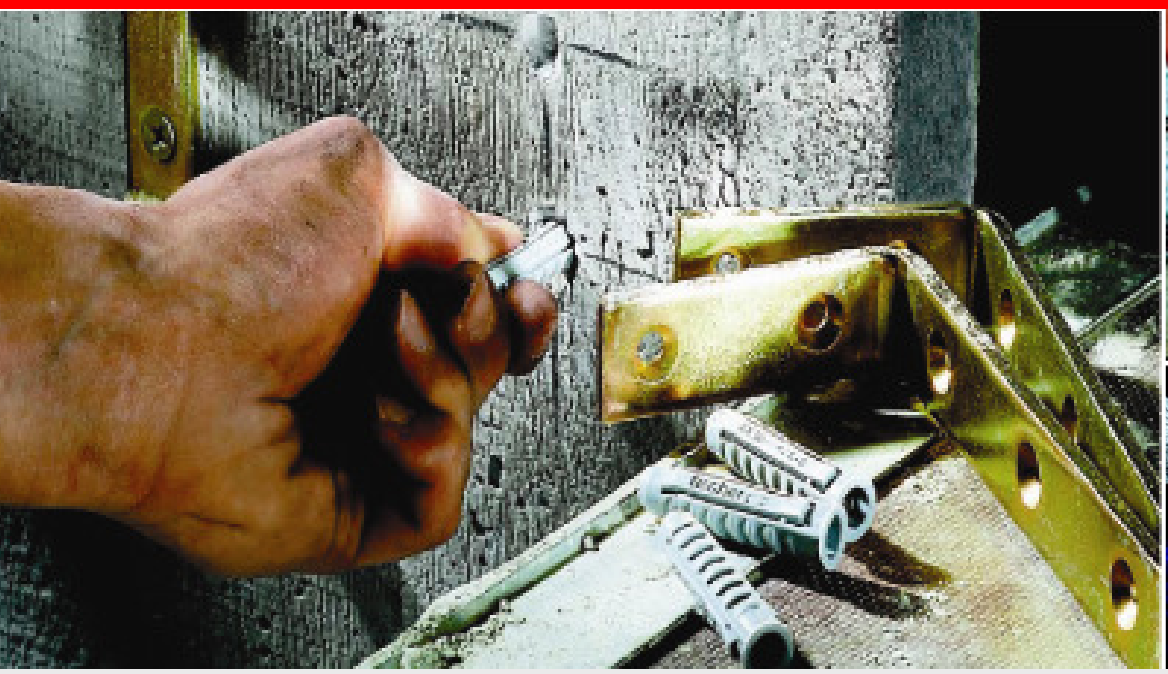
fischer Test Report



Fixing Tests for Durox Supabloc

Tarmac®

fischer FIXING SYSTEMS

Topblock

Technical Services

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Essex SS17 0PY

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Our Ref.:IG/FH/018

7th August 2002

Mr D Hanrahan
Arthur Fischer (UK) Limited
Hithercroft Road
Wallingford
Oxfordshire
OX10 9AT

Dear Sir

Re: Fischer Fixings Into Durox Supabloc

Attached is a copy of your Fixing Test report which has been marked up with a few minor amendments.

You will be aware that Durox Building Products was taken over by Tarmac Topblock Limited in January of this year. As part of the acquisition Tarmac brought the writes to the products, and market the entire product range under the brand name of Durox. The purchase did not include the limited company, Durox Building Products. Therefore, any reference to the company must be Tarmac Topblock Limited whilst the brand remains Durox and the specific product Supabloc.

As discussed I will draft a covering statement regarding the acquisition of Durox for the introduction section of the report which refers to the interrogations of Durox into the Topblock product range that now includes two aircrete products Toplite and Durox.

We would confirm that the test detailed in your report "Fixings Test Report for Durox" were carried out at Arthur Fischer, and that the tests were carried out into single Durox Supablocs. In this respect the results are a true record of the tests. We therefore recommend that the fixings described are suitable for use with Durox Supablocs, up to and the safe working loads stated.

