

\*Suit various design conditions

- Cracked concrete
- Seismic
- 4 hours FRP



## Description

**EPCON G5™ High Strength Epoxy**  
A high performance chemical epoxy adhesive. Fast cure with extended working time for use in tropical climate. Works well in dry, damp, wet and flooded holes.

## Features and Benefits

- Formulated for hot or warm weather
- High strength epoxy
  - Fire rated: tested up to 4 hours FRP
  - Shorter curing time with extended working time
  - Works in damp holes and underwater applications
  - Low shrinkage, suitable for cored and oversized holes
  - Virtually odorless, can be used indoors
  - Easy handling and installations
  - Re-sealable tip

## Specification

EPCON G5™ is a heavy duty, pure epoxy injection chemical anchor.

Setting characteristics at 27°C:

- Working time: 12 minutes
- Full cure time: 2 hours.

## Approvals / Listings



≡ **CSTB** fire tested.



- ASTM C881-99, Type IV, Grade 3, Class A, B and C
- ICC Evaluation Service, Inc. 20091BC
- Miami Dade County - #06-0425.02
- DOT Approval
- Florida Building Code FL#14419 Approval
- Warrington Fire Resistance Tests with Rebars BS 476 Part 20 - 1987
- HDB Prefabrication Technology Centre tested
- SETSCO Tests  
NSF/ANSI standard 61 - Drinking water system components

## Performance Related

## Material Specification



Dynamic Load



Pull down



Cracked Concrete



Fire Resistant



Seismic



Hot dipped Galvanised



Stainless Steel



Zinc Plated

## Substrates

- Concrete (cracked and non-cracked)
- Solid block
- Solid brick
- Natural stone

## Applications

- Reinforcing and starter bars
- Underwater fixings
- Diaphragm wall fixings
- Guard rail fixings
- Parapet wall fixings
- Tunnel fixings
- Floor slabs



Base Material Temperature (F°/C°)	Working Time	Cure Time
90° / 32°	8.5 minutes	2 hours
80° / 27°	12 minutes	2 hours
70° / 20°	15 minutes	2 hours
60° / 16°	18 minutes	3 hours
50° / 10°	21 minutes	6 hours

### Installation temperature

~ Substrate: 5°C to 40°C

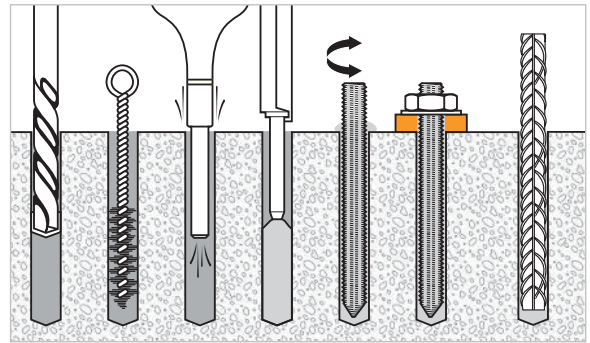
- Load should not be applied to anchor until the chemical has sufficiently cured as specified
- Warming of cartridge required if mortar temperature is below 20°C

### Service temperature

-10°C to 80°C

## Installation

1. Drill correct diameter hole to recommended depth.
2. Clean hole thoroughly with brush and air pump 3~4 times.
3. Assemble nozzle onto cartridge. Dispense and discard enough chemical until uniform mix is achieved. Inject from the bottom of the hole gradually, filling in until 40% full.
4. Insert the rod/stud or rebar by hand to full depth, using slow rotating movement.
5. Allow EPCON G5 to cure for specified period before loading.



