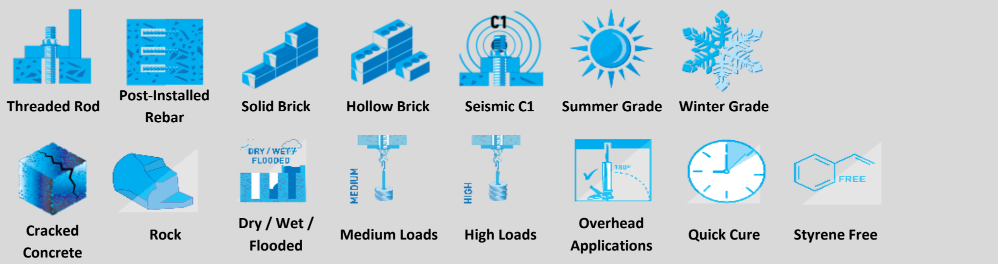
SCELL-IT HIGH LOAD RESIN - EASF-V

For high load applications.

EASF-V / VC / VE



Description

EASF-V bonded anchoring system is a Vinylester with very low voc content offering very high performance in both cracked and uncracked concrete, and under seismic conditions (C1). EASF-V together with its variations is one of the most versatile anchoring systems in our range.

Storage

Cartridges should be stored in their original packaging, the correct way up, in cool conditions (+5°C to +25°C) out of direct sunlight. When stored correctly, the product shelf life will be 12 months from the date of manufacture.

Health & Safety

For health and safety information, please refer to the relevant Safety Data Sheet.

Base Materials	Accessories	Uses/Applications
-Cracked and uncracked concrete	-Applicators	-Canopies
-Solid and hollow masonry	-Mixing nozzles	-Boilers
-Solid rock	-EZ flow mixing nozzle	-Bicycle Racks
-Hard natural stone	-Cleaning blow pump	-Hand Rails
-Voided stone or rock	-Cleaning brushes	-Safety Barriers
	-High flow mixing nozzles	-Balcony Fences
	-Extension tubes	-Racking
	-Resin stoppers	-Machinery
		-Satellite Dishes

Features

-Suitable for use with close edge distance and small anchor spacings
-Suitable for dry, wet & flooded holes
-Reduced drilling diameters, 22mm for M20 and 26mm for M24; results in significant material and labour savings.
-Variable embedment depths 8d to 20d
-Available in co-axial cartridges (380; 400; 410; 420ml), side by side cartridges (345; 350; 360; 825ml) and single piston foil pack cartridges (150; 170; 300; 410; 550; 850ml)

Approvals & Tests

-ETA Option 1 for cracked and uncracked concrete; EAD 330499-01-0601
-ETA according to EAD 330087-00-0601 (formerly TR023) for post-installed rebar connections
-ETA for EAD 330076-00-0604, injection anchors for use in masonry
-WRAS approval for contact with water
-NSF/ANSI 61 certified for contact with potable water
-A+ classification according to compulsory French VOC emissions regulation
-Meets the requirements of LEED v4.1 specifications
-Approved for 100 years' service life
-Bond Strength Reduction factor for Post-Installed Rebar connection when exposed to fire

EASF-V - Working & Loading Times			
Cartridge Temperature	**T Work**	**Base Material Temperature**	**T Load**
5°C	10 Minutes	5°C to 10°C	145 Minutes
	8 Minutes	10°C to 15°C	85 Minutes
	6 Minutes	15°C to 20°C	75 Minutes
	5 Minutes	20°C to 25°C	50 Minutes
	4 Minutes	25°C to 30°C	40 Minutes

Note: T Work is typical gel time at highest base material temperature in the range.
T Load is minimum set time required until load can be applied at the lowest base material temperature in the range.

EASF-VC- Working & Loading Times			
Cartridge Temperature	**T Work**	**Base Material Temperature**	**T Load**
0°C	10 Minutes	0°C to 5°C	75 Minutes
	5 Minutes	5°C to 20°C	50 Minutes
	100 seconds	+20°C	20 Minutes

Note: T Work is typical gel time at highest base material temperature in the range.
T Load is minimum set time required until load can be applied at the lowest base material temperature in the range.

EASF-VE - Working & Loading Times			
Cartridge Temperature	**T Work**	**Base Material Temperature**	**T Load**
+15°C	15 Minutes	15°C to 20°C	5 hours
	10 Minutes	20°C to 25°C	145 Minutes
	7.5 Minutes	25°C to 30°C	85 Minutes
	5 Minutes	30°C to 35°C	50 Minutes
	3.5 Minutes	35°C to 40°C	40 Minutes

Note: T Work is typical gel time at highest base material temperature in the range.
T Load is minimum set time required until load can be applied at the lowest base material temperature in the range.

Physical Properties				
Property		Value	Unit	Test Standard
Compressive Strength	24 hrs	72.3	N/mm^2	BS6319
	7 days	77.8		
Tensile Strength	24 hrs	13.5	N/mm^2	ASTM D 638 @ +20°C
	7 days	15.2		
Elongation at Break	24 hrs	6	%	ASTM D 638 @ +20°C
	7 days	6.7		
Tensile Modulus	24 hrs	3.75	GN/m^2	ASTM D 638 @ +20°C
	7 days	3.8		
Flexural Strength	7 days	28.3	N/mm^2	ASTM D 790 @ +20°C

