

GEBRIK SPECIFICATION

General

External wall cladding to be Gebrik Insulating Brick System supplied by: -

Aquarian Cladding Systems Ltd
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Aquarian Cladding Systems Ltd is the sole distributor of Gebrik for England, Scotland and Wales in accordance with a Distribution Agreement established with Isosystems AG

Gebrik Insulating Brick System is manufactured by: -

Isosystems AG
Industrie Park 53
B-4770 Schoppen/Amel
Belgium

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Website: www.gebrik.be

Description

The principle of the Gebrik Insulating Brick Cladding System is to directly fix panels and corners to a solid substrate to create a natural brick appearance which insulates and protects the building from water penetration. The system can be applied to buildings constructed of masonry, timber or steel frame and used as a lightweight cladding system on new buildings or to refurbish and protect existing buildings.

Gebrik Insulating Brick System comprises of 17-20mm thick frost-resistant, clay brick slips, cast in polyurethane insulation, in either stretcher, stack or Flemish bond format (with typically 10mm joints) to form composite panels. There is a range of approx 500 no standard brick finishes - samples and details of which are available upon request. Alternatively, non-standard brick finishes can be developed subject to quantity and agreement with the manufacturer. Generally, the brick tiles are extruded and some finishes are produced from brick slips cut from whole bricks.

Key Components

Standard panels: Stretcher Bond (Type P, SP, SP1, SP1.5), Stack Bond (Type RP, RP+), Flemish Bond (Type FP) or Gecaro (Type RP)

Factory-produced corner units: External Corner (Type HE), Window Corner (Type FE), Soffit Corner (Type ST), Stack Bond Corner (Type RE). Dimensions are expressed as no of bricks per return eg HE 1/1.5 = External Corner one brick x one and half bricks, ie 215 x 327.5mm. These are typically produced from cut and bonded panels.

Site-applied corner units: PU Corners (Type PUE) and External Pistol Returns (Type ER) and Slips (Type R). Dimensions of PU corners are expressed in mm to suit required lengths, eg PUE85/200 = 85mm x 200mm and used instead of HE0.5/1.

Fixing screws, plugs, collars & washers: Galv or Stainless Steel 4.6 – 4.9mm Ø screws with 11mm Ø conical headed TORX T30 heads to suit masonry and Galv or Stainless Steel 6mm Ø screws with 11mm Ø conical headed TORX T30 heads to suit sheathing board. Masonry screws supplied with polyamide plugs colour coded to suit substrate and sheathing fixings supplied with polyamide collar to maintain watertight performance. Polyamide, "ISO-Fixing" washers are available upon request and cast in panels during manufacture. These washers enable the fixing head to be isolated from the pointing mortar by inserting a polystyrene plug.

Foam chamber filler: Gebrik one component, expanding polyurethane foam.

Loose brick slips for maintaining stretcher bond

Cement-based glue for application of loose brick slips and returns.

Aluminium starter rail

Material

Brick specification

- Standardisation in conformity with CE NEN EN 771-1 Category I - HD
- Type: extruded / machine-thrown / sanded stock / waterstruck (WS)
- Measurements (l x h x t / mm): UK: 215x65x15-20
- Co-ordinating dimensions of bricks & mortar joints (mm): UK: 225x75mm
- Masonry bond: stretcher bond and Polymetrish Bond
- Surface texture: smooth and sanded
- Colour shade: cream yellow orange
- Frost resistance: F2 (very frost resistant)
- Average water absorption: 3% - 15% (subject to brick type)
- $\lambda = 0.5 \text{ W/mK}$
- Density (kg/m³) > 1800

Insulation

- Polyurethane hard foam, CFC free and HCFC free (propellant = n-pentane)
- Thermal conductivity A (Ao based on EN 13165): $\lambda = 0.030 \text{ W/mK}$
- Insulation thickness (mm) ≥ 40
- Density (kg/m³) > 35
- European fire category (NBN EN 13501-1:2007+A1:2009): B-S1-D0