## Product Range - EPCON G5™ Epoxy Resin Adhesive

Part No.	Description	Order Qty
G5	EPCON G5 (650ml)	6
E55	E55 Nozzle	24
E102	E102 Dispensing Tool	1
E202	Pneumatic Dispenser Tool E202	1



## EPCON G5™ - Recommended Working Loads in 40N/mm<sup>2</sup> non-cracked Concrete - Anchor Studs

Thread Ø	Hole Ø (mm)	Fixture Hole Ø (mm)	Embedment Depth (mm)	Hole Depth (mm)	Torque (Nm)	Shear Load (kN)	Tension Load (kN)
M8	10	10	80	80	10	5.3	6.3
M8	10	10	100	100	10	5.3	8.0
M10	12	12	90	90	20	8.4	13.1
M10	12	12	110	110	20	8.4	16.0
M12	14	15	110	110	30	12.1	19.1
M12	14	15	150	150	30	12.1	26.0
M16	18	19	125	125	60	22.5	30.4
M16	18	19	190	190	60	22.5	46.2
M20	24	24	170	170	120	36.5	43.1
M20	24	24	250	250	120	36.5	63.3
M24	28	28	210	210	200	52.7	56.9
M24	28	28	280	280	200	52.7	75.9
M30	35	35	280	280	400	83.9	84.6
M30	35	35	380	380	400	83.9	114.8

\* Safety factor for all loads = 3

\* This table does not consider edge distance and anchor spacing effects. Please refer to Ramset Design Guide for more information

\* Recommended shear load is limited by anchor stud grade 8.8 refer to ISO 898-i:2009(E). For loading of other material grade, please contact Ramset Technical Department.

\* Pull out test for single anchor = working load x 1.5

\* For cracked concrete design condition or anchor size larger than M30, please contact Ramset for further support.

Rebar Fixing with EPCON G5 - for loading and installation, please refer to following pages.

## STRENGTH LIMIT STATE DESIGN (Rebar Fixing)

### RAMSET CHEMSET INJECTION SYSTEM - EPCON G5 METHOD STATEMENT FOR INSTALLATION OF REBARS

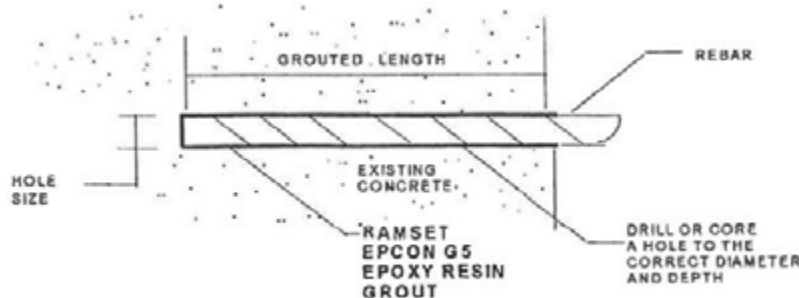
BAR DIA	HOLE SIZE	GROUTED LENGTH	CHAR. ULT. TENSILE LOAD as per BS5080 Part 1	YIELD STRENGTH OF 460N/mm <sup>2</sup> HIGH YIELD DOWEL BAR	YIELD STRENGTH OF 500N/mm <sup>2</sup> HIGH YIELD DOWEL BAR
Y10	12 mm	100 mm	46.8 kN	36.1 kN	39.3 kN
Y12	16 mm	120 mm	57.8 kN	52.0 kN	56.6 kN
Y16	20 mm	160 mm	103.7 kN	92.5 kN	100.5 kN
Y20	25 mm	200 mm	167.9 kN	144.5 kN	157.1 kN
Y25	30 mm	250 mm	255.4 kN	225.8 kN	245.4 kN
Y32	40 mm	320 mm	431.5 kN	369.9 kN	402.1 kN
Y40	48 mm	400 mm	630.5 kN	578.0 kN	628.3 kN
Y50	62 mm	500 mm	982.0 kN	903.2 kN	981.8 kN

\* It is based on non-cracked concrete with strength 30MPa.

