



# STYROFOAM Solutions

## Insulating Cavity walls





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## Introduction

This brochure describes the thermal insulation of walls using STYROFOAM\* blue extruded polystyrene insulation from Dow. It covers the principles, design considerations, and installation methods for partial fill insulation of cavity masonry walls.

## Insulating cavity walls

The required thermal performance of external walls on any project will not be less than that stipulated by national Building Regulations: a higher level will often be justified. A well recognised way of achieving compliance in masonry walling is to incorporate thermal insulation into the construction.

Wall insulation may be placed:-

- ◆ on the outside.
- ◆ within a construction cavity.
- ◆ on the inside.

Wherever the insulation is placed it should:-

- ◆ provide sufficient thermal resistance to enable the construction to meet the specified level of performance.
- ◆ provide an unbroken layer of insulation without thermal bridges.
- ◆ not compromise the weather resistance of the wall.
- ◆ resist water penetration.

Agrément Certificate 88/2105 covers the use of WALLMATE\* CW-X insulation boards in cavity wall construction.

## Note

Information contained in this brochure may be subject to change.

When specifying STYROFOAM it is important to follow the most recent advice and recommendations.

Contact Dow or visit our web site at [www.styrofoameurope.com](http://www.styrofoameurope.com)

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# Insulating within a cavity: design

## General considerations

A cavity wall is commonly formed of two leaves of masonry joined by wall ties. The outer leaf is usually of brick and the inner leaf of block, although brick/brick and block/block constructions are also used. Cavity walls may also be formed with a timber framed inner leaf.

To meet the requirements for the conservation of power set out in Building Regulation L1 (Regulation 22 in Scotland) external walls require the provision of thermal insulation.

In new buildings that is best achieved by placing the insulation in the cavity.

Partial cavity fill consisting of rigid boards held flush against the inner leaf, allows a clear drained cavity and offers better resistance to rain penetration.

A heavy inner leaf of brick or dense block backed by insulation will absorb and retain heat energy whilst the building is being heated. The masonry will return that heat to the rooms when the building is not being heated, thus maintaining a more even internal temperature.

## STYROFOAM Solutions

STYROFOAM is blue extruded polystyrene insulation from Dow. The extrusion process gives STYROFOAM its characteristic closed cell structure and key physical properties:-

- ◆ low thermal conductivity
- ◆ low water absorption
- ◆ high compressive strength

**The STYROFOAM Solution for partial cavity insulation is WALLMATE CW-X.**

WALLMATE CW-X is designed to give the maximum benefit in cavity wall construction:-

- ◆ ship-lapped edges, close fitting, give continuity of insulation.
- ◆ the 450mm board width suits the normal vertical spacing of wall ties.
- ◆ a range of thicknesses from 40 to 80mm allows thermal performance to be matched to project requirements.

Consult STYROFOAM Solutions Product Data for the full physical and performance data of WALLMATE CW-X insulation.

## Wall construction

For guidance on masonry walls of brick and block see BS 5628: Part 3.

**WALLMATE CW-X boards require fixing at 600mm max horizontal centres and 450mm vertical centres.** Special ties with collars or pins are used to retain the boards. A list of manufacturers of suitable ties is available from the Dow web site.