Panels

- Measurements (L x W x H): UK/WF/R5/R6: 1350 x 60 x 675 mm; 61 1375 x 60 x 688 mm
- The panels are supplied with a pre-formed channel to create a chamber for in-situ foam injection

Fixings

General

- 18no fixing positions are cast within the panel during manufacture and are evenly distributed across the panel, located in joints between brick slips.
- The appropriate type and number of fixings used should be subject to the building exposure and condition and type of substrate.
- Fixings are typically supplied zinc-coated and stainless steel fixings are available upon request.
- All fixings must be supplied by Isosystems in accordance with BBA certification
- "ISO-Fixing" washers are designed to ensure continuity of the component's thermal insulation and are available upon request for an additional cost. Typically 9no are cast in panels during manufacture in the locations typically provided for standard fixings. During site-assembly, they will allow the heads of fixings to be set deeper within the panel and the fixing head is then isolated from the mortar by inserting a polystyrene plug. Their purpose is to reduce the cold-bridging effect of standard fixings and improve the pull-through resistance of panels.

Masonry Substrates

- The screw is typically Ø8mm with a Ø11mm conical headed TORX30 head.
- Fixings are supplied with pre-assembled Ø12mm polyamide plugs, colour-coded to suit the substrate and are available in lengths of 100mm, 120mm, 140mm, 160mm, 180mm, 200mm and 220mm (supplied boxed in 100s).
- Typical anchorage for concrete and clay substrates is 70mm but pull-out tests should be carried out and the depth of anchorage adjusted to suit
- Typical anchorage for aircrete is 110mm but pull-out tests should be carried out and the depth of anchorage adjusted to suit
- Pre-drilling is required and the depth should be 10mm deeper than anchorage required
- For example design loads table please refer to Aquarian Gebrik Data Sheets
- For more information on the masonry fixings please consult the Aquarian Gebrik Data Sheets

Steel or Timber Frame Substrates

- The screw is typically Ø6mm with a Ø11mm conical headed TORX25 head.
- Polyamide collars are supplied separately and must be used to prevent water ingress at the interface between the fixing countersink and pre-cast fixing location. These are typically available in lengths of 70, 90, 100mm, 120mm, 140mm, 160mm, 180mm and 200mm (supplied boxed in 100s).
- Fixings for securing Gebrik to sheathing board have a cutting tip therefore can be directly screwed through the Gebrik into the min 15mm thick exterior grade sheathing board, taking care to avoid metal studwork
- For more information on the sheathing fixings please consult the Aquarian Gebrik Data Sheets

Approx Fixing Guide

- The number of fixings for standard panels depends on the height of the building (h) and the wind pressure (W) on the finished assembly as calculated by a professional Engineer. For guidance purposes,
 - Where $h \leq 10$ metres and $W < 2.3 \text{ KNm}^2$ use 9no fixings (3 rows of 3)
 - If $h > 10$ & < 18 metres and $W < 2.565 \text{ KNm}^2$ use 12no fixings (4 rows of 3 or 3 rows of 4)
 - If $h > 18$ & < 50 metres and $W < 2.831 \text{ KNm}^2$ use 16no fixings (4 rows of 4)

Foam Chambers and Expandable PU Foam

- Channels are cut into the perimeter of Gebrik panels during manufacture so that a chamber is created when components abut.
- Apertures occur at approx. 330mm intervals along the horizontal panel abutments to access the chambers. The chamber is accessed at vertical abutments through the half brick 'blanks'
- The chamber is filled with a single component Gebrik polyurethane foam applied using a Gebrik PU Pistol applicator.
- In temperatures below 5°C the foam capacity is reduced.
- Gebrik PU Plugs should be used to ensure the foam expands within the chamber.
- Where panels are cut on site, the chamber must be created manually by cutting a channel using the Gebrik PU Cutter or a sharp tool
- Any excess PU foam should be removed from the face of the brickwork using Gebrik PU Cleaner within 48 hours of application to aid clean removal
- For more information on the PU foam please consult the Aquarian Gebrik Data Sheets

