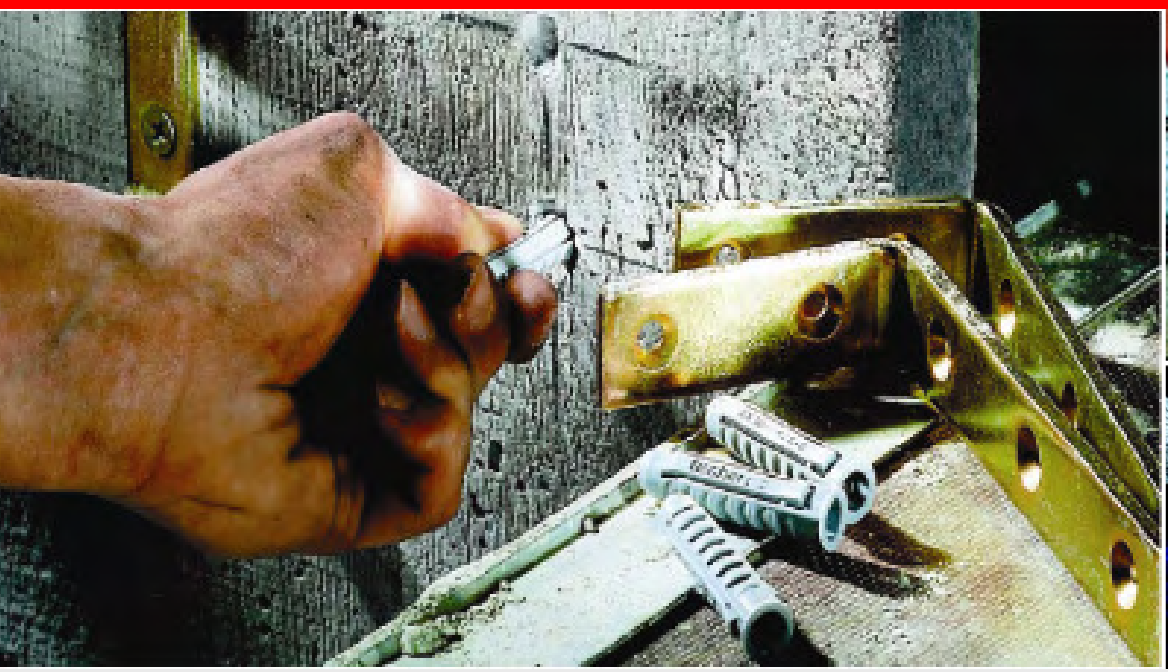
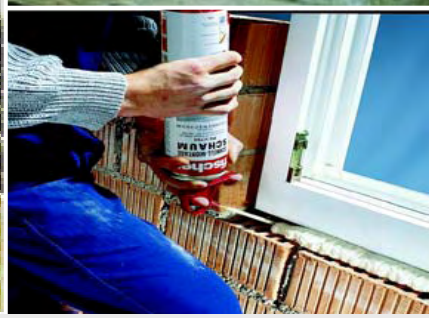
fischer Test Report





Fixing Tests for
Omnia Slabs &

COBIAXDECK

Long spanning, biaxial, concrete deck system – without beams

Hanson

fischer
FIXING SYSTEMS

Hanson Building Products
Wilden Road
Pattinson South Industrial Estate
Washington
Tyne & Wear
NE38 8QB
Tel 0191 417 0066
Fax 0191 417 0131
www.hanson.com

NW/EF

13th May 2009

Artur Fischer (UK) Ltd
Hithercroft Road
Wallingford
Oxton
OX10 9AT

Dear Sirs

Re: Testing of Fischer Fixings in Hanson's Cobiax & Omnia Slabs

We confirm that the test as detailed in your document title "Fixing Testing on Hanson Cobiax & Omnia Slabs" was carried out at our Washington Factory. The test was carried out on the soffit of a standard 75mm & 50mm deep slab, and the results are a true record of the tests. Therefore, we can recommend that the fixings described are suitable for use in our hollow core slabs, up to the safe working loads stated.

Yours faithfully
For Hanson Building Products Ltd

Nigel Wheeler
Production Manager

Testing on Hanson Cobiax Pre Cast Flooring System

1. Introduction

Test Parameters
Slab Information
Omnia Slab Information

2. Fixing Products Tested

FDA-R Rimmed Internally Threaded Anchor in 6,8 & 10mm versions
FNA II 6x30/5 Nail Anchor
SXS 10x160 FUS High Performance Frame Fixing
FISV 360 S Injection Resin with M8 Resin Stud
FBS M8/M10 I Internally Threaded Concrete Screw
FBS 6x40 with Shallow Embedment Depth
FISV 360 S Resin, FZUB 14x40M12 Drill Bit & M12 Threaded Stud

3. Test Results in both 50 & 75mm Thick Slab

FDA-R 6x25
FDA-R 8x30
FDA-R 10x30
FNA II 6x30/5
SXS 10x160 FUS
FISV 360 S Resin with RG M 8
FBS M8/M10 I
FBS Concrete Screw 6x40 with Shallow Embedment Depth of 35mm
FISV 360 S Resin, FZUB 14x40M12 Drill Bit & M12 Threaded Stud

4. Results Summary in 50mm Slab Thickness

5. Results Summary in 75mm Slab Thickness

6. Conclusion

Test Parameters

fischer fixings working with Hanson Precast Flooring Systems to offer their joint customers comprehensive and accurate information regarding the fixing compatible with the Cobiax Precast Slabs and Omnia Slabs.

