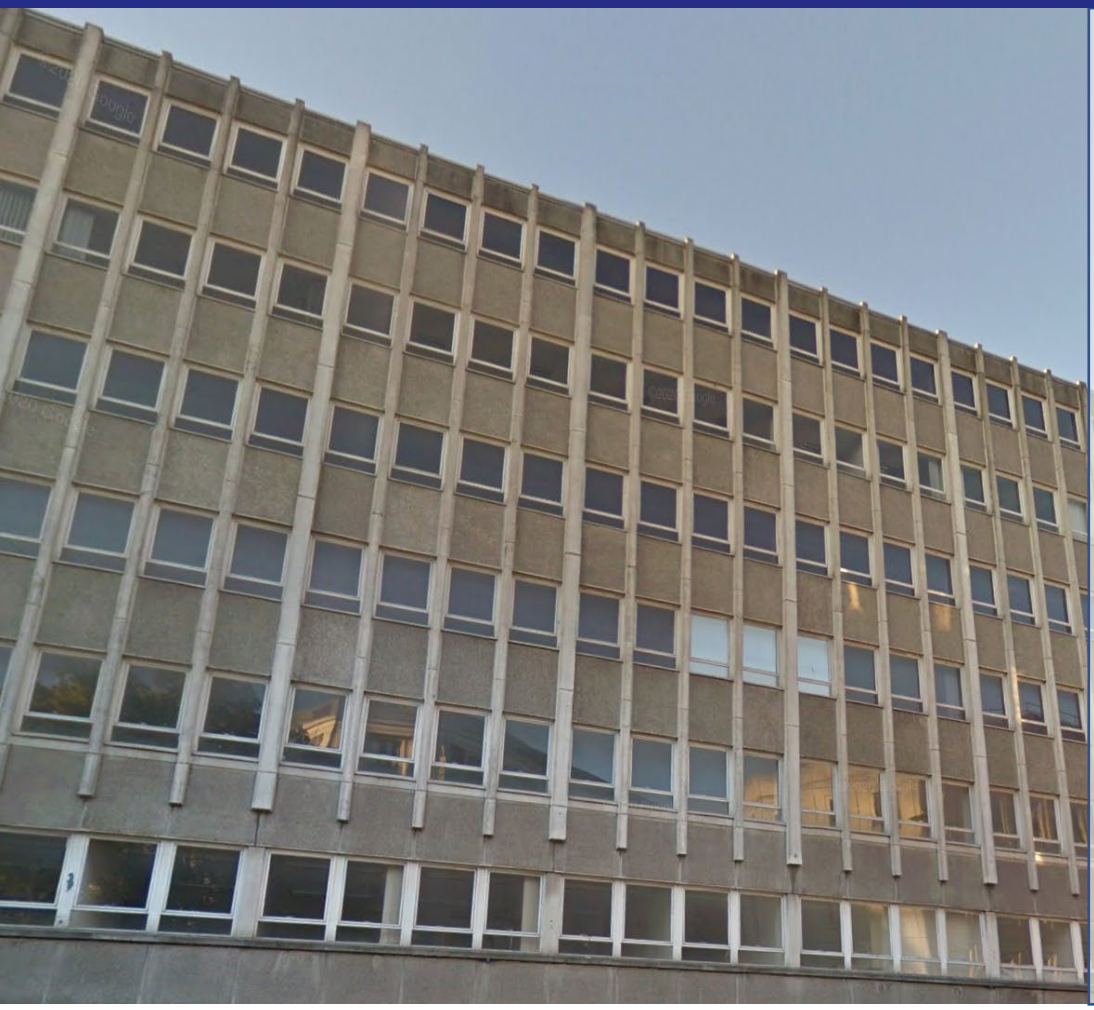
certifix

Test Report

Threadneedle House – Ultimate Load



Purpose of fixing:
Helping hand bracket
Items tested:
CFCSH4-6*60
CFCSH4-6*60
CFCS4-8*105/M10*30
Test standard:
BS8539:2012
Substrates: Precast Concrete Panel, Concrete Column & Hollow Brick
Date: 14th March 2022
Author: Jacob Shaw on behalf of Mountley Group Ltd & JK Building Construction

MOUNTLEY GROUP

JK BUILDING CONSTRUCTION

SITE CONDITION ASSESSMENT

BUILDING SUBSTRATE – PRECAST CONCRETE PANEL WITH RENDER

Threadneedle House has current panels made from Precast Concrete panels. The precast concrete panel is uniform in shape and aggregate consistency. See photo below:

I used a SDS-X-6.0*210-P drill bit (rebar drill) with hammer action as the pebble render makes it more difficult to drill with a SDS-P-6.0*210-P standard drill bit.

