

## Minimum Requirements for Wall Ties to PD 6697: 2010 (Table 12) and BS 5268-6.1: 1996 (Annex B)

Type of Tie	Minimum Mortar Class and Designation	Tensile Load Capacity (N)	Compressive Load Capacity (N)	
1	M2 (iv)	2500	2500 (2000)	
2	M2 (iv)	1800	1300 (1050)	
3	M2 (iv)	1100	800 (650)	
4	M2 (iv)	650	450 (350)	
5	M4 (iii)	600	425	
6	M4 (iii)	630	440	
7	M4 (iii)	To be declared by the Wall Tie Manufacturer		

Bracketed compression values are those confirmed for inclusion in the next issue of PD6697 following a change to test procedures in BS EN 846-5:2012 which affects wall tie tests from August 2015 and are applied by Ancon as appropriate.

## Masonry-to-Masonry Wall Tie Types to PD 6697: 2010

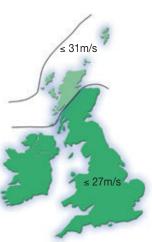
Туре	Application	Density	Maximum Building Height	Geographical Location
Type 1	Heavy duty tie suitable for most building sizes and types. Not very flexible and not recommended for applications where there is expected to be excessive differential movement between leaves	2.5 ties/m² 3-4 ties/m² at unbonded edges	Any Height	Suitable for most sites. However, for relatively tall or unusually shaped buildings in vulnerable areas such as coastal sites, the tie provision should be calculated
Type 2	General purpose tie for domestic and small commercial buildings	As Type 1	15m	Suitable for flat sites where the basic wind speed is up to 31m/s and altitude is not more than 150m above sea level

Type 2 ties are suitable for use outside the parameters stated e.g. sites over 150m above sea level, buildings exceeding 15 metres etc, if shown to be adequate by calculation. Contact Ancon for more information.

Type 3	Basic wall tie generally as	As Type 1	15m	Suitable for flat sites where the basic
.,,,,,	Type 2 above	7.6 Type T	10111	wind speed is up to 27m/s and altitude is not more than 150m above sea level
Type 4	Light duty wall tie suitable for box-form domestic dwellings with leaves of similar thickness	As Type 1	10m	Suitable for flat sites in towns and cities where the basic wind speed does not exceed 27m/s and altitude is not more than 150m above sea level

**Lime Mortars** 

Ancon stainless steel wall ties and Teplo-BF wall ties are suitable for use with lime mortars (minimum strength HLM2); tie selection should be based on the general guidance given here.



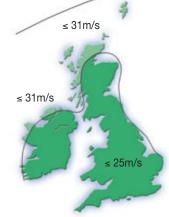
Wind speed information taken from BS EN 1991-1-4: 2005 for use with





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Туре	Application	Ma Density	ximum Building Height	Geographical Location
Type 5	Timber frame tie suitable for domestic houses and industrial/ commercial developments of up to three storeys	4.4 ties/m² 3-4 ties/m at unbonded edges	15m	Suitable for flat sites in towns and cities where the basic wind speed does not exceed 25m/s and altitude is not more than 150m above sea level
Type 6	As Type 5 but suitable for developments of up to four storeys	As Type 5	15m	Suitable for flat sites in towns and cities where the basic wind speed does not exceed 25m/s and altitude is not more than 150m above sea level
Type 7	As Type 5 but suitable for developments of between five and seven storeys, being designed to accommodate the increased vertical differential movement	Calculated for actual performance required for each site location	18m	Calculated for actual performance required for each site location



Wind speed information taken from BS 6399-2: 1997 Code of Practice for Wind Loads for use with BS 5268-6.1: 1996.



# Wall Ties and Restraint Fixings

## **Density & Positioning of Ties**

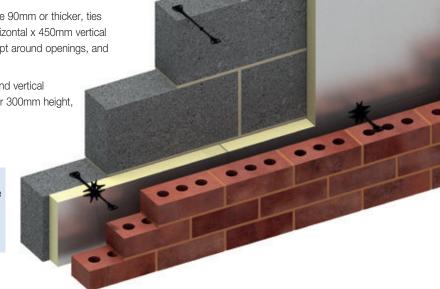
PD 6697: 2010 recommends that for walls in which both leaves are 90mm or thicker, ties should be used at not less than 2.5 per square metre (900mm horizontal x 450mm vertical centres). Ties should be evenly distributed over the wall area, except around openings, and should preferably be staggered.