Hanson Precast Slabs are design in accordance with the BS8110. The 28 day cube strength of the concrete is in excess of 50N/mm^2.

The primary slabs are manufactured in two depths, of 50mm and 75mm. Owing to the composite nature of the finished product this report relates to fixing's into the primary component only.

fischer initially introduced and tested suitability and load capacity of six high performance fixings, ranging from the FNA metal nail anchor through to the FISV 360 S high performance injection resin anchor system. All the fixings were due to be tested into both the 50 & 75mm slabs variants. The test results for all the tests show a good variation in ultimate loads. This allows the engineer, architect and end user to have a broad range of anchors to choose from depending on both function and load characteristics required for their applications.

The tests were carried out at:

Hanson Concrete Products
Wilden Road
Pattinson South Industrial Estate
District 8
Washington
NE8 8QB

All tests were conducted using a Hydrajaws calibrated tensile tester with 0-5kN and 0-20kN gauge, in conjunction with attachments required. To conform to the CFA (Construction Fixing Association) guidelines each fixing was tested six times.

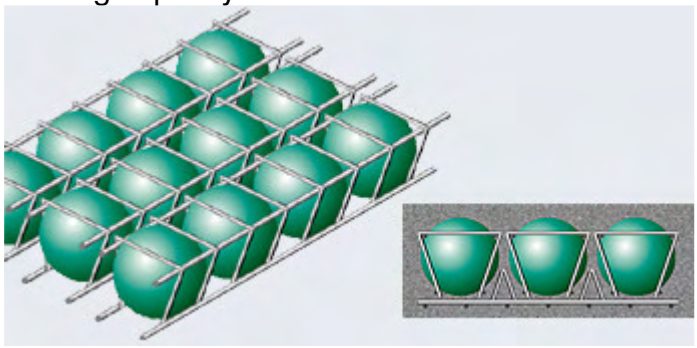
Slab Information

Cobiax precast panel offers a huge range of advantages in construction projects where large spans without beams and with a reduced number and size of vertical bearing elements are the preferred solution.

Cobiax technology was developed in Switzerland. Hanson designs and manufactures the precast concrete product under licence in the UK at their factory in Washington Tyne and Wear.

Slab thicknesses range from 240mm up to more then 600mm depending on application.

Cobiax has been designed to remove the non-working, dead load in concrete slabs whilst maintaining biaxial strength. This is achieved by placing hollow plastic spheres between the upper and lower static reinforcement of the concrete slab, displacing concrete where it has no structural benefit. The effect is to decrease the overall weight by up to 35% when compared to a solid slab of the same bearing capacity.



The reduced weight allows the quantity and dimensions of vertical bearing elements, such as columns, to be reduced. Reduced dead weight means a smaller deflection of the slab and also provides scope for savings in foundation design, including fewer piles and/or reduced length of piles.

While the design reduces overall weight, the Cobiax slabs offer very high load carrying capacity and flexibility. However, in contrast to more conventional hollowcore slabs which have load transfer in only one direction, in the Cobiax slabs load transfer is possible in any direction.

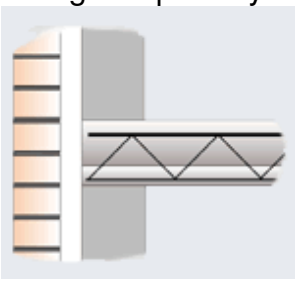
Because the Cobiax flat slab does not require beams, flat unobstructed soffits are produced and the costs of installing services in a building are also substantially reduced.

With up to 40% less columns supporting the slabs, Cobiax offers great design including direct and indirect cost savings in building materials (reduced volume, lower transport costs and easier, more cost effective, lifting). Cobiax also means improved build-speed through reduced bracing and formwork (no beams) and because there is less concrete volume to place on site.

Hanson is already the UK's leading supplier of pre-cast Omnia wide slab panels, and the Omina panel, with its integrated lattice girder panel, forms the basis of the Cobiax system. Rebar cages containing the plastic spheres, manufactured from recycled polyethylene, are also cast into the 4 panel and the system is completed with upper reinforcement and in-situ concrete.

