H+H Thin-Joint System
A Modern Method of Construction
Contents

Aircrete  1-3
Thin-Joint  4-5
Thin-Joint Product Range  6-7
Rå Build Method  8-9
Where to use Thin-Joint  10
Structural Design  11
Acoustic Design  12-13
Thermal Design  14
Fire Resistance Design  15
Building with Thin-Joint  16-22
Case Studies  23-24
H+H aircrete is used extensively in all types of construction including houses, apartments, commercial properties, multi-storey concrete, steel framed buildings and schools.

Aircrete’s unique characteristics make it ideal for the construction of cavity external walls as well as internal separating walls, partitions and foundations.

With its combination of strength, resistance to moisture ingress and thermal insulation, it may also be used for external leaves and solid wall construction.

H+H aircrete combines superb thermal and sound insulation qualities, with impressive load bearing capabilities. Simple to work with, it has the additional benefits of being light weight with a high resistance to water penetration, fire, frost and sulfate attack.
H+H Aircrete – sustainable in manufacture, sustainable in use

For over 60 years H+H has been manufacturing aircrete using pulverised fuel ash (PFA) and has gained recognition from WRAP as a ‘recycled’ product. PFA accounts for up to 80% of the material used in the manufacture of H+H aircrete and is a by-product of coal-fired power stations, which would otherwise be sent for landfill.

H+H also uses raw materials of which 99% are sourced from the UK. Production plants are located strategically around the UK for ease of manufacture and transport. Waste aircrete from the process is recycled as an aggregate to avoid land fill.

The manufacturing process uses recycled energy to heat the factories and an advanced water management system capturing rainwater and recycling process water. Due to its lightweight cellular construction, the CO₂ emissions created from transportation are reduced when compared to other commonly used building materials.

Despite its light weight, H+H aircrete also adds a useful contribution to the Thermal Mass of the building, which is now recognised as an important contribution to reducing energy use, by calming down the heating/cooling cycle and combating summer overheating.
The Building Research Establishment’s (BRE) Green Guide to construction components bases its ranking system on Life Cycle Assessment of materials. With inherently low conductivities, aircrête enhances thermal performance within external walls enabling them to achieve a ranking of A+ within the Green Guide.

H+H aircrête has also been accredited by the Carbon Trust as showing a year-on-year commitment to reducing CO₂ emissions, which has contributed to H+H being awarded ISO 14001 Environmental Management Standard certification, as well as a plethora of other awards and recommendations for their commitment to sustainability. H+H is also certified to BRE’s standard for responsible sourcing of construction products, BES 6001:2008, obtaining a ‘very good’ performance rating over all products and manufacturing sites.

This provides the maximum credits within the materials section of the Code for Sustainable Homes.
H+H Thin-Joint Aircrete System

H+H’s Thin-Joint system combines high quality large format aircrete products, specially manufactured for use with Celfix – a quick-setting, thin-layer mortar, developed by H+H UK Ltd.

The system promotes the use of much larger blocks with 2mm joints, rather than the traditional 10mm joints and can be used for solid or cavity walls in all types of buildings, be it houses, apartments, commercial buildings, schools or offices.

**Celfix Mortar**

Designed to replace traditional sand:cement mortar, the key to the H+H Thin-Joint system is Celfix Mortar designed specifically for use with H+H aircrete. Celfix is cement-based and supplied as a dry, pre-mixed powder, in 25kg bags.
Thin-Joint construction combines the use of large format, accurately dimensioned aircrete blocks and quick drying mortar to create a highly productive and cost-effective building system.

The Thin-Joint system, recognised as a modern method of construction (MMC), is an established build system in the UK construction industry which responds directly to Government initiatives for speeding up the supply of housing, whilst improving the quality of build and reducing its environmental impact. It allows construction times equivalent to an off site manufactured solution without the restrictive long lead-in times and offers the benefit of design flexibility.

The system retains the flexibility of design that a traditional build enjoys, allowing adaptations on site for any issues that may have been overlooked at the design stage. It also simplifies any changes that are made to the building at a later date, such as extensions or conversions or conservatories.

Since air-tightness is now an integral part of achieving Building Regulation compliance, it has become an important factor in the design and construction of any building. Preventing warm air from escaping through uncontrolled ventilation and air leakage is a key component in controlling heat loss through the fabric of a building.

Tests undertaken by Building Services Research and Information Association (BSRIA) have shown that H+H aircrete achieved an air permeability of 0.12 m³/hr/m² measured at 50 pascals. Using H+H aircrete can therefore make a significant contribution to achieving low Design Air Permeability rates now commonly required for dwellings under Part L of the Building Regulations.

Although the aircrete itself is virtually airtight and when Thin-Jointed with fully filled joints (without finish), gives an air tightness performance of around 1 m³/hr/m², the overall air leakage of a building is very much dependent on the external fabric performance as a whole. It relies on good workmanship and detailing at junctions and service penetrations. Values of less than 5 m³/hr/m² have been regularly achieved with these systems.

### The Benefits of Thin-Joint

**Speed**

- H+H’s Thin-Joint system has some positive speed benefits:
  - Reduces the quantity of mortar used by approximately 75%
  - Reduction of site wastage
  - Fast setting mortar allows continuous laying to storey height
  - Ease of mixing and application of mortar
  - Early installation of floors and roofs
  - Early installation of internal block walls in frame buildings - not reliant on weathertight shell
  - Post fixing of cavity ties, enables outer leaf to be taken off critical path planning
  - Simplicity of installing insulation

**Quality**

- The Thin-Joint system results in some very specific benefits:
  - 2mm joints and larger units reduces Thermal Bridging
  - Improved air tightness
  - Improved build accuracy of finished walls
  - Easy to extend or adapt during or after construction
  - Allows the use of thin coat finishes (eg spray plasters)
  - Provides solid robust walls
  - Fixing location not reliant on studwork centres
H+H Thin-Joint Product Range

H+H’s Thin-Joint range of aircrete products is made up from Celcon Plus Blocks, Jumbo Bloks and Multi Plates; manufactured in the UK using the latest manufacturing technology.

