AVAILABLE IN NEW ZEALAND ONLY (Australia refer to ChemSet™ Reo 502™)

9.1 GENERAL INFORMATION

PERFORMANCE RELATED	INSTALLATION RELATED
	

Product

Epcon C6 is a versitile pure epoxy anchoring adhesive

Benefits, Advantages and Features

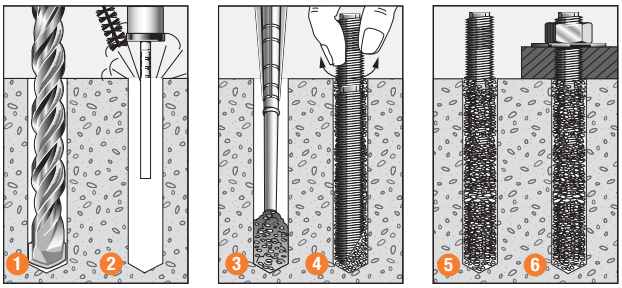
Features

- Superior strength in shallow embedment.
- Close to edge, stress free anchoring.
- Suitable for use with zinc plated, hot dipped galvanized or stainless steel Chemset Anchor Studs.
- Resistant to cyclic loading and vibration.
- Resistant to alkaline conditions.
- Suitable for use in core drilled holes.
- Superior strength with grade 5.8 steel Chemset Anchor Studs.
- Suitable for underwater installations.

Principal Applications

- **Structural beams and columns**
- **Batten fixing**
- **Installing, handrails, balustrades and gates**
- **Racking**
- **Safety barriers**
- **Stadium seating**
- **Machinery and heavy plant hold down**

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 to cure as per setting times.
6. Attach fixture.

Installation temperature limits:

- Substrate: 5°C to 40°C.
- Mortar: 15°C to 35°C.

Load should not be applied to anchor until the chemical has sufficiently cured as specified.

Approximate Setting Times

Substrate Temperature	Epcon C6 Gel Time (mins)	Epcon C6 Loading Time (hrs)
40°C	-	-
30°C	11	2
25°C	15	2.5
20°C	20	3
15°C	32	6
10°C	45	12
5°C	60	24
0°C		

Note: Cartridge temperature minimum 15°C.

Note: Cure time extended in flooded conditions. Refer to technical data sheet.

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Installation and performance details: Epcon™ C6 Series and ChemSet™ Anchor Studs

Anchor size, d_b (mm)	Installation details				Optimum dimensions*		
	Drilled hole diameter, d_h (mm)	Fixture hole diameter, d_f (mm)	Anchor effective depth, h (mm)	Tightening torque, T_r (Nm)	Edge distance, e_c (mm)	Anchor spacing, a_c (mm)	Substrate thickness b_m (mm)
M8	10	10	80	10	35	50	100
M10	12	12	90	20	40	60	120
M12	14	15	110	40	50	70	140
M16	18	20	125	95	65	100	160
M20	24	24	150	180	80	120	190
			170				220
M24	26	28	160	315	100	145	200
			210				270

*Note: For shear loads acting towards an edge or where these optimum dimensions are not achievable, please use the simplified strength limit state design process to verify capacity.

Anchor size, d_b (mm)	Reduced Characteristic Capacity#								
	Grade 5.8 Steel Studs		Grade 8.8 Steel Studs		AISI 316 Stainless Steel Studs		Concrete		
							Tension, $ØN_{uc}$ (kN)**		
	Shear, $ØV_{us}$(kN)	Tension, $ØN_{us}$(kN)***	Shear, $ØV_{us}$(kN)	Tension, $ØN_{us}$(kN)***	Shear, $ØV_{us}$(kN)	Tension, $ØN_{us}$(kN)***	Concrete compressive strength, f'_c		
							20 MPa	32 MPa	40 MPa
M8	8.9	14.3	14.5	23.4	10.7	14.9	15.2	17.6	18.7
M10	14.1	22.7	23.0	37.1	17.0	23.8	19.9	23	24.5
M12	21.0	33.8	33.5	54.0	25.3	35.3	29.0	33.5	35.7
M16	39.7	64.7	62.3	100.5	49.6	69.3	39.3	45.5	48.4
M20	59.9	97.6	97.2	156.8	74.9	104.6	56.5	65.4	69.6
							68.2	78.9	84.0
M24	86.8	141.3	140.1	225.9	108.5	151.4	66.9	77.4	82.4
							100.6	116.4	123.9

*Note: For shear loads acting towards an edge or where these optimum dimensions are not achievable, please use the simplified strength limit state design process to verify capacity.

