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THERMALITE®

aircrete blocks **technical manual**

Hanson Building Products

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Hanson
HEIDELBERGCEMENT Group

THERMALITE®

aircrete blocks **technical manual**

Contents

Introduction

Thermalite aircrete blocks from Hanson offer cost-effective solutions for a wide range of applications. The closed micro-cellular structure of Thermalite, featuring millions of tiny pockets of trapped air, gives this product its distinctive features: high compressive strength, lightness for handling, high thermal insulation and moisture resistance.

The Thermalite range of aerated concrete blocks offers both builders and specifiers a wealth of benefits unrivalled by any other concrete block manufacturer. Continual research and development mean that this range of building blocks continue to meet the demands of the modern construction industry. Thermalite blocks are not only easy to handle, they are extremely workable and can be easily cut, sawn and chased accurately with ordinary hand tools.

Up to 80% of the raw material used in the manufacture of Thermalite is pulverised fuel ash (PFA), a stable by-product of coal-burning power stations. This recycled material is mixed with sand, cement, lime, aluminium powder, together with processed waste and water, to produce a range of blocks noted for their excellent properties.

Sustainability
Thermalite blocks are a sustainable building material that can help designers and specifiers to meet all current Building Regulations, legislation and codes of practice. Thermalite blocks are manufactured with up to 80% recycled material, have a long life span and are recyclable after use, making them an exceptionally sustainable building material. Further details can be found on pages 6-9.

Products
The high level of performance achieved by Thermalite blocks, combined with the extensive product range offered, ensures that cost-effective solutions for wall, floor and below ground constructions can be achieved. Further details can be found on pages 10-25.

Thin joint masonry
Thin joint masonry is a system of construction that is designed to lower costs by speeding up the time taken to build walls and improve quality. By using Thermalite Thin Layer Mortar and aircrete blocks, the depth of mortar can be reduced from 10mm to 3mm or less. The lightweight nature of Thermalite and the rapid setting time of Thin Layer Mortar, means that a continuous build is possible, which in turn creates substantial productivity gains. Further details can be found on pages 26-35.

Performance
The closed micro-cellular structure of Thermalite, featuring millions of tiny pockets of trapped air, gives this product its distinctive features: high compressive strength, excellent fire protection, high thermal and sound insulation and good air permeability and moisture resistance. Further details can be found on pages 36-59.

Design detailing
Comprehensive design detailing for foundations, floors, external walls, partitions and separating walls are illustrated in this technical guide. Detailed advice is also given on linear thermal bridging and the Code for Sustainable Homes. Further details can be found on pages 60-91.

Sitework
Thermalite products meet current CDM Regulations with Thermalite blocks generally falling well below handling guideline limits. Full COSHH data information is readily available that covers the entire Thermalite product range. Technical guidance on mortar, workability, fixings and internal/external finishes are also given. Further details can be found on pages 92-107.

Quality
All Thermalite products are manufactured to a quality assured system, in accordance with EN ISO 9001 and BS EN 771-4, ensuring compliance with all relevant standards and codes of practice. In addition, Thermalite products have independent accreditation from the British Board of Agrément. All manufacturing locations hold a BSI Kitemark license and have dedicated laboratories where testing is routinely conducted. Hanson also has a UKAS accredited laboratory. Further details can be found on page 108.

Services
The Thermalite technical team continually researches the needs of customers and keeps abreast of changing regulations and legislation to provide an excellent range of products. Additionally, a comprehensive range of literature and an up-to-date website are available along with technical advice on all aspects of the application and use of Thermalite products in construction. Further details can be found on pages109-111.

ENP168

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KM 27012
KM 27013

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Sustainability

Thermalite blocks are a sustainable building material that can help designers and specifiers to meet all current Building Regulations, legislation and codes of practice. Thermalite blocks are manufactured with up to 80% recycled material, have a long life span and are recyclable after use, making them an exceptionally sustainable building material.

Thermalite lifecycle – from cradle to cradle

The whole lifecycle of Thermalite blocks has sustainability at its core. From manufacture and delivery through to design in use, construction and reuse, Thermalite blocks are inherently sustainable.

Thermalite – manufacture and delivery
Thermalite blocks contain recycled content and we source our materials responsibly. We also operate strict waste minimisation schemes and employ a modern transport fleet.

Thermalite – in design
Thermalite blocks can help designers and specifiers to meet all current Building Regulations, legislation and codes of practice.

Thermalite – in construction
Thermalite blocks meet current CDM Regulations and can be easily and accurately cut to reduce waste on site.

Thermalite – in use
The inherent properties of the blocks mean they provide good thermal and acoustic comfort for occupants of homes constructed from Thermalite.

Thermalite – end of life use
Thermalite blocks can be fully recycled to create new construction materials. Buildings constructed from Thermalite can be easily altered should their use change, avoiding the need to demolish and rebuild.

Thermalite manufacture and delivery

Recycled content
Up to 80% of the material used in Thermalite blocks is pulverised fuel ash (PFA), a by-product from coal burning power stations, which is both stable and environmentally friendly.

Waste minimisation
A strict waste minimisation scheme is operated during manufacture, and all waste from the process is either crushed and recycled into the next mix or used in other concrete products.

Quality
All Thermalite blocks are manufactured in accordance with ISO 9001 (quality management system) and all sites are certified to ISO 14001 (environmental management system) and have a BSI Kitemark licence.

Responsibly sourced
All Thermalite blocks are certified as 'Very Good' under BES 6001, Responsible Sourcing of Materials – giving additional credits under the Code for Sustainable Homes.

UK sourced
Over 99% of the materials used to manufacture Thermalite blocks are sourced in the UK. Not only does this help towards the UK economy but it means that the materials don't travel an excessive distance to the factory.

Low embodied carbon dioxide (CO_2)
Thermalite has a low embodied carbon dioxide figure compared with generic aircrete. For information on our CO_2 figures refer to the Green Guide table on page 89.

Delivery
Hanson also operates a modern transport fleet, which, when combined with the lightweight Thermalite product, ensures that energy consumption during haulage is minimised.

Thermalite in design

Code for Sustainable Homes
Thermalite blocks can help designers and specifiers meet all levels of the Code for Sustainable Homes (the code). For further information on how Thermalite can help you achieve credits under the Code see pages 84-91.

Part L
Thermalite offers cost-effective solutions to both current and future Part L requirements. For further information on how Thermalite can help you meet your Part L requirements, see pages 38-47.

Life cycle assessment
Thermalite was the first aircrete block to have its life cycle assessment (LCA) data independently reviewed and to be awarded certified Environmental Profiles by BRE Certification. LCA is a method that measures the environmental impact of a product by assessing the energy and materials used and carbon dioxide released to the environment over its full life cycle.

Green Guide
When used in an external wall, Thermalite products achieve an A+ rating in the Green Guide to Specification, earning the maximum three Mat1 credits for the 'Environmental Impact of Materials' section in the Code for Sustainable Homes. In addition, Thermalite separating walls give superior ratings compared with generic aircrete and achieve up to 'A' ratings. For further information, see page 89.

Air permeability
Thermalite blocks have a closed micro-cellular structure that is highly resistant to the passage of air. Air permeability contributes to the thermal insulation performance of a building. For further information on air permeability, see page 48.

Fire resistance
Thermalite blocks are classified as A1 non-combustible, meaning they are highly fire-resistant. For further information on fire protection, see page 49.

Linear thermal bridging
Linear thermal bridging is where heat loss occurs through the junction of building elements such as walls and floors where the continuity of the insulation is interrupted. The use of Thermalite enhanced construction details (ECDs) can help reduce heat loss through thermal bridging. This can give a 10-15% improvement in CO_2 emissions, dependant on the house type. For further information on thermal bridging, see pages 76-77.

Thermalite in construction

Health and well-being
Thermalite products meet current CDM Regulations, with Thermalite blocks generally falling well below handling guideline limits. The Health and Safety Executive also recommends that blocks with handholds should be selected wherever possible. Thermalite Trenchblock Tongue and Groove is the first block manufactured in the UK to offer handholds. Further information on CDM Regulations and health and safety can found on pages 94-97.

Product waste
The finished product also contributes to waste reduction. Thermalite blocks are made to high dimensional tolerances and can be easily and accurately cut to reduce waste on site.

Fire protection during construction
Thermalite blocks are one of the best building materials to fire-proof a development during construction. The combination of the closed micro-cellular structure of Thermalite blocks and the use of non-combustible raw materials is the key to making them fire resistant. This means a safer site for construction workers.

Thermalite in use

Thermal comfort
The micro-cellular structure of the Thermalite product offers remarkably high thermal insulation and can help achieve an energy-efficient building fabric, lowering heat loss through walls and at junctions of building elements.

Acoustic comfort
Thermalite provides excellent acoustic performance, insulating against noise from adjoining buildings and from external noise. Further details on sound insulation can be found on pages 50-55.

Durability
Thermalite blocks are an extremely durable building material which will exceed the assumed 60 year life expectancy of a building. They also ensure resistance to weathering, abrasion and impact damage, mould/rot, sunlight and water damage.

Thermal mass
Thermal mass reduces the extremes of internal temperature within a building, keeping it at a more consistent and comfortable level. Further details on thermal mass can be found on page 87.

Air permeability
Thermalite has a very low air permeability $<0.10 m^3/(h.m^2)$ which helps in achieving an airtight building fabric, consequently reducing energy use.

Fire protection
Thermalite blocks are one of the best building materials to fire-proof a development. The combination of the closed micro-cellular structure of Thermalite blocks and the use of non-combustible raw materials is the key to making them fire resistant. This makes a safer living environment for future occupants.

Thermalite end of life use

Recyclable
At end of life, Thermalite blocks can be fully recycled to create new construction materials.

No pollution
The Thermalite product provides no direct pollution risk to water or air, and the stable and inert waste materials can be safely used as land infill if recycling is not feasible.

Flexibility
A building constructed from aircrete blocks can easily be altered should its use change, avoiding the need to demolish and rebuild.

Product data

Product summary

This summary is representative of the standard product range. Other sizes may be available to special order. Please contact Customer Services 08705 626500 for further details.

	Product	Available block widths (mm)	Available face dimensions (mm)	Compressive strength (N/mm²) to: BS EN 771-4	Thermal conductivity λ (W/m.K)	Nominal density (kg/m³)	Soil or groundwater DS class[1]	External wall solid	Cavity inner leaf	Separating (party) wall	Below dpc level
	**Turbo**	100 115 125 130[3] 140 150 190 200 215 265 300	440 x 215 440 x 430[3]	2.9	0.11	470	1, 2, 3	✓[7]	✓	–	✓[2]
	**Shield**	50[9] 75[9] 90[3] 100 115 125 140 150 190 200	440 x 215 440 x 140[3] 440 x 240[3] *440 x 430[3] 440 x 540[4] *440 x 100 x 430 stock product	3.6	0.15	600	1, 2, 3, 4	✓	✓	✓	✓
	**Hi-Strength 7**	100 115 125 140 150 190 200 215	440 x 215 440 x 430[3]	7.3	0.18	730	1, 2, 3, 4	✓	✓	✓	✓
	**Hi-Strength 10**	100 140 150[3] 190[3] 200[3] 215[3] 275[3] 300 355[3]	440 x 215	9.0[8]	0.19	770	1, 2, 3, 4	✓	✓	✓	✓
	**Paint Grade Smooth**	100 140 150[3] 190[3] 200[3] 215[3]	440 x 215 440 x 430[3]	4.0	0.16	660	–	–	✓	–	–
	**Hi-Strength Paint Grade Smooth**	100 140 150[3] 190[3] 200[3] 215[3]	440 x 215 440 x 430[3]	7.3	0.18	730	–	–	✓	✓	–
	**Party Wall**	100 215	440 x 215 440 x 430[3]	4.0	0.16	660	1, 2, 3, 4	✓	✓	✓	✓
	**Floorblock** **Floor Endblock** **Flooring Slip**	100 150[3] 175[3] 40 65	440 x 350 440 x 215 540 x 440 440 x 140[3] 215 x 100 (Plan dimensions)	4.0	0.16	660	–	–	–	–	–
	**Trenchblock / Tongue & Groove**	255 275 300 355	440 x 215 440 x 140[5][3]	3.6	0.15	600	1, 2, 3, 4	–	–	–	✓
	**Hi-Strength Trenchblock / Tongue & Groove (7.3N/mm² shown)**	255 275 300 355	440 x 215 440 x 140[5][3]	7.3 9.0	0.18 0.19	730 800	1, 2, 3, 4 1, 2, 3, 4	– –	– –	– –	✓ ✓
	**Coursing Brick / Hi-Strength Coursing Brick**	100 115 125 130[3] 140 150 100 115[3] 125[3] 140 150[3]	215 x 65	2.9[6] 7.3[6] 9.0[6]	0.15 0.18 0.19	n/a n/a n/a	– – –	– – –	✓ ✓ ✓	✓ ✓ ✓	– – –

Notes (1) BRE Special Digest 1: Concrete in aggressive ground. (2) May be used in situations described in Table 13 of BS 5628: Part 3 A1, A2, but not in situations described in A3 and exposure clauses MX1-MX3.2 of Table B1 and A1 BS EN1996-2. (3) Manufactured to special order only. (4) Compressive strength 3N/mm², manufactured to special order only. (5) Not available with tongue and groove jointing. (6) See notes on page 24.
Key ✓ = recommended use **Note** Thermalite products have a typical mean moisture movement value of 0.4mm/m.

(7) Where an external leaf is constructed using Turbo blocks of widths less than 215mm, a traditional sand/cement render should not be applied. This is to minimise the risk of failure caused by the differences in tensile strength between the finish and background material. If a 'technical' render system solution is proposed, the advice of the render system manufacturer should be sought.
(8) 10.4N/mm² equivalent. Blocks are manufactured to BS EN 771-4, Category 1 which allows the use of an enhanced partial safety factor (BS EN 1996-1-1). Manufactured to special order only. 10.4N/mm² equivalent Trenchblock is not available with tongue and groove jointing. (9) Not to be used in load-bearing situations. (Also, due to limitations within the manufacturing process, not all 50mm and 75mm blocks will be separated when received on site.)

Turbo

- **external walls**
- **foundations**
- **partitions**

Strength
2.9N/mm²
Thermal conductivity
0.11W/m.K
Density
470kg/m³

Turbo offers very high thermal insulation properties and is therefore ideal for external solid wall applications (min. block thickness 215mm) where low U-values are required.

- Available in large format
- For use with Thermalite Thin Layer Mortar
- Use only in soils up to Design Sulfate Class DS 3* below ground

Working dimensions

Face dimensions (mm) 440 x 215, 440 x 430†

Tolerances

- For general purpose mortar:
  Length: + 3mm, - 5mm
  Width: ± 2mm
  Height: + 3mm, - 5mm
- For Thin Layer Mortar:
  Length: ± 3mm
  Width: ± 2mm
  Height: ± 1.5mm

Properties

- Mean compressive strength not less than 2.9N/mm²
- Design thermal conductivity (λ) 0.11W/m.K
- Dry thermal conductivity value:
  (λ_{10}, dry, unit) 0.10W/m.K
- Specified gross dry density 470kg/m³

* May be used in situations described in Table 13 of BS 5628: Part 3 A1, A2 but not in situations described in A3.

†Manufactured to special order only.

Widths and weights

Block weight for 440 x 215mm face dimensions										
block width (mm)	100	115	125	130†	140	150	190	200	215	265	300
block weight[1]	4.6	5.3	5.7	6.0	6.4	6.9	8.7	9.2	9.8	12.1	13.7
wall weight[2] @ equilibrium moisture content (kg/m²)	57	66	72	75	80	86	109	115	123	152	172

[1] Weights quoted are based on 3% equilibrium moisture content. For typical as received weights the above figures should be increased by a further 20%. This is, however, dependent on climatic and storage conditions.

[2] Weight of erected wall (including mortar). Add 11kg/m² per side for a 2-coat lightweight plaster finish (24kg/m² for dense plaster).

Shield

- **external walls**
- **foundations**
- **partitions**
- **separating walls**

Strength
3.6N/mm²
Thermal conductivity
0.15W/m.K
Density
600kg/m³

Shield combines all the normal qualities of Thermalite blocks with high moisture resistance.

- Available in large format
- For use with Thermalite Thin Layer Mortar

Working dimensions

Face dimensions (mm) 440 x 215, 440 x 140†, 440 x 430†, 540 x 440‡, 440 x 240†

Tolerances

- For general purpose mortar:
  Length: + 3mm, - 5mm
  Width: ± 2mm
  Height: + 3mm, - 5mm
- For Thin Layer Mortar:
  Length: ± 3mm
  Width: ± 2mm
  Height: ± 1.5mm

Properties

- Mean compressive strength not less than 3.6N/mm²
- Design thermal conductivity (λ) 0.15W/m.K
- Dry thermal conductivity value:
  (λ_{10}, dry, unit) 0.13W/m.K
- Specified gross dry density 600kg/m³

†Manufactured to special order only (100mm width is a stock product).

‡Only available in 100mm thickness with a compressive strength of 3N/mm², manufactured to special order only.

Widths and weights

Block weight for 440 x 215mm face dimensions										
block width (mm)	50	75	90†	100	115	125	140	150	190	200
block weight[1]	2.9	4.4	5.3	5.8	6.7	7.3	8.2	8.8	11.1	11.7
wall weight[2] @ equilibrium moisture content (kg/m²)	35	52	63	70	80	87	98	105	133	140

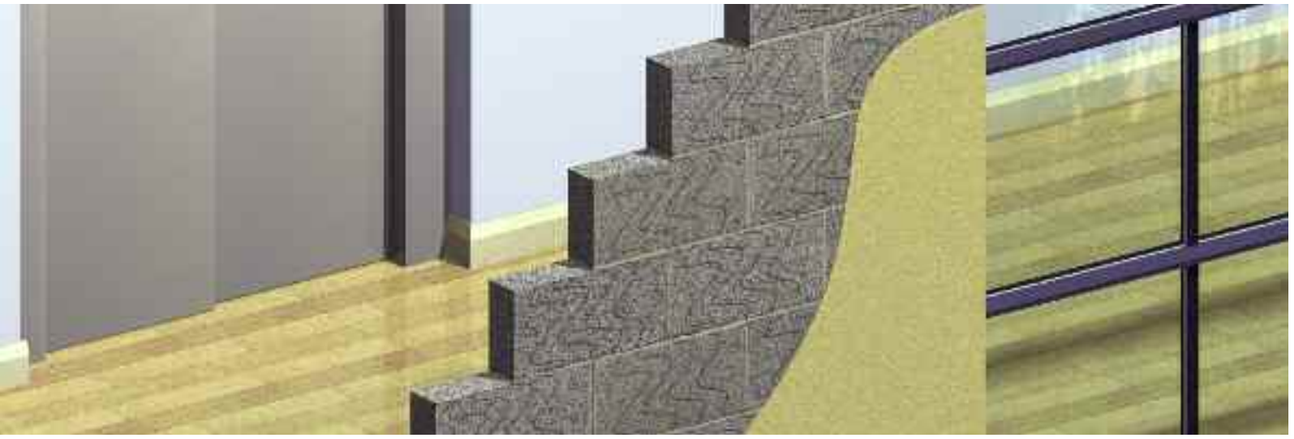
[1] Weights quoted are based on 3% equilibrium moisture content. For typical as received weights the above figures should be increased by a further 20%. This is however dependent on climatic and storage conditions.

[2] Weight of erected wall (including mortar). Add 11kg/m² per side for a 2-coat lightweight plaster finish (24kg/m² for dense plaster).

Hi-Strength 7

- external walls
- foundations
- partitions
- separating walls

Strength
7.3N/mm²
Thermal conductivity
0.18W/m.K
Density
730kg/m³



Hi-Strength 7 has been specifically designed for applications such as flats of three storeys or more, offices, supermarkets and retail parks, where loading conditions require a 7.3N/mm² building block.

- Available in large format
- For use with Thermalite Thin Layer Mortar

Working dimensions
Face dimensions (mm) 440 x 215, 440 x 430†

Tolerances
- For general purpose mortar:
  Length: + 3mm, - 5mm
  Width: ± 2mm
  Height: + 3mm, - 5mm
- For Thin Layer Mortar:
  Length: ± 3mm
  Width: ± 2mm
  Height: ± 1.5mm

Properties
- Mean compressive strength not less than 7.3N/mm²
- Design thermal conductivity (λ) 0.18W/m.K
- Dry thermal conductivity value:
  (λ_{10}, dry, unit) 0.16W/m.K
- Specified gross dry density 730kg/m³

† Manufactured to special order only.

Widths and weights

Block weight for 440 x 215mm face dimensions							
block width (mm)	100	115	125	140	150	190	200	215
block weight[1]	7.1	8.2	8.9	10.0	10.7	13.5	14.2	15.3
wall weight[2] @ equilibrium moisture content (kg/m²)	82	88	96	115	124	157	165	177

[1] Weights quoted are based on 3% equilibrium moisture content. For typical as received weights the above figures should be increased by a further 19%. This is, however, dependent on climatic and storage conditions.

[2] Weight of erected wall (including mortar). Add 11kg/m² per side for a 2-coat lightweight plaster finish (24kg/m² for dense plaster).

Hi-Strength 10

- external walls
- foundations
- partitions
- separating walls

Strength
9.0N/mm²
(10.4N/mm² equivalent)*
Thermal conductivity
0.19W/m.K
Density
770kg/m³

Hi-Strength 10 has been specifically developed for structural applications such as three or four storey buildings, where loading conditions require a 10.4N/mm² building block.

Hi-Strength 10 blocks are available in a range of widths as a special order item only. Please contact our Product Services department for full details.

Working dimensions
Face dimensions (mm) 440 x 215

Tolerances
- For general purpose mortar:
  Length: + 3mm, - 5mm
  Width: ± 2mm
  Height: + 3mm, - 5mm
- For Thin Layer Mortar:
  Length: ± 3mm
  Width: ± 2mm
  Height: ± 1.5mm

Properties
- Mean compressive strength not less than 9.0N/mm²*
- Design thermal conductivity (λ) 0.19W/m.K
  (below ground 0.31W/m.K)
- Dry thermal conductivity value:
  (λ_{10}, dry, unit) 0.17W/m.K
- Specified gross dry density 770kg/m³

Widths and weights

Block weight for 440 x 215mm face dimensions									
block width (mm)	100	140	150†	190†	200†	215†	275†	300	355†
block weight[1]	7.8	10.9	11.7	14.8	15.6	16.8	21.4	23.4	27.7
wall weight[2] @ equilibrium moisture content (kg/m²)	86	121	129	164	173	186	245	268	317
Block weight for 440 x 140mm face dimensions†									
block width (mm)	275	300	355						
block weight[1]	14.0	15.2	18.0						
wall weight[2] @ equilibrium moisture content (kg/m²)	251	274	325						

[1] Weights quoted are based on 3% equilibrium moisture content. For typical as received weights the above figures should be increased by a further 20%. This is, however, dependent on climatic and storage conditions.

[2] Weight of erected wall (including mortar). Add 11kg/m² per side for a 2-coat lightweight plaster finish (24kg/m² for dense plaster).

* Blocks are manufactured to BS EN 771-4, Category 1, which allows the use of an enhanced partial safety factor (BS EN 1996-1-1). This provides the equivalent of a 10.4N/mm² compressive strength.

† Manufactured to special order only.

Paint Grade Smooth

- **inner leaves of external walls**
- **partitions**

Strength
4.0N/mm²
Thermal conductivity
0.16W/m.K
Density
660kg/m³

Paint Grade Smooth is a paint grade block with the clean lines, even surfaces and neat sharp arrises that smooth-faced walling demands. It is available for use in a variety of building projects such as leisure centres, retail buildings, offices and schools.

Note: If required, Paint Grade Smooth can also be laid fair faced. However, consideration should be given to the fact that colour variation can occur.

It is recommended that a Paint Grade Smooth sample panel is erected for comparison purposes before construction commences and that selection is undertaken during construction. It may also be necessary to fill small blow holes before decoration.

Due to width variations within manufacturing tolerances, it may be difficult to build solid partition walls which have a smooth and even surface on both sides.

Working dimensions

Face dimensions (mm) 440 x 215, 440 x 430†

Tolerances

- For general purpose mortar:
  Length: + 3mm, - 5mm
  Width: ± 2mm
  Height: + 3mm, - 5mm
- For Thin Layer Mortar:
  Length: ± 3mm
  Width: ± 2mm
  Height: ± 1.5mm

† Manufactured to special order only.

Widths and weights

Block weight for 440 x 215mm face dimensions					
block width (mm)					
100	140	150†	190†	200†	215†
block weight[1]					
6.4	9.0	9.6	12.2	12.9	13.8
wall weight[2] @ equilibrium moisture content (kg/m²)					
76	106	114	144	151	163

[1] Weights quoted are based on 3% equilibrium moisture content. For typical as received weights the above figures should be increased by a further 25%. This is, however, dependent on climatic and storage conditions.

[2] Weight of erected wall (including mortar).

Properties

- Mean compressive strength not less than 4.0N/mm²
- Design thermal conductivity (λ) 0.16W/m.K
- Dry thermal conductivity value:
  (λ_{10}, dry, unit) 0.14W/m.K
- Specified gross dry density 660kg/m³

Hi-Strength Paint Grade Smooth

- **inner leaves of external walls**
- **partitions**

Strength
7.3N/mm²
Thermal conductivity
0.18W/m.K
Density
730kg/m³

Hi-Strength Paint Grade Smooth combines the high-quality appearance of Paint Grade Smooth with the compressive strength of Thermalite Hi-Strength blocks.

It is recommended that a Hi-Strength Paint Grade Smooth sample panel is erected for comparison purposes before construction commences and that selection is undertaken during construction. It may also be necessary to fill small blow holes before decoration.

Due to width variations within manufacturing tolerances, it may be difficult to build solid partition walls which have a smooth and even surface on both sides.

Working dimensions

Face dimensions (mm) 440 x 215, 440 x 430†

Tolerances

- For general purpose mortar:
  Length: + 3mm, - 5mm
  Width: ± 2mm
  Height: + 3mm, - 5mm
- For Thin Layer Mortar:
  Length: ± 3mm
  Width: ± 2mm
  Height: ± 1.5mm

† Manufactured to special order only.

Widths and weights

Typical as received block weight for 440 x 215mm face dimensions					
block width (mm)					
100	140	150†	190†	200†	215†
block weight[1]					
7.1	10.0	10.7	13.5	14.2	15.3
wall weight[2] @ equilibrium moisture content (kg/m²)					
82	115	124	157	165	177

[1] Weights quoted are based on 3% equilibrium moisture content. For typical as received weights the above figures should be increased by a further 19%. This is, however, dependent on climatic and storage conditions.

[2] Weight of erected wall (including mortar).

Properties

- Mean compressive strength not less than 7.3N/mm²
- Design thermal conductivity (λ) 0.18W/m.K
- Dry thermal conductivity value:
  (λ_{10}, dry, unit) 0.16W/m.K
- Specified gross dry density 730kg/m³

Party Wall

- **separating walls**
- **partitions**
- **external walls**
- **foundations**

Strength
4.0N/mm²
Thermal conductivity
0.16W/m.K
Density
660kg/m³

Party Wall blocks give high levels of sound reduction in separating walls between buildings.

- Suitable for both cavity and solid wall constructions
- Available in large format
- For use with Thermalite Thin Layer Mortar

Working dimensions
Face dimensions (mm) 440 x 215, 440 x 430†

Tolerances
- For general purpose mortar:
  Length: + 3mm, - 5mm
  Width: ± 2mm
  Height: + 3mm, - 5mm
- For Thin Layer Mortar:
  Length: ± 3mm
  Width: ± 2mm
  Height: ± 1.5mm

Properties
- Mean compressive strength not less than 4.0N/mm²
- Design thermal conductivity (λ) 0.16W/m.K
- Dry thermal conductivity value:
  (λ_{10}, dry, unit) 0.14W/m.K
- Specified gross dry density 660kg/m³

† Manufactured to special order only in 100mm width.