With a plain face and exceptional dimensional tolerances, they are specially made for use with Celfix Mortar. Using Thin-Joint technology. With larger face formats, these aircrete blocks can significantly increase the speed of construction and improve thermal performance, by reducing cold bridging through the mortar and significantly reducing the quantity of mortar required.

Celcon Plus Blocks
Face size 610mm x 215mm
Celcon Plus Blocks are produced in various thicknesses. They are suitable for the construction of solid and cavity wall types and manufactured in Solar, Standard and Hi-Strength grades.

Jumbo Bloks
Face size 610mm x 270mm
Jumbo Blok is produced in 100mm thicknesses and above. They are suitable for the construction of cavity and partition walls. These blocks are manufactured in Solar, Standard and Hi-Strength grades.

Multi Plates
Face Size 610mm x 375mm
H+H Multi Plates are a new generation of aircrete products that build on the efficiency of thin layer construction and are available in 100mm thicknesses in Standard and Hi-Strength grades. At almost 2½ times the size of a traditional concrete block, Multi Plates and the Thin-Joint system will deliver significant savings in site productivity.
Solar Grade H+H aircrete
With very low conductivity, Solar Grade is principally used where enhanced thermal performance is required. They are generally suitable for above and below DPC for buildings up to two storeys, but excluding separating walls between dwellings. They have a compressive strength of 2.9N/mm², density of 460kg/m³ and a conductivity of 0.11W/mK.

Standard Grade H+H aircrete
H+H Standard Grade is extremely versatile and can be used below DPC, as well as above ground. Due to its all round performance, it is possible for a 100mm Standard Block to be used throughout a build including separating walls. They have a compressive strength of 3.6N/mm², density of 600kg/m³ and a conductivity of 0.15W/mK.

High Strength Grade H+H aircrete
H+H Hi-Strength Grades are used principally where higher compressive strengths are required such as in foundations, the lower storeys of three or four storey buildings or piers under high vertical loads. They have compressive strengths of 7.3N/mm² and 8.7N/mm², density of 750kg/m³ and a conductivity 0.19W/mK.

Celfix Motar
Celfix is supplied by H+H, dry in 25kg bags and should be added to water (approx. 4.5 litres per bag). Applied with either a scoop or sledge to maintain a consistent joint thickness of 2mm, it remains workable within the bucket for several hours.

With an initial bond time of around 15 minutes, storey height panels can be achieved in one lift and structurally loaded within 1-2 hours, enabling blockwork to be built extremely quickly and in the case of cavity wall construction, independently of the outer leaf.

Applications:
- Internal and external leaf in cavity walls
- Solid walls
- Separating / party walls
- Flanking walls
- Partitions
- Infill to framed buildings
Rå Build is a method of build that capitalises on the benefits of the Thin-Joint system.

The Rå (pronounced ‘raw’) Build method is an evolutionary approach to building that utilises some of the most innovative building materials and processes available to produce cutting-edge, eco-friendly buildings.
The method offers a super-quick construction and with the recommended contractor’s knowledge of both the products and method, a quality finished weather-tight masonry shell is erected in just a few days.

Rå Build is a high-performance, all-in-one solution that is readily available and reliably delivered. Meeting all the required Building Regulations (thermal, sound, structure and fire) the method is recognised by the NHBC for their warranties.

Rå Build enables the shell of a building to be constructed faster and to a better quality, allowing follow-on trades to start work sooner in a weatherproof environment, whilst retaining the flexibility of on-site construction.

With the inner leaf being constructed first, brickwork can usually be taken off the critical path making the build less weather dependant.

Rå Build delivers cost-effective superior quality without the delays and logistical problems often associated with other types of construction. Low on waste, the method saves time and money by combining H+H’s Thin-Joint system, with the impressive benefits of H+H aircrete.

H+H’s Thin-Joint system can normally be used anywhere that traditional blockwork is used and offers the benefit of improved U-values over traditional build by reducing thermal bridging. Air-tightness and sound insulation are also improved, as the blockwork has better integrity.

Fully adopted as the preferred method of wall construction throughout most of Europe, with more than 65% of all aircrete construction being produced using the Thin-Joint system, it is now firmly established within the UK as a recognised modern method of construction (MMC).

When using this method, it is important to understand how the complete system works as, without planning, the benefits of a quicker build time could be lost.

Recommended Contractor Scheme
H+H UK Ltd run a nationwide recommended contractor scheme for Thin-Joint and Rå Build contractors. All of our recommended contractors are experienced in the use of H+H Thin-Joint system and undergo continual on site monitoring to ensure standards are maintained. The recommended contractors’ experience combined with H+H’s scheme support ensures that maximum benefits are achieved during a project.

Please contact the H+H Internal Object Team 01732 880111 for more information regarding our recommended contractors.

H+H Research
Amongst other considerations, cost is a key driver when deciding on which construction method to use, so H+H UK Ltd commissioned calfordsdeaden to conduct a cost comparison between H+H’s Rå Build method (utilising the Thin-Joint system) and other common methods of construction, taking into account varying labour and material prices (see adjoining table).

