RSS SHIELD ANCHOR

PRODUCT FEATURES

- Anchor placement flush with concrete surface.
- Shallow embedment depth.
- Temporary or permanent fixings.
- Through-fixing installation; prefixing installation.
- Can accept all types of head profile fixings.
- Rapid installation without setting the plug.
- Suitable for anchoring in tension and fixture thickness up to 70mm.
- Recommended for soft base materials and suspended fixings.

MATERIAL SPECIFICATIONS

- Carbon steel; zinc galvanised ≥ 6µm.

SUBSTRATES

- RC concrete C20/25 to C50/60 at maximum according to EN 206-1:2000-12.
- Brick work or block work.
- Solid stone & other solid masonry

3-SEGMENTS TYPE

4-SEGMENTS TYPE

LOADING ZONES

BASIC LOADING DATA

- For static and quasi-static loadings.
- For non-cracked concrete only.
- Only a single anchor is considered.
- No anchor spacing and edge distance influences.
- Concrete compressive strength C20/25 ($f_{ck,cube}$ = 25 N/mm^2).

CHARACTERISTIC RESISTANCE [F_{Rk}]					
Anchor Size		**M6**	**M8**	**M10**	**M12**
Tensile Load, N_{Rk}	[kN]	3.8	6.2	9.2	12.6
Shear Load, V_{Rk}	[kN]	6.0	11.0	17.4	25.3

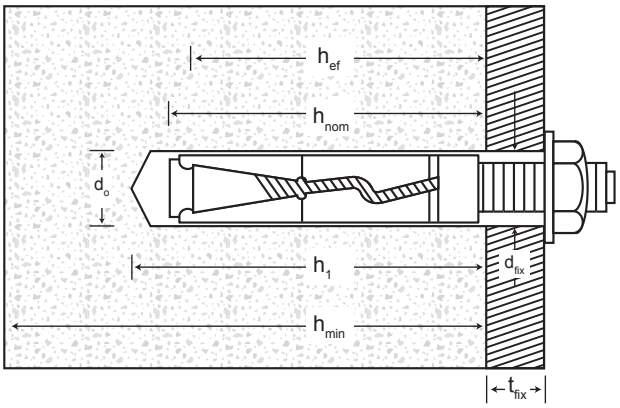
DESIGN RESISTANCE [F_{Rd}]					
Anchor Size		**M6**	**M8**	**M10**	**M12**
Tensile Load, N_{Rd}	[kN]	2.5	4.1	6.1	8.4
Shear Load, V_{Rd}	[kN]	4.8	8.8	13.9	20.2

RECOMMENDED LOAD [F_{Rec}]					
Anchor Size		**M6**	**M8**	**M10**	**M12**
Tensile Load, N_{Rec}	[kN]	1.8	2.9	4.4	6.0
Shear Load, V_{Rec}	[kN]	3.4	6.3	9.9	14.4