Yours faithfully

I J Gray
Technical Services Manager

c.c. C Marshall

Testing into 3.5 N/mm^2 Durox Supabloc

1.1 Test Parameters

Various fixings were testing into Durox Supabloc. The fixings were installed and tested in individual blocks not walls. The block is manufactured using Portland cement, hydrated lime and sand. The face size is 215 x 620mm and a thickness of 100mm. The block is available in four grades of compressive strength, but the 3.5 N/mm^2 Durox Supabloc was used during these tests.

The tests were carried out at:

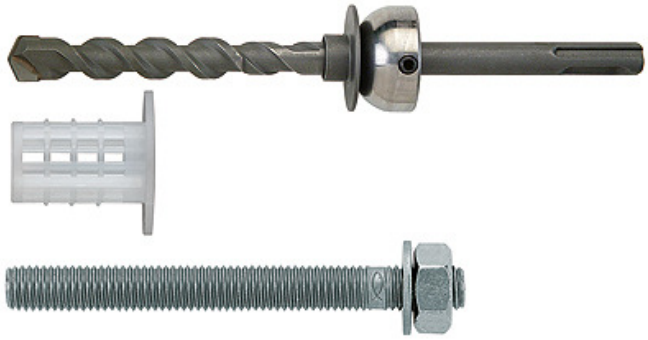
fischer Fixings UK Ltd
Hithercroft Road
Wallingford
Oxfordshire
OX10 9AT

All tests were carried out using a calibrated 20kN Hydrajaws tensile tester. To conform to CFA (Construction Fixing Association) guidelines each type of fixing was tested six times.

2.1 Fischer PBB Undercut Anchor System

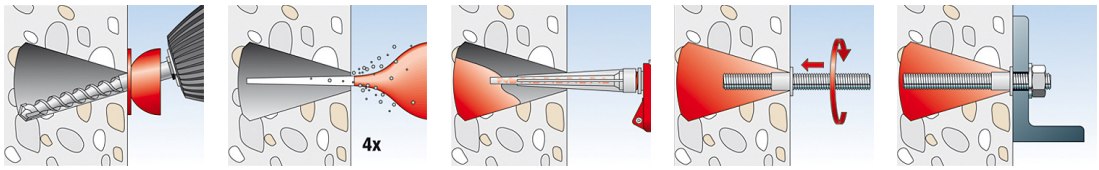
Material: Cone Drill PBB, Centering Sleeve PBZ, FIS V 360 S Resin

Range:M8 – M12



The PBB undercut anchor system is designed specifically for aircrete with FISV resin and threaded rod. The special PBB drill produces a conical hole, which when filled with resin, produces a mechanical interlock which guarantees maximum load bearing capacity with stress free installation.

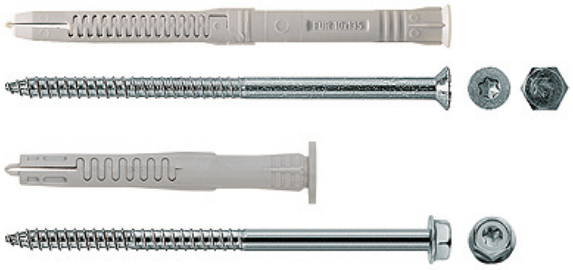
In order for the stud to remain central within the hole a plastic centering sleeve is placed in the mouth of the conical hole.



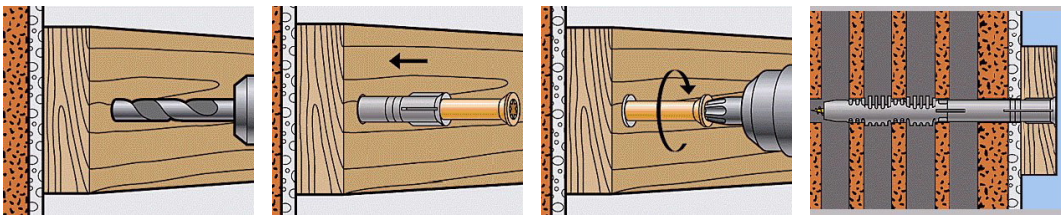
2.2 fischer FUR Universal Frame Fixing

Material:	Plug -	Nylon (polyamide 6)
	Screw -	Steel grade 6.8 or A4 Stainless steel

Range: FUR 8, 10 & 14mm diameter
Hexagon or countersunk head
Zinc plated or stainless steel
80-270mm long



The fischer FUR sets a new standard for frame fixing. Its innovative expansion section results in the FUR being suitable for virtually all construction materials with high loads and optimum reliability. Anchorage in solid materials is by friction locking. The close-set teeth provide ideal expansion of the fixing in solid substrates, ensuring constant expansion force along the entire anchorage length. The close-set teeth expand and form lock in hollow materials.

