

SCAFFOLDING TIES & ANCHORS

Safe anchorage for scaffolding is imperative in view of the safety issues: scaffold structures are not self supporting, and anchors are the principal method of stabilising and securing the scaffold.

There are various methods used today for different applications, and all need to be considered, particularly in view of the opportunities arising from frame systems,

which are gaining ground.

We are witnessing the simplifying of the erection and dismantling of scaffolding in order to achieve greater economy. The anchoring methods will also contribute to improving efficiency and safety.

This summary covers the different alternatives, including the currently used well-known methods, and introduces those which have proved very successful in combination with frame or modular systems and represent new opportunities.

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The information in this booklet is written by SGB Youngman for general guidance.

More specific information should be obtained from the supplier prior to installing any of these products.

**SCAFFOLDING
TIES & ANCHORS**



90.20

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Quick Selector

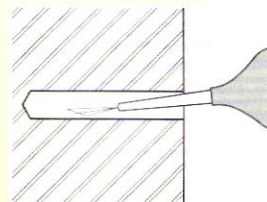
8-9

Progressive Methods

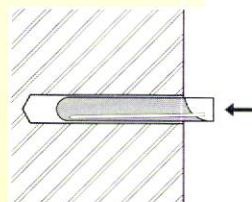
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PROGRESSIVE METHODS RESIN ANCHOR SLEEVE

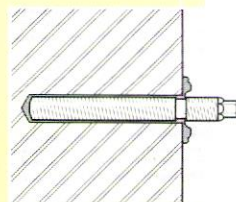
Designed for special loading situations and less reliable face materials. In the pre-drilled hole, a resin cartridge is inserted which will be fractured when the threaded eyebolt is inserted. The anchor cannot immediately take the maximum load. The thread of the eyebolt must be left in the wall and the protruding part has to be cut off after use. Each use costs £2.00, therefore it is only recommended for special requirements. Expert supervision may be necessary.



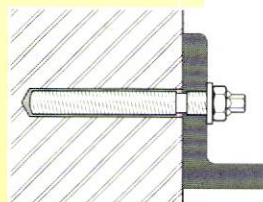
1. Clear the hole of dust



2. Insert the resin cartridge



3. Thread in the anchor



4. Before it can take the full load a temperature-dependent period has to pass

Illustration: Fischer Fixings

PROGRESSIVE METHODS

EYEBOLT WITH BUILT-IN PLUG

The advantage with this alternative is that the hole for the plug only needs to have a diameter of 12mm. Screwing in the eyebolt the conical nut widens the expansion element (plug) and the eyebolt cannot move.

Eyebolt Expansion sleeve Conical nut



The eyebolt may be used several times but new plugs will be needed each time. Occasionally the plug, left in the wall, might also be used several times, when an anchor is required in the same place.

The eyebolt has to be tightened up to a torque of 35Nm to provide the ultimate loads described below and therefore another special tool might be necessary.

Additionally, it is only feasible for some kinds of concrete and not for brickwork.

Concrete strength class	B15	B25	B35	B45
Extraction forces in kN	2.7	4.5	5.0	5.5

Tightening moment of 35Nm required. The hole has to be sealed with mastic or mortar. The principle is very simple but compared to the price the extraction forces are rather low.

Illustration: Fischer Fixings

TRADITIONAL METHODS

THROUGH TIE

A simple and useful method of tying a scaffold. A tube is mounted at right angles to the scaffold through a window or another opening in the building. On the inside a cross tube is mounted (see picture below).

However it is only feasible where windows or similar openings in the wall can remain open. It may damage the inside wall where the cross tube is mounted unless "packing" is introduced. Safe working load: 6.25 - 12.5kN.

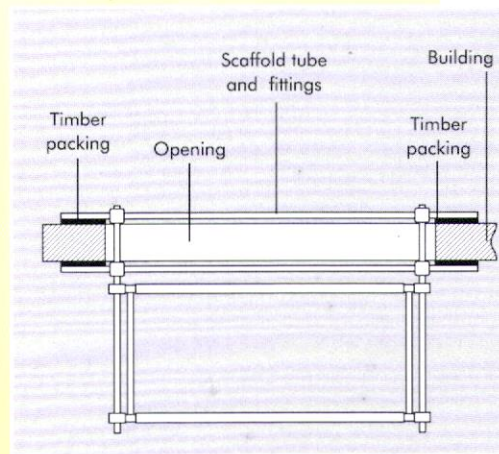


Illustration: SGB Youngman

TRADITIONAL METHODS REVEAL TIE

To tie the scaffold to a building where the through tie cannot be used and drilled anchors are not allowed, the reveal tie is an acceptable alternative within limits. Using this method a tube is wedged in between the window frame by means of a jacking device (Reveal Pin) and a tube is fitted to it (see picture below).