Widths and weights

Block weight for 440 x 215mm face dimensions	
block width mm	
100	215
block weight[1]	
6.4	13.8
wall weight[2] @ equilibrium moisture content (kg/m²)	
76	163

[1] Weights quoted are based on 3% equilibrium moisture content. For typical as received weights the above figures should be increased by a further 20%. This is, however, dependent on climatic and storage conditions.

[2] Weight of erected wall (including mortar). Add 11kg/m² per side for a 2-coat lightweight plaster finish (24kg/m² for dense plaster).

Floorblock

- **beam and block floors**

Strength
4.0N/mm²‡
Thermal conductivity
0.16W/m.K
Density
660kg/m³

Floorblock is an efficient method of providing insulated floors. It is light in weight and is designed for use with all proprietary T-beams and can improve thermal performance of the floor.

Detailing is made simple by the availability of special Floor Endblocks and Coursing Slips in two modular bedding heights for closing at the edge of the floor.

Note: After the Floorblocks have been positioned, before any traffic or loading is allowed and before any floor finish is commenced, the floor must be grouted with a 1:4 cement/sharp sand composition.

‡ 7.3N/mm² also available on request, subject to manufacturer's assessment.

Widths and weights

Block weights[1]			
face dimensions (mm)	440 x 350	440 x 215	540 x 440*
block width (mm)	100	100	100
block weight[1]	10.5	6.4	16.2
Floor Endblock† Block weights[1]			
face dimensions (mm)	440 x 140		
block width (mm)	150	175	
block weight†[1]	5.7	6.7	

* Blocks can be laid to correspond with 540mm beam spacing (660kg/m³ density only).

[1] Weights quoted are based on 3% equilibrium moisture content. For typical as received weights the above figures should be increased by a further 19%. This is, however, dependent on climatic and storage conditions.

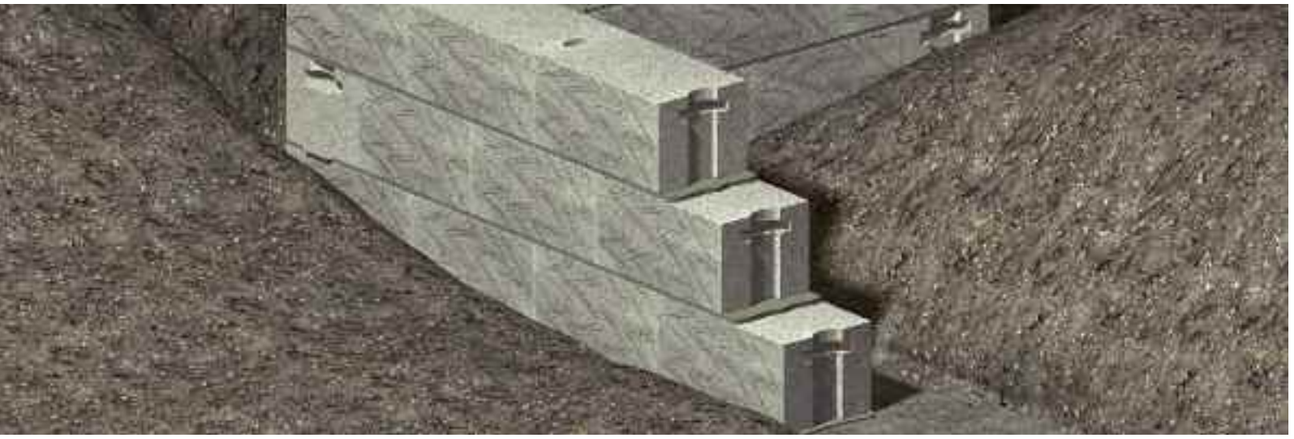
† Manufactured to special order only.

Properties
- Mean compressive strength not less than 4.0N/mm²
- Design thermal conductivity (λ) 0.16W/m.K
- Dry thermal conductivity value:
  (λ_{10}, dry, unit) 0.14W/m.K
- Specified gross dry density 660kg/m³

Trenchblock/ Tongue & Groove

• foundations

Strength
3.6N/mm²
Thermal conductivity
above dpc 0.15W/m.K
below ground 0.24W/m.K
Density
600kg/m³



Thermalite Trenchblock is a tried and tested, economical alternative to the construction of cavity walls with concrete infill for foundations.

- For use in soils of up to Design Sulfate Class DS 4
- Available with tongue and groove joints and handholds
- Improves thermal performance
- Eliminates the need to mortar perpends

Dimensions

- Face dimensions (mm): 440 x 215, 440 x 140*

*Not available with tongue and groove joints.

Tolerances

- For general purpose mortar:
  Length: + 3mm, - 5mm
  Width: ± 2mm
  Height: + 3mm, - 5mm
- For Thin Layer Mortar:
  Length: ± 3mm
  Width: ± 2mm
  Height: ± 1.5mm

Properties

- Mean compressive strength: not less than 3.6N/mm²
- Design thermal conductivity (λ): 0.15W/m.K (above dpc), 0.24W/m.K (below ground)
- Dry thermal conductivity value: (λ_{10}, dry, unit) 0.13W/m.K
- Specified gross dry density: 600kg/m³

Widths and weights

Block weight for 440 x 215mm face dimensions			
block width mm			
255	275	300	355
block weight¹			
14.9	16.1	17.5	20.8
wall weight @ equilibrium moisture content (kg/m²)			
178	192	210	248

Widths and weights

Block weight for 440 x 140mm face dimensions†			
block width mm			
255	275	300	355
block weight¹			
9.7	10.5	11.4	13.5
wall weight @ equilibrium moisture content (kg/m²)			
185	200	218	258

¹ Weights quoted are based on 3% equilibrium moisture content. For typical as received weights the above figures should be increased by a further 19%. This is, however, dependent on climatic and storage conditions.

† Manufactured to special order only.

Hi-Strength Trenchblock/ Tongue & Groove

• foundations

Strength
7.3N/mm²
Thermal conductivity
above dpc 0.18W/m.K
below ground 0.29W/m.K
Density
730kg/m³

Thermalite Hi-Strength Trenchblock provides all the benefits of Trenchblock, together with the 7.3N/mm² compressive strength of Thermalite Hi-Strength.

- For use in soils of up to Design Sulfate Class DS 4
- Available with tongue and groove joints and handholds

Dimensions

- Face dimensions (mm): 440 x 215, 440 x 140**

**Not available with tongue and groove joints.

Tolerances

- For general purpose mortar:
  Length: + 3mm, - 5mm
  Width: ± 2mm
  Height: + 3mm, - 5mm
- For Thin Layer Mortar:
  Length: ± 3mm
  Width: ± 2mm
  Height: ± 1.5mm

Properties

- Mean compressive strength: not less than 7.3N/mm²
- Design thermal conductivity (λ): 0.18W/m.K (above dpc), 0.29W/m.K (below ground)
- Dry thermal conductivity value: (λ_{10}, dry, unit) 0.16W/m.K
- Specified gross dry density: 730kg/m³

Widths and weights

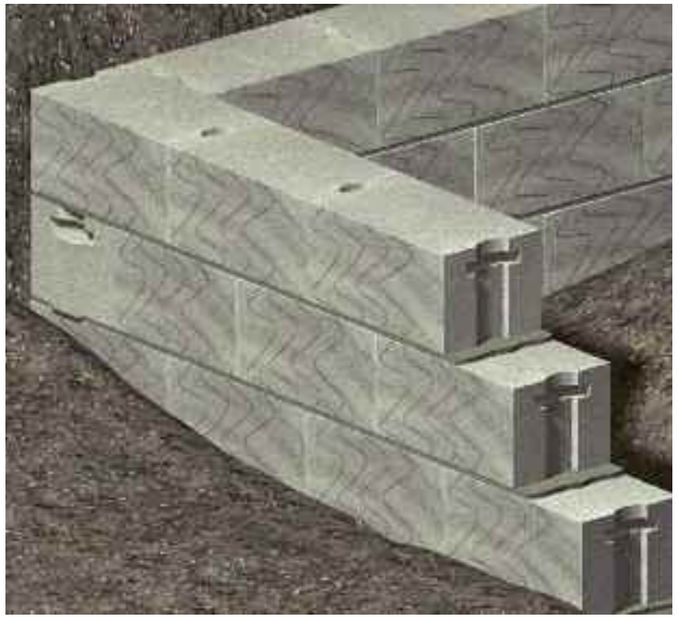
Typical as received block weight for 440 x 215mm face dimensions			
block width mm			
255	275	300	355
block weight¹			
18.1	19.6	21.3	25.3
wall weight @ equilibrium moisture content (kg/m²)			
210	227	247	293

Widths and weights

Typical as received block weight for 440 x 140mm face dimensions†			
block width mm			
255	275	300	355
block weight¹			
11.8	12.7	13.9	16.4
wall weight @ equilibrium moisture content (kg/m²)			
216	233	255	301

¹ Weights quoted are based on 3% equilibrium moisture content. For typical as received weights the above figures should be increased by a further 20%. This is, however, dependent on climatic and storage conditions.

† Manufactured to special order only.



Coursing Brick

- **bonding**
- **coursing**
- **infill**
- **making-up**

Strength
2.9, 7.3, 9.0†N/mm²
(10.4 N/mm² equivalent)‡
Thermal conductivity
standard 0.15W/m.K
Hi-Strength 7 0.18W/m.K
Hi-Strength 10 0.19W/m.K

Coursing Bricks are aerated blocks produced in standard brick sizes for use in bonding and infill to ensure that a uniform thermal performance is achieved throughout the wall.

- Protect against pattern staining
- Improves linear thermal bridging values
- Infill above doors and windows
- Coursing at floor and ceiling level
- Making-up between joists
- Hi-Strength Coursing Bricks are also available for use in walls built of Hi-Strength 7 and Hi-Strength 10 blocks

Working dimensions

- Face dimensions (mm) 215 x 65

Properties

- Mean compressive strength:
  Standard 2.9N/mm²
  Hi-strength 7 7.3N/mm²
  Hi-strength 10 9.0N/mm²
- Design thermal conductivity (λ):
  Standard 0.15W/m.K
  Hi-strength 7 0.18W/m.K
  Hi-strength 10 0.19W/m.K
- Dry thermal conductivity value:
  Standard (λ_{10}, dry, unit) 0.13W/m.K
  Hi-strength 7 (λ_{10}, dry, unit) 0.16W/m.K
  Hi-strength 10 (λ_{10}, dry, unit) 0.17W/m.K

Notes
Thermalite Coursing Bricks are suitable for use externally and internally, above or below dpc level in loadbearing or non-loadbearing applications.

Loadbearing walls should not be constructed with Thermalite Coursing Bricks as the sole masonry unit.

Additionally, standard Coursing Bricks should not be used in walls where the compressive strength requirement for the blockwork is in excess of 2.9N/mm².

Widths

Coursing Brick						
face dimensions (mm)	215 x 65					
block width (mm)	100	115	125	130†	140	150
Hi-Strength Coursing Brick						
face dimensions (mm)	215 x 65					
block width (mm)	100	115†	125†	140	150†	

†Manufactured to special order only. Please allow a minimum of 10 working days for availability.

‡Blocks are manufactured to BS EN 771-4, Category 1 which allows the use of an enhanced partial safety factor. This provides the equivalent of 10.4N/mm² compressive strength. Manufactured to special order only.

Thin joint masonry

Thin joint masonry

Thermalite Thin Joint Masonry is a fast, clean and accurate system of construction, designed to lower costs by reducing the time taken to build walls. The thin joint system can achieve improvements on many different build programmes and when used with aircrete blocks, the depth of mortar can be reduced from 10mm to 3mm, or less.

'Overall, the use of Thermalite blocks in a thin joint construction can improve build quality and offers time and cost **savings for the builder.**'

Introduction

Thermalite Thin Joint Masonry is a fast, clean and accurate construction system using Thermalite blocks manufactured to a high degree of dimensional accuracy and a thin layer of mortar.

Trials were first conducted on thin joint construction in the 1980s, but there is a far longer history of its use in continental Europe. The increasing demands of the UK construction industry for higher build quality, greater productivity, and improved thermal performance, airtightness and waste reduction, mean that the benefits offered by Thin Layer Mortar are becoming increasingly relevant.

Thin layer mortar

Thermalite Thin Layer Mortar is a pre-mixed, cement-based product which, once added to water, makes an easily applied mortar. It differs from general purpose mortar in that it sets far more rapidly, thus giving early stability to the construction.

It provides an alternative to general purpose sand/cement mortar and allows the depth of the mortar to be reduced from at least 10mm to 3mm or less.

Thin joint masonry

The benefits offered by Thermalite Thin Layer Mortar are provided by a system which retains many of the characteristics of traditional blockwork construction. This means that familiarity with the build process and flexibility are inherent in the system.

The nature of Thermalite blocks and strict control of the manufacturing process ensures that the blocks are produced to a high degree of dimensional accuracy (± 1.5mm on bed height) making them ideal for use with Thermalite Thin Layer Mortar.

Benefits

All of the blocks in the Thermalite range can be produced with the required tolerances for use in walls constructed using Thermalite Thin Layer Mortar. This allows both designers and builders to benefit from the full range of opportunities offered by this construction.

Faster build speed

The application of Thermalite Thin Layer Mortar to Thermalite blocks is achieved by the use of a serrated scoop applicator, which allows mortar to be quickly and accurately applied to the bed joint of the wall. The full benefits can be realised on long runs of walling.

Independent speed trials, conducted by a leading Chartered Building Surveyor, have indicated that a wall of Thermalite blocks and Thermalite Thin Layer Mortar can be laid twice as fast as that built with aggregate blocks and general purpose mortar (see Speed Trial Report, page 32).

This speed of construction can be further enhanced when using Thermalite Large Format blocks, which have a face size equivalent to two traditional concrete blocks.

Increased productivity

Thermalite Thin Layer Mortar is different from general purpose mortar in that it sets far more rapidly. The same high levels of productivity are not achievable with masonry built using general purpose mortar, which requires more time to attain sufficient strength to support further construction, thus limiting the height that can be built in one day.

Typically, Thermalite blocks built with Thermalite Thin Layer Mortar will be stable after 60 minutes. This will allow the amount of walling that can be built to be increased and enable the earlier installation of other components, such as floors and roof timbers.
The completion of a weathertight envelope allows brickwork to be taken off the critical path and for internal work, such as plastering, service installation and partitioning to progress.

Improved thermal performance

The thermal insulation requirements of the Building Regulations call for attention to be given to the effects of cold bridging. Consequently, when calculating U-values for walls, heat loss through mortar joints must be taken into consideration.

By reducing the amount of mortar in any given area of wall by at least 70%, compared with a traditional mortar joint, heat loss through the mortar joints is reduced. In a clear cavity construction, an improvement of up to 10% in U-values is possible.

Improved airtightness of construction

The thermal performance of the wall is also improved by the effect of Thermalite Thin Layer Mortar on the airtightness of the construction. Reducing the air infiltration rate of the masonry will, in turn, decrease the ventilation heat loss through the fabric.

Airtightness test results for Thermalite 100mm blockwork and Thermalite Thin Layer Mortar, as conducted by the Building Services Research and Information Association (BSRIA) were better than $<0.10 m^3/1(h.m^2)$, the lowest possible score.

Reduced site wastage

A key benefit of Thermalite blocks is that they can be easily cut, sawn and worked accurately on site.
The precision cutting of blocks for use with Thermalite Thin Layer Mortar allows greater utilisation of the blocks, which can substantially reduce site wastage.

Mortar wastage can also be minimised through correct application and by mixing only the required amount of mortar for the job in hand.

Improved construction quality

The combination of high tolerance blocks and Thin Layer Mortar allows greater accuracy to be achieved for the internal face of a completed wall, which can provide a suitable substrate for the application of thin coat spray plaster. This has the added advantage of fast application and quick drying times, resulting in further productivity gains.

Improved construction performance

Through a combination of benefits - including waste minimisation, improved U-values, improved quality of build and structural performance (as recognised in BS EN1996-1-1), Thermalite Thin Joint Masonry helps to achieve all levels of the Code for Sustainable Homes.

Products

Thermalite Thin Layer Mortar
Thermalite Thin Layer Mortar is factory-made and supplied as a dry, pre-mixed, bagged product. It is cement-based and, once added to water, gives a mortar that is easy to apply and has high stability.

Thermalite Thin Layer Mortar is manufactured under a quality system approved by the BSI.

Thin layer mortar should be stored in dry conditions.

It is recommended that the mortar is used in temperatures at, or above 5°C.

Working below these temperatures, down to -6°C, is only possible by protecting building elements in accordance with Codes of Practice.

Product data – Thin Layer Mortar

Bag weight	25kg
Approximate coverage	(100mm thick walling) 13m^2
Compressive strength	9.0 - 12.0N/mm^2
Density	1800kg/m^3

Thermalite products
The high level of performance achieved by Thermalite products, combined with the extensive block range offered, ensures that cost-effective solutions for walls and foundations can be achieved with thin joint construction.

Thin joint construction can be employed with all the Thermalite products listed below.

- Turbo
- Shield
- Trenchblock/Tongue & Groove
- Paint Grade Smooth
- Hi-Strength 7
- Hi-Strength 10
- Hi-Strength Paint Grade Smooth
- Hi-Strength Trenchblock
- Party Wall

Thermalite Large Format blocks
Thermalite Large Format blocks have been specifically designed to complement the use of Thermalite Thin Layer Mortar and offer considerable productivity gains.

They are produced with face dimensions of 440 x 430mm in a range of thicknesses. This is equivalent to two normal concrete blocks, or twelve bricks.

Order quantities
In a thin joint masonry construction, the maximum joint thickness is only 3mm. Consequently, when blocks with a face size of 440 x 215mm are selected an additional 4% of blocks will be required to complete a m^2 of walling.

When Large Format blocks with a face size of 440 x 430mm are selected for use in thin joint walling, an additional 5% of blocks will be required to complete a m^2 of walling.

The Thermalite House

The principal objectives of the 'Thermalite House' project were to establish that the thin joint system could safely be used to construct the loadbearing inner leaf of masonry up to wall plate level, without the stabilising effect of the brickwork outer leaf, and to complete this process quickly and accurately.

The successful results indicated that brickwork could be taken off the critical path and the shell made weatherproof far earlier in the building programme.

The project also identified, and solved, the problems that a typical builder would face when using the thin joint process for the first time.

Pre-construction planning and partnering agreements with other component suppliers were found to offer significant advantages in the construction of thin joint masonry.

By pre-planning the inclusion of standard and cut blocks into the large format block structure, it was possible to accommodate design datum levels for floors and wall plate, as well as minimising cutting,

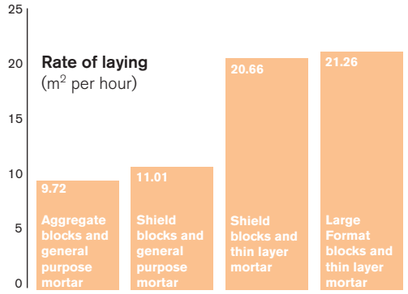
Following the successful completion of the project, the Thermalite thin joint system can be recommended and endorsed for the building of the loadbearing inner leaf of a two-storey house, up to roof level.

'The adoption of thin joint in the design and build process **will significantly increase speed and efficiency of construction,** reduce wastage on site and improve SAP energy ratings.'

Conclusions
- The inner leaf of a three bedroom detached house, including floor and roof truss installation, was completed in a combined time of just 16 hours, using a standard team of two block layers and one labourer.
- The quick setting properties of Thermalite Thin Layer Mortar, combined with the inherent dimensional accuracy of the blocks, aided stability and allowed rapid vertical progress.
- Temporary buttressing was found to be unnecessary at ground floor level, even prior to the inclusion of the first floor joists.
- Because of the design of the first floor walls, temporary buttressing was found to be necessary to aid stability prior to roof truss placement.
- After wall plate location, roof truss placement and restraint strapping, temporary bracing of the upper floor walls could be safely removed without risk to the structure.

Speed trial report

The following is a synopsis of independent tests conducted by Percy Howes, Chartered Surveyors, using Thermalite.



Introduction
The tests were conducted to determine the effects of replacing general purpose mortar with Thermalite Thin Layer Mortar in typical inner leaf masonry constructions.

Specification
L-shaped walls were constructed, each 100mm thick and of a similar length and height (4.5m x 1.5m), for stability and to reflect normal building practice.

The wall types chosen for comparison were:

- Aggregate blocks and general purpose mortar
- Thermalite Shield blocks and general purpose mortar
- Thermalite Shield blocks and Thin Layer Mortar
- Thermalite Large Format blocks and Thin Layer Mortar.

Testing
The speed tests were undertaken and completed over a two-day period. The same operatives undertook each test to rule out the human factor.

Rate of laying
The average block laying rates calculated from the speed trials are shown in the graph above.

Comparative results
The times taken to build one wall panel with corner, in each of the wall types chosen were as follows:

Wall type	Time taken
Aggregate blocks and general purpose mortar	32 mins : 30 secs
Shield blocks and general purpose mortar	28 mins : 50 secs
Shield blocks and Thin Layer Mortar	16 mins : 20 secs
Large Format blocks and Thin Layer Mortar	14 mins : 40 secs

Conclusions
- A simple wall built with standard Thermalite Shield blocks and Thin Layer Mortar can be erected almost twice as quickly as a similar one built with aggregate blocks and general purpose mortar.
- A simple wall built with standard Thermalite Shield blocks and Thin Layer Mortar can be erected 70% faster than a similar wall built with general purpose mortar. The speed benefit will be reduced if window openings are incorporated, due to the need to accurately cut blocks.
- A simple wall built with Large Format blocks and Thin Layer Mortar can be erected 35% faster than a similar wall built with standard size material.
- The erected Thermalite Thin Layer Mortar panels were set and stable within half an hour of laying. This did not apply to the general purpose mortar panels.

Installation

The build process is as simple as with general purpose mortar. The skills required are very similar. It is necessary, for example, to maintain regular checks of level and line.

In common with all types of masonry, Thermalite thin joint blockwork should generally be constructed to BS 5628: Part 3 'Code of Practice for the use of Masonry – Materials, Components, Design and Workmanship'*.

Setting out

The most important aspect to achieving the full benefits of thin joint masonry lies in the quality of the base course. Base course blocks must be bedded in general purpose mortar and laid level, aligned, vertical, and be fully set before commencement of thin joint construction. The use of a laser level has been found to be beneficial in this process. It must be stressed that inaccuracy in this base course cannot easily be corrected in the subsequent Thin Layer Mortar beds.

Any damp proof membrane should be incorporated into the base course bed joint.

Pre-construction planning will allow maximum advantage to be taken of the thin joint system, particularly with Large Format blocks.

Thin joint masonry combines a thin mortar bed of 2-3mm with standard, close-tolerance, Thermalite blocks. This will not course with the standard brick coursing of the outer leaf.

For the inner leaf, a mix of standard bed height, 240mm bed height, 140mm bed height, Large Format and cut blocks can be used to meet design datum levels for floors and roof plate. A thicker bed of Thin Layer Mortar, or general-purpose mortar, can be used when making up to a level of a few millimetres.

Mixing
The correct application and performance of Thermalite Thin Layer Mortar is reliant on attention being given to the mixing procedure.

Thermalite Thin Layer Mortar must be mixed in a suitable mixing tub (always add mortar to water) at a rate of one 25kg bag of mortar to 5.75-6.0 litres of clean water. Mix with an electrical slow-speed drill with a whisk attachment for approximately 2-3 minutes. Allow to stand for 5 minutes to enable mortar to gain its properties. A short final re-mix will create folds in the mortar which is indicative of correct consistency.

The mortar remains workable in normal conditions in the tub for not less than 2 hours, with occasional re-mixing. No additional mixtures or water should be added. To minimise wastage, the rate of mixing should be equated to the rate of use.

*No longer current, but still cited in Building Regulations.

Installation

Laying
Minor adjustments to the build process should be considered to gain most benefit from the product, for example, applying mortar to the exposed block perpends whilst retained in the pack. Alternatively, blocks could be placed on a flat surface which will enable a number of perpendicular joint faces to be mortared to a consistent standard in one operation.

Use of the recommended notched scoop will deliver the appropriate depth and spread of mortar to the block bed surface and perpendicular joint.

Subject to ambient conditions, the exposed mortar bed will remain workable for up to 20 minutes. However, once blocks have been laid, initial setting takes place within 10 minutes; any adjustment should be made during the correction period.

Cutting
It is recommended that the blocks be cut to size using either a powered bench saw, reciprocating saw or block saw. To ensure the correct meeting of the jointing surfaces, attention to the squareness and clean lines of the cut face is necessary.

Wall ties
Wall ties designed for use with general purpose mortar are not suitable for use with thin joint masonry. Helical wall ties are most suitable and can be hammered into the Thermalite blocks to a minimum depth of 50mm (90mm with Turbo material).

Adjustable face fix ties may also be used. Helical ties can be obtained with a retaining clip allowing installation of cavity insulation without loss of performance.

Ties should be installed at not less than 2.5 ties per square metre (900mm centres horizontally, 450mm vertically). Additional ties will be required around openings and at movement joints, at centres not more than 300mm and within 225mm of the unreturned or unbonded edge.

It is important to ensure that the wall is set and stable before application of the ties. The tie manufacturer's instructions should be followed, and special tools used where recommended.

Wall ties should comply with either DD140 or BS EN 845-1 and should be made of material as per references 1 or 3 in BS EN 845 Table A1, austenitic stainless steel. To satisfy the requirements of Approved Document A, 'Structure', wall ties should be selected in accordance with Table 5 of that document.

Movement joints
In common with all cement-based products, Thermalite walls are subject to movement as the walls dry out. BS 5628: Part 3* recognises that drying out movement occurs in all types of concrete masonry and recommends that such movement should be considered at the design stage.

It is particularly important to provide movement joints in long runs of walls such as those that occur in industrial, commercial and large residential buildings. It is also important to provide movement joints in external solid walls and in the outer faces of external cavity walls. The following general recommendations apply to aircrete:

- Blockwork walls in excess of 6m in length should be divided up into a series of rectangular panels, separated by movement joints at no more than 6m centres.
- Where a wall is continuous at internal or external corners, the location of the first joint should be approximately 3m from the angle.

Movement may be accommodated using movement joints or bed joint reinforcement/movement control mesh, or a combination of the two. Where a movement joint is required, this should be built in as work proceeds.

Bed joint reinforcement/movement control mesh
In walls containing openings, or in areas where stress is anticipated, movement joints may need to be provided at more frequent intervals than 6m. Alternatively, the masonry should be reinforced with bed joint reinforcement of adequate length to distribute any stresses into adjacent blockwork and extending at least 600mm each side and 430mm above and below each opening (see page 81).

Optimum performance can be achieved with the provision of bed joint reinforcement/movement control mesh for the full perimeter at levels as indicated.

As the mortar joint is thin, the reinforcement must be no more than approximately 1.5mm thick. Proprietary stainless steel, galvanised or steel mesh bed joint reinforcement, manufactured for use with thin joint masonry, is available for use with Thermalite in thin joint blockwork. Always follow manufacturers' instructions. Alternatively, a GRP (glass reinforced plastic) movement control mesh may be used where reinforcement of the masonry is not required. Please contact Hanson's Product Services department for further advice.

Wall junctions
At wall junctions where either a movement joint is located, or where normal bonding is not possible, straight joints may be used provided that ties are built in across the joint.

Other components, such as joist hangers, lintels, cavity trays, restraint straps, can be accommodated by chasing or cutting of the blockwork, as necessary.

Supervision and workmanship
As with all masonry, the level of supervision during installation of Thermalite thin joint blockwork and the associated structure must be sufficient to ensure the quality of workmanship as described in BS 5628: Part 3* and Annex A thereof.

*No longer current but still cited in Building Regulations.