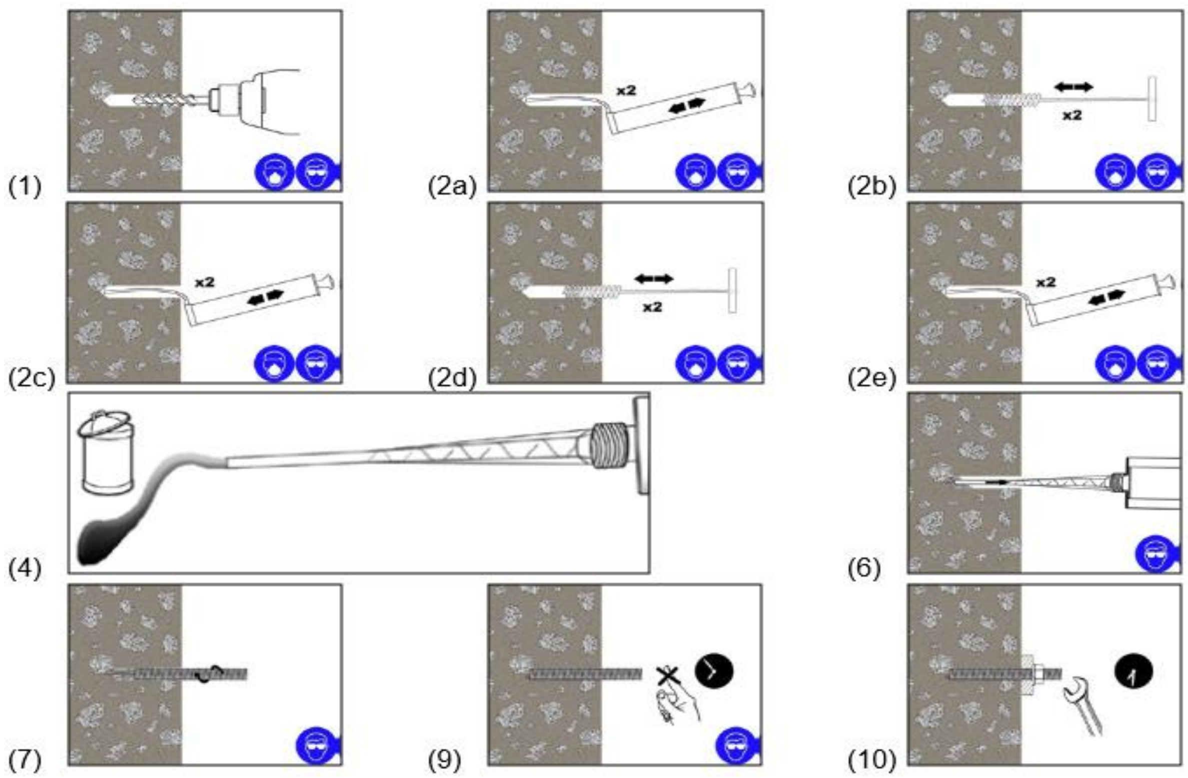
Chemical Resistance					
Chemical Environment	**Concentration**	**Result**	**Chemical Environment**	**Concentration**	**Result**
Aqueous Solution Acetic Acid	10%	C	Hexane	100%	C
Acetone	100%	✗	Hydrochloric Acid	10%	✓
Aqueous Solution Aluminium Chloride	Saturated	✓		15%	✓
Aqueous Solution Aluminium Nitrate	10%	✓		20%	C
Ammonia Solution	5%	✗	Hydrogen Sulphide Gas	100%	✓
Jet Fuel	100%	✗	Linseed Oil	100%	✓
Benzoic Acid	Saturated	✓	Lubricating Oil	100%	✓
Sodium Hypochlorite Solution	5 - 15%	✓	Mineral Oil	100%	✓
Butyl Alcohol	100%	C	Paraffin / Kerosene (Domestic)	100%	C
Calcium Sulphate Aqueous Solution	Saturated	✓	Phenol Aqueous Solution	1%	✗
Carbon Monoxide	Gas	✓	Phosphoric Acid	50%	✓
Carbon Tetrachloride	100%	C	Potassium Hydroxide	10% / pH13	✓
Chlorine Water	Saturated	✗	Sea Water	100%	C
Chloro Benzene	100%	C	Sulphur Dioxide Solution	10%	✓
Citric Acid Aqueous Solution	Saturated	✓	Sulphur Dioxide (40°C)	5%	✓
Cyclohexanol	100%	✓	Sulphuric Acid	10%	✓
Diesel Fuel	100%	C		30%	✓
Diethylene Glycol	100%	✓	Turpentine	100%	C
Ethanol	95%	✗	White Spirit	100%	✓
Heptane	100%	C	Xylene	100%	✗

✓ = Resistant to 75°C with at least 80% of physical properties retained.
C = Contact only to a maximum of 25°C. ✗ = Not resistant.

Solid Substrate Installation Method

1. Drill the hole to the correct diameter and depth. This can be done with either a rotary percussion or rotary hammer drilling machine depending upon the substrate.
2. Thoroughly clean the hole in the following sequence using a brush with the required extensions and a source of clean compressed air. For holes of 400mm or less deep, a blow pump may be used: Blow Clean x2 → Brush Clean x2 → Blow Clean x2 → Brush Clean x2 → Blow Clean x2.

   If the hole collects water, the current best practice is to remove standing water before cleaning the hole and injecting the resin. Ideally, the resin should be injected into a properly cleaned, dry hole.
3. Select the appropriate static mixer nozzle for the installation, open the cartridge/foil pack and screw nozzle onto the mouth of the cartridge. Insert the cartridge into a good quality applicator.
4. Extrude the first part of the cartridge to waste until an even colour has been achieved without streaking in the resin.
5. If necessary, cut the extension tube to the depth of the hole and push onto the end of the mixer nozzle, and (for rebars 16mm dia. or more) fit the correct resin stopper to the other end. Attach extension tubing and resin stopper.
6. Insert the mixer nozzle (resin stopper / extension tube if applicable) to the bottom of the hole. Begin to extrude the resin and slowly withdraw the mixer nozzle from the hole ensuring that there are no air voids as the mixer nozzle is withdrawn. Fill the hole to approximately ½ to ¾ full and withdraw the nozzle completely.
7. Insert the clean threaded bar, free from oil or other release agents, to the bottom of the hole using a back and forth twisting motion ensuring all the threads are thoroughly coated. Adjust to the correct position within the stated working time.
8. Any exces resin will be expelled from the hole evenly around the steel element showing that the hole is full. This excess resin should be removed from around the mouth of the hole before it sets.
9. Leave the anchor to cure. Do not disturb the anchor until the appropriate loading time, has elapsed depending on the substrate conditions and ambient temperature.
10. Attach the fixture and tighten the nut to the recommended torque. Do not overtighten.