SITE CONDITION ASSESSMENT

BUILDING SUBSTRATE – CONCRETE COLUMN

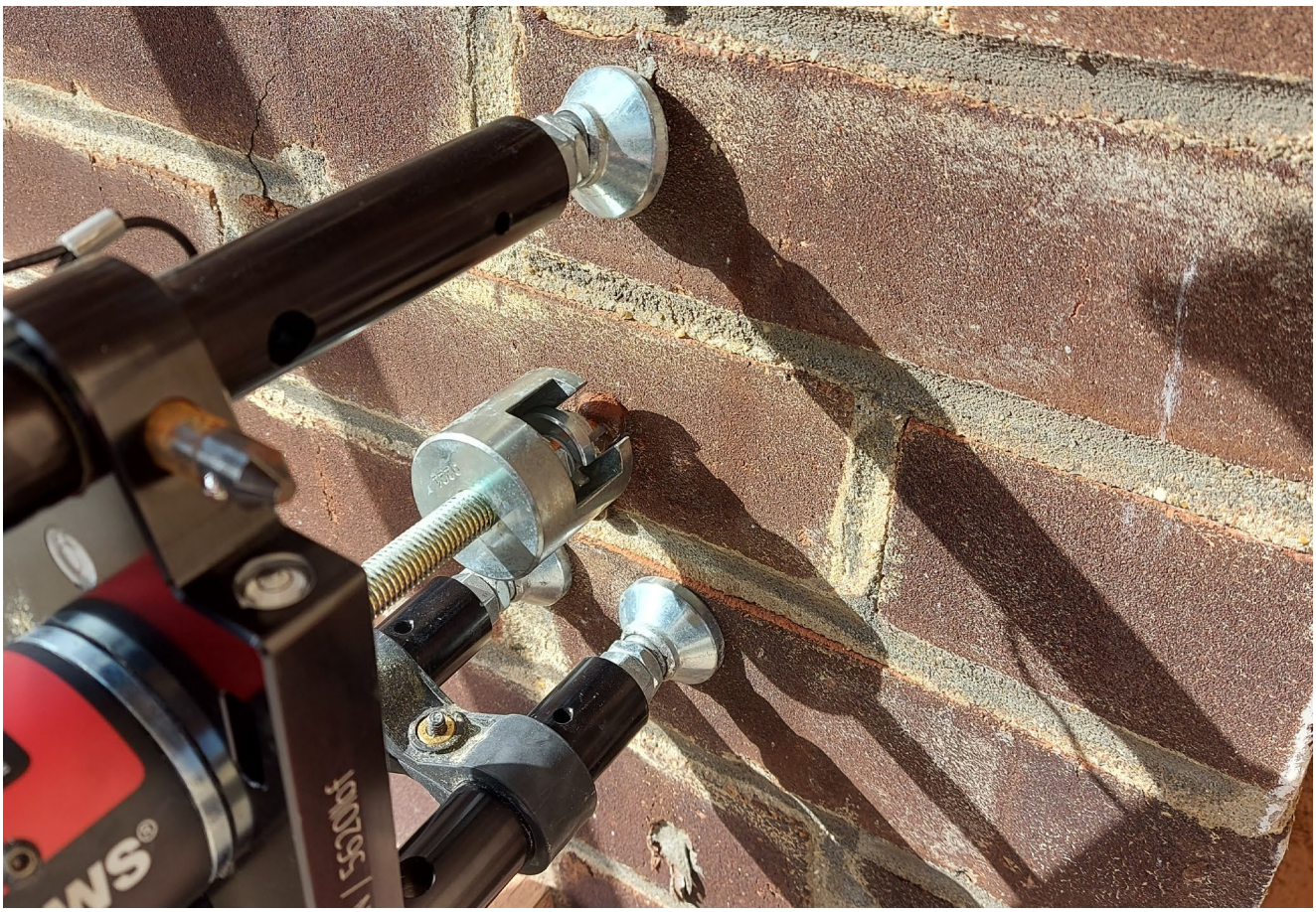
Threadneedle House has concrete columns which appears to be cracked concrete. The concrete column seems consistent from my observations. See photo below:

I was able to drill the concrete with a standard SDS drill bit – SDS-P-6.0*210-P – hammer action was required.

SITE CONDITION ASSESSMENT

BUILDING SUBSTRATE – HOLLOW BRICKWORK

Threadneedle House has hollow brickwork on some areas of the building in place of the precast concrete and render façade. The hollow brickwork seems to be a fairly uniform in shape and consistency. See photo below:



The bricks were drilled with a SDS-P-8.0*210-P drill bit, with hammer drilling enabled. I did try without the hammer setting enabled but the brick is too dense for this.

PLEASE NOTE WE WERE INFORMED AFTER THE TEST WAS CARRIED OUT THAT NO AREAS WILL BE FIXED INTO THE HOLLOW BRICK

ENVIRONMENT

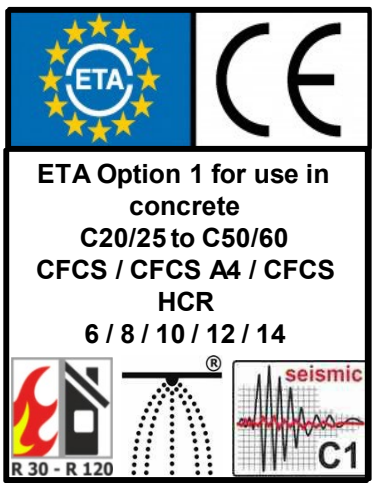
Threadneedle House is located within Chelmsford which puts it in C3 category environment, which is described as "*urban and industrial atmospheres with moderate sulphur dioxide pollution and coastal areas with low salinity*". The site is likely to be exposed to average wind loads, due to its proximity to the other high rise buildings and the building height compared with the surrounding landscape.

FIXINGS TESTED – TO FAILURE

CFCS 6 x 60 hex washer head A4 stainless
Product Code: CFCSH4-6*60
Amount of Fixings tested: 5no. per substrate, 10no. total
Test Method: BS8539:2012 test to failure
Embedment depth: 55mm
Drill hole depth: 65mm
Simulated build up: 5mm
Notes: We did preliminary tests in each substrate-hollow brick work, concrete column and precast concrete panel. All of the preliminary test were very satisfactory so we decided to proceed with 5no. test to BS8539:2012 in each substrate. However we found in brickwork in the full test the results were not consistent so we swapped it to an 8mm for a more consistent result. On the concrete column we had to drill just off centre to avoid the rebar. In the concrete panel we got a consistent excellent result with the CFCSH4-6*60 solution with CF resin.

PRODUCT DESCRIPTION

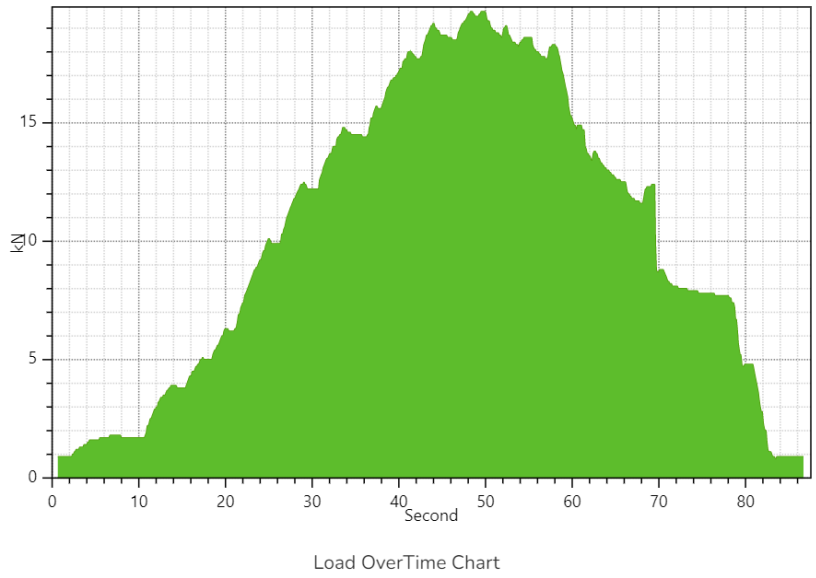
CFCS is a high performance concrete screw ideal for use on Rainscreen Cladding, stocked in both A4 Stainless and Zinc-Plated steel. The saw tooth geometry is perfect for a quick and easy installation and there no need to clean the drill hole for installation in ceilings and walls, provided our installation instructions are carried out.