At vertical edges of an opening, unreturned or unbonded edges, and vertical expansion joints, additional ties should be used at a rate of one per 300mm height, located not more than 225mm from the edge.

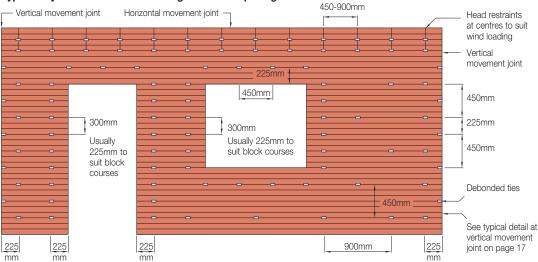
A typical layout is shown below. Various details incorporating debonding ties at vertical movement joints are shown on page 17.

#### **Lime Mortars**

Ancon stainless steel wall ties and Teplo-BF wall ties are suitable for use with lime mortars (minimum strength HLM2). Tie length, spacing and density should be the same as for cement mortars where the performance is based on M2 (iv).



## Typical Layout of Wall Ties Indicating Maximum Spacing



Standard spacing for cavity brickwork 900mm x 450mm centres in a staggered pattern (2.5 ties per square metre)

## Length of Tie & Embedment

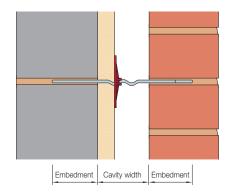
Wall ties should be of the correct length to ensure they are properly embedded in the masonry.

Masonry-to-masonry wall ties are typically symmetrical and should be centred from the middle of the cavity to ensure equal embedment in each leaf.

The minimum embedment of symmetrical Ancon wall ties, i.e. ST1, RT2, HRT4 and Teplo-BF, is 50mm in each leaf and the PD6697 Tie Types declared by Ancon are backed by independent testing at this minimum embedment.

However, Ancon recommends tie lengths which achieve a design embedment of between 62.5mm and 75mm in each leaf (see table), to allow for site tolerance in both cavity width and centring of the ties.

Longer wall ties will be required where cavities are outside the tolerance offered by Ancon and a minimum 50mm embedment cannot be achieved in each leaf.



**Embedment of Wall Ties** 

## Recommended Lengths of Masonry / Masonry Wall Ties

Cavity Width (mm)	Length of Wall Tie (mm)
50-75	200
76-100	225
101-125	250
126-150	275
151-175	300
176-200	325
201-225	350
226-250	375
251-275	400
276-300	425
301-325	450
326-350	475
351-375	500
376-400	525
401-425	550
426-450	575

## **Low Thermal Conductivity** Wall Ties to PD 6697 for

**Brick-to-Block Construction** 

## Ancon ST1 Type 1 Tie (Masonry Heavy Duty)

The Ancon ST1 is suitable for cavities from 50mm to 225mm and can be used for all types of buildings of any height, anywhere in the British Isles. The section that spans the cavity has a series of holes to provide water drips. The ST1 has a measured dynamic stiffness of <113MN/m<sup>3</sup> that meets the performance requirement of Approved Document E for use in external masonry walls. For internal separating walls of new-build attached dwellings see HRT4. Type 1 performance is declared in M2 mortar.