Calfordsdeaden was commissioned to research the comparative costs of five different common house construction methods based on a 20 unit development of 3 bedroom houses. The research concluded that the Rå Build method delivers a cost effective masonry construction that end-users prefer, in the time it would normally take to build a framed construction.

<table>
<thead>
<tr>
<th>Method</th>
<th>Cost Additional Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rå Build</td>
<td>£656.00/m² –</td>
</tr>
<tr>
<td>Aircrete, masonry blocks</td>
<td>£669.00/m² 2.0%</td>
</tr>
<tr>
<td>Aggregate, masonry blocks</td>
<td>£671.00/m² 2.3%</td>
</tr>
<tr>
<td>Timber Frame</td>
<td>£715.00/m² 9.0%</td>
</tr>
<tr>
<td>SIPS</td>
<td>£715.00/m² 9.0%</td>
</tr>
</tbody>
</table>

Note: For a copy of the full report, please contact the sales department or visit www.hhcelcon.co.uk/library/factsheets
Where to use Thin-Joint

The range of H+H large format blocks provides the designer with a wide choice of solutions for all applications. The closed cell structure of H+H aircrete is the key to the material’s high thermal and acoustic performance as well as its resistance to water penetration.

Below DPC

H+H Celfix mortar can be used below DPC in ground sulfate conditions up to DS2. However, it is more common for below DPC blockwork to be built in traditional mortar, in which case H+H aircrete can be used in conditions up to and including DS4.

External Solid Walls

The H+H Thin-Joint system offers the architect a choice of solutions with the benefit of both strength and thermal insulation. The use of thin layer mortar techniques gives improved U-values when compared to conventional joints in solid external walls.

Externally, traditional or monocouche renders may be applied directly, taking into account exposure levels and movement control (see page 19). The blockwork provides a sound substrate for mechanical fixing where cladding, tile hanging, brick slip or insulated render systems are specified. Internally, plasters and dry lining systems are the usual finish, however, the inherent accuracy of the system can allow plasterboard to be fixed directly, using nylon nails, or proprietary thin coat projection plasters.

Cavity Wall, External

For the load-bearing inner leaf, there is a choice of strengths.

In two-storey housing, Standard and Solar grade blocks are generally more than adequate to meet structural requirements.

For multi-storey construction, walls or piers under high vertical loads, the H+H Hi-Strength blocks may be required.

As these blocks also have excellent thermal properties, less secondary insulation will be required.

H+H aircrete can also be used for the construction of the outer leaf with an appropriate finish.

Separating Walls

Separating and flanking walls constructed with the H+H Thin-Joint system can satisfy the sound insulation requirements of the national Building Regulations, allowing the building to benefit from the construction speed of the H+H Thin-Joint system whilst retaining an homogeneous build system.

Partitions

The excellent sound insulation and its high fire resistance makes H+H aircrete, when used with the Thin-Joint system, ideally suited for the construction of partition walls. With its inherent speed of build due to the mortar setting more quickly, it is possible for the walls to be plastered, or otherwise finished, without delay.

The H+H Thin-Joint system also allows greater flexibility and choice for applied finishes (see Page 22).
The structural benefits can be further enhanced when using Hi-Seven and Hi-Ten blocks as they are manufactured to a special category of manufacturing control (i.e. Category I), which permits a reduced material partial safety factor to be used in design calculations. Furthermore, the Celfix thin layer mortar is factory produced to BS EN 998-2, which enables the utilisation of special category of construction control. These two factors combined means that a reduced partial safety factor of 2.5 (gamma_m, BS 5628:Pt1 Table 4) may be used for both compression and flexure. This can be equivalent to an additional improvement of at least 20% to wall strength when compared to the safety factors of 3.1 or 3.5 as normally assumed.

Alternatively EC6, the Structural Eurocode for masonry BS EN 1996.1.1 (2005) may also be used. This standard also recognises the improved performance of thin layer mortar joints relative to traditional mortar. A basic difference between the EC6 approach and that of BS5628 is that EC6 uses a formula to calculate the characteristic compressive strength of masonry (and take into account mortar mixes, different sizes and strength of units) whereas BS5628:Pt1 is based on tabulated values.

Walls constructed using the H+H Thin-Joint system can be designed in accordance with BS5628: Part 1 which states that when determining the characteristic compressive (fk) and flexural (fkx) strengths for walls built using thin layer mortars, values given for mortar class M12 (designation (ii)) should be used. In addition, the larger face format of our Jumbo Bloks (270mm high) and Multi Plates (375mm high) can further improve the fk value of a wall (see Table below).

As an example, a 140mm thick wall designed with 10.4N/mm² concrete blocks in traditional designation (iii) mortar will have an fk of 6.8N/mm². This can be compared to 6.6N/mm² with Hi-Seven (7.3N/mm²) Jumbo Bloks or 7.5N/mm² with Hi-Ten (8.7N/mm²) blockwork (both taking into account the face size and Celfix mortar).