FEATURES

- ✓ Quick and safe installation
- ✓ High load capacity
- ✓ Can be loaded immediately
- ✓ Adjustment is possible
- ✓ Fire rated and ETA approved

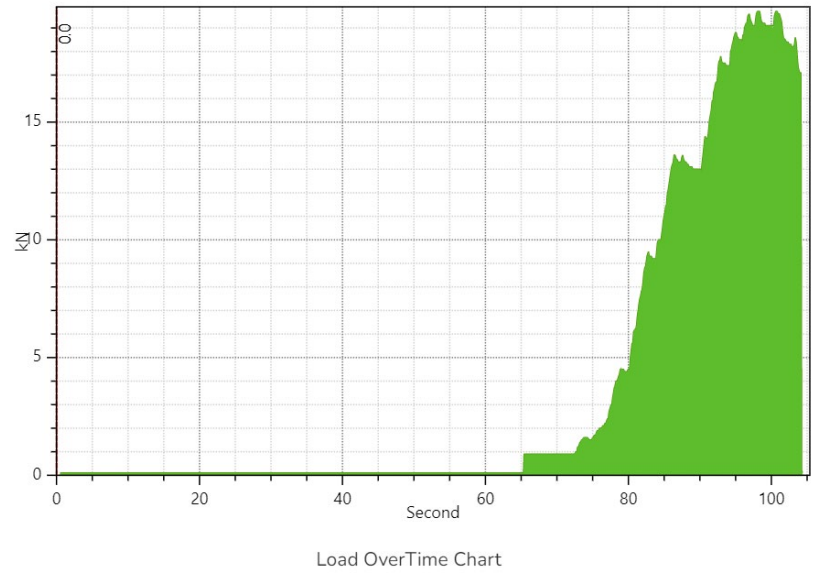
(CFCSH4-6*60 Test no. 1/5 – Precast Concrete Panel + 25mm render)



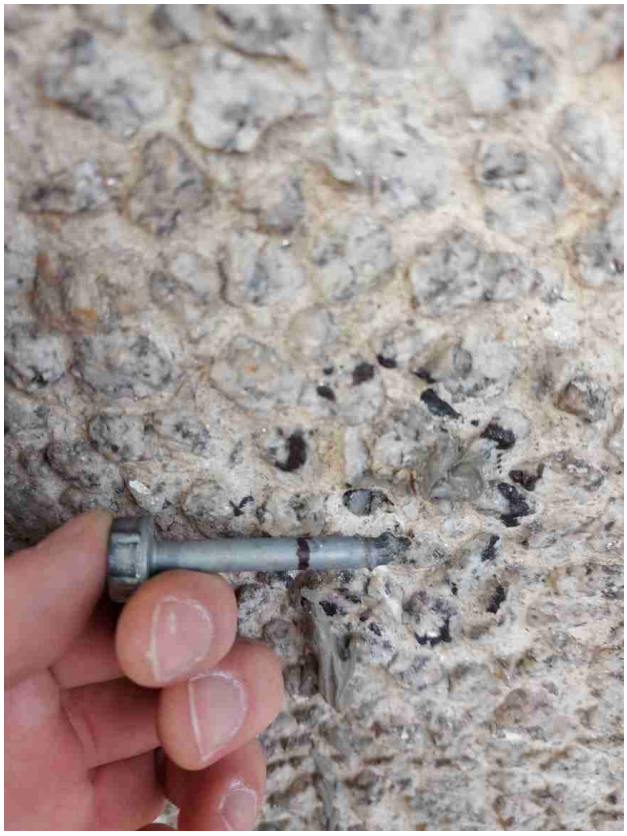
Load OverTime Chart

Test Reference: 2MEAVEPKZ9P41W
Test results: Pass – 19.7kN

(CFCSH4-6*60 Test no. 2/5 – Precast Concrete Panel + 25mm render)

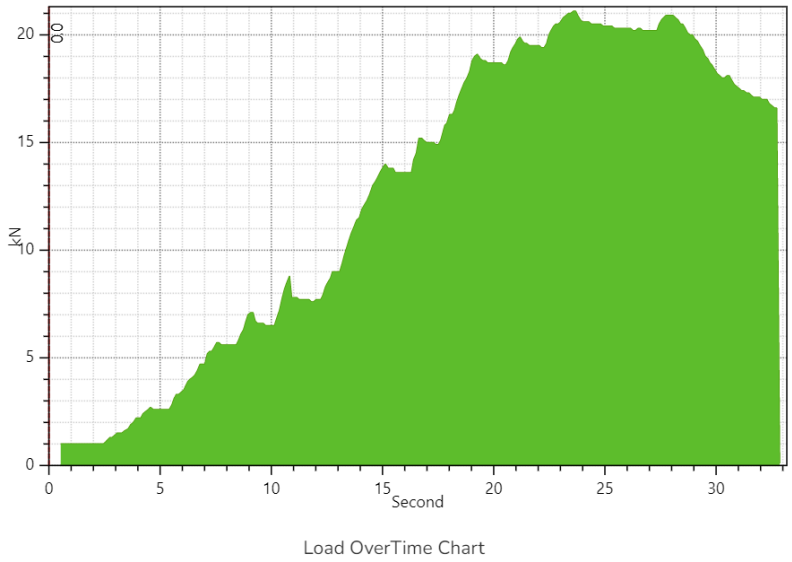


Load OverTime Chart



Test Reference: UFHPIW7PAKYQAZ
Test results: Pass – 19.7kN
Notes: 5mm less embedment than usual, still excellent result.