Not more than 50% of all anchors should be designed as reveal ties. Timber packing should be used to prevent damage to the window frame and the ties need to be checked regularly for tightness. Safe working load: 3.5kN.

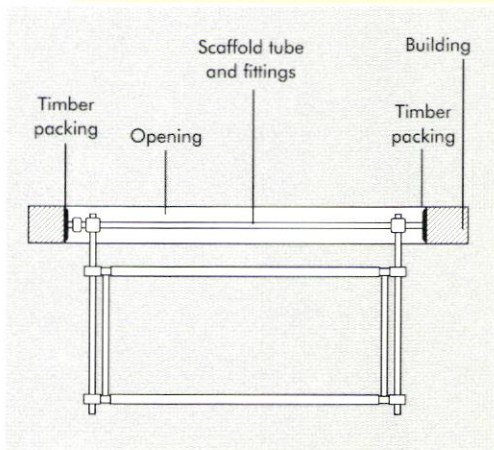


Illustration: SGB Youngman



Technical data

Material	Embedment depth (mm)	Tensile load in kN	
		ultimate	safe
Concrete 60N/mm ²	50	29.0	7.2
	75	48.0	12.0
Concrete 30N/mm ²	50	18.8	4.7
	75	33.4	8.3
Engr. Brick 100N/mm ²	45	20.0	5.0
	45	14.2	3.6
Fletton 20N/mm ²	45	11.6	2.9
	45	3.9	1.0
Hemelite 3.5N/mm ²	75	10.6	2.6
	75	9.0	2.2
Topcrete 7.0N/mm ²	75	14.0	3.6

All hole diameters are 10mm

The above loads have been independently verified to the relevant European Standards.

Suppliers: Excalibur Screwbolt Distributors

PROGRESSIVE METHODS **EXCALIBUR**

This anchor, with a special coarse thread, suitable for use in brick, block or concrete, is designed to self tap its way into the wall material once a pilot hole has been drilled. Simply drill the hole of a specified diameter into the substrate and screw the eyebolt straight in. No additional plug or setting tool is required, so it can be very fast and economical.

The diameter of the pre-drilled hole depends on the structure of the wall material; either 11mm in soft or 12mm in hard material. The ultimate loads will depend on the wall material as shown in the chart below.

Accuracy

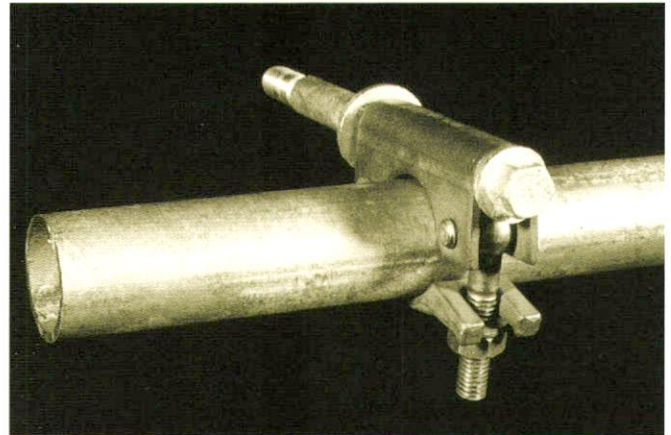
The Excalibur type of anchor, however, requires installation training available from the manufacturer, as it relies on accurate drilling. A 10mm screwbolt requires a hole drilled with a **10mm hammer drill bit** for concrete or brick, and a **9mm rotary bit** for soft materials. The hole depth will need to be 20mm greater than the screwbolt embedment depth. Excess dust must be removed from the hole before the eyebolt is screwed in.

There are safeguards not commonly found in other alternatives: if the drill bit is worn, the screwbolt will not screw into the undersized hole. Conversely, if the drill bit is 1mm oversized the thread cut will fail as one tightens, so the fix will not be made. Therefore it will only be fixed with the correct standard of drill bit. When fixed correctly, very high tensile and shear loads are obtained.

TRADITIONAL METHODS **BOULTON SUPA TIE**

The Supa Tie is designed to offer direct tubular connection without an anchor ring and permits improved lateral restraint for tie forces parallel to the façade. The fixing of the Boulton Supa Tie is based on the same principle as the Hilti Ring with the steel sleeve, ie an anchor is inserted into a pre-drilled hole of 20mm diameter and the sleeve is captivated by expansion of the wedge at the bottom of the hole with the help of a hammer and the hammerset. The coupler unit is then screwed into the anchor; then the coupler is connected to the scaffold.