**Note: Reduced characteristic ultimate concrete tensile capacity = $ØN_{uc}$ where Ø = 0.6 and N_{uc} = Characteristic ultimate concrete tensile capacity.
For conversion to Working Load Limit MULTIPLY $ØN_{uc}$ x 0.55

***Note: Reduced characteristic ultimate steel tensile capacity = $ØN_{us}$ where Ø = 0.8 and N_{us} = Characteristic ultimate steel tensile capacity (carbon steel).
For conversion to Working Load Limit MULTIPLY $ØN_{us}$ x 0.45

#Note: Design Tensile Capacity $ØN_{ur}$ = minimum of $ØN_{uc}$ and $ØN_{us}$ **WET HOLES: Multiply $ØN_{uc}$ x 0.7**

9.2 DESCRIPTION AND PART NUMBERS

Description	Cartridge Size	Part No.
Epcon™ C6EF	450 ml	C6EF-450
Epcon™ C6 Nozzles	-	ISNE
Dispensing Tool	-	E108

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.

Substrate thickness, b_m (mm)

$$b_m = \text{greater of: } 1.25 \times h, \; h + (2 \times d_h)$$

Drilled hole depth, h_1 (mm)
$h_1 = h$
h = Effective depth

9.3 ENGINEERING PROPERTIES

Refer to “Engineering Properties” for ChemSet™ Anchor Studs on page 43.

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STEP 1 Select anchor to be evaluated

Table 1a Indicative combined loading – interaction diagram

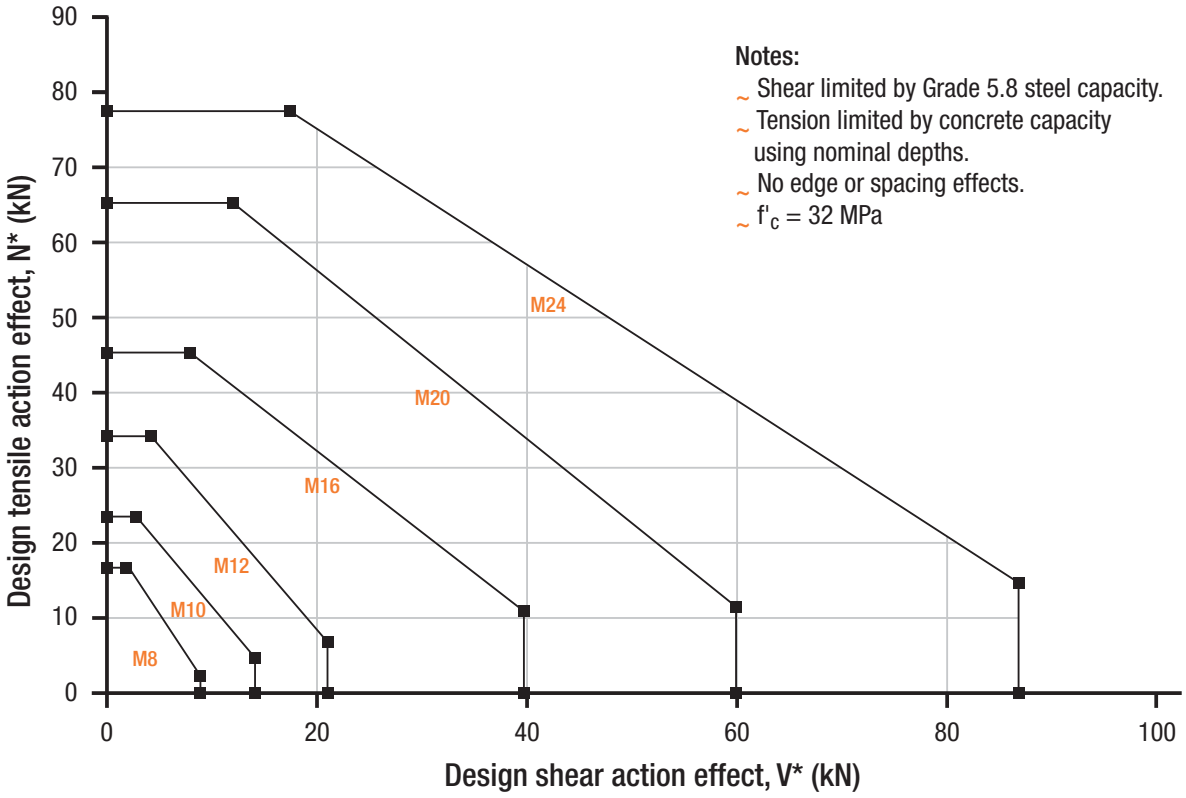

Table 1b Absolute minimum edge distance and anchor spacing values, e_m and a_m (mm)

Anchor size, d_b	M8	M10	M12	M16	M20	M24
e_m, a_m	25	30	35	50	60	75

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.**

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STEP 2 Verify concrete tensile capacity - per anchor

Table 2a Reduced characteristic ultimate concrete tensile capacity, ϕN_{uc} (kN), $\phi_c = 0.6$, $f'_c = 32$ MPa

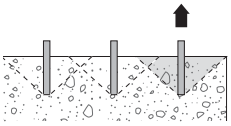
Anchor size, d_b	M8	M10	M12	M16	M20	M24
Drilled hole dia., d_h (mm)	10	12	14	18	24	26
Effective depth, h (mm)						
60	11.4					
65	12.9					
70	14.4	15.8				
80	**17.6**	19.3				
90	21.0	**23.0**	24.8			
100	24.6	26.9	29.0			
110		31.1	**33.5**	37.6		
120		35.4	38.2	42.8		
125		37.6	40.6	**45.5**		
140			48.1	53.9	59.0	
150			53.3	59.8	**65.4**	
160			58.8	65.9	72.0	**77.4**
170				72.2	78.9	84.8
180				78.6	86.0	92.4
190				85.3	93.2	100.2
200					100.7	108.2
210					108.3	116.4
220					116.2	124.8
230						133.4
240						142.2
250						151.2

Bold values are at ChemSet™ Anchor Stud nominal depths.
Note: Effective depth, h must be ≥ 6 x drilled hole diameter, d_h for anchor to achieve tabled shear capacities.

Table 2b Concrete compressive strength effect, tension, X_{nc}

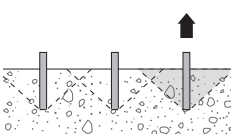
f'_c (MPa)	20	25	32	40	50
X_{nc}	0.87	0.93	1.00	1.07	1.14

Table 2c Edge distance effect, tension, X_{ne}



Anchor size, d_b	M8	M10	M12	M16	M20	M24
Edge distance, e (mm)						
25	0.85					
30	0.96	0.83				
35	1	0.91	0.81			
40		1	0.88			
50			1	0.85		
60				0.96	0.83	
65				1	0.87	
75					0.96	0.85
80					1	0.88
100						1

Table 2d Anchor spacing effect, end of a row, tension, X_{nae}
For single anchor design, X_{nae}=1.0



Anchor size, d_b	M8	M10	M12	M16	M20	M24
Anchor spacing, a (mm)						
25	0.76					
30	0.81	0.75				
35	0.86	0.79	0.74			
40	0.92	0.83	0.78			
50	1	0.92	0.85	0.76		
60		1	0.92	0.81	0.75	
75			1	0.89	0.81	0.76
100				1	0.92	0.85
120					1	0.92
150						1

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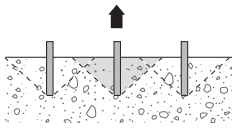

Table 2e Anchor spacing effect, internal to a row, tension, X_{nai}
For single anchor design, X_{nai}=1.0