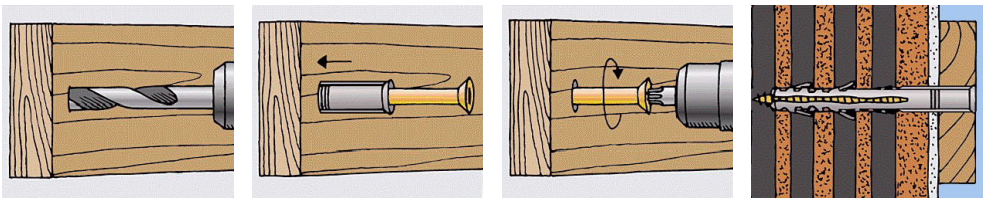


2.3 fischer S-H-R Frame Fixing

Material:	Plug -	Nylon (polyamide 6)
	Screw -	Steel grade 5.8
Range:	8, 10 & 14mm diameter	
	Zinc plated or stainless steel	
	80-360mm long	

The S-H-R frame fixing operates in the more common two-way expansion, but due to the longer expansion section a deeper embedment depth is used, increasing the load bearing capability in hollow and softer substrates.

The S-H-R frame fixing has an ancillary tool known as GBS hole punch. The GBS has been specifically designed for aircrete substrates like Durox building blocks. The hole punch has a SDS drive adapter, so it can been used with a hammer drill, and the anti-rotational chuck prevents any rotational movement allowing the GBS hole punch to vibrate it's way through the block. This in turn compresses the excavated material against the walls, resulting in the walls of the hole being more dense and, therefore, more suitable for fixing into.

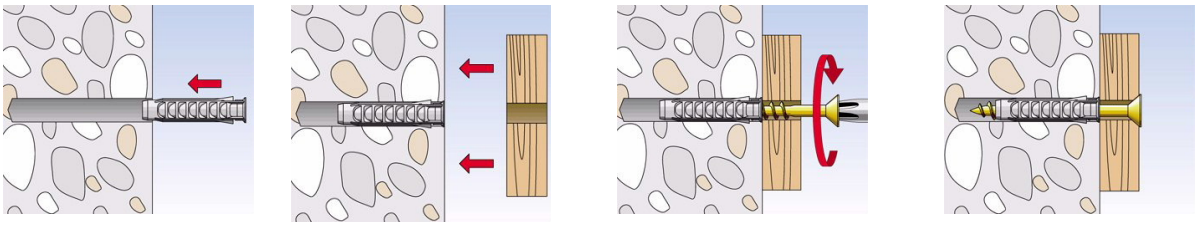


2.4 fischer SX with fischer Safety Screw

Material:	Plug -	Nylon (polyamide 6)
	Screw -	Metal grade 6.8
Range:	SX4-16	

The fischer SX plug has a four-way expansion section compared to conventional two-way expansion plugs. This unique four-way expansion gives a greater load capacity, as the surface area in contact with the substrate is much greater than with standard plugs. Therefore, the SX plug is designed for both solid and hollow building materials.

Not only can the SX be installed as a flush fixing, but it can also be installed as a through fixing due to its retaining collar and 'knock-in' lock effect just below the collar. This prevents the plug from expanding prematurely when the plug and screw are being hammered through the fixture towards the surface of the building material.



