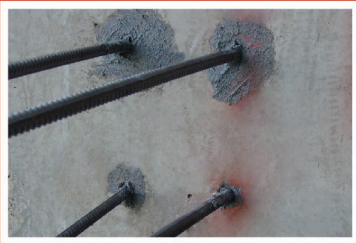


The Multi Purpose Resin Anchor



X-Tite™ ResiLoc EX22

High Performance
Pure Epoxy SMR™
Anchor System



X-CALIBUR®

STRUCTURAL SYSTEMS

Design Information

Tensile and Shear Load Data

The information to follow is specific only to anchors or bars installed using the X-Tite ResiLoc EX22 SMR™ system.

In critical applications X-Calibur recommends pull out or proof testing be performed.

Threaded Bar

This data is applicable to all grades of carbon and stainless steel threaded bar up to 1040 MPa ultimate tensile stress. Ensure that threaded bar used can accommodate the loads shown below.



Rod Diameter mm	Hole Diameter mm	Hole Depth mm	Minimum Concrete Thickness mm	Ultimate Loads		Allowable Loads	
				Tension Load kN	Shear Load kN	Tension Load kN	Shear Load kN
10	11	90	120	42	31	10.5	7.7
12	14	108	140	100	57	25	14
14	20	140	160	134	102	33	25
16	18	144					
20	22	180		175	144	43	36
22	25	200		241	162	60	40
25	28	225		280	233	70	53
30	35	270		396	309	99	77

Rebar (Grade 500 Metric)

Bar Size (mm)	Minimum Hole Diameter mm	Hole Depth mm	Characteristic Loads		Allowable Loads	
			Tension Load kN	Shear Load kN	Tension Load kN	Shear Load kN
10	12	90	28.6	21.6	14.3	14.4
12	16	110	58.0	31.1	29.0	20.7
16	20	145	98.9	55.3	49.4	36.9
20	25	180	134.5	86.4	67.2	57.6
25	32	225	145.7	135.0	72.8	90.0
32	38	290	175.3	221.2	87.6	147.5

Embedment Depths for Threaded Rods and Reinforcing Steel

Embedment Depth	Load Factor
8d	0.9
10d	1.1
12d	1.3
15d	1.5

The tensile load capacity data has been based on embedment depths of 9 times bar diameter. Some design codes require a higher embedment depth. Load capacity is dependent on the fully bonded depth. The load factors shown on the opposite table may be fully used when the bars are to be installed at bond lengths other than 9 times bar diameter (d).

Critical Edge and Spacing for Solid Base Materials

Rod Diameter mm	Hole Diameter mm	Hole Depth mm	Critical Edge mm	Critical Spacing mm	Torque Nm
10	11	90	130	180	16 to 20
12	14	110	160	225	30 to 38
16	20	140	210	280	70 to 80
20	22	180	265	340	120 to 145
22	25	200	300	400	190 to 250
25	28	225	345	450	260 to 370
30	35	270	410	570	340 to 500

Effect of Concrete Compressive Strength

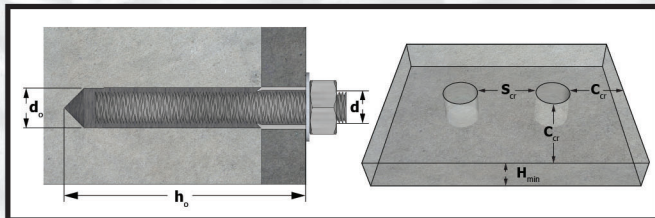
The quote values of tensile loads have been calculated for 20MPa concrete for higher strength concretes apply the factors shown in the table below.