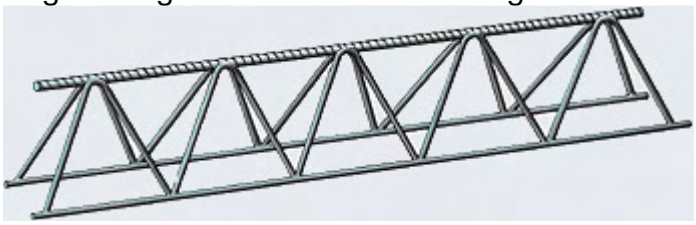
Omnia Slab Information

This is a floor slab comprising Omnia pre-cast concrete permanent formwork acting compositely with an in-situ concrete structural topping.



The Omnia system has been developed to provide the direct equivalent of an in-situ slab and provides the facility to combine pre-cast and in-situ concrete, offering major benefits to specifiers, engineers and contractors.

The Omnia flooring system is equally suitable for steel or concrete framed structures and also masonry buildings. It has a proven track record over many year in a wide range of building types including – Commercial Building, Civil Engineering and Residential housing.



The only manufactures of the Omnia range of products are Hanson Concrete Products and all such products are generally manufactured at the Washington factory. All Omnia products from Hanson Concrete Products incorporate the Omnia lattice girder manufactured from cold drawn wire designed with a characteristic strength of 500kN/mm^2.

The triangular Omnia lattice girders ensure a mechanical bond between pre-cast and in-situ concrete and provides the pre-cast panel with its stiffness during the temporary condition. It also facilitates a support for the top layer of reinforcement provided by the contractor.

The dimensions of the lattice girders are determined by the overall depth of the slab, cover and the temporary condition requirements during construction. Various propping arrangements may be examined at this stage.

From drawings Hanson engineers will determine the optimum arrangements of steel reinforcement, concrete and lattice and provide all necessary calculations prior to manufacture. The amount of reinforcement required in any panel is determined by the eventual load that it will have to support in the complete structure. On a complex project with varying load combinations, the numbers of individual load cases can run into hundreds, with each span reinforced according to its specific need.

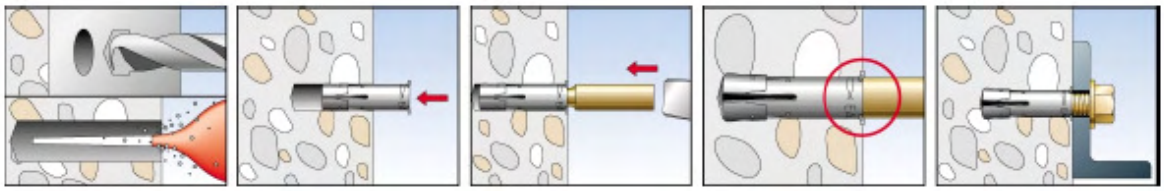
2. Fixing Products Tested

FDA-R Rimmed Internally Threaded Anchors

Material: Zinc plated and passivated to 5 microns

Range: M6-M10

The FDA-R is similar to the conventional Drop-In anchor. Its rimmed collar on the fixing ensures the anchor remains flush with the surface at all times even if the hole is drilled slightly deeper then required. To ensure correct installation setting tool shall be used with this anchor.



FNA II 6x30/5 Metal Nail Anchor

Material: Zinc Plated, Stainless Steel A4 and High Corrosion Resistant Steel 1.4529

Range: M6 with various head types

Nail anchor for fast and simple hammerset installation. The anchor expands automatically under load, pulls the cone into the expansion clip and expands against the hole wall.

The main feature is simple and easy setting with only a few hammer blows and only 6mm hole. Reduced setting energy required is important benefit particularly with overhead installation and allows sensitive materials to be fixed, i.e. fire protection boards. A fixing with different head designs for different areas of application. A stainless steel A4 version for outdoor use and in damp conditions. And the highly corrosion-resistant steel C for applications in aggressive atmosphere.

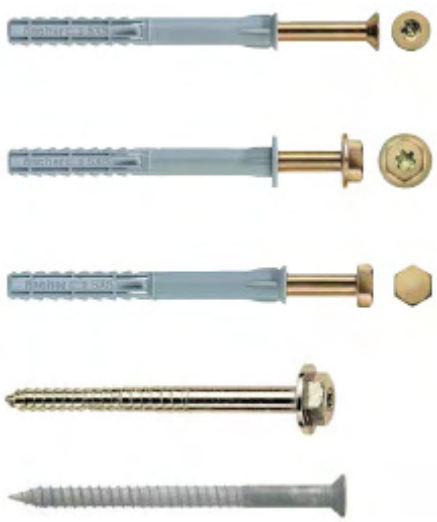
ETA

For multiple fixing for non-structural applications in cracked concrete.