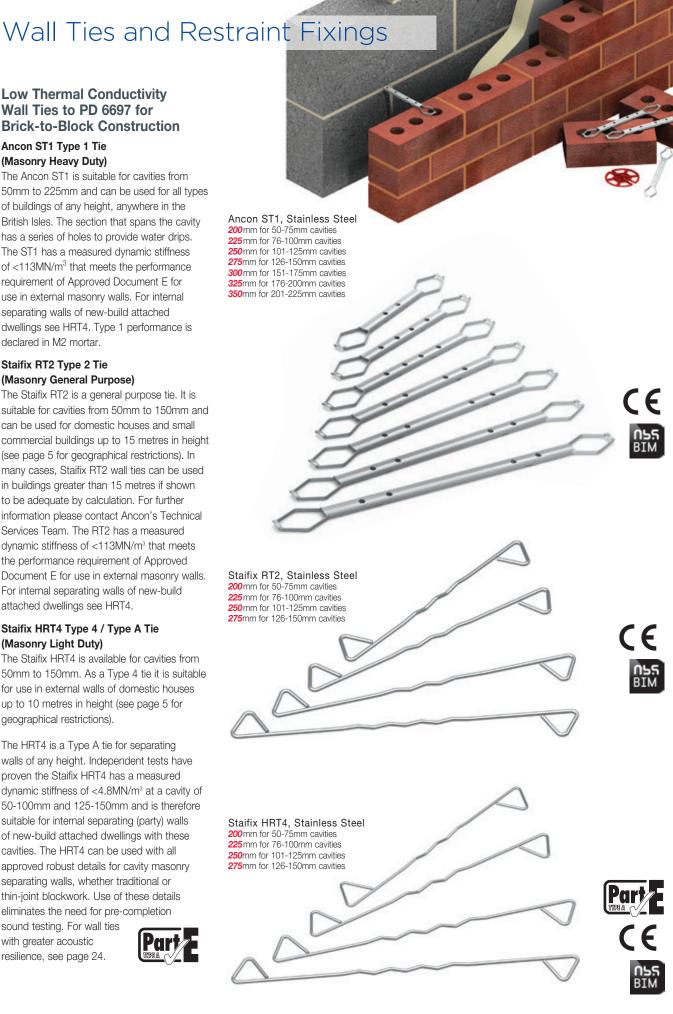
## Staifix RT2 Type 2 Tie (Masonry General Purpose)

The Staifix RT2 is a general purpose tie. It is suitable for cavities from 50mm to 150mm and can be used for domestic houses and small commercial buildings up to 15 metres in height (see page 5 for geographical restrictions). In many cases, Staifix RT2 wall ties can be used in buildings greater than 15 metres if shown to be adequate by calculation. For further information please contact Ancon's Technical Services Team. The RT2 has a measured dynamic stiffness of <113MN/m³ that meets the performance requirement of Approved Document E for use in external masonry walls. For internal separating walls of new-build attached dwellings see HRT4.

## Staifix HRT4 Type 4 / Type A Tie (Masonry Light Duty)

The Staifix HRT4 is available for cavities from 50mm to 150mm. As a Type 4 tie it is suitable for use in external walls of domestic houses up to 10 metres in height (see page 5 for geographical restrictions).

The HRT4 is a Type A tie for separating walls of any height. Independent tests have proven the Staifix HRT4 has a measured dynamic stiffness of <4.8MN/m3 at a cavity of 50-100mm and 125-150mm and is therefore suitable for internal separating (party) walls of new-build attached dwellings with these cavities. The HRT4 can be used with all approved robust details for cavity masonry separating walls, whether traditional or thin-joint blockwork. Use of these details eliminates the need for pre-completion sound testing. For wall ties with greater acoustic resilience, see page 24.



## **Ties for Timber Frames**

Ancon provides a choice of three Type 6 Timber Frame Ties designed to fix brickwork or blockwork to timber-framed structures up to 4 storeys in height and accommodate maximum differential movement of 24mm; the Type 7 Ancon TFMT wall tie is available for other timber frame applications.

### Staifix Timber Frame Tie, STF6 (Type 6)

The Staifix STF6 tie is available in three lengths to suit 50mm, 75mm and 100mm cavities.

It is supplied complete with an annular ring shank nail. The tie is cranked to simplify correct installation and to prevent moisture from crossing the cavity. The STF6 has a cross-sectional area of 12mm² and stainless steel has a thermal conductivity of 17W/mK; this information is provided to aid U-value calculations.

The Staifix STF6 tie has been independently tested for use with 15mm OSB (Oriented Strand Board) SIPS Panel. The standard annular ring shank nail should be replaced with a 4 x 30mm stainless steel Spax® screw.

## Staifix-Thor Helical Timber Tie, TIM6 (Type 6)

The Staifix-Thor Helical TIM6 is available in four standard lengths. It is suitable for cavities from 50mm to 150mm and can be used with the red Staifix Universal Clip where insulation is to be retained in the cavity. An installation tool is required to hammer the tie into the timber frame. The TIM6 has a cross-sectional area of 6.6mm² and stainless steel has a thermal conductivity 17W/mK; this information is provided to aid U-value calculations.