28 MPa	35 MPa	40 MPa	50 MPa	55 MPa
1.02	1.04	1.05	1.08	1.09

Standard Anchor Spacing Tensile Reduction Factors

Anchor Diameter						
mm	10	12	16	20	25	32
Edge Distance	Load Multiplier					
40						
45	0.58					
50	0.59					
55	0.60	0.58				
63	0.61	0.59	0.58			
70	0.62	0.60	0.59			
85	0.65	0.62	0.61	0.58		
85	0.65	0.62	0.61	0.58		
90	0.66	0.63	0.62	0.58		
100	0.68	0.65	0.63	0.60		
105	0.69	0.66	0.63	0.60	0.58	
110	0.70	0.66	0.64	0.61	0.58	
120	0.72	0.67	0.66	0.62	0.59	
130	0.73	0.69	0.67	0.62	0.60	
135	0.75	0.70	0.67	0.62	0.60	
140	0.76	0.71	0.68	0.63	0.61	
150	0.77	0.72	0.70	0.64	0.62	
200	0.87	0.80	0.76	0.69	0.66	
220	0.90	0.83	0.79	0.71	0.67	
240	0.94	0.86	0.82	0.73	0.68	
260	0.97	0.89	0.84	0.75	0.70	
270		0.91	0.86	0.76	0.71	
280		0.92	0.87	0.77	0.72	
300		0.96	0.90	0.79	0.73	
320		0.98	0.92	0.81	0.75	
330			0.93	0.82	0.76	
340			0.96	0.83	0.77	
360			0.97	0.85	0.78	
376				0.87	0.80	
380				0.87	0.80	
400				0.88	0.81	
420				0.91	0.83	
440				0.92	0.85	
460				0.95	0.86	
480				0.97	0.87	
500				0.98	0.89	
510					0.90	
550					0.93	
600					0.97	
650						

Concrete Capacity Tensile Load Reduction Factors



Standard Edge Tensile Reduction Factors

Edge Distance	Anchor Diameter					
	mm	10	12	16	20	25
	Load Multiplier					
40						
45	0.52					
50	0.55					
55	0.57	0.52				
63	0.62	0.55	0.53			
70	0.65	0.58	0.55			
85	0.72	0.65	0.61	0.52		
85	0.72	0.65	0.61	0.52		
90	0.75	0.67	0.62	0.54		
100	0.81	0.71	0.66	0.56		
105	0.83	0.73	0.68	0.57	0.52	
110	0.85	0.75	0.69	0.59	0.54	
120	0.91	0.80	0.73	0.62	0.55	
130	0.97	0.84	0.76	0.64	0.57	
135		0.82	0.79	0.66	0.59	
140		0.88	0.82	0.67	0.60	
150		0.93	0.85	0.69	0.62	
160		0.97	0.88	0.72	0.64	
165			0.90	0.73	0.65	
170			0.93	0.75	0.67	
180			0.97	0.78	0.68	
188				0.81	0.70	
200				0.83	0.72	
220				0.89	0.77	
240				0.96	0.82	
255					0.85	
260					0.87	
280					0.91	
300					0.96	
315						

Designing for Fire

Anchor diameter x embedment depth mm	Maximum anchor load kN at various fire exposure times			
	30 mins	60 mins	90 mins	120 mins
M10 x 90	5.0	2.0	1.1	0.8
M12 x 110	9.0	4.5	3.0	2.3
M16 x 125	15.0	9.5	7.3	6.0
M20 x 170	24.0	15.5	12.0	10.0
M24 x 210	35.0	23.0	18.0	15.0

d anchor nominal diameter (mm or ins)
 d_o drilled hole diameter (mm or ins)
 h_o hole depth (= h_{ef}) (mm or ins)
 h_{ef} effective bond length (mm or ins)
 C close edge distance (mm or ins)

S anchor spacing (mm or ins)
 $C_{CR,N}$ minimum close edge distance to achieve N_{RK}
 $S_{CR,N}$ minimum anchor spacing to achieve N_{RK}
 N_{RK} characteristic tensile load (kN)
 N_{Rd} design resistance (kN)

Concrete capacity reduction factors, tension (ψ_N)

Single anchor, close edge C

Two anchors, close spacing S

Two anchors, c/l perpendicular to close edge C1

Two anchors, c/l parallel to close edge C2

$$\psi_{c,N} = 0.50 (C/h_{ef}) + 0.5 < 1??$$

$$\psi_{s,N} = 0.25 (S/h_{ef}) + 0.5 < 1??$$

$$\psi_{cs,N} = 0.25 (C_1/h_{ef}) + 0.125 (S/h_{ef}) + 0.125 (C_2/h_{ef}) (S/h_{ef}) + 0.25 < 1??$$

$$\psi_{sc,N} = 0.25 (S/h_{ef}) + 0.25 (C_1/h_{ef}) + 0.25 < 1??$$

Concrete capacity reduction for more complex anchor configurations in tension, and for shear forces acting towards a close edge, should be determined using the design method A, given in ETAG 001. Annex C can be provided free of charge.

Creep (Long Term Load Performance)

Creep tests were carried out on M12 x 120mm anchors in accordance with the European Technical Approval, ETAG 001 Part 5, at 20°C and 50°C. At both temperatures the extrapolated displacements were significantly less than the displacement at loss of adhesion ($S_{u,adh}$) for the corresponding reference test at 20°C, and therefore complying with the European Technical Approval requirements.