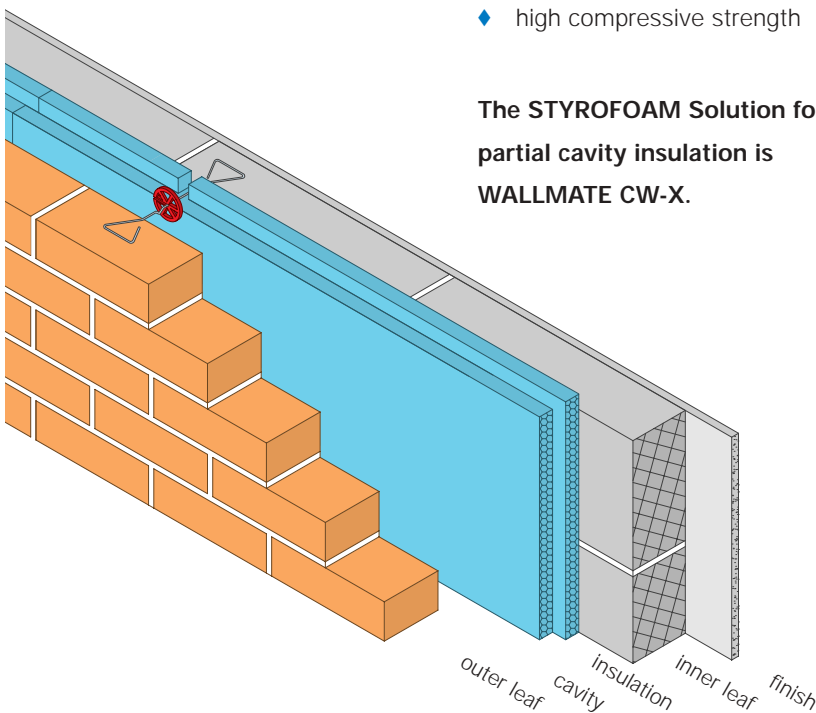


Figure 01 Principles of partial cavity insulation

## Insulating within a cavity: design

### Fire

The use of WALLMATE CW-X within an unventilated cavity does not prejudice the fire resisting properties of a wall: the boards are unlikely to be ignited if fire penetrates an unventilated cavity, spread of flame will be minimal as there will be insufficient air to support combustion.

In some circumstances cavity barriers may be required, refer to the guidance provided in Approved Document B (Technical Standard D in Scotland). Figure 02 details the construction requirements for cavity walls not requiring cavity barriers England and Wales - see Approved Document B, with notes. (For Scotland see provisions of Technical Standard D 10.)

When positioning heat producing appliances, follow the guidance in Approved Document J (Technical Standard F in Scotland). Gas flue pipes penetrating the cavity should be separated from WALLMATE CW-X boards by a non-combustible sleeve enclosing an air space of at least 25mm (In Scotland, the outer surface of either a single flue pipe or the inner wall of a double-walled flue pipe must be at least 25mm from WALLMATE CW-X boards.)

**PVC-covered cables likely to come into contact with WALLMATE CW-X boards should be protected by metal or uPVC conduit or trunking to avoid the risk of plasticizer migration from the PVC.**

For further information on the fire performance of WALLMATE CW-X insulation see BS 6203 and Agrément Certificate 88/2105.

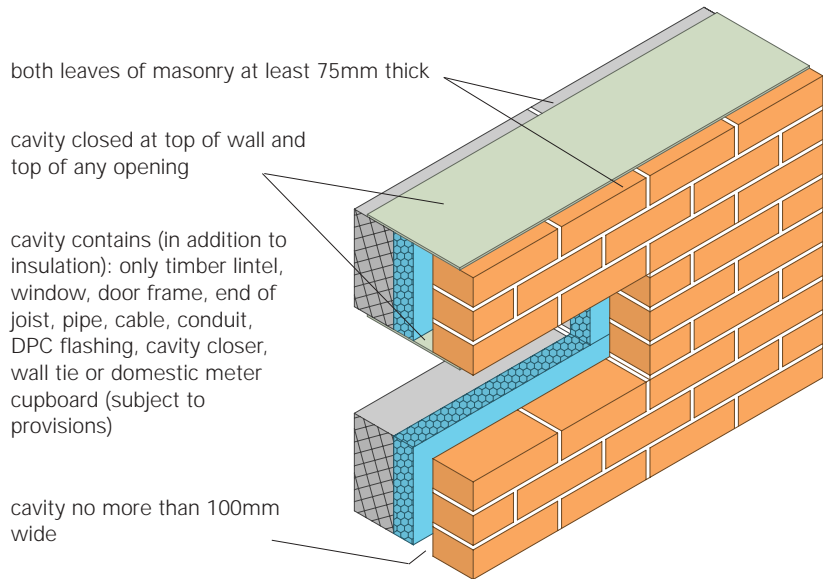


Figure 02 Cavity walls not requiring cavity barriers (England and Wales)

### Rain penetration

Brickwork masonry is porous. In prolonged periods of driving rain, rainwater will penetrate the outer leaf and may run down the inner face of that leaf. To prevent moisture crossing from the inner leaf to the outer leaf there should be a clear cavity between the outer leaf and the external face of the WALLMATE CW-X boards.

**A clear cavity 50mm wide will be suitable for all exposure ratings and will comply with Building Regulation C4 (Regulation 17 in Scotland) and will meet NHBC Standard 6.1.**

**For some exposure ratings a 25mm clear cavity will be sufficient to prevent moisture crossing to the inner leaf (see BBA certificate 88/2105 and BS 5628: Part 3 for details of exposure ratings).**

# Insulating within a cavity: design

## Thermal performance

Building Regulation L1 (Regulation 22 in Scotland) requires reasonable provision be made to conserve fuel. Table 01 shows the U-values for walls set out in Approved Document L1 and L2 (Technical Standard J in Scotland).

