	M30
Grade 5.8 Carbon Steel	6.1	8.7	16.1	18.5	26.7	42.4
Grade 8.8 Carbon Steel	9.7	13.9	25.8	29.6	42.7	67.9
A4 316 Stainless Steel	8.5	12.1	22.5	25.9	37.4	59.4

Checkpoint 5

Design seismic cracked shear resistance, $ØV_{ur,sis}$
$ØV_{ur,sis}$ = minimum of $ØV_{urc,sis}$, $ØV_{crp,sis}$, $\alpha_{V,sis}ØV_{us}$
Check $V^*/ØV_{ur,sis} \leq 1$,
if not satisfied return to step 1

Checkpoint 6

Check
$N^*/ØN_{ur,sis} + V^*/ØV_{ur,sis} \leq 1.2$,
if not satisfied return to step 1

Specify

Ramset™ Reo502™SA with (Anchor Size) grade 5.8 Chemset Drilled Hole Depth to be (h) mm.

Example

Ramset™ Chemset™ Injection Reo502™SA with M16 grade 5.8 Chemset™ Anchor Stud (CS16190GH). Drilled hole depth to be 125 mm. To be installed according to Ramset™ Technical Data Sheet.