Warmshell Woodfibre External wall insulation system
Design and installation guidelines for masonry

1 OVERVIEW

Cladding the outside of a building with Warmshell is an excellent way of upgrading its thermal performance and at the same time improving its weather protection and visual appearance.

Warmshell is a high performance system designed around thermally insulating woodfibre board and lime-based render. It provides an effective and simple way of increasing insulation values for a wide range of properties, keeping walls warm, dry and weather-proofed. Due to the vapour-open properties of its main components, Warmshell also helps to create a more comfortable and healthier living space within the property itself.

The Warmshell system is equally beneficial for solid masonry walls and historic timber frames. The advantages of good thermal insulation, high levels of breathability and excellent weather-proofing are just as important for new build, and Warmshell can be incorporated into the design of modern timber-framed structures.

Highly breathable boards and renders Lime Green Weather Protect renders compliment the high diffusion properties of woodfibre insulation panels, making this system an ideal match	**Fire** Woodfibre provides a natural defense against fire. Wall constructions providing fire resistance of up to 90 minutes are achievable
Lime based mineral render The nature of lime render allows for a range of finishes to be achieved, providing anything from a crisp modern appearance to a softer or more textured finish in keeping with the needs of a renovation or conservation project	**Low thermal bridging** The fitting of external insulation significantly reduces the potential for thermal bridging through the wall construction
Sound protection In addition to its thermal properties, woodfibre provides excellent levels of acoustic insulation	**Heat storage in hot and cold weather** Woodfibre insulation has a higher heat storage capacity than many 'conventional' insulation products, which in turn provides a higher degree of summer heat protection. Many highly insulated modern properties use as much energy to stay cool during the summer months as they do to stay warm in the winter

Warmshell Woodfibre External wall insulation system
Design and installation guidelines for masonry

2 SYSTEM SUPPORT

The Warmshell system is fully certified by the British Board of Agrément (BBA). Certification ensures that the system is specified, supplied and installed correctly. In addition, Warmshell is the only lime render insulation system that has passed ETAG004, the main European standard for wall insulation systems.

To offer peace of mind, three site visits are recommended. A pre-order visit is made to confirm that Warmshell is an appropriate solution. A second visit is made after the insulation boards have been fixed but before the render is applied, and a third and final "signing off" visit is made on completion. Installation contractors must be system trained. (We offer training either on site, at Lime Green's own premises, or at the premises of our approved agents.)

Warranties are available, so please contact us for further information.

3 SYSTEM COMPONENTS

Warmshell consists of insulation panels made of compressed wood fibre, covered with an engineered "Weather Protect" render made from Natural Hydraulic Lime and selected kiln-dried sands, plus a range of additional specified components that together ensure that the system is fit for purpose.

3.1 Woodfibre Boards

Woodfibre board is made from timber waste and thinnings from sustainably managed forests. The material is pulped and then re-formed into sheets in a process akin to paper-making where the addition of water and heat re-activates the lignin and hemicellulose in the fibres to produce a stable sheet material. Instead of using artificial pesticides which may cause health problems, the material is protected against insects by the removal from the wood of the aromatics which attract pests. In addition, the final product has a moisture content of approximately 7 to 8%. Wood-destroying insects are attracted to softwoods with moisture contents above 15%.

Woodfibre insulation boards contain no toxic chemicals, and are fully recyclable.

The boards are of a tongue and groove profile which when fitted, give the boards some structural rigidity in their own right. They are manufactured in thicknesses of 40, 60, 80, 100, 120, 140 and 160 mm. The boards may be laminated for thicknesses in excess of 160 mm. A 20 mm square edged board is available for insulating window and door reveals. Each board is 590 x 1300 mm in size, not including the tongue.

3.2 Fixings

Special thermal fixings are used to secure the boards to the wall. These fixings are designed to prevent cold bridging, keeping the wall warmer and reducing the risk of moisture condensation. Various types are available for different backgrounds.

Structural fixing for brick, stone and block backgrounds:
WT hammer-in fixing: Refer to Warmshell information sheet N° 06 for further information. Supplied in boxes of 200 fixings.

Structural fixing for low aggregate concrete and aerated blocks:
WT-S screw in fixing: Refer to Warmshell information sheet N° 07 for further information. Supplied in boxes of 200 fixings.

Fixing pull out tests may be required if the condition of the masonry is doubtful.

Having determined the correct fixing type, the quantity and positioning is dependent on the masonry substrate and height of the building. The geographical location of the property is also important in terms of height above sea level, exposure to prevailing winds etc.