Temp °C	Loads kN			Displacements mm		
	Characteristic N_{Rk}	Design N_{Rd}	Sustained N_{sust}	$S_{u,adh}$	$S_{(50\text{ years})}$	$S_{(10\text{ years})}$
20	50.0	27.8	30.6	4.72	0.57	–
50	50.0	27.8	30.6	2.51	–	0.82

Method of Use

Importance of hole drilling and cleaning

It is essential that holes are drilled with a rotary percussive drill to produce a hole with roughened edges of the correct diameter. If, for any reason, the hole has to be diamond cored then they must be roughened and cleaned in order to maximize the high performance of the anchors. One way to achieve this is to re-drill the holes with a suitably-sized rotary percussive drill. Drilling debris and dust must be thoroughly cleaned from the hole using the correct sized X-Tite SMR Brush and clean compressed air and/or clean water. If water is used the hole may be left damp or even full of water, but the water and the sides of the hole must be clean.

Maximum Hole Size

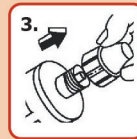
Generally, the maximum hole size for threaded rod is 4mm more than the bar diameter, and for rebar it is 1.4 times the normal bar diameter. For specific sizes please refer to the relevant Load Capacity table.



1. Drill hole to correct diameter and length using a rotary percussive machine.



2c. Use brush and blow pump to clean the hole. Repeat operations illustrated in 2a. and 2b



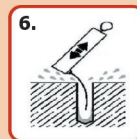
3. Once hole is prepared, remove the screw cap from the cartridge.



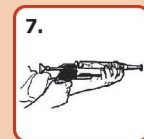
4. Attach the mixer nozzle and place cartridge in applicator.



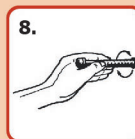
5. Dispense the first part of waste, until an even colour is achieved.



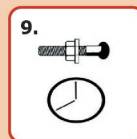
6. Remove any free water from the hole.



7. Insert the nozzle to the far end hole using extension tube if necessary. Inject resin withdrawing the nozzle as the hole fills.



8. Immediately insert the fixing, slowly with a slight twisting motion. Remove excess resin from the hole mouth before it sets.



9. Leave fixing undisturbed until the cure time has elapsed.



10. Attach the fixture and tighten the nut.

Estimating Guide: Holes per 400ml Cartridge (Multiply x 1.5 for 600ml Cartridge)

Threaded Rod in Concrete

Hole Depth in mm

Rod Size mm	Hole Size mm	Hole Depth in mm																		
		50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	500
10	12	192	128	96	77	64	55	48	43	39	35	32	30	28	26	24	23	22	21	20
12	14	136	91	68	55	46	39	34	29	28	25	23	21	19	18	17	16	15	15	14
16	20	70	47	35	28	24	20	18	16	14	13	12	11	10	10	9	9	8	8	7
20	22	56	37	28	23	19	16	14	13	11	10	10	9	8	8	7	7	7	6	6
22	25	47	31	24	19	16	12	12	11	10	9	8	8	7	7	6	6	6	5	5
25	28	38	26	19	16	13	11	10	9	8	7	7	6	6	5	5	5	5	4	4

Rebar in Concrete

Number of Holes per Cartridge

Rebar Size mm	Hole Size mm	Number of Holes per Cartridge																		
		163	109	82	66	55	47	41	37	33	30	28	26	24	22	21	20	19	18	17
10	12	163	109	82	66	55	47	41	37	33	30	28	26	24	22	21	20	19	18	17
12	16	127	85	64	51	43	37	32	29	26	24	22	20	19	17	16	15	15	14	13
16	20	103	69	52	41	35	30	26	23	21	19	17	16	15	14	13	12	12	11	11
20	22	82	55	41	32	28	24	21	19	17	15	14	13	12	11	11	10	10	9	9
22	25	72	48	36	29	24	21	18	16	15	13	12	11	11	10	9	9	8	8	8
25	28	62	41	31	25	21	18	16	14	13	12	11	10	9	9	8	8	7	7	7
30	35	31	21	16	13	11	9	8	7	7	6	6	5	5	4	4	4	4	4	3
32	38	30	20	15	12	10	9	8	7	6	6	5	5	5	4	4	4	4	4	3

The X-Tite ResiLoc EX22 System is one of the most technologically advanced Self Mixing Cartridge Resin - SMR™ pure epoxy anchors on the market today.



X-Tite ResiLoc EX22 SMR™ Advantages

- Can be applied at high ambient temperatures.
- Accommodates long term loads.
- High tensile strength.
- Easy to use.
- Long working time.
- Consistent mixing.
- Fast assured cure.
- Same day loading.
- Resistant to a wide range of chemicals.
- Vibration resistant.
- Styrene free.
- Dimensionally stable.
- Can be used with hollow masonry units.
- Creep resistant formulation.
- 50 year design life.
- Safe to use.
- No offensive odor.
- Low wastage.
- Can also be used as high performance adhesive.