Performance

Part L and thermal insulation

Building Regulations Part L 2010 is intended to deliver a 25% improvement in thermal performance and energy efficiency over Part L 2006 (equivalent to Level 3 of the Code for Sustainable Homes).

Part L 2010, like the previous document, adopts a single compliance route based on the whole building energy performance approach. Therefore elemental U-values alone will not achieve the required 25% improvement factor.

Introduction
The new Approved Document L came into effect on 1 October 2010 and allows a transitional period for the following existing work:

- Existing work which had already started before 1 October 2010 and where a building notice or full plans had been deposited with the Building Control Body (BCB)
- New build, where a building notice or full plans had been deposited with the BCB before 1 October 2010 and work to have started on site before 1 October 2011.

As with the previous 2006 document, the new Part L 2010 is published in four parts:

Dwellings - L1 will be sub-divided into:
- L1A: New Dwellings
- L1B: Work on Existing Dwellings

Non-dwellings - L2 will be sub-divided into:
- L2A: New Buildings other than dwellings (compliance by NCM/SBEM 2010)
- L2B: Work on Existing Buildings other than dwellings (compliance by elemental approach)

A dwelling, means a self-contained unit such as a house or flat designed to accommodate a single household and must meet the requirements of AD L1.

Rooms for residential purposes (such as nursing homes, residential homes, hostels and hotels) are not dwellings and must meet the requirements of AD L2.

Summary of main changes

Regulation changes
It is now a requirement to submit CO_2 Target Emission Rates (TER), Dwelling Building Emission rates (DER/TER) for the building, and a list of specifications used in the calculations to the BCB before work starts on site.

Party wall bypass
SAP2005 assumed no heat loss through the party wall bypass affect, but in SAP2009, effective U-values are assigned based on the construction of the party wall.

Construction	U-value
Solid wall	0.0
Unfilled cavity with no effective edge sealing	0.5
Unfilled cavity with effective edge sealing*	0.2
Fully filled cavity with effective edge sealing*	0.0

A fully filled cavity separating wall (or party wall) for the purposes of this regulation means a cavity wall which has been insulated such that no continuous air path communicates between the top and bottom of the wall, nor are there any uninterrupted air paths between flanking elements at either end of the wall, whether or not such junctions are edge-sealed, nor between any intervening structural junctions or service penetrations in the separating wall.

Generally, the insulation should be designed such that, after installation, it will be in contact with both sides of the cavity. However, in practice, it should be ensured that any resultant voids do not interconnect and that any such voids are not so extensive as to provide an air path between external wall cavities and/or floor, roof and intermediate floor cavities. The wall may then be regarded as fully filled for these purposes.

Thermalite Robust Details E-WM-6, E-WM-10 and E-WM-13 now have the option to use any mineral wool (batts, rolls or blown) insulation (max. density 40kg/m^3) within the cavity of the separating wall. When this is used in conjunction with effective edge sealing*, an effective U-value of 0.0 can be claimed for the separating wall.

*For definition of effective edge sealing, please refer to Building Control Alliance website: **www.buildingcontrolalliance.org**

Linear thermal bridges
Linear thermal bridging is where heat loss occurs through the junction of building elements such as walls and floors where the continuity of the insulation is interrupted. These heat losses may be significant, but can be reduced by adopting accredited construction details (ACDs).

The ACD document produced by the government and the Energy Saving Trust (EST) focuses on insulation continuity and airtightness, and gives guidance to the builder on how to demonstrate that provision has been made to eliminate thermal bridges in the insulation layers.

The use of ACDs means that Ψ (psi) values from Appendix K of SAP2009 can be used, giving an equivalent y-value of 0.08 instead of the default y-value of 0.15 that would otherwise be used. This effectively halves the heat loss from thermal bridges.

Thermalite can offer a number of Enhanced Construction Details (ECDs) that have been verified by the Building Research Establishment (BRE). Using these in conjunction with all other details conforming to ACDs means that greatly reduced Ψ-values can be used instead of those given in ACDs giving an equivalent y-value of 0.04, effectively halving the heat losses again.

For further information please refer to Linear thermal bridging pages 76-77.

Part L and thermal insulation

Air permeability (see also page 48)
Under the requirements of Part L 2010, there will be more on-site testing: either three units or 50% of each dwelling type should be tested on each site, whichever is the lesser. Blocks of flats are treated as separate sites, even if there are multiple blocks within the same development.

The specific dwellings to make up the test sample should be selected by the BCB in consultation with the appointed pressure testing body.

The other significant change is the relevant information to include in the DER calculation. Where pressure tested, this specific figure should be used. For non-tested dwellings, the DER figure should be the average test results achieved for the same dwelling type +2.0m^3/(h.m^2) at 50Pa. In other words, this means that design air permeability will be nearer 8.0m^3/(h.m^2) to achieve compliance with the maximum value of 10.0.

Thermal mass
The heat capacity of the external and internal building fabric will be used in the calculation of TER and DER results. The internal walls, floors and ceilings now have to be defined, along with any party walls. Increasing the effective thermal mass reduces the need for heating and cooling. However, the rules for calculating heat capacity mean that items such as internal drylining, thermal lining and lightweight construction will reduce the effective thermal mass.

The effect of thin joint masonry
The use of Thermalite Thin Layer Mortar, with a bed joint thickness of approximately 2.5mm, can provide a significant contribution to improving the overall U-value of a masonry wall without the need to increase the amount of insulation.

This is seen at its most effective in solid wall constructions, as shown on pages 46-47.

For cavity constructions, although the contribution to improved thermal performance of Thin Layer Mortar is less than that for the solid walls, useful improvements on U-values can be gained, in addition to the airtightness benefits offered by thin joint construction.

Specific heat capacity
The mean specific heat capacity of dry Thermalite over the temperature range 20–100° is 1.05kJ/kg °C.

Improved limiting U-values

New limiting U-values have been introduced for the building fabric and have been set out in the table below:

Table 1a: New build – AD L1A

Fabric element	U-value (W/m^{2}K)
External walls	0.30
Roofs	0.20
Party walls	0.20
Floors	0.25
Windows	2.00

These values are not too difficult to achieve and would have already been used to comply with Part L 2006. Adopting lower U-values throughout the design will help to avoid the need for renewable energy technologies to meet emissions targets.

Extension to dwellings – AD L1B
For extensions, AD L1B requires that the wall achieves a U-value of 0.28W/m^{2}K.

Also for extensions, AD L1B can be met by limiting the total area of windows, roof windows and doors in extensions so that it does not exceed the sum of:

- 25% of the floor area of the extension and
- the total area of any windows or doors which, as a result of the extension works, not longer exist.

The U-values should meet the standards set out in the table below:

Table 1b: New build – AD L1B

Fabric element	U-value (W/m^{2}K)
Wall	0.28
Pitched roof – insulation at ceiling level	0.16
Pitched roof – insulation at rafter level	0.18
Pitched roof or roof with integral insulation	0.18
Floors	0.22
Swimming pool basin	0.25

Part L and thermal insulation

Full fill

Full fill construction

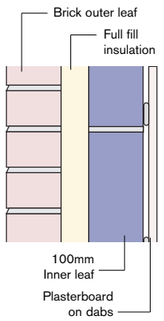


Table 2: Minimum thickness of insulation in mm required to achieve illustrated U-values (W/m²K)

Inner leaf block	Insulation conductivity (W/m.K)	U-value (W/m²K)						
		0.30	0.28	0.25	0.22	0.20	0.18	0.15
Turbo	0.021	45	49	58	69	78	90	114
	0.032	68	75	88	105	119	141	191
	0.034	71	79	94	112	131	150	-
	0.037	78	86	102	122	142	174	-
	0.040	84	93	110	135	163	188	-
Shield	0.021	48	53	62	73	82	93	116
	0.032	73	80	93	111	125	146	196
	0.034	77	85	99	118	136	165	-
	0.037	84	94	108	131	148	180	-
	0.040	91	100	117	142	170	194	-
Hi-Strength 7	0.021	50	54	63	74	84	95	118
	0.032	75	83	96	113	131	149	199
	0.034	80	88	102	120	139	168	-
	0.037	87	96	111	134	160	183	-
	0.040	94	103	120	145	173	198	-

Full fill construction

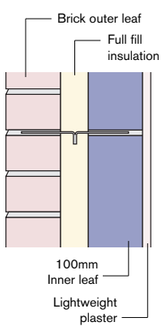


Table 3: Minimum thickness of insulation in mm required to achieve illustrated U-values (W/m²K)

Inner leaf block	Insulation conductivity (W/m.K)	U-value (W/m²K)						
		0.30	0.28	0.25	0.22	0.20	0.18	0.15
Turbo	0.021	47	51	60	71	81	92	115
	0.032	71	78	92	109	123	144	194
	0.034	75	83	97	115	134	163	-
	0.037	82	90	106	129	146	178	-
	0.040	88	98	114	139	167	192	-
Shield	0.021	50	55	64	75	84	95	118
	0.032	76	84	97	114	132	150	199
	0.034	81	89	103	121	140	169	-
	0.037	88	96	112	135	161	184	-
	0.040	95	104	121	146	174	199	-
Hi-Strength 7	0.021	52	57	65	77	86	97	120
	0.032	79	86	100	107	134	162	-
	0.034	84	91	106	124	143	172	-
	0.037	91	100	115	138	164	187	-
	0.040	98	108	124	149	177	-	-

Table 4: Minimum thickness of insulation in mm required to achieve illustrated U-values (W/m²K) in conjunction with 100mm blockwork

Inner leaf block	Insulation conductivity (W/m.K)	U-value (W/m²K)						
		0.30	0.28	0.25	0.22	0.20	0.18	0.15
Turbo	0.021	36	41	50	61	70	81	104
	0.032	55	62	75	92	106	123	165
	0.034	58	66	80	98	113	133	174
	0.037	63	72	87	106	123	144	189
	0.040	68	77	94	115	134	160	-
Shield	0.021	40	45	53	64	74	85	107
	0.032	60	67	81	98	112	129	171
	0.034	64	72	84	104	119	139	181
	0.037	69	78	93	113	131	151	196
	0.040	75	84	101	122	141	167	-
Hi-Strength 7	0.021	41	46	55	66	75	87	109
	0.032	63	70	83	100	114	133	174
	0.034	67	74	89	106	121	142	184
	0.037	72	81	96	116	134	158	199
	0.040	78	87	104	125	148	170	-

Full fill construction

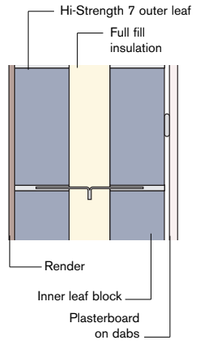
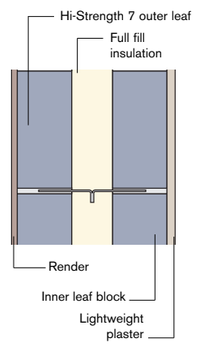


Table 5: Minimum thickness of insulation in mm required to achieve illustrated U-values (W/m²K) in conjunction with 100mm blockwork

Inner leaf block	Insulation conductivity (W/m.K)	U-value (W/m²K)						
		0.30	0.28	0.25	0.22	0.20	0.18	0.15
Turbo	0.021	38	43	52	63	72	84	106
	0.032	58	65	79	96	110	129	169
	0.034	62	70	84	101	116	136	178
	0.037	67	76	91	110	128	148	193
	0.040	72	82	98	119	138	164	-
Shield	0.021	42	47	56	67	76	87	110
	0.032	63	71	84	101	115	134	167
	0.034	67	75	89	107	122	142	185
	0.037	73	82	97	117	135	159	200
	0.040	79	88	105	126	145	172	-
Hi-Strength 7	0.021	44	49	57	68	78	89	111
	0.032	66	74	87	104	118	137	177
	0.034	70	78	92	110	125	145	188
	0.037	76	85	100	120	136	163	-
	0.040	82	92	108	131	149	175	-

Full fill construction



Part L and thermal insulation

Partial fill

Partial fill construction

Low emissivity cavity resistance 0.644m²K/W

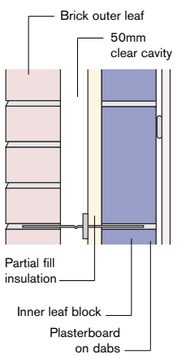


Table 6: Minimum thickness of insulation in mm required to achieve illustrated U-values (W/m²K) in conjunction with 100mm blockwork

Inner leaf block	Insulation conductivity (W/m.K)	U-value (W/m²K)						
		0.30	0.28	0.25	0.22	0.20	0.18	0.15
Turbo	0.021	31	36	44	55	65	76	98
	0.022	32	37	46	58	68	79	103
	0.023	34	39	49	61	71	83	107
Shield	0.021	34	39	48	59	68	80	102
	0.022	36	41	50	62	72	83	107
	0.023	37	43	52	65	75	87	111
Hi-Strength 7	0.021	36	41	50	61	70	81	104
	0.022	38	43	52	64	73	85	108
	0.023	39	45	54	67	77	89	113

Partial fill construction

Low emissivity cavity resistance 0.644m²K/W

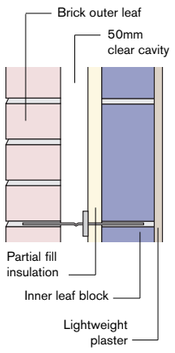


Table 7: Minimum thickness of insulation in mm required to achieve illustrated U-values (W/m²K) in conjunction with 100mm blockwork

Inner leaf block	Insulation conductivity (W/m.K)	U-value (W/m²K)						
		0.30	0.28	0.25	0.22	0.20	0.18	0.15
Turbo	0.021	33	38	47	58	67	78	100
	0.022	35	40	48	60	70	82	105
	0.023	36	41	51	63	73	86	110
Shield	0.021	37	41	50	61	71	82	104
	0.022	38	43	53	64	74	86	109
	0.023	40	45	55	67	77	89	114
Hi-Strength 7	0.021	38	43	52	63	72	84	106
	0.022	40	45	54	66	76	88	111
	0.023	42	47	57	69	78	91	116

Table 8: Minimum thickness of insulation in mm required to achieve illustrated U-values (W/m²K) in conjunction with 100mm blockwork

Inner leaf block	Insulation conductivity (W/m.K)	U-value (W/m²K)						
		0.30	0.28	0.25	0.22	0.20	0.18	0.15
Turbo	0.021	23	27	36	47	56	68	90
	0.022	24	29	38	49	59	71	94
	0.023	25	30	39	52	62	74	98
Shield	0.021	26	31	40	51	60	71	94
	0.022	27	32	42	53	63	75	98
	0.023	28	34	43	56	66	78	102
Hi-Strength 7	0.021	28	33	41	53	62	73	95
	0.022	29	34	43	55	65	76	100
	0.023	30	36	45	57	68	80	104

Partial fill construction

Low emissivity cavity resistance 0.644m²K/W

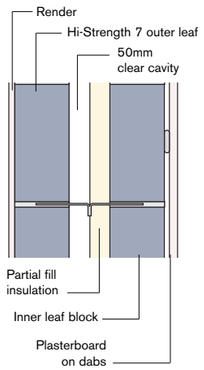
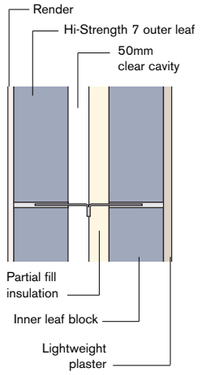


Table 9: Minimum thickness of insulation in mm required to achieve illustrated U-values (W/m²K) in conjunction with 100mm blockwork

Inner leaf block	Insulation conductivity (W/m.K)	U-value (W/m²K)						
		0.30	0.28	0.25	0.22	0.20	0.18	0.15
Turbo	0.021	25	30	38	50	59	70	92
	0.022	26	31	40	52	61	73	97
	0.023	27	32	42	54	64	76	101
Shield	0.021	28	33	42	53	62	74	96
	0.022	30	35	44	56	65	77	100
	0.023	31	36	46	58	68	80	105
Hi-Strength 7	0.021	30	35	44	55	64	75	98
	0.022	31	37	46	57	67	78	102
	0.023	33	38	48	60	70	82	107

Partial fill construction

Low emissivity cavity resistance 0.644m²K/W



Part L and thermal insulation

External solid wall

External solid wall construction

20mm external render
Traditional mortar

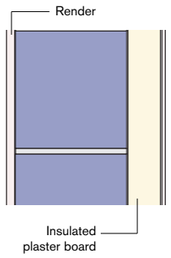


Table 10: Thickness of Thermaline Super or K17 insulated plasterboard in mm required to achieve illustrated U-values (W/m²K)

	Insulated plasterboard thickness						
	30mm	40mm	50mm	60mm	70mm	80mm	90mm
Single leaf block	U-value (W/m²K)						
215mm Turbo	0.35	0.30	0.26	0.22	0.20	0.18	0.17
265mm Turbo	0.32	0.27	0.24	0.21	0.19	0.17	0.16
300mm Turbo	0.29	0.25	0.22	0.20	0.18	0.16	0.15
190mm Shield	0.42	0.35	0.30	0.25	0.22	0.20	0.18
190mm Hi-7	0.45	0.37	0.31	0.26	0.23	0.21	0.19
215mm Hi-7	0.43	0.35	0.30	0.26	0.23	0.20	0.18

External solid wall construction

20mm external render
Thin layer mortar

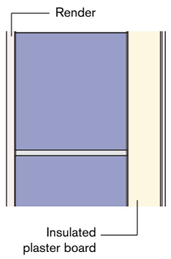


Table 11: Thickness of Thermaline Super or K17 insulated plasterboard in mm required to achieve illustrated U-values (W/m²K)

	Insulated plasterboard thickness						
	30mm	40mm	50mm	60mm	70mm	80mm	90mm
Single leaf block	U-value (W/m²K)						
215mm Turbo	0.32	0.28	0.24	0.21	0.19	0.18	0.16
265mm Turbo	0.28	0.25	0.22	0.20	0.18	0.16	0.15
300mm Turbo	0.26	0.23	0.21	0.18	0.17	0.16	0.14
190mm Shield	0.40	0.33	0.29	0.24	0.22	0.20	0.18
190mm Hi-7	0.43	0.35	0.30	0.26	0.23	0.20	0.19
215mm Hi-7	0.41	0.34	0.29	0.25	0.22	0.20	0.18

Table 12: Thickness of Structherm insulation located externally in mm required to achieve illustrated U-values (W/m²K)

	Expanded polystyrene λ=0.038			Platinum polystyrene λ=0.030			Mineral fibre λ=0.036			Phenolic foam λ=0.022		
	100	150	200	100	150	200	100	150	200	100	150	200
Single leaf block	U-value (W/m²K)											
215mm Turbo	0.22	0.17	0.14	0.19	0.14	0.12	0.21	0.16	0.13	0.15	0.11	0.09
265mm Turbo	0.20	0.16	0.13	0.18	0.14	0.11	0.20	0.15	0.13	0.15	0.11	0.09
300mm Turbo	0.19	0.15	0.13	0.17	0.13	0.11	0.19	0.15	0.12	0.14	0.11	0.09
190mm Shield	0.25	0.19	0.15	0.21	0.16	0.12	0.24	0.18	0.14	0.17	0.12	0.10
190mm Hi-7	0.26	0.19	0.15	0.22	0.16	0.13	0.25	0.18	0.15	0.17	0.12	0.10
215mm Hi-7	0.25	0.19	0.15	0.21	0.16	0.12	0.24	0.18	0.14	0.17	0.12	0.10

External solid wall construction

Plasterboard on dabs internally
Traditional mortar

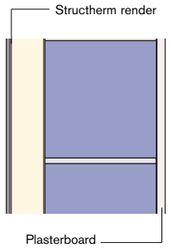
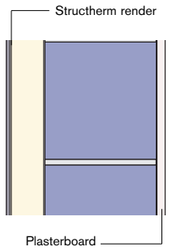


Table 13: Thickness of Structherm insulation located externally in mm required to achieve illustrated U-values (W/m²K)

	Expanded polystyrene λ=0.038			Platinum polystyrene λ=0.030			Mineral fibre λ=0.036			Phenolic foam λ=0.022		
	100	150	200	100	150	200	100	150	200	100	150	200
Single leaf block	U-value (W/m²K)											
215mm Turbo	0.21	0.16	0.13	0.18	0.14	0.11	0.20	0.16	0.13	0.15	0.11	0.09
265mm Turbo	0.19	0.15	0.13	0.17	0.13	0.11	0.19	0.15	0.12	0.14	0.11	0.09
300mm Turbo	0.18	0.15	0.12	0.16	0.13	0.10	0.18	0.14	0.12	0.13	0.10	0.08
190mm Shield	0.24	0.18	0.15	0.20	0.15	0.12	0.23	0.17	0.14	0.16	0.12	0.09
190mm Hi-7	0.25	0.19	0.15	0.21	0.16	0.12	0.24	0.18	0.14	0.17	0.12	0.10
215mm Hi-7	0.24	0.18	0.15	0.21	0.15	0.12	0.23	0.18	0.14	0.17	0.12	0.09

External solid wall construction

Plasterboard on dabs internally
Thin layer mortar



Air permeability

Thermalite blocks have a micro-crystalline closed cellular structure that is highly resistant to the passage of air. The fact that air permeability contributes to both the thermal and sound insulation performance of a building is recognised in the Building Regulations.

Air permeability

In addition to the increase of the required U-values, Part L of the Building Regulations specifies that the air permeability limits be set at 10m³/(h.m²) (at 50 pascals pressure). Thermalite blocks have a micro-crystalline cellular structure that is highly resistant to the passage of air, and have impressive performance levels that are confirmed by independent tests undertaken by BSRIA, detailed below:

Table 14: Air permeability

Report 15055A/1
100mm Thermalite Shield blocks <0.1m³/(h.m²) with acrylic sealed joints
100mm Thermalite Shield blocks <0.1m³/(h.m²) Thin Layer Mortar joints
Report 15919A
100mm Thermalite Turbo blocks 0.18m³/(h.m²) with acrylic sealed mortar joints
Report 16918A
100mm Thermalite Turbo blocks 0.22m³/(h.m²) with acrylic sealed mortar joints
100mm Thermalite Turbo blocks 1.04m³/(h.m²) with standard mortar joints
The conclusion can be drawn that, when used as recommended, Thin Layer Mortar joints offer a higher level of sealing performance than standard mortar joints.

Thermalite success with air seepage tests

Thermalite products have achieved success in air seepage tests carried out by a leading house builder. Using Thermalite aircrete blocks throughout the inner leaf of a cavity wall, the houses all achieved less than the required airflow rate of <10m³/(h.m²) @ 50 Pa. These plots, constructed in traditional mortar, returned results that ranged from 2.60m³/(h.m²) to 8.81m³/(h.m²), with the highest figure recorded for an uncompleted house.

Table 15: Air seepage

Plot number	Airflow rate (m³/(h.m²)
104	2.60
137	8.81
140	3.96
143	5.90

Fire protection

All Thermalite products provide excellent fire protection. They are classified as A1, non-combustible in accordance with BS EN 771-4.

Compliance with Building Regulations

The following requirements of the Building Regulations can therefore be easily satisfied:

1. Means of escape.
2. Internal fire spread (surfaces): surfaces within the building should be such as to inhibit the spread of flame.
3. Internal fire spread (structure): the structure shall be designed so as to inhibit the spread of fire and retain its stability for a reasonable period.
4. External fire spread: the external surfaces of the building shall offer adequate resistance to the spread of fire from one building to another.

Combustibility

Thermalite blocks are classified as non-combustible in accordance with the Building Regulations, and Class A1, non-combustible, in accordance with BS EN 771-4.

Fire resistance

Information contained in the Building Regulations and in BS 5628–3* confirms that Thermalite may be used to achieve fire resistance grades as given in the following table, and is consistent with the information contained in BS EN 1996-1-2. All data has been adjusted to suit available block sizes.

Table 16: Fire resistance based on BS 5628-3

Wall type	Fire resistance grade (hr) for block thickness (mm)				
	1hr	2hr	3hr	4hr	6hr
Non-loadbearing single leaf unplastered	75	75	75	100	150
Loadbearing single leaf unplastered	90	100	140	190	215
Non-load bearing cavity wall (per leaf) unplastered	75	75	75	75	90
Loadbearing cavity wall (per leaf) unplastered	90	100	140	150	150

Table 17: Fire resistance based on thickness

Wall type	Fire resistance grade (hr) for block thickness (mm)					
	0.5hr	1hr	1.5hr	2hr	3hr	4hr
Thermalite Turbo Load bearing, single leaf,unplastered (plastered)						
a ≥ 1.0	100	100	125	125	150	150
	(100)	(100)	(115)	(125)	(150)	(150)
a ≥ 0.6	100	100	100	125	140	150
	(100)	(100)	(100)	(100)	(125)	(125)
Thermalite Turbo Non-loadbearing, single leaf, unplastered (plastered)						
	100	100	100	100	100	100
	(100)	(100)	(100)	(100)	(100)	(100)
Thermalite Shield, Paint Grade Smooth, Party Wall, Hi-Strength Loadbearing, single leaf, unplastered (plastered)						
a ≥ 1.0	90	90	100	100	140	150
	(90)	(90)	(90)	(90)	(100)	(100)
a ≥ 0.6	90	90	100	100	125	150
	(90)	(90)	(90)	(90)	(100)	(100)
Thermalite Shield, Paint Grade Smooth, Party Wall, Hi-Strength Non-loadbearing, single leaf unplastered (plastered)						
	75	75	75	75	75	100
	(75)	(75)	(75)	(75)	(75)	(100)

Note: a = the proportion of load on a wall.

Surface spread of flame

It is often sufficient that materials should not be readily ignitable and that their tendency to spread flame be limited.

The surface spread of flame tests in BS 476: Part 7 define spread of flame as 'propagation of a flame front over the surface of a product under the influence of proposed irradiance'.

Thermalite blocks have a Class 0 resistance to surface spread of flame as described in the Building Regulations.

* No longer current but still cited in Building Regulations.

Sound insulation

Hanson offers a wide range of Thermalite block solutions for walls and floors, to satisfy the performance standards of Part E of the Building Regulations, as well as the specific needs of builders and designers. Hanson solutions to Part E offer high levels of performance and can achieve compliance through Robust Details, pre-completion testing and alternate design and test.

Background

Unwanted sound, particularly in dwellings, has in recent years given rise to an increasing number of complaints by occupiers. It was recognised that existing standards, of both regulation and workmanship were failing to protect residents adequately. Rising housing densities, changes of lifestyle, technology, perception and tolerance had all contributed to the pressure for change. Therefore, Approved Document E (AD E) was amended in 2003 and again in 2010.

The overall aim of the amendments to AD E was to improve the sound insulation, through better specification and workmanship, both between and within dwellings, as well as between rooms in hostels, hotels and residential homes. The scope has been extended to cover reverberation in common parts of blocks of flats and acoustic conditions in schools.

AD E provides some of the technical specifications and solutions that may be adopted to satisfy the new statutory requirements; as an alternative to pre-completion testing, the use of Robust Details will demonstrate compliance with AD E for new dwellings. Robust Details are high-performance separating wall and floor constructions (with associated details) that are expected to be sufficiently reliable not to need the check provided by pre-completion testing.

AD E Requirements

E1 Protection against sound from other parts of the building and adjoining buildings

E1 states:

Dwelling-houses, flats and rooms for residential purposes shall be designed and constructed in such a way that they provide reasonable resistance to sound from other parts of the same building and from adjoining buildings.

As part of the construction process, sound insulation testing (Pre-completion testing) to demonstrate compliance with Requirement E1 should be carried out on site and is the responsibility of the builder. Testing should be carried out for the 4 categories listed in Tables 18a and 18b in accordance with the procedure and testing regime outlined in Section 1 of AD E.

As an alternative to pre-completion testing in purpose built dwelling-houses and flats, separating walls and floors shall be designed and constructed as specified in the Robust Details Handbook. These approved designs represent minimum performance standards far superior to those in the Approved Document, and eliminate the need for pre-completion testing.