Installation Parameters - Threaded Rods										
Size			M8	M10	M12	M16	M20	M24	M27	M30
Nominal Drill Hole Diameter	d_o	mm	10	12	14	18	22	26	30	35
Diameter of Cleaning Brush	d_b	mm	14	14	20	20	29	29	40	40
Torque Moment	T_{inst}	Nm	10	20	40	80	150	200	240	275
Minimum Embedment Depth	h_{ef}	mm	64	80	96	128	160	192	216	240
Maximum Embedment Depth	h_{ef}	mm	160	20	240	320	400	480	540	600
Minimum Edge Distance	c_{min}	mm	35	40	50	65	80	96	110	120
Minimum Spacing	s_{min}	mm	35	40	50	65	80	96	110	120
Minimum Member Thickness	h_{min}	mm	h_{ef} + 30 mm ≥ 100mm			$h_{ef} + 2d_o$				

Characteristic Resistance - Combined Pullout & Concrete Cone Failure Using Threaded Rods										
Size			M8	M10	M12	M16	M20	M24	M27	M30
Characteristic Bond Resistance in Uncracked Concrete For a Working Life of 50 Years and 100 Years Dry/Wet Concrete -40°C to 80°C	$\tau_{Rk,uncr}$	N/mm^2	10.0	9.5	9.5	9.0	8.5	8.0	6.5	5.5
Characteristic Bond Resistance in Uncracked Concrete Working Life of 50 Years and 100 Years Flooded Holes -40°C to 80°C	$\tau_{Rk,uncr}$	N/mm^2	8.5	7.5	7.0	7.0	6.5	5.5	-	-
Partial Safety Factor — Dry/Saturated Concrete	γ_{inst}	[-]	1.2						1.4	
Partial Safety Factor — Flooded Holes	γ_{inst}	[-]	1.4							
Characteristic Bond Resistance in Cracked Concrete Working Life of 50 Years Dry/Wet Concrete and flooded holes -40°C to 80°C	$\tau_{Rk,cr}$	N/mm^2	-	4.5	4.5	4.5	4.0	4.0	-	-
Characteristic Bond Resistance in Cracked Concrete Working Life of 100 Years Dry/Wet Concrete and flooded holes -40°C to 80°C	$\tau_{Rk,cr}$	N/mm^3	-	3.0	3.0	3.0	2.5	2.5	-	-
Partial Safety Factor — Dry/Saturated Concrete	γ_{inst}	[-]	1.2						-	-
Partial Safety Factor — Flooded Holes	γ_{inst}	[-]	1.4						-	-
Factor for Concrete	Ψ_c	C30/37	1.12						-	-
		C40/50	1.23						-	-
		C50/60	1.30						-	-
Factor For Influence of Sustained Loading for a working like of 50 years	Ψ_{sus}	T2: 50/80	0.73						-	-

Splitting Failure										
Size			M8	M10	M12	M16	M20	M24	M27	M30
Edge Distance	$c_{cr,sp}$	mm	1.5hef							
Spacing	$s_{cr,sp}$	mm	3hef							

Resistance Values for Threaded Rod in Uncracked Concrete - 50 Years and 100 years Working Life Combined Pullout & Concrete Cone Failure and Concrete Cone Failure Temperature Range: -40°C to 80°C										
Property	Unit		Anchor Diameter							
			M8	M10	M12	M16	M20	M24	M27	M30
Effective Embedment Depth = MIN = 8d	h_{ef}	mm	64	80	96	128	160	192	216	240
Design Resistance	N_{Rd}	kN	8.5	13.0	19.0	32.0	47.0	64.0	56.5	59.0
Effective Embedment Depth = 8d	h_{ef}	mm	64	80	96	128	160	192	216	240
Design Resistance	N_{Rd}	kN	8.5	13.0	19.0	32.0	47.0	64.0	56.5	59.0
Effective Embedment Depth = 10d	h_{ef}	mm	80	100	120	160	200	240	324	360
Design Resistance	N_{Rd}	kN	11.0	16.5	23.5	40.0	59.0	80.0	85.0	88.5
Effective Embedment Depth = 12d	h_{ef}	mm	96	120	144	192	240	288	540	600
Design Resistance	N_{Rd}	kN	13.0	19.5	28.5	48.0	71.0	96.5	141.5	148

1. Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to EC2-4. Resistance for steel failure must also be considered - the lowest value controls.
2. Resistance values are for single anchors without close edges or eccentric loading considerations.
3. Tabulated values correspond to the above stated temperature range and installation conditions only.
4. Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, e.g.: diurnal cycling.
5. The cylinder compressive strength of the concrete (fck),is assumed to be 20 N/mm2.
6. Tabulated resistance values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Resistance Values for Threaded Rod in Cracked Concrete - 50 Years Working life Combined Pullout & Concrete Cone Failure and Concrete Cone Failure Temperature Range: -40°C to 80°C										
Property	Unit		Anchor Diameter							
			M8	M10	M12	M16	M20	M24	-	-
Effective Embedment Depth = MIN = 8d	h_{ef}	mm	-	80	96	128	160	192	-	-
Design Resistance	N_{Rd}	kN	-	6.0	9.0	16.0	22.0	32.0	-	-
Effective Embedment Depth = 12d	h_{ef}	mm	-	120	144	192	240	288	-	-
Design Resistance	N_{Rd}	kN	-	9.0	13.5	24.0	33.5	48.0	-	-
Effective Embedment Depth = 20d	h_{ef}	mm	-	200	240	320	400	480	-	-
Design Resistance	N_{Rd}	kN	-	15.5	22.5	40.0	55.5	80.0	-	-

1. Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to EC2-4. Resistance for steel failure must also be considered - the lowest value controls.
2. Resistance values are for single anchors without close edges or eccentric loading considerations.
3. Tabulated values correspond to the above stated temperature range and installation conditions only.
4. Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, e.g.: diurnal cycling.
5. The cylinder compressive strength of the concrete (fck),is assumed to be 20 N/mm2.
6. Tabulated resistance values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Resistance Values for Threaded Rod in Cracked Concrete - 100 Years Working life Combined Pullout & Concrete Cone Failure and Concrete Cone Failure Temperature Range: -40°C to 80°C										
Property	Unit		Anchor Diameter							
			M8	M10	M12	M16	M20	M24	-	-
Effective Embedment Depth = MIN = 8d	h_{ef}	mm	-	80	96	128	160	200	-	-
Design Resistance	N_{Rd}	kN	-	4.0	6.0	10.5	13.5	20.0	-	-
Effective Embedment Depth = 12d	h_{ef}	mm	-	120	144	192	240	300	-	-
Design Resistance	N_{Rd}	kN	-	6.0	9.0	16.0	20.5	30.0	-	-
Effective Embedment Depth = 20d	h_{ef}	mm	-	200	240	320	400	500	-	-
Design Resistance	N_{Rd}	kN	-	10.0	15.0	26.5	34.5	50.0	-	-

1. Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to EC2-4. Resistance for steel failure must also be considered - the lowest value controls.
2. Resistance values are for single anchors without close edges or eccentric loading considerations.
3. Tabulated values correspond to the above stated temperature range and installation conditions only.
4. Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, e.g.: diurnal cycling.
5. The cylinder compressive strength of the concrete (fck),is assumed to be 20 N/mm2.
6. Tabulated resistance values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Threaded Rods - Characteristic Values for Steel Failure (Tension)										
Size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Steel Grade 4.6	$N_{Rk,s}$	kN	15	23	34	63	98	141	184	224
Partial Safety Factor	γ_{Ms}	[-]	2							
Steel Grade 5.8	$N_{Rk,s}$	kN	18	29	42	79	123	177	230	281
Partial Safety Factor	γ_{Ms}	[-]	1.50							
Steel Grade 8.8	$N_{Rk,s}$	kN	29	46	67	126	196	282	367	449
Partial Safety Factor	γ_{Ms}	[-]	1.50							
Steel Grade 10.9*	$N_{Rk,s}$	kN	37	58	84	157	245	353	459	561
Partial Safety Factor	γ_{Ms}	[-]	1.33							
Stainless Steel Grade A4-70	$N_{Rk,s}$	kN	26	41	59	110	172	247	321	393
Partial Safety Factor	γ_{Ms}	[-]	1.87							
Stainless Steel Grade A4-80	$N_{Rk,s}$	kN	29	46	67	126	196	282	367	449
Partial Safety Factor	γ_{Ms}	[-]	1.60							
Stainless Steel Grade 1.4529	$N_{Rk,s}$	kN	26	41	59	110	172	247	321	393
Partial Safety Factor	γ_{Ms}	[-]	1.50							

**Galvanized rods of high strength are sensitive to hydrogen induced brittle failure.*

Threaded Rods - Characteristic Values for Steel Failure (Shear – without lever arm)										
Size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Steel Grade 4.6	$V_{Rk,s}$	kN	7	12	17	31	49	71	92	112
Partial Safety Factor	γ_{Ms}	[-]	1.67							
Steel Grade 5.8	$V_{Rk,s}$	kN	9	15	21	39	61	88	115	140
Partial Safety Factor	γ_{Ms}	[-]	1.25							
Steel Grade 8.8	$V_{Rk,s}$	kN	15	23	34	63	98	141	184	224
Partial Safety Factor	γ_{Ms}	[-]	1.25							
Steel Grade 10.9*	$V_{Rk,s}$	kN	18	29	42	79	123	177	230	281
Partial Safety Factor	γ_{Ms}	[-]	1.50							
Stainless Steel Grade A4-70	$V_{Rk,s}$	kN	13	20	30	55	86	124	161	196
Partial Safety Factor	γ_{Ms}	[-]	1.56							
Stainless Steel Grade A4-80	$V_{Rk,s}$	kN	15	23	34	63	98	141	184	224
Partial Safety Factor	γ_{Ms}	[-]	1.33							
Stainless Steel Grade 1.4529	$V_{Rk,s}$	kN	13	20	30	55	86	124	161	196
Partial Safety Factor	γ_{Ms}	[-]	1.25							

**Galvanized rods of high strength are sensitive to hydrogen induced brittle failure.*

Threaded Rods - Characteristic Values for Steel Failure (Shear – with lever arm)										
Size			**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Steel Grade 4.6	$M^0_{Rk,s}$	N.m	15	30	52	133	260	449	666	900
Partial Safety Factor	γ_{Ms}	[-]	1.67							
Steel Grade 5.8	$M^0_{Rk,s}$	N.m	19	37	66	166	325	561	832	1125
Partial Safety Factor	γ_{Ms}	[-]	1.25							
Steel Grade 8.8	$M^0_{Rk,s}$	N.m	30	60	105	266	519	898	1332	1799
Partial Safety Factor	γ_{Ms}	[-]	1.25							
Steel Grade 10.9*	$M^0_{Rk,s}$	N.m	37	75	131	333	649	1123	1664	2249
Partial Safety Factor	γ_{Ms}	[-]	1.50							
Stainless Steel Grade A4-70	$M^0_{Rk,s}$	N.m	26	52	92	233	454	786	1165	1574
Partial Safety Factor	γ_{Ms}	[-]	1.56							
Stainless Steel Grade A4-80	$M^0_{Rk,s}$	N.m	30	60	105	266	519	898	1332	1799
Partial Safety Factor	γ_{Ms}	[-]	1.33							
Stainless Steel Grade 1.4529	$M^0_{Rk,s}$	N.m	26	52	92	233	454	786	1165	1574
Partial Safety Factor	γ_{Ms}	[-]	1.25							
Concrete pryout failure										
Factor k **	-		2							
Partial Safety Factor	γ_{Ms}		1.50							

**Galvanized rods of high strength are sensitive to hydrogen induced brittle failure.*
*** K Value from TR029 Design of bonded anchors pt 5.2.3.3*

Installation Parameters - Rebar									
Size			8	10	12	16	20	25	32
Nominal Drill Hole Diameter	d_o	mm	12	14	16	20	25	32	40
Diameter of Cleaning Brush	d_b	mm	14	14	19	22	29	40	42
Minimum Embedment Depth	h_{ef}	mm	64	80	96	128	160	200	256
Maximum Embedment Depth	h_{ef}	mm	160	200	240	320	400	500	640
Minimum Edge Distance	c_{min}	mm	35	40	50	65	80	100	130
Minimum Spacing	s_{min}	mm	35	40	50	65	80	100	130
Minimum Member Thickness	h_{min}	mm	h_{ef} + 30 mm ≥ 100mm			$h_{ef} + 2d_o$			

Characteristic Resistance - Combined Pullout & Concrete Cone Failure for Rebar									
Rebar Diameter (mm)			8	10	12	16	20	25	32
Characteristic Bond Resistance in Uncracked Concrete For a Working Life of 50 and 100 Years Dry/Wet Concrete and Flooded Holes -40°C to 80°C	$\tau_{Rk,uncr}$	N/mm^2	11.0	9.5	9.5	9.0	8.5	8.5	5.5
Installation Factor — Dry/saturated Concrete	γ_{inst}	[-]	1.2						
Installation Factor — Flooded Holes	γ_{inst}	[-]	1.4						
Factor for Concrete	Ψ_c	C50/60	1.00						
Factor for Influence of Sustained Load with working life of 50 years	Ψ_{sus}	T2: 50/80	0.73						

Splitting Failure - Rebar									
Size			**8**	**10**	**12**	**16**	**20**	**25**	**32**
Edge Distance	$c_{cr,sp}$	mm	$2h_{ef}$						
Spacing	$s_{cr,sp}$	mm	$2\ C_{cr,sp}$						

Resistance Values for Reinforcing Bars in Uncracked Concrete - 50 and 100 years working life
Combined Pullout & Concrete Cone Failure and Concrete Cone Failure
Temperature Range: -40°C to 80°C

Property			Rebar Diameter						
			8mm	10mm	12mm	16mm	20mm	25mm	32mm
Effective Embedment Depth = MIN = 8d	h_{ef}	mm	64	80	96	128	160	200	256
Design Resistance	N_{Rd}	kN	9.5	13.0	19.0	32.0	47.0	74.0	78.5
Effective Embedment Depth = 12d	h_{ef}	mm	96	120	144	192	240	300	384
Design Resistance	N_{Rd}	kN	14.5	19.5	28.5	48.0	71.0	111.0	117.5
Effective Embedment Depth = 20d	h_{ef}	mm	160	200	240	320	400	500	640
Design Resistance	N_{Rd}	kN	24.5	33.0	47.5	80.0	118.5	185.0	196.5

1. Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to EC2-4 Resistance for steel failure must also be considered - the lowest value controls.
2. Resistance values are for single anchors without close edges or eccentric loading considerations.
3. Tabulated values correspond to the above stated temperature range and installation conditions only.
4. Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, e.g.: diurnal cycling.
5. The cylinder compressive strength of the concrete (fck),is assumed to be 20 N/mm2.
6. Tabulated resistance values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Seismic Category C1 Characteristic Resistance - Combined Pullout & Concrete Cone Failure Using Threaded Rods								
Size				M10	M12	M16	M20	M24
Characteristic Bond Resistance Category C1 for 50 years working life -40°C to 80°C		$\tau_{Rk,uncr}$	N/mm^2	3.5	3.5	3.5	3.5	3.5
Characteristic Bond Resistance Category C1 for 100 years working life -40°C to 80°C		$\tau_{Rk,uncr}$	N/mm^2	3.2	3.2	3.2	2.2	2.2
Installation Factor	Dry Concrete	γ_{inst}	[-]	1.2				
	Flooded Holes			1.4				
Factor for Concrete		Ψ_c	C30/37	1.12				
			C40/50	1.23				
			C50/60	1.30				

Seismic Category C1 **Threaded Rods - Characteristic Values for Steel Failure (Tension)**							
Size			**M10**	**M12**	**M16**	**M20**	**M24**
Steel Grade 4.6	$N_{Rk,s}$	kN	23	34	63	98	141
Partial Safety Factor	γ_{Ms}	[-]	2				
Steel Grade 4.8	$N_{Rk,s}$	kN	23	34	63	98	141
Partial Safety Factor	γ_{Ms}	[-]	1.5				
Steel Grade 5.6	$N_{Rk,s}$	kN	29	42	79	123	177
Partial Safety Factor	γ_{Ms}	[-]	2.00				
Steel Grade 5.8	$N_{Rk,s}$	kN	29	42	79	123	177
Partial Safety Factor	γ_{Ms}	[-]	1.50				
Steel Grade 8.8	$N_{Rk,s}$	kN	46	67	126	196	282
Partial Safety Factor	γ_{Ms}	[-]	1.50				
Steel Grade 10.9*	$N_{Rk,s}$	kN	58	84	157	245	353
Partial Safety Factor	γ_{Ms}	[-]	1.40				
Stainless Steel Grade A4-70	$N_{Rk,s}$	kN	41	59	110	172	247
Partial Safety Factor	γ_{Ms}	[-]	1.90				
Stainless Steel Grade A4-80	$N_{Rk,s}$	kN	46	67	126	196	282
Partial Safety Factor	γ_{Ms}	[-]	1.60				
Stainless Steel Grade 1.4529	$N_{Rk,s}$	kN	41	59	110	172	247
Partial Safety Factor	γ_{Ms}	[-]	1.50				

**Galvanized rods of high strength are sensitive to hydrogen induced brittle failure.*

Threaded Rods - Characteristic Values for Steel Failure (Shear – without lever arm)							
Size			**M10**	**M12**	**M16**	**M20**	**M24**
Steel Grade 4.6	$V_{Rk,s}$	kN	12	17	31	49	71
Partial Safety Factor	γ_{Ms}	[-]	1.67				
Steel Grade 4.8	$V_{Rk,s}$	kN	12	17	31	49	71
Partial Safety Factor	γ_{Ms}	[-]	1.25				
Steel Grade 5.6	$V_{Rk,s}$	kN	15	21	39	61	88
Partial Safety Factor	γ_{Ms}	[-]	1.68				
Steel Grade 5.8	$V_{Rk,s}$	kN	15	21	39	61	88
Partial Safety Factor	γ_{Ms}	[-]	1.25				
Steel Grade 8.8	$V_{Rk,s}$	kN	23	34	63	98	141
Partial Safety Factor	γ_{Ms}	[-]	1.25				
Steel Grade 10.9*	$V_{Rk,s}$	kN	29	42	79	123	177
Partial Safety Factor	γ_{Ms}	[-]	1.50				
Stainless Steel Grade A4-70	$V_{Rk,s}$	kN	20	30	55	86	124
Partial Safety Factor	γ_{Ms}	[-]	1.56				
Stainless Steel Grade A4-80	$V_{Rk,s}$	kN	23	34	63	98	141
Partial Safety Factor	γ_{Ms}	[-]	1.33				
Stainless Steel Grade 1.4529	$V_{Rk,s}$	kN	20	30	55	86	124
Partial Safety Factor	γ_{Ms}	[-]	1.25				

**Galvanized rods of high strength are sensitive to hydrogen induced brittle failure.*

Resistance Values for Threaded Rod in Seismic Category C1 - 50 years working life

Combined Pullout & Concrete Cone Failure and Concrete Cone Failure
Temperature Range: -40°C to 80°C

Property	Unit		Anchor Diameter				
			M10	M12	M16	M20	M24
Effective Embedment Depth = MIN = 8d	h_{ef}	mm	80	96	128	160	192
Design Resistance	N_{Rd}	kN	4.5	7.0	12.5	19.5	29.0
Effective Embedment Depth = 12d	h_{ef}	mm	120	144	192	240	288
Design Resistance	N_{Rd}	kN	7.0	10.5	18.5	29.0	42.0
Effective Embedment Depth = STD	h_{ef}	mm	90	110	128	170	210
Design Resistance	N_{Rd}	kN	5.0	8.0	12.5	20.5	30.5
Effective Embedment Depth = MAX = 20d	h_{ef}	mm	200	240	320	400	480
Design Resistance	N_{Rd}	kN	12.0	17.5	31.0	48.5	70.0

1. Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to EC2-4. Resistance for steel failure must also be considered - the lowest value controls.
2. Resistance values are for single anchors without close edges or eccentric loading considerations.
3. Tabulated values correspond to the above stated temperature range and installation conditions only.
4. Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, e.g.: diurnal cycling.
5. The cylinder compressive strength of the concrete (fck),is assumed to be 20 N/mm2.
6. Tabulated resistance values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Resistance Values for Threaded Rod in Seismic Category C1 - 100 years working life Combined Pullout & Concrete Cone Failure and Concrete Cone Failure Temperature Range: -40°C to 80°C							
Property	Unit		Anchor Diameter				
			M10	M12	M16	M20	M24
Effective Embedment Depth = MIN = 8d	h_{ef}	mm	80	96	128	160	200
Design Resistance	N_{Rd}	kN	4.0	6.0	11.0	12.0	18.0
Effective Embedment Depth = 12d	h_{ef}	mm	120	144	192	240	288
Design Resistance	N_{Rd}	kN	6.5	9.5	17.0	18.0	26.5
Effective Embedment Depth = MAX = 20d	h_{ef}	mm	200	240	320	400	480
Design Resistance	N_{Rd}	kN	11.0	16.0	28.5	30.5	44.0

1. Resistance values are based on combined pullout & concrete cone failure and concrete cone failure according to EC2-4. Resistance for steel failure must also be considered - the lowest value controls.
2. Resistance values are for single anchors without close edges or eccentric loading considerations.
3. Tabulated values correspond to the above stated temperature range and installation conditions only.
4. Long term temperatures are those that remain roughly constant over prolonged periods. Short term temperatures occur over brief intervals, e.g.: diurnal cycling.
5. The cylinder compressive strength of the concrete (fck),is assumed to be 20 N/mm2.
6. Tabulated resistance values assume that the geometry of the anchor(s) and concrete member is sufficient to avoid splitting failure.

Post Installed Rebar - Installation Parameters						
Rebar		Drill hole Diameter (mm)	Cleaning Brush	Min. Anchorage Length (mm)	Min. Lap/Splice Length (mm)	Max. Embedment Depth (mm)
Diameter (mm)	f_{yk} (N/mm^2)					
8	500	12 (10)	Hybrid 13/14F	113	200	400
10	500	14 (12)	Hybrid 19/20F	141	215	500
12	500	16	Hybrid 19/20F	170	260	600
14	500	18	Hybrid 19/20F	198	300	700
16	500	20	Hybrid 22/24F	226	345	800
20	500	25	Hybrid 28/29F	283	430	1000
25	500	32	Hybrid 40/42F	354	535	1000

note - Installation parameters are based on C20/25 concrete

Minimum Anchorage Length:

$l_{bPIR} = \alpha_{lb} \bullet \ell_{b,min}$

α_{lb} = amplification factor for minimum anchorage length

ℓb,min = minimum anchorage length of cast-in rebar according to EN 1992-1-1, eq. 8.6

Design Bond Strength for 50 and 100 years working life									
Rebar Diameter (mm)	Concrete Class								
	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8	1.60	2.00	2.30	2.70	3.00	3.40	3.70	4.00	4.30
10	1.60	2.00	2.30	2.70	3.00	3.40	3.70	4.00	4.30
12	1.60	2.00	2.30	2.70	3.00	3.40	3.70	4.00	4.30
14	1.60	2.00	2.30	2.70	3.00	3.40	3.70	4.00	4.30
16	1.60	2.00	2.30	2.70	3.00	3.40	3.70	4.00	4.30
20	1.60	2.00	2.30	2.70	3.00	3.40	3.70		
25	1.60	2.00	2.30	2.70	3.00				

Note:

Tabulated values are valid for good bond conditions according to EN 1992-1-1.

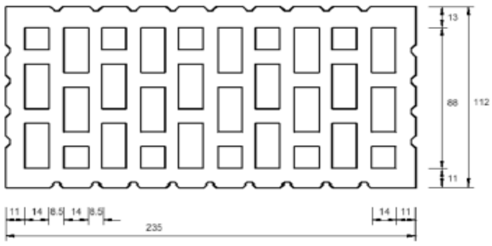
For all other bond conditions multiply the values by 0.7.

Values for bond strengths have had reduction factors applied.

Amplification Factor For Embedment Depth										
Rebar	Amplification Factor	C12/15	C16/20	C20/25	C25/30	C30/37	C35/45	C40/50	C45/55	C50/60
8	α_{lb}	1								
10										
12										
14										
16										
20										
25										

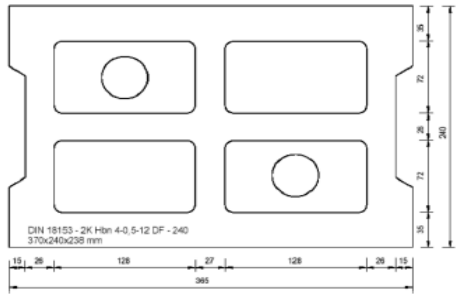
Types and Dimensions of Bricks

Brick N° 1



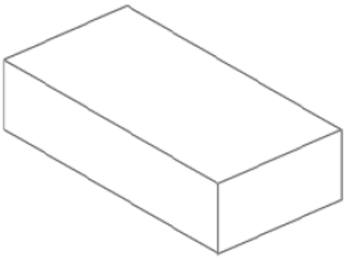
Hollow clay brick HLz 12-1,0-2DF
according to EN 771-1
length/width/height = 235 mm/112 mm/115 mm
$f_b \geq 12$ N/mm² / $\rho \geq 1{,}0$ kg/dm³

