PF PRO

Introduction

PF PRO epoxy injection adhesive is a new and improved two component structural epoxy packaged in a specially designed cartridge. The cartridge is made from an engineered plastic and is used with either a manual or pneumatically operated injection tool. The new epoxy is an low odour, premium, high strength pure epoxy, which contains no volatile organic compounds (VOCs) and has a proven track record. PF PRO has longer gel/working time and easier handling (extrudes better) when compared to Power-Fast®PLUS. PF PRO epoxy injection adhesive is designed for use in anchoring threaded rod, bolts, and reinforcing bars into concrete and other solid base materials. PF PRO is fire rated and details of this test program are available in the fire resistance section of this manual.

In addition to anchoring applications, PF PRO epoxy injection adhesive can be used for bonding steel and cured concrete to cured concrete. It can also be used for pick proofing applications and for surface sealing cracks in concrete.

Specification data

PF PRO Cartridge

The design of the PF PRO cartridge eliminates the leakage and dispensing problems often found with other systems. Supplied in a 385ml or 585ml capacity, each cartridge is manufactured in a side by side configuration using two parallel tubes. One tube contains the Component A - Base Resin while the other tube contains the Component B - Hardener. The tubes are separated to keep the components out of contact until they are ready to be dispensed. Each cartridge is formed from an engineered plastic using a special high tolerance molding process. At the front end of each cartridge is a reinforced retention cap and a threaded manifold. A set of plastic pushers is inserted into the rear of each tube to pressurise the epoxy during dispensing. This provides the user with a cartridge which is easy to dispense, yet durable.

PF PRO Mixing nozzles

To ensure complete and proper mixing of the epoxy components, the PF PRO system use a static mixing nozzle. This reduces the possibility of mixing errors which are common with hand mixed pourable grout materials. The mixing nozzles have been designed with a unique tapered extension tip that allows for easy assembly of the extension nozzle. The assembled nozzle system can be used to inject epoxy into most anchor hole sizes. Each nozzle contains a series of stationary components called mixing elements. The elements are motionless and remain in a fixed or static position as the epoxy components are pumped through the nozzle.

As the components are pumped through the nozzle, they are progressively divided and recombined by the stationary mixing elements to insure precise automatic mixing of the components.

PART NO	DESCRIPTION	QUANTITY
PFPN	Mixing nozzle for PF PRO, includes extension nozzle	10

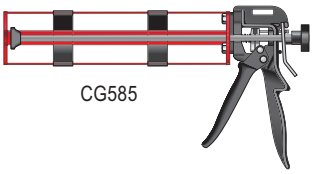
Cartridge system selection guide

PF PRO Cartridge

PART NO	DESCRIPTION	QUANTITY
PF PRO	385ml Cartridge + 2 mixing nozzles	1
PF PRO-585	585ml Cartridge + 2 mixing nozzles	1

Manual injection tools

The CG 585 manual injection tool is designed with a pump style drive mechanism which has a high pump ratio to provide fast dispensing. The base unit and the handle assembly is manufactured from a precision steel casting for long life. A specially designed wear compensation mechanism ensures consistent pumping over the life of the tool. The tool is designed for use with the 385ml and 585ml cartridge only.


CG585

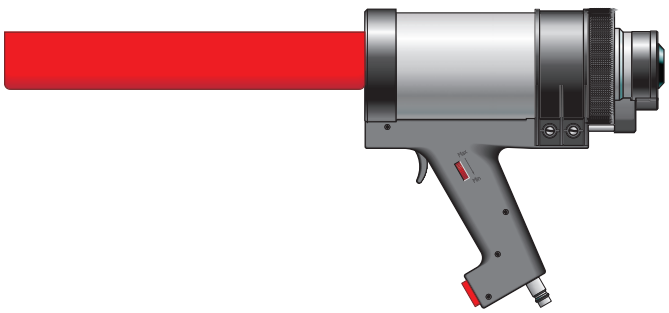
The Multi-PRO (CG PRO-4) manual injection tool is designed with a pump style drive mechanism which has a high pump ratio to provide fast dispensing. The base unit is a unique design which allows for the dispensing of different cartridge sizes consisting of different component ratios. The CG PRO-4 will dispense the 385ml (3:1) cartridge, the 585ml (3:1) cartridge, 380ml (10:1) cartridge, and 300ml (10:1) cartridge. CG PRO-4 is ideal for those who use the entire Powers adhesive range.