- Please apply appropriate factor of safety to get your design working load.
- Pull Out Test Per BS5080: Part 1 had been performed on full range of high yield dowels bar of yield strength 460N/mm<sup>2</sup>. Characteristic tensile capacity for Y50 is derived from the test load of Y50 with 480mm embedment depth (per BS5080 Part 1 clause 7.1).
- No load reduction to be applied for installation conditions including dry, water-saturated, water-filled, and underwater applications.
- For design condition considering cracked concrete, please contact Ramset Technical Department for more information.
- **For design condition under 1-4 hours FRP, please refer to the following pages.**

## Installation Procedure

- 1) Drill a hole to the correct diameter and depth for particular rebar size being installed.
- 2) Wire brush the hole using wire brush, blow out all dust with forced air and leave no slurry.
- 3) Insert nozzle and fill the hole to at least one third its depth. When starting new cartridges or new nozzle, dispense and discard enough adhesive until uniform light grey colored is achieved.
- 4) Before the G5 gels, insert rebar into the bottom of hole with a slow twisting motion. Wipe off the excess resin if necessary.
- 5) After the G5 has fully cured, attach the fixture.



## Warrington Fire Test Report



**UP TO 4 HOURS FIRE RESISTANCE TEST PERFORMED ON REBAR GROUTED USING RAMSET EPCON G5 AT SPLICE OR ANCHORAGE CONNECTION TO BS 476 PART 20-1987**

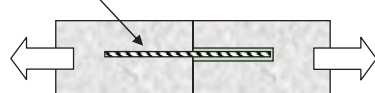
WFRA is NATA accredited. Two sets of fire tests under different concrete joint connection have been carried out to assess bond stress model that quantifies the relationship between bond stress and temperature for deformed bars anchored with RAMSET EPCON G5 when exposed to fire. The bond stress model is based on withdrawal tests of various bar diameters from heated concrete cylinders in addition to a fire test of a representative section of a loaded wall to slab as well as slab to slab connections exposed to heating regime of BS 476 Part 20. Briefly, the overall testing procedures conducted by Warrington Fire Research Centre can be illustrated as follows:

- (1) Cylinder test: Pull out tests of full range of bar diameters (from 012 to 040) from heated concrete cylinders at different temperature were performed.
- (2) Bond stress model: By comparing various heated temperatures and pull out force, temperature dependence bond stress model was obtained. Note that temperature based on was the temperature of coldest end of bar to gives conservative bond stress model.
- (3) FEM: At the same time, with the help of finite element analysis of model TASEF, temperature at various covers and a range of slab/element thickness for periods of exposure between 30 minutes and four hours to the BS476:Part 20-1987 heating regime, were obtained.
- (4) Full scale 4 hours Fire-resistance test in accordance with BS476:Part 20: Taking Splice Connection Test as an example, 2 reinforced slabs were connected by 2 nos of Y16 rebars, one end bonded to concrete with EPCON G5 and the one end cast-in. Based on concrete cover and slab thickness, temperature was obtained from finite-element modelling (FEM) as in (3). Consequently, bond stress was calculated using the bond stress model and applied loading was determined with reference to bond length, temperature dependence bond stress and bar diameter used in the full scale test.
- (5) FEM validation: Temperature probe were installed at various location to validate the temperature indicate by FEM. Therefore, temperature obtained from FEM can be confidently used to tabulate bond stress at different combinations of concrete cover and slab/element depth.
- (6) Bond stress model validation: Since slab splice joint did not failed after 4 hours fire test with the loading derived from bond stress model and loading has been increased up to 6 times higher to reach failure mode, the bond stress model is again proved to be very conservative.



For details, please refer to WFRA Report No.45832.3 for test under splice joint condition & WFRA Report No.45838.4 for test under anchorage joint condition.