fischer FIXING SYSTEMS

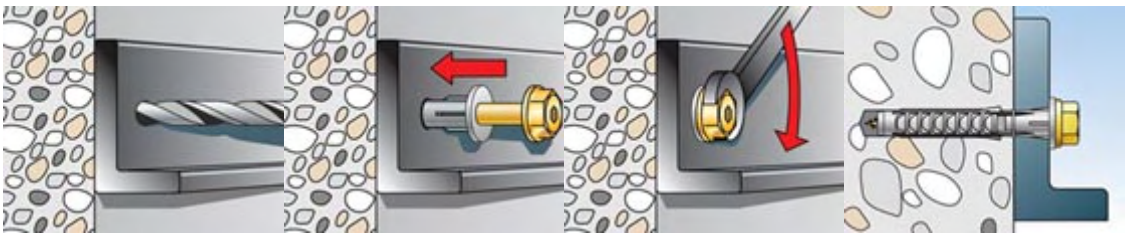
SXS 10x160 FUS Frame Fixing

Material:	Plug:	Nylon (Polyamide 6)
	Screw:	Metal Grade 6.8
Range:	6, 8 & 10mm	



First Nylon frame fixing approved for cracked concrete due to its unique and patented CONA screw.

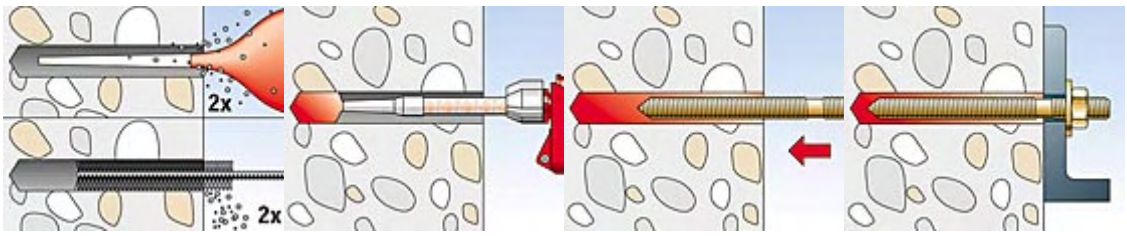
All fixings come with pre-installed screw for fast installation. The fischer CONA screw makes the SXS performance superior in various substrate. Very high permissible loads and bending moments allows reduction in number of fixings required, saving installation time even further. Integral hammer-in stop prevents the fixing from expanding prematurely during installation. The SXS-FUS version does not require addition washers and prevents contact corrosion. Fixings set with A4 stainless steel CO-NA screws for external applications and in damp conditions.



FISV 360 S Injection Resin, RG M 8 Threaded Rod and FIS H 12 x50 K sleeve

Material:	Resin:	Hybrid Vinyl Ester Injection Resin
	Rod:	Zinc Plated grade 5.8 & Stainless Steel A4

The fischer Injection System FIS V 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 without expansion pressure. The 2 components are mixed together inside the static mixer. A simple exchange of the static mixer allows the cartridges to be reused after they have been opened.

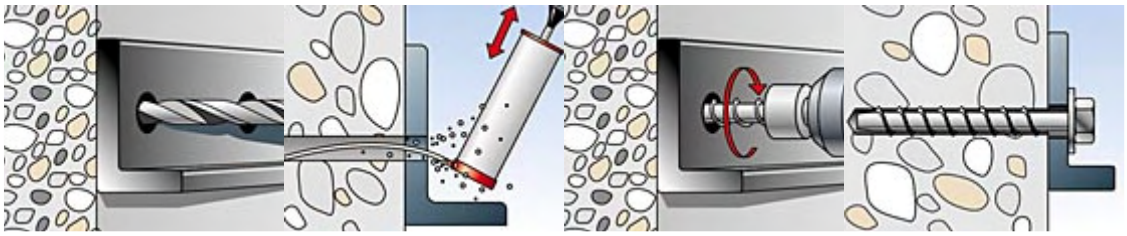


FBS 6 M8/M10 I Concrete Screws

Material: Zinc plates grade 5.8 and stainless steel A4

Range: M8/M10 only for the I version, M6 – M12 with Various head types

The fischer Concrete Screws have a special hardened thread. The serration on the thread makes the screw easy to install, reducing the amount of energy required to insert the screw into concrete. Concrete screws are completely removable anchors, therefore particularly suitable for temporary fixings. Virtually expansion free operation allows cost-efficient fixing with small axial spacing and edge distances. The thread turns creating a fine undercut, thereby ensuring that a perfect form fit safely supports the load. Fixing with different head design allows solutions for various applications.

