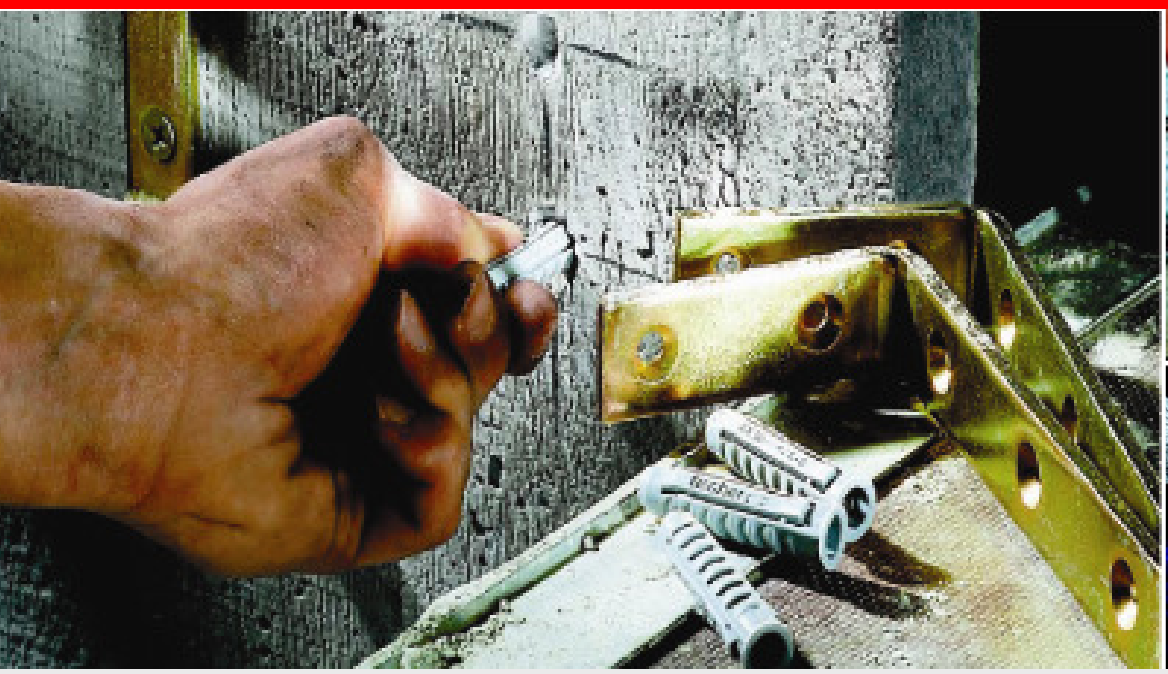
fischer Test Report



Fixing Tests for

Hanson

fischer
FIXING SYSTEMS

CONTENTS

1. Test Parameters

The fixings were tested into a 200 mm deep Hollowcore unit, a product of Hanson Building Products.

The tests were carried out at; Hanson Building Products
Birchwood Way
Cotes Park Industrial Estate
Somercotes
Alfreton
Derbyshire
DE55 4NH

All tests were carried out using a calibrated tensile test meter. To conform to CFA (Construction Fixings Association) guidelines each type of fixing was tested six times.

2. Fixing Products Tested

2.1 fischer Nylon SX Plug

The SX plug is a nylon wall plug for the installation of wood, chipboard and self tapping screws.
The 4-fold expansion of the fixing results in higher load bearing capacity in solid materials. Although it was developed with solid materials in mind it shows a performance in hollow materials which exceeds that of many universal fixings. The design of the SX permits "push-through" installation, thereby saving valuable time and energy. A "knock-in" lock effectively prevents the fixing from expanding prematurely.
All of these points mean that the fischer SX plug is an ideal lightweight fixing for Hollowcore floor slabs.

Typical Applications;