Robust Detail wall constructions (E-WM-6, E-WM-10, E-WM-13, E-WM-15) are illustrated on page 74.

E1 Performance requirements for pre-completion testing

Table 18a
Dwelling-houses and flats – performance standards for separating walls, separating floors, and stairs that have a separating function

	Airborne sound insulation ($D_{nT,w} + C_{tr}$) dB (minimum values)	Impact sound insulation ($L'_{nT,w}$) dB (maximum values)
Purpose built dwelling-houses and flats		
Separating walls	45	–
Separating floors and stairs	45	62
Dwelling-houses and flats formed by material change of use		
Separating walls	43	–
Separating floors and stairs	43	64

Table 18b
Rooms for residential purposes – performance standards for separating walls, separating floors and stairs that have a separating function

	Airborne sound insulation ($D_{nT,w} + C_{tr}$) dB (minimum values)	Impact sound insulation ($L'_{nT,w}$) dB (maximum values)
Purpose built rooms for residential purposes		
Separating walls	43	–
Separating floors and stairs	45	62
Rooms for residential purposes formed by material change of use		
Separating walls	43	–
Separating floors and stairs	43	64

Thermalite E1 solutions

Table 19
Thermalite Robust Details separating walls, no pre-completion testing required. (applies to purpose built dwelling-houses and flats)

Robust detail	E-WM-6	E-WM-10	E-WM-13	E-WM-15
Block density range (kg/m³)	600-800	600-800	600-800	600-800
Thermalite product(s)	Shield Party wall Hi-Strength 7 Hi-Strength 10	Shield Party wall Hi-Strength 7 Hi-Strength 10	Shield Party wall Hi-Strength 7 Hi-Strength 10	Shield Party wall Hi-Strength 7 Hi-Strength 10
Block thickness	100mm (min.)	100mm (min.)	100mm (min.)	100mm (min.)
Mortar type	General purpose mortar	Thin layer mortar	Thin layer mortar	General purpose mortar
Wall tie	Type 'A'	Ancon Staifix HRT4 or Clan PWT4	No wall ties – the structural adequacy of the wall should be assessed by a structural engineer	Type 'A'
Cavity	75mm (min.) clear cavity or option of insulating with mineral wool with a maximum density of 40kg/m³. This includes mineral wool batts, rolls and blown mineral wool	75mm (min.) clear cavity or option of insulating with mineral wool with a maximum density of 40kg/m³. This includes mineral wool batts, rolls and blown mineral wool	75mm (min.) clear cavity or option of insulating with mineral wool with a maximum density of 40kg/m³. This includes mineral wool batts, rolls and blown mineral wool	75mm (min.) leaf-to-leaf, partially filled with 35mm Saint Gobain Isover RD35 mineral wool acoustic batt
Internal finish	Gypsum-based board (nominal 8 kg/m²) on dabs on nominal 8mm render coat with scratch finish (or British Gypsum Gyproc Soundcoat Plus)	Gypsum-based board (nominal 8 kg/m²) on dabs on nominal 8mm render coat with scratch finish (or British Gypsum Gyproc Soundcoat Plus)	Gypsum-based board (nominal 8 kg/m²) on dabs on nominal 8mm render coat with scratch finish (or British Gypsum Gyproc Soundcoat Plus)	Gypsum-based board (nominal 9.8 kg/m²) on dabs
Code for Sustainable Homes credits - Sound insulation	1	0	3	1
Code for Sustainable Homes credits and Green Guide rating	1 (B*)	2 (A*)	1 (B)	2 (A*)

Notes – All constructions require the external (flanking) walls to be masonry with 50mm (min.) cavity.
All plots to be pre-registered with Robust Details Limited.
All constructions should be built in accordance with the Robust Details Handbook.
*Thermalite-specific rating which outperforms the generic aircrete rating.

Sound insulation

Table 20
Use of Thermalite Robust Details in flats/apartments using Robust Detail separating floors

	Concrete separating floors											Code for Sustainable Homes credits - sound Insulation (see note 3)	Code for Sustainable Homes credits for materials and Green Guide rating
	E-FC-1 (pre-cast plank & screed)	E-FC-4 (pre-cast plank, screed on 'Thermal Economics Isorubber')	E-FC-5 (pre-cast plank, screed on 'Cellecta Yelofon HD10+')	E-FC-6 (beam & aggregate block, screed on 'Regupol E48')	E-FC-7 (beam & aggregate block, screed, floating floor)	E-FC-8 (pre-cast plank, bonded floor cover on screed on resilient layers)	E-FC-9 (pre-cast plank, 'Isorubber Top' on screed)	E-FC-10 ('Isorubber top' on in-situ concrete)	E-FC-11 (pre-cast plank screed on 'Icopal-Monarfloor Tranquilt')	E-FC-12 (pre-cast plank 'Thermal Econmics Isorubber Base HP3')	E-FC-13 (pre-cast plank Instacoustic Instalay 65		
Separating wall construction													
E-WM-6* see note 1 (Shield, Party Wall, Hi-Strength 7 or 10)	F	✓	✓[2]	F	F	✓	✓	✓	F	F	F	1	1(B*)
E-WM-10* see note 1 (Shield, Party Wall, Hi-Strength 7 or 10)	F	✓	✓[2]	F	F	✓	✓	✓	F	F	F	0	2(A*)
E-WM-13* see note 1 (Shield, Party Wall, Hi-Strength 7 or 10)	F	✓	✓[2]	F	F	✓	✓	✓	F	F	F	3	1(B)
E-WM-15* see note 1 (Shield, Party Wall, Hi-Strength 7 or 10)	F	✓	✓[2]	F	F	✓	✓	✓	F	F	F	1	2(A*)
Inner leaf of external (flanking) wall construction (subject to structural requirements)													
Turbo (density 470kg/m³)	X	✓	✓	X	X	X	X	X	X	✓	✓		
Shield (density 600kg/m³)	X	✓	✓	X	X	✓	✓	X	X	✓	✓		
Party Wall (density 660kg/m³)	X	✓	✓	X	X	✓	✓	X	X	✓	✓		
Hi-Strength 7 (density 730kg/m³)	X	✓	✓	X	X	✓	✓	X	X	✓	✓		
Hi-Strength 10 (density 800kg/m³)	X	✓	✓	X	X	✓	✓	X	X	✓	✓		
Code for Sustainable Homes credits for sound insulation[3]	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**3**	**0**	**1[4]**	**1**		
Code for Sustainable Homes credits for Green Guide rating	**1, 0.5 or 0.5** (B to D)	**0.5 or 0.25** (C or D)	**0.5** (C)	**0.5 or 0.25** (C or D)	**2 or 1** (A or B)	**0.5 or 0.25** (C or D)	**0.5 or 0.25** (C or D)	**1** (B)	**0.5** (C)	**NR***	**0.25** (D)		

Key
✓ Permissible wall and floor combinations for flats/apartments which do not require pre-completion sound testing
X Wall may not be used with floor
F Only the separating floor requires pre-completion sound testing
NR No rating at time of publication (see **www.bre.co.uk/greenguide**)

Notes
1 At least one storey of the separating wall flanking the separating floor must be built with Hi-Strength 7 or Hi-Strength 10 – typically for two-storey flats this will consist of Hi-Strength 7 or 10 on the ground floor as a minimum, with a lower density product (if required) on the first floor. For three storey flats Hi-Strength 7 or 10 on the ground and first floor as a minimum, with a lower density product (if required) on the second floor.

2 200mm (min.) thick precast concrete planks and CT5 ceiling treatment must be used.

3 The number of credits is awarded based on the lower performing wall or floor construction. For example, if the floor is subject to PCT and qualifies for 3 credits and the wall is in the RD scheme and qualifies for 4 credits, only 3 credits would be awarded.

4 Top storey flats only.

* Thermalite-specific rating which outperforms the general rating.

Robust Detail wall constructions (E-WM-6, E-WM-10, E-WM-13, E-WM-15) are illustrated on page 74.

Table 21
Alternative Thermalite cavity separating walls. Pre-completion testing required (applies to new build dwellings – houses, bungalows and flats)

Minimum density required (kg/m³)	650	650	600
Thermalite product	Party Wall	Party Wall	Shield
Thickness of leaves	100mm (min.)	100mm (min.) with a minimum 300mm step or stagger	100mm (min.)
Mortar type	General purpose or Thin Layer Mortar	General purpose mortar	General purpose mortar
Wall tie	Type 'A'	Type 'A'	Type 'A'
Cavity	75mm (min.) clear cavity	75mm (min.) clear cavity	75mm (min.) clear cavity
Internal finish	12.5mm Gypsum-based board (nominal 8kg/m²) on dabs or 13mm lightweight plaster	12.5mm Gypsum-based board (minimum 10kg/m²) on dabs or 13mm plaster.	12.5mm Gypsum-based board (minimum 9kg/m²) on dabs
Flanking wall	Inner leaf of flanking wall shall be 100mm Thermalite Turbo (min.) with a partial fill cavity	See AD E guidance	Inner leaf of flanking wall shall be 100mm Thermalite Shield with a full fill cavity
Authority	British Board of Agrément letter 16/09/03	AD E guidance Wall Type 2.4	Flanking Laboratory test. AD E Annex B, B3.10 to B3.14. BRE test report 215493
Code for Sustainable Homes credits for Green Guide rating	2 (A)	2 (A)	2 (A)

Table 22
Thermalite solid separating walls for rooms for residential purposes and dwellings formed by material change of use

Minimum density required (kg/m³)	730	650
Thermalite product	Hi-Strength 7	Party Wall
Block thickness	215mm	215mm
Mortar type	General purpose mortar	General purpose mortar
Internal finish	Minimum 20mm plaster (minimum mass 10kg/m²)	Minimum 13mm plaster (minimum mass 10kg/m²)
Flanking wall	Inner leaf of flanking wall shall be 150mm Thermalite Hi-Strength with a full fill cavity	Inner leaf of flanking wall shall be 100mm Thermalite Shield with a partial fill cavity
Authority	Supported by UKAS test data	British Board of Agrément letter 16/09/03 and supported by AIRO tests

Sound insulation

E2 Protection against sound within a dwelling-house, etc.
Dwelling-houses, flats and rooms for residential purposes shall be designed and constructed in such a way that internal walls between a bedroom or a room containing a water closet and other rooms, and internal floors, provide reasonable resistance to sound.

Limits on application
Requirement E2 does not apply to:

a) An internal wall which contains a door

b) An internal wall which separates an en suite toilet from the associated bedroom

c) Existing walls and floors in a building which is subject to a material change of use.

Internal walls and floors do not require pre-completion testing but do have to meet the laboratory sound insulation values in Table 24.

Where Robust Details are not employed, the mass per unit area of any load-bearing internal wall or any internal wall rigidly connected to a separating floor should be at least 120kg/m^2 excluding finish.

Where Robust Details are employed, the internal wall should have a minimum mass per unit area of 120kg/m^2 including the finish OR at least that of the approved flanking wall inner leaf, if this is less.

Table 24
Laboratory values for new internal walls and floors within dwelling-houses, flats and rooms for residential purposes, whether purpose built or formed by material change of use

	Airborne sound insulation R_WdB (minimum values)
Internal walls	40
Internal floors	40

Table 23
Thermalite single leaf internal walls – estimated weighted sound reduction values, R_W, from aircrete mass law[(1)]

Product	Block	Unfinished thickness (mm)	Dense plaster[2]	Lightweight plaster[3]	12.5mm plasterboard on dabs[4]
Turbo	100	-	44.4	41.0	41.9
	115	-	45.4	42.3	43.1
	215	46.3	50.3	48.3	48.8
	265	48.8	52.1	50.5	50.9
Shield	100	-	45.8	42.8	43.5
	150	44.4	48.9	46.7	47.2
	300	52.7	55.2	53.9	54.2
Party Wall	100	40.4	46.4	43.5	44.2
	215	49.7	52.8	51.2	51.6
Hi-Strength 7	100	41.5	47.0	44.3	45.0
	150	46.4	50.3	48.3	48.8
	215	50.7	53.6	52.1	52.4
	300	54.7	56.8	55.7	56.0

[1] From paper entitled 'Sound Insulation Performance of Autoclaved Aerated Concrete', Dr A Jones, AIRO.
[2] 24.0kg/m^2 has been added to the erected Thermalite wall weight for each side of two-coat dense plaster.
[3] 11.0kg/m^2 has been added to the erected Thermalite wall weight for each side of two-coat lightweight plaster.
[4] 14.0kg/m^2 has been added to the erected Thermalite wall weight for each side of 12.5mm plasterboard.

Coloured figures: Denote that calculated figures are backed up with test reports, see table 25. Tested values generally tend to be 1-3dB lower than estimated.

Table 25
Weighted sound reduction values of single leaf constructions using Thermalite (Testing carried out by AIRO)

Test Report No.	Construction	R_W (dB)
L/2794/2	Shield, 100mm, solid, drylined	42
L/2794/3	Shield, 100mm, solid, plastered	40
L/2674/1	Party Wall, 215mm, Thin Layer Mortar, solid, drylined	48
L/2674/2	Party Wall, 215mm, Thin Layer Mortar, solid, plastered	51
L/2674/3	Party Wall, 215mm, solid, drylined	48
L/2674/4	Party Wall, 215mm, solid, plastered	51
L/2751/1	Hi-Strength 7, 215mm, solid, drylined	49
L/2751/2	Hi-Strength 7, 215mm, solid, render/skim	54
L2889/1	Hi-Strength 7, 215mm, solid, fair face	51
L2889/2	Hi-Strength 7, 215mm, solid, drylined (Triline)	58
L2889/3	Hi-Strength 7, 215mm, solid, drylined (Gypliner)	61
L2889/4	Hi-Strength 7, 215mm, solid, render/Gypliner	62

E3 Reverberation in the common internal parts of buildings containing flats or rooms for residential purposes

The common internal parts of buildings which contain flats or rooms for residential purposes shall be designed and constructed in such a way as to prevent more reverberation around the common parts than is reasonable.

Limits on application
Requirement E3 only applies to corridors, stairwells, hallways and entrance halls which give access to the flat or room for residential purposes.

To satisfy requirement E3, sound absorption techniques detailed in section 7 of AD E should be employed.

E4 Acoustic conditions in schools

1. Each room or other space in a school shall be designed and constructed in such a way that it has the acoustic conditions and the insulation against disturbance by noise appropriate to its intended use.
2. For the purpose of this Part - 'school' has the same meaning as in section 4 of the Education Act 1 1996 and 'school building' means any building forming a school or part of a school.

To satisfy requirement E4, refer to Building Bulletin 93 'Acoustic Design of Schools' produced by the DFES and published by the Stationery Office. Because of the complexity of the design process, BB93 states, 'In all but the simplest cases, it is advisable to appoint a suitably qualified acoustic consultant, who would normally be a corporate member of The Institute of Acoustics'.

BRE's Acoustics Centre has developed an Excel spreadsheet to help designers carry out calculations of façade insulation and reverberation times in rooms. This can be downloaded from:

http://projects.bre.co.uk/envdiv/school_acoustics

Moisture penetration

All Thermalite products, because of their closed cell structure, provide good resistance to the passage of moisture. Independent tests have indicated that Thermalite blocks make water penetration extremely difficult.

Walls which contain an insulating material with the capacity to store heat, such as Thermalite blocks, can help reduce condensation, because the temperature drop across the wall is gradual.

Vapour resistivity

The vapour resistivity of Thermalite is 60MNs/gm.

Moisture penetration

Both single leaf and cavity masonry walls of various configurations will resist moisture penetration if correctly designed, specified and constructed using proper standards of workmanship as defined in Annex A of BS 5628: Part 3* and BS 8000: Part 3.

Cavity walls

Cavity walls with a minimum outer leaf thickness will perform acceptably in all Exposure Zones, (see Table 26, and map opposite.) Thermalite is commonly used as either the inner leaf to a brick outer leaf separated by a cavity, or as two separate leaves, finished externally with a moisture-resistant or impervious cladding. A cavity wall with a rendered outer leaf of 100mm Shield will perform acceptably in zones of very severe exposure. Generally, a 50mm cavity is satisfactory, but consideration should be given to wider cavities in conditions of severe or very severe exposure.

Single leaf walls

Thermalite is suitable for external solid walls, finished externally with a moisture-resistant or impervious cladding (see Table 27). To provide a weatherproof wall resistant to rain penetration, an appropriate external finish will be necessary, selected by reference to local exposure conditions as described in BRE Report 262 - Thermal insulation: avoiding risks.

Application of insulation

Enhanced levels of insulation required by Building Regulations increase the risk of moisture penetration, if correct standards of specification, application and construction are not applied. The simplified Table 28 indicates recommended wall constructions for insulated masonry walls.

* No longer current but still cited in Building Regulations.

Table 26: Exposure zones

Zone	Description	Quantity of wind-driven rain litres/m² per spell*
1	Sheltered	Less than 33
2	Moderate	33 to less than 56.5
3	Severe	56.5 to less than 100
4	Very severe	100 or more

* Maximum wall spell index with reference to BS 8104

Table 27: Recommended thicknesses of single leaf masonry for different finishes and exposure zones (for walls up to 12m high)

Minimum block thickness (mm)	Unrendered	Rendered as BS 5262	External insulation	Impervious cladding*
90	No	Sheltered	Severe	Very severe
190	No	Moderate	Severe	Very severe
215	Sheltered	Severe	Severe	Very severe
440	Moderate	Severe	Severe	Very severe

* Impervious cladding, as described in BS 5628 : Part 3*, including slates, tile hanging, shingles, timber boarding or sheeting

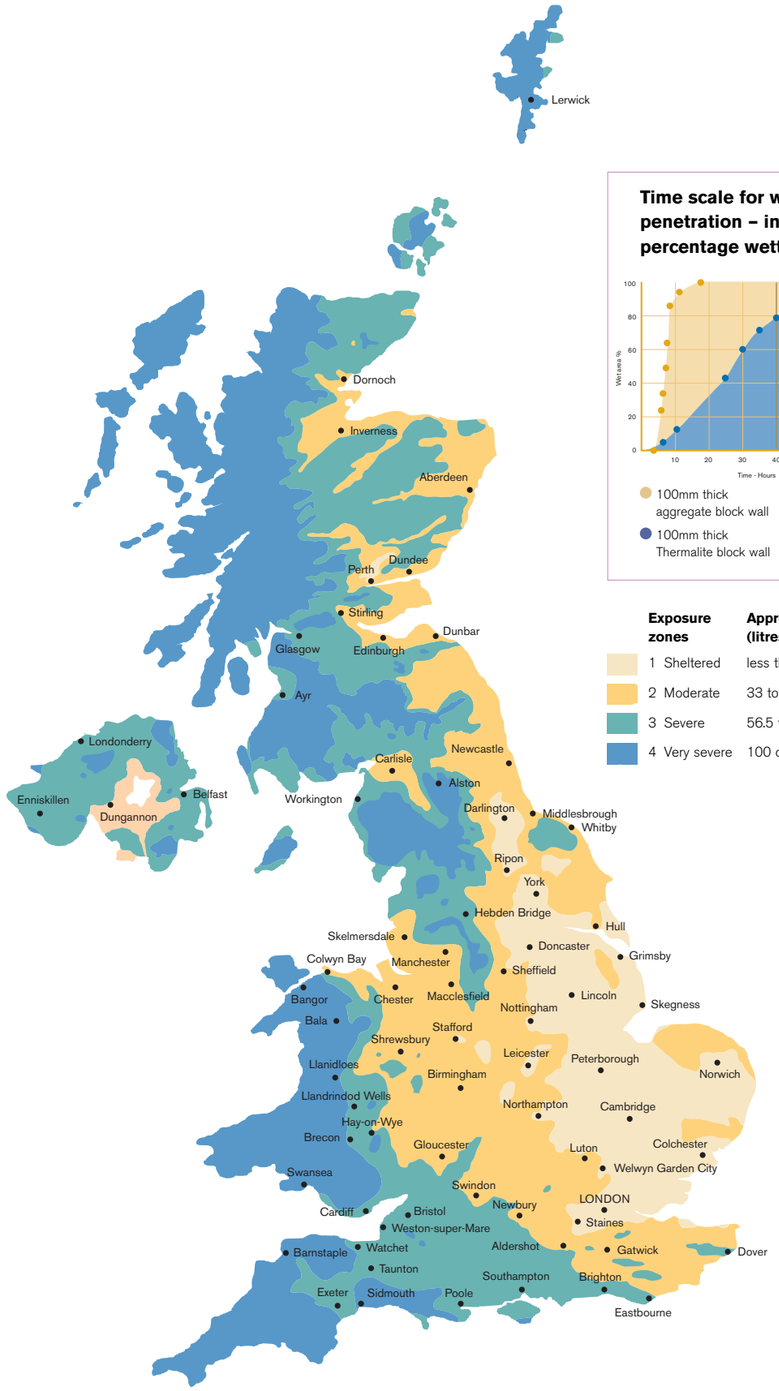
Table 28: Maximum recommended exposure zones (see Table 26) for insulated masonry walls

Insulation type	Built-in full fill		Injected full (not UF foam)		Injected full (UF foam)		Partial fill insulation		Internal
Cavity width (mm)	75	100	75	100	75	100	50* residual	50 clear	50 full fill
Wall type impervious cladding (full height)	4	4	4	4	4	4	4	4	4
Rendered finish (full height)	3	4	4	4	3	3	3	4	3
Facing masonry (tooled flush joints)	2	3	2	3	1	2	2	3	2

Refer to BRE Report 262 *Thermal insulation: avoiding risks* for a full table of recommendations

Building Regulations for England & Wales, Scotland and Northern Ireland contain local requirements

* Partial fill cavities should maintain a minimum 50mm residual clear cavity width.



This map is an extract from *Thermal Insulation: avoiding risks* and is reproduced with kind permission of the BRE.

Frost resistance

The micro-cellular structure of Thermalite, incorporating millions of pockets of trapped air, gives the material protection against the effects of frost.

Independent comparative frost resistance tests have been carried out on facing bricks, common bricks and Thermalite blocks. After 20 freeze/thaw cycles, the facing bricks were severely cracked. At 61 cycles, the Thermalite blocks showed no signs of cracking.

This test was repeated with additional strength tests being carried out after 20, 40 and 60 cycles, and this confirmed that Thermalite has satisfactory frost resistance and that there is no reduction in strength under these conditions.

Table 29: Compressive strength and freeze/thaw resistance (from blocks at each density)

	0 cycles	20 cycles	40 cycles	60 cycles
Saturated cube strength (N/mm^2)	4.67	4.94	5.37	5.45
Change on original	Nil	+15%	+15%	+16%

A similar test undertaken by the British Board of Agrément (BBA) produced similar results.

Table 30: Compressive strength and freeze/thaw resistance (from blocks at each density)

Nominal density (kg/m^3)	As received	After 60 cycles freeze/thaw	Increase
500	3.20	3.25	+1%
600	3.85	4.10	+6%
730	5.80	6.00	+3%

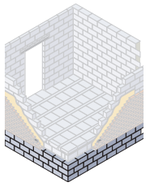
The inherent frost resistance of Thermalite blocks means that all products within the range are suited for use below dpc level. The mortar properties should be appropriate to the degree of frost resistance required.

Design detailing

Foundations

Trenchblock | Hi-Strength Trenchblock | Hi-Strength 7 | Hi-Strength 10 | Shield | Turbo | Party Wall

Thermalite Trenchblock and Hi-Strength Trenchblock are ideal blocks for foundation walling below dpc level. They combine lightweight construction with added insulation and, as no cavity infill is required, Trenchblocks provide a saving in both construction time and cost. Other Thermalite blocks may also be used.



Applications

In addition to Thermalite Trenchblock and Hi-Strength Trenchblock, Hi-Strength 7, Party Wall and Shield blocks can also be used as foundation blocks where soil and groundwater conditions prevail up to and including Class DS4 sulfate levels, and Turbo blocks in conditions of Class DS3, both as defined in Table 2 of BRE Special Digest 1.

Thermal insulation

Foundation walls constructed of Thermalite Trenchblock provide a high level of thermal resistance. This limits the effects of cold bridging at the intersection of the insulated external wall, the ground floor and the foundation wall. See details on pages 62-63.

Thermalite Trenchblock foundation walls can also enhance the U-value of ground floors and reduce the need for additional insulation in the floor construction, making them a cost-effective way of complying with the appropriate regulations.

Typical details

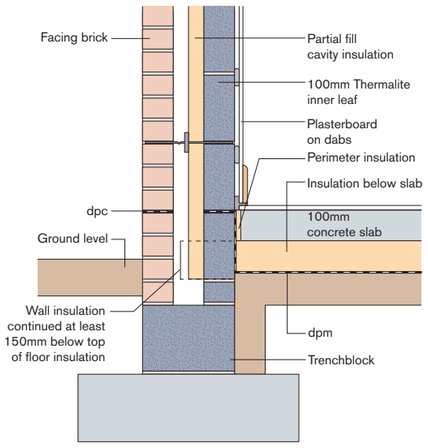
The following typical details are taken from Thermalite Enhanced Construction Details. For further guidance please refer to 'Cost-effective solutions to thermal bridging heat loss' at **www.hanson.com/uk/thermalite**.

Concrete floor slab edge insulation

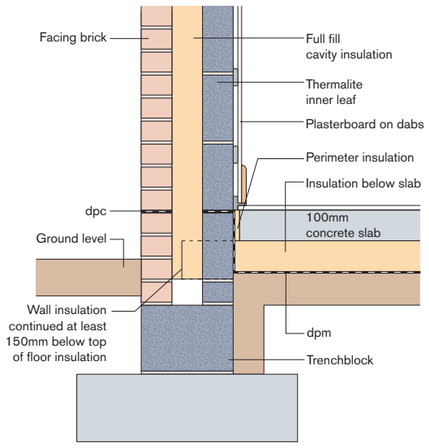
Thermalite Enhanced Construction details require installation of perimeter insulation with a minimum R-value of 0.08m²K/W (eg: 20mm of insulation with a thermal conductivity of 0.025W/m.K).

Using T&G-ended blocks below ground

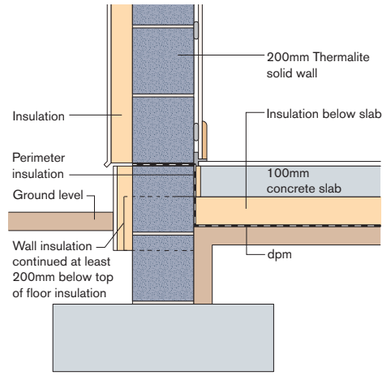
One of the aims of tongue-and-groove configuration is to assist in aligning the tongue-and-groove units: the tongues and grooves do not, and are not intended to, contribute to the structural performance of blockwork incorporating them. As a result, for belowground construction, unless the masonry forms a retaining wall or basement walls, plain ended units can be used with unfilled vertical joints so long as the units are built with their ends closely butted together to stop the passage of vermin.