CGPRO-4

PART NO	DESCRIPTION	QTY
CG585	Dispensing gun for 385ml and 585ml cartridge	1
CGPRO-4	Dispensing gun for all Powers adhesives	1

Pneumatic injection tool

The pneumatic injection tool is designed for large jobs. The main cylinder is formed using top quality aluminum to provide a lightweight, durable tool. The dispensing trigger is designed to provide instant pressure relief from the cartridge which reduces waste.



PART NO	DESCRIPTION	QUANTITY
CGPN585	Pneumatic Dispensing gun for 385ml and 585ml cartridge	1

Maximum Operating Pressure - 110 psi
Normal Operating Range - 80 to 100 psi
Maximum Free Air Required - 1 CFM based on average use

Threaded rod retaining cap

For use in overhead applications (Ref. Design Manual page 19)

PART NO	DESCRIPTION	DRILL Ø mm	STUD Ø mm	QUANTITY
RC8	8mm Retaining Cap	10	8	10
RC10	10mm Retaining Cap	12	10	10
RC12	12mm Retaining Cap	14	12	10
RC16	16mm Retaining Cap	18	16	10
RC20	20mm Retaining Cap	24	20	10

PF PRO material properties

The PF PRO epoxy is an amine based material. The benefits of using an amine based material include no foul odour, better resistance to moisture, and better chemical resistance. The properties listed in this section apply to the PF PRO epoxy injection adhesive. The performance criteria for use as an anchoring system for threaded rod and reinforcing bars is described in the sections that follow.

Shelf life	24 months
Storage conditions	Store dry at 5º to 25º C.
Colour	Component A – Light beige Component B – Black Mixed epoxy – Dark gray
Mixing ratio	3 to 1
Consistency	Smooth, non sag paste
Compressive strength	145 MPa
Modulus of Elasticity	7356 MPa
Bonding strength	63.0 MPa

PF PRO Epoxy injection gel setting time

The setting times listed for the PF PRO epoxy vary according to the volume of epoxy used and the base material temperature. The working time is the maximum time during which the epoxy can be dispensed before it begins to set. The full curing time is the minimum time required for the epoxy to reach its published physical properties.

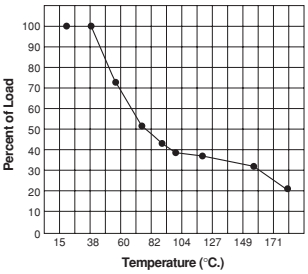
BASE MATERIAL TEMP. (C)	MAXIMUM WORKING TIME (MINUTES)	FULL CURING TIME (HOURS)
0	180	50
10	120	24
20	30	10
30	20	6
40	12	4

Effect of elevated temperature

As with all adhesive anchors, the bond strength of the PF PRO epoxy is effected by elevated temperatures in the base material. As the temperature of the base material increases, the bond strength of the anchor will decrease. Typical performance of the PF PRO epoxy at elevated base material temperatures is shown to the right. The values are based on maintaining the concrete test samples used at a given temperature for a minimum of 24 hours before applying a test load.

The testing described above is based on heating the entire concrete test element. During a fire, the actual behavior of the PF PRO epoxy injection adhesive depends upon the heat dissipation inside the concrete. The rate of heat dissipation will vary depending upon the concrete mix design along with the shape and thickness of the structural member. Normally, at depths beyond 75mm, the concrete heats up relatively slowly since only one face of a slab is actually exposed to the fire.

In addition to the heat dissipation within the base material, the transfer of heat into the adhesive by the anchor rod should be considered. One method of reducing the transfer of heat energy is to protect the fixture and the head of the anchor with a suitable coating. Stainless steel anchor rods typically have a low degree of heat transfer and can be used in conjunction with the PF PRO epoxy injection adhesive to provide an anchor which has a degree of fire resistance. Testing conducted with Type 316 stainless steel rods installed in normal weight concrete has shown that the PF PRO epoxy material can sustain a design load for at least 30 minutes when exposed to a temperature of 815° C. Contact Powers for details of the test program.