To demonstrate compliance with Building Regulations U-values of walls must not exceed those shown in Table 01 below.

Table 02 shows the thickness of WALLMATE CW-X insulation required to achieve a U-value of 0.35W/m<sup>2</sup>K in a typical cavity wall construction - calculated to BS EN ISO 6946 and BR 443

For assistance with U-value calculations visit the STYROFOAM web site or, for complex calculations, contact the Dow Technical Centre.

## Thermal bridging

The cavity must be effectively closed around all openings through the wall, avoiding heat loss, water migration and air infiltration. Approved Documents L1 and L2 (Technical Standard J in Scotland) refers to "Robust constructions details which provide examples of design details and constructions practices that will satisfy the requirement to limit thermal bridging. Alternatively, designers may demonstrate compliance by a calculation method - BRE IP 17/01.

**Table 01 U-values of walls**

England and Wales: Approved Documents L1+ L2  
Scotland: Technical Standard J

Elemental method U-values		
	Exposed element <sup>(1)</sup> W/m <sup>2</sup> K	Poorest <sup>(2)</sup> W/m <sup>2</sup> K
Dwellings	0.35 (0.30) <sup>(3)</sup>	0.70
Other buildings	0.35 (0.30)	0.70

\*( ) Scotland TS J

(1) For a wall exposed to the outside air via an unheated space:  
Dwellings - refer to SAP 2001 3.3  
Other buildings - calculate transmission heat coefficient - BS EN ISO 13789

(2). Dwellings - Target U-value and Carbon Index Methods  
Other buildings - trade-off between construction elements

(3). SEDBUK values

Approved Document L1 - Table 2

Technical Standard J - Table 2 to J3.2 - otherwise use 0.27

**Table 02 Required thickness of WALLMATE CW-X to achieve U-value of 0.35 (0.30) W/m<sup>2</sup>K**

Block type	WALLMATE CW-X	
	Thermal conductivity W/mK	mm
Lightweight	0.19	60(70)
Medium	0.81	60 (80)
Dense	1.63	70 (80)

\*( ) Scotland TS J

\*all constructions feature:-

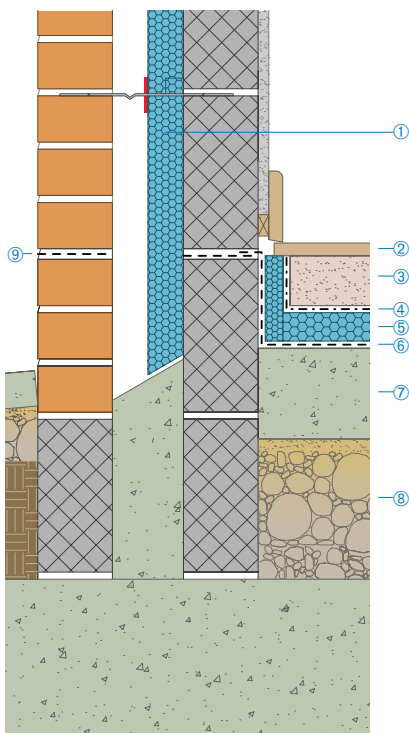
- 103mm brick outer leaf
- 25mm cavity
- WALLMATE CW-X insulation
- 100mm block inner leaf
- 13mm plaster
- 2.50/m<sup>2</sup> wall tie spacing
- insulation air gap correction u = 0.0 W/m<sup>2</sup>K

## Insulating within a cavity: design

Figures 03 to 11 show how junctions in cavity walls may be detailed to avoid thermal bridging.

### Wall/floor junction

Thermal bridging may be avoided by using FLOORMATE\* insulation board as edge insulation to the groundbearing slab with WALLMATE CW-X boards installed down to the top of the foundation or concrete cavity fill (Figure 03).



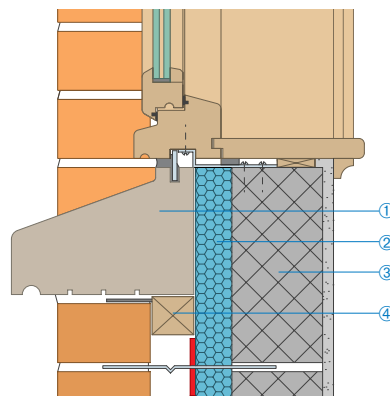
- ① WALLMATE CW-X insulation
- ② floor finish
- ③ screed
- ④ vapour control layer (VCL)
- ⑤ FLOORMATE insulation
- ⑥ damp proof membrane (DPM)
- ⑦ concrete slab
- ⑧ hardcore with sand blinding
- ⑨ damp proof course (DPC)

Figure 03 Wall to floor junction

### Cill or threshold detail

Including a sub-cill is good practice, it allows the window or door frame to be inserted into a prepared opening, to be fully supported and set well back. An impervious cill does not require a DPC.