The same considerations that affect the Hilti Anchor will apply (see Hilti section pages 6-7). The hole has to be sealed with mastic or mortar. Safe working load of Supa Tie: 6.25kN.



TRADITIONAL METHODS HILTI RING HKD HAMMER SET ANCHOR

Drilled Anchors: General

For anchoring in this way a pre-drilled hole in the façade is necessary. The diameter of the hole depends on which method is used and may vary from 11mm to 20mm.

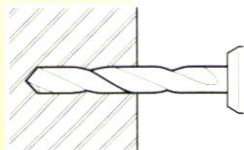
Hilti Ring HKD

A steel sleeve is inserted in the pre-drilled hole and captivated by expansion by the cone at the bottom of the hole with the help of a hammer and a special setting tool which must be used. Then the eyebolt is threaded (hand tight only) into the steel sleeve. If the expansion cone in the steel sleeve is hammered in too far it can come out the other side of the sleeve. In these circumstances the anchor doesn't expand. If it isn't knocked in far enough it has the same result. The latter situation can be quite common if the setting tool is not used.

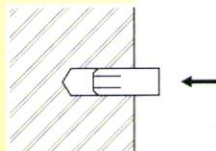
The diameter of the eye is nominally 50mm to allow a tube to pass through to form the tie assembly. The hole needs to be sealed with mastic, cement, or a FCIL filler cap (plastic). Note: This product is designed primarily for tensile (pull out) loads.

Illustrations: Hilti
(Great Britain) Ltd

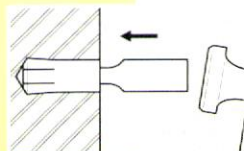
Installation



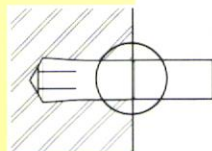
1. Drill a hole; 20mm diameter, minimum depth 69mm (flush) or greater if to be plugged. The hole must be cleared now.



2. Insert the steel sleeve, using rear end of setting tool.

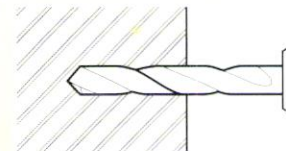


3. Knock in the expansion cone using the Hilti setting tool....

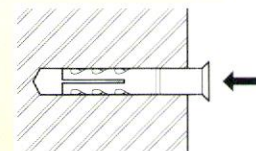


4.until the collar of the setting tool reaches the steel sleeve

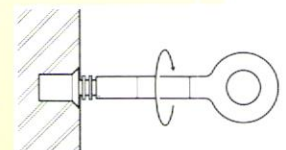
Installation method



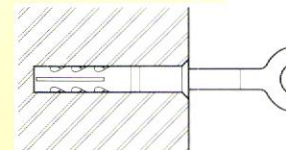
1. Drill a hole of 14mm diameter



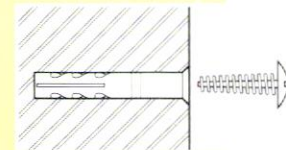
2. Insert plastic plug



3. Thread in the eyebolt



4. Mounted eyebolt



5. Remove eyebolt (re-usable). Seal hole with cap (painted in the appropriate colour)

when the maximum load is required because the load cannot be calculated when it is used several times. The forces mentioned in the quick selector are therefore guaranteed for first use only.

Installation

Easy and fast to fix. The anchor method with the 'plastic' plug provides a fast and safe way to ensure the required load for the scaffold (see extraction forces in chart below).

Extraction Forces (ultimate loads) in kN

Concrete B 25	25.5
Solid red brick Mz 12	16.5
Sand-lime solid brick KSV 12	22.7
Lightweight concrete solid brick V 2	7.4
Sand-lime perforated brick KSL 12	6.5
High perforated brick HLz 12	3.5

Illustration: Fischer Fixings

PROGRESSIVE METHODS

PLASTIC PLUG

The use of the 'plastic' (nylon) plug and the eyebolt with a coarse thread is a more progressive alternative to the current widely used steel anchors and other methods mentioned before.

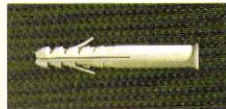
The pre-drilled hole needs to be only 14mm in diameter and is therefore quite easy and faster to drill. In addition the smaller hole reduces the damage to the wall. The 'plastic plug' is suitable for various wall materials and has reasonable extraction figures as shown in the chart.