PF PRO Quality control procedures

PF PRO epoxy injection adhesive is packaged individually. Each cartridge contains a manufacture date which provides traceability of the components back to the original manufacturing batch. Every batch of material is subjected to extensive physical and chemical property testing during manufacture. Each combination of base resin and hardener material batches is tested as an installed anchor to ensure that the proper bond strength is developed. These procedures ensure consistent, top quality performance to the specifier and the installer of the PF PRO epoxy injection adhesive.

PF PRO environmental certification

The Environmental Choice Australia Label is recognised by architects, manufacturers, designers and building industry professionals as the leading LCA based ecolabelling program in Australia. The program is managed by Good Environmental Choice Australia Ltd (GECA) a non profit organization.

Products certified by GECA like PF PRO provide Green Star accredited professionals with the right resources for their Green Star projects. A GECA EPD (Environmental Product Declaration) and manufacturers GECA licence will in many cases satisfy Green Star compliance criteria which reduces complexity, paperwork and documentation time for Green Star accredited professionals.

The PF PRO EPD can be downloaded from the Powers website at www.powers.com.au, or the GECA website at www.geca.org.au

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Adhesives

Resistance of PF PRO epoxy to chemicals

The resistance of the cured PF PRO epoxy to various chemicals was determined by laying moulded samples of the resin in the respective chemical agents. The samples were subjected to a bending strength test before and after a 12 month exposure to the chemicals. The epoxy was rated as resistant if there was no visible deterioration and less than 25% reduction in bending strength. This exposure is extreme. Under normal installation conditions, the epoxy is exposed to the chemical agents only at the surface of the concrete around the top of the anchor hole.

CHEMICAL AGENT	CONCENTRATION	RESISTANT	NOT RESISTANT
Acetic Acid	40		◆
Acetone	10		◆
Ammonia	5	●	
Aniline	100		◆
Beer	100	●	
Benzine	100	●	
Benzole	100		◆
Boric acid, aqueous solution		●	
Calcium carbonate, suspended in water	All	●	
Calcium chloride, suspended in water		●	
Calcium hydroxide, suspended in water		●	
Carbon tetrachloride	100	●	
Caustic soda solution	40		◆
Citric acid	All	●	
Chlorine	All	●	
Diesel oil	100	●	
Ethyl alcohol, aqueous solution	50		◆
Formaldehyde	30	●	
Formic Acid	100		◆
Formic Acid	10	●	
Freon		●	
Fuel oil		●	
Glycol (Ethylene Glycol)		●	
Hydrogen peroxide	30		◆
Hydrochloric acid	Conc.	●	
Isopropyl alcohol	100		◆
Lactic acid		●	
Laitance		●	
Linseed oil	100	●	
Lubricating oil	100	●	
Magnesium chloride, aqueous solution	All	●	
Methanol	100		◆
Motor Oil (SAE 20 W-50)	100	●	
Nitric acid	30		◆
Nitric acid	10	●	
Oleic acid	100	●	
Perchloroethylene	100	●	
Petroleum	100	●	
Phenol, aqueous solution	8		◆
Phosphoric acid	85	●	
Phosphoric acid	10	●	
Potash Lye (Potassium Hydroxide,10% and 40% solutions)		●	
Potassium carbonate, aqueous solution	All	●	
Potassium Chlorite, aqueous solution	All	●	
Potassium nitrate, aqueous solution	All	●	
Premium gasoline	100	●	
Sodium carbonate, aqueous solution	All	●	
Sodium chloride, aqueous solution	All	●	
Sodium phosphate, aqueous solution	All	●	
Sodium silicate	All	●	
Sulfuric acid	30		◆
Tartaric acid	All	●	
Tetrachoraethylene	100	●	
Toluene			◆
Turpentine	100	●	
Trichloraethylene	100		◆

Performance data

Working stress design

Allowable working loads are based on the lesser of the allowable bond strength and allowable steel strength.