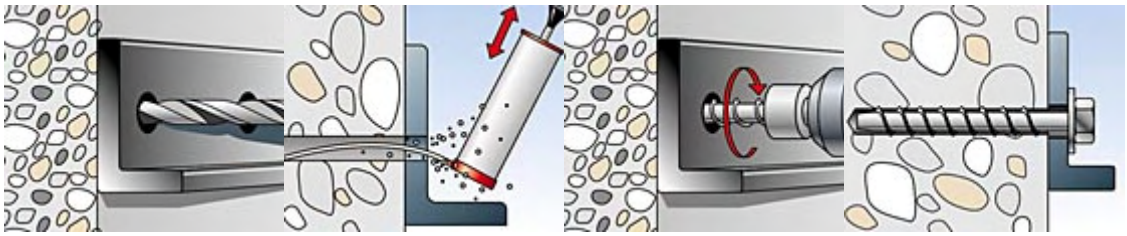


FBS 6x40 with Shallow Embedment Depth

Material: Zinc Plated grade 5.8

Range: 6x40 and 6x50

The FBS is a self-tapping concrete screw for push through and prior insertion installation, when the concrete screw is screwed into the hole, the thread taps in to the concrete and creates a positive fit anchorage. There is an A4 stainless steel version for outdoor use or in damp conditions.
You can install and set the anchor in one time saving working operation. It is a completely removable anchor, therefore particularly suitable for temporary fixings. It is virtually expansion free which allows cost-efficient fixing with small axial spaces and edge distances. Serrations on the thread make the screws easy to screw in.



FISV 360 S Resin, FZUB 14x40M12 Drill Bit and Threaded Stud

FISV 360 S Resin: Contains a styrene free, quick setting, high quality hybrid resin mortar, which is characterized by its universal suitability for many applications. This resin can be used solo or in conjunction with an anchor sleeve dependent on application and substrate. When fully cured this resin produces a form type locking in hollow materials and friction type locking in solid material, allowing the application to be a street free fixing.

FZUB Drill Bit: Has a unique four cutting drill head which reduces the risk of drill moving out of location at the start of drilling. The drill depth stop prevents you from over drilling the hole to help avoid reinforcement bar and because it is made of rubber it reduces sound and impact vibration. It has an SDS Plus adaptor for easy installation in to the drill. The optimized spiral helps transport the drill dust quicker then normal drills.

The Combination: The system has been designed specially for Cobiax Slabs. As the slab does not allow deep embedment this fixing system has the high strength of resin combined with an undercut hole for greater load distribution.

3. Test Results

FDA-R 6x25

FDA-R 6x25 in to **50mm thick Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	11.5kN	1st Tensile Slip 3mm
2	12.5kN	1st Tensile Slip 3mm
3	12.5kN	1st Tensile Slip 3mm
4	11.5kN	1st Tensile Slip 3mm
5	13.0kN	1st Tensile Slip 3mm
6	12.75kN	1st Tensile Slip 3mm

Average ultimate load is: **12.3kN**

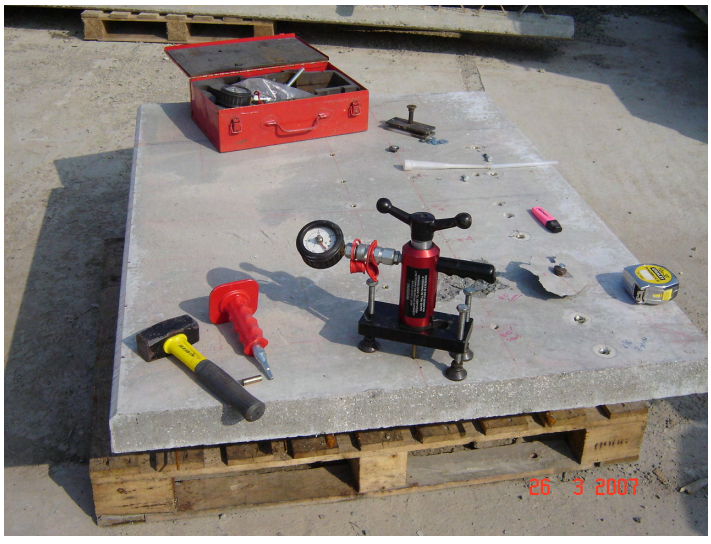
Using a global safety factor of 4, safe working load is: **3.07kN**

FDA-R 6x25 in to **75mm thick Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	13.5kN	1st Tensile Slip 3mm
2	14.0kN	1st Tensile Slip 3mm
3	14.5kN	1st Tensile Slip 3mm
4	12.5kN	1st Tensile Slip 3mm
5	11.0kN	1st Tensile Slip 3mm
6	12.0kN	1st Tensile Slip 3mm

Average ultimate load is: **12.9kN**

Using a global safety factor of 4, safe working load is: **3.2kN**



FDA-R 8x30

FDA-R 8x30 in to **50mm thick Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	16.0kN	1st Tensile Slip 3mm
2	15.5kN	1st Tensile Slip 3mm
3	17.0kN	1st Tensile Slip 3mm
4	14.5kN	1st Tensile Slip 3mm
5	15.0kN	1st Tensile Slip 3mm
6	15.5kN	1st Tensile Slip 3mm