Frame systems, which are gaining ground, have a specially designed anchor tube with a hook fitting neatly into an eyebolt of 23mm diameter. The plastic plug comes in various lengths suitable for the various lengths of the eyebolts.

The price for a set containing plug, cap and eyebolt is lower than other alternatives (see quick selector chart on pages 8-9). The eyebolt can be used several times and because it has a coarse thread it is resistant to damage.

Using the steel anchor the part left in the wall may rust unless a more expensive stainless version is used. This is avoided with the plastic plug.

The 'plastic' wall plug that remains may also be used a second time when an anchor is required again in the same place. However the manufacturer gives advice to use it only once



Plastic plug:
Diameter 14mm
Lengths from 70 to 185mm



Eyebolt:
Eye diameter 23/30mm
Lengths from 90 to 350mm
Electroplated or in stainless steel



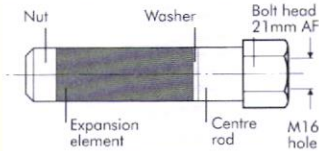
Cap:
Lengths from 40 to 80mm

TRADITIONAL METHODS

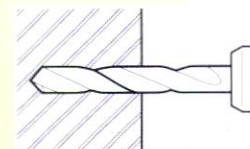
HILTI RING HTA

Designed for special applications, particularly where sensitive wall materials (historic buildings) require a method that limits fabric damage. The Hilti Ring HTA is a temporary re-usable scaffolding anchor which works on the principle of compressing a replaceable chloroprene element (see illustration).

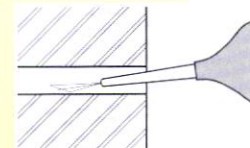
To achieve adequate expansion of the chloroprene element three or four turns are advisable in order to ensure the correct extraction force. The anchor will be difficult to remove if excessively tightened, but it must reach approximately 12Nm. Not suitable for hollow base material, etc. How many times the plug may be used will depend on the control of installation and removal.



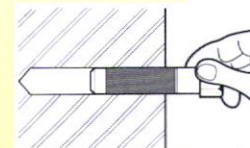
Installation



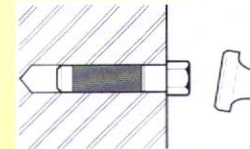
1. Drill a hole: 20mm diameter, 65mm minimum depth



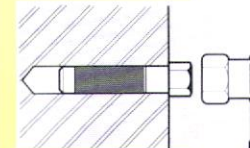
2. Clear the hole of dust



3. Insert the plug: pre-expand by 2 to 3 turns to grip hole



4. Hammer in the plug



5. Thread in the plug to force the chloroprene to expand - approximately 3 to 4 spanner turns (12Nm torque)



QUICK SELECTOR

	Drilling hole diameter	Safe working or ultimate load in concrete 25N/mm ²	Setting tool	Sale price (1996)	Price of lost parts	Hole sealing method	Recommended for wall materials
Through Tie	N/A	6.25 - 12.25 kN SWL	spanner	2 x couples £21.76	N/A	N/A	brickwork + concrete
Reveal Tie	N/A	3.5 kN SWL	spanner	N/A	N/A	N/A	brickwork + concrete
Hilti HKD plus Ringbolt	20mm	11.5 kN SWL (in 30N/mm ²)	special hammer set	£7.45	steel sleeve £1.00	mastic, mortar	concrete
Hilti Ring HTA	20mm	6.25 kN SWL	torque gauge	£10.73	N/A	mastic, mortar	concrete + masonry
Boulton Supa Tie + HKD	20mm	6.25 kN SWL	special hammer set + spanner	£6.00	steel sleeve £1.00	mastic, mortar	brickwork + concrete
Plastic Plug	14mm	Ultimate 25.5 kN	hammer	£3.31	plastic plug + cap £0.75	plastic cap or mastic, mortar	brickwork + concrete
Built-in Plug	12mm	4.5 kN SWL	torque gauge	£6.00	steel plug £0.80	mastic, mortar	concrete only
Excalibur	11-12mm	Ultimate 18.8 kN (in 30 N/mm ²)	spanner	£2.95	n/a	mastic, mortar	concrete
Resin Anchor, Rod + Eyenut	15mm	11 kN SWL	spanner	£5.37	cartridge, rod £2.12	mastic, mortar	any kind of concrete / brickwork

All safe working/ultimate load figures are subject to the method of fixing and the quality of the substrate material