Tension

				ALLOWABLE BOND STRENGTH CONCRETE – TENSION			ALLOWABLE STEEL STRENGTH (min)		
ANCHOR SIZE mm	DRILL SIZE mm	EMBED. DEPTH mm	TORQUE RANGE Nm	15MPa kN	32MPa kN	40MPa kN	TENSION kN Class 5.8	TENSION kN Class 8.8	TENSION kN 316 S/S (A4-50)
M8	10	40	10 - 20	3.6	5.1	6.5	7.6	11.7	8.1
		60		5.7	7.7	9.6			
		85		8.5	9.9	12.8			
M10	12	40	15 -25	4.4	6.4	7.4	12.1	18.6	12.8
		60		6.6	9.9	11.5			
		85		10.6	13.3	16.5			
		115		13.7	16.6	20.1			
M12	14	50	27 - 55	6.8	10.6	11.6	17.5	27.0	18.6
		75		10.9	15.4	17.8			
		115		16.7	23.7	27.1			
		150		21.8	28.9	34.2			
M16	18	65	67 - 120	11.4	13.3	17.2	32.7	50.0	34.5
		95		17.0	22.8	26.4			
		145		27.1	38.3	44.3			
		190		35.5	46.5	56.8			
M20	24	75	135 - 210	13.2	15.2	18.5	51.0	81.2	53.9
		115		23.8	26.8	35.1			
		170		38.6	54.6	59.7			
		230		52.4	65.3	76.6			
M24	28	100	330 - 400	27.4	34.1	41.4	73.4	117.2	77.9
		150		40.9	51.4	56.8			
		230		61.4	86.0	99.0			
		300		87.3	118.4	136.5			
M30	35	125	470 - 600	37.0	52.3	60.4	116.7	186.4	123.4
		190		56.0	79.6	91.9			
		285		84.4	119.4	137.9			
		380		123.8	175.2	202.4			
M36	40	140	470 - 800	47.3	67.0	77.4	169.9	271.2	179.7
		210		71.0	100.6	116.0			
		315		106.4	150.8	174.2			
		420		150.0	212.2	245.0			

Incorporated Safety Factors (Tension and shear):
Allowable bond strength (concrete)f_{sc}=3
Allowable steel strength f_{ss}=2.5

Shear

				ALLOWABLE BOND STRENGTH CONCRETE – SHEAR			ALLOWABLE STEEL STRENGTH (min)		
ANCHOR SIZE mm	DRILL SIZE mm	EMBED. DEPTH mm	TORQUE RANGE Nm	15MPa kN	32MPa kN	40MPa kN	SHEAR kN Class 5.8	SHEAR kN Class 8.8	SHEAR kN 316 S/S (A4-50)
M8	10	40	10 - 20		5.6		4.2	6.5	5.0
M10	12	40	15 - 25		7.7		6.7	10.4	7.9
M12	14	50	27 - 55		13.2		9.8	15.1	11.5
M16	18	65	67 - 120		20.9		18.6	28.6	21.4
M20	24	75	135 - 210		34.7		29.0	46.3	33.4
M24	28	100	330 - 400		63.0		41.8	66.7	48.3
M30	35	125	470 - 600		99.7		66.9	115.5	76.5
M36	40	140	470 - 800		116.5		97.9	168.2	111.4

Incorporated Safety Factors (Tension and shear):
Allowable bond strength (concrete)f_{sc}=3
Allowable steel strength f_{ss}=2.5

NOTE:
The allowable Working Load used should be the lesser of the bond or steel strength.

Limit state design

Anchor design capacities are based on the lesser of the design capacity concrete- and design steel capacity