### Characteristic compressive strength, f_k, of masonry (to BS5628:Pt1) for H+H blocks

<table>
<thead>
<tr>
<th>Block</th>
<th>Designation (iii) / M4 mortar</th>
<th>Celfix thin layer mortar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thickness</td>
<td>Height</td>
<td>Solar (2.9)</td>
</tr>
<tr>
<td>100mm</td>
<td>215mm</td>
<td>2.15</td>
</tr>
<tr>
<td>270mm</td>
<td>2.70</td>
<td>2.8</td>
</tr>
<tr>
<td>375mm</td>
<td>3.75</td>
<td>2.8</td>
</tr>
<tr>
<td>140mm</td>
<td>215mm</td>
<td>1.54</td>
</tr>
<tr>
<td>270mm</td>
<td>1.93</td>
<td>2.7</td>
</tr>
<tr>
<td>215mm</td>
<td>0.65</td>
<td>1.5</td>
</tr>
<tr>
<td>140mm</td>
<td>1.00</td>
<td>1.8</td>
</tr>
<tr>
<td>250mm</td>
<td>140mm</td>
<td>0.56</td>
</tr>
<tr>
<td>215mm</td>
<td>0.86</td>
<td>1.7</td>
</tr>
<tr>
<td>275mm</td>
<td>140mm</td>
<td>0.51</td>
</tr>
<tr>
<td>215mm</td>
<td>0.78</td>
<td>1.6</td>
</tr>
<tr>
<td>300mm</td>
<td>140mm</td>
<td>0.47</td>
</tr>
<tr>
<td>215mm</td>
<td>0.72</td>
<td>1.5</td>
</tr>
</tbody>
</table>

* Aggregate block by others, included for comparison purposes only
Sound insulation of any masonry construction depends to a large extent on the density and porosity of the material used. However, the structure of aircrete consisting of a vast number of non-interconnecting air cells gives it a high resistance to airborne sound relative to its density. Therefore the normally accepted mass law relationship is considerably improved.

H+H products can easily achieve the requirements of Part E of the Building Regulations for separating (party) and internal walls as well as for flanking elements.

Separating Walls

Dwellings
For new build dwellings (houses or apartments), Robust Details E-WM-10 and E-WM-13 confirm the suitability of the following cavity wall constructions:

Two leaves of 100mm (minimum) Standard or Hi-Strength Grade with thin-layer mortar with a render or Gyproc Soundcoat Plus (parge) coat (nominal 8mm) plus plasterboard (8kg/m²) on dabs finish.

The cavity should be a minimum 75mm and may be tied (E-WM-10) or untied (E-WM-13). A suitable tie listed in the RD Handbook is Ancon HRT4 (shown). The untied cavity can offer enhanced acoustic performance (giving 3 credits under the Code for Sustainable Homes or 4 for EcoHomes), however, this method may not be appropriate for all situations and should be assessed by a Structural Engineer.

For apartments, the RD separating floor E-FC-4,5,8,9 and 10 may be used in conjunction with E-WM-10 and 13, enabling compliance to be shown via the RD route (provided at least one storey of the separating wall flanking the separating floor is built in Hi-Strength). Other RD concrete floor solutions may also be used but compliance would need to be shown by PCT of the floors only (providing walls are registered as RDs).

Alternatively, plaster finishes may be adopted in lieu of dry lining. Although this form of construction should easily exceed the Building Regulations requirement of 45dB DnT,w+Ctr, compliance via the pre-completion testing (PCT) route will be required, as it is not a currently registered Robust Detail (RD).

Rooms for Residential purposes or material change of use
Separating walls in houses or flats formed by material change of use or separating walls between defined rooms for residential purposes are not covered by Robust Details, therefore PCT will be required for all forms of construction. However the previously given new build solutions will be suitable. In addition, a solid wall consisting of a minimum 215mm leaf of Standard or Hi-Strength Grade with a 13mm plaster finish to both room faces, will also satisfy the 43dB DnT,w+Ctr requirement.
Flanking Walls

Flanking walls to separating walls may be 100mm (min) Solar, Standard or Hi-Strength Grade with either 13mm plaster or nominal 8kg/m² plasterboard finishes. When used in conjunction with separating floors, reference should be made to the relevant robust detail which may specify a particular grade block.

Further details of junctions between the separating walls and external (flanking) walls, ground/upper floor junctions and roof may be found in the relevant detail section of the RD Handbook.

Internal Partitions

Dwellings

A wall which separates a bedroom or w.c. from a room of any function in dwellings is required to provide a sound insulation value of 40dB $R_w$. This can be achieved by a single 100mm leaf of Standard or Hi-Strength Grade with any finish.

Buildings other than dwellings

The acoustic performance of partitions in buildings other than dwellings, eg. schools, will normally be determined by an acoustic consultant and specified in dB $R_w$. Typical values for H+H Thin-Joint system walls are given in the Table below.

Separating Walls in Framed Buildings

The cavity separating wall options given previously normally require the cavity to be continuous from below ground up to roof level, making them ideal for loadbearing masonry constructions. By their nature, framed buildings will have continuous floor slabs which will bridge the cavity at the bottom or head of the walls. In such cases, isolation of the structure from the wall can be achieved using Icopal Bridgestop, enabling Thin-Joint solutions to be adopted for multi-storey developments. As these types of construction do not conform to RDs, PCT will be required.

### Predicted weighted sound reduction index $R_w$ (dB)

<table>
<thead>
<tr>
<th>Block Thickness (mm)</th>
<th>Unfinished Surfaces</th>
<th>Finished both sides with 13mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Solar</td>
<td>Standard</td>
</tr>
<tr>
<td>100</td>
<td>36.9</td>
<td>39.5</td>
</tr>
<tr>
<td>140</td>
<td>41.0</td>
<td>43.6</td>
</tr>
<tr>
<td>215</td>
<td>46.2</td>
<td>48.7</td>
</tr>
<tr>
<td>275</td>
<td>49.1</td>
<td>51.7</td>
</tr>
<tr>
<td>300</td>
<td>50.2</td>
<td>52.7</td>
</tr>
</tbody>
</table>
### Thermal Design

Given the excellent thermal properties inherent with H+H aircrete, the H+H Thin-Joint system can offer enhanced benefits. National Building Regulations require heat loss through mortar joints be taken into consideration when calculating U-values for walls.

