

# Masonry cavity walls

## Masonry cavity wall design

### DriTherm Slab

#### Wall ties

Apart from structural considerations, which are obviously pre-eminent, the correct specification of wall ties is crucial in two additional respects. Firstly, it is necessary that the tie does not compromise the performance of the cavity wall insulation with regard to liquid water penetration.

Secondly, the U-value calculation method must take into consideration the number of wall ties per square metre as well as the cross sectional area, and thermal performance of the wall tie.

Stainless steel wall ties can be used for cavities up to 175mm and are recommended because they have a low cross sectional area minimising their impact on the thermal performance of the wall. Where wider cavities are used a two part wall tie is recommended. These are more robust and can have a significant impact on the U-value of the wall. In all circumstances it is recommended that the designer seeks advice from the manufacturer of the wall tie to ensure that the tie selected meets the structural requirements of the building work.

Low thermal conductivity wall ties are also available and are suitable for cavities up to 300mm wide, their thermal performance is such that they have negligible impact on the U-value of the wall.

#### Prevention of liquid water penetration

Prevention of liquid water penetration from the outer to inner leaf is one of the major considerations when designing cavity walls. The selection of appropriate materials and jointing methods for the outer leaf are crucial.

#### Cavity trays

Cavity trays should be provided:

- At all interruptions of the cavity, such as lintels and sleeved vents and ducts
- Above cavity insulation that stops short of the top of the wall

Cavity trays should rise at least 140mm within the cavity, be self-supporting or fully supported with joints lapped and sealed. Stop ends should be provided to the ends of all cavity trays. Weep holes should be provided at not more than 900mm centres to drain each cavity tray with at least two weep holes per cavity tray.

#### Condensation risk

In a properly insulated masonry cavity wall there is negligible risk of condensation forming on the inner block leaf.

Condensation may have a detrimental effect on the thermal performance of a structure or cause damp on the warmer face of the wall. Un-faced mineral wool products, being 'vapour open' offer negligible resistance to the passage of water vapour through the wall.

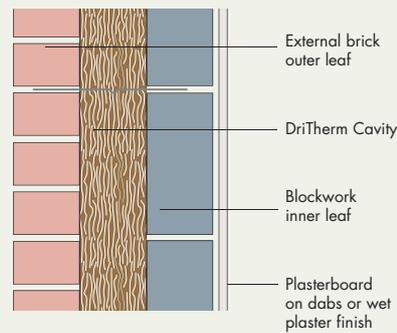
The Knauf Insulation Technical Support Team are able to carry out condensation risk calculations if further reassurance is required.

### Recommended solutions

The recommended masonry cavity wall solution is full-fill built in slabs (DriTherm Cavity).

These systems not only provide the best U-value to wall width ratio but are also the lowest in cost. Even with dense concrete blocks it is possible to achieve very high thermal performance in a manageable wall width.

1) Full-fill: built-in



### Solution optimiser and pathfinder

Key

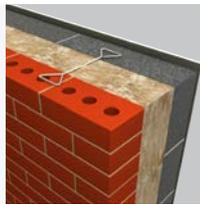
Thermal insulation achievable by constructions within this document.

#### Knauf Insulation solution

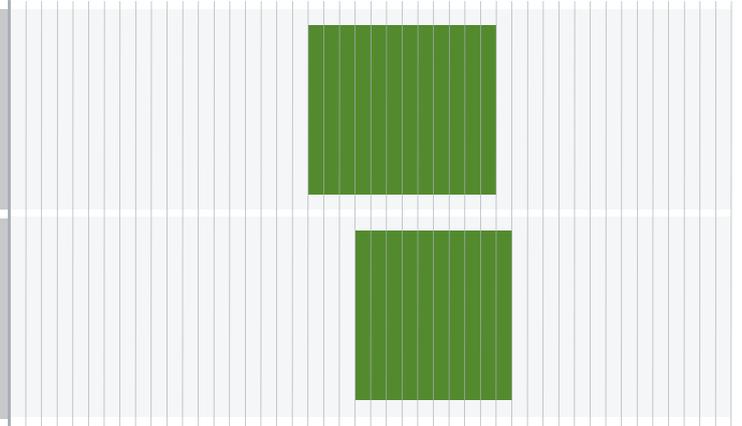
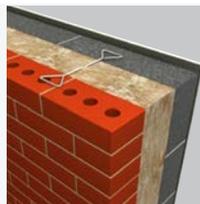
#### U-values