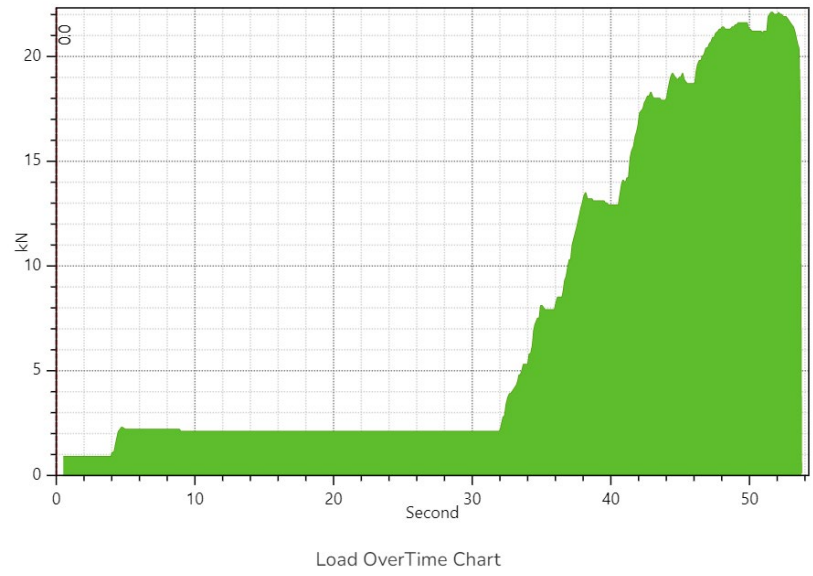
(CFCSH4-6*60 Test no. 3/5 – Precast Concrete Panel + 25mm render)



Load OverTime Chart

Test Reference: 5EC6MDDXUMCNRC
Test results: Pass – 21.1kN
Notes: excellent result, felt like resin was holding last bit.

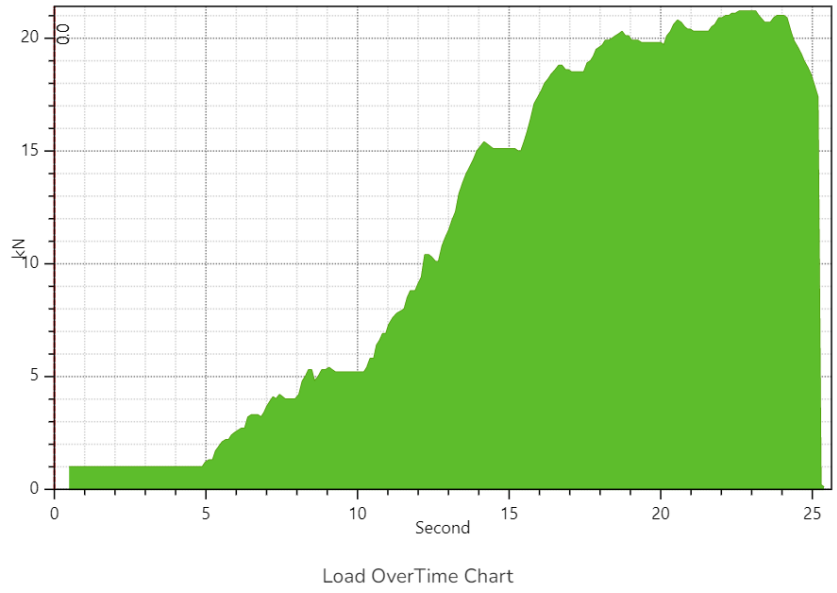
(CFCSH4-6*60 Test no. 4/5 – Precast Concrete Panel + 25mm render)



Load OverTime Chart

Test Reference: G1JVYGUFJ3EH5X
Test results: Pass – 22.1kN

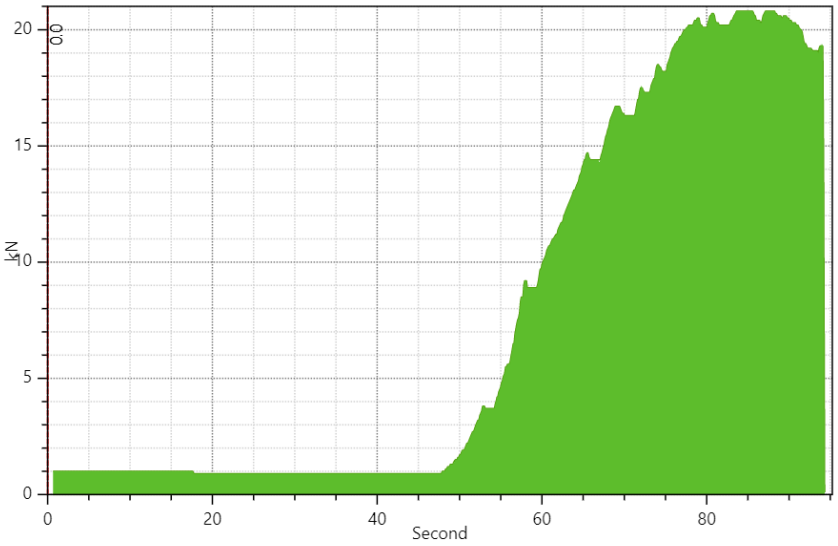
(CFCSH4-6*60 Test no. 5/5 – Precast Concrete Panel + 25mm render)



Load OverTime Chart

Test Reference: WIQZWVNCYWNTGB
Test results: Pass – 21.2kN
Notes: 50mm embedment only.

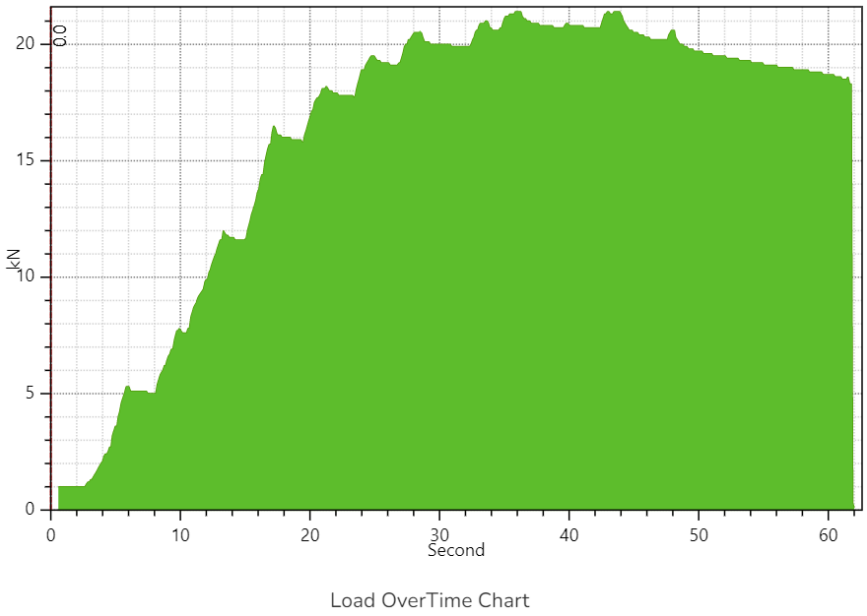
(CFCSH4-6*60 Test no. 1/5 – Concrete Column)