<table>
<thead>
<tr>
<th>Clear Cavity</th>
<th>Partial Fill Cavity</th>
<th>Fully filled Cavity</th>
<th>Solid wall - internal insulation</th>
<th>Solid wall - external insulation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U-value</strong></td>
<td><strong>U-value</strong></td>
<td><strong>U-value</strong></td>
<td><strong>U-value</strong></td>
<td><strong>U-value</strong></td>
</tr>
<tr>
<td>0.30W/m²K</td>
<td>0.25W/m²K</td>
<td>0.20W/m²K</td>
<td>0.18W/m²K</td>
<td></td>
</tr>
<tr>
<td>Brick Outer Leaf</td>
<td>Clear cavity</td>
<td>Brick Outer Leaf</td>
<td>Clear cavity</td>
<td>Brick Outer Leaf</td>
</tr>
<tr>
<td>100mm Standard grade</td>
<td>60mm Thermaline Super</td>
<td>100mm Standard grade</td>
<td>70mm Thermaline Super</td>
<td>100mm Standard grade</td>
</tr>
<tr>
<td>0.26W/m²K</td>
<td>0.23W/m²K</td>
<td>0.25W/m²K</td>
<td>0.20W/m²K</td>
<td></td>
</tr>
<tr>
<td>Brick Outer Leaf</td>
<td>Clear cavity</td>
<td>Brick Outer Leaf</td>
<td>Clear cavity</td>
<td>Brick Outer Leaf</td>
</tr>
<tr>
<td>40mm Kingspan TW50</td>
<td>50mm Kingspan TW50</td>
<td>100mm Standard grade</td>
<td>Lightweight Plaster</td>
<td>150mm Dritherm</td>
</tr>
<tr>
<td>0.29W/m²K</td>
<td>0.25W/m²K</td>
<td>0.30W/m²K</td>
<td>0.18W/m²K</td>
<td></td>
</tr>
<tr>
<td>Brick Outer Leaf</td>
<td>Clear cavity</td>
<td>Brick Outer Leaf</td>
<td>Clear cavity</td>
<td>Brick Outer Leaf</td>
</tr>
<tr>
<td>75mm Dritherm 32</td>
<td>100mm Standard grade</td>
<td>Any finish*</td>
<td>0.30W/m²K</td>
<td>100mm Dritherm</td>
</tr>
<tr>
<td>0.29W/m²K</td>
<td>0.25W/m²K</td>
<td>0.30W/m²K</td>
<td>0.18W/m²K</td>
<td></td>
</tr>
<tr>
<td>Brick Outer Leaf</td>
<td>Clear cavity</td>
<td>Brick Outer Leaf</td>
<td>Clear cavity</td>
<td>Brick Outer Leaf</td>
</tr>
<tr>
<td>215mm Solar grade</td>
<td>215mm Solar grade</td>
<td>50mm Thermaline Super</td>
<td>70mm Thermaline Super</td>
<td>80mm Solar grade</td>
</tr>
<tr>
<td>0.29W/m²K</td>
<td>0.24W/m²K</td>
<td>0.20W/m²K</td>
<td>0.17W/m²K</td>
<td></td>
</tr>
<tr>
<td>Brick or cladding finish</td>
<td>Render finish</td>
<td>Brick or cladding finish</td>
<td>Render finish</td>
<td>Brick or cladding finish</td>
</tr>
<tr>
<td>50mm EPS OR 30mm Kingspan K5</td>
<td>75mm EPS OR 40mm Kingspan K5</td>
<td>215mm Solar grade</td>
<td>Any finish*</td>
<td>110mm EPS OR 60mm Kingspan K5</td>
</tr>
<tr>
<td>Solid wall - internal insulation</td>
<td>Solid wall - external insulation</td>
<td>Solid wall - internal insulation</td>
<td>Solid wall - external insulation</td>
<td>Solid wall - external insulation</td>
</tr>
<tr>
<td>Render finish</td>
<td>Render finish</td>
<td>Render finish</td>
<td>Render finish</td>
<td>Render cladding finish</td>
</tr>
<tr>
<td>215mm Solar grade</td>
<td>215mm Solar grade</td>
<td>70mm Thermaline Super</td>
<td>80mm Solar grade</td>
<td>Any Finish</td>
</tr>
<tr>
<td>0.17W/m²K</td>
<td>0.19W/m²K</td>
<td>0.18W/m²K</td>
<td>0.18W/m²K</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:** * Any internal finish assumes dense plaster as worst case. Lightweight plaster or Plasterboard on dabs may also be used. Above U-values are not exhaustive, please contact our Technical Department for other constructions or grades of block not shown.
Fire Resistance Design

H+H aircrete has excellent resistance to fire. Extensive use has proved its capability in fire-break walls and as protective cladding for other forms of construction, eg. steel frames. BBA Certificate No. 01/3816 confirms that all H+H aircrete products are non-combustible as defined in the national Building Regulations and have a reaction to fire of Class A1 to BS EN 13501-1:2002.

For the standard fire exposure, walls are required to comply with mechanical resistance, integrity, insulation and mechanical impact criteria, defined in BS EN 1996-1-2:2005 Clause 2.1.2 as follows:
- Loadbearing only criterion R
- Separating only criteria EI
- Separating and Loadbearing criteria REI
- Loadbearing, Separating and mechanical impact criteria REI-M
- Separating and mechanical impact criteria EI-M

The fire resistance figures given (in hours) in the table below have been taken from BS EN 1996-1-2:2005 Tables.