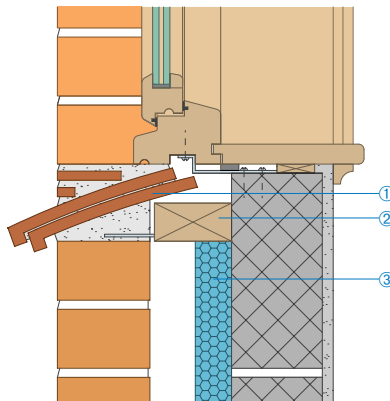
Extend WALLMATE CW-X boards to the top of the cill (Figure 04).



- ① cill
- ② WALLMATE CW-X insulation
- ③ inner leaf
- ④ sub-frame

Figure 04 Solid cill

For a tile cill butt the WALLMATE CW-X boards to the underside of the sub-frame (Figure 05).

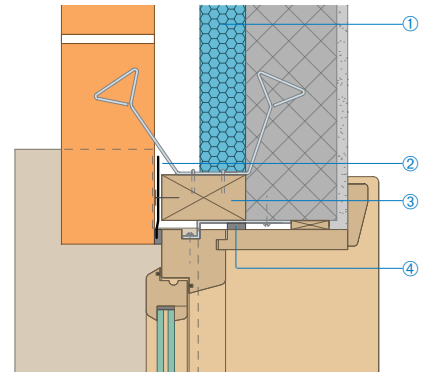


- ① tile cill
- ② sub-frame
- ③ WALLMATE CW-X insulation

Figure 05 Tile cill

### Jamb

Butt the WALLMATE CW-X boards tightly against the sub-frame or cavity closer (Figure 06).

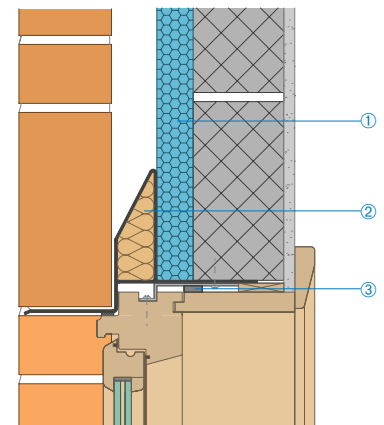


- ① WALLMATE CW-X insulation
- ② vertical DPC fixed to sub-frame
- ③ sub-frame
- ④ airtight seal

Figure 06 Jamb

### Head detail with galvanised steel lintel

Where steel lintel supports both leaves, cover the whole inner leaf with WALLMATE CW-X insulation (Figure 07).



- ① WALLMATE CW-X insulation
- ② steel lintel
- ③ airtight seal

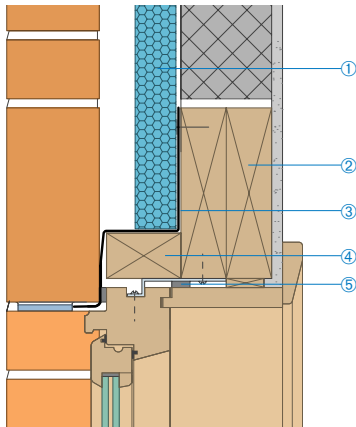
Figure 07 Head detail with galvanised steel lintel

\*Trademark of The Dow Chemical Company

## Insulating within a cavity: design

### Head detail with timber lintel in inner leaf

If a timber lintel is used on the inner leaf sit WALLMATE CW-X boards on top of the cavity closer (Figure 08).



- ① WALLMATE CW-X insulation
- ② internal lintel of timber bressumers
- ③ cavity tray
- ④ sub-frame
- ⑤ airtight seal