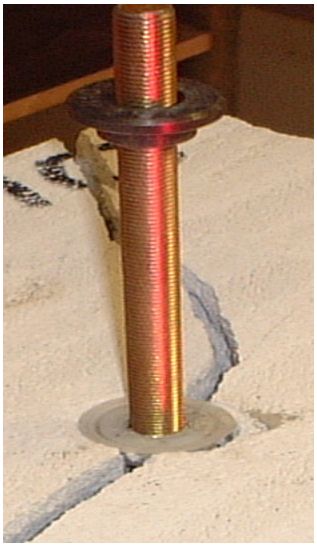
3 Test Results

3.1 fischer PBB Undercut Anchor System

Size Tested: PBB 12

Test No	Free Edge	Axial Space	Load Achieved kN	Remarks
1	150	150	4.8kN	Cone failure, Block cracked
2	150	150	5.7kN	Cone failure, Block cracked
3	150	150	4.8kN	Cone failure, Block cracked
4	150	150	5.1kN	Cone failure, Block cracked
5	150	150	6.0kN	Cone failure, Block cracked
6	150	150	5.8kN	Cone failure, Block cracked

Average ultimate load **=5.36kN**
Using a global safety factor of 4, safe working load in tension **=1.34kN**

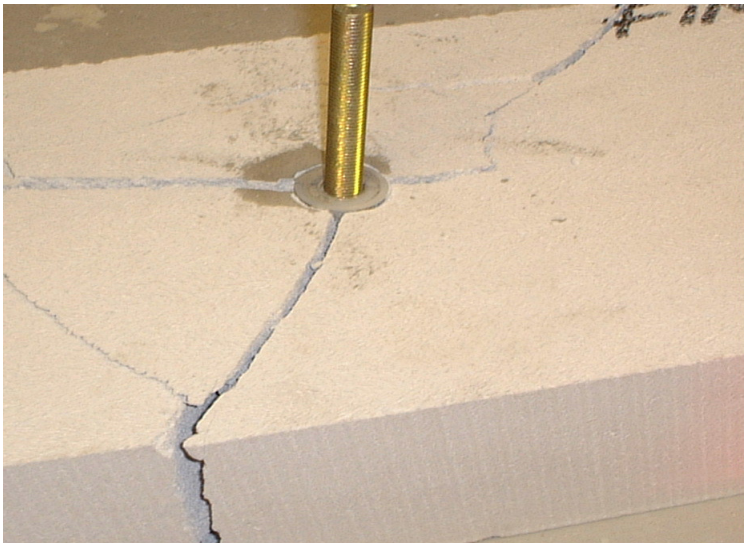


3.2 fischer PBB Undercut Anchor System

Size Tested: PBB 10

Test No	Free Edge	Axial Space	Load Achieved kN	Remarks
1	150	150	5.5kN	Cone failure, Block cracked
2	150	150	4.2kN	Cone failure, Block cracked
3	150	150	4.2kN	Cone failure, Block cracked
4	150	150	4.7kN	Cone failure, Block cracked
5	150	150	4.1kN	Cone failure, Block cracked
6	150	150	5.1kN	Cone failure, Block cracked

Average ultimate load **=4.63kN**
Using a global safety factor of 4, safe working load in tension **=1.15kN**

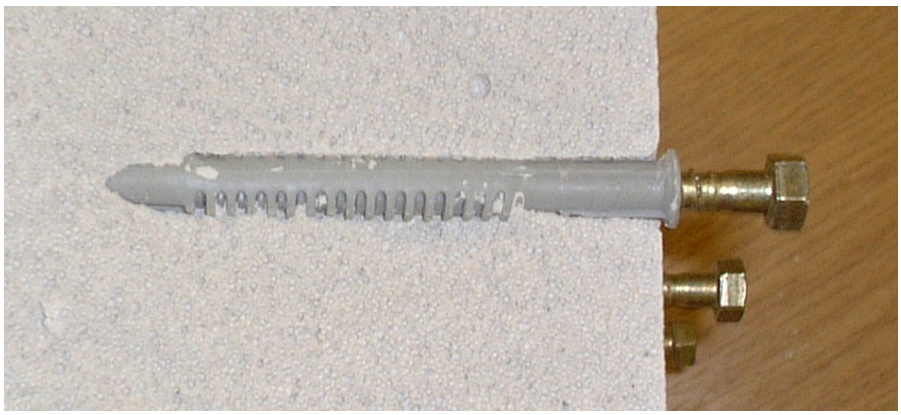


3.3 fischer FUR Universal Frame Fixing

Size Tested: FUR 8X80T

Test No	Free Edge	Axial Space	Load Achieved kN	Remarks
1	100	110	1.8kN	Tensile slip failure
2	210	110	1.7kN	Tensile slip failure
3	320	110	1.8kN	Tensile slip failure
4	320	110	2.0kN	Tensile slip failure
5	210	110	2.0kN	Tensile slip failure
6	100	110	2.2kN	Tensile slip failure