Load OverTime Chart

Test Reference: H5PNBTNSRISUGN
Test results: Pass – 20.8kN
Notes: snapped 20kN+

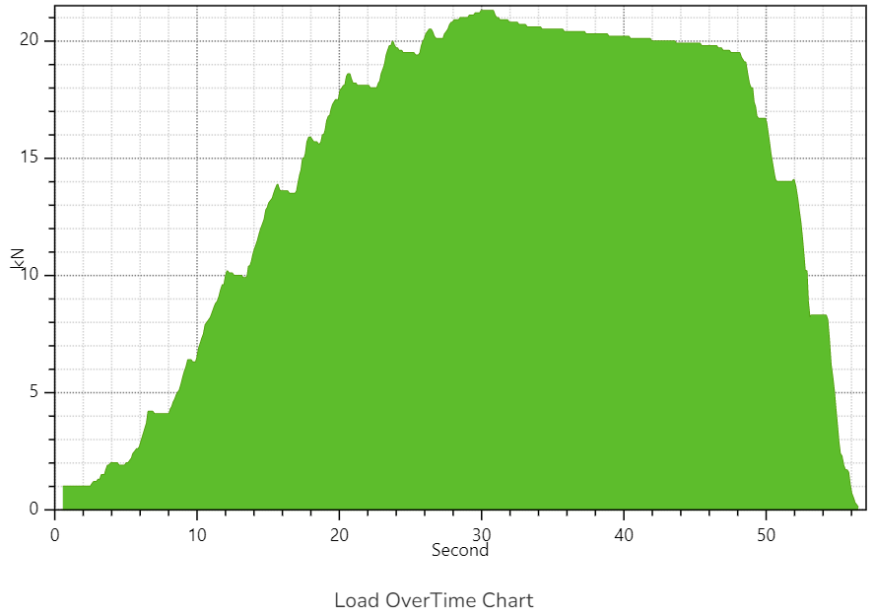
(CFCSH4-6*60 Test no. 2/5 – Concrete Column)



Load OverTime Chart

Test Reference: UFWVAFJMRUOVVG
Test results: Pass – 21.4kN
Notes: 20kN+

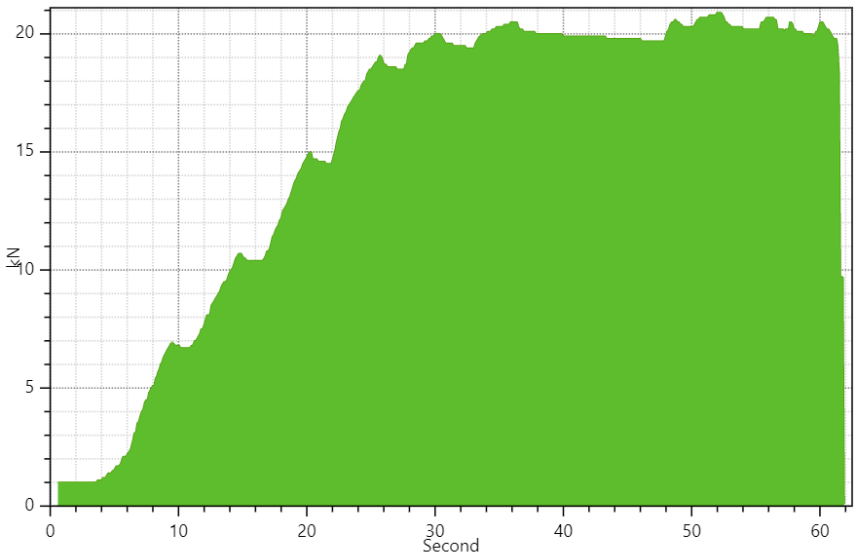
(CFCSH4-6*60 Test no. 3/5 – Concrete Column)



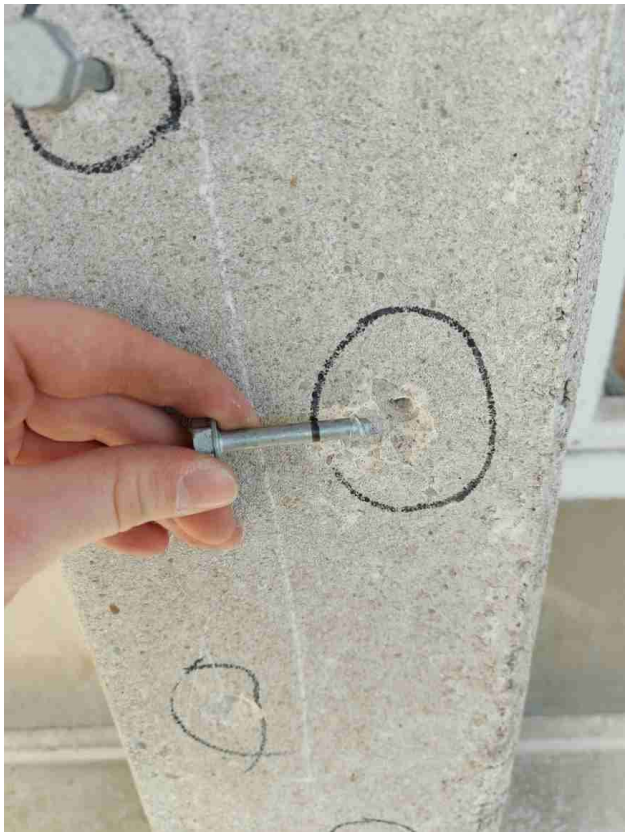
Load OverTime Chart

Test Reference: 596ZTFGMNFUBER
Test results: Pass – 21.3kN
Notes: couldn't wind it tighter with one hand, so just released the load, fixing did not fail.