Anchor Design Tension Capacities

ANCHOR SIZE mm	DRILL SIZE mm	EMBED. DEPTH mm	TORQUE RANGE Nm	DESIGN CAPACITY - CONCRETE 15MPa ϕN_A kN	32MPa ϕN_A kN	40MPa ϕN_A kN	DESIGN STEEL CAPACITY Class 5.8 ϕN_{tf} kN	Class 8.8 ϕN_{tf} kN	(A4-50) ϕN_{tf} kN
M8	10	40	10 - 20	6.4	9.3	11.6	15.2	23.4	16.2
		60		10.2	13.8	17.3			
		85		15.3	17.8	23.0			
M10	12	40	15 -25	7.9	11.4	12.4	24.1	37.1	25.6
		60		11.9	17.8	20.7			
		85		19.1	24.0	29.7			
		115		24.7	29.9	36.1			
M12	14	50	27 - 55	12.3	19.0	21.0	35.1	53.9	37.2
		75		19.6	27.8	32.1			
		115		30.1	42.6	48.7			
		150		39.3	52.0	61.5			
M16	18	65	67 - 120	20.5	24.0	30.9	65.3	100.0	69.0
		95		30.7	41.1	47.4			
		145		48.8	69.0	79.7			
		190		64.0	83.6	102.2			
M20	24	75	135 - 210	23.8	27.3	33.3	101.9	162.4	107.8
		115		42.8	48.2	63.2			
		170		69.5	98.3	107.4			
		230		94.3	117.6	137.8			
M24	28	100	330 - 400	49.2	61.3	74.5	146.8	234.4	155.8
		150		73.7	92.4	102.2			
		230		110.6	154.8	178.2			
		300		157.1	213.1	245.7			
M30	35	125	470 - 600	66.5	94.2	108.6	233.4	372.8	246.8
		190		100.9	143.2	165.5			
		285		151.8	214.9	248.2			
		380		222.9	315.3	364.2			
M36	40	140	470 - 800	85.1	120.5	139.3	339.9	542.4	359.4
		210		127.9	181.0	208.9			
		315		191.6	271.5	313.6			
		420		270.0	381.9	440.9			

Anchor Design Shear Capacities

ANCHOR SIZE mm	DRILL SIZE mm	EMBED. DEPTH mm	TORQUE RANGE Nm	DESIGN CAPACITY - CONCRETE 15MPa / 32MPa / 40MPa ϕV_A kN	DESIGN STEEL CAPACITY Class 5.8 ϕV_{tf} kN	Class 8.8 ϕV_{tf} kN	(A4-50) ϕV_{tf} kN
M8	10	25	10 - 20	10.1	8.5	13.0	10.1
M10	12	40	15 - 25	13.9	13.5	20.8	15.9
M12	14	50	27 - 55	23.8	19.7	30.2	23.1
M16	18	65	67 - 120	37.6	37.1	57.1	42.8
M20	24	75	135 - 210	62.5	58.0	92.6	66.8
M24	28	100	330 - 400	113.4	83.6	133.4	96.6
M30	35	125	470 - 600	179.5	133.9	231.0	153.0
M36	40	140	470 - 800	209.7	195.8	336.4	222.8

Design for strength limit state

Design is based on the lesser of the concrete and steel capacities.

N*	≤	$\phi N_{A,tf}$	Tension
V*	≤	$\phi V_{A,f}$	Shear
$(N^*/\phi N_{A,tf})^{5/3} + (V^*/\phi V_{A,f})^{5/3} \leq 1$			Combined loading

Where:

N* = Design tension force (kN)
V* = Design shear force (kN)
$\phi N_{A,tf}$ = Anchor design tension capacity (kN)
ϕV_{Af} = Anchor design shear capacity (kN)

Concrete:

N_A = Characteristic ultimate tension load capacity (kN)
V_A = Characteristic ultimate shear load capacity (kN)
ϕ = 0.6 [Strength reduction factor]– tension and shear

Steel:

N_{tf} = Nominal tension capacity of steel (kN)
V_f = Nominal shear capacity of steel (kN)
ϕ = 0.8 [Capacity factor – tension and shear]