<table>
<thead>
<tr>
<th>Fire Resistance table (Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Block Thickness (mm)</strong></td>
</tr>
<tr>
<td><strong>Solar</strong></td>
</tr>
<tr>
<td>Non-loadbearing</td>
</tr>
<tr>
<td>Loadbearing</td>
</tr>
<tr>
<td><strong>Standard and Hi-Strength</strong></td>
</tr>
<tr>
<td>Non-loadbearing</td>
</tr>
<tr>
<td>Loadbearing</td>
</tr>
</tbody>
</table>

- Clear Cavity
  - Brick Outer Leaf
  - Clear cavity
  - 100mm Standard grade
  - 40mm TW50 between battens
  - 90mm Thermaline Super
  - 0.15W/m²K

- Partial Fill Cavity
  - Brick Outer Leaf
  - Clear cavity
  - 100mm Kingspan Kooltherm K8
  - 100mm Solar grade
  - Lightweight Plaster
  - 0.15W/m²K

- Fully filled Cavity
  - Brick Outer Leaf
  - 100mm CavityTherm
  - 100mm Standard grade
  - 30mm Thermaline Super
  - 0.15W/m²K

- Solid wall - internal insulation
  - Render finish
  - 215mm Solar grade
  - 25mm TW50 between battens
  - 80mm Thermaline Super
  - 0.15W/m²K

- Solid wall - external insulation
  - Render finish
  - 175mm EPS OR 95mm Kingspan K5
  - 215mm Solar grade
  - Any finish
  - 0.15W/m²K
Building with the H+H Thin-Joint system is a fast and simple process. Provided the initial stages are followed, the quality and speed of the Thin-Joint system allows continual building. With the brickwork taken off the critical path this allows the first lift to be easily achievable in one day and building to roof plate within 2-3 days.

**Specific tools required**

Although Thin-Joint is quick and easy to build, specific tools and equipment will be required.

These include: Scoop, Sanding boards, Rasp, Whisk, Tie Driver, Block Saw. Some tools are available from H+H UK. For prices and availability please contact our Sales Office on 01732 886444

1. The first course of blocks should be bedded normally using a conventional designation (iii) mortar. Conventional mortar is required to accommodate any irregularities in the supporting structure and to incorporate the DPC.

2. It is essential that the blocks are laid accurately, true to level (±1mm) and vertical (many builders use a simple laser level for speed and accuracy).

3. The perpend joints on the first course should be with Celfix Mortar, giving a more rigid base in a shorter time.
As laying proceeds, blocks should be pressed firmly against the mortared vertical face of the adjacent block whilst lowered onto the mortared bed below, ensuring that the joints are fully filled.

Blocks can be cut with traditional hand tools. However, builders have found it more efficient on larger sites to use mechanical tools.

Supplied dry and pre-mixed in bags, Celfix Mortar should be added to water in a clean bucket (full guidance is given on the bag). Mixing using a power tool with whisk attachment, set at a low speed, achieves the thick smooth consistency required. Celfix is workable for several hours whilst in the bucket. Celfix Mortar should be applied using a scoop (or a sledge for solid walls) to suit the block thickness in order to provide a consistent joint thickness.

Should any irregularities or imperfections occur on the bed course, surfaces should be sanded down using a proprietary sanding board or rasp. Jointing faces should be clean and free from dust and if necessary, cleaned using a stiff brush.
Building with the Thin-Joint System continued

Cutting Blocks
There are a number of ways that H+H aircrete products can be cut. The traditional method is to use a hand saw. However, depending on the size of the project and particularly when cutting larger blocks, more efficiency can be gained by using mechanical tools such as reciprocating hand saws, circular and band saws.

Mechanical saws are particularly useful when there is a need to cut several blocks so as to achieve floor or plate height.

Cavity Insulation
To maximise the productivity advantage of the H+H Thin-Joint system the inner leaf can be built first. In addition to achieving an immediate weathertight structure, this also allows easy inspection of the cavity side of the blockwork and permits the use of partial fill or full fill insulation. Since the inner leaf blockwork is free of wall ties and mortar runs, insulation boards can be placed up against the blockwork with helical type wall ties driven through the insulation into the blockwork. As insulation boards are fixed with mechanical ties, they cannot become loose during construction, thus the risk of rain penetration is significantly reduced. As with the blockwork, this allows the insulation to also be inspected.
Movement Control

As with all masonry walls, the accommodation of movement should be considered at the design stage. BS5628 Part 3 gives the following general recommendations, which apply to aircrete.

- Walls in excess of 6m long should be designed as a series of panels separated by movement joints at not more than 6m centres.
- The position of the first joint from the corner should be designed to be within 3m of a corner or fixed end.
- It is also advisable to incorporate a movement joint where blockwork abuts other structural elements, such as concrete or steel.

Bed Joint Reinforcement

As the strength of mortar is a contributory factor for the accommodation of movement, H+H advise the incorporation of bed joint reinforcement in all Thin-Joint blockwork. As a minimum this should be incorporated into every other course throughout. Where reinforcement has been incorporated, the above movement joint spacings may be increased by up to 50% for internal walls.

Where a floor, which is itself subject to deflection, supports a wall, the first two courses of the wall should be reinforced. H+H recommend the use of appropriate ‘steel’ bed joint reinforcement which is compatible with thin layer mortar. The Technical Services Department will be pleased to give recommendations for specific projects.

Construction of Movement Joints

Straight, unbonded vertical joints are the most common form of movement joint. They should be formed by leaving a nominal gap filled with fibreboard/polyethylene foam. The internal surface of the movement joint should be sealed with a flexible sealant in order to maintain air tightness.

Movement joints should normally be continued through all wet finishes using stop beads (at one or both edges of the joint). Alternatively, a proprietary cover strip or an architrave pinned to one edge of the joint can be used.