(CFCSH4-6*60 Test no. 4/5 – Concrete Column)

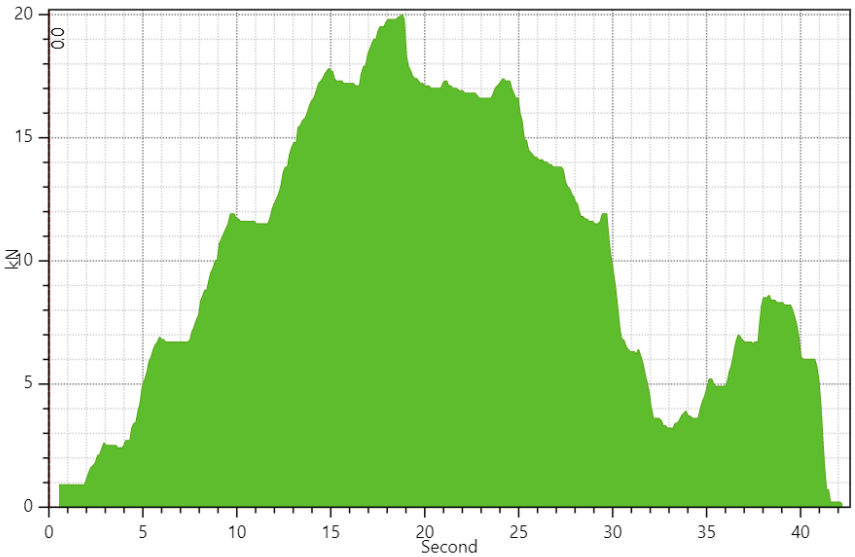


Load OverTime Chart



Test Reference: UZMAIDRRYPLQ91
Test results: Pass – 20.9kN
Notes: 20kN+

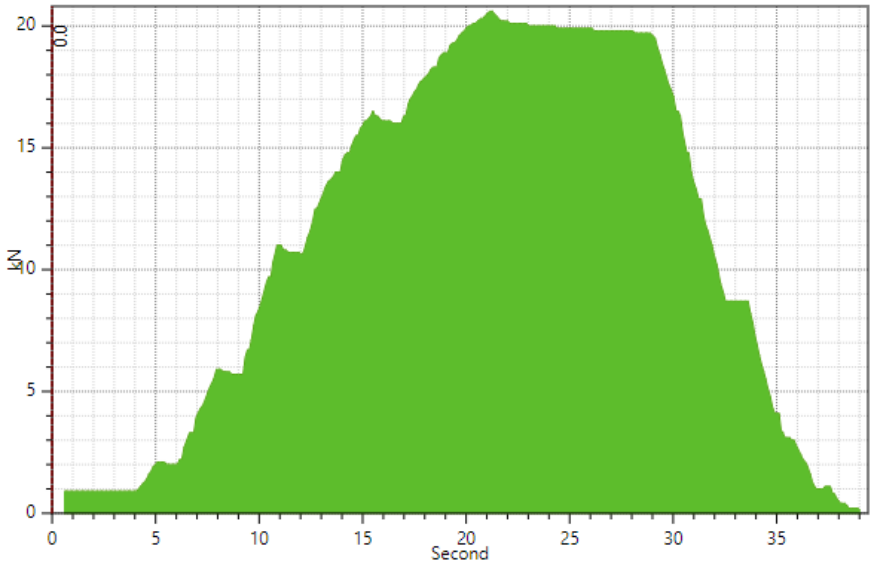
(CFCSH4-6*60 Test no. 5/5 – Concrete Column)



Load OverTime Chart

Test Reference: TJPAAS1WT32AJP
Test results: Pass – 20kN
Notes: classic cone failure anchor did not break

(CFCS4-8 Test no. 1/5 – Hollow Brickwork)



Load OverTime Chart

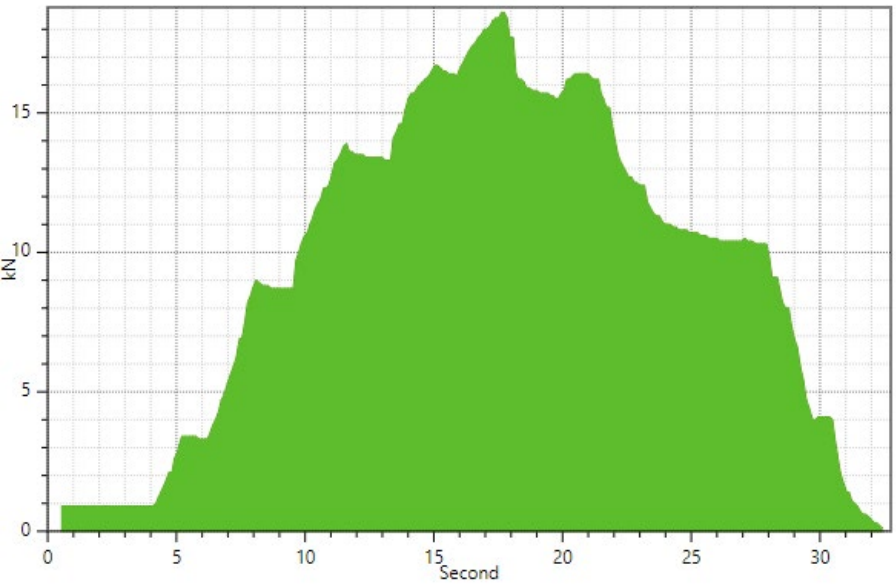
Test Reference: TOM4CRXJFF0HGF
Test results: Pass – 20.6kN
Notes: excellent result, no visible cracking

(CFCS4-8 Test no. 2/5 – Hollow Brickwork)

Load OverTime Chart

Test Reference: MQPHBI9LG8OVWQ
Test results: Pass – 19kN
Notes: brick started to crack so I wound down