Ancon recommends a minimum embedment depth of 35mm in the timber frame and 65mm in the masonry leaf.

#### TIM6 (Type 6) Recommended Lengths

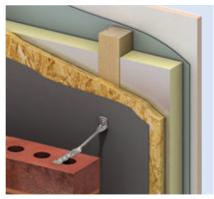
Tie Length (mm)	Cavity Width (mm)
175	50-75
200	76-100
225	101-125
250	126-150

# Ancon Timber Frame Movement Tie, TFMT7 (Type 7)

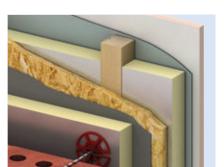
Where standard Type 6 Timber Frame Ties are unsuitable, Ancon recommends the use of the Timber Frame Movement Tie.

Manufactured to suit any cavity from 50mm to 150mm, the Ancon Timber Frame Movement Tie comprises a channel, a strip tie and a screw. This system accommodates maximum differential movement of 65mm; the tie should be positioned 10-12mm from the bottom of the channel. The tie is suitable for use with the Universal Insulation Clip.

The TFMT complies with BS 5268-6.1 as a Type 7 tie. The product has a declared value of 960N. See page 5 for more information on Type 7 ties.



Staifix STF6 Timber Frame Tie Available to suit 50mm, 75mm and 100mm cavities.



Staifix-Thor Helical TIM6 Tie



Ancon TFMT7 Timber Frame Movement Tie

C

CE

CE

#### Teplo-L-Tie Type 6 Range and Chi Values

Product Code	Length mm	Cavity mm	BS5268 Type	Chi-value W/K	$\Delta U_f$ (if 4.4 ties/m²) W/m²K
TEPLO-L-5-165	165	100	6	0.000335	0.00147
TEPLO-L-5-190	190	125	6	0.000260	0.00114
TEPLO-L-5-215	215	150	6	0.000215	0.00095
TEPLO-L-5-240	240	175	6	0.000175	0.00077
TEPLO-L-5-265	265	200	6	0.000150	0.00066
TEPLO-L-7-290	290	225	6	0.000210	0.00092
TEPLO-L-7-315	315	250	6	0.000190	0.00084
TEPLO-L-7-340	340	275	6	0.000165	0.00073
TEPLO-L-7-365	365	300	6	0.000150	0.00066

#### Ancon Teplo-L-Tie (Type 6)

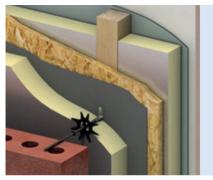
The Teplo-L-Tie is ideal where a low thermal conductivity restraint fixing is required between a masonry outer leaf and an in-situ timber frame. The body is manufactured from basalt fibres set in a resin matrix and features a stainless steel upstand at one end with a 7mm diameter fixing hole. When fixing to timber, Ancon recommends a 5mm x 30mm countersunk wood screw.

This tie is suitable for cavities from 100mm to 300mm, features a moveable o-ring drip to prevent water crossing the cavity and can be used with the black Teplo-Clip where insulation is to be retained.

The Teplo-L-Tie has been independently tested, is approved by the BBA and can be used in line with NHBC standards.

A Lambda value (W/mK) is normally given for Ancon wall ties which expresses the thermal conductivity of the material i.e. 17W/mK for stainless steel ties and 0.7W/mK for basalt fibre Teplo ties, however, as the Teplo-L-Tie comprises both materials a Lambda value is not applicable. Instead, to aid with U-value calculations, the table below provides the Chi value of an individual Teplo-L-Tie and the U-value correction (ΔU<sub>f</sub>) if Teplo-L-Ties were installed at the standard 4.4 ties per square metre. BS EN ISO 6946 permits the corrections due to wall ties and air gaps between insulation boards etc, to be omitted from U-value calculations if the corrections amount to less than 3% of the uncorrected U-value of the element.

The Teplo-L-Tie is suitable for fixing to a range of substrates. For more information, see page 15.