Reinforcing bar limit state design data

BAR Ø mm	DRILL Ø mm	ANCHOR DESIGN TENSION CAPACITIES (kN)														DEVELOPMENT LENGTH $L_{sy,t}$
N10	12	24.6	30.8	36.9	***39.3***	***39.3***										128
N12	15	30.8	38.5	46.1	***56.5***	***56.5***										147
N16	20		51.3	57.7	72.1	86.5	***100.5***	***100.5***								210
N20	25		58.1	69.7	87.1	104.5	122.0	139.4	***157.0***	***157.0***						270
N24	30			86.5	108.2	129.8	151.4	173.0	194.7	216.3	***226.0***	***226.0***				314
N28	35			100.9	126.2	151.4	176.6	201.9	227.1	252.4	294.4	***308.0***	***308.0***			366
N32	40				139.4	167.3	195.2	223.0	250.9	278.8	325.3	371.7	***402.0***	***402.0***		433
N36	44				149.1	178.9	208.7	238.6	268.4	298.2	347.9	397.6	497.0	***510.0***	***510.0***	513
N40	50							249.9	281.2	312.4	364.5	416.6	520.7	***628.5***	***628.5***	600
INSTALLED LENGTH L_{inst}		80	100	120	150	180	210	240	270	300	350	400	500	600	700	mm

Notes:

1 Capacities in ***bold italic*** indicate rebar development strength
2 Capacities incorporate a strength reduction factor ϕ=0.6, in accordance with AS3600-2001
3 f_c=32MPa minimum
4 Capacities based on Grade 500N rebar, in accordance with AS/NZS 4671:2001

Splicing of reinforcement

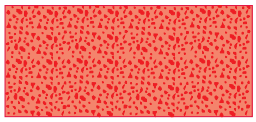
Design requirements for the splicing of reinforcement shall be in accordance with AS 3600-2001, clause 13.2 (Splicing of reinforcement) or local code/standard.

Guide load capacities in masonry walls

The following tables list the characteristic ultimate load capacities for the PF PRO epoxy when tested with class 4.6 threaded rod. The data contained in these tables should be used as a guide since the consistency of masonry base materials varies greatly. Job site tests are advisable to determine actual load capacities.

Characteristic Ultimate load capacities in solid red brick (55MPa)

The following loads are based on tests conducted using threaded rods and mesh screen tubes installed in a multiple wythe wall constructed from solid red brick



ANCHOR SIZE mm	HOLE SIZE mm	EMBEDMENT DEPTH mm	SOLID BRICK	
			TENSION kN	SHEAR Kn
M8	12	60	11.8	11.0
M10	16	70	14.2	15.7
M12	18	80	29.9	22.8

Characteristic Ultimate load capacities in grout filled block

The following loads are based on tests conducted using threaded rods installed in a wall constructed from hollow block filled with fine grout. The actual amount of material will vary depending upon job site installation procedures and waste.

Block 12MPa, fine grout 20MPa

ANCHOR SIZE mm	HOLE SIZE mm	EMBEDMENT DEPTH mm	HOLLOW BLOCK	
			TENSION kN	SHEAR Kn
M8	12	25	8.3	12.5
		50	11.7	
M10	16	40	16.2	16.2
		90	24.9	
M12	18	50	18.6	23.2
		100	34.6	

Note: Refer to page 10 of the Adhesive Anchoring System Design Manual for masonry design criteria

Design guidelines: *Working stress design*

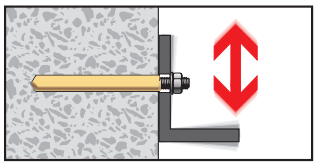
Divide characteristic ultimate load capacities by a factor of safety of 3.

Limit state design

Multiply characteristic ultimate load capacities by $\phi = 0.6$

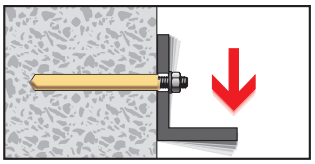
Dynamic loading – anchors for use in seismic design

Dynamic loads and shock loads



Dynamic loads are intermittent and varying loads such as those imposed by a central air conditioning unit, manufacturing machinery, or earthquakes. They are normally alternating or pulsating loads associated with vibration. Shock loads are instantaneous, periodic loads of high intensity such as those applied by an automobile striking a guard rail support or a truck hitting a dock bumper. Standard industry practice with regard to safety factors varies depending upon the frequency and intensity of the load. However, safety factors for dynamic or shock load conditions may be as high as 10:1.

