Loadbearing - timber frame

Drylining to external timber frame walls

This section includes updated information, added since it was first published in July 2009. Please see the WHITE BOOK update document for details.
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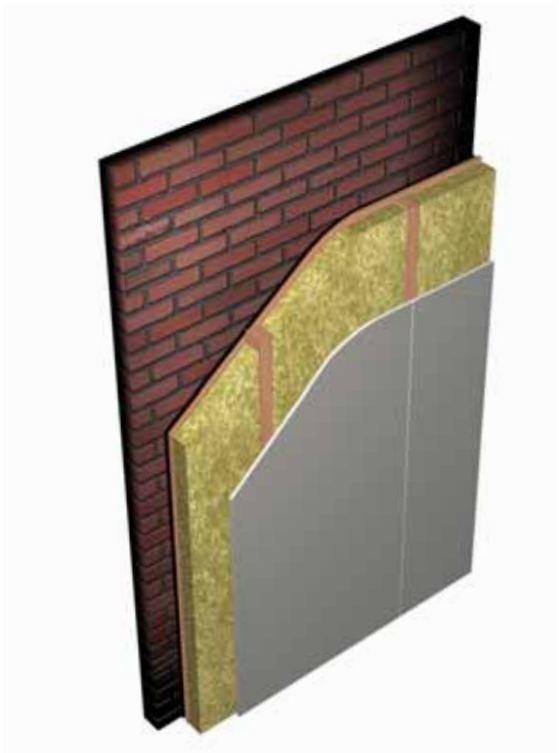
Images courtesy of Taylor Wimpey

Loadbearing - timber frame

40 – 55 R_w dB | 30 – 60 mins | 0.30 – 0.27 W/m²K

Gyproc plasterboards and thermal laminates are used as the internal lining to structural timber frame walls. Buildings constructed from timber frames include new houses and public / commercial developments, such as hotels and nursing homes. Typical external wall constructions are comprised of factory-produced timber panels and components to which a sheathing board and breather membrane are attached. The frame is tied to the external cladding using flexible wall ties.



Key facts

- U-values down to 0.27 W/m²K
- Maintains a clear wall cavity
- Gyproc thermal laminates can be specified to achieve enhanced U-values
- Gyproc DUPLEX grade boards and 48mm Gyproc ThermaLine PLUS provide an internal lining incorporating a vapour control layer

Applications

A wide range of applications.

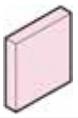
Sector

- ✓ Education
- ✓ Healthcare
- ✓ Housing
- ✓ Apartment buildings
- ✓ High-rise multi-occupancy

System components

Board products

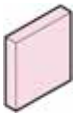
Gyproc WallBoard
Thickness 12.5, 15mm
Width 1200mm



Gyproc FireLine
Thickness 12.5mm
Width 1200mm

Gyproc ThermaLine PLUS (with integral vapour check)
Thickness 48mm
Width 1200mm

Gyproc WallBoard DUPLEX
Thickness 12.5, 15mm
Width 1200mm



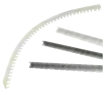
Gyproc FireLine DUPLEX
Thickness 12.5, 15mm
Width 1200mm

Fixing and finishing products

Gyproc Drywall Timber Screws
For fixing boards to normal softwoods, super-dried timber and engineered 'I' beams.

Gyproc Sealant
Sealing air paths for optimum sound insulation.

Gyproc jointing materials
For seamless jointing.



Gyproc edge and angle beads
Protecting and enhancing board edges and corners.

Thistle Board Finish or Thistle Multi-Finish
To provide a plaster skim finish.

or

Thistle Durafinish
To provide improved resistance to accidental damage.

Insulation products

Isover Frame Batt 32
50mm and 90mm, to achieve thermal and acoustic performance.

Isover Cavity Barrier
For sealing the cavity between the outer brick wall and the internal timber frame leaf.

Installation overview

Erecting the timber frame

Factory manufactured timber wall panels of the required dimensions are installed to form the structural building frame. Additional framing members are normally incorporated into wall units during factory construction, in the required positions, to accommodate door / window openings, adjoining partitions, and support heavy fixtures. Sheathing board and breather membrane are installed as specified. Electrical and other services are located within the stud cavity. Timber noggings are installed to support recessed switch boxes / socket outlets.