Specification Compliance

X-Tite ResiLoc EX22 meets the revised ICC to AC308 Acceptance Criteria for Adhesive Anchors in Concrete.

X-Tite ResiLoc EX22 meets the requirements of ETAG 001 Part 1.

Certified SMR™ Anchor Installers





Ensure that your SMR™ anchors are installed correctly first time by enrolling your operatives in the X-Calibur Resin Anchor Installer training course. This 5 hour practical training program can be conducted at one of our facilities or at the jobsite and includes:

- Correct drill and drill bit section
- Embedment depths
- Hole drilling
- Hole cleaning and preparation
- Cartridge set up and injection
- Installation of anchor bars
- Safety
- Proof load tests



The certification is valid for two years, re-certification is achieved via a 1 hour update program. All attendees who satisfactorily complete the program receive a certificate, a Certified Installer I.D. Card and Safety Helmet Decal to allow Construction Inspectors to check easily that trained operatives are installing the anchors. The program is also useful in helping contractors meet ISO 9000 training requirements.

Open and Loading Times

Resin Cartridge Temperature	T Work	Base Material Temperature	T Load
 °F		 °F	
50 to 59°F	20 minutes	50 to 59°F	12 hours
59 to 72°F	15 minutes	59 to 72°F	8 hours
72 to 77°F	11 minutes	72 to 77°F	7 hours
77 to 86°F	8 minutes	77 to 86°F	6 hours
86 to 95°F	6 minutes	86 to 95°F	5 hours
95 to 104°F	4 minutes	95 to 104°F	4 hours
104°F	3 minutes	104°F	3 hours

Note: T Work is the typical time to gel at the highest temperature in the range.

Application Equipment and Ancillaries

Dispensing Equipment

X-Tite SMR SS600 used for 400ml cartridge.



X-Tite Resin Stoppers

X-Tite Resin Stoppers are specifically designed to reduce the possibility of any significant air voids being trapped when reinforcing bars are to be installed in an overhead situation, particularly when using larger diameter bars. When fitted to the end of the injection tube they ensure that the injected resin fills the hole from the back, thus helping to eliminate any reduction in bond and loss of performance.



Hole Cleaning Brushes

X-Tite SMR Brushes are available in the following sizes:

Ref No.	Hole Size
S14	10 to 12 mm
M20	14 to 18 mm
L28	22 to 26 mm
XL40	26 to 36 mm



X-Tite ResiLoc EX22 Specification

The resin anchoring material shall be X-Tite ResiLoc EX22 or equivalent. It shall be a fast curing epoxy resin system supplied in self mixing resin (SMR) dispensers, and shall have meet the requirements of International Conference of Building Officials (ICBO) Uniform Code AC58. The resin anchor shall be of a composition that is safe to use during installation and in use. It will have a long-term service temperature of 50°C or higher. The resin anchor will have a gel time of 20 minutes or less at 30°C will be able to accept full design load at 4 hours after installation at 30°C.

The manufacturer of the product will be required to submit creep test data confirming that the product is able to accept long term loads. The use of polyester or styrene containing resins will not be permitted.

The manufacturer of the resin to provide independently certified pull out test data. In critical areas the contractor is to arrange independent proof testing on site.

The resin anchors will be installed by installers that have been certified by the manufacturer and should carry proof of such training with them any time they are installing anchors on the project.

X-Tite SMR Hollow Wall Inserts

Fixing in to hollow masonry units is made easy by the use of X-Tite SMR Hollow Wall Inserts. These provide a physical insert that allows the resin to extrude and set forming a reinforced expanded larger than hole diameter anchor that is as strong as the masonry unit itself.



X-Tite SMR Hollow Inserts available in the following sizes:

Ref No.	Diameter (mm)	Length (mm)
12/50	12	50
15/85	15	85
15/120	15	120
20/85	20	85

Blow Tools

Holes can be blown clean using the X-Tite SMR Manual Air Pump or the X-Tite SMR Air Lance that can be connected to a low pressure air supply. Extension tubes are available for both products for cleaning deeper holes.



Mixing Nozzles



Suitable for use on both epoxy and polyester chemical anchoring system cartridges and fits 257ml and 400ml cartridges.

A Professional Approach

X-Calibur is an active member of many professional trade associations that regulate and promote various aspects of the industry. We are currently members of:

