EPC80 HIGH PERFORMANCE HYBRID EPOXY WITH VA RODS

PRODUCT FEATURES

- High and critical load applications.
- Excellent for chemical resistance fixings.
- Fire resistance up to 240 minutes in concrete structure.
- For use in dry and wet concrete.
- High durability; tested based on a 50 years working life of anchor according to ETA.
- Structural applications in cracked and uncracked concrete applications in seismic zones C1.

RESIN SPECIFICATIONS

- 100% Solid Epoxy Resin - grey after mixing.
- Specific weight: 1.5 g/cm³.
- Compressive strength (ASTM D 695): 95 N/mm².

SHELF LIFE

- Shelf life is 24 months with the cartridges stored in their original packing, the correct way up and in cool dry conditions (+5°C to +25°C) out of direct sunlight.

SUBSTRATES

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

CONC STONE

HOLE ORIENTATION

Floor Wall

LOADING ZONES

APPROVALS / CERTIFICATIONS

- ETA-17/0410 according to ETAG 001 Part 1 & 5 Option 1.
- CE Certified No. 1020-CPR-090-038603.
- Seismic Performance Report.
- F240 Fire Test Report No. 26069571/B.
- LEED 2009 EQ c4.1 SCAQMD rule 1168 (2005).
- VOC A+ Rating (Volatile Organic Compound).
- WRAS No. 1510550 according to BS6920-1:2014.
- Creep Test Certificate No. 15/10972-1820-S.

VA RODS AVAILABILITY

Z ZINC | G | A2 INOX | A4 INOX

BASIC LOADING DATA

- For static and quasi-static loadings.
- Only a single anchor is considered.
- No anchor spacing and edge distance influences.
- Loading applicable to dry and wet concrete.
- Concrete compressive strength C20/25 ($f_{ck,cube}$ = 25 N/mm²).
- Loading based on standard anchorage depth.
- For non-cracked and cracked concrete.
- Loading data conformed to ETA-17/0410, except M8 and M27.

CHARACTERISTIC RESISTANCE [F_{Rk}]							STEEL CLASS 5.8		
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
					Non-Cracked Concrete				
Tensile Load, N_{Rk}	[kN]	***18.0***	***29.0***	***42.0***	69.1	111.9	153.7	199.6	224.0
Shear Load, V_{Rk}	[kN]	9.0	15.0	21.0	39.0	61.0	88.0	115.0	140.0
					Cracked Concrete				
Tensile Load, N_{Rk}	[kN]	17.1	24.0	35.3	50.3	58.8	87.1	116.6	140.0
Shear Load, V_{Rk}	[kN]	9.0	15.0	21.0	39.0	61.0	88.0	115.0	140.0

DESIGN RESISTANCE [F_{Rd}]									
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
					Non-Cracked Concrete				
Tensile Load, N_{Rd}	[kN]	***12.0***	17.3	21.7	32.9	56.0	90.5	101.0	121.2
Shear Load, V_{Rd}	[kN]	7.2	12.0	16.8	31.2	48.8	70.4	92.0	112.0
					Cracked Concrete				
Tensile Load, N_{Rd}	[kN]	9.5	13.4	16.8	25.4	28.0	41.5	55.5	66.7
Shear Load, V_{Rd}	[kN]	7.2	12.0	16.8	31.2	48.8	70.4	92.0	112.0

RECOMMENDED LOAD [F_{Rec}]									
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
					Non-Cracked Concrete				
Tensile Load, N_{Rec}	[kN]	***8.6***	12.3	15.5	23.5	40.0	64.6	72.1	86.6
Shear Load, V_{Rec}	[kN]	5.1	8.6	12.0	22.3	34.9	50.3	65.7	80.0
					Cracked Concrete				
Tensile Load, N_{Rec}	[kN]	6.8	9.5	12.0	18.2	20.0	29.6	39.7	47.6
Shear Load, V_{Rec}	[kN]	5.1	8.6	12.0	22.3	34.9	50.3	65.7	80.0

** Bold Italic numbers represent steel failure.*

EPC80 HIGH PERFORMANCE HYBRID EPOXY WITH VA RODS

HIGH TENSILE STEEL CLASS 8.8

CHARACTERISTIC RESISTANCE [F_{Rk}]									
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Non-Cracked Concrete									
Tensile Load, N_{Rk}	[kN]	22.1	31.1	45.6	69.1	111.9	153.7	199.6	224.0
Shear Load, V_{Rk}	[kN]	15.0	23.0	34.0	63.0	98.0	141.0	184.0	224.0
Cracked Concrete									
Tensile Load, N_{Rk}	[kN]	17.1	24.0	35.3	50.3	58.8	87.1	116.6	140.0
Shear Load, V_{Rk}	[kN]	15.0	23.0	34.0	63.0	98.0	141.0	184.0	224.0

DESIGN RESISTANCE [F_{Rd}]									
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Non-Cracked Concrete									
Tensile Load, N_{Rd}	[kN]	12.3	17.3	21.7	32.9	56.0	90.5	101.0	121.2
Shear Load, V_{Rd}	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	147.2	179.2
Cracked Concrete									
Tensile Load, N_{Rd}	[kN]	9.5	13.4	16.8	25.4	28.0	41.5	55.5	66.7
Shear Load, V_{Rd}	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	147.2	179.2

RECOMMENDED LOAD [F_{Rec}]									
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Non-Cracked Concrete									
Tensile Load, N_{Rec}	[kN]	8.8	12.3	15.5	23.5	40.0	64.6	72.1	86.6
Shear Load, V_{Rec}	[kN]	8.6	13.1	19.4	36.0	56.0	80.6	105.1	128.0
Cracked Concrete									
Tensile Load, N_{Rec}	[kN]	6.8	9.5	12.0	18.2	20.0	29.6	39.7	47.6
Shear Load, V_{Rec}	[kN]	8.6	13.1	19.4	36.0	56.0	80.6	105.1	128.0

** Bold Italic numbers represent steel failure.*

STAINLESS STEEL CLASS A2/A4

CHARACTERISTIC RESISTANCE [F_{Rk}]									
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Non-Cracked Concrete									
Tensile Load, N_{Rk}	[kN]	22.1	31.1	45.6	69.1	111.9	153.7	199.6	224.0
Shear Load, V_{Rk}	[kN]	13.0	20.0	30.0	55.0	86.0	124.0	161.0	196.0
Cracked Concrete									
Tensile Load, N_{Rk}	[kN]	17.1	24.0	35.3	50.3	58.8	87.1	116.6	140.0
Shear Load, V_{Rk}	[kN]	13.0	20.0	30.0	55.0	86.0	124.0	161.0	196.0

DESIGN RESISTANCE [F_{Rd}]									
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Non-Cracked Concrete									
Tensile Load, N_{Rd}	[kN]	12.3	17.3	21.7	32.9	56.0	90.5	101.0	121.2
Shear Load, V_{Rd}	[kN]	8.3	12.8	19.2	35.3	55.1	79.5	103.2	125.6
Cracked Concrete									
Tensile Load, N_{Rd}	[kN]	9.5	13.4	16.8	25.4	28.0	41.5	55.5	66.7
Shear Load, V_{Rd}	[kN]	8.3	12.8	19.2	35.3	55.1	79.5	103.2	125.6

RECOMMENDED LOAD [F_{Rec}]									
Anchor Size		**M8**	**M10**	**M12**	**M16**	**M20**	**M24**	**M27**	**M30**
Non-Cracked Concrete									
Tensile Load, N_{Rec}	[kN]	8.8	12.3	15.5	23.5	40.0	64.6	72.1	86.6
Shear Load, V_{Rec}	[kN]	6.0	9.2	13.7	25.2	39.4	56.8	73.7	89.7
Cracked Concrete									
Tensile Load, N_{Rec}	[kN]	6.8	9.5	12.0	18.2	20.0	29.6	39.7	47.6
Shear Load, V_{Rec}	[kN]	6.0	9.2	13.7	25.2	39.4	56.8	73.7	89.7

** Bold Italic numbers represent steel failure.*

SERVICE TEMPERATURE RANGE

The Statheros EPC80 100% Solid Epoxy Resin performance based on the tabulated temperature range as given below. A gradual temperature increase in base material may lead to a reduction of design bond stress.

TEMPERATURE RANGE	BASE MATERIAL TEMPERATURE	MAXIMUM LONG TERM BASE MATERIAL TEMPERATURE	MAXIMUM SHORT TERM BASE MATERIAL TEMPERATURE
Temperature Range	-40 °C to + 40 °C	+ 24 °C	+ 40 °C

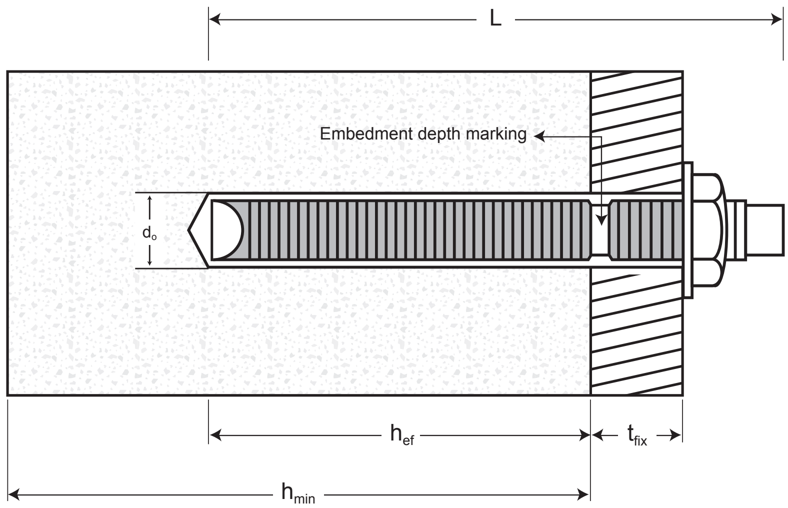
Maximum Short Term Base Material Temperature
Short term temperature refers to those elevated base material temperature occurred over brief moment such as diurnal cycling intervals.

Maximum Long Term Base Material Temperature
Long term temperature refers to those elevated base material temperature occurred over a significant long period of time.

SETTING DETAILS

ANCHOR SIZE		M8	M10	M12	M16	M20	M24	M27	M30
Standard Anchor Length, L	[mm]	110	130	160	190	260	300	340	380
Nominal Drill Hole Diameter, d_0	[mm]	10	12	14	18	24	28	32	35
Fixture Hole Diameter, d_{fix}	[mm]	9	12	14	18	22	26	30	33
Maximum Fixture Thickness, t_{fix}	[mm]	15	20	30	40	50	55	60	70
Recommended Torque, T_{inst}	[Nm]	10	20	40	80	135	200	240	270
Minimum Anchorage Depth, $h_{ef,min}$									
Minimum Anchorage Depth, $h_{ef,min}$	[mm]	60	60	70	80	90	96	108	120
Minimum Spacing, s_{min}	[mm]	40	40	40	45	50	55	60	65
Minimum Edge Distance, c_{min}	[mm]	40	40	40	45	50	55	60	65
Minimum Concrete Thickness, h_{min}	[mm]	100	100	100	115	130	160	180	200
Maximum Anchorage Depth, $h_{ef,max}$									
Maximum Anchorage Depth, $h_{ef,max}$	[mm]	160	200	240	320	400	480	540	600
Minimum Spacing, s_{min}	[mm]	40	40	40	45	50	55	60	65
Minimum Edge Distance, c_{min}	[mm]	40	40	40	45	50	55	60	65
Minimum Concrete Thickness, h_{min}	[mm]	200	224	268	336	444	532	600	670
Standard Anchorage Depth, $h_{ef,std}$									
Standard Anchorage Depth, $h_{ef,std}$	[mm]	80	90	110	125	170	210	250	270
Minimum Spacing, s_{min}	[mm]	40	45	55	65	85	105	125	135
Minimum Edge Distance, c_{min}	[mm]	40	45	55	65	85	105	125	135
Minimum Concrete Thickness, h_{min}	[mm]	$h_{ef,std} + 30mm \geq 100mm$			$h_{ef,std} + 2d_o$				

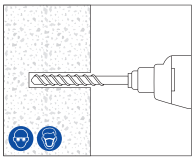
SETTING DIAGRAM



INSTALLATION PROCEDURES

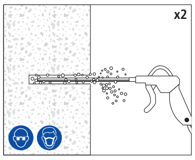
Before commencing installation ensure the operative is equipped with appropriate personal protection equipment, SDS Hammer Drill, Air Blower, Hole Cleaning Brush, good quality Dispensing Tool – either manual or power operated, Chemical Cartridge with mixing nozzle and extension tube, if needed.

1. Using the SDS Hammer Drill in rotary hammer mode for drilling, with a carbide tipped drill bit of the appropriate size, drill the hole to the specified hole diameter and depth.



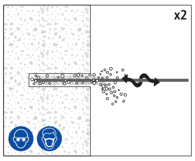
2. Insert the Air Lance to the bottom of the hole and depress the trigger for 2 seconds. The compressed air must be clean – free from water and oil – and at a minimum pressure of 6bar.

   Perform the blowing operation twice.



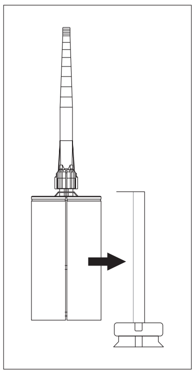
3. Select the correct size Hole Cleaning Brush. Ensure that the brush is in good condition and the correct diameter. Insert the brush to the bottom of the hole, use a brush extension if needed to reach the bottom of the hole and withdraw with a twisting motion. There should be positive interaction between the steel bristles of the brush and the sides of the drilled hole.

   Perform the brushing operation twice.

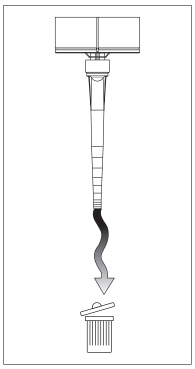


4. Repeat 2
5. Repeat 3
6. Repeat 2
7. Select the appropriate static mixer nozzle, check that the mixing elements are present and correct ***(do not modify the mixer).*** Attach mixer nozzle to the cartridge. Check the Dispensing Tool is in good working order. Place the cartridge into the dispensing tool.

   Note: The Nozzle type 4 is in two sections. One section contains the mixing elements and the other section is an extension piece. Connect the extension piece to the mixing section by pushing the two sections firmly together until a positive engagement is felt.

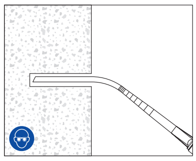


8. Extrude some resin to waste until an even-colored mixture is extruded. The cartridge is now ready to use.

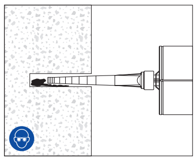


9. Attach an extension tube with resin stopper (if required) to the end of the mixing nozzle with a push fit.

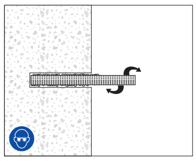
   (The extension tubes may be pushed into the resin stoppers and are held in place with a coarse internal thread).



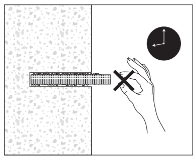
10. Insert the mixing nozzle to the bottom of the hole. Extrude the resin and slowly withdraw the nozzle from the hole. **Ensure no air voids are created** as the nozzle is withdrawn. Inject resin until the hole is approximately ¾ full and remove the nozzle from the hole.



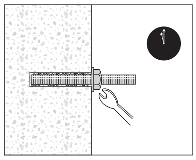
11. Select the steel anchor element and ensure it is free from oil or other contaminants, and mark with the required embedment depth. Insert the steel element into the hole using a back and forth twisting motion to ensure complete cover, until it reaches the bottom of the hole. Excess resin will be expelled from the hole evenly around the steel element and there shall be no gaps between the anchor element and the wall of the drilled hole.



12. Clean any excess resin from around the mouth of the hole.
13. Do not disturb the anchor until at least the minimum curing time has elapsed. Refer to the Gel and Curing Timetable to determine the appropriate cure time.



14. Position the fixture and tighten the anchor to the appropriate installation torque.



Do not over-torque the anchor as this could adversely affect its performance.

GEL AND CURING TIME[1,2]

BASE MATERIAL TEMPERATURE $T_{base\ material}$ (°C)	GEL TIME (WORKING TIME) t_{gel} (mins)	CURING TIME t_{cure} (hrs)
$+5 \leq T_{base\ material} < +10$	20	24
$+10 \leq T_{base\ material} < +15$	20	12
$+15 \leq T_{base\ material} < +20$	15	8
$+20 \leq T_{base\ material} < +25$	11	7
$+25 \leq T_{base\ material} < +30$	8	6
$+30 \leq T_{base\ material} < +35$	6	5
$+35 \leq T_{base\ material} < +40$	4	4
+40 & above	3	3

[1] Cartridge should be ≥ +10°C.
[2] The curing time are for dry base material only. In wet base material, the curing time must be doubled.

MATERIAL SPECIFICATIONS

DESIGNATION	MATERIAL
VA Rods - Class 5.8 & 8.8 M8 - M30	Strength class 5.8, 8.8 to EN ISO 898-1 Steel, zinc plated ≥ 5µm to EN ISO 4042 Steel, hot dipped galvanised ≥ 40µm to EN ISO 10684
Washer ISO 7089	Steel, zinc plated to EN ISO 4042 Steel, hot dipped galvanised to EN ISO 10684
Hexagon Nut EN ISO 4032	Strength class 5.8, 8.8 to EN ISO 898-2 Steel galvanised ≥ 5µm to EN ISO 4042 Hot dipped galvanised ≥ 40µm to EN ISO 10684
VAS Rods - Class A2 & A4 M8 - M30	Strength class A2-70 & A4-70 to EN ISO 3506-1 Stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 to EN 10088
Washer ISO 7089	Stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 EN 10088
Hexagon Nut EN ISO 4032	Strength class A2-70 & A4-70 to EN ISO 3506-2 Stainless steel 1.4401; 1.4404; 1.4578; 1.4571; 1.4439; 1.4362 to EN 10088

MECHANICAL PROPERTIES

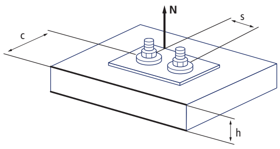
ANCHOR SIZE		M8	M10	M12	M16	M20	M24	M27	M30
Cross Sectional Area, A_s	[mm²]	36.6	58.0	84.3	157.0	245.0	353.0	459.0	519.0
Nominal Tensile Strength, f_{uk}	[N/mm²]								
~ Carbon Steel: Class 5.8		500	500	500	500	500	500	500	500
~ High Tensile Steel: Class 8.8		800	800	800	800	800	800	800	800
~ Stainless Steel: Class A2/A4		700	700	700	700	700	700	700	700
Nominal Yield Strength, f_{yk}	[N/mm²]								
~ Carbon Steel: Class 5.8		400	400	400	400	400	400	400	400
~ High Tensile Steel: Class 8.8		640	640	640	640	640	640	640	640
~ Stainless Steel: Class A2/A4		450	450	450	450	450	450	450	450
Elastic Moment Of Resistance, W_{el}	[mm³]	31.2	62.3	109.2	277.5	540.9	935.5	1,245.0	1,668.0
Design Bending Moment, $M_{Rd,s}$	[Nm]								
~ Carbon Steel: Class 5.8		15.2	29.6	52.8	132.8	260.0	448.8	665.6	900.0
~ High Tensile Steel: Class 8.8		24.0	48.0	84.0	212.8	415.2	718.4	1,065.6	1,439.2
~ Stainless Steel: Class A2/A4		16.7	33.3	59.0	149.4	291.0	503.8	746.8	1,009.0

The design bending moment is derived from $M_{Rd,s} = M_{Rk,s} / \gamma_{Ms,N}$ where the partial safety factor is 1.25 for carbon steel 5.8 and high tensile steel 8.8; 1.56 for stainless steel A2/A4. The recommended bending moment is derived from $M_{Rec,s} = M_{Rd,s} / \gamma_F$ where the partial safety factor is 1.4.

EPC80 HIGH PERFORMANCE HYBRID EPOXY WITH VA RODS

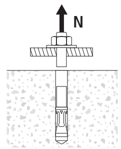
TENSION LOAD [N_{Rd}]

Design Tensile Resistance, N_{Rd}:	lower value of [$N_{Rd,s}$; $N_{Rd,p}$; $N_{Rd,c}$]
Design Steel Tensile Resistance:	$N_{Rd,s}$
Design Pull-Out Resistance:	$N_{Rd,p} = N^0_{Rd,p} \cdot \Psi_{h,N} \cdot \Psi_{\beta,N}$
Design Concrete Cone Resistance:	$N_{Rd,c} = N^0_{Rd,c} \cdot \Psi_{h,N} \cdot \Psi_{\beta,N} \cdot \Psi_{s,N} \cdot \Psi_{c,N}$



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

- For static and quasi-static loadings.
- Only a single anchor is considered.
- For non-cracked and cracked concrete.
- Data valid only for specified steel grade.
- Loading data conformed to ETA-17/0410.

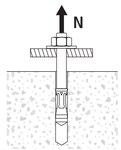


ANCHOR SIZE		M8	M10	M12	M16	M20	M24	M27	M30
Carbon Steel: Class 5.8									
$N_{Rd,s}$	[kN]	12.0	19.3	28.0	52.7	82.0	118.0	153.3	187.3
High Tensile Steel: Class 8.8									
$N_{Rd,s}$	[kN]	19.3	30.7	44.7	84.0	130.7	188.0	244.7	299.3
Stainless Steel: Class A2/A4									
$N_{Rd,s}$	[kN]	13.7	21.6	31.1	57.9	90.5	130.0	168.9	206.8

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 for carbon steel 5.8 and high tensile steel 8.8; 1.9 for stainless steel A2/A4. The recommended load is derived from $N_{Rec,s} = N_{Rd,s} / \gamma_F$ where the partial safety factor is 1.4.

PULL-OUT RESISTANCE [$N_{Rd,p}$]

- For static and quasi-static loadings.
- Only a single anchor is considered.
- No anchor spacing and edge distance influences.
- Loading applicable to dry and wet concrete.
- Concrete compressive strength C20/25 ($f_{ck,cube}$ = 25 N/mm²).
- For non-cracked and cracked concrete.
- Loading data conformed to ETA-17/0410.

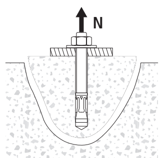


ANCHOR SIZE		M8	M10	M12	M16	M20	M24	M27	M30
$h_{ef,std}$	[mm]	80	90	110	125	170	210	250	270
Non-Cracked Concrete									
$N^0_{Rd,p}$	[kN]	12.3	17.3	21.7	32.9	56.0	90.5	101.0	121.2
Cracked Concrete									
$N^0_{Rd,p}$	[kN]	9.5	13.4	16.8	25.4	28.0	41.5	55.5	66.7

The design pull-out resistance is derived from $N^0_{Rd,p} = N^0_{Rk,p} / \gamma_{Mc,N}$ where the partial safety factor is 1.8 for M8 ~ M10 and 2.1 for M12 and above. The recommended load is derived from $N^0_{Rec,p} = N^0_{Rd,p} / \gamma_F$ where the partial safety factor is 1.4.

CONCRETE CONE RESISTANCE [$N_{Rd,c}$]

- For static and quasi-static loadings.
- Only a single anchor is considered.
- No anchor spacing and edge distance influences.
- Loading applicable to dry and wet concrete.
- Concrete compressive strength C20/25 ($f_{ck,cube}$ = 25 N/mm²).
- For non-cracked and cracked concrete.
- Loading data conformed to ETA-17/0410.



ANCHOR SIZE		M8	M10	M12	M16	M20	M24	M27	M30
$h_{ef,std}$	[mm]	80	90	110	125	170	210	250	270
Non-Cracked Concrete									
$N^0_{Rd,c}$	[kN]	24.1	28.7	38.8	47.1	74.6	102.5	133.1	149.4
Cracked Concrete									
$N^0_{Rd,c}$	[kN]	17.2	20.5	27.7	33.5	53.2	73.0	94.9	106.5

The design concrete cone resistance is derived from $N^0_{Rd,c} = N^0_{Rk,c} / \gamma_{Mc,N}$ where the 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.

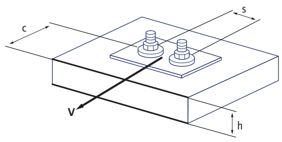
SHEAR LOAD [V_{Rd}]

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

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

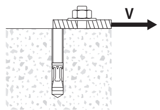
Design Concrete Edge Shear Resistance: $V_{Rd,c} = V^0_{Rd,c} \cdot \Psi_{\beta,V} \cdot \Psi_{\alpha,V} \cdot \Psi_{sc,V}$

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 and cracked concrete.
- Data valid only for specified steel grade.
- Loading data conformed to ETA-17/0410.

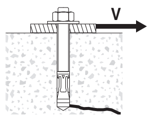


ANCHOR SIZE		M8	M10	M12	M16	M20	M24	M27	M30
Carbon Steel: Class 5.8									
$V_{Rd,s}$	[kN]	7.2	12.0	16.8	31.2	48.8	70.4	92.0	112.0
High Tensile Steel: Class 8.8									
$V_{Rd,s}$	[kN]	12.0	18.4	27.2	50.4	78.4	112.8	147.2	179.2
Stainless Steel: Class A2/A4									
$V_{Rd,s}$	[kN]	8.3	12.8	19.2	35.3	55.1	79.5	103.2	125.6

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 for carbon steel 5.8 and high tensile steel 8.8; 1.56 for stainless steel A2/A4. 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 static and quasi-static loadings.
- Only a single anchor is considered.
- No anchor spacing and edge distance influences.
- Loading applicable to dry and wet concrete.
- Concrete compressive strength C20/25 ($f_{ck,cube} = 25$ N/mm^2).
- For non-cracked and cracked concrete.
- Loading data conformed to ETA-17/0410.

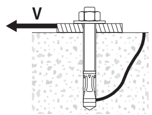


ANCHOR SIZE		M8	M10	M12	M16	M20	M24	M27	M30
$h_{ef,std}$	[mm]	80	90	110	125	170	210	250	270
c_{min}	[mm]	40	45	55	65	85	105	125	135
Non-Cracked Concrete									
$V^0_{Rd,c}$	[kN]	3.6	4.7	6.9	10.1	17.4	25.8	34.7	42.1
Cracked Concrete									
$V^0_{Rd,c}$	[kN]	2.6	3.3	4.9	7.1	12.3	18.2	24.5	29.7

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 static and quasi-static loadings.
- Only a single anchor is considered.
- No anchor spacing and edge distance influences.
- Loading applicable to dry and wet concrete.
- Concrete compressive strength C20/25 ($f_{ck,cube} = 25$ N/mm^2).
- For non-cracked and cracked concrete.
- Loading data conformed to ETA-17/0410.



ANCHOR SIZE		M8	M10	M12	M16	M20	M24	M27	M30
$h_{ef,std}$	[mm]	80	90	110	125	170	210	250	270
Non-Cracked Concrete									
$V^0_{Rd,cp}$	[kN]	48.2	57.5	77.7	94.1	149.2	204.9	266.2	298.7
Cracked Concrete									
$V^0_{Rd,cp}$	[kN]	34.3	41.0	55.4	67.1	106.4	146.1	189.7	213.0

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 to 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 ANCHORAGE DEPTH [$\Psi_{h,N}$]

$\Psi_{h,N} = \frac{h_{act}}{h_{ef,std}}$ Limits: $h_{ef,min} \leq h_{act} \leq 20 * d$

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

$\Psi_{\beta,N} = \left(\frac{f_{ck,cube}}{25}\right)^{0.3}$ Limits: 25 MPa $\leq f_{ck,cube} \leq$ 60 MPa

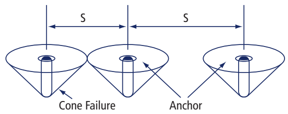
Concrete Strength Designation (ENV 206)		C 20/25	C 25/30	C 30/37	C 35/45	C 40/50	C 50/60
Concrete Cylinder Strength, $f_{ck,cyl}$	[MPa]	20	25	30	35	40	50
Concrete Cube Strength, $f_{ck,cube}$	[MPa]	25	30	37	45	50	60
Concrete Strength Factor, $\psi_{\beta,N}$		1.00	1.06	1.12	1.19	1.23	1.30

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

Anchor Spacing 's' [mm]	M8	M10	M12	M16	M20	M24	M27	M30
40	0.63							
45	0.64	0.63						
55	0.67	0.65	0.63					
65	0.70	0.68	0.65	0.63				
85	0.77	0.74	0.69	0.67	0.63			
105	0.83	0.79	0.74	0.71	0.65	0.63		
125	0.89	0.85	0.78	0.75	0.68	0.65	0.63	
135	0.92	0.88	0.81	0.77	0.70	0.66	0.64	0.63
160	1.00	0.94	0.86	0.82	0.74	0.69	0.66	0.65
180		1.00	0.91	0.86	0.76	0.71	0.68	0.67
220			1.00	0.94	0.82	0.76	0.72	0.70
250				1.00	0.87	0.80	0.75	0.73
340					1.00	0.90	0.84	0.81
420						1.00	0.92	0.89
500							1.00	0.96
540								1.00
Critical Spacing 's_{cr}' [mm]	160	180	220	250	340	420	500	540
Minimum Spacing 's_{min}' [mm]	40	45	55	65	85	105	125	135

$\Psi_{s,N} = 0.5 + \frac{s}{4 * h_{ef,std}}$

Limits: $s_{min} \leq s \leq s_{cr}$
$s_{min} = 0.5 * h_{ef,std}$
$s_{cr} = 2.0 * h_{ef,std}$

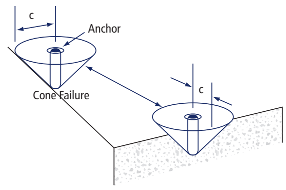


INFLUENCE OF EDGE DISTANCE [$\psi_{c,N}$]

Edge Distance 'c' [mm]	M8	M10	M12	M16	M20	M24	M27	M30
40	0.65							
45	0.69	0.65						
55	0.78	0.73	0.65					
65	0.87	0.81	0.71	0.66				
80	1.00	0.92	0.81	0.75				
85		0.96	0.84	0.78	0.65			
90		1.00	0.87	0.80	0.67			
105			0.97	0.89	0.73	0.65		
110			1.00	0.92	0.75	0.67		
125				1.00	0.81	0.72	0.65	
135					0.86	0.75	0.68	0.65
150					0.92	0.80	0.72	0.69
165					0.98	0.85	0.76	0.73
170					1.00	0.87	0.78	0.74
210						1.00	0.89	0.84
250							1.00	0.95
270								1.00
Critical Edge Distance 'c_{cr}' [mm]	80	90	110	125	170	210	250	270
Minimum Edge Distance 'c_{min}' [mm]	40	45	55	65	85	105	125	135

$\Psi_{c,N} = 0.3 + 0.7 * \frac{c}{h_{ef,std}}$

Limits: $c_{min} \leq c \leq c_{cr}$
$c_{min} = 0.5 * h_{ef,std}$
$c_{cr} = 1.0 * h_{ef,std}$



INFLUENCING FACTORS - SHEAR

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

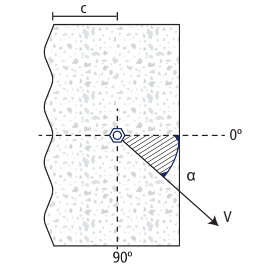
$$\Psi_{\beta,V} = \sqrt{\frac{f_{ck,cube}}{25}}$$

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

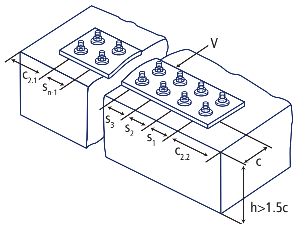


INFLUENCE OF ANCHOR SPACING AND EDGE DISTANCE ON CONCRETE EDGE SHEAR RESISTANCE [$\Psi_{sc,V}$]

$$\Psi_{sc,V} = \frac{c}{c_{min}} * \sqrt{\frac{c}{c_{min}}}$$ 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

EPC80 HIGH PERFORMANCE HYBRID EPOXY FOR POST-INSTALLED REBAR APPLICATIONS

(Design Load Approach with BS8110 Bond Strength Method)

Concrete Compressive Strength: $f_{ck,cube}$ = 25 N/mm²

Rebar Size, d_s		ϕ10	ϕ12	ϕ16	ϕ20	ϕ25	ϕ32	ϕ40
Design Steel Resistance, $N_{Rd,s}$	[kN]	31.4	45.2	80.4	125.7	196.4	321.7	502.7
Design Bond Stress, τ_{Rd}	[N/mm²]	6.1	5.2	5.7	5.7	5.7	5.7	5.2
Drilled Hole Diameter, d_o	[mm]	13 ~ 14	15 ~ 16	20 ~ 22	25 ~ 28	30 ~ 32	40 ~ 42	50 ~ 52
Bar Spacing, s	[mm]	50	65	80	100	125	160	200
Edge Distance, c	[mm]	40	40	40	50	65	80	100
$L_{b,rqd}$ / Rebar ϕ		16	19	18	18	18	18	19
Anchorage Length, L_b [mm]		Design Tensile Bonding Capacity, N_{Rd} [kN]						
100		19.2						
120		23.0	23.7			*"Minimum depth to develop full steel shear"*		
160		30.7	31.6	46.0				
200		**31.4**	39.5	57.5	71.8			
250			**45.2**	71.8	89.8	112.2		
320				**80.4**	114.9	143.6	183.9	
350					**125.7**	157.1	201.1	
400						179.5	229.8	263.3
440						**196.4**	252.8	289.7
500							287.3	329.2
560							**321.7**	368.7
650								427.9
700								460.8
770								**502.7**
Length to Develop Steel Yield, $L_{b,rqd}$ [mm]		164	229	280	350	438	560	764

1) Safety factor for design tensile steel resistance: $\gamma_{Ms,N}$ = 1.15 (based on steel yield strength of 460 N/mm²).
2) Safety factor for design tensile pull-out resistance: $\gamma_{Mc,N}$ = 1.8 for ϕ10 and 2.1 for ϕ12 and above.
3) Loading applicable to non-cracked concrete with design comply in accordance to BS8110.
4) Loading data conformed to ETA-17/0410 ETAG 001 Part 1 & Part 5 Option 1.
5) Safety factor for design tensile concrete cone resistance: $\gamma_{Mc,N}$ = 1.5
6) Minimum spacing shall be $4d_s$ bar to bar or $5d_s$ centre-to-centre.
7) Minimum edge distance shall be $2d_s$ bar to bar or $2.5d_s$ centre-to-centre.

APPROVAL LISTING

European Technical Approval- Option 1 for Cracked Concrete ETA 17/0410

FIRE RESISTANCE

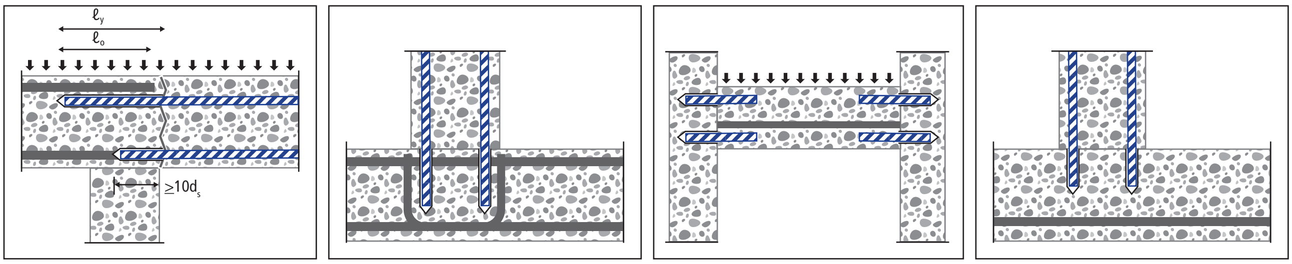
ÉMISSIONS DANS L'AIR INTÉRIEUR A+ A B C

WRAS APPROVED MATERIAL

LEED TESTED

SEISMIC C1

SUGGESTED APPLICATIONS



Overlap joints for slabs and beams or foundation column or wall; rebar connection for simply supported slabs or beams; shear connector or compression component joints.

Important note: Architect or design engineer must conduct final checked with the actual site condition for any variations against tabulated data.

EPC80 HIGH PERFORMANCE HYBRID EPOXY FOR POST-INSTALLED REBAR APPLICATIONS

(Design Load Approach with BS8110 Bond Strength Method)

Concrete Compressive Strength: $f_{ck,cube}$ = 30 N/mm²

Rebar Size, d_s		**ϕ10**	**ϕ12**	**ϕ16**	**ϕ20**	**ϕ25**	**ϕ32**	**ϕ40**
Design Steel Resistance, $N_{Rd,s}$	[kN]	31.4	45.2	80.4	125.7	196.4	321.7	502.7
Design Bond Stress, τ_{Rd}	[N/mm²]	6.3	5.4	5.9	5.9	5.9	5.9	5.4
Drilled Hole Diameter, d_o	[mm]	13 ~ 14	15 ~ 16	20 ~ 22	25 ~ 28	30 ~ 32	40 ~ 42	50 ~ 52
Bar Spacing, s	[mm]	50	65	80	100	125	160	200
Edge Distance, c	[mm]	40	40	40	50	65	80	100
$L_{b,rqd}$ / Rebar ϕ		16	19	17	17	17	17	19
Anchorage Length, L_b [mm]		Design Tensile Bonding Capacity, N_{Rd} [kN]						
100		19.8						
120		23.7	24.4					
160		**31.4**	32.5	47.3				
200			40.7	59.2	74.0			
225			**45.2**	66.6	83.2			
250				74.0	92.5	115.6		
275				**80.4**	101.7	127.1		
320					118.4	147.9	189.4	
340					**125.7**	157.2	201.2	
400						184.9	236.7	271.2
425						**196.4**	251.5	288.2
475							281.1	322.1
545							**321.7**	369.6
600								406.8
740								**502.7**
Length to Develop Steel Yield, $L_{b,rqd}$ [mm]		159	222	272	340	425	544	741

"Minimum depth to develop full steel shear"

1) Safety factor for design tensile steel resistance: $\gamma_{Ms,N}$ = 1.15 (based on steel yield strength of 460 N/mm²).
2) Safety factor for design tensile pull-out resistance: $\gamma_{Mc,N}$ = 1.8 for ϕ10 and 2.1 for ϕ12 and above.
3) Loading applicable to non-cracked concrete with design comply in accordance to BS8110.
4) Loading data conformed to ETA-17/0410 ETAG 001 Part 1 & Part 5 Option 1.
5) Safety factor for design tensile concrete cone resistance: $\gamma_{Mc,N}$ = 1.5
6) Minimum spacing shall be $4d_s$ bar to bar or $5d_s$ centre-to-centre.
7) Minimum edge distance shall be $2d_s$ bar to bar or $2.5d_s$ centre-to-centre.

APPROVAL LISTING

European Technical Approval-Option 1 for Cracked Concrete ETA 17/0410

FIRE RESISTANCE

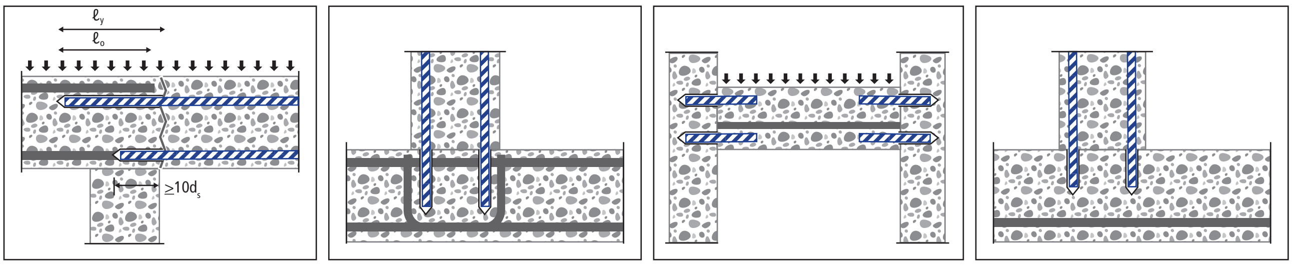
ÉMISSIONS DANS L'AIR INTÉRIEUR A+

WRAS APPROVED MATERIAL

LEED TESTED

SEISMIC C1

SUGGESTED APPLICATIONS



Overlap joints for slabs and beams or foundation column or wall; rebar connection for simply supported slabs or beams; shear connector or compression component joints.

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EPC80 HIGH PERFORMANCE HYBRID EPOXY FOR POST-INSTALLED REBAR APPLICATIONS

(Design Load Approach with BS8110 Bond Strength Method)

Concrete Compressive Strength: $f_{ck,cube}$ = 35 N/mm²

Rebar Size, d_s		ϕ10	ϕ12	ϕ16	ϕ20	ϕ25	ϕ32	ϕ40
Design Steel Resistance, $N_{Rd,s}$	[kN]	31.4	45.2	80.4	125.7	196.4	321.7	502.7
Design Bond Stress, τ_{Rd}	[N/mm²]	6.4	5.5	6.0	6.0	6.0	6.0	5.5
Drilled Hole Diameter, d_o	[mm]	13 ~ 14	15 ~ 16	20 ~ 22	25 ~ 28	30 ~ 32	40 ~ 42	50 ~ 52
Bar Spacing, s	[mm]	50	65	80	100	125	160	200
Edge Distance, c	[mm]	40	40	40	50	65	80	100
$L_{b,rqd}$ / Rebar ϕ		16	18	17	17	17	17	18
Anchorage Length, L_b [mm]		Design Tensile Bonding Capacity, N_{Rd} [kN]						
100		20.2						
120		24.2	24.9					
160		**31.4**	33.2	48.3				
200			41.5	60.3	75.4			
220			**45.2**	66.4	82.9			
250				75.4	94.3	117.8		
265				**80.4**	99.9	124.9		
300					113.1	141.4		
320					**125.7**	150.8	193.0	
375						176.7	226.2	
400						**196.4**	241.3	276.5
450							271.5	311.1
535							**321.7**	369.8
600								414.7
725								**502.7**
Length to Develop Steel Yield, $L_{b,rqd}$ [mm]		156	218	267	333	417	533	727

"Minimum depth to develop full steel shear"

1) Safety factor for design tensile steel resistance: $\gamma_{Ms,N}$ = 1.15 (based on steel yield strength of 460 N/mm²).
2) Safety factor for design tensile pull-out resistance: $\gamma_{Mc,N}$ = 1.8 for ϕ10 and 2.1 for ϕ12 and above.
3) Loading applicable to non-cracked concrete with design comply in accordance to BS8110.
4) Loading data conformed to ETA-17/0410 ETAG 001 Part 1 & Part 5 Option 1.
5) Safety factor for design tensile concrete cone resistance: $\gamma_{Mc,N}$ = 1.5
6) Minimum spacing shall be $4d_s$ bar to bar or $5d_s$ centre-to-centre.
7) Minimum edge distance shall be $2d_s$ bar to bar or $2.5d_s$ centre-to-centre.