Where lateral stability demands continuity across the joint, proprietary ties should be set in at 450mm maximum vertical centres.
Once the initial blocks are laid and building commences, the Thin-Joint system is a simple to follow process. Detailed here are elements of that process which should be taken into consideration along with suggested materials and methods, to produce successful Thin-Joint buildings.

Cavity Wall Ties

Traditional Mortar Outer Leaf

Generally the most effective cavity wall ties are the helical type. These are driven directly into the face of the Thin-Joint blockwork as the external traditional masonry leaf is constructed, using a support driver to prevent bending the tie during insertion and to control the depth of penetration. It may be necessary to drill a small pilot hole to achieve this when fixing into Hi-Strength blocks. Alternatively, an SDS drill set to hammer action may be used with an appropriate support tool adapter.

The ties should be installed as required for traditional blockwork and in accordance with the manufacturers guidelines. The normal spacing of 2.5 ties/m² (900 x 450mm) will generally be adequate within the UK. However, the density may need to be increased depending upon exposure conditions. For 150 wide cavities with Solar or Standard Grade blocks, the distribution should be increased to 3.7 ties/m² (450 x 600mm).

Thin-Joint Outer Leaf

Proprietary Thin-Joint to Thin-Joint cavity ties are available to build in as work proceeds. However, the preferred option is to retrospectively tie across the cavity with a helical tie, which is driven through one leaf and in to the other, either by hand or with an SDS drill set to hammer action (longer ties will be required).

Cavity Separating Walls

Different wall ties are required for Cavity Separating Walls, to achieve minimum levels of Acoustic Performance (see separating walls on page 12). Tie spacing can be amended to suit the block height, but should not be greater than 2.5 ties/m² (acoustic implications) or less than 2.0 ties/m² (structural implications).

Example spacings are:

Plus Blocks (215mm high)
434 (every 2nd course) x 1000mm centres gives 2.3 ties/m²

Jumbo Bloks (270mm high)
544 (every 2nd course) x 800mm centres gives 2.3 ties/m²

Multi Plates (375mm high)
754 (every course) x 610mm centres gives 2.3 ties/m²

Multi Plates (375mm high)
377 (every course) x 1150mm centres gives 2.3 ties/m²

Ties should be staggered and evenly distributed.
**Stability**
During construction it may be necessary to temporarily prop walls, particularly due to site or weather conditions. Care should be taken at the design stage to accommodate this possibility. Internal partition walls and partially completed external walls can be vulnerable, particularly in housing developments, where they may be subject to adverse temporary loadings; eg. exceptionally windy conditions.

**Blockwork to Structural Frame**
Proprietary ties are available (see photos, below) (head and end restraint).

**Scaffolding Systems**
In common with any other form of build, traditional tube and clip scaffolding can be used but must be independent and will require adjustment once the outer leaf has been started. It is not possible to use a conventional putlog tied scaffold, which relies on the presence of the outer leaf, where the inner leaf blockwork is built ahead of the outer leaf. Proprietary scaffolds are also suitable and offer advantages, such that they are more readily adjustable on site. It is also advisable to ensure the scaffolding is set out taking into account the outer leaf being built at a later date.

**Wall Junctions**
External walls should normally be bonded at corners or returns unless a movement joint is required. When a section of wall is constructed after other work, bonding can be replaced by a straight joint, providing proprietary flat strip shear ties are built in across the joint or helical ties driven in during construction. A movement joint should be provided where differential movement is likely to occur (eg. where sections of wall are built up from different types of foundation). Where an inner leaf is built prior to the outer leaf, helical ties can be driven through the inner leaf into the internal partition. These ties can be positioned irrespective of coursing.

**Blockwork to Blockwork Junctions**
For blockwork to blockwork junctions, proprietary ties are available which are suitable for bedding in a thin layer mortar bed. Alternatively, helical ties may be driven from the exposed end. Where movement joints are also required, the proprietary ties are supplied with a bend to allow for movement (see photos below).

For separating walls the flanking wall should either be block bonded with, or abut to the separating wall.
Building with the Thin-Joint System continued

Finishes

Traditional cement : sand render can be applied as an external finish to Thin-Joint blockwork. However, as it is not practicable to recess joints to provide a render key, it is recommended that either a stipple bonding coat is applied first or a metal lath reinforced render is used. Similarly, when applying traditional cement: sand plaster internally, a PVA bonding coat should be applied in accordance with the manufacturers recommendations (typically a stipple bonding coat will be recommended). For lightweight plasters PVA may be applied diluted in two coats, with the first acting as a primer (which is allowed to dry) and the plaster is applied to the second coat whilst it is still tacky.

Alternatively, many proprietary monocouche renders are suitable for direct application onto aircrete. One of the benefits of the H+H Thin-Joint system is that, due to greater build accuracy, alternative finishes, not suited to traditional mortar joints, such as thin coat spray systems, may be considered.

Contact the H+H Technical Services Department for further information.

Spray Plaster

Applied direct to blockwork with a total thickness of 3-4mm, the use of spray plaster can greatly reduce the time taken to apply an internal finish, in particular drying times are reduced. It therefore complements the inherent speed of the H+H Thin-Joint system.

Insulating Render and Brick Slip/Cladding Systems

Brick Slip and insulated render systems can be applied on to solid walls, to provide the most cost effective solutions for low U-values with minimal wall thicknesses.

Spray plaster

Applied direct to blockwork with a total thickness of 3-4mm, the use of spray plaster can greatly reduce the time taken to apply an internal finish, in particular drying times are reduced. It therefore complements the inherent speed of the H+H Thin-Joint system.