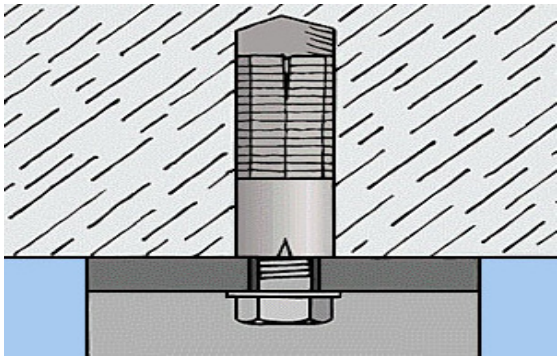
M&E Services Hanger Rods

Bracketry for Suspended Ceilings

2.2 Fischer Nylon M Unit

The M unit is a glass fibre reinforced nylon expansion anchor with an integral internally threaded brass cone for the universal installation of machine screws or metric threaded studs (i.e. zinc plated, Galvanised, stainless steel without bi-metallic action).
As a result of its high expansion capacity, the fixing can accommodate inaccuracies in the drill holes formed within the hollow cores. Typical hammer drilling action will create spalling of the concrete within the hollow and can effectively reduce the web thickness from 30mm to 15mm in the location of the fixing and more critically, the applied load.
Tightening torque is not relevant to this application, as the expansion segments do not exert a compression force to the surrounding base material. This fixing principle is known as “form-locking”.

Typical Applications;



Installation Detail

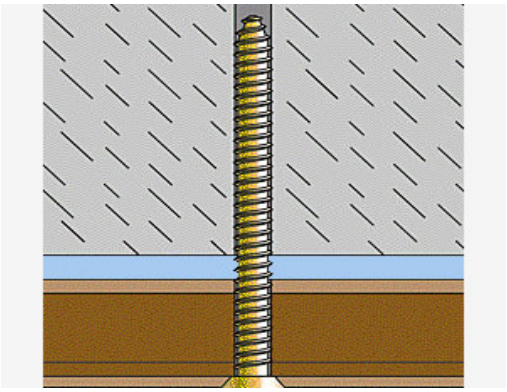
M&E Services Hanger Rod

Bracketry for Suspended Ceilings

2.3 fischer FFS Frame Fixing Screw

The fischer frame fixing screw type FFS allows a stress-free “through-fixing”.
A 6mm diameter hole can be drilled through the assembly item and through the web of the floor slab, and the 7.5mm diameter screw subsequently installed through the item into the hollow of the slab. Providing the screw penetrates into the hollow, the maximum possible load capacity of the FFS is achieved. The screw itself has a tapered lead-in thread for easy attachment and an easy turning action due to a smooth-hardened screw surface and slim thread.

Typical Application;



Typical Timber batten installation detail

Bracketry for suspended ceilings

2.4 FIS V 360 S Hybrid Vinyl Ester Resin with FIP 18x85 net and M10 Rod

The fischer Injection System FIS V 360 S contains a styrene free, quick-setting, high quality hybrid resin mortar, which is characterized by its universal suitability for many applications. It achieves maximum strength values in almost all building materials and anchors safely and without expansion pressure. The 2 components are mixed together inside the static mixer, on extrusion. A simple replacement of the static mixer allows for the continuing use of the cartridges after they have been opened.

Typical Applications;

Installation Detail

Suspended Ceiling Grids

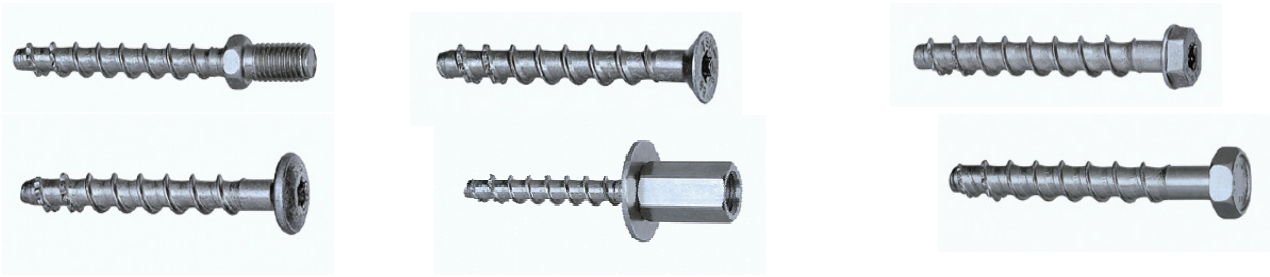
2.5

Building Services

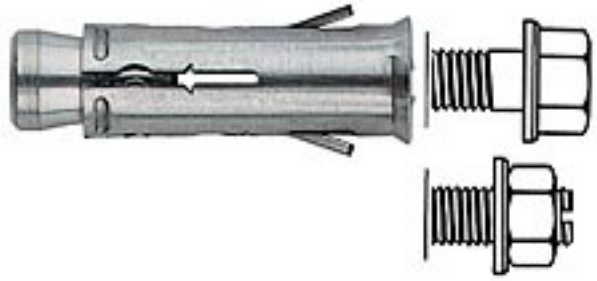
2.5 fischer Concrete Screw FBS

fischer concrete screws, FBS, have a special hardened thread. The lower sections of the thread also have teeth. The diameter of the hole and the teeth on the front threads of the screw are optimised so that the screw cuts into the concrete creating a fine undercut ensuring that a perfect form fit safely supports the load.
As it is the teeth that cut the thread into the concrete they reduce the amount of energy required to insert the screw into the concrete.