0.55 0.50 0.45 0.40 0.35 0.30 0.25 0.20 0.15 0.09

**Full-fill with built-in glass mineral wool**  
Product: DriTherm Cavity 38



**Full-fill with built-in glass mineral wool**  
Product: DriTherm Cavity 35



# Masonry cavity walls

Full-fill with built-in glass mineral wool

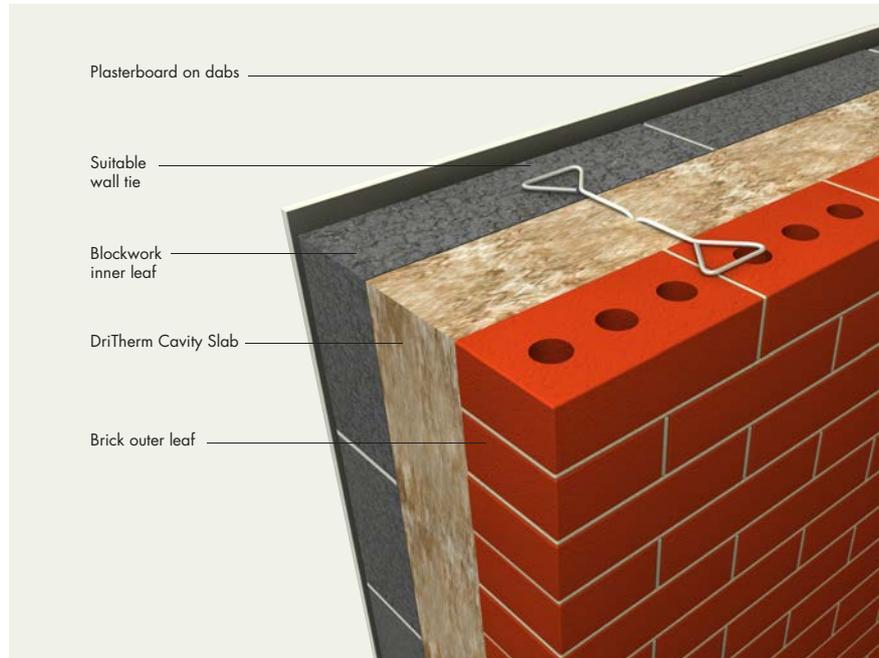
## DriTherm Cavity Slabs and Rolls



- Slabs fully fill the cavity and knit together at joints, preventing air movement and infiltration through or around the insulation
- Slabs are installed under compression, preventing moisture penetration and cold bridging at joints
- Low cost, quick and easy to install

### DriTherm Cavity Slabs

- Glass mineral wool is non-combustible
- Zero Ozone Depletion Potential (ODP)
- Zero Global Warming Potential (GWP)



## Products

**DriTherm Cavity Slabs and Rolls** are a range of lightweight semi rigid or rigid slabs of glass mineral wool with a water repellent additive. They are manufactured to fit between wall ties at standard vertical spacings.

## Typical construction

Brick or block outer leaf (which may be rendered), brick or block inner leaf with cavity fully filled with DriTherm Cavity. Internal finish of 12.5mm standard plasterboard on dabs.

For additional information contact our Technical Support Team Centre on +971 2 551 2453.

## Installation

DriTherm Cavity should be kept clean and free from mortar droppings. All joints should be closely butted. Any cutting and fitting should be neatly done and not distort the layers of glass mineral wool which comprise the product. Damp proof courses should be installed to ensure that penetrating water is directed only to the outer leaf.

## Performance

### Thermal performance

DriTherm Cavity Roll 38 Standard has a thermal conductivity of 0.038 W/mK.

DriTherm Cavity Slab 35 Super has a thermal conductivity of 0.035 W/mK.

### Fire performance

Unfaced DriTherm insulation is A1 non-combustible.