Average ultimate load is: **15.6kN**

Using a global safety factor of 4, safe working load is: **3.9kN**

FDA-R 8x30 in to **75mm thick Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	16.0kN	1st Tensile Slip 3mm
2	15.5kN	1st Tensile Slip 3mm
3	17.0kN	1st Tensile Slip 3mm
4	14.5kN	1st Tensile Slip 3mm
5	15.0kN	1st Tensile Slip 3mm
6	15.5kN	1st Tensile Slip 3mm

Average ultimate load is: **15.5kN**

Using a global safety factor of 4, safe working load is: **3.9kN**

FDA-R 10x30

FDA-R 10x30 in to **50mm Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	16kN	1st Tensile Slip 3mm
2	14kN	Concrete Failure
3	15kN	Concrete Failure
4	14kN	Concrete Failure
5	14kN	1st Tensile Slip 3mm
6	16kN	Concrete Failure

Average ultimate load is: **14.8kN**

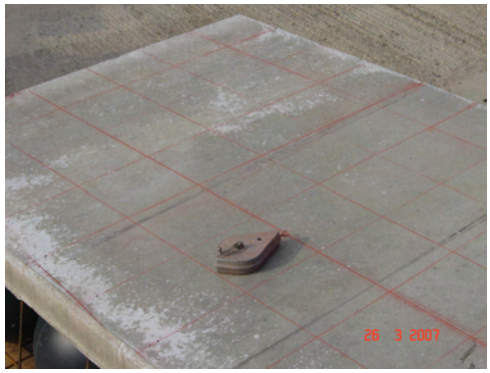
Using a global safety factor of 4, safe working load is: **3.7kN**

FDA-R 10x30 in to **75mm Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	9.5kN	1st Tensile Slip 3mm
2	8.2kN	1st Tensile Slip 3mm
3	8.5kN	1st Tensile Slip 3mm
4	9.1kN	1st Tensile Slip 3mm
5	9.5kN	1st Tensile Slip 3mm
6	10.5kN	1st Tensile Slip 3mm

Average ultimate load is: **9.21kN**

Using a global safety factor of 4, safe working load is: **2.3kN**



FNA II 6x30/5

FNA II 6x30/5 in to **50mm thick Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	8.3kN	Steel Failure
2	8.0kN	Steel Failure
3	8.2kN	Steel Failure
4	8.1kN	Steel Failure
5	8.0kN	Steel Failure
6	7.9kN	Steel Failure

The average ultimate load is: **8.08kN**

Using a global safety factor of 4, safe working load is: **2.02kN**

FNA II 6x30/5 in to **75mm thick Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	8.1kN	Steel Failure
2	8.0kN	Concrete Failure
3	8.2kN	Steel Failure
4	8.2kN	Steel Failure
5	7.9kN	Steel Failure
6	7.9kN	Steel Failure

Average ultimate load is: **8.05kN**

Using a global safety of 4, safe working load is: **2.01kN**

SXS 10x160FUS

SXS 10x160 FUS in to **50mm thick Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	9.0kN	1st Tensile Slip 3mm
2	8.2kN	1st Tensile Slip 3mm
3	8.5kN	1st Tensile Slip 3mm
4	9.0kN	1st Tensile Slip 3mm
5	9.5kN	1st Tensile Slip 3mm
6	8.5kN	1st Tensile Slip 3mm

Average ultimate load is: **8.7kN**

Using a global safety factor of 7, safe working load is: **1.25kN**

SXS 10x160 FUS in to **75mm Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	9.4kN	1st Tensile Slip 3mm
2	8.2kN	1st Tensile Slip 3mm
3	8.5kN	1st Tensile Slip 3mm
4	9.1kN	1st Tensile Slip 3mm
5	9.5kN	1st Tensile Slip 3mm
6	1.1kN	1st Tensile Slip 3mm

Average ultimate load is: **7.6kN**

Using a global safety factor of 7, safe working load is: **1.09kN**

FISV 360 S Injection Resin with RGM 8 & FIS H 12x50 K Injection Anchor Sleeve

FISV 360 S Injection Resin with RGM 8 in to **50mm thick Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	4.9kN	1st Tensile Slip 3mm
2	4.7kN	1st Tensile Slip 3mm
3	5.1kN	1st Tensile Slip 3mm
4	5.0kN	1st Tensile Slip 3mm
5	4.9kN	1st Tensile Slip 3mm
6	4.7kN	1st Tensile Slip 3mm