Typical Applications;

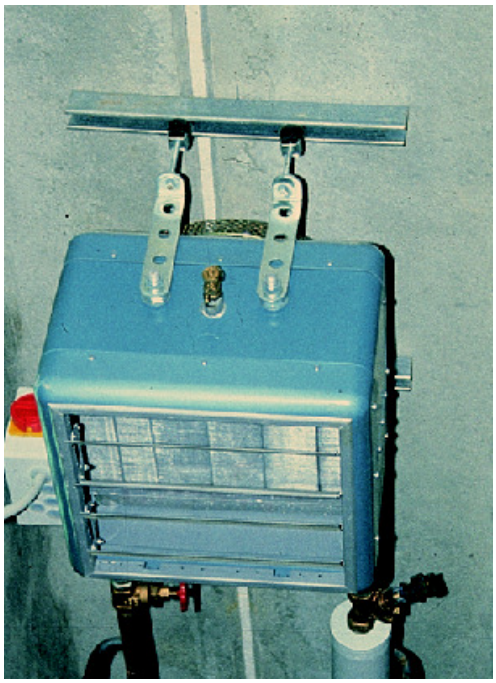


2.6 Fischer Hollow Ceiling Anchor FHY

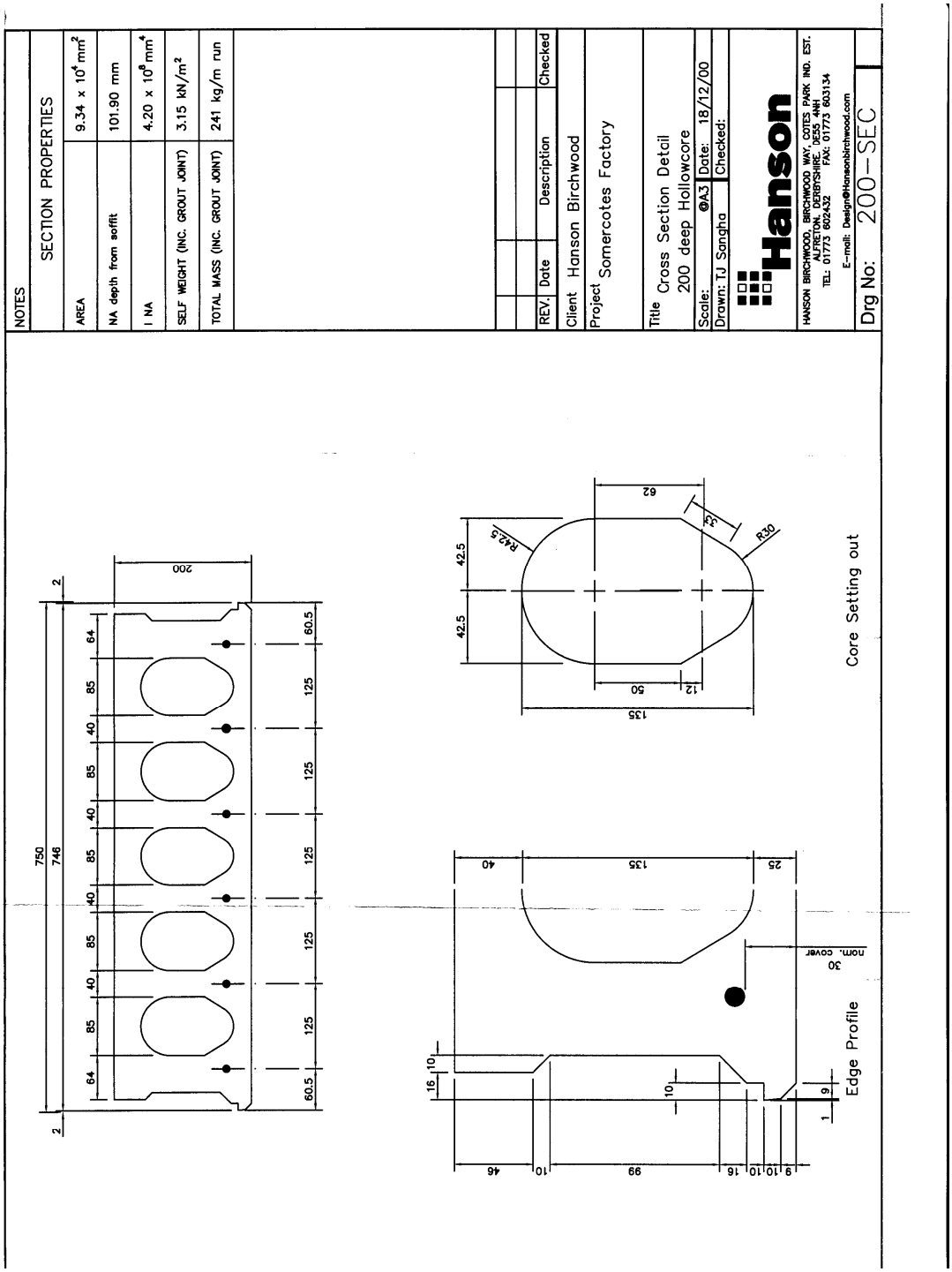


The fischer hollow ceiling anchor, FHY, has been developed specially for fastening into hollow-ceiling slabs of pre-stressed concrete. It is designed for use with standard bolts or threaded rods with metric threads from M6 to M10. The Hollow ceiling anchor FHY is installed flush with the concrete surface. When the bolt or the nut is tightened a tapered element is pulled into the sleeve, which presses this outward. In this way, the FHY presses against the sides of the hole, creating a friction fit. If the anchor encounters a cavity during installation, the expansion of the sleeve forms a Y shape. The holding power is now the result of a combination of expansion pressure and form fit. The fischer hollow ceiling anchor FHY offers considerable scope in the location of attachment points. Unlike other competing products, it does not have to be located at the centre of the cavity axis, which is often very difficult to define. Instead, it can be installed at a minimum distance of 50mm from the pre-stressing steel.

Typical Applications;



3. Substrates Tested



4. Test Results

4.1 fischer Nylon SX Plug (SX 10 with 7mm fischer safety screw)

Test No	Load in kN	Mode of Failure
1	8	Anchor Pull Through
2	8	Anchor Pull Through
3	8.5	Anchor Pull Through
4	7	Anchor Pull Through
5	8	Anchor Pull Through
6	7.5	Anchor Pull Through

Average Ultimate Tensile Load **= 7.8 kN**
Using a global safety factor of 7, safe working load in tension **= 1.1 kN**