APPROVAL LISTING

ETA CE — European Technical Approval-Option 1 for Cracked Concrete — ETA 17/0410

FIRE RESISTANCE

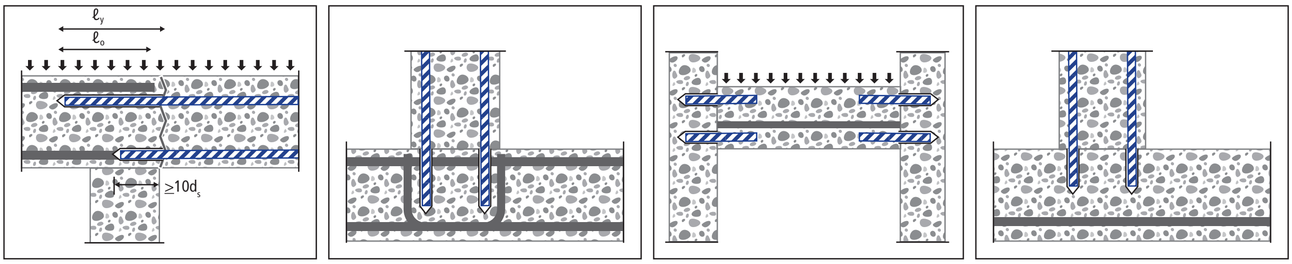
ÉMISSIONS DANS L'AIR INTÉRIEUR* A+

WRAS APPROVED MATERIAL

LEED TESTED

SEISMIC C1

SUGGESTED APPLICATIONS



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EPC80 HIGH PERFORMANCE HYBRID EPOXY
FOR POST-INSTALLED REBAR APPLICATIONS
(Design Load Approach with BS8110 & ACI 318 Concrete Splitting Criteria)

Concrete Compressive Strength: $f_{ck,cube}$ = 25 N/mm²

Rebar Size, d_s		ϕ10	ϕ12	ϕ16	ϕ20	ϕ25	ϕ32	ϕ40
Design Steel Resistance, $N_{Rd,s}$	[kN]	34.4	49.6	88.1	137.6	215.1	352.4	550.6
Splitting Bond Stress, $\tau_{sp,d}$	[N/mm²]	3.49	3.49	3.49	3.25	2.80	2.80	2.80
Drilled Hole Diameter, d_o	[mm]	13 ~ 14	15 ~ 16	20 ~ 22	25 ~ 28	30 ~ 32	40 ~ 42	50 ~ 52
Bar Spacing, s	[mm]	50	60	80	100	125	160	200
Edge Distance, c	[mm]	40	40	40	50	65	80	100
$L_{b,rqd}$ / Rebar ϕ		31	31	31	34	39	39	39
Anchorage Length, L_b [mm]		Design Tensile Pull-Out / Concrete Cone Resistance, N_{Rd} [kN]						
100		11.0						
120		13.2	15.8			*"Minimum depth to develop full steel shear"*		
160		17.5	21.1	28.1				
200		21.9	26.3	35.1	40.8			
250		27.4	32.9	43.9	51.1	55.0		
300		32.9	39.5	52.6	61.3	66.0		
320		**34.4**	42.1	56.1	65.4	70.4	90.1	
400			**49.6**	70.2	81.7	88.0	112.6	140.8
450				79.0	91.9	99.0	126.7	158.4
500				**88.1**	102.1	110.0	140.8	176.0
600					122.5	132.0	168.9	211.1
675					**137.6**	148.5	190.0	237.5
750						165.0	211.1	263.9
980						**215.1**	275.9	344.9
1000							281.5	351.9
1250							**352.4**	439.9
1400								492.7
1565								**550.6**
Length to Develop Steel Yield, $L_{b,rqd}$ [mm]		314	377	502	674	978	1,252	1,565

1) Design tensile steel resistance: $N_{Rd,s} = f_y * A_s / \gamma_{Ms,N}$ where $\gamma_{Ms,N}$ = 1.05 (based on steel yield of 460 N/mm²).
2) Design value complied in accordance to BS8110 and ACI 318 concrete splitting criteria.
3) Loading data conformed to ETA-17/0410 ETAG 001 Part 1 & Part 5 Option 1.
4) Minimum spacing shall be $4d_s$ bar to bar or $5d_s$ centre-to-centre.
5) Minimum edge distance shall be $2d_s$ bar to bar or $2.5d_s$ centre-to-centre.
6) Applicable to dry and wet concrete application.
7) Design value based on non-cracked concrete.

APPROVAL LISTING

European Technical Approval-Option 1 for Cracked Concrete ETA 17/0410

FIRE RESISTANCE

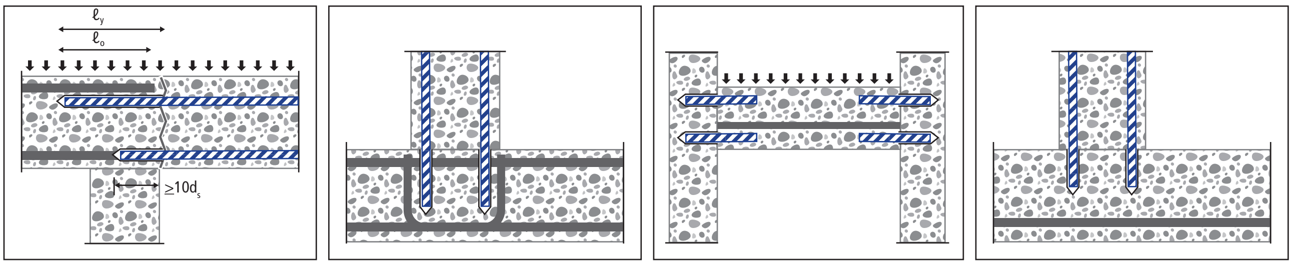
ÉMISSIONS DANS L'AIR INTÉRIEUR A+

WRAS APPROVED MATERIAL

LEED TESTED

SEISMIC C1

SUGGESTED APPLICATIONS



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EPC80 HIGH PERFORMANCE HYBRID EPOXY FOR POST-INSTALLED REBAR APPLICATIONS

(Design Load Approach with BS8110 & ACI 318 Concrete Splitting Criteria)

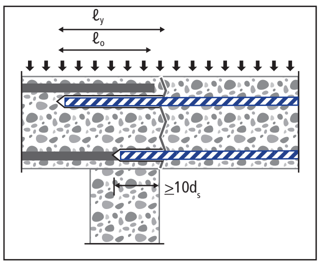
Concrete Compressive Strength: $f_{ck,cube}$ = 30 N/mm²