Installation of the loadbearing timber framework, sheathing board and breather membrane, should be carried out according to established timber frame building principles with reference to the UKTFA (United Kingdom Timber Frame Association) guidelines. A number of cladding options are available and the method of securing or tying-back the cladding will be determined by the designer.

Installing the insulation and lining

Isover Frame Batt 32 is friction-fitted in the stud cavity. Boards are fixed to framing members using Gyproc Drywall Timber Screws as specified.

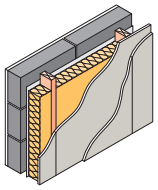
For more information, visit www.timber-frame.org

Performance (▶ Refer to **section 3 - Basic principles of system design**)

EN

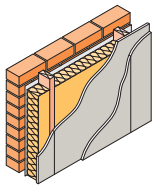
Table 1 – Timber frame external walls
Solutions to satisfy the requirements of *BS EN 1365-1-1999*

1



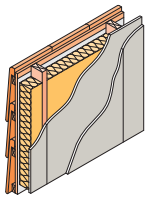
Cladding of 100mm aggregate block (λ = 0.49W/mK) with 20mm render, tied with stainless steel wall ties across a nominal 50mm clear cavity through breather membrane and sheathing board[2] to minimum 140mm x 38mm timber studs at max. 600mm centres. 140mm Isover Frame Batt 32 (90mm + 50mm) in stud cavity. Internal linings as in table. 60% load ratio.

2



Cladding of 103mm facing brick (or rendered dense block) (λ = 0.75W/mK) tied with stainless steel wall ties across a nominal 50mm clear cavity through breather membrane and sheathing board[2] to minimum 140mm x 38mm timber studs at max. 600mm centres. 140mm Isover Frame Batt 32 (90mm + 50mm) in stud cavity. Internal linings as in table. 60% load ratio.

3



Cladding[1] comprising vertical tile hanging on treated 25mm timber battens fixed through breather membrane and plywood sheathing board[2] to minimum 140mm x 38mm timber studs at max. 600mm centres. 90mm Isover Frame Batt 32 (90mm + 50mm) in stud cavity. Internal linings as in table. 60% load ratio.

Detail	Nominal wall thickness mm	Board type	Lining thickness mm	U-value[4] W/m²K	Sound insulation R_w estimated[5] dB	System reference
30 minutes fire resistance EN						
3	205	WallBoard DUPLEX	1 x 15[3]	0.30	40	B606006
2	318	WallBoard DUPLEX	1 x 15	0.28	50	B606005
1	335	WallBoard DUPLEX	1 x 15	0.27	50	B606004
60 minutes fire resistance EN						
3	215	FireLine (inner layer) + FireLine DUPLEX (outer layer)	2 x 12.5[3]	0.30	45	B606009
2	328	FireLine (inner layer) + FireLine DUPLEX (outer layer)	2 x 12.5	0.28	55	B606008
1	345	FireLine (inner layer) + FireLine DUPLEX (outer layer)	2 x 12.5	0.27	55	B606007

[1] Other lightweight claddings, such as timber sidings, cementitious render, etc, can be used which may offer the same performance.
[2] Based on sheathing board with a vapour resistivity of less than 250MNs/gm. If greater, an additional vapour control layer positioned behind the Gyproc plasterboard is recommended.
[3] 15 minutes (minimum) fire insulation only.
[4] Enhanced U-values can be achieved, using a suitable Gyproc ThermaLine laminate in addition to that quoted above. Please contact the British Gypsum Drywall Academy for further guidance.
[5] These constructions have not been tested but an estimation of performance has been given. The overall sound insulation performance will vary depending on the density, porosity and permeability of the external element.

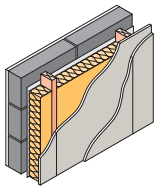
NB U-values are calculated by the proportional area method and use a typical timber fraction (the proportion of timber to mineral wool) of 15%. This follows the general guidance identified in the BRE 'Conventions for U-value Calculations'. The Thermal Conductivity (λ) value used of 0.12W/mK for timber is based on that applicable to the Spruce / Pine / Fir groups from North America and Europe used in timber frame structures.

NB The fire resistance and sound insulation performances are for imperforate partitions, walls and ceilings incorporating boards with all joints taped and filled, or skimmed according to British Gypsum's recommendations. The quoted performances are achieved only if British Gypsum components are used throughout, and the Company's fixing recommendations are strictly observed. Any variation in the specifications should be checked with British Gypsum.