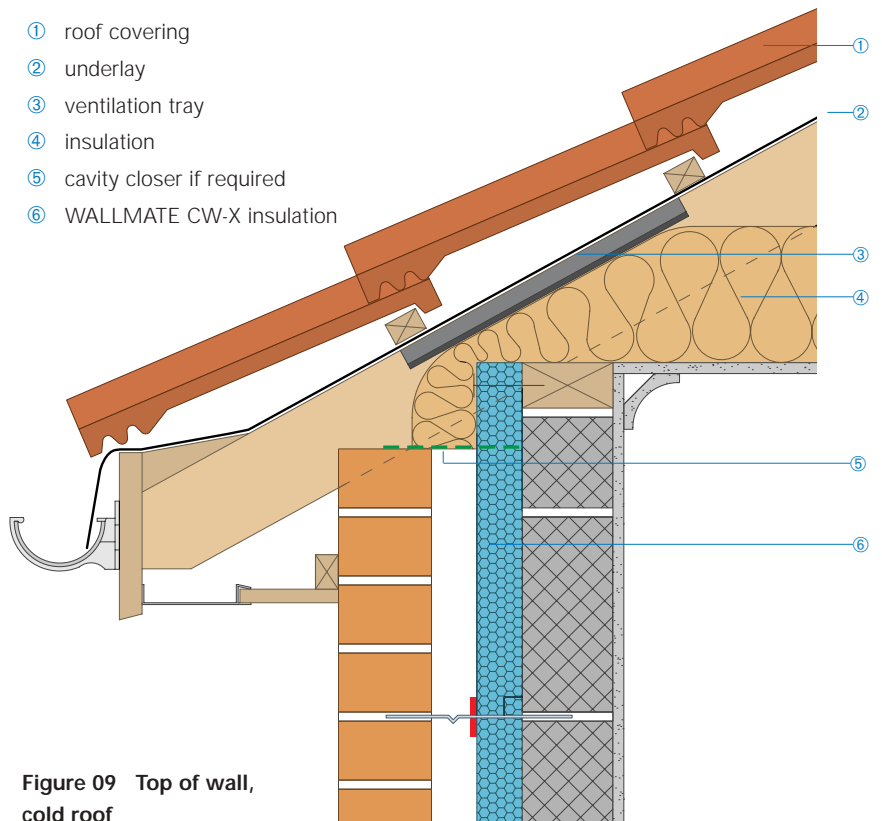
**Figure 08** Head detail with timber lintel in inner leaf

### Top of wall, cold roof

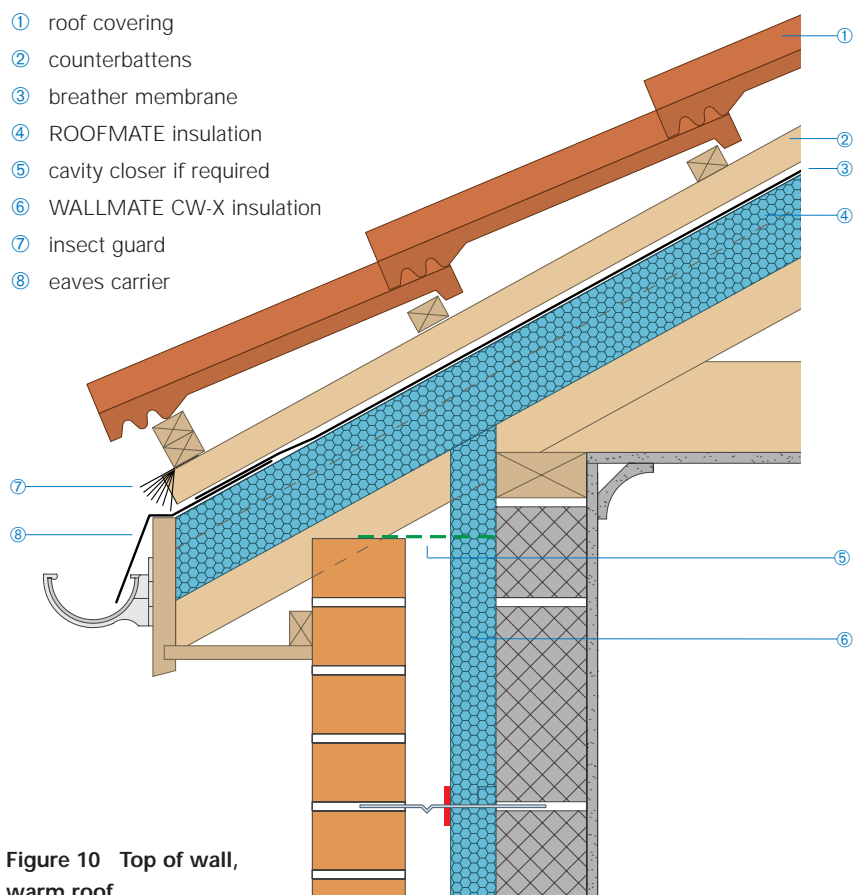
For a cold roof construction extend ceiling level insulation over the wall to prevent thermal bridging (Figure 09).