Not all stone walls are suitable for hammer fixings so it may be worth considering a timber batten arrangement with flexible insulation between battens and the woodfibre boards fitted over the top as if to a timber frame.

3.3 Baserail, render beading etc

Aluminium baserail is fitted to the bottom of the walls but above DPC with the woodfibre board above. This forms a horizontal reference point for fixing the boards.

Render beads are supplied for every render junction. Rounded corners are unlikely to be successful over square edged board. A clip-on drip bead fits to the baserail. Proprietary render bead profiles and trims are used at wall edges and corners and around windows and doors. Expanding foam tape or beading frame seal is applied around frames to ensure weather-tightness.

All profiles are supplied in either 2.4 or 2.5 metre lengths, and expanding tape Weather Seal in approximately 7 metre coils depending on width.

3.4 Glass fibre reinforcing mesh

Lime Green 660 glass fibre mesh is used to reinforce the lime render into a single piece across the elevation of the building, increasing its resistance to cracking and improving its impact performance. The basecoat render is applied in two passes with the mesh encased between. In most instances the 660 mesh is appropriate, but other meshes are available which may give better strength and impact resistance.

The mesh is supplied on rolls 1 m wide by 50 m long.

3.5 Lime Render Weather Protect Basecoat

Prepbond Weather Protect is specially formulated as an undercoat for Warmshell woodfibre insulation boards. Its use ensures that the correct bond, impact resistance, vapour

permeability and weather proofing are achieved. In addition, special additives in the render reduce the risk of cracking and algae growth.

Prepbond WP is packed in 18 kg paper sacks. It has a shelf life of 6 to 8 months if stored in dry conditions.

3.6 Decorative Finish

The Warmshell system offers two options for the final decorative surface. Each has its own features and benefits, but both give a high degree of weather protection and a permanent coloured finish that will not need re-coating for many years.

FINISH WP	SILICATE MINERAL FINISH
Traditional lime render finish	Modern looking crisp finish
Relatively small range of classic colours	Over 100 vibrant colours available

3.6.1 Option 1: Finish WP Through-Coloured Lime Render

Finish WP is a decorative and weather-proof pre-coloured topcoat render for Warmshell woodfibre boards. It has exceptional water resistance while remaining highly breathable, a combination that protects and preserves the insulation beneath and maintains a healthy environment inside the building.

Finish WP gives a beautiful traditional look as opposed to the synthetic appearance of many “modern” renders. It is available in different textures and in 36 colours, avoiding the cost of regular painting and reducing the risk of inappropriate coatings being used in the future. Care should be taken with the choice of colour as this affects heat absorption. Too much heat absorbed carries a correspondingly greater risk of thermal stress in the render. While darker colours obviously absorb more heat, the effect of colour wavelength is also significant. Darker colours at the blue end of the spectrum may absorb less heat than lighter colours at the red end. Please contact us to discuss your choice.

Finish WP is supplied in 22 kg paper sacks.

3.6.2 Option 2: Lime Green Silicate Mineral Finish

Waterglass technology – durability through silicification

As an alternative to the lime render finish, we can offer Lime Green Silicate Mineral Finish. Although it feels and looks like a paint, Silicate Mineral Finish does not form a film over the surface, but becomes a part of the Warmshell render through silicification, the chemical process whereby the liquid product reacts to become solid silica, permanently fused to the sand in the render.

Lime Green Silicate Mineral Finish in combination with Prepbond WP has similar properties to Finish WP. It offers low water absorption yet high vapour exchange, combined with excellent durability. Additional attributes are absolute light fastness and resistance to Ultra Violet light.

Lime Green Silicate Mineral Finish is a two coat product, a coarse textured undercoat and a fine top coat. Both are supplied in 12.5 litre tubs.

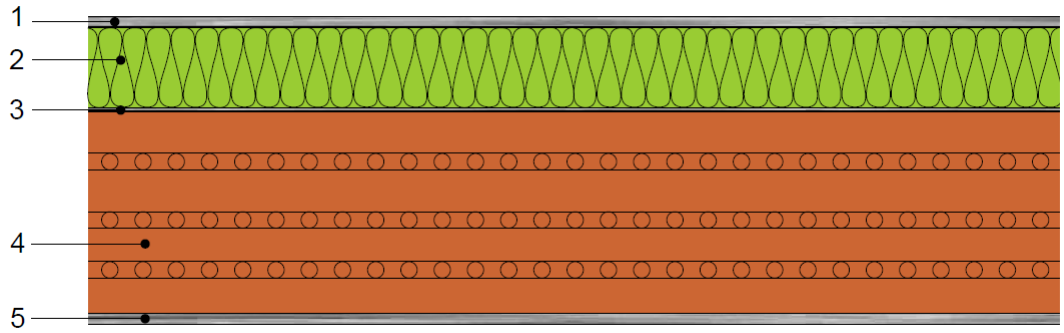
In exposed locations, we recommend the more robust two-coat render system, but this can be discussed at the initial site assessment visit.