Brick N° 2



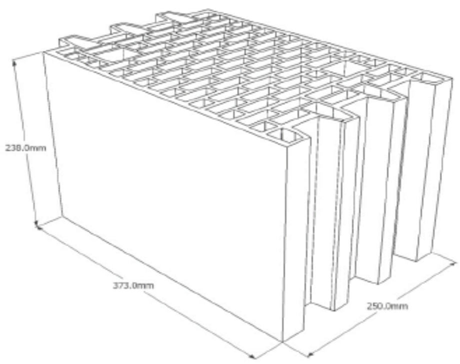
Concrete masonry unit Hbn 4-12DF
according to EN 771-3
length/width/height = 370 mm/240 mm/238 mm
$f_b \geq 4$ N/mm² / $\rho \geq 1{,}2$ kg/dm³

Brick N° 3



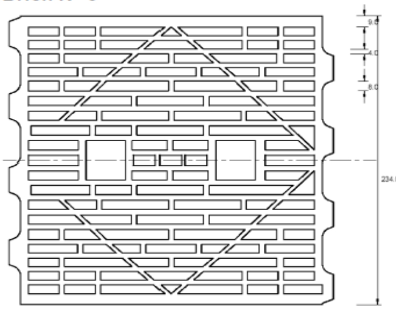
Solid clay brick Mz 12-2,0-NF
according to EN 771-1
length/width/height = 240 mm/116 mm/71 mm
$f_b \geq 12$ N/mm² / $\rho \geq 2{,}0$ kg/dm³

Brick N° 4



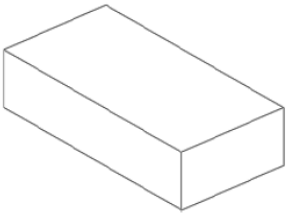
Hollow clay brick Porotherm 25 P+W KL15
according to EN 771-1
length/width/height = 373 mm/250 mm/238 mm
$f_b \geq 12$ N/mm² / $\rho \geq 0{,}9$ kg/dm³

Brick N° 5



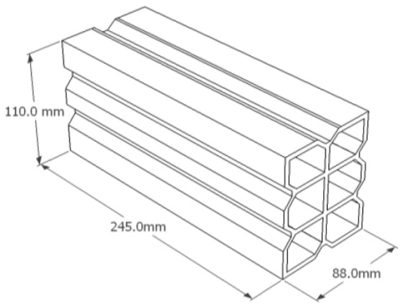
Hollow clay brick HLzW 6-0,7-8DF
according to EN 771-1
length/width/height = 250 mm/240 mm/240 mm
$f_b \geq 6$ N/mm² / $\rho \geq 0{,}8$ kg/dm³

Brick N° 6



Solid sand lime brick KS 12-2,0-NF
according to EN 771-2
length/width/height = 240 mm/115 mm/70 mm
$f_b \geq 12$ N/mm² / $\rho \geq 2{,}0$ kg/dm³

Brick N° 7



Hollow clay brick Hueco Doble
according to EN 771-1
length/width/height = 245 mm/110 mm/88 mm
$f_b \geq 2{,}5$ N/mm² / $\rho \geq 0{,}74$ kg/dm³

EASF-V, EASF-VC, EASF-VE Product Data Sheet

Installation parameters in solid and hollow masonry											
Anchor Type			Anchor Rod								
Size			M8	M10	M12	M8		M10		M12
Sieve Sleeve	l_s	[mm]	-	-	-	85		85		85
	d_s	[mm]	-	-	-	15	16	15	16	20
Nominal drill hole diameter	d_0	[mm]	15	15	20	15	16	15	16	20
diameter of cleaning brush	d_b	[mm]	$20^{\pm1}$	$20^{\pm1}$	$20^{\pm1}$	$20^{\pm1}$		$20^{\pm1}$		$20^{\pm1}$
depth of drill hole	h_0	[mm]	90							
Effective anchorage depth	h_{ef}	[mm]	85							
Diameter of clearence hole in the fixture	$d_f \leq$	[mm]	9	12	14	9		12		14
Torque moment	$T_{inst} \leq$	[mm]	2							

Edge distances and spacing									
	Anchor rod								
	M8			M10			M12		
Base Material	$C_{cr}=C_{min}$	S_{cr} ǁ = S_{min} ǁ	S_{cr}⊥ = S_{min}⊥	$C_{cr}=C_{min}$	S_{cr} ǁ = S_{min} ǁ	Scr⊥ = Smin⊥	Ccr=Cmin	S_{cr} ǁ = S_{min} ǁ	S_{cr}⊥ = S_{min}⊥
	mm	mm	mm	mm	mm	mm	mm	mm	mm
Brick No 1	100	235	115	100	235	115	120	235	115
Brick No 2	100	370	238	100	370	238	120	370	238
Brick No 3	128	255	255	128	255	255	128	255	255
Brick No 4	100	373	238	100	373	238	120	373	238
Brick No 5	100	250	240	100	250	240	120	250	240
Brick No 6	128	255	255	128	255	255	128	255	255
Brick No 7	100	245	110	100	245	110	120	245	110

Characteristic resistance under tension and shear loading			
Base Material	Anchor Rods		
	M8	M10	M12
	NRK=VRK [KN] 1)	NRK=VRK [KN] 1)	NRK=VRK [KN] 1)
Brick No 1	2.0	2.0	2.0
Brick No 2	2.0	1.5	2.5
Brick No 3	1.5	1.5	2.5
Brick No 4	1.2	1.2	1.2
Brick No 5	1.2	0.9	0.9
Brick No 6	0.75	0.75	1.2
Brick No 7	0.75	0.5	0.5