### Top of wall, warm roof

For a warm roof, extend WALLMATE CW-X or ROOFMATE\* insulation from the top of the cavity closer to the underside of the roof insulation (Figure 10).



**Figure 09** Top of wall, cold roof



**Figure 10** Top of wall, warm roof

## Insulating within a cavity: design

### Parapets

Extend the WALLMATE CW-X boards to overlap with the roof insulation (figure 11).

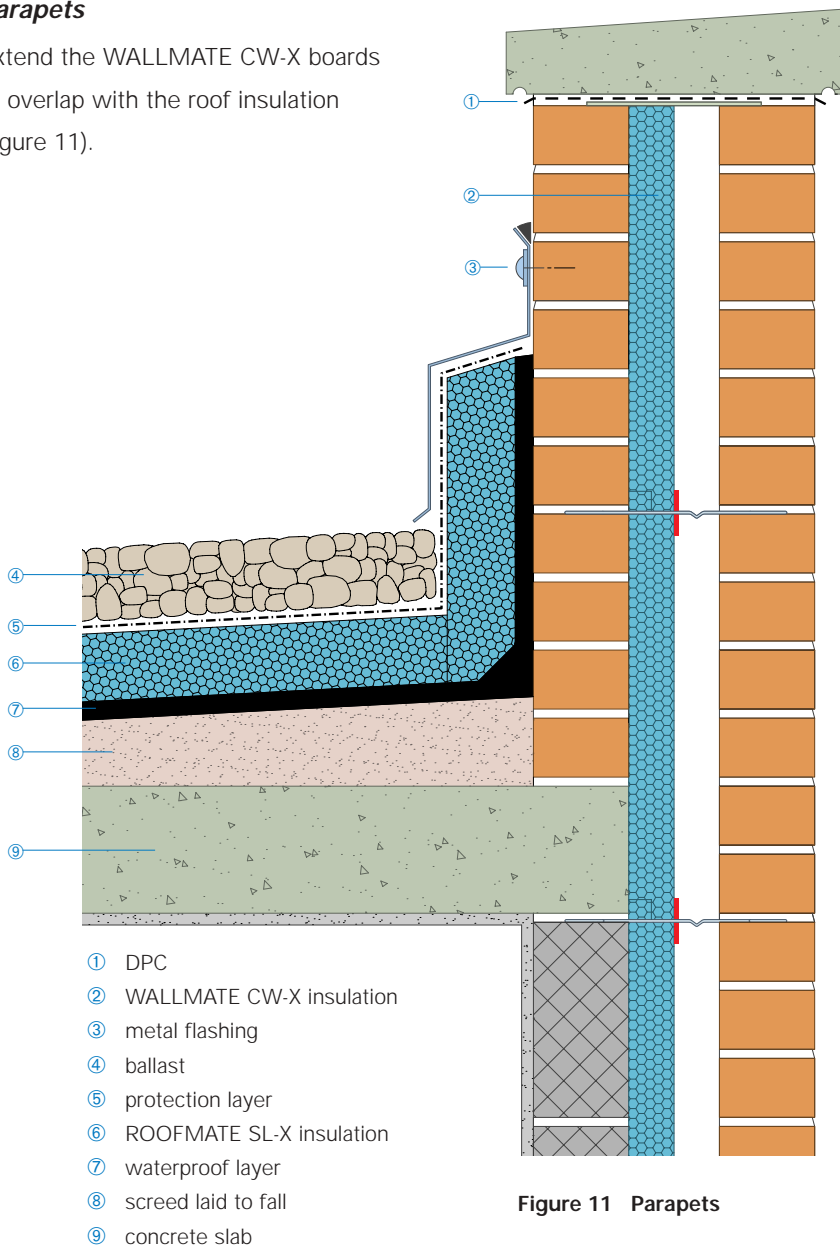


Figure 11 Parapets

### Condensation risk

Where internal conditions are similar to the dry/moist occupancy described in BS 5250: 2002 Appendix B cavity walls featuring

WALLMATE CW-X insulation are unlikely to suffer interstitial condensation. When the building is likely to have a high level of humidity, condensation risk analysis should be performed.

A method for calculating the risk of interstitial condensation is given in BS 5250 Appendix D. For assistance with condensation risk calculations contact the Dow Technical Centre.