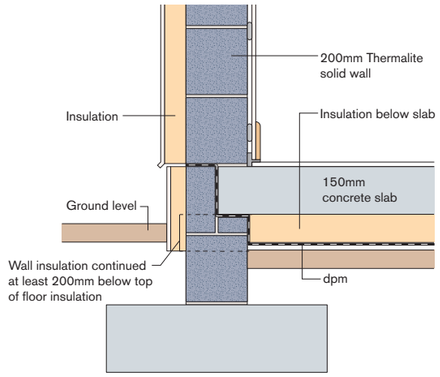
PF-GF-01 - Partial fill cavity wall with ground bearing floor - insulation below slab



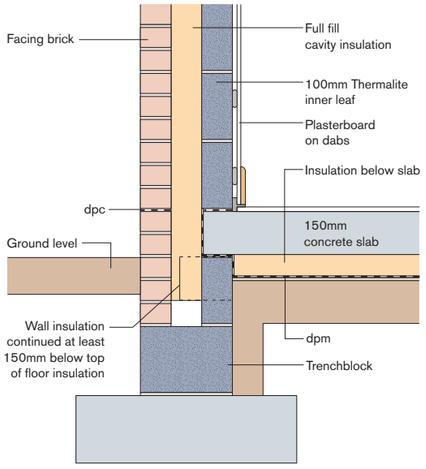
FF-GF-01 - Full fill cavity wall with ground bearing floor - insulation below slab



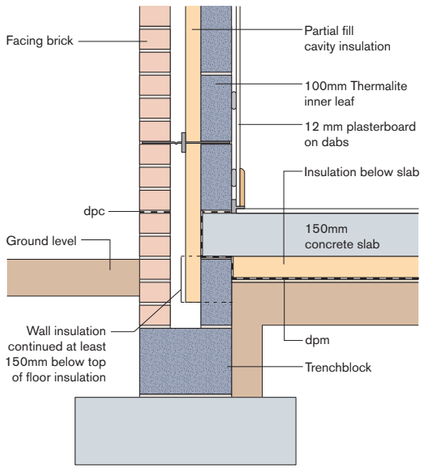
EI-GF-01 - Solid, externally insulated wall with ground bearing floor - insulation below slab



EI-GF-03 - Solid, externally insulated wall with beam and block floor - insulation below slab



FF-GF-03 - Full fill cavity wall with suspended concrete floor - insulation below slab

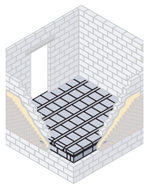


PF-GF-03 - Partial fill cavity wall with suspended concrete floor - insulation below slab

Floors

Floorblock | Floor Endblock | Coursing Slips

Thermalite Floorblock, together with Floor Endblocks and Flooring Slips, form a complete insulated flooring system for use with any proprietary inverted T-beam structure.



Applications

Thermalite Floorblock is suitable for both domestic projects and, with floor beams at closer centres, may also be used in non-domestic applications. For further information, please contact Hanson's Product Services department.

Floors built with Thermalite Floorblock will meet the structural requirements of the Building Regulations, provided that the floor load spans are calculated in accordance with BS 8110: Part 1*, and the Floorblocks are specified and installed in accordance with Agrément Certificate No 91/2723.

Installation

After the Floorblocks have been positioned, before any traffic or loading is allowed, and before any floor finish is commenced, it is recommended that the floor be grouted with a 1:4 cement/sharp sand composition.

Screeding

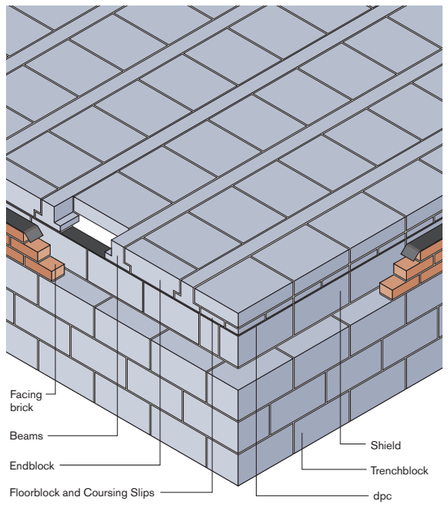
The floor screed should be 1:3 cement/sand in accordance with BS 8204: Part 1. The minimum depth recommended for domestic ground floors is 50mm.

For non-domestic applications, a minimum 50mm thick concrete screed with a minimum compressive strength of 20N/mm^2 should be specified. The manufacturers of the floor beams should be consulted with regard to beam spacing and the possible need for reinforcement to the screed.

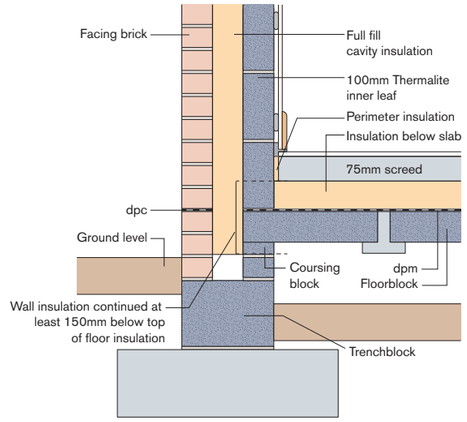
The cement/sand screed can be laid directly on the grouted floor and, unless it is particularly moisture-sensitive, a damp-proof membrane need not be laid over the grouted pre-cast floor.

Floating layers

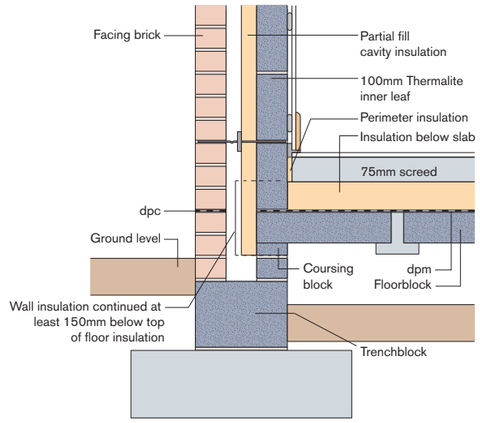
Floating layers, such as timber boarding on battens, including insulation, may be laid over the grouted Floorblocks.



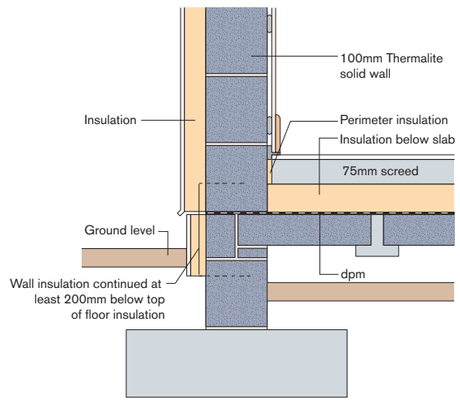
Typical edge detail of inverted T-beam and Floorblock system



FF-GF-02 - Full fill cavity wall with beam and block floor - insulation above slab



PF-GF-02 - Partial fill cavity wall with beam and block floor - insulation above slab

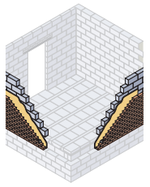


EI-GF-02 - Solid, externally insulated wall with beam and block floor - insulation above slab

External walls

Turbo | Shield | Hi-Strength 7 | Hi-Strength 10 | Party Wall | Paint Grade Smooth | Coursing Bricks

One of the primary functions of external walls is to provide an efficient weathershield, by preventing the penetration of moisture which can have a detrimental effect on the internal structure. The highly moisture-resistant properties of Thermalite aircrete blocks make them ideal for the construction of the inner and outer leaves of external cavity walls, as well as solid external walls.



External walls

The combination of moisture-resistance, strength and thermal insulation performance makes possible a wide range of external wall solutions for all types of buildings from traditional dwellings to commercial/industrial units.

For two-storey dwellings, Thermalite Turbo and Shield are normally more than adequate to satisfy the structural requirements of the Building Regulations. The introduction of Thermalite Hi-Strength 7 and Hi-Strength 10, however, extends the range of Thermalite applications to include three- and four-storey residential buildings, as well as offices and other commercial and industrial buildings.

The inherent thermal insulation characteristics of the Thermalite product range also enable external wall constructions to meet the thermal insulation requirements of the Building Regulations. Possible Thermalite solutions include cavity walls incorporating insulation material that partially or fully fills the cavity or, alternatively, cavity walls with insulating internal lining systems.

External solid walls, which are growing in popularity, are another method of meeting the requirements of the Building Regulations. The external wall may be of solid Thermalite alone or a combination of Thermalite and internal or external insulation systems.

The construction of Thermalite blocks should be carried out in accordance with BS 5628: Parts 1* and 3*, BS 5250 and BS EN1996-2 as well as the information contained in the British Board of Agrément certificate 00/3720.

Lintels

The external wall should be set out to ensure that the ends of lintels bear onto full blocks, not onto cut pieces of block, and the length of the bearing should be at least 150mm.

Situations will occur where the stress beneath the lintel bearing is likely to exceed the design stress. In such cases either the lintel bearing area should be increased or concrete padstones or spreader beams should be positioned beneath the ends of the lintel.

The use of lintels can introduce thermal bridging. Please refer to details on pages 76-77.

Wall ties

It is important that the correct type of cavity wall tie is selected. The wall ties most suitable for use with Thermalite are those that will transmit axial load between the leaves of the cavity wall, but at the same time be sufficiently flexible to allow differential movement to take place between the two leaves.

Wall tiles should comply with BS EN 845-1 and should be made of material as described in references 1 or 3 in BS EN 845 Table A1, austenitic stainless steel. To satisfy the requirements of Approved Document A, 'Structure', wall tiles should be selected in accordance with Table 5 of that document.

In external cavity walls the wall ties should be bedded into each leaf to a minimum depth of 50mm.

The spacing of wall ties should be as given in the following table reproduced from BS 5628: Part 3*.

Table 31: Tie spacing

Least leaf thickness (one or both)	Cavity width (mm)	Equivalent no. of ties per m²	Approximate spacing of ties Horizontal (mm)	Vertical (mm)
65 - 90mm	50 - 75	4.9	450	450
≥ 90mm	50 - 300	2.5	900	450

Additional ties to those shown in the table above should be provided at not more than 300mm vertical centres:

1. Within 225mm of vertical edges of openings
2. Within 225mm of other vertical unrestrained edges (i.e. movement joints)
3. At sloping unrestrained edges (i.e. sloping roof verges)
4. In narrow piers between openings.

* No longer current but still cited in Building Regulations.

Elimination of thermal bridging

The continuous use of Thermalite blocks, together with Thermalite Coursing Bricks, across junctions with floors, will reduce thermal bridging.

See also BRE IP 17/01 *Assessing the effects of thermal bridging at junctions and around openings.* and linear thermal bridging section page 76-77.

Installation

Thermalite blocks are suitable for the construction of external cavity and solid walls, when installed in accordance with the relevant Detail Sheet of Agrément Certificate 00/3720. The walls should be designed and constructed in accordance with the recommendations of BS EN1996-1-1 and 2 and BS EN1966-2, BS 5628: Part 1*, BS 5628: Part 3* and BS 5250.

In addition, the table below gives minimum thicknesses of blocks in solid rendered walls related to exposure conditions as defined in BS 5628: Part 3 and BS EN 1996-1-1 (Eurocode 6).

Table 32: Thickness of rendered Thermalite solid walls for various exposure conditions

Exposure	Minimum block thickness (mm)
Severe	215
Moderate/severe	190
Sheltered/moderate	140
Sheltered	90
Very sheltered	90

For further information on resistance to moisture penetration, see pages 56 and 57.

* No longer current but cited in Building Regulations.

Solid walls

Thermalite is an ideal material for the construction of extensions to existing properties, with a range of block sizes and strengths that offer choice of structural performance, external appearance and internal finish.

Solid wall construction is also viable for the design of complete houses and other buildings, fully in compliance with Building Regulations and Standards, especially when associated with Thermalite Thin Layer Mortar. High levels of insulation can be achieved and advantage can be taken of the thermal mass to assist with heat retention in winter and cooling in summer.

Render is a traditional external finish in many parts of the UK, and is easily applied to Thermalite solid walls to give a wall with excellent resistance to water penetration by wind driven rain (see Table 33).

Table 33: BS 5628-3 describes exposure categories for wind driven rain

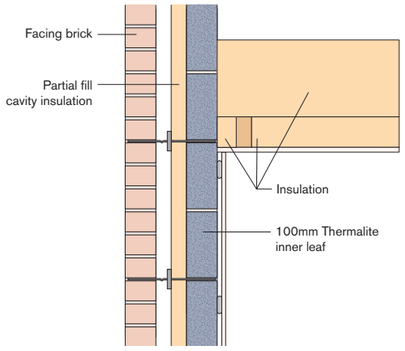
Exposure category	Wall construction
3 – Severe	215mm Thermalite blocks rendered to BS EN 13914-1
4 – Very severe	Solid wall with impervious cladding

In addition to traditional and technical renders, Thermalite will readily accept a range of impervious claddings fixed with either mechanical fasteners or adhesives such as:

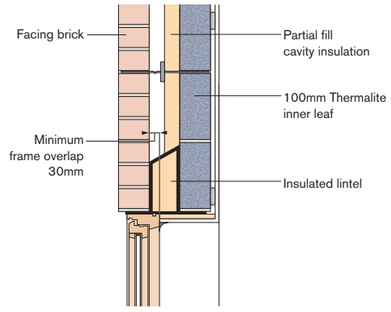
- timber weatherboard
- tile hanging
- manufactured board cladding
- insulated render systems
- ceramic tiles
- brick slip systems.

The ease with which the material can be worked on site, by cutting or chasing, means that it is easy to accommodate standard construction accessories such as lintels, restraints and weathering materials.

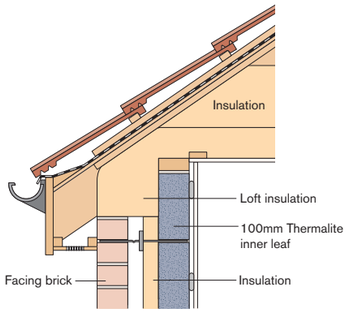
External walls



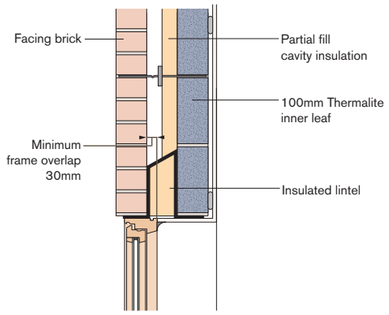
PF-RG-01 - Partially filled cavity - roof/gable wall - insulation at ceiling level



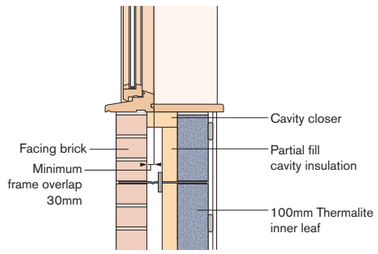
PF-WD-01 - Partially filled cavity with windows and doors - lintels (insulated base plate)



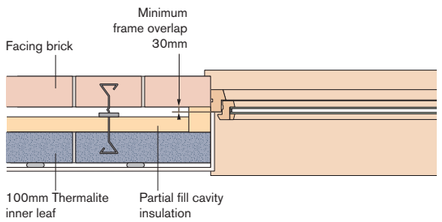
PF-RE-01 - Partially filled cavity - roof/eaves - insulation at ceiling level



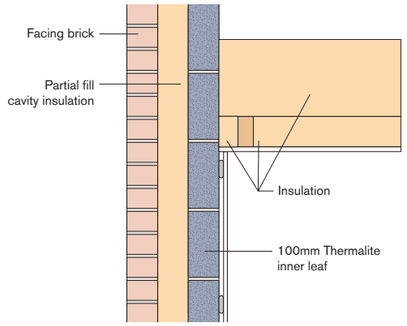
PF-WD-02 - Partially filled cavity - windows and doors - lintels (non-continuous base plate)



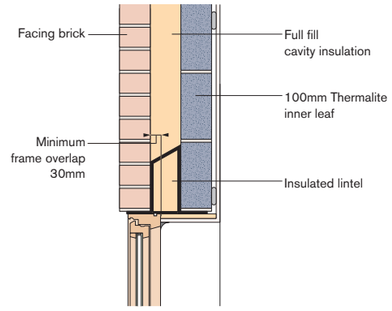
PF-WD-03 - Partially filled cavity - windows and doors - cills



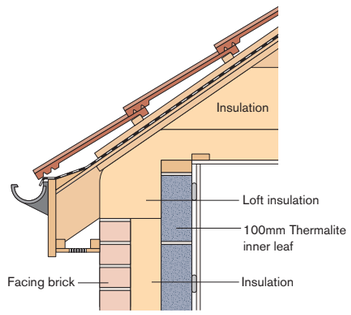
PF-WD-04 - Partially filled cavity - windows and doors - jambs



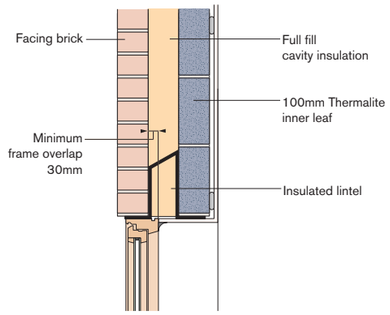
FF-RG-01 - Full fill cavity - roof/gable wall - insulation at ceiling level



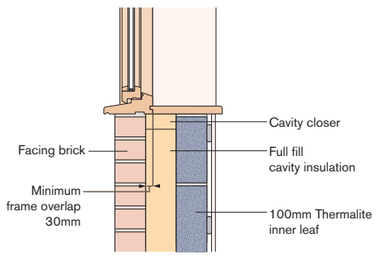
FF-WD-01 - Full fill cavity - windows and doors - lintels (insulated base plate)



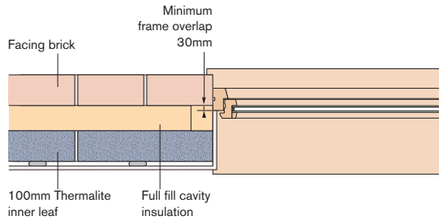
FF-RE-01 - Full fill cavity - roof/eaves - insulation at ceiling level



FF-WD-02 - Full fill cavity - windows and doors - lintels (non-continuous base plate)

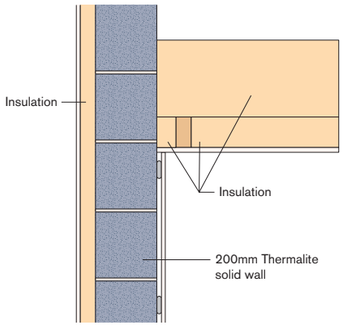


FF-WD-03 - Full fill cavity - windows and doors - cills

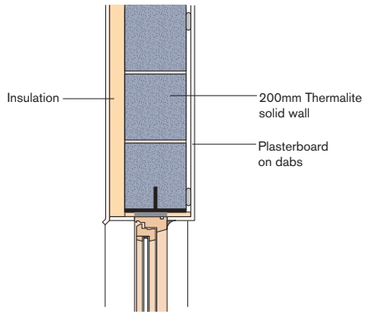


FF-WD-04 - Full fill cavity - windows and doors - jambs

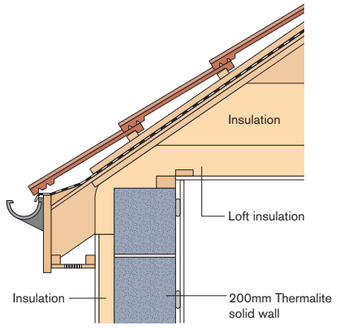
External walls



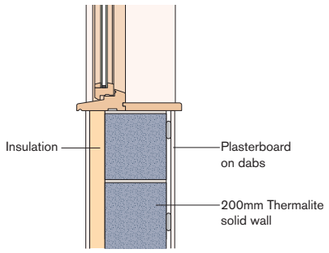
EI-RG-01 - Solid externally insulated walls - roof/gable wall - insulation at ceiling level



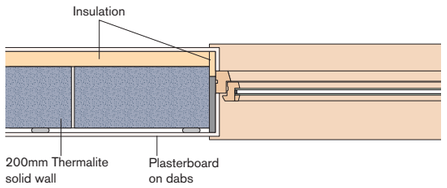
EI-WD-01 - Solid externally insulated walls - windows and doors - lintels (insulated base plate)



EI-RE-01 - Solid externally insulated walls - roof/eaves - insulation at ceiling level



EI-WD-03 - Solid externally insulated walls - windows and doors - cills

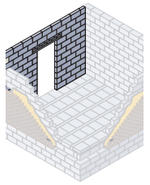


EI-WD-04 - Solid externally insulated walls - windows and doors - jambs

Partitions

Turbo | Shield | Party Wall | Hi-Strength 7 | Hi-Strength 10 | Paint Grade Smooth | Coursing Bricks

When used to construct partitions, Thermalite blocks reduce sound transmission between rooms and provide a secure fixing for shelves, radiators and other fittings.



Applications

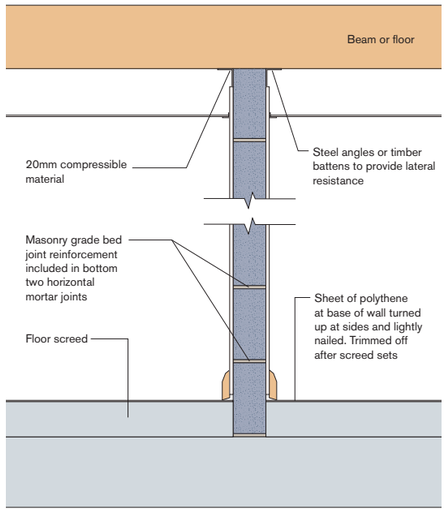
Thermalite Turbo, Shield, Party Wall, Hi-Strength and Paint Grade Smooth blocks are suitable for the construction of internal partition walls above and below dpc level. To meet the requirements of Approved Document E, 'internal wall type D', a plasterboard finish will need to be applied to both sides.

Typical details

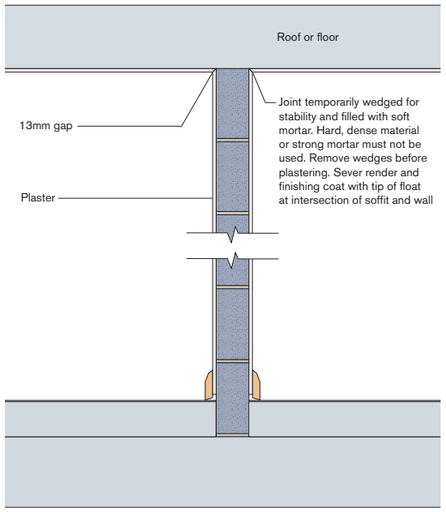
Unless they are designed as free-standing walls, internal partitions should always be restrained by continuous or intermittent horizontal or vertical supports, similar to those shown in Details 1 and 2 below. The lengths and heights of the walls should be within the limits quoted in within the limits shown in Figures 1-3, opposite.

Non-loadbearing walls and partitions (unplastered)

Figures 1, 2 and 3 (opposite) are taken from BS EN 1996-1-1. For advice on free-standing walls, please consult Hanson's Product Services department.



Detail 1. Non-loadbearing partition between beams or floors subject to large deflection



Detail 2. Joint between non-loadbearing partition and soffit of floor or roof subject to small deflection or thermal movement

Figure 1 - Limiting height and length to thickness ratios of walls restrained on all four edges

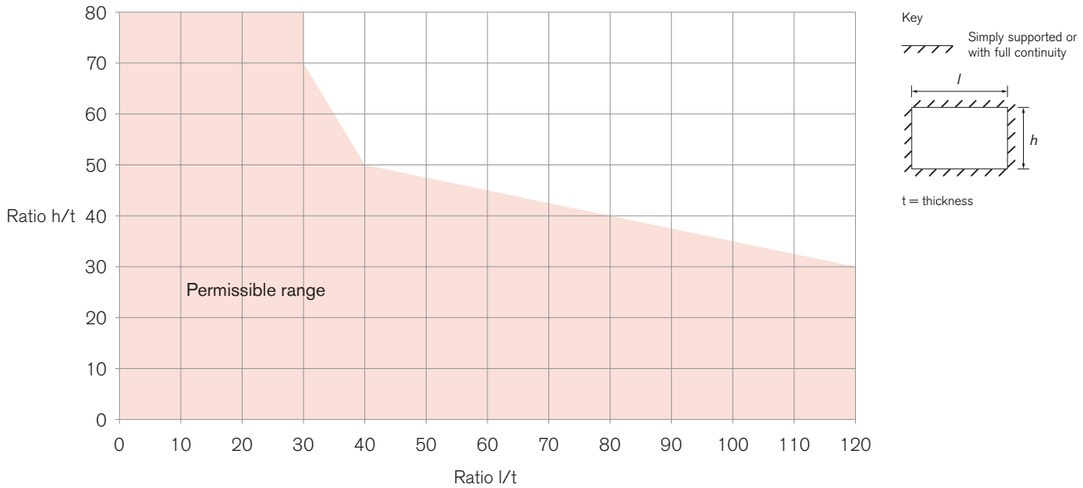


Figure 2 - Limiting height and length to thickness ratios of walls restrained at the bottom, at the top and on one vertical edge

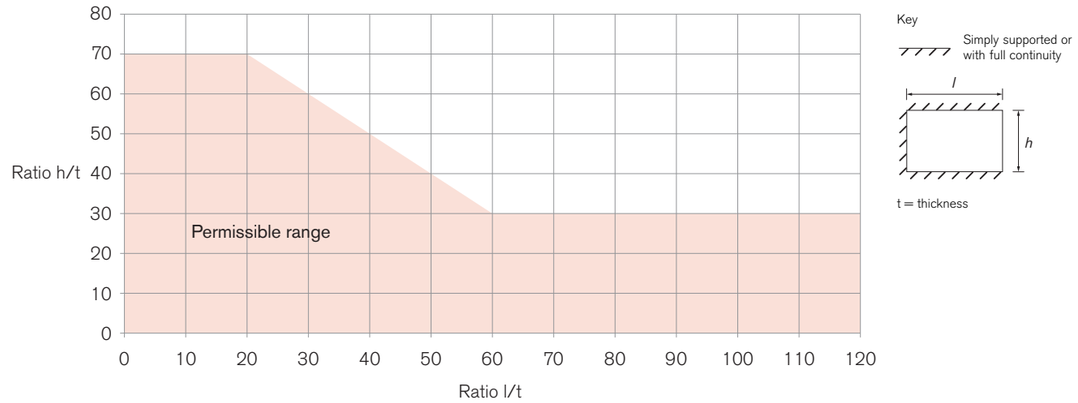
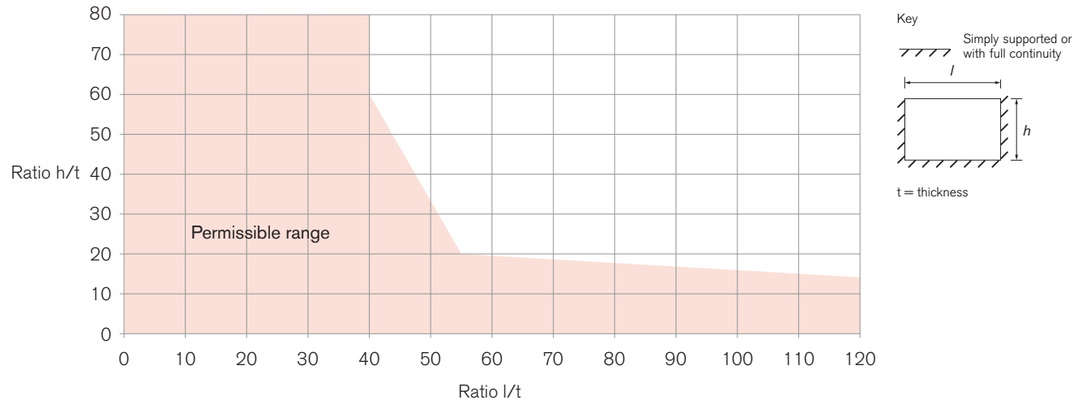


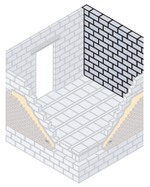
Figure 3 - Limiting height and length ratios of walls restrained at vertical edges and the bottom edge but not the top



Separating walls

Party Wall | Shield | Hi-Strength 7 | Hi-Strength 10

Thermalite blocks have been independently tested and proven for use in the construction of sound insulating walls between dwellings.