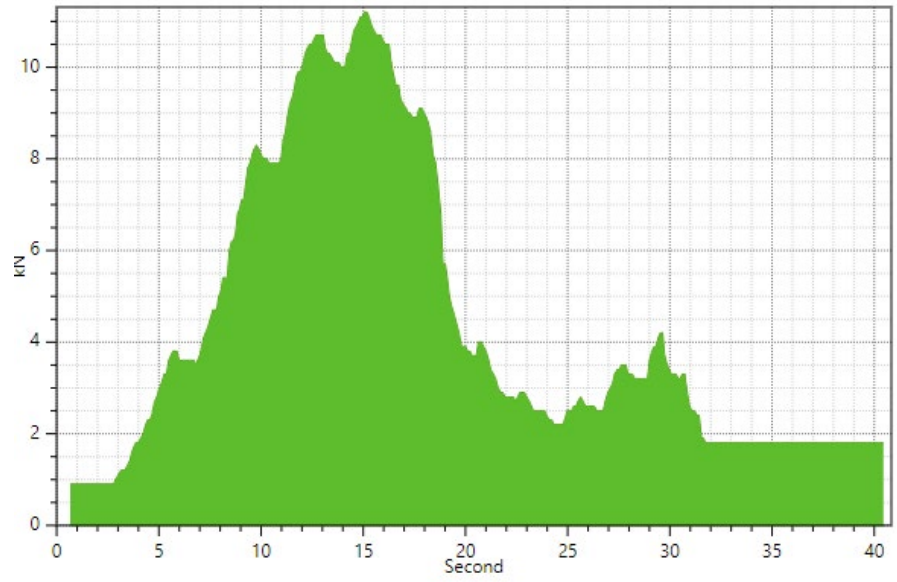
(CFCS4-8 Test no. 3/5 – Hollow Brickwork)



Load OverTime Chart

Test Reference: 6VBR11FY1SG7FT
Test results: Pass – 18.6kN
Notes: brick started to give down to 10kN so wound down

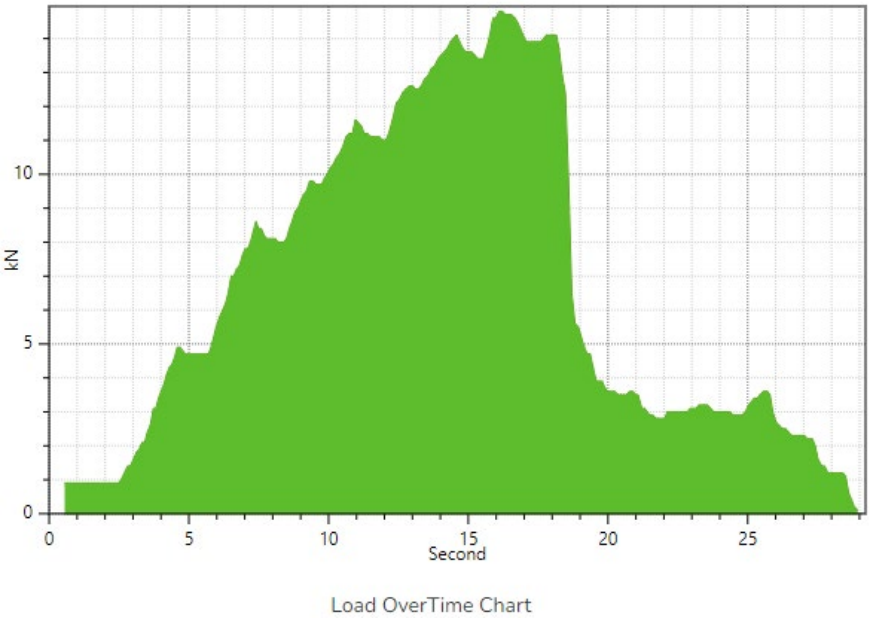
(CFCS4-8 Test no. 4/5 – Hollow Brickwork)



Load OverTime Chart

Test Reference: BUSHUQPK6GD6MA
Test results: Pass – 11.2kN
Notes: started to slide out then cracked face of brick

(CFCS4-8 Test no. 5/5 – Hollow Brickwork)



Load OverTime Chart

Test Reference: RXA5NY7F99NYMA
Test results: Pass – 14.8kN
Notes: started to slide out then cracked face of brick

OBSERVATIONS – Precast Concrete Panel

Tested failures of a CFCS concrete screw for this application due to installation quality – and solutions
Due to the presence of render, these tests were performed with CF resin to ensure a consistent result. The same resin should be used during installation.

Failure	Solution
Cone failure (render only)	Ensure that the drill hole is done to 65mm, the fixing must be embedded all the way through the 25mm of render, otherwise you will get a cone failure on the render. In our testing, the render failed first at 7.9kN.
Concrete screw failed to drive in – stripping threads	Drive in the concrete screw at minimum speed with the impact driver, and ensure the drill hole is 65mm.

OBSERVATIONS – Concrete Column

There were no tested failures in the concrete column, however it may be worth mentioning the below which could come up as a problem due to installation quality.

Failure	Solution
Threads stripping	Ensure that the drill hole is done to 65mm, we did not strip the threads in our testing, but it may be possible for this to happen if the hole depth is not 10mm or more than the embedment depth, due to drill hole dust build up.

OBSERVATIONS – Brickwork

Tested failures of a CFCS concrete screw for this application due to installation quality – and solutions

Failure	Solution
Pull out - Use of the CFCS 6 concrete screw resulted in multiple pull outs. It was decided we would attempt with the CFCS 8 series, which in contrast provided consistent passes.	Use a larger diameter concrete screw without CF resin (use CFCS 8 A4 series of concrete screws) to achieve a more consistent result.
Pull out – poor spacing of drill hole	The hole must be drilled 45mm from the end of the brick to ensure it is not in the hollow part of the brick, and vertically it must be in the centre of the brick.
Pull out – incorrect drill hole diameter	Ensure the drill bit used with the fixing is the correct diameter. With the CFCS 6 series, use a SDS-X-6.0*210-P drill bit across all substrates to get a consistent result, or a similar PGM approved drill bit.
Pull out – brick cracks	Ensure CF resin is used, to reinforce the substrate. This increase the load at which the substrate cracks.
Pull out – brick crumbles	Ensure that the CF resin is not used when installing the CFCS 8 into the **Brickwork** substrate, as it seems to lessen the substrates ability to grip the threads as they are driven in.

SUMMARY & RECOMMENDATIONS

The tests above consistently achieved a satisfactory result, providing my solutions are actioned.
BS8539:2012 gives guidance on how these test results should be interpreted, which we can assist with if required.