### Specification

Use the following NBS clause to specify WALLMATE CW-X insulation as partial fill cavity wall insulation:-

#### F30 Accessories/sundry items of brick/block/stone walling

#### 151 Partial fill cavity insulation

- ◆ Insulation: [extruded polystyrene boards to BS EN 13164](#)
- ◆ Thickness: 40/50/60/70/80\*mm  
*\*delete as appropriate*
- ◆ Manufacturer and reference:  
Dow Construction Products,  
2 Heathrow Boulevard,  
284 Bath Road, West Drayton,  
Middlesex, UB7 0DQ.  
Tel: 020 8917 5050  
Fax: 020 8917 5413

#### WALLMATE CW-X

Board size: 1200 x 450mm

Edge profile: shiplap

Fire classification: Euroclass E -  
BS EN 13164

Operating temperature:  
-50°C to +75°C

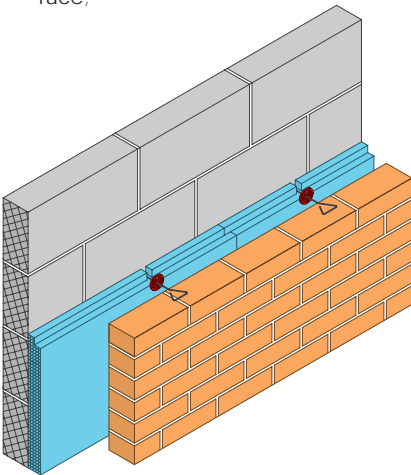
- ◆ fix securely to inner leaf, ensuring that:-
  - edges are not damaged
  - boards are close butted at horizontal and vertical joints and at closures
  - joints between boards are kept clean and dry and free from mortar droppings, grout and other debris
  - the residual cavity is not blocked or bridged by offcuts of insulation.
- ◆ place and secure each course of insulation before building up inner leaf above level of previous course of insulation.

## Insulating within a cavity: installation

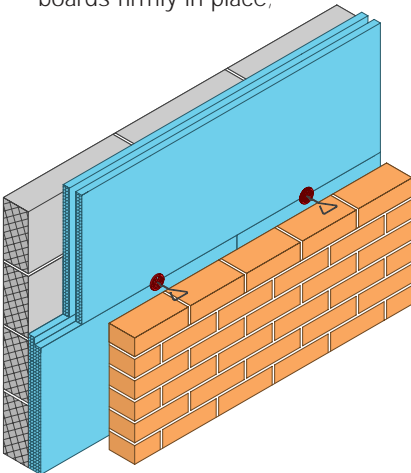
Observe the following installation guidance to gain the maximum benefit from WALLMATE CW-X insulation.

### Installation sequence

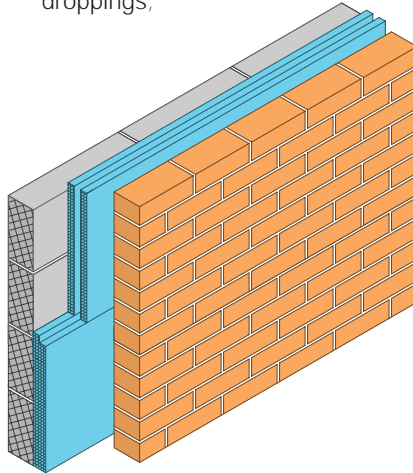
1. Raise inner leaf 450mm, remove any excess mortar from the outer face;



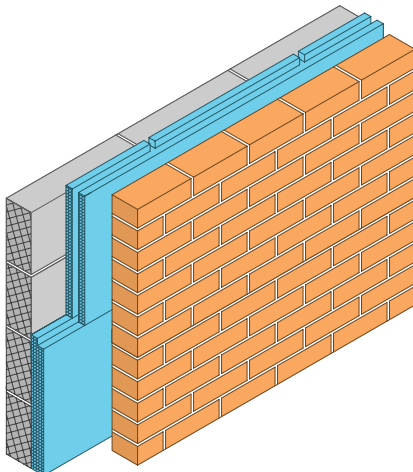
2. Set WALLMATE CW-X boards firmly on wall ties, lay with vertical joints staggered and with shiplap joints arranged to shed water away from the inner leaf. Fit discs or collars to hold the boards firmly in place;



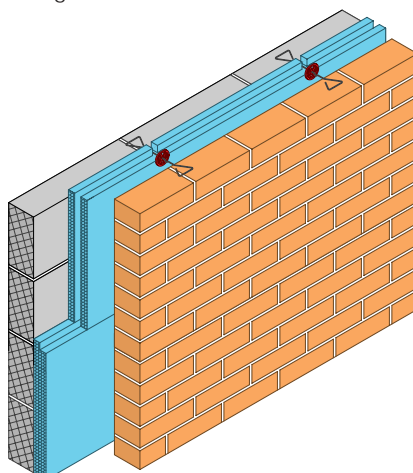
3. Raise outer leaf 450mm, keeping the cavity clear of mortar droppings;



4. Cut neat notches in upper edge of boards to receive wall ties;



5. Place wall ties and fit collars to hold insulation boards firmly against inner leaf.



Repeat steps 1 to 5 to finished height of masonry.