DriTherm is tested and listed UL 723, ASTM E84

Classification (UL723)	Unfaced	FSK
<b>Flame spread</b>	not over 25	not over 25
<b>Smoke developed</b>	not over 50	not over 50

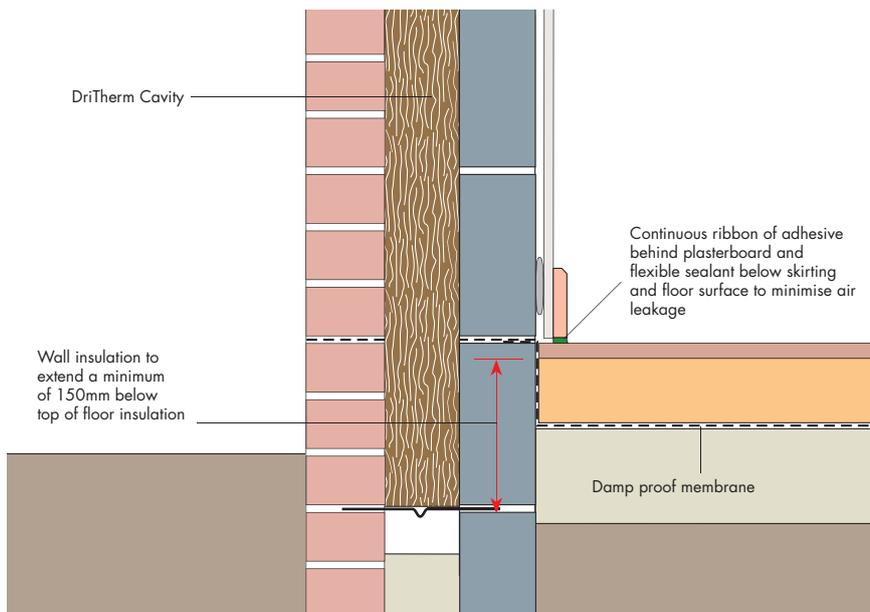
### Moisture resistance

DriTherm Cavity contain a water-repellent silicone additive to ensure that no liquid water is able to pass through the slabs and reach the inner leaf of masonry.

### Vapour resistance

DriTherm Cavity have negligible water vapour resistance, allowing water vapour to pass freely through the slabs.

Typical wall/ground floor junction



Typical specification

All external walls to be insulated during construction by completely filling the cavity with DriTherm Cavity 38\*/35\* .....mm thick. (\*Delete as appropriate).

The first run of wall ties to be located at 600mm centres horizontally at a level to be determined by the specifier. Subsequent runs of wall ties to be at not more than 900mm centres horizontally, or as otherwise required by the structure, and at 450mm vertically.

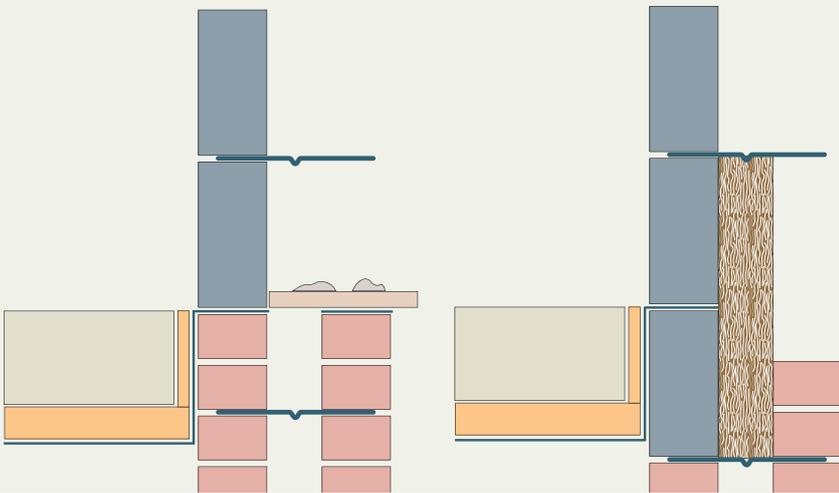
U-values (W/m <sup>2</sup> K) 100mm outer leaf/cavity/100mm block inner leaf, plasterboard					
Cavity width (mm)	Product	Masonry Hollow Normal Weight Block ( $\lambda = 1.13$ )	Masonry Solid Normal Weight Block ( $\lambda = 1.69$ )	Lightweight Autoclave Aerated Concrete (AAC) Block ( $\lambda = 0.13$ )	High strength Autoclave Aerated Concrete (AAC) Block ( $\lambda = 0.16$ )
100	DriTherm 38	0.36	0.36	0.24	0.26
	DriTherm 35	0.33	0.34	0.23	0.24