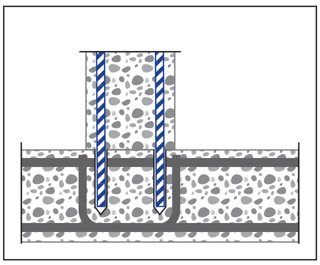
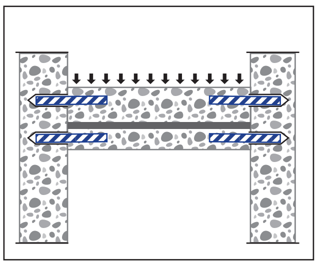
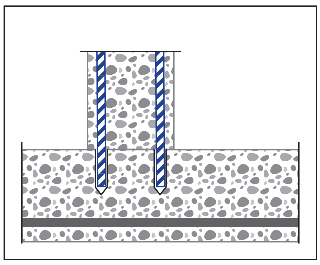
Rebar Size, d_s		ϕ10	ϕ12	ϕ16	ϕ20	ϕ25	ϕ32	ϕ40
Design Steel Resistance, $N_{Rd,s}$	[kN]	34.4	49.6	88.1	137.6	215.1	352.4	550.6
Splitting Bond Stress, $\tau_{sp,d}$	[N/mm²]	3.91	3.91	3.91	3.63	3.13	3.13	3.13
Drilled Hole Diameter, d_o	[mm]	13 ~ 14	15 ~ 16	20 ~ 22	25 ~ 28	30 ~ 32	40 ~ 42	50 ~ 52
Bar Spacing, s	[mm]	50	60	80	100	125	160	200
Edge Distance, c	[mm]	40	40	40	50	65	80	100
$L_{b,rqd}$ / Rebar ϕ		28	28	28	30	35	35	35
Anchorage Length, L_b [mm]		Design Tensile Pull-Out / Concrete Cone Resistance, N_{Rd} [kN]						
100		12.3						
120		14.7	17.7			*"Minimum depth to develop full steel shear"*		
160		19.7	23.6	31.5				
200		24.6	29.5	39.3	45.6			
250		30.7	36.9	49.1	57.0	61.5		
275		33.8	40.5	54.1	62.7	67.6		
280		**34.4**	41.3	55.0	63.9	68.8		
320			47.2	62.9	73.0	78.7	100.7	
335			**49.6**	65.8	76.4	82.4	105.4	
400				78.6	91.2	98.3	125.9	157.4
450				**88.1**	102.6	110.6	141.6	177.0
525					119.8	129.1	165.2	206.5
605					**137.6**	148.7	190.4	238.0
750						184.4	236.0	295.0
875						**215.1**	275.4	344.2
950							299.0	373.7
1120							**352.4**	440.6
1300								511.4
1400								**550.6**
Length to Develop Steel Yield, $L_{b,rqd}$ [mm]		280	336	448	603	875	1,120	1,400

1) Design tensile steel resistance: $N_{Rd,s} = f_y * A_s / \gamma_{Ms,N}$ where $\gamma_{Ms,N}$ = 1.05 (based on steel yield of 460 N/mm²).
2) Design value complied in accordance to BS8110 and ACI 318 concrete splitting criteria.
3) Loading data conformed to ETA-17/0410 ETAG 001 Part 1 & Part 5 Option 1.
4) Minimum spacing shall be $4d_s$ bar to bar or $5d_s$ centre-to-centre.
5) Minimum edge distance shall be $2d_s$ bar to bar or $2.5d_s$ centre-to-centre.
6) Applicable to dry and wet concrete application.
7) Design value based on non-cracked concrete.

APPROVAL LISTING

SUGGESTED APPLICATIONS



Overlap joints for slabs and beams or foundation column or wall; rebar connection for simply supported slabs or beams; shear connector or compression component joints.

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EPC80 HIGH PERFORMANCE HYBRID EPOXY FOR POST-INSTALLED REBAR APPLICATIONS

(Design Load Approach with BS8110 & ACI 318 Concrete Splitting Criteria)

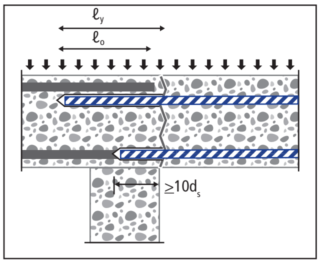
Concrete Compressive Strength: $f_{ck,cube}$ = 35 N/mm²

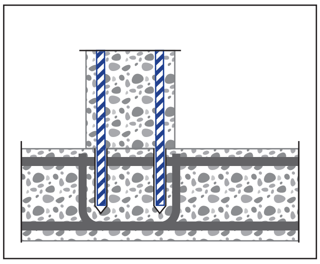
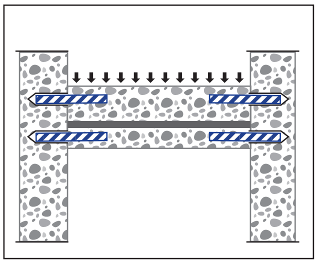
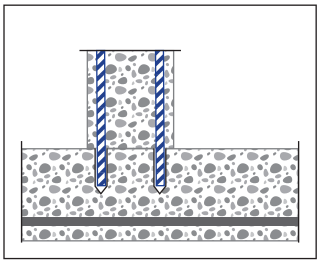
Rebar Size, d_s		ϕ10	ϕ12	ϕ16	ϕ20	ϕ25	ϕ32	ϕ40
Design Steel Resistance, $N_{Rd,s}$	[kN]	34.4	49.6	88.1	137.6	215.1	352.4	550.6
Splitting Bond Stress, $\tau_{sp,d}$	[N/mm²]	4.17	4.17	4.17	3.88	3.34	3.34	3.34
Drilled Hole Diameter, d_o	[mm]	13 ~ 14	15 ~ 16	20 ~ 22	25 ~ 28	30 ~ 32	40 ~ 42	50 ~ 52
Bar Spacing, s	[mm]	50	60	80	100	125	160	200
Edge Distance, c	[mm]	40	40	40	50	65	80	100
$L_{b,rqd}$ / Rebar ϕ		26	26	26	28	33	33	33
Anchorage Length, L_b [mm]		Design Tensile Pull-Out / Concrete Cone Resistance, N_{Rd} [kN]						
100		13.1						
120		15.7	18.9			*"Minimum depth to develop full steel shear"*		
160		21.0	25.2	33.5				
200		26.2	31.4	41.9	48.8			
250		32.8	39.3	52.4	61.0	65.6		
265		**34.4**	41.7	55.6	64.6	69.5		
300			47.2	62.9	73.1	78.7		
320			**49.6**	67.1	78.0	84.0	107.5	
375				78.6	91.4	98.4	125.9	
400				**88.1**	97.5	104.9	134.3	167.9
450					109.7	118.1	151.1	188.9
565					**137.6**	148.2	189.7	237.2
700						183.6	235.1	293.8
820						**215.1**	275.4	344.2
900							302.2	377.8
1050							**352.4**	440.8
1100								461.7
1200								503.7
1310								**550.6**
Length to Develop Steel Yield, $L_{b,rqd}$ [mm]		263	315	420	565	820	1,049	1,312

1) Design tensile steel resistance: $N_{Rd,s} = f_y * A_s / \gamma_{Ms,N}$ where $\gamma_{Ms,N}$ = 1.05 (based on steel yield of 460 N/mm²).
2) Design value complied in accordance to BS8110 and ACI 318 concrete splitting criteria.
3) Loading data conformed to ETA-17/0410 ETAG 001 Part 1 & Part 5 Option 1.
4) Minimum spacing shall be $4d_s$ bar to bar or $5d_s$ centre-to-centre.
5) Minimum edge distance shall be $2d_s$ bar to bar or $2.5d_s$ centre-to-centre.
6) Applicable to dry and wet concrete application.
7) Design value based on non-cracked concrete.

APPROVAL LISTING

SUGGESTED APPLICATIONS



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