Ancon Teplo-L-Tie (Type 6)

# Wall Ties and Restraint Fixings

## **Standard Wall Ties** Lengths shown in *red italics* refer to items normally available at all times. Ancon's Technical Services Team will be pleased to advise on the correct selection and use of our wall ties. ST1 Lengths 200, 225, 250, 275, 300, 325, 350mm

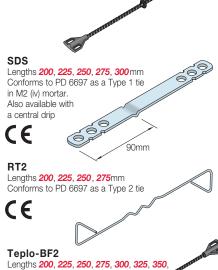
Teplo-BF1

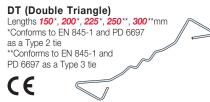
375, 400, 425mm Conforms to PD 6697 as

a Type 2 tie

Lengths 200, 225, 250, 275mm Conforms to PD 6697 as a Type 1 tie.



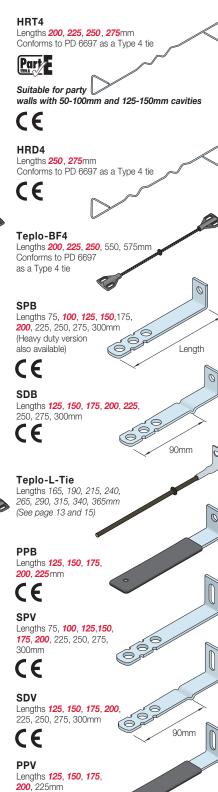






## Recommended Lengths for Masonry/ **Masonry Wall Ties**

Cavity Width (mm)	Tie Length (mm)
50-75	200
76-100	225
101-125	250
126-150	275
151-175	300
176-200	325
201-225	350
226-250	375
251-275	400
276-300	425



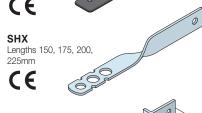
## **Recommended Lengths for Frame Cramps** and Cast-in Channel Ties\*

CE

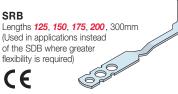
Cavity Width (mm)	Tie Length (mm)
<20	75
20-44	100
45-69	125
70-94	150
95-119	175
120-144	200
145-169	225
*Excluding surface-fixed ch	annels Ancon Fastrack and

ce-fixed channels, Ancon Fastrack and Ancon Teplo-L-Tie

## SP21 Lengths 75, 100, 125, 150, 175, 200 mm For use with 21/18 Omega Channel Length CE Lengths 125, 150, 175, 200, 225, 250, 275, 300mm For use with 21/18 Omega Channel 90mm CE **PP21** Lengths 125, 150, 175, 200, 225 mm For use with 21/18 Omega Channel Lengths 150, 200, 225, **250**, **275**, **300**mm (Not suitable for collar-jointed construction. See below) CE SPS CJ Length 150mm (3mm thickness for collar-jointed construction PPS Lengths 175, 225, 250, 275, 300mm











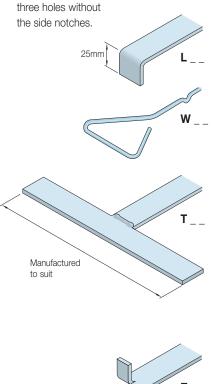


#### **References for Wall Ties**

Many variations are available in addition to the standard ties. Wall ties for special applications may be specified and ordered with ease by using a reference letter for the tail, shank and head of the tie.

These bespoke ties are manufactured to order, typically for use on a single unique project and therefore are not tested to EN 845 and do not carry CE marking.

Ancon ties are produced in lengths from 150mm for masonry-to-masonry ties, and 75mm for masonry-to-concrete ties, in increments of 25mm. Drips will usually be positioned 90mm from the outer end of the tie (first reference letter). Masonry-to-masonry ties can also be supplied with a central drip. Special wall ties with a section wider than 20mm referenced S , will have an end with three holes without



**Insulation Retaining Clips** 

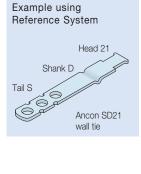
TJ2 wall tie (see page 12).