# Masonry cavity walls

## Full-fill with built-in glass mineral wool

### Installation sequence

- 1 Build up the first stage of one leaf of masonry to include the first row of ties above the commencement of the DriTherm Cavity. Clean mortar squeeze from the masonry and snots from any ties or cavity tray.
- 2 Position the DriTherm Cavity against the masonry, so that the wall tie drips are halfway across the top edge of the slabs. The DriTherm Cavity should be cut to course if necessary. DriTherm Cavity should be taken below DPC level (preferably by at least 150mm) to provide edge insulation, with no risk of capillary action. DriTherm Cavity does not wick. Always bring DriTherm Cavity to course with wall ties.



### Installation

The thickness of DriTherm Cavity and the cavity width should be designed within the tolerances given in Table 2 (right). It is not possible to compress DriTherm Cavity during installation because its resilience will be enough to dislodge bricks before the mortar has set.

DriTherm Cavity should be kept clean and free from mortar droppings. All joints should be closely butted. Any cutting and fitting should be neatly done and not distort the layers of glass/rock mineral wool which comprise the material – see 'Problems to avoid' on opposite page. Cavity trays and damp proof courses (dpc's) should be installed to ensure that penetrating water is directed only to the outer leaf.

The illustrations above outline technique only, and do not imply that the outer leaf must be built first.

Construction practice will vary from site to site. Where design details differ from those

illustrated please do not hesitate to contact Knauf Insulation for any clarification required.

### Wall ties

DriTherm Cavity is supplied in 1200 x 455mm slabs for use between wall ties at 450mm vertical centres. Standard butterfly, stainless steel wire ties and vertical twist ties are suitable, as are all ties with a positive drip which will penetrate the top edge of the DriTherm Cavity halfway across its width. The use of any other type of tie should be referred to Knauf Insulation Technical Support Team Centre. Advice should also be sought from the wall tie manufacturer as to the maximum cavity width for which the use of a specific tie is approved.

Generally, rows of wall ties should be at 450mm vertical spacing and at horizontal spacings of not more than 900mm or as otherwise required by the structure.

Where whole rows of ties are at different vertical spacing, DriTherm Cavity should be cut to course, allowing an extra 5mm for

compression to form close butt joints.

Where extra ties are required, e.g. at the side of openings, DriTherm Cavity should be cut and fitted carefully around them. When off-cuts of DriTherm Cavity are needed, they can be cut with a long bladed knife or bricklayer's trowel.