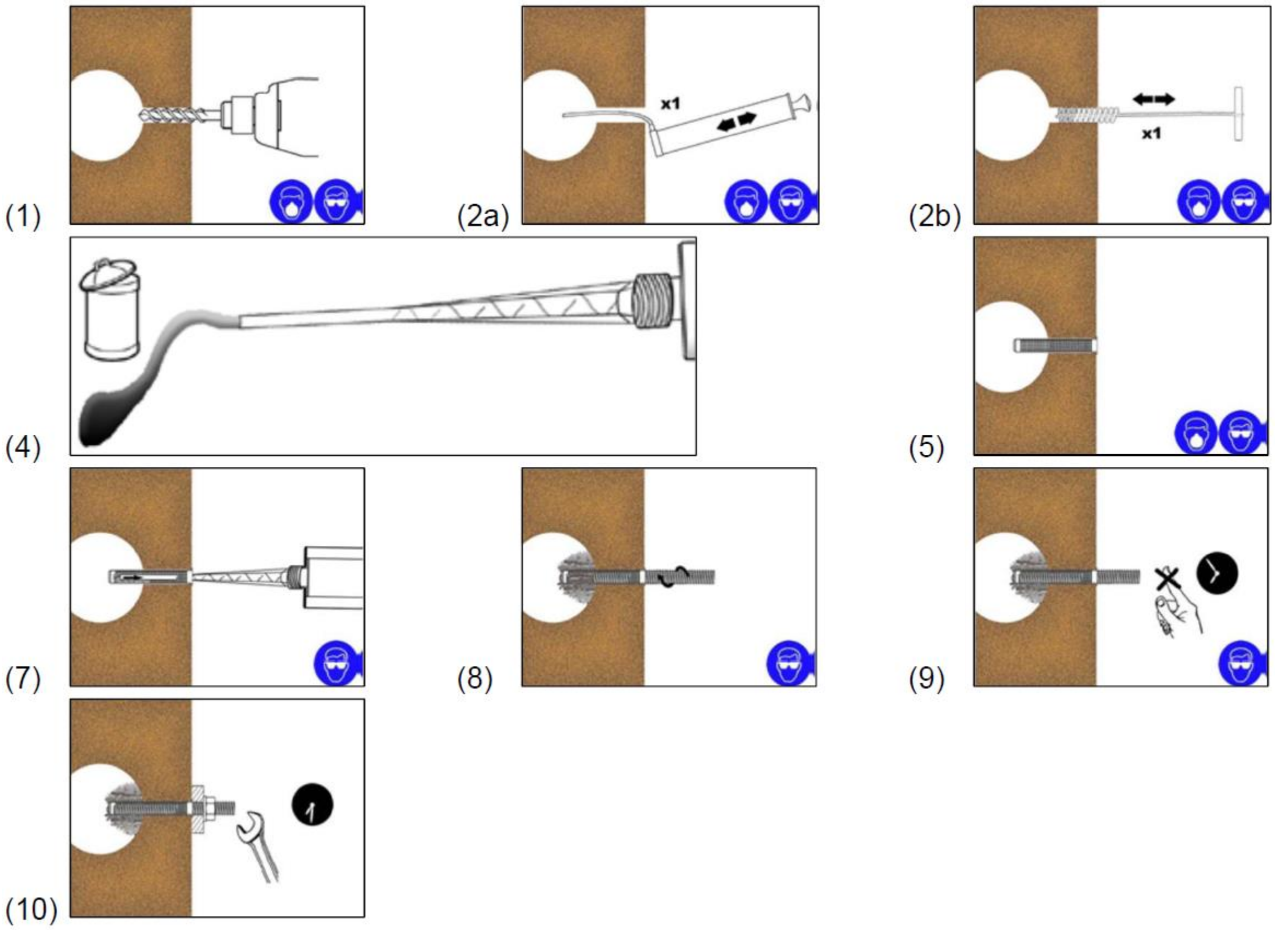
Characteristic Bending Moment			
Steel Grade	Anchor Diameter		
	M8	M10	M12
	$M_{Rk,s}$	$M_{Rk,s}$	MRk,s
Steel Grade 5.8	19	37	66
Steel Grade 8.8	30	60	105
Steel Grade 10.9*	37	75	131
Stainless Steel A2-70, A4-70	26	52	92
Stainless Steel A4-80	30	60	105
Stainless Steel 1.4529 strength class 70	26	52	92
Stainless Steel 1.4565 strength class 70	26	52	92

Displacements under tension and shear load					
Base Material	F (kN)	δN0 [mm]	δN∞ [mm]	δV0 [mm]	δV∞ [mm]
Solid Bricks	NRk/(1.4 · ɣM)	0.6	1.2	1.0	1.5
Perforated & Hollow Bricks		0.14	0.28	1.0	1.5

β - Factors for Job Site Test According to TR053							
Brick No.	No 1	No 2	No 3	No 4	No 5	No 6	No 7
β - Factor	0.62	0.6	0.48	0.65	0.43	0.26	0.65

Hollow Masonry Insallation Method

1. Drill the hole to the correct diameter and depth. This should be done with a rotary percussion drilling machine to reduce spalling.
2. Thoroughly clean the hole in the following sequence using the 2K DF Brush with the required extensions and a source of clean compressed air. For holes of 400mm or less deep, a 2K Blow Pump may be used: Brush Clean x1. Blow Clean x1.
3. Select the appropriate static mixer nozzle for the installation, open the cartridge/foil pack and screw nozzle onto the mouth of the cartridge. Insert the cartridge into a good quality applicator.
4. Extrude the first part of the cartridge to waste until an even colour has been achieved without streaking in the resin.
5. Select the appropriate perforated sleeve and insert into the hole.
6. Insert the mixer nozzle to the bottom of the perforated sleeve, withdraw 2-3mm then begin to extrude the resin and slowly withdraw the mixer nozzle from the hole ensuring that there are no air voids as the mixer nozzle is withdrawn. Fill the perforated sleeve and withdraw the nozzle completely.
7. Insert the clean threaded bar, free from oil or other release agents, to the bottom of the hole using a back and forth twisting motion ensuring all the threads are thoroughly coated. Adjust to the correct position within the stated working time.
8. Any excess resin will be expelled from the hole evenly around the steel element showing that the hole is full. This excess resin should be removed from around the mouth of the hole before it sets.
9. Leave the anchor to cure. Do not disturb the anchor until the appropriate loading time, has elapsed depending on the substrate conditions and ambient temperature.
10. Attach the fixture and tighten the nut to the recommended torque. Do not overtighten.



Note:
For solid masonry applications, please refer to 'Solid Substrate Installation Method'.

Important Notes:

Use in Porous Substrates

This bonded anchor is not intended for use as a cosmetic or decorative product. When anchoring into porous or reconstituted stone it is recommended that technical assistance is sought. Due to the nature of the product, migration of the monomer in the resin may cause staining in certain materials. If you are still uncertain, it is advisable to test the resin by applying it in a small, discrete area and testing before using the resin on the project.

Important Note

Whilst all reasonable care is taken in compiling technical data on the Company's products, all recommendations or suggestions regarding the use of such products are made without guarantee, since the conditions of use are beyond the control of the Company. It is the customer's responsibility to satisfy himself that each product is fit for the purpose for which he intends to use it, that the actual conditions of use are suitable and that, in the light of our continual research and development programme the information relating to each product has not been superseded.

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