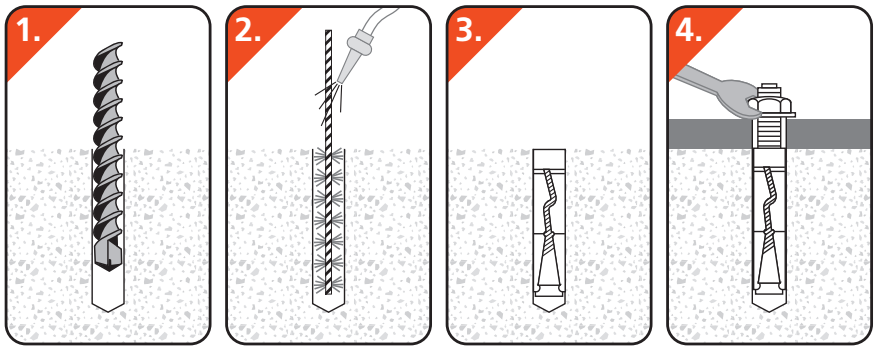
SETTING DETAILS

ANCHOR SIZE		M6	M8	M10	M12
Thread Length, L_t	[mm]	11	13	15	20
Drilled Hole Diameter, d_0	[mm]	12	14	16	20
Fixture Hole Diameter, d_{fix}	[mm]	7	9	12	14
Minimum Hole Depth, h_1	[mm]	50	60	70	80
Embedment Depth, h_{nom}	[mm]	45	55	65	75
Effective Anchorage Depth, h_{ef}	[mm]	30	40	50	60
Minimum Concrete Thickness, h_{min}	[mm]	75	90	100	125
Recommended Torque, T_{inst}	[Nm]	8	15	30	40
Critical Anchor Spacing, s_{cr}	[mm]	90	120	150	180
Minimum Anchor Spacing, s_{min}	[mm]	30	40	50	60
Critical Edge Distance, c_{cr}	[mm]	45	60	75	90
Minimum Edge Distance, c_{min}	[mm]	30	40	50	60

SETTING DIAGRAM



INSTALLATION PROCEDURES



1. Examine the concrete base is well compact and porosity is insignificant. Drill a hole through the pre-drilled hole fixture into concrete at right angle on the substrate surface, to the specified diameter and depth.
2. Clean the drilled hole by using air pump or brush prior inserting the anchor.
3. Insert the anchor into the drilled hole until it is flush with the concrete surface.
4. Attach fixture and then tighten the anchor according to the recommended torque.

MECHANICAL PROPERTIES

ANCHOR SIZE		M6	M8	M10	M12
Cross Sectional Area, A_s	[mm²]	20.1	36.6	58.0	84.3
Nominal Tensile Strength, f_{uk}	[N/mm²]	500	500	500	500
Elastic Moment Of Resistance, W_{el}	[mm³]	12.7	31.2	62.3	109.2
Design Bending Moment, $M_{Rd,s}$	[Nm]	6.1	15.0	29.9	52.4

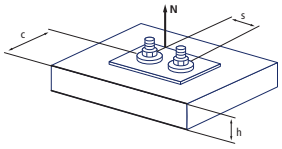
The design bending moment is derived from $M_{Rd,s} = M_{Rk,s} / \gamma_{Ms,N}$ where the partial safety factor is 1.25. The recommended bending moment is derived from $M_{Rec,s} = M_{Rd,s} / \gamma_F$ where the partial safety factor is 1.4.

TENSION LOAD [N_{Rd}]

Design Tensile Resistance, N_{Rd}: lower value of [$N_{Rd,s}$; $N_{Rd,c}$]

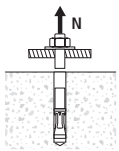
Design Steel Tensile Resistance: $N_{Rd,s}$

Design Concrete Cone / Pull-Out Resistance: $N_{Rd,c} = N^0_{Rd,c} * \Psi_{\beta,N} * \Psi_{s,N} * \Psi_{c,N}$



STEEL TENSILE RESISTANCE [$N_{Rd,s}$]

- For static and quasi-static loadings.
- Only a single anchor is considered.
- For non-cracked concrete only.

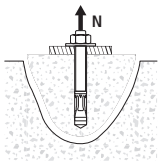


ANCHOR SIZE		M6	M8	M10	M12
$N_{Rd,s}$	[kN]	6.7	12.2	19.3	28.1

The design steel tensile resistance is derived from $N_{Rd,s} = N_{Rk,s} / \gamma_{Ms,N}$ where the partial safety factor is 1.5. The recommended load is derived from $N_{Rec,s} = N_{Rd,s} / \gamma_F$ where the partial safety factor is 1.4.

CONCRETE CONE / PULL-OUT RESISTANCE [$N_{Rd,c}$]

- For static and quasi-static loadings.
- For non-cracked concrete only.
- Only a single anchor is considered.
- No anchor spacing and edge distance influences.
- Concrete compressive strength C20/25 ($f_{ck,cube}$ = 25 N/mm²).



ANCHOR SIZE		M6	M8	M10	M12
h_{ef}	[mm]	3.0	40	50	60
$N^0_{Rd,c}$	[kN]	2.5	4.1	6.1	8.4

The design concrete cone resistance is derived from $N^0_{Rd,c} = N^0_{Rk,c} / \gamma_{Mc,N}$ where partial safety factor is 1.5. The recommended load is derived from $N^0_{Rec,c} = N^0_{Rd,c} / \gamma_F$ where the partial safety factor is 1.4.

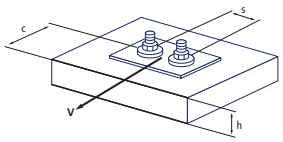
SHEAR LOAD [V_{Rd}]

Design Shear Resistance, V_{Rd}: lower value of [$V_{Rd,s}$; $V_{Rd,c}$; $V_{Rd,cp}$]

Design Steel Shear Resistance: $V_{Rd,s}$

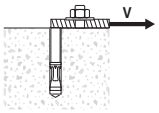
Design Concrete Edge Shear Resistance: $V_{Rd,c} = V^0_{Rd,c} \cdot \Psi_{\beta,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{sc,V}$

Design Concrete Pry-Out Resistance: $V_{Rd,cp} = V^0_{Rd,cp} \cdot \Psi_{\beta,V} \cdot \Psi_{s,N} \cdot \Psi_{c,N}$



STEEL SHEAR RESISTANCE [$V_{Rd,s}$]

- For static and quasi-static loadings.
- Only a single anchor is considered.
- For non-cracked concrete only.

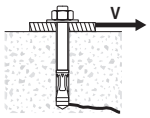


ANCHOR SIZE		M6	M8	M10	M12
$V_{Rd,s}$	[kN]	4.8	8.8	13.9	20.2

The design steel shear resistance is derived from $V_{Rd,s} = V_{Rk,s} / \gamma_{Ms,v}$ where the partial safety factor is 1.25. The recommended load is derived from $V_{Rec,s} = V_{Rd,s} / \gamma_F$ where the partial safety factor is 1.4.

CONCRETE EDGE SHEAR RESISTANCE [$V_{Rd,c}$]

- For non-cracked concrete.
- Only a single anchor is considered.
- No anchor spacing and edge distance influences.
- Single embedded depth is used for loading tabulation.
- Concrete compressive strength C20/25 ($f_{ck,cube}$ = 25 N/mm²).

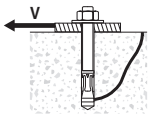


ANCHOR SIZE		M6	M8	M10	M12
h_{ef}	[mm]	30	40	50	60
c_{min}	[mm]	30	40	50	60
$V^0_{Rd,c}$	[kN]	2.6	4.3	6.4	9.4

The design concrete edge shear resistance is derived from $V^0_{Rd,c} = V^0_{Rk,c} / \gamma_{Mc,V}$ where the partial safety factor is 1.5. The recommended load is derived from $V^0_{Rec,c} = V^0_{Rd,c} / \gamma_F$ where the partial safety factor is 1.4.

CONCRETE PRY-OUT RESISTANCE [$V_{Rd,cp}$]

- For non-cracked concrete.
- Only a single anchor is considered.
- No anchor spacing and edge distance influences.
- Single embedded depth is used for loading tabulation.
- Concrete compressive strength C20/25 ($f_{ck,cube}$ = 25 N/mm²).



ANCHOR SIZE		M6	M8	M10	M12
h_{ef}	[mm]	30	40	50	60
$V^0_{Rd,cp}$	[kN]	2.5	4.1	6.1	16.8

The design concrete pry-out resistance is derived from $V^0_{Rd,cp} = V^0_{Rk,cp} / \gamma_{Mp,v}$ where the partial safety factor is 1.5. The recommended load is derived from $V^0_{Rec,cp} = V^0_{Rd,cp} / \gamma_F$ where the partial safety factor is 1.4.

COMBINED TENSION & SHEAR

Combined Tension & Shear: $\frac{N_{Sd}}{N_{Rd}} + \frac{V_{Sd}}{V_{Rd}} \leq 1.2$

The resultant force must be satisfied with the above conditions. The designer must cross check the loading conditions, types of applied loads and substrate to ensure the recommended anchor is applicable to the actual site applications. This would avoid any design faults which commonly caused by inconclusive load requirements with respective to actual site conditions.

INFLUENCING FACTORS - TENSION

INFLUENCE OF CONCRETE STRENGTH ON PULL-OUT AND CONCRETE CONE RESISTANCE [$\Psi_{\beta,N}$]

$$\Psi_{\beta,N} = \sqrt{\frac{f_{ck,cube}}{25}}$$

Limits: 25 MPa $\leq f_{ck,cube} \leq$ 60 MPa

Concrete Strength Designation (ENV 206)		C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 50/60
Concrete Cylinder Strength, $f_{ck,cyl}$	[MPa]	20	25	30	35	40	50
Concrete Cube Strength, $f_{ck,cube}$	[MPa]	25	30	37	45	50	60
Concrete Strength Factor, $\Psi_{\beta,N}$		1.00	1.10	1.22	1.34	1.41	1.55

INFLUENCE OF ANCHOR SPACING [$\Psi_{s,N}$]

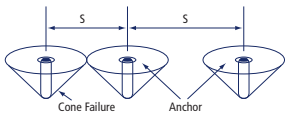
Anchor Spacing 's' [mm]	M6	M8	M10	M12
30	0.67			
40	0.72	0.67		
50	0.78	0.71	0.67	
60	0.83	0.75	0.70	0.67
90	1.00	0.88	0.80	0.75
120		1.00	0.90	0.83
150			1.00	0.92
180				1.00
Critical Spacing 's_{cr}' [mm]	90	120	150	180
Minimum Spacing 's_{min}' [mm]	30	40	50	60

$$\Psi_{s,N} = 0.5 + \frac{s}{6 * h_{ef}}$$

Limits: $s_{min} \leq s \leq s_{cr}$

$s_{min} = 1.0 * h_{ef}$

$s_{cr} = 3.0 * h_{ef}$



INFLUENCE OF EDGE DISTANCE [$\Psi_{c,N}$]

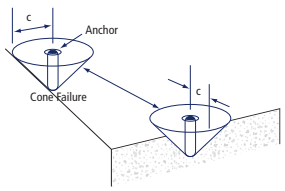
Edge Distance 'c' [mm]	M6	M8	M10	M12
30	0.76			
40	0.92	0.76		
45	1.00	0.82		
50		0.88	0.76	
60		1.00	0.85	0.76
75			1.00	0.88
90				1.00
Critical Edge Distance 'c_{cr}' [mm]	45	60	75	90
Minimum Edge Distance 'c_{min}' [mm]	30	40	50	60

$$\Psi_{c,N} = 0.29 + 0.47 * \frac{c}{h_{ef}}$$

Limits: $c_{min} \leq c \leq c_{cr}$

$c_{min} = 1.0 * h_{ef}$

$c_{cr} = 1.5 * h_{ef}$



INFLUENCING FACTORS - SHEAR

INFLUENCE OF CONCRETE STRENGTH ON CONCRETE EDGE SHEAR AND CONCRETE PRY-OUT RESISTANCE [$\Psi_{\beta,V}$]

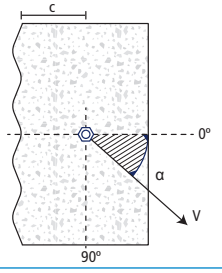
$$\Psi_{\beta,V} = \sqrt{\frac{f_{ck,cube}}{25}}$$

Limits: 25 MPa $\leq f_{ck,cube} \leq$ 60 MPa

Concrete Strength Designation (ENV 206)		C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 50/60
Concrete Cylinder Strength, $f_{ck,cyl}$	[MPa]	20	25	30	35	40	50
Concrete Cube Strength, $f_{ck,cube}$	[MPa]	25	30	37	45	50	60
Concrete Strength Factor, $\Psi_{\beta,V}$		1.00	1.10	1.22	1.34	1.41	1.55

INFLUENCE OF SHEAR LOAD DIRECTION [$\Psi_{\alpha,V}$]