### Further recommendations

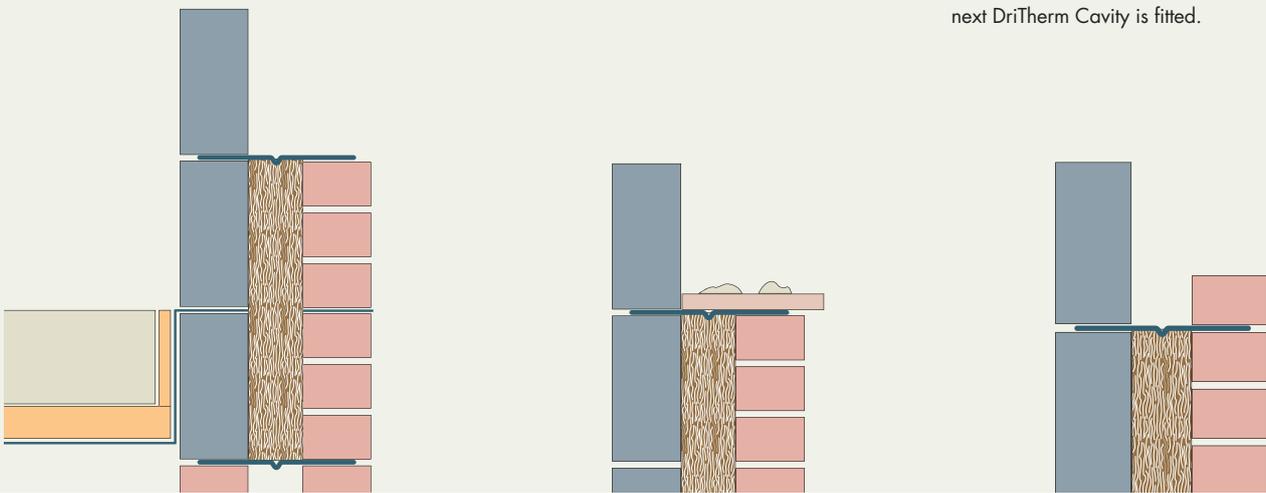
Above, below and beside openings, where cut strips of DriTherm Cavity may be needed, particular care should be taken to fit closely and ensure work is clean and free from debris. At the end of the day's work and during rainy periods, any exposed DriTherm Cavity should be covered.

If DriTherm Cavity is terminated vertically at an open cavity, a vertical dpc must be fitted up the inside face of the outer leaf to ensure that any mortar droppings on exposed edges do not bridge the cavity.

**3** The following leaf is then built to the top level of the DriTherm Cavity. Do not let the second leaf overtake the DriTherm Cavity so as to create a trough (but see 5 regarding choice of leading leaf).

**4** Proceed similarly with successive stages of the wall. As with normal masonry cavity construction, no mortar should remain in the cavity. Particular care should be taken to keep slab joints closely butted and free from mortar. To facilitate keeping the top edges of slabs clean it is recommended that a cavity board be used.

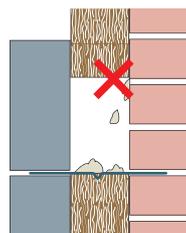
**5** Building may proceed leading with either the inner or the outer leaf. When leading with the inner leaf it is recommended to build a trough not more than one brick deep at horizontal joints in DriTherm Cavity. The mortar joint should be struck flush inside the cavity and any mortar droppings must be cleaned off before the next DriTherm Cavity is fitted.



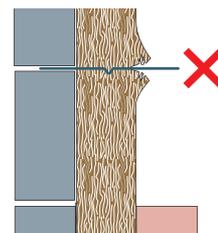
Permitted deviations in cavity widths

DriTherm Cavity size and nominal cavity width	Permitted cavity deviation
Thickness (mm)	(mm)
100	-0 or +15

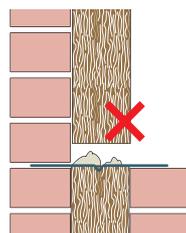
Problems to avoid



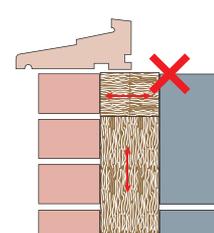
Do not push into the cavity. Mortar spots may be dislodged and bridge the cavity. This can happen all too easily where a change in the leading leaf occurs and care should be exercised at such positions to ensure correct application.



Do not tear or impale DriTherm Cavity. If there are protrusions into the cavity, DriTherm Cavity should be carefully cut to fit, particularly where there are extra wall ties around openings.



Do not position DriTherm Cavity on others which have not been cleaned of mortar droppings.



When using small off-cuts, the face of the product and not the edge, shall be positioned against the wall surface.

# Masonry cavity walls

## Full-fill with built in glass mineral wool, extra wide cavities

### Wider cavities

With the move towards carbon zero buildings, the use of wider cavities in masonry cavity walls is likely to become much more common.

DriTherm Cavity can be installed in multiple layers to fully fill cavities up to 300mm wide. Proprietary cavity closers and folded steel lintels are widely available for cavities up to 100mm wide. For cavities over 100mm wide, the choice of proprietary products is more limited. For cavities over 150mm wide, the detailing of openings may need to be altered radically.