4 APPLICATION GUIDE

4.1 Site Assessment

Suitable substrates	Unsuitable substrates
Solid masonry walls	Painted masonry walls or render Ventilated cavity walls
Good practice Designs with good overhangs, eaves detailing and measures to deal with rainwater should be as robust as possible.	

Masonry walls



1. *15 mm with the Lime Green Two Coat Render or 10 mm with Prepbond WP and Silicate Mineral paint.*
2. *Woodfibre insulation boards 40, 60, 80, 100, 120, 140 or 160 mm fixed with insulated mechanical fixings*
3. *Leveling coat if required*
4. *Masonry*
5. *Internal plaster*

Expected U values on old solid brick wall		
Build Up	Woodfibre Board Thickness (mm)	Thermal performance U value W/(m^2K)
Old lime plaster (20 mm) Solid brick wall (225mm) Woodfibre Board Lime Green Render 15mm	0	1.89
	40	0.73
	60	0.56
	80	0.46
	100	0.36
	120	0.31
	140	0.28
	160	0.25

4.1 Preparation

Use independently tied scaffolding and mask off critical features. Remove all down pipes and other services. Gutters must be re-routed away from the building during the works.

Check the condition of the masonry. It is important to avoid air gaps between the woodfibre and the masonry so old or uneven walls may need to be levelled to ± 5 mm per linear meter with Lime Green Duro basecoat render. If required, use Lime Green Fungicide to kill any algal growth.

Check condition and size of eaves, window and door reveals etc. Eaves and cills may need to be extended. Ensure the maintenance of eaves ventilation if required. Drawings for typical applications are available.

Check DPC. Ensure exterior ground level is below interior floor level. If there is no DPC, consider installing a French drain.

4.2 Base Rail

Fix the aluminium baserail to the masonry wall using the correct ZH fixings. The baserail should be fitted a minimum of 150 mm above the finished ground level or just above DPC. Ensure the rail is level and each length is joined using the dedicated joining clip. Ensure that the baserail supplied is the correct width to match the woodfibre boards.

4.3 Beneath DPC

If the wall requires insulation below DPC, woodfibre board should not be used but fix a non-water absorbent material such as Warmshell Plinthboard instead. The area below DPC is potentially at risk from environmental contaminants such as de-icing salts etc, so we recommend the use of Prepbond WP and Finish WP as the render coating.

The Plinthboard should be thinner than the woodfibre by a minimum of 25 mm so that the drip bead attached to the baserail above can work and rainwater will freely flow to the drain and not flood the base of the wall.

- *Drawing Warmshell… Plinth retrofit & timber frame*

4.4 Behind flashing and in proximity to roofs

Woodfibre board should not be used behind lead flashing. Use Plinthboard in place of woodfibre. The flashing should be returned up the Plinthboard by approximately 150 mm, and back over the top of the Plinthboard so that the woodfibre board is completely seated on the flashing. Detail drawings are available.

- *Drawing Warmshell… Eaves & Roof junction*

4.5 Woodfibre Board

The woodfibre is delivered on pallets containing between 18 and 56 boards per pallet, depending on the board thickness. Appropriate handling equipment should be available so that the pallets may be quickly unloaded and stacked, taking care not to damage the tongue and grooved board edges. Pallets should be stacked no more than two high to avoid compression damage to the boards.

4.5.1 Cutting the boards

Protect edges from damage during handling. Boards can be cut with conventional electric woodworking tools. Any board waste may be disposed of in the same manner as untreated wood waste. When cutting and handling the product please ensure that the correct personal protection equipment is used and inhalation of dust is prevented.

4.5.2 Fixing the boards

Always cut out small pieces from a whole board
Do not use damp or water damaged boards
Place the first board on the baserail and fasten with the appropriate fixing
Position the boards in a horizontal lattice pushed tightly together
Boards should alternate down corners such that vertical joints are staggered
Each board should have a minimum of 5 fixings, depending on masonry condition, height of building and wind exposure
Cut pieces and staggers between boards should be at least 200 mm wide
Additional gluing of the boards to the subsurface is not necessary

Gaps between the boards will be minimal due the innovative tongue and groove design. However any gaps in the boards should be filled with a combination of woodfibre and glue. Larger gaps should be filled with wedge shaped pieces of board glued into place.