Load Type	Angle, α [°]	$\Psi_{\alpha,V}$
Oblique 0°	0° < α ≤ 15°	1.00
Oblique 30°	15° < α ≤ 37.5°	1.14
Oblique 45°	37.5° < α ≤ 52.5°	1.35
Oblique 60°	52.5° < α ≤ 67.5°	1.71
Oblique 90°	67.5° < α ≤ 90°	2.00

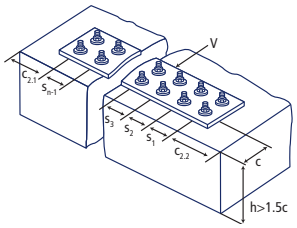


INFLUENCE OF ANCHOR SPACING AND EDGE DISTANCE ON CONCRETE EDGE SHEAR RESISTANCE [$\Psi_{sc,V}$]

$$\Psi_{sc,V} = \frac{c}{c_{min}} * \sqrt{\frac{c}{c_{min}}}$$ for single anchor towards a concrete edge

$$\Psi_{sc,V} = \frac{3c + s}{6c_{min}} * \sqrt{\frac{c}{c_{min}}}$$ for two anchors when $s \leq 3c$

$$\Psi_{sc,V} = \frac{3c + s_1 + s_2 + s_{n-1}}{3nc_{min}} * \sqrt{\frac{c}{c_{min}}}$$ for multiple anchors when s_1 to $s_{n-1} \leq 3c$ and $c_2 \geq 1.5c$



$\Psi_{sc,V}$		c / c_{min}															
		1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0
Edge influence with single anchor		1.00	1.31	1.66	2.02	2.41	2.83	3.26	3.72	4.19	4.69	5.20	5.72	6.27	6.83	7.41	8.00
s / c_{min}	1.0	0.67	0.84	1.03	1.22	1.43	1.65	1.88	2.12	2.36	2.62	2.89	3.16	3.44	3.73	4.03	4.33
	1.5	0.75	0.93	1.12	1.33	1.54	1.77	2.00	2.25	2.50	2.76	3.03	3.31	3.60	3.89	4.19	4.50
	2.0	0.83	1.02	1.22	1.43	1.65	1.89	2.13	2.38	2.63	2.90	3.18	3.46	3.75	4.05	4.35	4.67
	2.5	0.92	1.11	1.32	1.54	1.77	2.00	2.25	2.50	2.77	3.04	3.32	3.61	3.90	4.21	4.52	4.83
	3.0	1.00	1.20	1.42	1.64	1.88	2.12	2.37	2.63	2.90	3.18	3.46	3.76	4.06	4.36	4.68	5.00
	3.5		1.30	1.52	1.75	1.99	2.24	2.50	2.76	3.04	3.32	3.61	3.91	4.21	4.52	4.84	5.17
	4.0			1.62	1.86	2.10	2.36	2.62	2.89	3.17	3.46	3.75	4.05	4.36	4.68	5.00	5.33
	4.5				1.96	2.21	2.47	2.74	3.02	3.31	3.60	3.90	4.20	4.52	4.84	5.17	5.50
	5.0					2.33	2.59	2.87	3.15	3.44	3.74	4.04	4.35	4.67	5.00	5.33	5.67
	5.5						2.71	2.99	3.28	3.57	3.88	4.19	4.50	4.82	5.15	5.49	5.83
	6.0						2.83	3.11	3.41	3.71	4.02	4.33	4.65	4.98	5.31	5.65	6.00
	6.5							3.24	3.53	3.84	4.16	4.47	4.80	5.13	5.47	5.82	6.17
	7.0								3.67	3.98	4.29	4.62	4.95	5.29	5.63	5.98	6.33
	7.5									4.11	4.43	4.76	5.10	5.44	5.79	6.14	6.50
	8.0										4.57	4.91	5.25	5.59	5.95	6.30	6.67
	8.5											5.05	5.40	5.75	6.10	6.47	6.83
	9.0											5.20	5.55	5.90	6.26	6.63	7.00
	9.5												5.69	6.05	6.42	6.79	7.17
	10.0													6.21	6.58	6.95	7.33
	10.5														6.74	7.12	7.50
	11.0															7.28	7.67
	11.5																7.83
	12.0																8.00