Anchors for use in seismic design



Seismic (Earthquake) design is complex as it considers several influencing factors some of which are: geographic location, soil characteristics, structure classification, structure type, structural system and lateral forces. Design and specification of anchors in accordance with AS1170.4-1993 (Minimum design loads on structures - Earthquake loads) should be conducted by a design professional. Powers Fasteners have tested various epoxy injection systems under seismic conditions as outlined in ICC EEVALUATION SERVICE, INC. Report, AC 58: Acceptance Criteria for Adhesive Anchors in Concrete and Masonry Elements. The results revealed that epoxies can resist seismic loading up to two (2) times the allowable working load capacity of the adhesive in both Tension and Shear. Procedure outline of seismic testing including results available upon request.

Diamond cored holes

Some adhesive systems experience a considerable reduction in performance due to shrinkage during curing thus making them unsuitable for installation in diamond core-drilled holes. The PF PRO epoxy injection system does not experience any shrinkage during curing and performs equally well in both rotary hammer-drilled and diamond core-drilled holes.

Drinking water system components approval

The PF PRO epoxy injection system is certified under AS/NZS 4020:2002 (Products for use in contact with drinking water.).

Fire resistance

Fire resistance of PF PRO injection system in combination with anchor rods of sizes M8 to M30 in CLASS 5.8 galvanised steel. Fire resistance relates to maximum allowable tension loads for various durations of time in solid reinforced concrete of minimum strength 25MPa.

Designation	Powers PF PRO							
Fire resistance time t_u (minutes)	Maximum tensile load* F (kN)							
	M8	M10	M12	M16	M20	M24	M27	M30
Minimum set depth (mm)	80	90	110	125	170	210	250	280
30	0.90	3.20	4.20	8.25	17.25	24.85	32.30	39.50
60	0.50	1.80	2.30	5.30	10.20	14.75	19.15	23.40
90	0.30	1.10	1.40	3.80	6.70	9.70	12.60	15.40
120	0.20	0.75	0.90	3.00	5.00	7.20	9.30	11.35

FIRE RATED

NOTE: For report details please contat Powers Fasteners Technical Department

Use in special applications

Installation of anchors under water

PF PRO epoxy injection adhesive can be used for the installation of threaded anchor rod or reinforcing bars in submerged applications under water provided some installation and design criteria are followed. The anchor holes should be prepared following the standard installation instructions with the following exceptions.

Special care should be taken to clean the anchor hole as a slurry of concrete paste tends to form on the walls of the anchor hole when drilling under water. To inject the epoxy, insert the mixing nozzle to the bottom or rear of the anchor hole. Slowly withdraw the nozzle as the anchor hole is filled to insure that the water is displaced from the hole and that no air pockets are formed. The anchor hole should be filled completely with epoxy prior to inserting the anchor rod.

The setting time of the PF PRO epoxy in submerged applications depends upon the base material temperature as listed in the material properties section.

Laboratory tests and field experience have shown that a decrease of 15 to 20% in the ultimate tension load capacity can be expected for an anchor which is installed under water. The design professional should include this reduction in their calculations.

Installation of anchors overhead

PF PRO epoxy injection adhesive can be used for the installation of threaded anchor rod overhead. Anchor holes should be prepared in accordance with the overhead installation procedure, referenced page 19 in the Adhesive Anchoring Systems Design Manual.

Adhesive anchor functioning for removability

Many temporary anchoring applications which require high load capacities, also need to be removable. Adhesive systems often provide the highest load capacities, but have not been easily removable. When using the PF PRO epoxy injection adhesive, Powers has developed a method that has several advantages over those offered by competitive systems. Typically, a removable installation requires the use of a steel insert sleeve. A large hole size is required to accommodate the sleeve. The sleeve is expensive, and it must be left in the concrete which can cause corrosion problems. These problems are easily eliminated when using PF PRO epoxy injection adhesive. By wrapping Teflon pipe tape around the bond area of the threaded anchor rod or bolt prior to inserting it in the anchor hole filled with epoxy, it can easily be removed after the PF PRO epoxy has set, leaving threads formed from epoxy completely intact in the anchor hole. The bolt or rod can be re-threaded into the anchor and still achieve a high load capacity.

Pick proof applications

PF PRO epoxy injection adhesive is commonly used for pick proof applications in prison and security projects.