NB The fire resistances quoted are for loadbearing walls tested with fire exposure to the internal face.

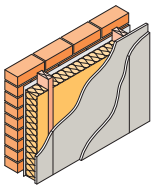
BS Table 2 – Timber frame. Typical external walls
Solutions to satisfy the requirements of *BS 476: Part 21: 1987*

1



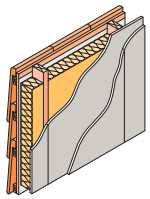
Cladding of 100mm aggregate block (λ = 0.47W/mK) with 20mm render, tied with stainless steel wall ties across a nominal 50mm clear cavity through breather membrane and sheathing board[2] to minimum 140mm x 38mm timber studs at max. 600mm centres. 140mm Isover Frame Batt 32 (90mm + 50mm) in stud cavity. Internal linings as in table. 100% load ratio.

2



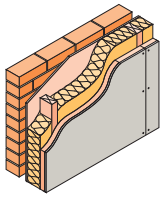
Cladding of 103mm facing brick (λ = 0.75W/mK) tied with stainless steel wall ties across a nominal 50mm clear cavity through breather membrane and sheathing board[2] to minimum 140mm x 38mm timber studs at max. 600mm centres. 140mm Isover Frame Batt 32 (90mm + 50mm) in stud cavity. Internal linings as in table. 100% load ratio.

3



Cladding[1] comprising vertical tile hanging on treated 25mm timber battens fixed through breather membrane and plywood sheathing board[2] to minimum 140mm x 38mm timber studs at max. 600mm centres. 140mm Isover Frame Batt 32 (90mm + 50mm) in stud cavity. Internal linings as in table. 100% load ratio[3].

4



Cladding of 103mm facing brick (λ = 0.75W/mK) tied with stainless steel wall ties across a nominal 50mm clear cavity through breather membrane and sheathing board[2] to minimum 89mm x 38mm timber studs at max. 600mm centres. 90mm Isover Frame Batt 32 in stud cavity. Internal linings as in table. 100% load ratio.

Detail	Nominal wall thickness mm	Board type	Lining thickness mm	U-value[4] W/m²K	Sound insulation R_w estimated[5] dB	System reference
30 minutes fire resistance BS						
3	203	WallBoard DUPLEX	1 x 12.5[3]	0.30	40	A066003
2	316	WallBoard DUPLEX	1 x 12.5	0.28	50	A066002
1	333	WallBoard DUPLEX	1 x 12.5	0.27	50	A066001
4	300	ThermaLine PLUS	1 x 48	0.27	50	A066010
60 minutes fire resistance BS						
3	215	WallBoard (inner layer) + WallBoard DUPLEX (outer layer)	2 x 12.5[3]	0.30	45	A066009
2	328	WallBoard (inner layer) + WallBoard DUPLEX (outer layer)	2 x 12.5	0.28	55	A066008
1	345	WallBoard (inner layer) + WallBoard DUPLEX (outer layer)	2 x 12.5	0.27	55	A066007

[1] Other lightweight claddings, such as timber sidings, cementitious render, etc, can be used and will offer the same performance.
[2] Based on sheathing board with a vapour resistivity of less than 250MNs/gm. If greater, an additional vapour control layer positioned behind the Gyproc plasterboard is recommended.
[3] 15 minutes (minimum) fire insulation only.
[4] Enhanced U-values can be achieved, using a suitable Gyproc ThermaLine laminate in addition to that quoted above. Please contact the British Gypsum Drywall Academy for further guidance.
[5] These constructions have not been tested but an estimation of performance has been given. The overall sound insulation performance will vary depending on the density, porosity and permeability of the external element.

NB U-values are calculated by the proportional area method and use a typical timber fraction (the proportion of timber to mineral wool) of 15%. This follows the general guidance identified in the BRE 'Conventions for U-value Calculations'. The Thermal Conductivity (λ) value used of 0.12W/mK for timber is based on that applicable to the Spruce / Pine / Fir groups from North America and Europe used in timber frame structures.

NB The fire resistance and sound insulation performances are for imperforate partitions, walls and ceilings incorporating boards with all joints taped and filled, or skimmed according to British Gypsum's recommendations. The quoted performances are achieved only if British Gypsum components are used throughout, and the Company's fixing recommendations are strictly observed. Any variation in the specifications should be checked with British Gypsum.