Average ultimate load is: **4.88kN**

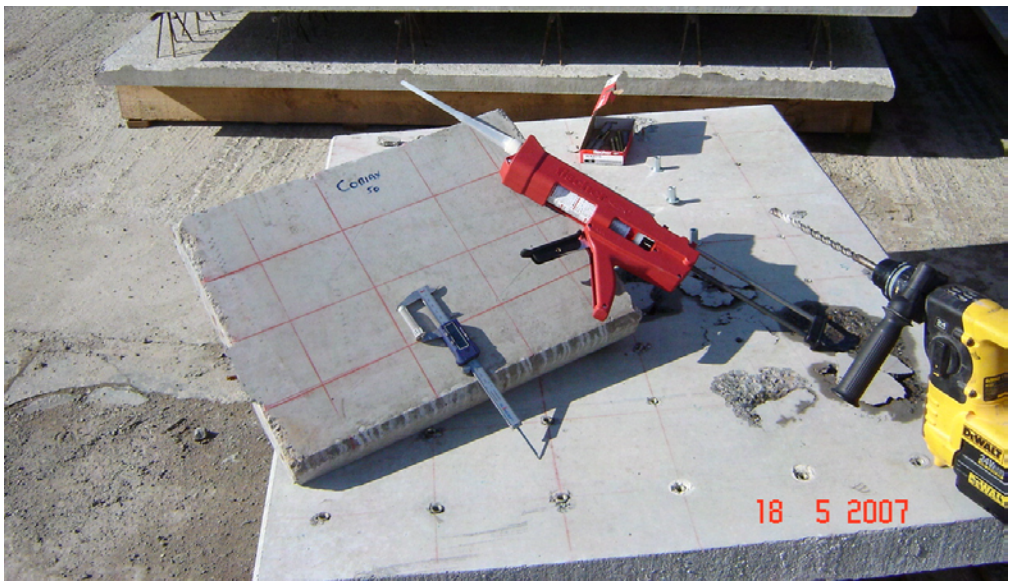
Using a global safety factor of 4, safe working load is: **1.22kN**

FISV 360 S Injection Resin with RGM 8 in to **75mm thick Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	7.2kN	1st Tensile Slip 3mm
2	7.5kN	1st Tensile Slip 3mm
3	7.4kN	1st Tensile Slip 3mm
4	8.0kN	1st Tensile Slip 3mm
5	7.9kN	1st Tensile Slip 3mm
6	7.2kN	1st Tensile Slip 3mm

Average ultimate load is: **7.53kN**

Using a global safety factor of 4, safe working load is: **1.88kN**



FBS M8/M10 I Concrete Screw with standard embedment depth of 55mm

FBS M8/M10 I into **50mm thick Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	14.5kN	Cracking to free edge
2	18.0kN	200mm Cone Failure
3	14.0kN	160mm Cone Failure
4	16.0kN	150mm Cone Failure
5	14.0kN	150mm Cone Failure
6	17.0kN	140mm Cone Failure

Average ultimate load is: **15.5kN**

Using a global safety of 4, safe working load is: **3.8kN**

FBS M8/M10 I into **75mm thick Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	15.0kN	Pull Through
2	20.0kN	No Failure
3	20.0kN	No Failure
4	19.8kN	Concrete Failure
5	20.0kN	No Failure
6	20.0kN	No Failure

Average ultimate loads: **19.1kN**

Using a global safety factor of 4, safe working load is: **4.7kN**

FBS Concrete Screws 6x40 with shallow embedment of 35mm

FBS 6x40 into **50mm thick Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	6.5kN	Concrete Failure
2	7.0kN	Concrete Failure
3	7.5kN	Concrete Failure
4	7.5kN	Concrete Failure
5	7.5kN	Concrete Failure
6	8.0kN	Concrete Failure

Average ultimate load is: **7.3kN**

Using a global safety factor of 4, safe working load is: **1.8kN**

FBS 6x40 in **75mm thick Cobiax/Omnia Slab**

Test No:	Load Achieved	Remarks
1	8.0kN	Concrete Failure
2	9.0kN	Concrete Failure
3	10.0kN	Concrete Failure
4	10.5kN	Concrete Failure
5	10.5kN	Concrete Failure
6	9.5kN	Concrete Failure

Average ultimate load is: **9.5kN**

Using a global safety factor of 4, safe working load is: **2.3kN**

FISV 360 S Resin, FZUB 14x40M12 Drill Bit & M12 Threaded Stud

FISV 360 S Resin, FZUB 14x40M12 Drill Bit & M12 Threaded Stud in to **50mm thick Cobiax/Omina Slab**

Test No:	Load Achieved	Remarks
1	17kN	Concrete Failure
2	17kN	Concrete Failure
3	18kN	Concrete Failure
4	17kN	Concrete Failure
5	16kN	Concrete Failure
6	17kN	Concrete Failure