Anchor size, d_b	M8	M10	M12	M16	M20	M24
Anchor spacing, a (mm)						
25	0.52					
30	0.63	0.50				
35	0.73	0.58	0.49			
40	0.83	0.67	0.56			
50	1	0.83	0.69	0.52		
60		1	0.83	0.63	0.50	
75			1	0.78	0.63	0.52
100				1	0.83	0.69
120					1	0.83
150						1

Table 2f Service temperature effect, tension, X_{ns}

Service Temp °C	<45	50	55	60	65	70	>70
X_{ns}	1.00	0.97	0.87	0.78	0.68	0.58	N/A

Table 2g Water in hole effect, tension, X_{nw}

Hole Condition	Dry	Damp	Wet
X_{nw}	1.00	1.00	0.70

Checkpoint 2

Design reduced ultimate concrete tensile capacity, $ØN_{urc}$

$$ØN_{urc} = ØN_{uc} * X_{nc} * X_{ne} * (X_{nae} \text{ or } X_{nai}) * X_{ns} * X_{nw}$$

STEP 3 Verify anchor tensile capacity - per anchor

Table 3a Reduced characteristic ultimate steel tensile capacity, $ØN_{us}$ (kN), $Ø_n$ = 0.8

Anchor size, d_b	M8	M10	M12	M16	M20	M24
ChemSet™ Anchor Stud Grade 5.8 Carbon Steel	14.3	22.7	33.8	64.7	97.6	141.3
ChemSet™ Anchor Stud A4/316 Stainless Steel	14.9	23.8	35.3	69.3	104.6	151.4
Typical Threaded Rod Grade 8.8 Carbon Steel	23.4	37.1	54.0	100.5	156.8	225.9

Step 3b Reduced characteristic ultimate bolt steel tensile capacity, $ØN_{tf}$ (kN)

Not appropriate for this product.

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Checkpoint 3

Design reduced ultimate tensile capacity, ϕN_{ur}

ϕN_{ur} = minimum of ϕN_{urc}, ϕN_{us}

Check $N^* / \phi N_{ur} \leq 1$,

if not satisfied return to step 1

Tensile performance conversion table

Performance Required	Concrete Tensile Performance		Steel Tensile Performance		
	Notation	Concrete Tension Capacity	Notation	Carbon Steel Tension Capacity	Stainless Steel Tension Capacity
Strength Limit State	ϕN_{urc}	MULTIPLY ϕN_{urc} x 1.00	ϕN_{us}	MULTIPLY ϕN_{us} x 1.00	MULTIPLY ϕN_{us} x 1.00
Working Load Limit	N_{ac}	MULTIPLY ϕN_{urc} x 0.55	N_{as}	MULTIPLY ϕN_{us} x 0.45	MULTIPLY ϕN_{us} x 0.50
Cyclic Loading	N_{yc}	MULITPLY ϕN_{urc} x 0.55	N_{ys}	MULITPLY ϕN_{us} x 0.45	MULITPLY ϕN_{us} x 0.50
Fire Resistance	$N_{Rk,c,fi,t}$	Refer to pages 238-257	$N_{Rk,s,fi,t}$	Refer to pages 238-257	Refer to pages 238-257
Cracked Concrete/Tension Zone	$N^0_{Rd,p}$	Refer to pages 258-298	$N_{Rd,s}$	Refer to pages 258-298	Refer to pages 258-298
Seismic	$N^0_{Rd,p,sis}$	Refer to pages 299-325	$N_{Rd,s,sis}$	Refer to pages 299-325	Refer to pages 299-325

NOTE: Design Tensile Capacity is the minimum of Concrete Tension and Steel Tension Capacities

STEP 4 Verify concrete shear capacity - per anchor

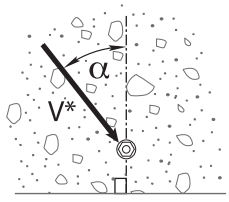
Table 4a Reduced characteristic ultimate concrete edge shear capacity, ϕV_{uc} (kN), $\phi_q = 0.6$, $f'_c = 32$ MPa