NB: We would recommend a minimum axial spacing of 100mm for nylon SX plug size M10, based on the stress cone diameters experienced during load tests to failure. This would ensure that overlapping of stress cones for pairs or series of anchors when loaded simultaneously does not occur, and the safe working load as quoted above would not have to be reduced accordingly.

4.2 fischer Nylon M Unit M10

Test No	Load in kN	Mode of Failure
1	12	Concrete Failure (Tensile Pull Out)
2	11	Concrete Failure (Tensile Pull Out)
3	12	Concrete Failure (Tensile Pull Out)
4	14	Concrete Failure (Tensile Pull Out)
5	12	Concrete Failure (Tensile Pull Out)
6	14	Concrete Failure (Tensile Pull Out)

Average Ultimate Tensile Load **= 12.5 kN**
Using a global safety factor of 7, safe working load in tension **= 1.78 kN**

NB: We would recommend a minimum axial spacing of 100mm for nylon M Unit size M10, based on the stress cone diameters experienced during load tests to failure. This would ensure that overlapping of stress cones for pairs or series of anchors when loaded simultaneously does not occur, and the safe working load as quoted above would not have to be reduced accordingly.

4.3 fischer FFS Fixing Screw

Test No	Load in kN	Mode of Failure
1	10	Concrete Failure (Tensile Pull Out)
2	10	Concrete Failure (Tensile Pull Out)
3	10	Concrete Failure (Tensile Pull Out)
4	14	Concrete Failure (Tensile Pull Out)
5	11	Concrete Failure (Tensile Pull Out)
6	12	Concrete Failure (Tensile Pull Out)

Average Ultimate Tensile Load = 11.2 kN
Using a global safety factor of 4, safe working load in tension = 2.8 kN

NB: We would recommend a minimum axial spacing of 50mm for FFS frame fixing screws 7.5mm diameter, based on the stress cones for pairs of anchors when loaded simultaneously does not occur, and the safe working load as quoted above would not have to be reduced accordingly.