The red Staifix Universal Insulation Retaining

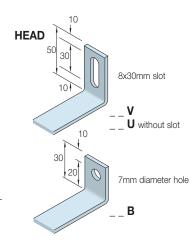
Clip (Uni) will fit all the standard stainless steel

ties shown on page 18. The black Teplo-Clip

should be used with the Teplo range and the









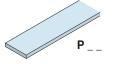
**TAIL** 



**SHANK** 

D





Υ

М

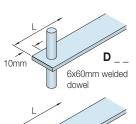
6x60mm loose

6x60mm loose dowel





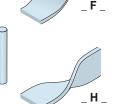


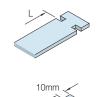


15mm~ 15mm 10mm

6.5mm

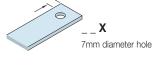
diameter holes











110mm

Tie will be 25mm

wide







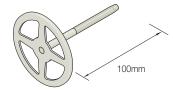
The H75/2 Insulation Retainer is for securing material to concrete, blockwork and brickwork. The 90mm diameter head can hold back up to 75mm of insulation (for thicker insulation please contact Ancon). A 10mm diameter hole is required in the base material. The projecting end of the retainer is pushed through the insulation material into the hole and tapped into position to secure the insulation.



## **Debonding Sleeves**

Debonded Ties require 100mm embedment. A 120mm long sleeve will provide an allowance for movement and tolerance, and will be suitable for most applications. Other lengths and sizes available to special order.





### **Wall Starter Systems**

#### 36/8 Wall Extension System

The 36/8 Wall Extension System can be supplied with either SP36 ties or, where some longitudinal movement must be accommodated at the joint, PP36 ties complete with debonding sleeves. The channel can be supplied in lengths of up to 3.4 metres with each length having a series of holes to allow fixing to the existing wall. The system is available as a kit comprising ten ties, a length of 36/8 channel 2400mm long and ten plugs and screws for fixing at 300mm vertical centres. It has a design resistance of 1.6kN per metre.





#### **Staifix Starter Tie**

This tie is quick and simple to install. It is suitable for use in brickwork and blockwork of up to 3 storeys or 8 metres in height and can be used in line with NHBC standards.

Supplied complete with an 8mm nylon wall plug, the Starter Tie is fixed into the existing wall at an angle of 30° to the horizontal and bent into the bed joints of the new brickwork. Ties should be fixed at 225mm vertical centres and be central to each leaf of the new wall.





#### Staifix Universal Wall Starter System

This system includes all necessary fixings to join a single skin of masonry, 2400mm high, to an existing wall and is suitable for wall widths from 60mm to 250mm. Each pack includes 2 fixing strips, 5 plugs, 5 washers, 5 screws and 10 wall ties. Wall Ties slide within the fixing strip to course with the bed joints of any masonry unit. This Universal Wall Starter System has a design resistance of 1.7kN per metre and can be used in line with NHBC standards.



#### Staifix Frame Tie

The Staifix Frame Tie is used to join timber door and window frames directly to brickwork. It is designed for use on buildings of up to 15 metres in height, and can be used in line with NHBC standards. The ties are screwed horizontally into the frame, surrounded by mortar and built into the bed joints of the new brickwork.

The vertical spacing of frame ties depends on the application. Please contact Ancon or your local Staifix stockist for more information.

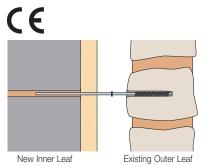


## **Staifix Cavity Starter Tie**

This tie simplifies the building of an inner leaf of blockwork within an existing structure. It is ideal for barn conversions.

The cavity starter tie is a Type 4 tie to PD 6697.

Length mm	Cavity mm	Embedment mm
180	50-70	65-85
200	75-95	65-85
230	100-120	65-85

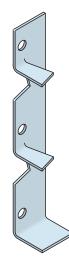


## Ancon Slip-Brick Ties

Ancon Slip-Brick Ties are bolted directly to blockwork or concrete

to give both support and restraint to thin slip brick facings.

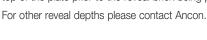
In addition to the standard three brick version, slip brick ties can be manufactured in other multiples on request.

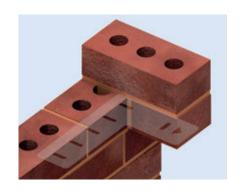


## **Reveal Support Plate**

The Ancon Reveal Support Plate is designed to support the first few bricks of a full brick (215mm deep) window reveal during construction. The plate will bond into the bed joint of the outer leaf providing a stable bearing for the reveal brick.