Anchor size, d_b	M8	M10	M12	M16	M20	M24
Edge distance, e (mm)						
25	1.6					
30	2.2	2.4				
35	2.7	3.0	3.2			
50	4.6	5.1	5.5	6.2		
60	6.1	6.7	7.2	8.2	9.4	
75	8.5	9.3	10.1	11.4	13.2	13.7
125	18.3	20.0	21.7	24.6	28.4	29.5
200	37.0	40.6	43.8	49.7	57.4	59.7
300	68.0	74.5	80.5	91.3	105.4	109.7
400	104.8	114.8	123.9	140.5	162.3	168.9
500	146.4	160.4	173.2	196.4	226.8	236.1
600	192.4	210.8	227.7	258.2	298.1	310.3

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

Table 4b Concrete compressive strength effect, concrete edge shear, X_{vc}

f'_c (MPa)	20	25	32	40	50
X_{vc}	0.79	0.88	1.00	1.12	1.25



Load direction effect, conc. edge shear, X_{vd}

Table 4c Load direction effect, concrete edge shear, X_{vd}

Angle, α°	0	10	20	30	40	50	60	70	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

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Table 4d Anchor spacing effect, concrete edge shear, X_{va}

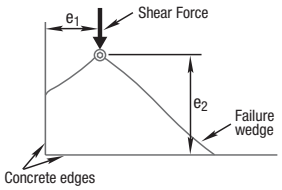
Note: For single anchor designs, $X_{va} = 1.0$

Edge distance, e (mm)	25	30	35	50	60	75	125	200	300	400	500	600
Anchor spacing, a (mm)												
25	0.70	0.67	0.64	0.60	0.58	0.57	0.54					
30	0.74	0.70	0.67	0.62	0.60	0.58	0.55	0.53				
35	0.78	0.73	0.70	0.64	0.62	0.59	0.56	0.54	0.52			
50	0.90	0.83	0.79	0.70	0.67	0.63	0.58	0.55	0.53	0.53		
60	0.98	0.90	0.84	0.74	0.70	0.66	0.60	0.56	0.54	0.53	0.52	
75	1.00	1.00	0.93	0.80	0.75	0.70	0.62	0.58	0.55	0.54	0.53	0.53
150			1.00	1.00	1.00	0.90	0.74	0.65	0.60	0.58	0.56	0.55
200						1.00	0.82	0.70	0.63	0.60	0.58	0.57
300							0.98	0.80	0.70	0.65	0.62	0.60
400							1.00	0.90	0.77	0.70	0.66	0.63
500								1.00	0.83	0.75	0.70	0.67
625									0.92	0.81	0.75	0.71
750									1.00	0.88	0.80	0.75
875										0.94	0.85	0.79
1000										1.00	0.90	0.83
1250											1.00	0.92
1500												1.00

Table 4e Multiple anchors effect, concrete edge shear, X_{vn}

Note: For single anchor designs, $X_{vn} = 1.0$

Anchor spacing / Edge distance, a / e	0.20	0.40	0.60	0.80	1.00	1.20	1.40	1.60	1.80	2.00	2.25	2.50
Number of anchors, n												
2	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3	0.72	0.76	0.80	0.83	0.86	0.88	0.91	0.93	0.95	0.96	0.98	1.00
4	0.57	0.64	0.69	0.74	0.79	0.82	0.86	0.89	0.92	0.94	0.97	1.00
5	0.49	0.57	0.63	0.69	0.74	0.79	0.83	0.87	0.90	0.93	0.97	1.00
6	0.43	0.52	0.59	0.66	0.71	0.77	0.81	0.85	0.89	0.93	0.96	1.00
7	0.39	0.48	0.56	0.63	0.69	0.75	0.80	0.84	0.88	0.92	0.96	1.00
8	0.36	0.46	0.54	0.61	0.68	0.74	0.79	0.84	0.88	0.92	0.96	1.00
9	0.34	0.44	0.52	0.60	0.67	0.73	0.78	0.83	0.87	0.91	0.96	1.00
10	0.32	0.42	0.51	0.59	0.66	0.72	0.77	0.82	0.87	0.91	0.96	1.00
15	0.26	0.37	0.47	0.55	0.63	0.70	0.76	0.81	0.86	0.90	0.95	1.00
20	0.23	0.35	0.45	0.54	0.61	0.68	0.75	0.80	0.85	0.90	0.95	1.00