Applications

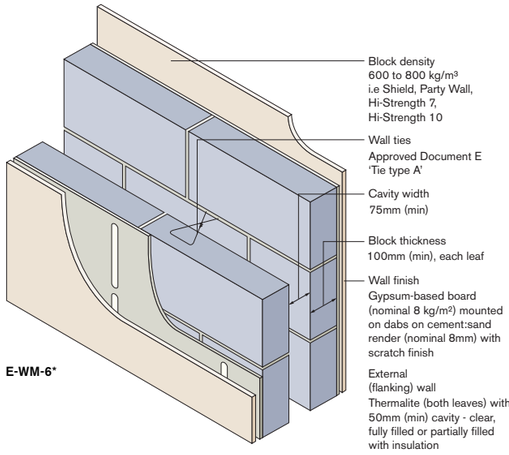
Thermalite Party Wall, Shield, Hi-Strength 7 and Hi-Strength 10 blocks can be used in all types of sound insulating separating walls between dwellings.

Sound insulation

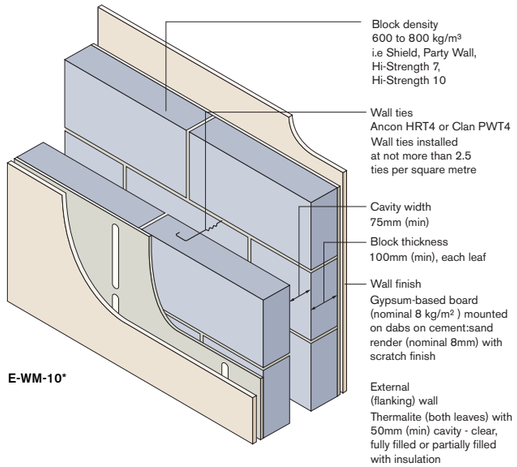
Designers and specifiers should ensure that all separating wall details meet the sound insulation requirements of the Building Regulations, and also that approval is obtained prior to commencing construction.

Overview of Thermalite Robust Detail separating walls

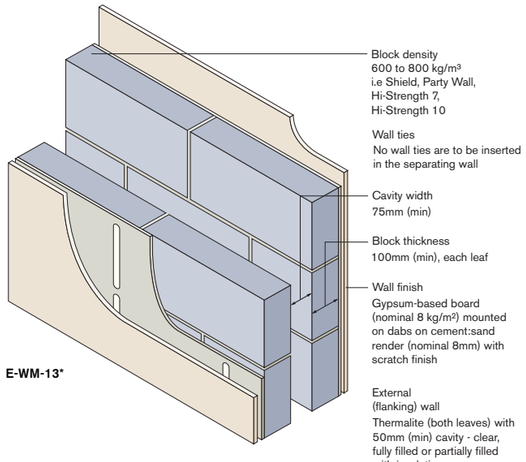
*Option - cavities can be fully filled with mineral wool with maximum density of 40kg/m³



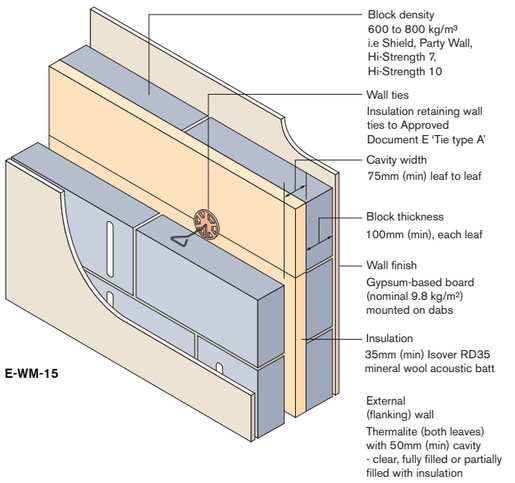
E-WM-6*



E-WM-10*

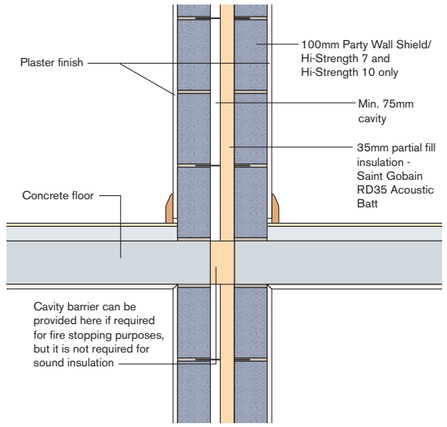


E-WM-13*

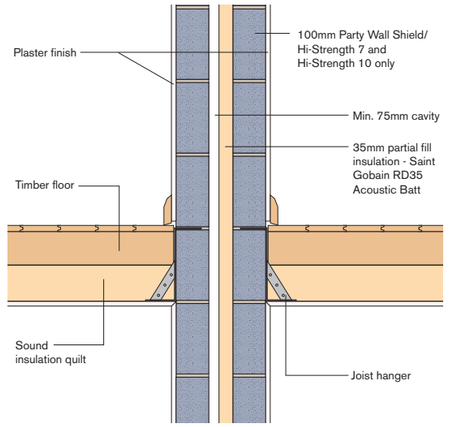


E-WM-15

Detail 3 & 4 - Typical junction of partial fill separating walls with intermediate floors

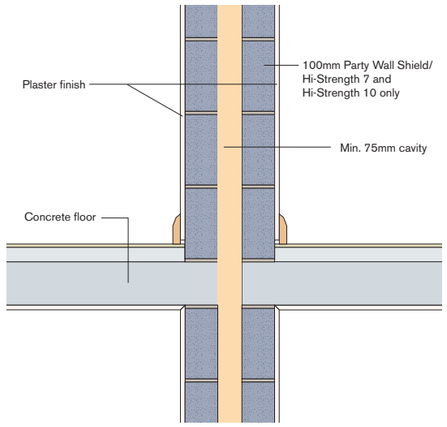


Detail 3. Section through cavity party wall with concrete suspended floors

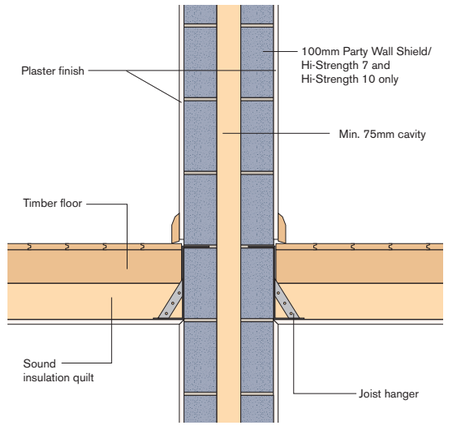


Detail 4. Section through cavity party wall with timber suspended floors

Details 5 & 6 - Typical junction of full fill separating walls with intermediate floors



Detail 5. Section through cavity party wall with concrete suspended floors



Detail 6. Section through cavity party wall with timber suspended floors

Further advice

If advice is required on meeting the requirements of Approved Document E with Thermalite blocks, please contact Hanson's Product Services department.

For further information on sound insulation performance, see pages 50-55.

Full specifications of Robust Details can be found in the Robust Details Handbook or at **www.robustdetails.com**

Linear thermal bridging

Introduction
In October 2010 a new version of Part L of the Building Regulations came into force. The guidance given in Approved Document L1A 2010 (new dwellings) sets out to reduce carbon dioxide (CO_2) emissions by 25% more than L1A 2006, in line with Level 3 of the Code for Sustainable Homes.
Thermalite blocks have inherent thermal insulation properties which make it easier to achieve U-value targets, and these properties also help to improve the linear thermal bridging performance (heat losses) which occur at junctions between building elements, giving lower y- and Ψ- ('psi') values (see below).

It is easier and more straightforward to achieve the 25% reduction in CO_2 emissions using Thermalite.

In addition, there are cost savings because there is no need to excessively increase fabric insulation in an attempt to meet carbon emission targets or to rely on renewable energy technologies.

Linear thermal bridging
Thermal bridging occurs where heat is lost through the junction of building elements such as walls and floors, where the continuity of the insulation is interrupted. As changes to the Building Regulations progressively force U-values lower, the proportion of heat lost through thermal bridging becomes more significant, and can have an increasing influence on the Dwelling Emission Rate (DER).

SAP 2009 calculates thermal bridging heat losses by examining the Ψ-values (the heat flow per metre) for each individual junction, i.e. the heat loss is the Ψ-value multiplied by the length of the junction. The values for the various junctions within a dwelling are added to give the total heat loss from thermal bridges. If necessary, specific y-values can then be determined for a particular house type for repetitive calculations, where the y-value = total heat loss from thermal bridging/fabric area.

These heat losses can be reduced by adopting accredited construction details (ACDs). The ACD document produced by Department for Communities and Local Government and the Energy Saving Trust focuses on the continuity of insulation and airtightness, and gives guidance to the builder on how to demonstrate that provision has been made to eliminate thermal bridges in the insulation layers.

The use of ACDs means that lower Ψ-values – equivalent to a y-value of 0.08 – can be used within the SAP 2009 calculation instead of the default value of 0.15.

The Aircrete Products Association (APA) commissioned the Building Research Establishment (BRE) to analyse a set of conventional construction details in accordance with BRE IP 106 and BR 497, as required by SAP, with the aim of showing that the use of aircrete will provide more cost-effective and straightforward junction details. This study concluded that enhanced y- and Ψ-values can be achieved.

As with the y-values, Ψ-values are greatly reduced when using Thermalite and the APA Enhanced Construction Details (ECDs). Please refer to the table of BRE verified Ψ-values.

For further information on ECDs using Thermalite, contact Hanson's Product Services department on 08705 258258 or download the Enhanced Construction Details guide from:
www.hanson.com/uk/thermalite

Y and Ψ (psi) values – What are they?
The Ψ-value (Greek letter psi – pronounced 'si') is the linear thermal transmittance value and is a property of a non-repeating thermal bridge junction in W/m.K. It is the rate of heat loss per unit length of the thermal bridge. i.e. the junction between an external wall and floor. When known, the Ψ-value is multiplied by length (l) of the bridge.

Under Part L 2010 SAP 2009 requirements, a performance penalty is applied for all non-accredited details i.e. those that have not been subject to an independent assessment of calculation and build-ability. The penalty is either a 25% increase in the calculated value or an increase of 0.02 W/m.K, whichever is the greater. A decision is awaited from government about setting up an accreditation scheme for enhanced thermal bridge details. Until then, the penalty is not in force.

In the interim, third-party assessment of thermal performance carried out by BRE is acceptable to Building Control Bodies and other parties. An important fact is that the use of Thermalite makes use of inherent insulation properties to enable straightforward, buildable construction details to be used.

Table 34: Enhanced construction details

Junction detail in external wall	SAP Table K1 (Accredited Details)	Ψ (W/m.K) APA Enhanced Construction Details[c] Partial fill cavity Turbo	Partial fill cavity Shield	Partial fill cavity Hi-Strength (7 or 10)	Full fill cavity Turbo	Full fill cavity Shield	Full fill cavity Hi-Strength (7 or 10)	Solid wall Turbo	Solid wall Shield	Solid wall Hi-Strength (7 or 10)	APA Detail reference	Additional comments
Steel lintel with perforated steel base plate	0.50	Use other lintel details as below			Use other lintel details as below			Use accredited detail				Not assessed
Other lintels (including other steel lintels)	0.30	0.228	0.234	0.239	0.214	0.219	0.223	Use accredited detail			WD-02	No continuous base plate
		0.195	0.208	0.218	0.204	0.214	0.222	0.028	0.028	0.027	WD-01	Insulated base plate
Sill	0.04	0.019	0.017	0.017	0.019	0.017	0.017	0.010	0.012	0.013	WD-03	-
Jamb	0.05	0.020	0.019	0.018	0.020	0.019	0.018	0.028	0.033	0.037	WD-04	-
Ground floor	0.16	0.048	0.055	0.061	0.044	0.051	0.058	0.050	0.061	0.070	GF-01	Ground bearing floor, insulation below slab
		0.040	0.046	0.054	0.044	0.051	0.056	0.047	0.058	0.069	GF-02	Beam and aircrete infill
		0.091	0.091	0.091	0.091	0.091	0.091	0.105	0.105	0.116	GF-03	Suspended concrete floor, insulation below slab
Intermediate floor within a dwelling	0.07	0.001	0.001	0.001	0.000	0.000	0.001	0.000	0.001	0.000	IF-01	Timber floors
Intermediate floor between dwellings[a]	0.07	Use accredited detail			Use accredited detail			Use accredited detail				Not assessed
Balcony within a dwelling[b]	0.00	Use accredited detail			Use accredited detail			Use accredited detail				Not assessed
Balcony between dwellings[a, b]	0.02	Use accredited detail			Use accredited detail			Use accredited detail				Not assessed
Eaves (insulation at ceiling level)	0.06	0.069	0.070	0.071	0.069	0.070	0.071	0.091	0.096	0.099	RE-01	
Eaves (insulation at rafter level)	0.04	Use accredited detail			Use accredited detail			Use accredited detail				Not assessed
Gable (insulation at ceiling level)	0.24	0.047	0.055	0.062	0.046	0.054	0.062	0.052	0.065	0.076	RG-01	
Gable (insulation at rafter level)	0.04	Use accredited detail			Use accredited detail			Use accredited detail				Not assessed
Flat roof	0.04	Use accredited detail			Use accredited detail			Use accredited detail				Not assessed
Flat roof with parapet	0.28	Use accredited detail			Use accredited detail			Use accredited detail				Not assessed
Corner (normal)	0.09	0.042	0.048	0.051	0.042	0.046	0.051	0.047	0.056	0.062	-	
Corner (inverted)	-0.09	Use accredited detail			Use accredited detail			Use accredited detail				Not assessed
Party wall between dwellings[a]	0.06	0.091	0.092	0.091	0.076	0.075	0.076	0.078	0.078	0.077	IW-02	Dense block party wall
		0.077	0.078	0.078	0.065	0.065	0.066	0.058	0.059	0.059	IW-01	Aircrete block party wall
Junction with a party wall[a]												
Ground floor	0.08	Use accredited detail			Use accredited detail			Use accredited detail				Not assessed
Intermediate floor within a dwelling	0.00	Use accredited detail			Use accredited detail			Use accredited detail				Not assessed
Intermediate floor between dwellings (in block of flats)	0.00	Use accredited detail			Use accredited detail			Use accredited detail				Not assessed
Roof (insulation at ceiling level)	0.12	Use accredited detail			Use accredited detail			Use accredited detail				Not assessed
Roof (insulation at rafter level)	0.02	Use accredited detail			Use accredited detail			Use accredited detail				Not assessed

a Value of Ψ is applied to each dwelling.
b This is an externally supported balcony (the balcony slab is not a continuation of the floor slab) where the wall insulation is continuous and not bridged by the balcony slab.
c The Ψ-values in this table are from various BRE reports 242241, 244504, 244836, and 245906. Further detail can be supplied upon request.

Movement control

Movement in masonry walls

All masonry walls are subject to movement, which can be caused when the walls dry out, as a result of cycles of heating and cooling or from changes in moisture content. If provisions are not made to allow movement without restraint, then there can be a build-up of compressive or tensile forces that may cause the masonry to bow or crack.

It is important that the designer recognises at the design stage the factors that may affect a building's performance and makes provisions to accommodate any likely movement.

To aid the designer, along with the information in this section of the manual, there is detailed information in BS 5628: Part 3* on movement in masonry and its accommodation.

In concrete masonry walls, including Thermalite walls, the movement that occurs is primarily a consequence of moisture movement during drying out (shrinkage) and therefore it is normally only necessary to accommodate this movement in simple construction joints.

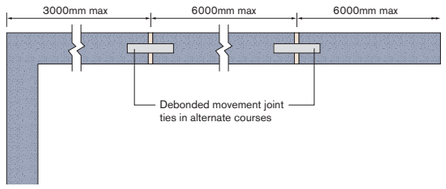
Positioning movement joints

When positioning movement joints at the design stage it is essential to ensure that the locations of the joints do not impair the stability of the walls in which they occur.

It is particularly important to provide movement joints in the long runs of walls that occur in commercial and industrial buildings as well as in large residential buildings. It is also important to provide movement joints in solid external walls and the outer leaves of external walls that are subject not only to drying out movement, but also to changes in temperature and moisture content.

Following the guidance in BS 5628: Part 3* and BS EN 1996-1, movement joints should be provided at 6.0m centres to divide up the walls into a series of rectangular panels. Where the wall is continuous at an internal or external corner, the first movement joint should be approximately 3.0m from the corner, (see Detail 7).

The risk of movement cracking increases where the length of the wall panel exceeds twice the height, for example, in low horizontal panels beneath continuous



Detail 7. Location of movement joints

window openings. In such cases it is advisable to provide movement joints at closer centres than the nominal 6m.

When positioning movement joints, the following features, which may influence the movement joint locations, should be taken into account:

- intersections of walls, piers and columns
- positions of doors and window openings
- changes in height and thickness of walls
- locations of chases in walls
- locations of structural movement joints in the building
- positions where dissimilar materials meet.

Lateral restraint

Where the design criteria require continuity across the movement joint, while still allowing horizontal movement, flat metal strips measuring 200 x 25 x 3mm or similar should be built into alternate bed joints, spanning the movement joint. One end of each metal strip should be debonded by wrapping in polythene or building paper to ensure free movement. Proprietary movement joints with one end sleeved are also available.

Wall finishes

All wall finishes should be discontinued at movement joints. In the case of plaster and render finishes. proprietary metal stop beads should be used on each side of movement joints.

Where ceramic wall tiling is to be fixed to the finished wall, the movement joints should be continued through the tiled finish. BS 5385: Part 1 recommends that large tiled areas be divided up into panels with movement joints at 3.0 to 4.5m centres.

* No longer current but still cited in Building Regulations.

Services

Any services or other fittings that are required to span the movement joints should be designed to allow for movement.

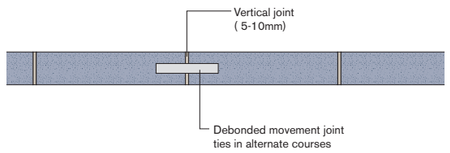
Dissimilar movement

Where Thermalite block walls join with other materials, such as brickwork, other concrete blockwork, structural steel or concrete, differential movement will occur. To allow such movement to take place, a vertical movement joint should be provided to separate the different materials.

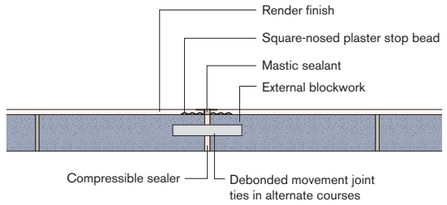
Where dissimilar materials bear onto Thermalite walls, such as in situ concrete floors, pre-cast beams or floor units, a separating layer should be introduced using a non-compressible material such as a bituminous damp proof course.

Construction of movement joints

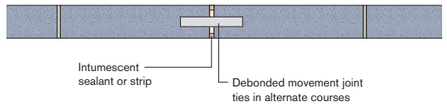
Movement joints should be built in as work proceeds. The simplest form of movement joint is a vertical butt joint (Detail 8) filled with a compressible joint filler.



Detail 8. Vertical movement joint in internal blockwork



Detail 9. Sealed movement joint in external blockwork

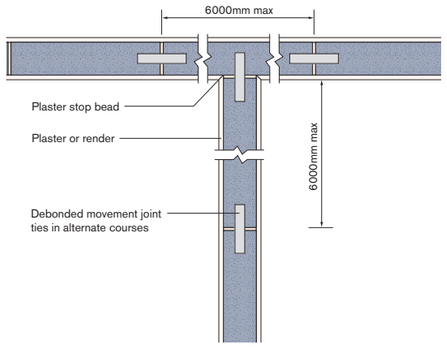


Detail 10. Movement joint in fire wall

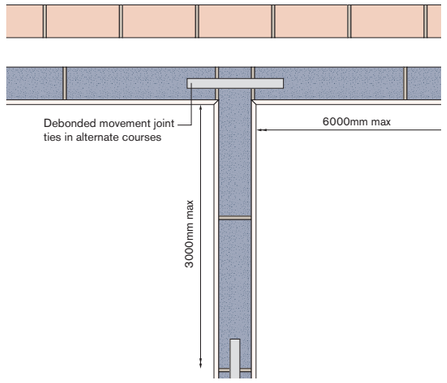
In the case of an external wall, the blockwork should be rendered to parallel square-nosed stop beads and the movement joint sealed with a proprietary mastic sealant (Detail 9). The selection and use of all sealants should be in accordance with BS 6213 and BS 5628: Part 3*. Movement joints in fire walls should be designed so that the ability of the wall to function as a fire barrier is not impaired. This is generally achieved by sealing the joint filler with intumescent sealant or strip (Detail 10).

Junctions of internal walls

Where movement has to be allowed for at junctions of internal walls, the movement joints may be incorporated into either or both of the walls (Details 11 and 12).



Detail 11. Junction of internal partitions



Detail 12. Junction of partition and inner leaf of external wall

* No longer current but still cited in Building Regulations.

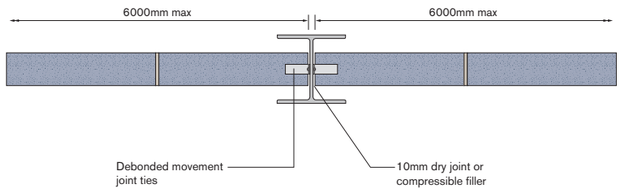
Movement control

Junctions with structural members
Where blockwork is tied to a structural steel or reinforced concrete column, the design of the joint should allow for any movement that may occur in the structural member (Details 13 and 14).

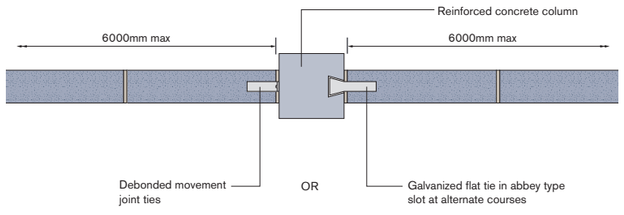
The Thermalite blockwork should be tied to the columns with 100mm x 100mm angles of 25mm x 3mm flat steel strip, fixed to the columns and built into alternate horizontal movement joints. Alternatively, proprietary ties may be used. It is advisable to debond the flat strip in the mortar joints.

Movement should be accommodated with debonding ties at both ends of a masonry panel (e.g. between columns).

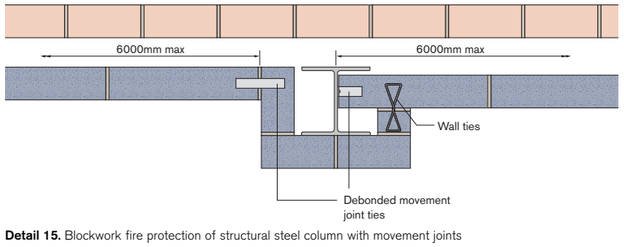
Fire protection of columns
Where blockwork is used to provide fire protection to columns, movement joints can be incorporated into the blockwork casing (Detail 15).



Detail 13. Junction with structural steel column



Detail 14. Junction with reinforced concrete column



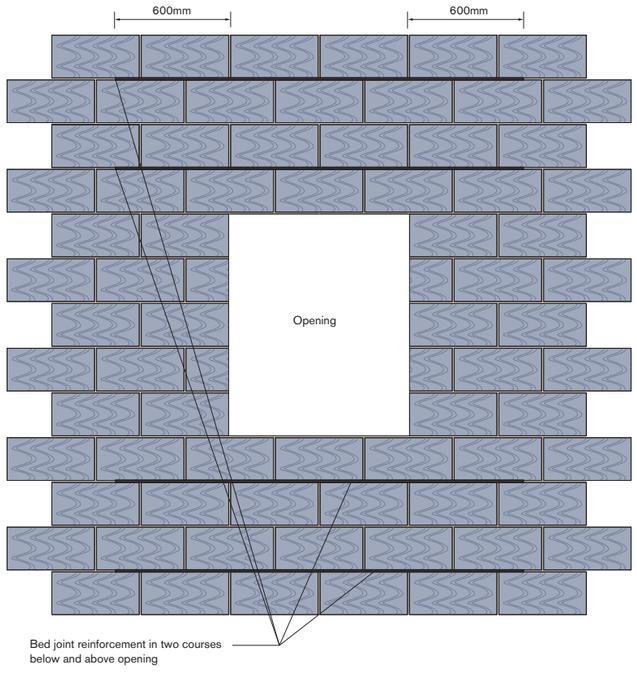
Detail 15. Blockwork fire protection of structural steel column with movement joints

Bed joint reinforcement
In walls containing openings, movement joints may need to be provided at more frequent centres than 6m. Alternatively, the masonry above and below the opening should be reinforced with masonry grade bed joint reinforcement (Detail 16).

The reinforcement should be contained in the horizontal mortar joints so that the mortar cover is 13mm on the face of the internal blockwork and 25mm on the external face. The reinforcement should extend at least 600mm beyond each side of the opening to ensure that any stresses are distributed into adjacent blockwork. In some instances, it may be appropriate to include bed joint reinforcement in the mortar joints over the full length of the wall in such a way that movement joints, which would normally be recommended, may be omitted. An example would be separating walls, where it is good practice not to provide movement joints.

Mortar strength
The strength of the mortar should be compatible with the strength of the blocks. In accordance with BS EN 1996-2 and Table 13 of BS 5628: Part 3*, mortar Strength Class M4 (designation iii) should be used. For further information, please refer to the Sitework section, pages 92-107.

* No longer current but still cited in Building Regulations.



Detail 16. Bed joint reinforcement at opening

Structural use

Thermalite blocks will provide an excellent structural solution for most applications.

Structural design

Dwellings of up to three storeys

For residential buildings of up to three storeys, the Building Regulations, along with BS 8103: Part 2, provide guidance in the form of 'simple rules' to enable the designer to determine the required strength and wall thicknesses of masonry to be used without the need for structural calculations.

Whilst the dimensions of the building layout will influence the strength and thickness of the masonry in general, for residential buildings of up to two storeys a compressive strength of 2.9N/mm^2 will meet the criteria of the 'simple rules', and can be achieved using any of the Thermalite block products.

In the case of the upper two storeys of three one-storey residential buildings 2.9N/mm^2 will meet the criteria, whilst at ground floor level and below dpc the 'simple rules' require a compressive strength of 7.3N/mm^2, which can be achieved by using Thermalite Hi-Strength 7.

As an alternative to following the 'simple rules' guidance, the required thickness and compressive strength of the masonry can be determined by calculation, see below.

Other types of building

For residential buildings of over three storeys and commercial and industrial buildings, the structural design should be carried out in accordance with BS EN 1996-1-1 by a suitably qualified engineer.

When carrying out the design in accordance with BS EN 1996-1-1, the structural engineer will take into account general factors when calculating the load that the particular wall will safely support. In respect of the Thermalite product range the following information will be required:

- the compressive strength of the product
- the partial safety factor for the material.

Hi-Strength 10 and 'Category of Manufacture'

Thermalite Hi-Strength10 blocks are manufactured to Category I BS EN 771-4. Therefore, γm 2.7 can be used. Design calculations show that the 9.0N/mm^2 Hi-Strength 10 material can provide an equivalent strength to 10.4N/mm^2 concrete blocks manufactured to Category II.

All other Thermalite products can be manufactured to Category I under special order. For further advice on the structural design of Thermalite masonry walls, contact Hanson's Product Services department.

Disproportionate collapse

Approved Document A 2004 contains important revisions to the application of Requirement A3, Disproportionate Collapse, to bring all buildings under control. The guidance refers to 4 Building Classes that are tabulated and described therein. In Class 1, for houses not exceeding four storeys, agricultural buildings or buildings into which people rarely go (subject to conditions), provided that they are designed and constructed in accordance with the 'simple rules' or other Section 1 guidance, no additional measures are likely to be necessary. Buildings in other classes will be subject to additional measures as described. A Technical Guidance Note has been produced by the NHBC in consultation with the DCLG to supplement the guidance in Section 5 of the Approved Document.

Lateral restraint

The Thermalite block walls should be provided with adequate lateral restraint at floor and roof levels. Clauses 28.2 and Appendix C of BS 5628: Part 1* provide detailed guidance on methods of restraint along with BS EN1996-1-1.