4.4 FIS V 360 S Hybrid Vinyl Ester Resin with FIP 18x85 net and M10 Rod

Test No	Load in kN	Mode of Failure
1	25	Pull Through
2	20	Pull Through
3	25	Pull Through
4	20	Pull Through
5	20	Pull Through
6	20	Pull Through

Average Ultimate Tensile Load **= 21.7 kN**
Using a global safety factor of 4, safe working load in tension **= 5.4 kN**

NB: We would recommend a minimum axial spacing of 100mm for resin sleeve size 18x85 with M10 connecting rod, based on the stress cone diameters experienced during load tests to failure. This would ensure that overlapping of stress cones for pairs or series of anchors when loaded simultaneously does not occur, and the safe working load as quoted above would not have to be reduced.

4.5 fischer Concrete Screw FBS

Test No	Load in kN	Mode of Failure
FBS 6		
1	12	Anchor Pull Through
2	18	Anchor Pull Through
3	18.5	Anchor Pull Through
4	18	Anchor Pull Through
5	20	No Failure
6	20	No Failure
FBS 8		
1	10.5	Anchor Pull Through
2	15	Anchor Pull Through
3	20	No Failure
4	18.5	Anchor Pull Through
5	20	Anchor Pull Through
6	20	No Failure
FBS 10		
1	13	Anchor Pull Through
2	18	Anchor Pull Through
3	20	Anchor Pull Through
4	15	Anchor Pull Through
5	17	Anchor Pull Through
6	12.5	Anchor Pull Through

FBS 6
Average Ultimate Tensile Load **= 17.75 kN**
Using a global safety factor of 4, safe working load in tension **= 4.4 kN**

FBS 8
Average Ultimate Tensile Load **= 17.3 kN**
Using a global safety factor of 4, safe working load in tension **= 4.3 kN**

FBS 10
Average Ultimate Tensile Load **= 15.9 kN**
Using a global safety factor of 4, safe working load in tension **= 4.0 kN**

4.6 fischer Hollow Ceiling Anchor FHY (M10)

Test No	Load in kN	Mode of Failure
1	20	1st Slip
2	20	1st Slip
3	20	1st Slip
4	18	1st Slip
5	20	1st Slip
6	20	1st Slip

Average Ultimate Tensile Load **= 19.7 kN**
Using a global safety factor of 4, safe working load in tension **= 4.9 kN**

At approximately 16kN there was some movement but the fixing stayed secure. This could only be put down to the expansion cone being drawn further into the fixing.

5. Results Summary

Fixing	Safe Working Tensile Load Unfactored (kN) Class 1,2 *	Reduction Factor *	Safe Working Tensile Load (kN)
fischer SX 10	1.1	0.8	0.88
ischer Nylon M Unit	1.78	0.8	1.42
Fischer FFS Screw	2.8	0.8	2.24
FIS V 360 S Hybrid Vinylester resin & FIP18x85 and M10 rod	5.4	0.8	4.32
Fischer FBS 6	4.4	0.8	3.52
Fischer FBS 8	4.3	0.8	3.44
Fischer FBS 10	4.0	0.8	3.30
Fischer FHY M10	4.9	0.8	3.92

* See conclusion below

6. Conclusion

In conclusion, it is our opinion, that the fixing types tested in conjunction with Hanson Building Products pre-cast Hollowcore floors are highly suitable for fixing applications such as fixing M&E Services via hanger rods, or timber batten installations for MDF ceilings.
As the tests were conducted into the 200 mm manufactured slab, it is also our opinion that the fixings would also be suitable for the thicker slab sections with web thickness greater than 25 mm.
The slabs were tested in an inverted condition for easier access and testing. The slabs would, however be laid in-situ with the reinforcement in the bottom face (i.e. tensile zone). For a class 3 design of floor slab, it is possible for cracks of up to 0.2 mm to be present when the slab is in service.

As there is no current research into pre-cast Hollowcore flooring concerning reductions in fixing load performance for crack widths of up to 0.2mm, we can apply the principles of fixings for cracked concrete with a solid structure.
In general terms, we apply an average reduction factor of 0.6 to the working loads of anchors installed into concrete compression zones (i.e. non-cracked concrete) in order to assess the working load performance of anchors approved for use in cracked concrete. This reduction factor is based on crack widths up to 0.4mm. Using simple linear interpolation, we can estimate that a reduction factor of 0.8 (or 20% reduction) applies to the loads achieved during the tests.
We can therefore conclude the load performances in section 5 for our fixings installed to Richard Lees Hollowcore floor slabs in-situ. The factored loads are applicable to Class 3 floor slabs and the unfactored loads are applicable to the remaining classes.