ANCHOR AT A CORNER

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

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Checkpoint 4

Design reduced ultimate concrete edge shear capacity, $\emptyset V_{urc}$

$$\emptyset V_{urc} = \emptyset V_{uc} * X_{vc} * X_{vd} * X_{va} * X_{vn} * X_{vs}$$

STEP 5 Verify anchor shear capacity - per anchor

Table 5a Reduced characteristic ultimate steel shear capacity, $\emptyset V_{us}$ (kN), $\emptyset_v = 0.8$

Anchor size, d_b	M8	M10	M12	M16	M20	M24
ChemSet™ Anchor Stud Grade 5.8 Carbon Steel	8.9	14.1	21.0	39.7	59.9	86.8
ChemSet™ Anchor Stud A4/316 Stainless Steel	10.7	17.0	25.3	49.6	74.9	108.5
Typical Threaded Rod Grade 8.8 Carbon Steel	14.5	23.0	33.5	62.3	97.2	140.1

Step 5b Reduced characteristic ultimate bolt steel shear capacity, $\emptyset V_{sf}$ (kN)

Not appropriate for this product.

Checkpoint 5

Design reduced ultimate shear capacity, $\emptyset V_{ur}$

$$\emptyset V_{ur} = \text{minimum of } \emptyset V_{urc}, \emptyset V_{us}$$

Check $V^* / \emptyset V_{ur} \leq 1$, if not satisfied return to step 1

Shear performance conversion table

Performance Required	Concrete Shear Performance		Steel Shear Performance		
	Notation	Concrete Shear Capacity	Notation	Carbon Steel Shear Capacity	Stainless Steel Shear Capacity
Strength Limit State	$\emptyset V_{uc}$	MULTIPLY $\emptyset V_{uc}$ x 1.00	$\emptyset V_{us}$	MULTIPLY $\emptyset V_{us}$ x 1.00	MULTIPLY $\emptyset V_{us}$ x 1.00
Working Load Limit	V_{ac}	MULTIPLY $\emptyset V_{uc}$ x 0.55	V_{as}	MULTIPLY $\emptyset V_{us}$ x 0.50	MULTIPLY $\emptyset V_{us}$ x 0.52
Cyclic Loading	V_{vc}	MULITPLY $\emptyset V_{uc}$ x 0.55	V_{vs}	MULITPLY $\emptyset V_{us}$ x 0.50	MULITPLY $\emptyset V_{us}$ x 0.52
Fire Resistance	$V_{Rk,c,fi,t}$	Refer to pages 238-257	$V_{Rk,s,fi,t}$	Refer to pages 238-257	Refer to pages 238-257
Cracked Concrete/Tension Zone	$V^0_{Rd,c}$	Refer to pages 258-298	$V^0_{Rd,s}$	Refer to pages 258-298	Refer to pages 258-298
Seismic	$V^0_{Rd,c,sis}$	Refer to pages 299-325	$V^0_{Rd,s,sis}$	Refer to pages 299-325	Refer to pages 299-325

NOTE: Design Shear Capacity is the minimum of Concrete Shear and Steel Shear Capacities

STEP 6 Combined loading and specification

Checkpoint 6

Check

$$N^*/\emptyset N_{ur} + V^*/\emptyset V_{ur} \leq 1.2,$$

if not satisfied return to step 1

Example

Ramset™ Epcon™ C6 series with M16 grade 5.8 ChemSet™ Anchor Stud (CS16190). Drilled hole depth to be 125 mm.

To be installed in accordance with Ramset™ Technical Data Sheet.

Specify – Threaded Stud Anchors

Ramset™ Epcon™ C6 series with (Anchor Size) grade 5.8 ChemSet™ Anchor Stud ((Anchor Stud Part Number)). Drilled hole depth to be (h) mm.