### Key points

- ◆ keep the cavity free from mortar droppings.
- ◆ ensure wall ties slope down towards outer face.
- ◆ tightly interlock WALLMATE CW-X boards: tighter fit means better thermal performance.
- ◆ secure the boards firmly against the face of the inner leaf of masonry: use additional wall ties where necessary.
- ◆ fit the boards neatly to the backs of frames, to cills, to cavity closers and lintels.
- ◆ ensure the insulation is continuous and there are no gaps at:-
  - top and bottom of the wall
  - openings
  - corners

## References

- ◆ Agrément Certificate 88/2105
- ◆ Approved Documents to the Building Regulations
  - B Fire safety
  - C Site preparation and resistance to moisture
  - J Heat producing appliances
  - L Conservation of fuel and power
- ◆ Technical Standards to Building Standards (Scotland) Regulations
  - Part D Structural fire precautions
  - Part F Heat producing installations
  - Part G Preparation of sites and resistance to moisture
  - Part J Conservation of fuel and power
- ◆ BS 5250: 2002 Code of practice for the control of condensation in buildings.
- ◆ BS 5628 Code of practice for use of masonry. Part 3: 1985: Materials and components, design and workmanship.
- ◆ BS 6203: 1991 (1996): Guide to fire characteristics and fire performance of expanded polystyrene materials used in building applications.
- ◆ NHBC Standards 6.1: External masonry walls.
- ◆ BS EN 13164: 2001 Thermal insulation product for buildings - Factory made products made of expanded polystyrene (XPS) - specification.
- ◆ BS EN 13789: 1999 Thermal performance of buildings - Transmission heat loss coefficient - Calculation Method.
- ◆ BR443 - Conventions for U-value calculations - B. Anderson BRE/DTLR: 2002.
- ◆ Limiting thermal bridging and air leakage: Robust construction details for dwellings and similar buildings 2001 - The Stationary Office.
- ◆ BRE IP 17/01 Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings.
- ◆ BS EN ISO 6946: 1997 Building components and building elements - Thermal resistance and thermal transmittance - Calculation method.

## Note

Recommendations about the methods, use of materials and construction details are given as a service to designers and contractors. These are based on the experience of Dow with the use of WALLMATE CW-X boards. Any drawings are meant only to illustrate various possible applications and should not be taken as a basis for design. Since Dow is a materials supplier and exercises no control over the installation of WALLMATE CW-X boards, no responsibility is accepted for such drawings and recommendations.

In particular, no responsibility is accepted by Dow for the systems in which WALLMATE CW-X is used or the method of application by which it is installed. The legal obligations of Dow in respect of any sale of WALLMATE CW-X boards shall be determined solely by the terms of the respective sales contract.



## Web site

The STYROFOAM Solutions web site is the on-line resource to assist designers develop STYROFOAM solutions for their own projects.

The site includes:-

- ◆ on-line U-value calculator.
- ◆ downloadable design details.
- ◆ the latest case studies featuring STYROFOAM Solutions.

[www.styrofoameurope.com](http://www.styrofoameurope.com)

## Printed literature

Dow offers a wide range of printed material which presents solutions to common thermal insulation requirements:-

- ◆ Insulating Floors
- ◆ Insulating Cavity walls
- ◆ Insulating Walls: systems for renovation
- ◆ Insulating Pitched roofs
- ◆ Insulating Inverted flat roofs
- ◆ Insulating roof terraces
- ◆ Insulating Single-ply roofs
- ◆ Insulating Agricultural buildings
- ◆ Product data

To order your literature:

**Tel: 020 8917 5050**

**Fax: 020 8917 5157**

## Technical support

The Dow Technical Centre offers extensive technical support and consultancy advice for specifiers, including:-

- ◆ guidance on insulation practice.
- ◆ detailed product application information.
- ◆ project specific U-value calculations and condensation risk analyses.

To consult the Technical Centre:

**email: [styrofoam-uk@dow.com](mailto:styrofoam-uk@dow.com)**

**Tel: 020 8917 5049**

**Fax: 020 8917 5413**



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## Insulating Cavity walls