Average ultimate load is: **17kN**

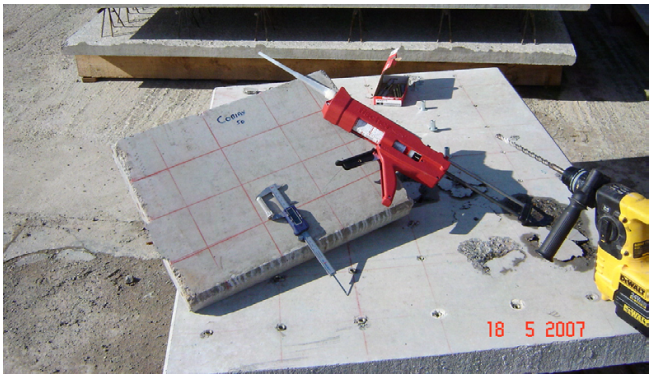
Using a global safety factor of 4, safe working load is: **4.25kN**

FISV 360 S Resin, FZUB 14x40M12 Drill Bit & M12 Threaded Stud in to **75mm thick Cobiax/Omina Slab**

Test No:	Load Achieved	Remarks
1	17kN	Concrete Failure
2	17kN	Concrete Failure
3	18kN	Concrete Failure
4	17kN	Concrete Failure
5	16kN	Concrete Failure
6	17kN	Concrete Failure

Average ultimate load is: **17kN**

Using a global safety factor of 4, safe working load is: **4.25kN**

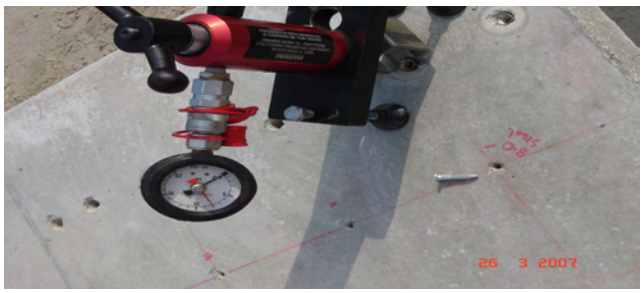


4. Results Summary in 50mm Slab Thickness

Product	Average Ultimate Load	Safe Working Load
FDA-R 6x25	12.3kN	3.07kN
FDA-R 8x30	15.6kN	3.9kN
FDA-R 10X30	-	-
FNA II 6x30/5	8.08kN	2.02kN
SXS 10x160 FUS	8.7kN	1.25kN
FISV 360 S Resin & RG M8 & FIS H 12x50 K Sleeve	4.8kN	1.22kN
FBS M8/M10 I	15.5kN	3.8kN
FBS 6x40	7.3kN	1.8kN
FISV 360 S, FZUB 14x40 & Threaded Stud	17kN	4.3kN

5. Results Summary in 75mm Slab Thickness

Product	Average Ultimate Load	Safe Working Load
FDA-R 6x25	12.9kN	3.2kN
FDA-R 8x30	15.5kN	3.9kN
FDA-R 10x30	9.21kN	2.3kN
FNA II 6x30/5	8.05kN	2.01kN
SXS 10x160 FUS	7.6kN	1.09kN
FISV 360 S Resin & RG M8 & FIS H 12x50 H Sleeve	7.53kN	1.8kN
FBS M8/M10 I	19.1kN	4.7kN
FBS 6x40	9.5kN	2.3kN
FISV 360 S, FZUB 14x40 & Threaded Stud	17kN	4.3kN



6. Conclusion

It is our opinion that all fixings tested are suitable for installation in conjunction with Hanson 75mm thickness (Primary Plank) Cobiax Flooring. Suitability into 50mm slab shall be assessed more carefully as only 5 anchor types have been approved for this shallower slab.

The metal and resin fixings tested reflect the typical needs of the mechanical, electrical and HEVAC trades. Inclusion of high performance nylon fixings allow safe anchoring for the dry lining and carpentry trades.

The tests were carried out on the primary plank only, without the positive influence of the supporting mass concrete above. If tests were to be conducted into finalized floor slab with poured concrete above the plank, the loads in some cases may be even higher. However we feel that wherever possible the recommended embedment depth of our fixings should not exceed that of the primary plank.

The slabs were tested in an inverted position for the ease of access and testing.
In practice the slabs would be laid in situ with the reinforcement in the bottom face (i.e. the tensile zone).

At the moment we assume anchors are installed in non-cracked concrete. Evaluation about possible width crack in floor slab shall be made by Cobiax so that we would be able to comment on load reduction for anchors being installed in tensile zone.

Hanson accepts it is possible for cracks widths of up to 0.3mm to be present when the slab is in service. As we are not aware of any research involving pre-cast Cobiax flooring concerning reductions in fixing load performance. For crack widths of up to 0.4mm we can apply the principles of fixings for cracked concrete with a solid structure and apply reduction factor 0.7 to take into account of anchors' performance in cracked concrete. For the FDA-R we would recommend a reduction factor of 0.4.