The long leg of the plate is built into the bed joint of the external leaf with the arrow pointing inwards. To ensure stability, the outer leaf should be built at least one brick high on top of the plate prior to the reveal brick being placed.







## Wall Ties and Restraint Fixings

### Ancon 63 Mechanical/Mechanical

Used when tying together two leaves of solid materials, this tie has mechanical expanders at each end. Requires 11mm Ø holes.

#### Ancon 63 Resin/Mechanical

For use when the material in the inner leaf is perforated, of low-density or a friable material. A resin fixing may be used to eliminate any imposed stress. Requires 11mm Ø holes.

#### Staifix Resin/Resin

Used where mechanical expanders are unusable. Normally inserted into a 10mm Ø hole, but if test facilities are required, a 12mm Ø hole must be used. A plastic sieve can be used to retain resin and is particularly useful in perforated brick or hollow blockwork. A 12mm Ø hole is required to fit the sieve.

#### Stairib Bar

Stainless steel ribbed bar, resin-grouted into the inner and outer leaves. Requires 10mm Ø hole (6mm dia. bar) or 12mm Ø hole (8mm dia. bar).

#### Ancon AC 31

Used where bricks are removed then replaced in the outer leaf. The wavy end is resin-bonded into the inner leaf in a 10mm Ø hole. The triangular end sits in the bed joint. Ancon AC 31 can be supplied with a drip or a neoprene ring.

#### Ancon AC 31C

Similar to the AC 31 but cranked by 25mm to aid fixing to the inner leaf. Requires 10mm  $\varnothing$  holes.

### TeploTie (Type 2)

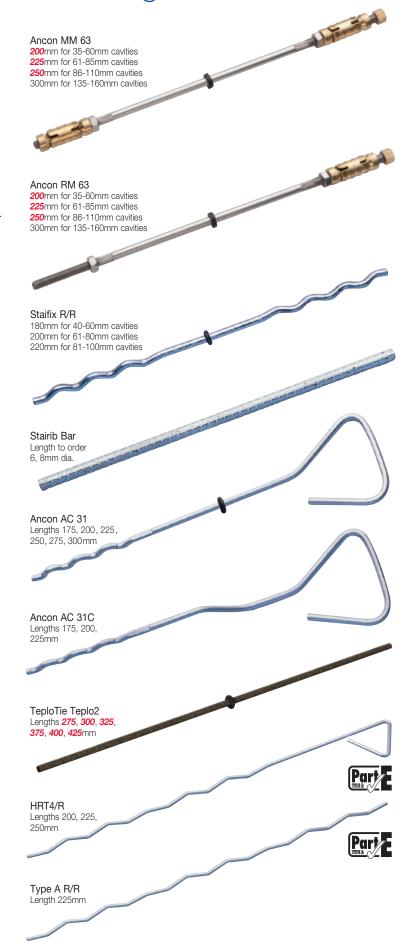
This plain-ended basalt fibre wall tie can be resin-fixed in remedial and retrofit applications. This tie has a thermal conductivity of only 0.7 W/mK. Requires 8mm  $\varnothing$  hole (6mm dia. bar) or 10mm  $\varnothing$  hole (7mm dia. bar).

## HRT4/R

Used for tying the two leaves of a cavity wall or separating wall where the first leaf has already been built. The wavy end is resin-bonded into the existing wall in a 10mm Ø hole. The tie is based on the Staifix HRT4 and has similar properties.

## Type A R/R

This is designed as a remedial tie for a separating wall. It will normally be inserted in 10mm Ø holes and resin-bonded into both leaves. It meets the requirements of a Type A wall tie to Approved Document E.



**Masonry Support Systems** Lintels

**Masonry Reinforcement** 

**Windposts and Parapet Posts** 

## **Wall Ties and Restraint Fixings**

**Channel and Bolt Fixings** 

**Tension and Compression Systems** 

**Insulated Balcony Connectors** 

**Shear Load Connectors** 

**Punching Shear Reinforcement** 

**Reinforcing Bar Couplers** 

**Reinforcement Continuity Systems** 

**Stainless Steel Fabrications** 

Flooring and Formed Sections

**Refractory Fixings** 





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