I recommend using the following fixing solutions for the following substrates:

Precast Concrete Panel with 25mm render:
CFCSH4-6*60 Hex head concrete screw A4 stainless – embedded 55mm with CF-T 300V resin
If using brackets with oversized holes use a *CFCS 6 A4 stainless washer*
SDS-X-6.0*210-P Premium Rebar SDS Plus Drill 6.0 x 210 – to drill an 65mm drill hole for CFCSH4-6*60
CFCSB-6 Drill hole cleaning brush for 6mm drill hole
CFCSP-6 Drill hole blow-out pump for 6mm drill hole
CFCST-410V CF 410ml resin
CFCSD CF resin dispenser
CFCS-SW13 CFCS SW13 Socket Driver

Concrete Column
CFCSH4-6*60 Hex head concrete screw A4 stainless – embedded 55mm
If using brackets with oversized holes use a *CFCS 6 A4 stainless washer*
SDS-P-6.0*210-P Standard SDS Plus Drill 6.0 x 210 – to drill an 65mm drill hole for CFCSH4-6*60
CFCS-SW13 CFCS SW13 Socket Driver

Hollow Brickwork:
CFCSH4-8*80 Hex head concrete screw A4 stainless - embedded 75mm
If using brackets with oversized holes use a *CFCS 8 A4 stainless washer*.
SDS-P-8.0*210-P – to drill an 85mm drill hole for CFCSH4-8*80
CFCS-SW7 CFCS SW13 Socket Driver

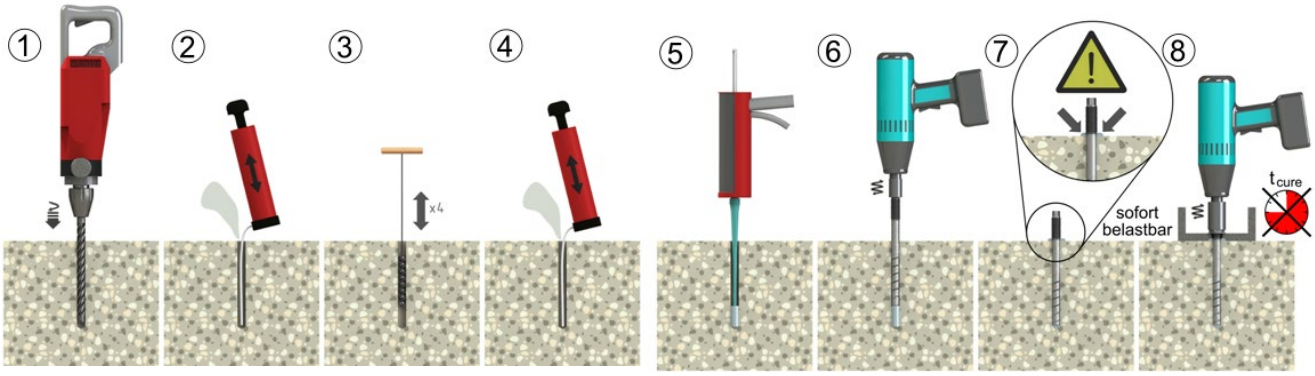
Alternatively:
CFCS4-8*105/M10*30 SW7 drive external threaded concrete screw A4 stainless – embedded 65mm, for use where lots of adjustment is required. You can tighten/loosen and adjust the metric threaded part as many times as required.
49021-10*30*1.4 - Penny washer DIN 9021 A4 stainless M10 x 30 x 1.4
9344-10 Full nut DIN 934 A4 stainless M10
SDS-P-8.0*210-P – to drill an 75mm drill hole for CFCSH4-8*80
CFCS-SW7 CFCS SW13 Socket Driver

PROPOSED METHODOLOGY

Precast Concrete Panel:

*Preparation: Set the drill with the SDS-X-6.0*210-P drill bit to 65mm*

1. Drill hole (at least 65mm depth)
2. Blow out drill hole with *CFCS 6 Blow Out Pump*
3. Brush out drill hole with *CFCS 6 Drill Hole Brush*
4. Blow out drill hole again with *CFCS 6 Blow Out Pump*
5. Inject Mortar
6. Install *CFCSH4-6*60* with *Wera SW13 stainless non-magnetic impact grade nutsetter*, using a MAXIMUM 160Nm impact driver
7. Ensure the mortar protrudes from the surface of the concrete
8. Fix the fixture with a MAXIMUM 160Nm impact driver. Once the fixture has been fitted, it can take load immediately.



Installation should not commence until operatives have been trained by Certifix.

REQUIRED TOOLS

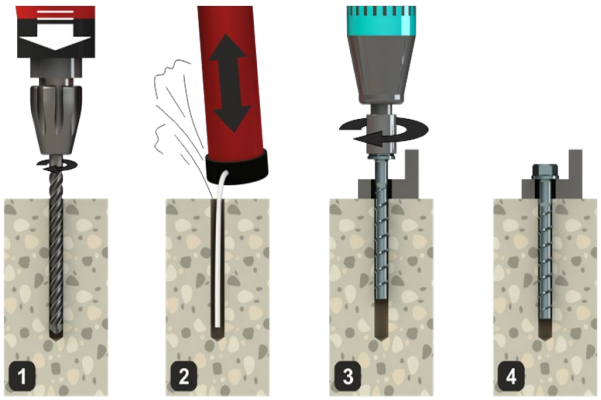
DTD 154 impact driver or direct equivalent (variable speed, max 160Nm)
[SDS-X-6.0*210-P] SDS plus rebar drill quad cutter 6.0mm x 210mm
CFCS 6 Blow Out Pump
CFCS 6 Drill Hole Brush
Wera SW13 non-magnetic nutsetter
Dispenser for Chemofast CF-T 300V 410ml

PROPOSED METHODOLOGY

Concrete Column:

*Preparation: Set the drill with the SDS-X-6.0*210-P drill bit to 65mm*

1. Drill hole (at least 65mm depth)
2. Blow out drill hole with *CFCS 6 Blow Out Pump*
3. Install *CFCSH4-6*60* with *Wera SW13 stainless non-magnetic impact grade nutsetter*, using a MAXIMUM 160Nm impact driver
4. Fix the fixture with a MAXIMUM 160Nm impact driver. Once the fixture has been fitted, it can take load immediately. Ensure that the screw head is resting on the fixture.



Installation should not commence until operatives have been trained by Certifix.

REQUIRED TOOLS

DTD 154 impact driver or direct equivalent (variable speed, max 160Nm) – or Direct Equivalent
[SDS-X-6.0*210-P] SDS plus rebar drill quad cutter 6.0mm x 210mm
CFCS 6 Blow Out Pump
Wera SW13 non-magnetic nutsetter