Insulating Render and Brick Slip/Cladding Systems

Brick Slip and insulated render systems can be applied on to solid walls, to provide the most cost effective solutions for low U-values with minimal wall thicknesses.

Approximate yield per 25kg bag - 2mm joints, no allowance made for site wastage

<table>
<thead>
<tr>
<th>Block Type</th>
<th>Block thickness (mm)</th>
<th>100</th>
<th>140</th>
<th>215</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plus Block</td>
<td>610 x 215mm</td>
<td>m² blockwork</td>
<td>11.0</td>
<td>7.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>no. blocks</td>
<td>83</td>
<td>59</td>
</tr>
<tr>
<td>Jumbo Blok</td>
<td>610 x 270mm</td>
<td>m² blockwork</td>
<td>12.4</td>
<td>8.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>no. blocks</td>
<td>75</td>
<td>54</td>
</tr>
<tr>
<td>Multi Plates</td>
<td>610 x 395mm</td>
<td>m² blockwork</td>
<td>15.5</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>no. blocks</td>
<td>67</td>
<td>-</td>
</tr>
</tbody>
</table>

Celfix Mortar

Celfix Mortar is easily mixed on site by adding the appropriate quantities of water and applied with a proprietary scoop or sledge, which will create a consistent joint thickness of 2-3mm.

Mortar should be used within 12 months of the date of manufacture which is stamped on each bag. As with any masonry, Thin-Joint mortar can be laid at temperatures of 1°C and rising and must stop at 3°C and falling.

The table below gives the yields for a bag of celfix mortar which have been achieved under factory conditions and makes no allowance for normal site wastage.

Design Guidelines

The H+H Thin-Joint system should be used following the general recommendations of BS 8000 Part 3:2005 and BS 5628-3:2001 and BBA certificate 01/3816. The inherent properties of aircrete masonry apply equally to Thin-Joint masonry.
Case Study
1000th Rå Build Dwelling
Royal Berkshire Court, Didcot

28 new affordable homes consisting of terraced, semi-detached houses and one, three-storey block of flats. There are 2 one-bed flats, 4 two-bed flats, 13 two-bed houses and 9 three-bed houses, one of which will be made suitable for a wheelchair bound resident. The site also makes use of micro-renewable technology in the shape of solar roof tiles.

Build time
With the scheme split between individual houses and an apartment block, build time varied. Approximately 10 weeks were taken to complete the aircrete element of the apartment block. 16 weeks were taken to complete the houses. In total, some 5,200m² of aircrete was laid.

Both 3.6N/mm² 610 x 270mm x 100mm and 7.3N/mm² 610 x 270mm x 140mm Jumbo Bloks were used.

Executive summary
The development made use of the Rå Build method of construction throughout. This involved building the entire inner skin of a building including inner leaf, internal and separating walls using H+H aircrete.

The development had to meet level 3 of the Code for Sustainable Homes.

Walls
The twin-skin internal and external walls use the same 100mm thickness of H+H’s 3.6N/mm² Jumbo Bloks. Rockwool insulation fills the 100mm cavities. For the apartment block’s outer walls, the higher 7.3N/mm² specification Jumbo Bloks were applied to take the load of the extra storey. The interiors were lined with plasterboard on dabs.

This specification has been predicted to achieve air loss levels of between 4 and 5m³ per hour, a U-value of 0.27W/m²K and therefore help to meet level 3 of the Code for Sustainable Homes.
Celcon Plus Blocks with Thin-Joint technology were chosen for ease of use. Balfour Beatty project manager Steve Penwill had used the system on an extension to his home and was very pleased with the results.

The original specification for the four-storey building in Hackney was to be dense block externally with a render finish. The internal lining was to have been a light gauge steel (LGS) frame system with a dry-lined, plasterboard finish.

However, while the light gauge steel (LGS) frame is quick to erect, lead times were lengthy and overall construction time would have been slow, due to the time required to build the dense block wall for the outer leaf. The solid wall solution negated the need for the LGS frame and Thin-Joint technology, using quick-setting Celfix mortar, ensured that the wall was built in much quicker time than the dense aggregate wall with conventional mortar. Masonry blockwork was also more flexible in use than the light gauge steel frame system.

The solid wall was finished with insulated render on the exterior and dry-lined on the inside.

However, while the light gauge steel (LGS) frame is quick to erect, lead times were lengthy and overall construction time would have been slow, due to the time required to build the dense block wall for the outer leaf. The solid wall solution negated the need for the LGS frame and Thin-Joint technology, using quick-setting Celfix mortar, ensured that the wall was built in much quicker time than the dense aggregate wall with conventional mortar. Masonry blockwork was also more flexible in use than the light gauge steel frame system.

The solid wall was finished with insulated render on the exterior and dry-lined on the inside.

“It’s a very good system and we will certainly be using it again. Overall, we reckon that using the aircrete thin-joint system saved us something between £60,000 and £80,000 compared to a LGS frame system, including the savings from fewer wind posts and bed reinforcement joints. The reduced amount of waste using aircrete and being able to recycle it was also a major benefit, especially for public sector projects.”

Steve Penwill, Project Manager, Balfour Beatty.
For further information and to check our most up-to-date product range please visit our website www.hhcelcon.co.uk or contact the following departments:

Sales
For sales enquiries or to find your local stockist please contact
Tel:  01732 886444
Fax:  01732 887013
or visit www.hhcelcon.co.uk

Technical
For technical enquiries please contact
Tel:  01732 880580
Fax:  01732 880581
Email: technical.services@hhcelcon.co.uk

Head Office
H+H Limited
Celcon House
Ightham Sevenoaks
Kent TN15 9HZ
Tel: 01732 886333
www.hhcelcon.co.uk