### Jambs

Cavities over 150mm wide present particular problems at the jambs. One solution to this is to use a plywood liner to the opening that can also double up as a former for the window frame. The diagrams below indicate this option for a 200mm wide cavity.

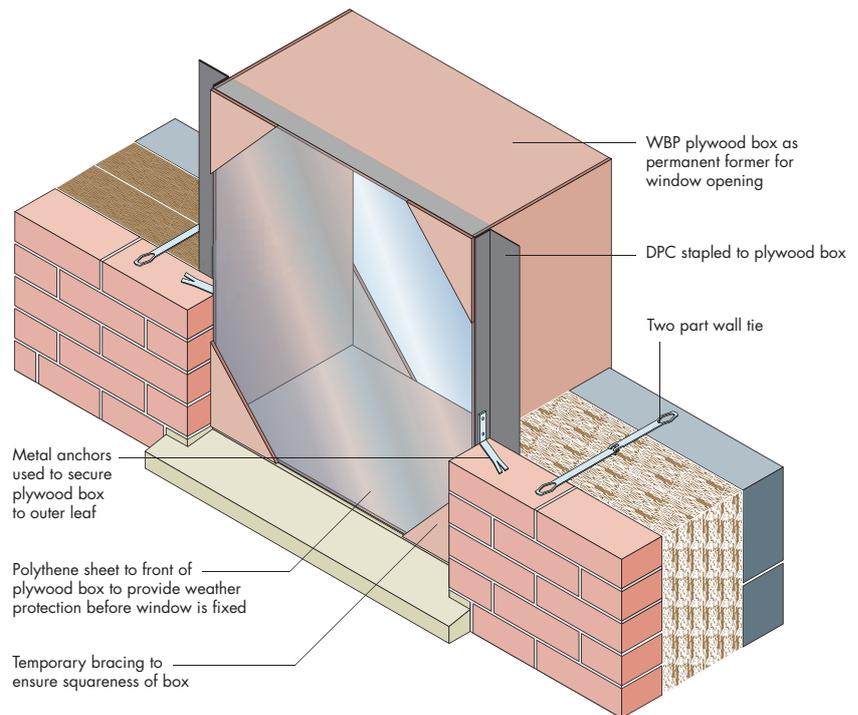
The plywood box solves a number of problems:

- It closes off the cavity
- It can be sealed against the inner and outer leaf to limit air leakage
- It provides an accurate template for the window frame
- The temporary polythene front cover provides weather protection until the window frame is installed
- The window frames can be installed after the brickwork is complete – reducing the risk of damage from mortar, etc.