Deformed reinforcing bar. One end cast-in the other bonded to concrete with Epcon G5



**Loaded Stud Heated to BS 476 Part20  
WFRA Report No. 45832.3**

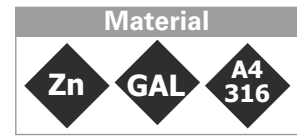
Deformed reinforcing bar. One end cast-in the other bonded to concrete with Epcon G5



**Loaded Anchorage Connection Heated to BS 476 Part20  
WFRA Report No. 45838.4**

## ChemSet™ Anchor Studs - Features and Benefits

- Grade 5.8 Carbon Steel - 500 MPa Steel Capacity
- High Corrosion resistant AISI 316(A4) Stainless Steel
- Hot Dip Galvanised to 45µm min
- External Hex Drive for reliable socket fit
- Depth Set Mark to ensure correct embedment
- Beveled tip to prevent unthreading
- High quality finish



## ChemSet™ Anchor Studs - Zinc Plated 6µm minimum 45° Single Cut



Part No.	Description	Anchor Size (mm)	Stud Length (mm)	Max Fixture Thickness (mm)	Drilled Hole Ø (mm)	Min Hole Depth (mm)	Order Qty
CS08110	CS08110 Chemset Studs	8	110	15	10	80	10
CS10130	CS10130 Chemset Studs	10	130	20	12	90	10
CS12160	CS12160 Chemset Studs	12	160	25	14	110	10
CS16190	CS16190 Chemset Studs	16	190	35	18	125	10
CS20260	CS20260 Chemset Studs	20	260	65	25	170	6
CS24300	CS24300 Chemset Studs	24	300	63	28	210	6
CS30380	CS30380 Chemset Studs	30	380	70	35	280	5

## ChemSet™ Anchor Studs - Hot Dipped Galvanised 45µm minimum 45° Single Cut



Part No.	Description	Anchor Size (mm)	Stud Length (mm)	Max Fixture Thickness (mm)	Drilled Hole Ø (mm)	Min Hole Depth (mm)	Order Qty
CS08110GH	CS08110GH Chemset Studs	8	110	15	10	80	10
CS10130GH	CS10130GH Chemset Studs	10	130	20	12	90	10
CS12160GH	CS12160GH Chemset Studs	12	160	25	14	110	10
CS16190GH	CS16190GH Chemset Studs	16	190	35	18	125	10
CS20260GH	CS20260GH Chemset Studs	20	260	65	25	170	6
CS24300GH	CS24300GH Chemset Studs	24	300	63	28	210	6
CS30380GH	CS30380GH Chemset Studs	30	380	70	35	280	5

## ChemSet™ Anchor Studs - Stainless Steel A4 316 45° Single Cut



Part No.	Description	Anchor Size (mm)	Stud Length (mm)	Max Fixture Thickness (mm)	Drilled Hole Ø (mm)	Min Hole Depth (mm)	Order Qty
CS08110SS	CS08110SS Chemset Studs	8	110	15	10	80	10
CS10130SS	CS10130SS Chemset Studs	10	130	20	12	90	10
CS12160SS	CS12160SS Chemset Studs	12	160	25	14	110	10
CS16190SS	CS16190SS Chemset Studs	16	190	35	18	125	10
CS20260SS	CS20260SS Chemset Studs	20	260	65	25	170	6
CS24300SS	CS24300SS Chemset Studs	24	300	63	28	210	6
CS30380SS	CS30380SS Chemset Studs	30	380	70	35	280	5

Lead time applies for Chemset™ Anchor Studs. Note: A4-70, A4-80 and Grade 8.8 are available for selection.

## ATP Stainless Steel A4 Internal Threaded Socket (to match Epcon C8/G5)



Part No.	Description	Anchor Size (mm)	Anchor Length (mm)	Drilled Hole Ø (mm)	Drilling Depth (mm)	Thread Length (mm)	Order Qty
062860	ATP Socket M8X60 A4	8	60	14	80	25	10
062960	ATP Socket M10X65 A4	10	65	20	90	32	10
063100	ATP Socket M12X75 A4	12	75	24	210	38	10
051175	ATP Socket M16X125 A4	16	125	28	280	50	10