Joist hangers

The use of joist hangers to support timber floor joists is becoming increasingly popular, particularly when the supporting wall is a party wall. It is important that the joist hangers used comply with BS EN 845-1 and are marked with the minimum compressive strength of the block with which they are to be used. The type and size of hanger should be selected to suit the span and the size of the joist to be supported.

It is important to install the joist hanger with the back plate tight against the surface of the supporting wall and in accordance with the manufacturer's instructions. The masonry flanges and the joist hanger should be held in position by sufficient masonry above the joist hanger support and should be allowed to achieve adequate strength before any load is applied to the hanger.

* No longer current but still cited in Building Regulations.

Manufacture and testing

The European Standard BS EN 771-4 is the standard for the specificaton of aircrete blocks.

It addresses the essential requirements of the Construction Products Directive and contains guidance on CE Marking of products. This is reflected in the Building Regulations, Approved Document A, 'Structure' (2004 and amendments), which contains tables of minimum compressive strengths of masonry units. A revised BS 8103 was published early in 2005, which reflects these circumstances.

The Thermalite product range provides compressive strength that reflects both the regulatory requirements and the need for designers to satisfy the structural requirements of a wide range of building types.

Modulus of elasticity

Typical values for the modulus of elasticity (E) of Thermalite blocks are as follows:

- Turbo: E = 1700N/mm^2
- Shield: E = 2100N/mm^2
- Floorblock: E = 2600N/mm^2
- Party Wall: E = 2600N/mm^2
- Hi-Strength 7: E = 2900N/mm^2
- Hi-Strength 10: E = 3100N/mm^2

Linear expansion

The co-efficient of linear expansion of all Thermalite blocks is 8 x 10^{-6}K.

Achieving the Code with Thermalite

Changes to the Code for Sustainable Homes were introduced in October 2010. This section explains how, by using Thermalite aircrete blocks, you can achieve all levels of the Code.

The Government introduced the Code for Sustainable Homes (the Code) in 2007, and it was subsequently revised in October 2010. The Code was published to drive a stepchange in sustainable home building practice. It is a rating system for the environmental sustainability of new homes.

New homes are assessed against nine criteria and are awarded a score ranging from Level 1(lowest) to Level 6 (highest).

- Code Level 3 is now required for all new social housing.
- The code is voluntary for private housing although many local authorities may stipulate a certain code level be met as part of planning requirements.

Key benefits when using Thermalite

Energy

- External wall U-values for Code Levels 3–6 are easily achieved.
- Thermal bridging can be reduced using Thermalite Enhanced Construction Details.
  - Cost-effective.
  - Simple construction.
  - Enhanced Y and ψ values = reduced carbon dioxide (CO_2) emissions.
- Thermal mass helps prevent overheating in the summer and stabilises temperatures.
- Impressive air permeability figures help to achieve or better the design value.
- Zero heat loss from party walls in SAP2009 when using Thermalite Robust Detail separating walls.

Materials

- BES 6001 certified – responsible sourcing rating of Very Good = tier level 1 (highest).
- Achieves A+ Green Guide ratings for external walls.
- Superior Green Guide ratings to generic aircrete separating walls – up to A rating.

Health and well-being

- 1–3 credits for sound insulation when using Thermalite Robust Detail separating walls.

The table below shows that if used correctly, Thermalite blocks can help in three key categories, significantly contributing towards the 67 credits available from these areas.

For comprehensive details on how to achieve the Code with Thermalite blocks, please download 'Achieving the Code with Thermalite' from **www.hanson.com/uk/thermalite**

Table 35: Where Thermalite can contribute - overview

Category	Credits available	Weighting factor (% points contribution)	Points score for each in category
Energy and CO_2 emissions	**31**	**36.4**	**1.17**
Health and well-being	**12**	**14.0**	**1.17**
Ecology	9	12.0	1.33
Management	9	10.0	1.11
Water	6	9.0	1.50
Materials	**24**	**7.2**	**0.30**
Waste	8	6.4	0.80
Pollution	4	2.8	0.70
Surface water run-off	4	2.2	0.55

Table 36: How Thermalite can gain credits

Issues	Credits available	Weighted % of final score	How credits are gained
Category 1 - Energy and carbon dioxide emissions			
Ene 1 Dwelling Emission Rate (DER) To limit CO_2 emissions arising from the operation of a dwelling and its services in line with current policy on the future direction of regulations.	**10**	**11.7**	Credits awarded based on the % improvement in the DER over the Target Emission Rate (TER) Mandatory elements: Specific % improvement of DER over TER for Code Levels 4–6.
Ene 2 Fabric energy efficiency To improve fabric energy efficiency performance, thus future-proofing reductions in CO_2 for the life of the dwelling.	**9**	**10.53**	3–9 credits awarded based upon fabric energy efficiency value from SAP (kWh/m²/year) Note - varies with dwelling type.
Category 3 - Materials			
Mat 1 Environmental impact of materials Encourage the use of materials with lower environmental impacts over their life cycle.	**15**	**4.5**	Mandatory element: At least three of the following to have Green Guide ratings of A+ to D: roof, external walls, internal walls, upper/ground floors, windows. Credits are awarded based on the Green Guide rating for the element, with ratings of A+ to E scoring from 3 credits to 0 respectively.
Mat 2 Responsible sourcing of materials basic building elements Encourage the specification of responsibly sourced materials for the basic building elements.	**6**	**1.8**	80% of the assessed materials in the following elements must be responsibly sourced: frame, ground floor, upper floors, roof, external walls, internal walls, foundations, staircases. Points are scored dependent upon the certification scheme used to demonstrate responsible sourcing for a specific material. These schemes are graded and range from Tier 1 (highest) to Tier 4 (lowest). Volumes and tier levels are fed into the Calculator Tool which converts the score to credits.
Category 7 - Health and well-being			
Hea 2 Sound insulation Provision of improved sound insulation to reduce the likelihood of noise complaints from neighbours.	**4**	**4.7**	Use Robust Details with credits or prove that the required sound insulation has been achieved through sound insulation testing.

Achieving the Code with Thermalite

Ene 1 - Energy and carbon dioxide emissions

To meet the requirements of the Building Regulations, the DER must be no worse than the TER. The Code sets out higher standards for the energy performance for dwellings, and credits are awarded based on the percentage improvement in the DER over the TER.

Dwelling Emission Rate – Estimated CO_2 emissions (kg/m^2) per year from energy use (heating, hot water and lighting) for the actual dwelling.

Target Emission Rate – The minimum performance standard for CO_2 emissions permitted by the Building Regulations, derived from a notional building of the same size and shape as the actual dwelling.

Table 37: 2010 Improvements

% Improvement 2010 DER/TER*	Credits**	Mandatory requirements
≥ 8	1	-
≥ 16	2	-
≥ 25	3	Level 4
≥ 36	4	-
≥ 47	5	-
≥ 59	6	-
≥ 72	7	
≥ 85	8	
≥ 100	9	Level 5
Zero net CO_2 emissions	10	Level 6

The percent improvement is calculated using Standard Assessment Procedure software (SAP 2009).

* Performance requirements are equivalent to those in previous scheme versions but are now measured using Approved Document L1A 2010 TER as the baseline.

** Up to nine credits are awarded on a sliding scale. The scale is based on increments of 0.1 credits, distributed equally between the benchmarks defined in this table.

Energy Saving Trust solutions

The Energy Saving Trust (EST) has produced guidance for achieving the required improvement of DER/TER for Code Levels 3, 4, 5 and 6. These can be found at:

www.energysavingtrust.org.uk

U-values

There are many ways of achieving the required improvement because there is a multitude of options in terms of materials and renewables available as well as site-specific aspects such as orientation of the building. However, the work carried out by EST acts as a starting point and gives design U-values as follows:

Table 38: EST solutions

Code level	Building element	Energy Saving Trust solution
3	Roof	0.13
	Walls	0.25
	Exposed floors	0.20
4	Roof	0.13
	Walls	0.20
	Exposed floors	0.20
5 and 6	Roof	0.10
	Walls	0.15
	Exposed floors	0.15

Based on these, Thermalite can easily provide the required U-values. Please refer to 'Part L and thermal insulation', pages 38-47.

Thermal bridging

Thermal bridging is where heat loss occurs through the junction of building elements such as walls and floors where the continuity of the insulation is interrupted. These heat losses may be significant, but can be reduced by adopting accredited construction details (ACDs).

The ACD document is produced by the government and the EST. It focuses on insulation continuity and airtightness, and gives guidance to the builder on how to demonstrate that provision has been made to eliminate thermal bridges in the insulation layers.

The use of ACDs means that ψ (Psi) values from Appendix K of SAP 2009 can be used, giving an equivalent y-value of 0.08 instead of the default y-value of 0.15 that would otherwise be used. This effectively halves the heat loss from thermal bridges.

The Aircrete Products Association (APA) instructed the Building Research Establishment (BRE) to undertake an examination of the use of aircrete with ACDs. This work has proved that thermal bridges are reduced even further when aircrete is used.

The use of these enhanced construction details (ECDs), plus all remaining details conforming to at least ACDs, means that greatly reduced ψ-values can be used instead of those given for ACDs, giving an equivalent y-value of 0.04, effectively halving the heat losses again.

Renewables

It is possible to meet Code Level 3 just through improvements to the building fabric. For Code Level 4 and above, renewables will be required in the majority of cases, to achieve the % improvement of DER/TER.

Thermal mass

Thermal mass is the ability of a material to store heat. Thermal mass enables buildings to absorb and release heat to respond naturally to weather conditions, stabilising the internal temperature. During summer, thermal mass helps to prevent overheating and reduces the need for air-conditioning. In winter, heat is absorbed during the day and released during the night, thus supplementing the heating of the building.

SAP 2009 takes account of thermal mass in the heating and cooling calculation. Thermalite provides a 'medium' level of thermal mass and so is well placed to stabilise temperatures within the building and also help to prevent overheating.

Hanson has proven the use of Thermalite in the EcoHouse™, its Code Level 4 house at the BRE Innovation Park. Thermalite was used in the external walls as part of Hanson's Quickbuild™ system.

Details of this project can be viewed at:
www.hanson.com/uk

Hanson EcoHouse™ – The BRE Innovation Park

Party wall bypass

SAP2005 assumed no heat loss through the party wall bypass affect, but in SAP2009, U-values are assigned based on the construction of the party wall.

Thermalite Robust Details E-WM-6, E-WM-10 and E-WM-13 (HEA 2– sound insulation, page 91) now have the option to use mineral wool insulation (batts, rolls or blown) max density 40kg/m^3 within the cavity of the separating wall. When this is used in conjunction with effective edge sealing, heat loss through the separating wall can be eliminated.

Table 39: Party wall bypass

Construction	U-value
Solid wall	0.0
Unfilled cavity with no effective edge sealing	0.5
Unfilled cavity with effective edge sealing	0.2
Fully filled cavity with effective edge sealing	0.0

Achieving the Code with Thermalite

Ene 2 - Energy and carbon dioxide emissions

Credits are awarded based upon the fabric energy efficiency of the building (kWh/m^2/year).

This relates to the heat loss through the building fabric and is affected by the external surface area of the building, the U-values of the building elements, thermal bridging heat loss and the air permeability of the building envelope.

U-values and thermal bridging

(For details, see Ene 1 – Energy and CO_2 emissions, page 86.)

Air permeability

Air permeability or air leakage is the uncontrolled flow of air through gaps and cracks in a building. Too much air leakage leads to unnecessary heat loss and an increase in CO_2 emissions.

Approved Document L1A 'Conservation of fuel and power in new dwellings' states that the worst allowable design air permeability is:

10m^3/(h.m^2) @ 50 Pa.

In order to achieve the required percentage improvement of DER/TER, the design air permeability figure can be set lower. This design value is then subject to confirmation by air permeability pressure testing once the building is completed.

Mat 1 – Environmental impact of materials

The Green Guide ratings are based on life cycle assessment (LCA) of the materials which make up a building element, e.g. an external wall. LCA measures and assesses a range of environmental impacts from 'cradle to grave'.

Most of the data is collected from trade associations and so is usually generic.

The specifications are compared over a 60-year study period and items such as repair and maintenance are examined. A score for each specification is calculated and ranges from A+ (lowest environmental impact) to E (highest environmental impact).

Mandatory requirement:

Three out of the five elements must achieve a rating of A+ to D.

Table 40: Credits are awarded as follows:

Green Guide rating	Credits
A+	3
A	2
B	1
C	0.5
D	0.25
E	0

Where there is more than one specification for an element (e.g. more than one type of floor) credits are awarded depending on the % area for each specification.

Thermalite Green Guide ratings

Thermalite affects three out of five of the elements and plays a part in the overall rating of the specification. Thermalite's LCA has raised the rating above the generic aircrete rating on a number of Robust Detail separating wall specifications. (See Green Guide ratings table, page 89).

For a complete list of aircrete construction details go to the green guide online at:

www.thegreenguide.org.uk

Table 41: Thermalite Green Guide ratings and Code for Sustainable Homes credits

Element specification	Wall and building type	Block type	Element number	Green Guide rating	CSH Mat1 credits	Embodied CO_2 (kg CO_2 eq.)
Brickwork outer leaf, insulation, aircrete blockwork inner leaf, cement mortar, plasterboard on battens, paint	External wall, all building types	Generic	806170615	A+	3	74
		Thermalite®	906170108	A+	3	71
Cement rendered aircrete blockwork cavity wall, insulation, cement mortar, plasterboard on battens, paint	External wall, all building types	Generic	806180035	A+	3	73
		Thermalite®	906180001	A+	3	48
Insulated polymeric render system, 215mm aircrete blockwork with cement mortar, insulation, plasterboard on battens, paint	External wall, all building types	Generic	806450637	A+	3	110
		Thermalite®	906450638	A+	3	97
Robust Detail E-WM-10: Twin leaf 100mm solid aircrete blocks (600-800kg/m^3), thin joint system, with 75mm min. cavity, proprietary wall ties, 8mm sand:cement render, gypsum-based board (8 kg/m^2) on dabs and paint to each side	Separating wall, domestic	Generic	818190023	B	1	88
		Thermalite®	918190002	A	2	68
Robust Detail E-WM-6: Twin leaf 100mm solid aircrete blocks (600-800 kg/m^3), with 75mm min. cavity, Type A wall ties, 8mm cement:sand render and gypsum-based board (8kg/m^2) on dabs with paint, to each side	Separating wall, domestic	Generic	818190020	C	0.5	88
		Thermalite®	918190003	B	1	69
Robust Detail E-WM-15: Twin leaf 100mm solid aircrete blocks (600-800 kg/m^3), with 75mm min. cavity including proprietary foil faced glass wool acoustic batts, Type A wall ties, with gypsum-based board (9.8kg/m^2) on dabs with paint, to each side	Separating wall, domestic	Generic	918190001	B	1	86
		Thermalite®	918190004	A	2	66
Aircrete blockwork, plasterboard, paint	Internal wall, all building types	Generic	809180003	B	1	48
		Thermalite®	909189004	B	1	45

Achieving the Code with Thermalite

Mat 2 – Responsible sourcing of materials

Responsible sourcing of materials (RSM) provides a way of managing a product from the point at which a material is mined or harvested in its raw state through manufacture and processing, and through use, re-use and recycling until its final disposal as waste.

RSM is demonstrated through supply chain management and product stewardship and encompasses social, economic and environmental dimensions.

Mat 2 assessment

Credits are awarded where materials used in key building elements are responsibly sourced.

The key building elements are:

- Frame
- Ground floor
- Upper floors (including separating floors)
- Roof
- External walls
- Internal walls (including separating walls)
- Foundations/sub-structure (excluding sub-base materials)
- Staircase.

Each element is broken down into its component materials. These materials fall into two categories and are either 'assessed materials' or 'excluded materials', as shown in the Table 43.

Table 43: Mat 2 assessed/excluded materials

Assessed material	Excluded material
Brick	Insulation
Resin-based composite materials (GRP, etc)	Fixings
Concrete	Adhesives
Glass	Additives
Plastics and rubbers	
Metals	
Stone	
Timber, wood panel products and wood-based composites	
Plasterboard and plaster	
Bituminous materials	
Other mineral-based materials (fibre cement, etc)	
Products with recycled content	

Volumes of the assessed materials, along with the appropriate tier level (see Table 42) if applicable, are entered into the Mat 2 calculator. This calculator then gives a points score which is then converted to credits.

Table 42: Mat 2 assessment

Tier level	Issue assessed	Point level per element	Evidence/measure	Examples of compliant schemes* assessed
1	Legality and responsible sourcing	3	Certification scheme	FSC, CSA, SFI with CoC, PEFC, Reused Materials, schemes compliant with BES 6001: 2008 (or similar) Excellent and Very Good performance ratings.
2a	Legality and responsible sourcing	2.5	Certification scheme	Schemes compliant with BES 6001:2008 (or similar) Good performance rating.
2b	Legality and responsible sourcing	2	Certification scheme	Schemes compliant with BES 6001:2008 (or similar) Pass performance rating.
3	Legality and responsible sourcing	1.5	Certification scheme/EMS	Timber: MTCC, Verified, SGS, TFT Other materials: Certified environmental management scheme (EMS) for the key process and supply chain. Recycled materials with certified EMS for the key process.
4	Legality and responsible sourcing	1	Certification scheme/EMS	Certified EMS for the key process.

HEA 2 – Sound insulation

Credits are awarded for achieving higher standards of sound insulation than those given in Approved Document E of the Building Regulations and demonstrating this by using either pre-completion testing (PCT) or Robust Details.

Table 44: Pre-completion testing criteria*

Houses and bungalows

Criteria	Credits
Airborne sound insulation values ≥ 3dB (≥ 48dB)	1
Airborne sound insulation values ≥ 5dB (≥ 50dB)	3
Airborne sound insulation values ≥ 8dB (≥ 53dB)	4

Flats

Criteria	Credits
Airborne sound insulation values ≥ 3dB (≥ 48dB)	1
Impact sound insulation values ≤ 3dB (≤ 59 dB)	1
Airborne sound insulation values ≥ 5dB (≥ 50dB)	3
Impact sound insulation values ≤ 5dB (≤ 57 dB)	3
Airborne sound insulation values ≥ 8dB (≥ 53dB)	4
Impact sound insulation values ≤ 8dB (≤ 54 dB)	4

*Sound insulation testing can only be carried out by UKAS-accredited organisations or approved testers belonging to the Association of Noise Consultants. Approved organisations can be found at either: **www.ukas.org.uk** or **www.association-of-noise-consultants.co.uk**

Robust Details

Separating walls and floors that have been assessed and approved by Robust Details Ltd and found to achieve the performance standards given above.

For further information, please refer to the sound insulation section, pages 50-55.

Case study: Lawn House

Hanson's Thermalite blocks have been used in the construction of a private ecohouse, built to achieve Code Level 6 of the Code for Sustainable Homes. The inclusion of Hanson's Thermalite in the construction of Lawn House contributes to the building's good air permeability and high thermal mass. For full details on the project visit: **www.hanson.com/uk/thermalite**

Sitework

CDM Regulations

Construction is one of Britain's most hazardous industries, with back pain cited as the single biggest cause of ill health. Musculo-skeletal disorders affecting the back are a major injury cost to employers according to the Health & Safety Executive (HSE). The HSE recommends improvements to health and safety standards during construction work. These include site visits to ensure the safe use of manual lifting techniques.

What are the CDM Regulations?

The CDM Regulations, devised by the Health & Safety Executive (HSE), are designed to reduce serious or fatal accidents and ill health in the construction industry by improving management and co-ordination of health, safety and welfare throughout all stages of a construction project.

'*...there is no excuse for either ignorance or complacency. We have no hesitation in taking enforcement action against those who fail to take the necessary action to control risks on site.*' HSE

When do CDM Regulations apply?

The CDM Regulations place responsibility on all individuals who can contribute to the health and safety of a construction project.

In commercial, domestic and industrial projects particular attention must be paid to:

- Site clearance
- New build, alteration, conversion and fitting out
- Renovation and repair
- Maintenance
- Demolition.

Block weights

The HSE provides guidance, in their Construction Information Sheet 37, on 'Handling or laying heavy blocks and other masonry units'. It advises that there is a high risk of injury in the single handed repetitive handling of blocks heavier than 20kg.

If single-person handling is needed, either blocks of '...20kg or lighter should be specified and used, or other precautions should be taken to reduce the risk of injury by, for example, the provision of mechanical handling' Construction Industry Advisory Committee (CONIAC).

The Thermalite solution

The Thermalite micro-cellular structure results in an unrivalled product range which is both strong and exceptionally light to handle. Indeed, standard sized blocks are available in weights less than 20kg, in accordance with guidelines.

Handholds

The HSE also recommends that blocks with handholds should be selected wherever possible. Thermalite is the first block manufacturer in the UK to offer handholds, which have been introduced in our Trenchblock range, to further aid the process of lifting and laying foundations, making building with Thermalite not only faster, but safer too.

Workability

Thermalite blocks are not only easy to handle, they are extremely workable and can be easily cut, sawn and chased accurately with ordinary hand tools. The light weight of Thermalite products, combined with their easy workability, ensures significant productivity gains.

Variation in block weights

Individual block weights cited in this manual are based on typical 'as received' moisture content. Moisture content at the time of use may be higher than the quoted value, being dependent on the age of material, weather and storage conditions.

The delivered weight format of the Thermalite product range generally falls well below handling guideline limits. However, if there are specific manual handling concerns, particularly with larger block sizes, Hanson recommends site sampling and weighing to determine safe handling practices.

Table 45: Block weights (for 215mm x 440mm blocks)

Thermalite block @ 730kg/m³ (7.3N/mm²)

Thickness (mm)	Weight (kg)
100	7.1
140	10.0
190	13.5
215	15.3

Notes

- 7.3N/mm² blocks are available in the Hi-Strength 7 and Hi-Strength Paint Grade Smooth product ranges.
- Block weights are calculated using specified dry density, with a moisture content of 3% by weight added to provide the equilibrium value. For typical 'as received' weights, these figures should be increased by a further 19%.

Material safety data
Aerated concrete blocks

The Control of Substances Hazardous to Health (COSHH) requirements of the Health and Safety at Work Act and the Chemicals Hazard Information and Packaging for Supply (CHIPS) regulations require manufacturers to provide relevant information regarding their products in respect of properties, correct use, storage/handling and disposal without risk to health.

Products
Standard Format; Large Format; Reduced Bed Height; Floor Blocks; End Blocks; Flooring Slips; Coursing Bricks; Trenchblock and Tongue & Groove with handholds. Trenchblocks in the relevant product specification of Turbo, Shield, Party Wall, Hi-Strength 7, Hi-Strength 10.

Manufacture
Hanson Building Products using the brand name of Thermalite.

Description
Autoclaved Aerated Concrete also known as AAC and Aircrete.

Composition
Pulverised Fuel Ash (PFA), sand, cement, lime, anhydrite, aluminium slurry, water.

Following manufacture, the products are deemed to be inert and therefore not hazardous in relationship with the Health and Safety at Work Act.

Personal protective equipment (PPE)
When working with Hanson Building Products' Thermalite blocks protective footwear, headwear, glasses and gloves should always be used.

In addition, suitable respiratory protection should be used when cutting blocks with hand or mechanical saws. If mechanical saws are used these should comply with regulatory requirements and be operated only by trained competent persons.

Hazard identification and first aid
Damage to skin by abrasion or irritation:

- First aid – wash with soap and water and if irritation persists seek medical advice.
- Prevention – wear suitable gloves.

Inhalation/ingestion of aircrete dust and particles:

- First aid: If ingested, drink plenty of clean water. If inhaled, aircrete dust causes irritation of the respiratory tract, seek medical advice.
- Prevention: Wear suitable respiratory protection and wash hands thoroughly with soap and water before eating or drinking after handling Thermalite blocks.

Dust in eyes may cause irritation and or abrasion:

- First aid: Irrigate liberally with water. If irritation persists seek medical advice.
- Prevention: Wear suitable eye protection.

Fire fighting measures
Products will not support combustion

Accident release measures
Not applicable.

Storage
Hanson Building Products' Thermalite blocks are delivered to site by road vehicles for which safe access and egress shall be made available. Blocks should be stacked on a dry level ground no more than three packs high. Whenever possible blocks should be protected from inclement weather by use of the pack's own wrapping or by a suitable tarpaulin. This will minimise the moisture content of the blocks and any resulting weight increase.

When removing packaging care should be taken to ensure blocks do not fall and cause injury to persons in the vicinity of the pack.

Packaging should be disposed of in accordance with local and statutory regulations.

Handling
Where blocks are handled manually, this should be undertaken in accordance with the Manual Handling Regulations 1992 and HSE Construction Information Sheet no. 37 'Handling Building Blocks'. These conclude that there is a high risk of injury in the single-handed repetitive manual handling of blocks heavier than 20kg. If single person handling is needed, blocks of 20kg or lighter should be specified and used, or other precautions should be taken to reduce the risk of injury by, for example, the provision of mechanical handling.

The HSE also recommends that blocks with handholds be selected wherever possible.

Individual block weights citied by the manufacturer in its literature and website are based on a theoretical equilibrium value of 3% moisture used for testing and calculation purposes. Moisture content prior to use will be higher than the quoted value and is variable subject to date of manufacture prior to delivery, weather and storage conditions.

The delivered weight of the Thermalite product range generally falls well below handling guideline limits. However, if there are specific manual handling concerns, particularly with larger block sizes, Hanson recommends site sampling and weighing to determine safe handling practices. For further advice please contact the Product Services department.

Transport information
No special precautions required.

Regulation information
Classified as non-hazardous for conveyance and supply.

Other information
In accordance with the Management of Health and Safety at Work Regulations 1992, employers must carry out a risk assessment to ensure the health and safety of their employees and non-employees who may be affected by their undertaking.

Contact details
Hanson Building Products
6 Pembroke Road
Sevenoaks
Kent TN13 1XR

Tel: 08705 626500

Mortar

The composition of mortar is very often given insufficient consideration, and in many instances it is left to site operatives to decide on the specification. Mortar forms an integral part of the wall, comprising between 6 and 18% of the total wall volume when general purpose mortar is being used, and approximately 2% when Thermalite Thin Layer Mortar is used. It is important, therefore, that the appropriate specification is determined at the design stage.

Thermalite blocks can be laid in either general purpose mortar or Thin Layer Mortar. Mortars for use with Thermalite should be as described in BS EN 998-2 Specifications for Mortar for Masonry.

General purpose mortar

The nominal thickness of general purpose mortar, in both horizontal and vertical joints, is normally taken to be 10mm, exclusive of any key in the jointing surface of the masonry units.

Specification of general purpose mortar

When specifying general purpose mortar, the following details of the project should be taken into account:

- The type of masonry unit to be used
- The structural requirements
- The degree of exposure of the site
- The level of workability required
- The location of the masonry, i.e. above or below ground level.

When selecting a suitable mortar specification, it is important to ensure that the composition is compatible in strength with the blocks selected for the project.

Mortars are defined by Strength Class M12-M2 (i) to (iv) in accordance with Table 13 of BS 5628: Part 3*. Based on this table, the following general use mortars are recommended for use with Thermalite:

Table 46: Mortar designation M4 (iii) for internal and external walls above dpc (all proportions by volume)

Ratio	Materials
1 : 1 : 6	cement : lime : sand
1 : 6	cement : sand with a plasticiser
1 : 5	masonry cement : sand

Table 47: Mortar designation M6 (ii) for use below dpc (all proportions by volume)

Ratio	Materials
1 : 4	cement : sand
1 : ½ : 4	cement : lime : sand

These mortar specifications are suitable for use with all products in the Thermalite range and may also be used with other types of masonry. They may be used throughout the United Kingdom for the construction of internal and external loadbearing and non-loadbearing walls.

The use of mortar mixes other than those listed above may cause difficulties during construction and may lead to defects after completion.

Application notes for general purpose mortar

Cement-rich mortar specifications are non-resilient and subject to high shrinkage. They are therefore less able to accommodate movement and may cause cracking in completed walls.

* No longer current but still cited in Building Regulations

It is important that the sand should be well graded and comply with BS EN 13139, and that the water should come from a clean supply.