Average ultimate load **=1.91kN**
Using a global safety factor of 7, safe working load in tension **=0.27kN**



3.4 fischer FUR Universal Frame Fixing

Size Tested: FUR 10X80T

Test No	Free Edge	Axial Space	Load Achieved kN	Remarks
1	100	110	2.6kN	Tensile slip failure
2	210	110	2.4kN	Tensile slip failure
3	320	110	2.5kN	Tensile slip failure
4	320	110	2.2kN	Tensile slip failure
5	210	110	2.3kN	Tensile slip failure
6	100	110	2.5kN	Tensile slip failure

Average ultimate load **=2.41kN**
Using a global safety factor of 7, safe working load in tension **=0.34kN**

3.5 fischer S-H-R Frame Fixing

Size Tested: S 8 H 80 RT

Test No	Free Edge	Axial Space	Load Achieved kN	Remarks
1	100	110	1.7kN	Tensile slip failure
2	210	110	1.5kN	Tensile slip failure
3	320	110	1.3kN	Tensile slip failure
4	320	110	1.7kN	Tensile slip failure
5	210	110	1.5kN	Tensile slip failure
6	100	110	1.6kN	Tensile slip failure

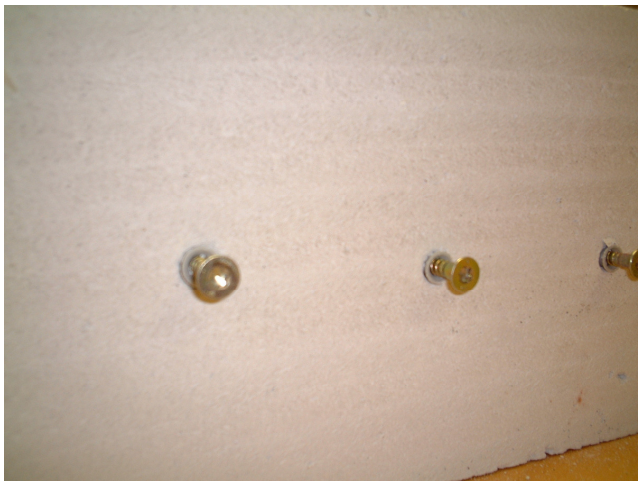
Average ultimate load **=1.55kN**
Using a global safety factor of 7, safe working load in tension **=0.22kN**

3.6 fischer S-H-R Frame Fixing

Size Tested: S 10 H 80 RT

Test No	Free Edge	Axial Space	Load Achieved kN	Remarks
1	100	110	1.4kN	Tensile slip failure
2	210	110	1.3kN	Tensile slip failure
3	320	110	1.2kN	Tensile slip failure
4	320	110	1.6kN	Tensile slip failure
5	210	110	1.3kN	Tensile slip failure
6	100	110	1.4kN	Tensile slip failure

Average ultimate load **=1.36kN**
Using a global safety factor of 7, safe working load in tension **=0.19kN**

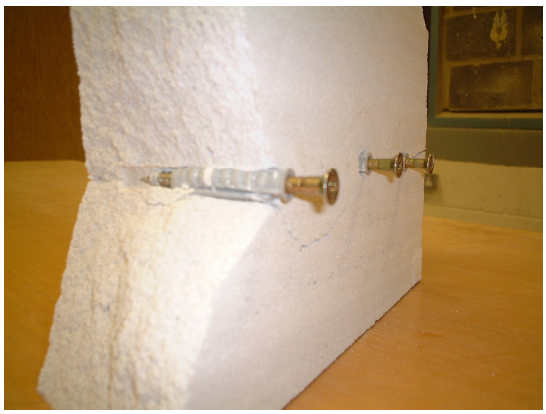


3.7 fischer SX with fischer Safety screw

Size Tested: SX8 with 6mm fischer safety screw

Test No	Free Edge	Axial Space	Load Achieved kN	Remarks
1	100	100	1.4kN	Tensile slip failure
2	210	100	1.6kN	Tensile slip failure
3	320	100	1.5kN	Tensile slip failure
4	320	100	1.4kN	Tensile slip failure
5	210	100	1.4kN	Tensile slip failure
6	70	100	1.5kN	Tensile slip failure