NB The fire resistances quoted are for loadbearing walls tested with fire exposure to the internal face.

Design

Planning - key factors

To minimise the risk of cracking at the plasterboard joints, seasoned timber with a moisture content not exceeding that recommended in *BS 5268: Part 2* should be used. The contractor should ensure that timber supports are accurately spaced, aligned, and levelled. When designing timber frame buildings, the designer should take account of relevant British Standards and associated documents.

Cavity barriers

Cavity barriers may be required to satisfy the requirements of Building Regulations. An Isover Cavity Barrier may be required to seal the cavity between the outer brick wall and the internal timber frame leaf.

▶ Refer to **section 10 – Cavity fire barriers**.

Services

Penetrations

Penetrations of fire-resistant or sound-insulating constructions for services need careful consideration to ensure that the performance of the element is not downgraded and also that the services themselves do not act as the mechanism of fire spread or sound transmission.

▶ Refer to **section 3.5 – Service installations**.

Electrical

The installation of electrical services should be carried out in accordance with *BS 7671*. Electrical and other small service runs can be routed within the timber stud cavity. Concealed cables may need earthed metallic covering, or be enclosed in earthed conduit, trunking, or ducting, to satisfy *BS 7671*. Cables located within Isover insulation may need to be up-rated to counter the effect of overheating.

▶ Refer to **section 3.5.2 – Service penetrations and fixing into drywall systems**.

Strength and robustness

The dimensions and assembly of timber supports should be sufficient to allow positive fixing of plasterboard without bounce or undue deflection because of the nailing, screwing, or other applied force.

Where boards are fixed at maximum centres in adverse conditions the standard of lining can be affected. Adverse conditions can generally be described as conditions where high humidity occurs, principally in the cold, damp, autumn / winter period. They also refer to buildings under construction over this period, where both the structure and wet applications such as plastering and screeding are subject to slow drying conditions. In these adverse conditions there is a risk of the plasterboard bowing and therefore additional plasterboard support framing should be incorporated.

Partition junctions

Where partition junctions occur, additional studs can be specified within the factory-produced wall panels, and can be incorporated either during manufacture or on-site. Alternatively, a suitable ladder frame can be installed between vertical studs during site construction, with horizontal members at 600mm centres.

Nail popping

Loosening of nails in timber can occur through timber shrinkage, or as a result of fixing boards to misaligned or twisted framing. To reduce the risks, boards should be fixed tight to framing members using Gyproc Drywall Timber Screws.

Vapour control

A vapour control layer must be provided to the room side of the stud framework. DUPLEX variants of Gyproc plasterboards and 48mm Gyproc ThermaLine PLUS incorporate integral vapour control. Where a higher vapour resistance is required, a minimum 500 gauge polyethylene film vapour control layer can be used in conjunction with standard Gyproc plasterboard.

Sheathing board

OSB, or other suitable wood-based sheet material, is nailed to the timber frame at pre-determined centres. By providing resistance to wind loads, it strengthens the structure and gives the building the required stiffness and strength. For information on plasterboard contribution to racking resistance of timber frames refer to *BS 5268: section 6.1*.

Breather membrane

A suitable membrane is applied to the outer face of the sheathing board. The breather membrane keeps rain out of the structure during construction, but allows the wall to breathe.

Linings

Plasterboard linings can be fixed as soon as the building envelope is sealed, which may be prior to installing the external cladding, e.g. brickwork. Before installing plasterboard linings, any air gaps around the perimeter should be sealed. This will ensure that thermal and sound insulation requirements are not compromised. Sealing can be achieved using Gyproc Sealant (in conjunction with Gyproc Joint Filler for deeper gaps, e.g. at base of lining).

Fixtures

For medium to heavyweight fixtures, screw fixings can be made directly into the timber supports. Additional studs or timber noggings should be installed as appropriate. For lightweight fixtures, suitable proprietary plasterboard fixing devices can be used.

▶ Refer to **section 3.5.2 – Service penetrations and fixing into drywall systems**.

Board finishing

▶ Refer to **section 13 – Finishing systems and decorative effects**.

▶ Please refer to **section 3 - Basic principles of system design** for general guidance