The addition of either lime or an air-entraining plasticiser to a lean mortar mix will improve frost resistance and greatly improve workability, thereby increasing productivity. Care should be taken to avoid misuse of liquid plasticisers, as it is possible to produce a workable mix with an unacceptably high sand:cement ratio. Masonry cements are less prone to misuse than liquid plasticisers.

Cement:lime:sand mortars have better wet adhesion and early strength with both bricks and blocks than mixes incorporating plasticisers or masonry cement, and may have superior bond characteristics. They also allow small amounts of movement without cracking.

Additionally, lime tends eventually to seal hairline cracks.

Tests carried out on behalf of the Mortar Producers Association have indicated that walls built with cement: lime:sand mortars have better resistance to driving rain than those built without lime.

Reduced adhesion between the masonry units and the mortar may be caused by inadequate cement content, excessive air content or the use of unspecified admixtures. Satisfactory adhesion can only be achieved by correct mix design and careful raw material selection.

Pre-mixed and ready-to-use general purpose mortars

The use of these mortars can be a means of ensuring consistent quality. Also, where large volumes of mortar are required, the storage of large quantities of raw materials and their potential deterioration can be eliminated.

One tonne of mortar will be sufficient for approximately 600 blocks or 60m^2 of 440(l) x 100(w) x 215(h)mm blocks.

Thermalite Thin Layer Mortar

For a description of properties and guidance in the use of Thermalite Thin Layer Mortar, please refer to Thin joint masonry, pages 26-35.

Cold weather working

BS 5628: Part 3* states that masonry should not be built when the air temperature is at or below 3°C and falling, or unless it is at least 1°C and rising. Thin Layer Mortar should be used in conditions above 5°C (see pages 28-37), although it may be used at 3°C on a rising scale. Conditions should be regularly monitored and account should be taken of the wind chill factor and structural stability of certain details. The use of covers will protect materials when not for immediate use. Frozen materials must not be used. It is essential to protect newly laid masonry from incidental conditions and ensure that it is protected from frost.

* No longer current but still cited in Building Regulations.

Workability

Thermalite blocks are easy to handle, extremely workable and can be easily cut, sawn and chased accurately with ordinary hand tools.

Chasing limitation
In accordance with the Building Regulations, vertical chases in walls should be not deeper than one third of the thickness of the wall, and horizontal chases not deeper than one sixth of the thickness of the wall.

Fixings

Most traditional fixing methods are suitable for use with all types of Thermalite blocks, but the properties of the material also enable a number of special fixing methods to be used.

Loading
The load which can be supported by a fixing depends upon the following factors:

- Strength of background material
- Positioning of fixings
- Strength of bond between fixing device and background material
- Size of fixing.

When fixings are subjected to pull-out tests, failure normally occurs as a result of bond failure between the fixing device and the background material. The strength of this bond can be optimised by careful installation.

Fixing types
The majority of general purpose fixings give excellent performance in Thermalite. Examples of such fixings, together with recommendations on how and where they should be used, are as follows:

Cut nails
Cut nails of tapered aluminium or mild steel, with a rectangular cross section, form an excellent bond when driven into all types of Thermalite. They are recommended for fixing skirting boards, timber battens for cladding and tiling, and lightweight door linings. Where there is a risk of timber splitting, pre-drilling of the timber or the use of longer 'slimline' cut nails is recommended.

Cut nails should be driven in askew at approximately 450mm centres. Recommended penetrations are 75mm into Turbo and 50mm into other Thermalite products.

Direct screwing
It is possible to screw No. 12 or No. 14 wood screws directly into Thermalite Shield blocks. A few taps with a hammer will create a pilot hole for the screw, which can then be tightened with a screwdriver. This provides a suitable method for fixing medium-weight door linings, where the screws should be at approximately 450mm centres, and should penetrate at least 50mm into the blockwork. Overtightening should be avoided.

Screws with plugs
The most common method of fixing into masonry, i.e. wood screws with plugs, is eminently suitable for use with Thermalite blocks. Both fibre Rawlplugs and plastic plugs, with either toothed or smooth sides, can be used successfully with Thermalite.

The strength of the bond between the fixing and the Thermalite block also depends critically on the size of hole used. The size of a drilled hole will depend upon a number of factors:

- Type of Thermalite block
- Size and type of drill bit (use a steel, not a masonry bit)
- Speed of drill (use as slow a speed as possible)
- Type of drill (do not use hammer action).

Correct use and suitable choice of drill size (0.5mm smaller than the diameter of the plug being installed) will produce a parallel-sided hole, into which the fixing has to be tapped home with a hammer.

Frame fixings
Frame fixings are 'through' fixings, which consist of extended plastic plugs that pass through the frame and into the blockwork. They are usually supplied complete with a complementary sized screw and have the advantage of accurate hole alignment and depth. The presence of the plastic sleeve in the door frame also acts as a shock absorber.

Fixings

Special aircrete fixings

Spiral plug

The most common type of fixing specifically designed for aircrete consists of a plastic plug which, when driven or screwed into a pre-drilled hole, cuts a thread in the material. A wood screw can then be driven into the hollow centre of the fixing.

Grouted fixing

Other special fixings use an 'under-cut' hole in the blockwork requiring a special cutter. The fixing is then expanded or grouted into the hole, the grout being injected through the hollow centre of the fixing.

These fixings are very strong and suitable for particularly heavy duty tasks such as fixing boilers and radiators.

Spiral nails

Spiral (or helical) nails, manufactured from stainless steel, provide an excellent hammered-in fixing for securing timber to Thermalite. The small, uniform cross-sectional area eliminates the risk of damage to timber and block.

'Sleeved' nails

These knock-in 'through' fixings expand into the blockwork after they have been driven to a certain depth. They provide an excellent fixing, even if they have been loosened, because the pull-out load is sustained.

Square anchors

These are reinforced glass-filled nylon hammer-in fixings that require no pre-drilling and provide a secure anchor for size 6-10 gauge screws in Thermalite Turbo, Shield and Party Wall blockwork.

Failing load values

The following tables provide indicative pull-out performance of common fixings into Thermalite. More detailed information should be obtained from the manufacturers.

Below are the average results of 12 tests carried out to determine the force required to withdraw 75mm and 100mm cut nails and screws of various sizes, fixed in fibre and nylon/plastic plugs, from Thermalite Turbo. All cut nails and screws were driven in to leave approximately 13mm protruding.

Table 48: Shield (failing load values)

	Plug diameter (mm)				
Nylon/plastic plugs	**8**	**8**	**10**	**10**	**12**
Screw size	No.10	No.12	No.10	No.12	No.12
Penetration (mm)	40	40	50	50	50
Hole diameter (mm)	7	7	9	9	11
Failing load (kg)	91	106	141	132	116
Cut nails					
Penetration (mm)	50	75	100		
Failing load (kg)	42	74	157		
No. 12 wood screws	**12**	**12**			
Penetration (mm)	50	63			
Failing load (kg)	142	142			

Table 49: Paint Grade Smooth/Party Wall (failing load values)

	Plug diameter (mm)					
Nylon/plastic plugs	**8***	**8***	**10**	**10**	**12**	**12**
Screw size	No. 8	No. 12	No. 8	No. 14	8mm	10mm
Penetration (mm)	40	40	50	50	60	60
Hole diameter (mm)	7	7	9	9	11	11
Failing load (kg)	157	158	133	134	162	161
Cut nails						
Penetration (mm)	50	75	100			
Failing load (kg)	46	81	73			
No. 12 wood screws	**12**	**12**				
Penetration (mm)	50	63				
Failing load (kg)	150	186				
Rawlnut type No:	**3240**	**5250**	**5380**	**6250**	**8509**	
Hole diameter (mm)	7	10	10	13	18	
Length (mm)	23	26	39	36	50	
Spacer length (mm)	25	32	38	32	38	
Penetration (mm)	48	58	77	68	88	
Failing load (kg)	100	163	209	308	469	

* 4-way expansion plug

Table 50: Turbo (failing load values)

	Plug diameter (mm)						
Nylon/plastic plugs	**8***	**8***	**8**	**8***	**10**	**10**	**12**
Screw size	No. 10	No. 12	No. 14	No. 14	8mm	8mm	10mm
Penetration (mm)	40	40	40	50	50	60	60
Hole diameter (mm)	7	7	7	9	9	10	10
Failing load (kg)	89	89	75	112	89	83	89
Cut nails							
Penetration (mm)	50	75	100				
Failing load (kg)	20	50	70				
	Plug diameter (mm)						
Fibre plugs	**8**	**10**	**12**	**14**	**16**	**18**	**20**
Screw size	No. 8	No. 10	No. 12	No. 14	8mm	8mm	10mm
Penetration (mm)	40	40	50	50	50	50	50
Hole diameter (mm)	7	9	11	13	15	17	19
Failing load (kg)	93	100	140	174	184	194	204

* 4-way expansion plug

Table 51: Hi-Strength 7 (failing load values)

	Plug diameter (mm)				
Nylon/plastic plugs	**8**	**8**	**10**	**10**	**10**
Screw size	6	6	8	8	10
Penetration (mm)	40	40	50	50	80
Hole diameter (mm)	7	7.5	9	9	9
Failing load (kg)	117	164	271	188	221

Table 52: Hi-Strength 10 (failing load values)

	Plug diameter (mm)				
Nylon/plastic plugs	**8**	**8**	**10**	**10**	**10**
Screw size	6	6	7	7	14
Penetration (mm)	80	40	60	70	100
Hole diameter (mm)	7.5	8	9	9.5	10
Failing load (kg)	116	121	202	357	377

Internal finishes

Introduction
The building should be allowed to dry out for a reasonable period after roofing before any internal finishings are applied to the walls.

Plaster undercoats
The following mixes are recommended for floating coats:

a) 1:1:6 cement:lime:sand by volume (a 1:2:9 cement:lime:sand mix may be used, except under cold winter conditions).

b) 1:6 cement:sand by volume, with the addition of an approved plasticiser used in accordance with the manufacturer's instructions.

c) Pre-mixed gypsum bound lightweight aggregate undercoat plaster.

d) Pre-mixed cement-lime bound lightweight aggregate undercoat plaster.

Note: The sand used in both external and internal render finishes should comply with BS EN 13139.

Plaster finishes
Undercoats a) and b) may be finished with a neat gypsum Class B finish coat. Undercoats c) and d) may be finished with a lightweight pre-mixed gypsum, or gypsum lime bound finish coat, respectively. Machine-projected plasters may be suitable for use on Thermalite walls.

Dry linings
The following systems are suitable for use on Thermalite walls:

a) Plaster dab method
Bonding compound dabs should be used to fix the boards to the wall. The dabs are applied to the wall and should be the length of the plasterer's trowel and 50mm to 70mm in width. Dabs should be 50mm to 70mm apart vertically and approximately 300mm apart horizontally. The boards are then pressed tightly into position and the face plumbed and lined. They should be wedged in position until the plaster dabs have set. Dabs should only be applied for one board at a time.

It may be advantageous to apply a bonding agent to the walls prior to the dry lining operations. Multi-purpose plaster should be used to fix insulating plasterboard linings.

For sound insulation and airtightness purposes, it is recommended that a continuous horizontal ribbon of adhesive is applied at floor and ceiling levels.

b) Timber batten method
Timber battens 50mm wide x 20mm thick should be fixed at centres in accordance with the lining board manufacturer's recommendations. The battens should be correctly aligned and fixed with cut or spiral nails of sufficient length to penetrate the Thermalite by at least 50mm (it may be necessary to increase the depth of penetration into Turbo). The board should then be fixed to the battens using flat-headed galvanised nails.

c) Metal framing systems
British Gypsum Limited manufactures a metal framing system that may be fixed to Thermalite walls and will provide a satisfactory internal finish. The application should be carried out in accordance with the manufacturer's instructions.

Taper edge boards should be jointed with a proprietary joint filler, taped and finished.

Sealing edges
It is a requirement of the Building Regulations that gaps be sealed between dry lining and masonry walls at the edges of openings, such as windows and doors, and at the junctions of walls, floors and ceilings. One method is to seal with continuous bands of fixing plaster.

Painting direct
Paint Grade Smooth blocks built fair-faced can be painted internally with any alkali-resistant paint, plastic emulsion paint being particularly suitable. Any small holes that occur on the faces of the blocks should be filled before painting.

Storage
As with all concrete products, it is desirable that Thermalite blocks be kept dry by stacking them close together, with blocks laid flat on top of the stack. Blockwork should be allowed to dry out thoroughly before commencement of rendering or plastering (BS 5628: Part 3* and BRE Digest 342).

Ceramic wall tiling
In the United Kingdom, as in many other European countries, tiles are now used extensively, not just in kitchens and bathrooms, but also in other spaces such as entrance halls and communal areas.

Tiles may be glazed, unglazed or partly glazed. The range of sizes, thicknesses and accessories available is now extensive, although the vast majority of tiles are square or rectangular

* No longer current but still cited in Building Regulations.

Tiling specification
The specification of internal wall tiling should be in accordance with BS EN 14411.

At present there is no British Standard by which to define tiles suitable for use in external situations. Therefore, please refer to the ISO 10545 series of standards and consult individual tile manufacturers for further advice on the choice of tile necessary to withstand the conditions to which they may be exposed.

Rendering for tiling
A sand/cement render provides a suitable intermediate substrate onto which tiles can be securely fixed. (See also External Finishes, pages 106-107).

Pre-treatment is seldom necessary as Thermalite is classed as a 'medium suction background'. However, this may vary under differing climatic conditions.

Although the scratch finish, which is an identification characteristic of Thermalite blocks, provides a key, render can also be applied to Thermalite Paint Grade Smooth blocks. The key can be improved by recessing the mortar joints. For tiling purposes, rendering to blocks with a density of less than 625kg/m^3 (i.e. Turbo and Shield) should be reinforced with welded wire mesh secured to the blockwork in accordance with BS 5385: Part 1*.

It is normal practice to apply render in two coats, which should not have a combined thickness greater than 13mm. It is normal for the first coat to be thicker than the second.

The first coat should be finished with a comb and allowed to harden and dry out before applying the second coat. Again, this should be lightly combed to receive the subsequent adhesive.

In accordance with BS 5385: Part 1, the recommended render mix for tiling purposes on Thermalite walls is:

1:4 Portland cement:sand by volume.

The sand should comply with BS EN 13139.

Plastering for tiling
It should be noted that a cement/sand render provides a much stronger background for tiling than plasterwork and wherever possible, for example in new installations, cement/sand render should be specified. Nevertheless, tiles can be fixed satisfactorily onto plastered Thermalite walls, provided a suitable adhesive is used and the correct procedures are followed.

* No longer current but still cited in Building Regulations.

BRE Defect Action Sheet No 137 advises that the use of gypsum plasters should be avoided where repeated or persistent wetting of the wall may occur.

Unrendered Thermalite walls
Tiles may be bedded directly onto blockwork walls using proprietary adhesives. It is important to leave the wall to dry out for as long as possible before commencing tiling. The tiles should be fixed onto a clean, dust-free and true Thermalite surface.

Adhesives
There are two basic types of adhesive:

- Organic-base
- Cement-base.

Adhesives are being continually developed and Table 3 in BS 5385: Part 1* gives guidance on the choice of adhesives now available.

Fixing and bedding procedures vary; it is therefore important to follow the particular adhesive manufacturer's instructions concerning, for example, mixing procedure, type of trowel to be used and working time.

Accommodation of movement
As with most building materials, careful consideration needs to be given to movement in the tiling and the background caused by factors such as temperature and moisture changes.

BS 5385: Part 1* and BS EN1996-2 recommend that this movement be controlled by the inclusion of simple movement joints, and that the following movement joint locations should be carefully considered at the design stage:

- Structural movement joints
- Junctions with different finishes
- Changes in background material
- At openings, or where changes of alignment occur and stresses are likely to be concentrated.

Large tiled areas should be divided into panels with movement joints at 3m to 4.5m centres, both horizontally and vertically. Movement joints in a blockwork wall should extend completely through the tiling, adhesive and rendering.

For further information, please refer to Movement Control on, pages 78-81, in the Design Detailing section.

External finishes

Introduction
Render specification is determined not only by the nature of the substrate, but also by the location of the building. General purpose sand/cement renders are defined by mix types (i) to (iv) in accordance with Table 1 in BS 5262*. Table 2 in BS 5262* confirms that mix type (iii) (1:1:6) is suitable for application to aerated concrete blockwork in areas of sheltered, moderate and severe exposure conditions.

If a cement-rich mix is used for rendering Thermalite, the amount of water necessary to hydrate the cement gives rise to a higher rate of drying shrinkage in the render than in the blockwork. This differential shrinkage can lead to a shearing action building up between the two materials, resulting in failure. However, this issue can easily be avoided by adopting a compatible render specification.

General
BS 8104 describes a method of establishing the local spell index for walls subject to wind-driven rain. This takes account of meteorological data and expresses the worst expected conditions prevailing in a spell of bad weather during any three year period.

Since such data is variable, the definitions of the exposure categories overlap and a range of indices is recommended for each category. Although the severe and very severe categories apply to much of the West of Scotland and Wales, for example, the exposure rating also takes account of local features which afford protection to a building. It is therefore possible for a 'severe' site to exist within an area deemed to be in the 'very severe' category.

On request, the Product Services department will assess any building to determine the suitability of block thickness and external finish, with reference to exposure categories.

See also information relating to Moisture Penetration, page 58-59.

Specification
It is normal practice to apply render in two coats. The first coat (undercoat) should be trowelled on to a thickness of 10mm to 16mm and scratched.
An adequate period of time should elapse between the application of coats in order to allow the undercoat to dry out thoroughly, but not too quickly, before the next coat is applied.

*No longer current, but still cited in Building Regulations. Use in conjunction with BS EN 13914-1.

The thickness of the final coat will be governed to some extent by the texture required, but will normally be 6mm to 10mm, as finished. The final coat should be thinner and no stronger than the undercoat and this, in turn, no stronger than the substrate. The finishes suitable for external renderings onto Thermalite blocks are classified by BS 5262* as follows:

- Float finish
- Scraped or textured, hand-applied
- Dry-dash, dry-thrown by hand
- Machine-applied, Tyrolean or power spray.

Mixes
When selecting a suitable render specification it is important to ensure that the composition is compatible and not too strong (or weak) in relation to the strength of the substrate. The following recommendations - mix type (iii) - take this into account and are based on the requirements of BS 5262* and BS EN 13914-1.

To gain benefit in both accommodation of movement and resistance to rain penetration, the preferred render mix is:

a) 1:1:6 cement:lime:sand by volume.

The addition of lime improves workability and cohesiveness. It improves the render's ability to accommodate movement, thereby reducing the tendency to crack. The lime should be hydrated and comply with the requirements of BS EN 459-1:2001.

b) 1:6 cement:sand by volume, with the addition of an approved plasticiser used in accordance with the manufacturer's instructions.

c) 1:5 masonry cement:sand by volume.

The sand in all coats should be sharp, clean and comply with the requirements of BS EN 13139. The grading of the sand is extremely important as it will affect the quality and performance of the finished render. Sands with excessive proportions of very fine material should be avoided as the finer the sand the greater the render's capacity to hold water.

In addition to inhibiting adhesion, excessive moisture retention will lead to high drying shrinkage, with consequent cracking and spalling. Conversely, a coarse sand retains insufficient moisture within the render, resulting in inadequate hydration and adhesion.

The use of ready-mixed renders to help avoid inconsistency in site batching is highly recommended.

Traditional sand/cement render should not be applied to an external leaf of Turbo material less than 215mm thick. This is to minimise the risk of failure caused by the differences in tensile strength between the finish and background material. If a 'technical' render system solution is proposed, the advice of the render system manufacturer must be sought.

Modern render systems
A wide range of cement-free and modified cement renders, some reinforced by fibre or mesh to resist thermal movement of the backing masonry, are readily available for application to Thermalite. These are often referred to as 'technical renders'. As these technically sophisticated products often require the services of an approved applicator, advice should be sought from the manufacturer prior to specification.

Preparation of background
Although the scratch finish, which is primarily an identification characteristic for Thermalite blocks, helps provide a key, it is also possible to apply render to Thermalite Paint Grade Smooth blocks. The scratch key should be augmented by recessing the mortar joints during construction.

The blockwork should be clean and free from dust, loose particles and any contamination which may have occurred during construction.

Thermalite normally provides a 'medium suction background'. Given certain ambient conditions, or where the blockwork has been allowed to dry out, high rates of initial suction may be experienced. This condition can have an adverse effect on hydration and adhesion and measures should be taken to reduce the suction.
This can be done by applying water using a stock brush or a fine spray immediately prior to rendering, taking care to avoid saturation of the surface.

Alternatively, should high rates of suction persist, then a spatterdash treatment or the application of an approved bonding agent may be considered. Further information may be obtained from Hanson's Product Services department.

Accommodation of movement
In accordance with the recommendations of BS 5628: Part 3*, BS EN1996-2 and BRE Digest 342, construction joints should be provided at maximum 6m centres, in order to minimise the effects of movement.
See also Movement Control on pages 80-83.

External wall insulation systems
There are many external wall insulation systems available to improve the thermal insulation performance of existing buildings. However, these systems can also be used on external walls of new build projects.

The systems vary depending on the particular manufacturer, but generally consist of a thermal insulation such as EPS insulation board or rigid fibre board, secured to the external wall with fixings direct into the wall. A base render coat is then applied to the insulation into which a fibre or metal reinforcing mesh is placed. The reinforcing mesh is also usually fixed direct into the external wall. The system is then completed with the application of a proprietary render.

It is advisable to ensure that the system to be used is supported by independent certification and full technical information is obtained from the manufacturer.

External tiling
External tiling should only be fixed to render finishes which have been applied over anchored re-enforcing mesh. It is also important to follow the guidance contained in BS 5385 : Part 3, in particular Table 3 of the standard, where information relevant to external tiling is contained.

Cladding
The two most commonly used external cladding systems are weather boarding and tile hanging. In both cases, it is advisable to include a suitable vapour-permeable membrane between the cladding and the blockwork.

Weather boarding
Although weather boarding can be fixed directly to the Thermalite surface, it is more commonly fixed to vertical battens securely fixed to the Thermalite blockwork.

Tile hanging
Clay or concrete tiles or slates can be used to create an attractive external façade and are normally nailed to horizontal timber battens which, in turn, are securely fixed to the Thermalite blockwork.

Wonderwall
Hanson's Wonderwall cladding system provides a durable, decorative and thermal insulating finish for external walls. The system comprises an insulated panel, prebonded to a vacuum-formed brickwork coordinating carrier sheet. This composite panel can be fixed directly to Thermalite using proprietary fixings. Brick slips are then fixed to the carrier sheet using a purpose-made adhesive, and finished off with a specialist pointing mortar.

* No longer current but still cited in Building Regulations.

Quality

Hanson manufactures its Thermalite products to a quality assured system in accordance with BS EN ISO 9001 and BS EN 771-4. Hanson also has a UKAS accredited laboratory for testing masonry units to the applicable product standard, with tests including compressive strength, transverse strength, moisture movement and dimensional accuracy.

The laboratory is also accredited for testing thermal conductivity of masonry and insulation materials to BS EN 12664, BS EN 12667 and ISO 8302.
The laboratory continues to work closely with authorised approving bodies when conducting field sound transmission tests to BS EN ISO 140-4 and is UKAS accredited for this test method including impact testing of floors to BS EN 140-7.

Joint work has been conducted with such bodies as the BBA, BSI, BRE and individual universities.

Other non-accredited tests carried out at the laboratory include fixing/pull-out strengths, mortar/plaster bond strength, equilibrium moisture content, freeze/thaw resistance and water absorption.

As part of the company's BS EN ISO 9001 system each Thermalite manufacturing site has a dedicated laboratory where testing is routinely conducted.

All manufacturing locations are covered by a Kitemark license. Additionally, Thermalite products have the independent accreditation of the British Board of Agrément.

Registered Trade Marks
Thermalite® is a registered Trade Mark. In addition, the following range of Trade Marks are registered:

Thermalite Floorblock®

Thermalite Shield®

Thermalite Trenchblock®

Turbo Block®

0640

ENP168

00/3720
91/2723

KM 27010
KM 27012
KM 27013

Technical advice

Product services
Hanson provides a free technical advisory service (08705 626500), staffed by a qualified team with specialist knowledge of all products and their application. Advice is offered on interpreting the Building Regulations and methods of compliance using specially developed software programs. These are updated when necessary, to keep abreast of changes to British and European Standards, Codes of Practice and Building Regulations.

This service should not be regarded as a substitute for the role carried out by the architect or structural engineer.

Members of our technical team are able to provide presentations on the use of products and regulatory compliance.

Thermal calculations
As a result of the continual drive to conserve fuel and power, the service will provide cost-effective solutions to enable compliance with the requirements.

Energy ratings
Energy assessments can be given using the Standard Assessment Procedure (SAP) only when Thermalite blocks are used to comply with the Building Regulations.

Sound insulation assessments
The provision of recommendations on sound insulation for all buildings when Thermalite blocks are used to comply with the Building Regulations.

Accommodation of movement in masonry
A service to detail the type and location of movement joints and/or bed joint reinforcement in aircrete block masonry walls to comply with the Building Regulations.

Sales

Customer services
Hanson has a reputation for providing first class customer care and this is supported by the operation of a dedicated Customer Contact Centre.

As a result of continuous investment we are able to ensure that a team of customer service staff are able to offer a fast response time to enquiries.

Wherever you are, the Thermalite Contact Centre can be reached by simply dialling the numbers shown below. Your call will be answered by one of our specialist team who are able to offer a range of services:

- Product information
- Quotations
- Orders
- Distribution facilities
- Stockist information

If the enquiry is of a more technical nature, Hanson's Product Services department is on hand to offer more expert advice. Alternatively, you can arrange to see one of our Area Sales Managers who will be pleased to meet you at your office or on site.

Logistics
Deliveries
Thermalite orders can be placed with leading builders' merchants throughout the United Kingdom for delivery direct to site by our team of dedicated professional drivers.

Packaging
Void packs
Void packaging has been developed in response to our customers' demands for packs that eliminate the need for a pallet and can be easily moved around the yard or on site. For further information, please contact Customer Services.

Grab packs
Grab packs are shrink-wrapped with strong plastic film, which provides protection for the blocks and stability to the packs. Grab packs can be easily unloaded and moved using normal brick grabs, thereby saving on pallet costs. Pallets can be supplied on request.

In addition to ensuring that the product is kept in good condition, the Thermalite packaging is clearly marked with the product description, leading to improved security and management of materials.

Site storage
Hanson recommends that Thermalite products be stacked not more than three packs high on firm, level ground.

Please contact Customer Services on:
Tel: 08705 626500
Fax: 08705 626550
Email: thermalitesales@hanson.com

Hanson's website allows you to access information on products, applications and performance quickly and easily. This includes the latest on Building Regulations and relevant technical advice.
www.hanson.com/uk/thermalite

Hanson UK

Our companies and products

Hanson UK is the leading supplier of heavy building materials to the UK construction industry. We are split into three business lines – Hanson Cement, Hanson Building Products and Hanson Quarry Products. Hanson UK is owned by the HeidelbergCement Group, which employs over 53,000 people and operates worldwide. Hanson UK employs around 5,300 people across over 300 sites.

For detailed information on all areas of Hanson and our products visit: **www.hanson.com/uk**

Hanson Quarry Products

- Crushed rock
- Sand and gravel
- Asphalt
- Contracting
- Ready-mixed concrete
- Ready-mixed mortar
- Screed
- Civil engineering

Hanson Cement

- Bulk cement
- Regen Ground Granulated Blast furnace Slag (GGBS)
- Pulverised Fly Ash (PFA)
- Packed products

Hanson Building Products

- Bricks
- Blocks
- Precast concrete products
- Permeable paving (SUDS)
- Chimneys and roofing
- Cladding
- Off-site solutions
- Specialist brick and block laying