Note: Movement joints or beading in the substrate must be carried through all applied materials. If there is any doubt about possible movement between different areas of the substrate, and the need to take this into account, specialist advice should be sought regarding the position and spacing of movement joints. Lime Green can take no responsibility for any faults caused by movement in the substrate.

- *Drawing Warmshell … Fixings masonry & timber frame*

4.6 Reveals

The importance of insulating around window and door reveals cannot be overstated. For a wall with a substantial window, any gains made by insulating the wall may be completely offset by losses from uninsulated reveals. Ideally use the same thickness of Woodfibre board as on the walls. The board may be mechanically fixed, or bonded with a coat of Prepbond WP Render.

- *Drawing Warmshell … Window & window cill*

4.7 Beading and other trims

4.7.1 Frame Seal

It is especially important to seal the junction between the system and other materials such as at window and door frames. This is best achieved using our special frame seal which ensures long lasting weather protection. This bead receives the render and acts as a means of mitigating crack formation. It has an adhesive backing which bonds to the frame, and a removable protective strip which prevents staining of the frame with the render during application.

- *Drawing Warmshell … Jamb masonry*

4.7.2 Corner beads

Corner beads have a glass fibre mesh incorporated into the design which ensures continuous reinforcement across the system. Use dabs of Prepbond WP behind the mesh to fix the bead to the board. The mesh wing of the bead and glass fibre mesh within the undercoat should overlap.

4.7.3 Drip bead for base rail

Ensure the clip-on drip bead is securely attached to the baserail. Using Prepbond WP embed the mesh wing onto the boards before the main undercoat is applied. The mesh wing of the drip bead and glass fibre mesh within the undercoat should overlap as above.

4.8 Weather Protect Lime Render

4.8.1 Basecoat: Prepbond WP

Coverage
Although mixing time, method and water addition will affect coverage, as a rule of thumb one 18 kg bag will cover approximately 1.5 m^2 at 10 mm thick on a flat background. Over 1m^2, each mm of thickness will require 1.2 kg of Prepbond WP. This does not include any allowance for wastage.

Mixing

Prepbond WP should be mixed with a drum mixer or drill and whisk. A suitable render spray machine may also be used. Add approximately 4 litres of clean water per 18 kg bag. The mixing time should ensure the product is thoroughly consistent without lumps of unmixed material. Typical mixing time is between 5 and 10 minutes. Once a mixing practice is established it should remain constant across the elevation or during one day's work

Application Guidelines

Typical Thickness: 10 mm

Working Temperature: Above 5°C and below 30°C. Refer to separate technical note for further advice including severe weather and winter and summer working.

Reworking: Prepbond WP may be reworked for up to 2 hours, but do not re-work if the mix has dried out.

Application: Apply Prepbond WP directly onto insulation boards in 2 passes in accordance with best practice guidelines in BS EN 13914-1: 2005. Into the first pass embed Lime Green 660 glass fibre mesh over the whole area, overlapping the joins by 100 mm. Apply the second pass of Prepbond WP immediately to final thickness.

Note: If a further coat of Prepbond WP is required, thoroughly scratch the first in a horizontal direction no deeper than 3 mm, using a render comb to produce a key. Re-coat after 2 to 4 days, once the first coat has stiffened but is still "green".

If the decorative final coat is to be Lime Green Silicate Mineral Finish rather than Finish WP, float Prepbond WP with a sponge, plastic or wooden float to achieve the desired finish. Wait for at least 10 days before applying the Silicate Mineral Finish.

Curing: Prevent from drying out too rapidly. Lightly spray each pass with water if it is hot or the product is drying too quickly. Protect from adverse conditions such as frost and rain until fully set (about 10 days).

- *Drawing Warmshell … Mesh*

4.8.2 Finish coat: Option 1 Finish WP

Coverage

Although mixing time, method and water addition will affect coverage, as a rule of thumb one 22 kg bag will cover approximately 2.75 m^2 at 5 mm thick. Over 1m^2, each mm of thickness will require 1.6 kg of Finish WP. This estimate does not include any allowance for wastage.

Surface Preparation

Apply to a flat, (typically ±3 mm per linear meter), previously keyed basecoat of Prepbond WP. Dampen the surface with a gentle mist spray of water before starting.