Average ultimate load **=1.46kN**
Using a global safety factor of 7, safe working load in tension **=0.20kN**

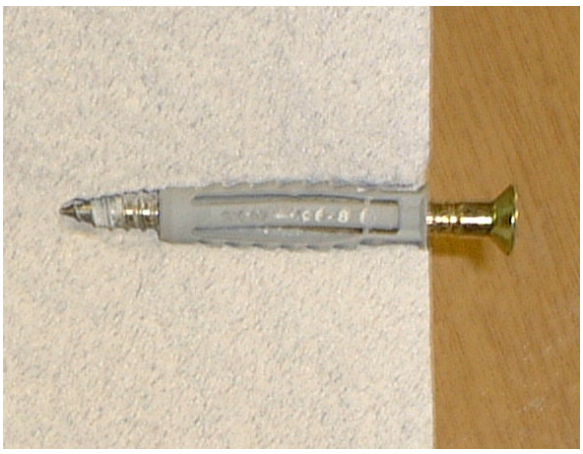


3.8 fischer SX with fischer Safety screw

Size Tested: SX10 with 7mm fischer safety screw

Test No	Free Edge	Axial Space	Load Achieved kN	Remarks
1	100	100	2.2kN	Tensile slip failure
2	210	100	2.4kN	Tensile slip failure
3	320	100	2.2kN	Tensile slip failure
4	320	100	2.1kN	Tensile slip failure
5	210	100	2.1kN	Tensile slip failure
6	70	100	1.7kN	Block cracked on installation, failure

Average ultimate load **=2.11kN**
Using a global safety factor of 7, safe working load in tension **=0.30kN**



4 Results summary

The table below shows the safe working loads of all the anchors tested into Durox Supabloc a product of Tarmac Topblock Ltd

Product tested	Average ultimate load	Safe working load	Characteristics Axial spacing	Remarks
PBB 10	**4.63kN**	**1.15kN**	**150**	**Complex but very effective**
PBB 12	**5.36kN**	**1.34kN**	**150**	**Complex but very effective**
FUR 8X80 T	**1.91kN**	**0.27kN**	**110**	**Quick & easy installation with fairly high loads**
FUR 10X80 T	**2.41kN**	**0.34kN**	**110**	**Quick & easy installation with slightly higher loads**
S8 H 80 RT	**1.55kN**	**0.22kN**	**110**	**Not as good as FUR**
S10 H 80 RT	**1.36kN**	**0.19kN ***	**110**	**Not as good as FUR**
SX8	**1.46kN**	**0.20kN**	**110**	**More common installation**
SX10	**2.11kN**	**0.30kN**	**110**	**More common installation**

* **See section 5 Conclusion**

5 Conclusion

Four fixings were selected for their potential suitability in these types of blocks and the test results collated into a summary table (see section 4).
All the fixings were installed in accordance with the manufactures guidelines.

The test results for all of the fixings tested show a good variation in ultimate loads. This allows the Engineer/Architect/End-user to have a broad range of anchors to choose from, depending on both function and load performance.

Failure of the fixing was determined by an ultimate load failure or excessive displacement. With the exception of the PBB Aircrete anchor all the fixings failed due to excessive displacement. This is technically a serviceability failure rather than an ultimate load failure.

Axial spacing's vary from anchor to anchor due to their expansion or form-locking characteristics. Axial spacing's are given in the results and should be used a guide only.
It is our opinion that for expansion anchors a characteristic axial spacing should be three times the embedment depth. This is to prevent stress interference from adjacent anchors under load.

The load for the S 10 H 80 RT is lower than the S 8 H 80 RT. This is due to the concentrated expansion forces at the end of the S-H-R type fixing causing localised compression of the substrate. For this reason it is possible to create the hole with the fischer GBS hole punch instead of a drill bit. Creating the hole in this way would increase the recommended load of the fixing by approximately **30% to 0.25kN**.

For any further information regarding the test report please contact fischer technical department. Tel: 01491 827 920