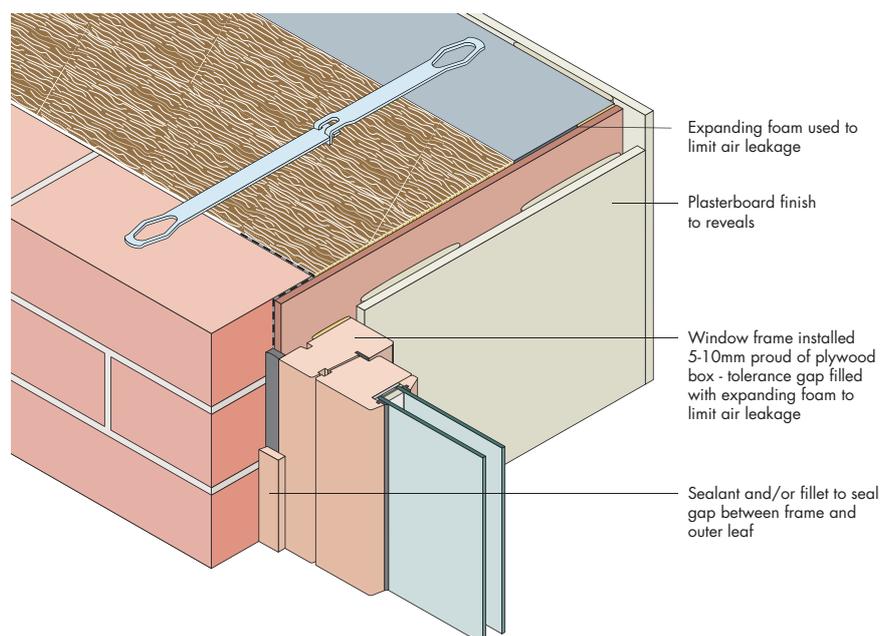
### Lintels

The use of separate lintels for the inner and outer leaf becomes more common and practical as the cavity width increases. Separate lintels not only avoid the thermal bridging problems of one piece steel lintels, but they also provide the designer with a greater level of design freedom. A concrete or aircrete lintel for the inner leaf is a simple, economic and firesafe option.

### Typical use of a plywood box as former for window opening



### Eaves detail showing installation of window frame in ply box



The lintel in the outer leaf can be anything from reconstituted stone to plain brickwork supported on a steel angle.

## Wall ties

DriTherm Cavity is supplied 1200 x 455mm for use between wall ties at 450mm vertical centres. For cavities up to 175mm wide, stainless steel wire ties are recommended by Knauf Insulation because:

- Stainless steel has a thermal conductivity of 17 W/mK, compared with 50 W/mK for mild steel
- Wire ties have a much smaller cross-sectional area than flat metal ties

For these two reasons, stainless steel wire ties present a smaller thermal bridge through the cavity insulation than other types of metal wall tie.

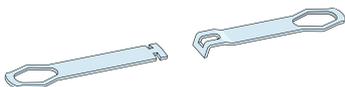
For cavities up to 175mm wide, double triangle stainless steel wire ties are available up to 300mm long.

These ties conform to BS EN 845 -1 : 2003 as a Type 3 tie. It is recommended that they are embedded 85mm into the inner leaf to help keep the cantilevered section of the tie horizontal during the build.

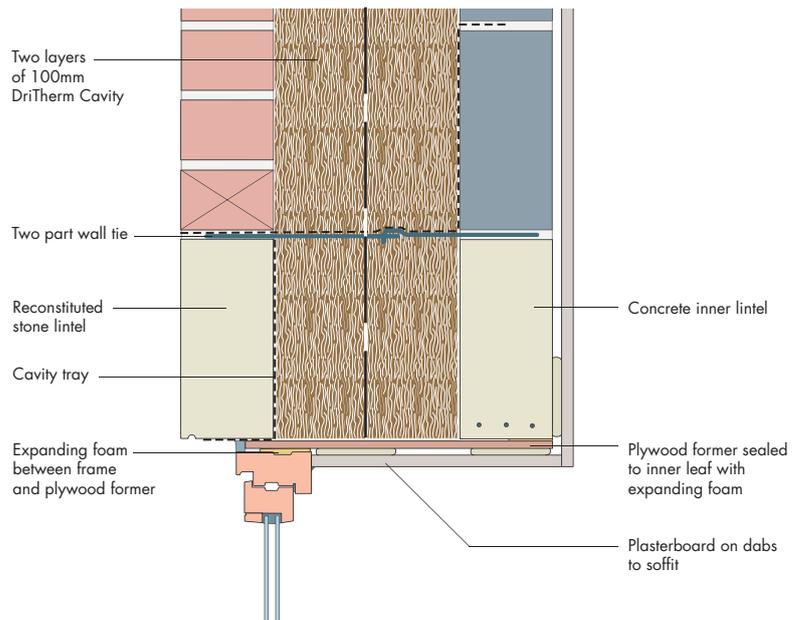
With the use of wider cavities, it is anticipated that other designs of stainless steel wire ties will be developed for cavities up to 175mm wide.

For cavities over 175mm wide, Knauf Insulation recommend the use of two part stainless steel ties. These ties overcome the problem of keeping a long tie horizontal when built into the inner leaf. However, they have a much greater cross-sectional area than wire ties and their thermal bridging effect must be taken into account when calculating the wall U-value. They are suitable for cavities up to 300mm wide.

### The Ancon two-part wall tie



## Typical detail using separate lintels



## Typical detail using separate lintels and rebated window frame