Mixing

Finish WP should be mixed should be mixed with a drum mixer or drill and whisk. A suitable render spray machine may also be used. Add 4 to 5 litres of clean water per bag. The mixing time should ensure the product is thoroughly consistent without lumps of unmixed material, typically between 5 and 10 minutes. Once a mixing practice is established it must remain consistent across the elevation or during one day's work.

Application Guidelines

Typical Thickness: 5mm

Working Temperature: Above 5°C and below 30°C. Refer to separate technical note for further advice including severe weather and winter and summer working.

Reworking: Finish WP may be reworked for up to 1 hour, but do not re-work if the mix has dried out.

Finishing: Apply Finish WP directly onto *Prepbond WP* in accordance with best practice guidelines detailed in BS EN 13914-1: 2005. Apply in a single uniform coat with a trowel to a finished thickness of 5 mm. Varying thicknesses will produce a patchy final appearance due to varying drying times. Different textures may be achieved using the following methods:

- Scraped finish
- Sponge Finish
- Wood float finish

Different methods of finishing will affect the colour and texture of the product, so agree the required finish in advance. It is advisable to make and retain sample panels for reference before starting the main work.

Curing: Prevent from drying out too rapidly. Lightly spray with water if it is hot or the product is drying too quickly. Protect from adverse conditions such as frost and rain until fully set (typically 3 to 7 days, but much longer in cold and damp conditions).

4.8.3 Finish coat: Option 2 Lime Green Silicate Mineral Finish

Coverage

Approximately 80 to 100 m^2 per 12.5 litre tub. Always blend tubs from different batches on the same elevation to avoid variations.

Surface Preparation

Lime Green Silicate Mineral Finish should be applied directly to a previously floated coat of Prepbond WP. Cure the Prepbond WP for a minimum of 3 days against the effects of rapid drying and leave for at least 10 days before finishing with Lime Green Silicate Mineral Finish.

Application Guidelines

Application: Thoroughly stir Lime Green Silicate Mineral Finish before use. Use Silicate Mineral Finish "Coarse" as the first coat, thinning with up to 10 % water to aid application. Follow with Silicate Mineral Finish "Fine" a minimum of 12 hours later, thinned with a little water up to a maximum of 5% to ease application. Apply crosswise, sparingly, evenly and lap-free with a brush, roller or spray gun. Treat adjacent surfaces all at once. Avoid drying of edges.

Working Temperature: Above 5°C and below 30°C. Refer to separate technical note for further advice including severe weather and winter and summer working. Do not apply to hot surfaces and avoid bright sunlight.

5 Q S INFORMATION GUIDE

Approximate Product Requirements for 1 m² installed			
Main components	**Product**	**Thickness/Dimension mm**	**Per m² installed**
Insulation board	System	20 - 180 mm	1.3 boards
Fixings for masonry	Insulated hammer fixings	As required	6.5 pieces
Undercoat render	Lime Green Prepbond WP	Approximately 8 - 10 mm	10-12 kg
Re-enforcement	Lime Green glass fibre mesh 660	Standard	1.1 m²
Finish coat	Lime Green Finish WP	Approximately 5 - 7 mm	8-11 kg
	Lime Green Silicate Finish	≤1mm	0.27L
Other principal components			
Base rail	Length of wall to be insulated	2.5 m lengths	As required
Base rail fixings	ZH fixing	Approximately 9 fixings per 2.5m length	
Render beads	Base rail drip bead	2.5 m lengths	As required
	Corner bead	2.5 m lengths	As required
Joint between render and frames	Frame seal	2.4 m lengths	As required
No allowance for wastage has been made, or any requirement for other minor components.			

6 MAINTENANCE AND AFTERCARE

Cleaning

Lime Green Weather Protect renders and Silicate Mineral paints are designed for low maintenance, and are unlikely to need attention for decades. Dirt, lichen and algae can be removed with gentle scrubbing using Lime Green Fungicide. Downspouts and gutters should be checked on a regular basis to ensure rainwater is not spilling on to the render.

System maintenance

If re-painting is required for aesthetic reasons at some future point, both Finish WP coloured render and Lime Green Silicate Mineral Finish may be re-coated with further applications of Silicate Mineral Finish. Do not apply masonry paint or other film forming paints with a high vapour resistance.

Since its formation in 2002, Lime Green has established itself as the UK's foremost manufacturer of hydraulic lime mortars, renders and plasters.
By working with other companies and organisations, as well as through ongoing research and development in key areas such as product chemistry, environmental assessment and historic building maintenance, we continue to make our products even better.