Adhesive

- To maintain stretcher (or Flemish) bond brick slips must be applied on site at panel/corner abutments
- There are typically 4no slips to be applied per panel/corner abutment
- Slips are applied using specially formulated cement-based IsoCol adhesive, supplied dry in 25kg bags
- Water is added to the dry adhesive in accordance with the mixing instructions on the bag or in the Gebrik Installation Manual
- Isocol should only be used in temperatures between 5°C and 25°C .
- For more information on the IsoCol adhesive please consult the Aquarian Gebrik Data Sheets

Additional insulation

(To achieve the target U value an additional ...Xmm layer of rigid insulation will be required in accordance with U value calculations ""dated ...X)

An additional rigid layer of insulation can be factory-applied to panels or applied to the substrate prior to application of the Gebrik system. Up to 60mm of PUR ($\lambda = 0.025\text{W/mK}$) can be applied at the factory or up to 100mm PUR, PIR, EPS or XPS can be used provided it has sufficient resistance to compression, Additional insulating layers must be pre-attached independent of the fastening of Gebrik as follows:

When working with two layers, we recommend using the Gebrik PUR foam (PUB cans) to bond the back of the Gebrik panel to the installed insulation layer as follows:

- Additional insulation thickness $< 60\text{mm}$: No additional bonding required.
- Additional insulation thickness $\geq 60\text{mm}$: Additional PUR bonding is recommended.
- Additional insulation thickness $\geq 100\text{mm}$: Additional PUR bonding is required.

NB: Provided there is no additional foil or paper layer on the face of the insulation.

Furthermore, we recommend that the first insulation layer should be bonded to the substrate with either adhesive mortar or PUR foam as follows:

- Additional insulation thickness $< 80\text{mm}$: No additional bonding required.
- Additional insulation thickness $\geq 80\text{mm}$: min 40% of the surface must be glued.
- Additional insulation thickness $\geq 140\text{mm}$: min 60% of the surface should be glued.

It is also recommended that a minimum of 2no fixings/ m^2 should be used to mechanically attach the first layer of insulation layer.

Insurance

- Gebrik is supplied with an insurance-backed guarantee of 10 years on the entire system. A copy is available upon request.
- Gebrik has been accepted for use by NHBC, Premier Insurance and Zurich but the policy holder must satisfy

themselves and their insurer during the design stage that Gebrik will be covered under warranty for the intended project-specific use.

Certification

- Gebrik has a BBA certificate (no 07/4403) for:
 - application to concrete and masonry substrates on buildings >18m when used in accordance with the BR135 Annex A fire test
 - application to light gauge steel framing, timber framing and SIPs framing on buildings ≤18m
 - application to light gauge steel framing on buildings >18m when used in accordance with the BR135 Annex B fire test
- Gebrik has been tested in accordance with CWCT Standard Test Methods for building envelopes, 2005 for application to light gauge steel frame and SIPs systems.
- Gebrik has been successfully tested in accordance with BS8414_Part 1 & Part 2 (BR135 Annex A & B) to demonstrate its fire performance for use on buildings >18m.

Installer Guidance

- The manufacturer or distributor must recognise the contractor as an installer of the system.
- The contractor must follow the supplier's installation instructions.
- Prior to application of the Gebrik system, the substrate must be sufficiently flat and in accordance with the guidance within the supplier's installation manual and the BBA certificate so that work can be carried out to a high standard and will comply with the guarantee.
- Installation of the system may only be completed with materials that are part of the system.
- The panels are mechanically fixed and must be packed and shimmed to ensure the face is flat.
- The fixing points must be spread evenly over the surface of the element.
- The number of fixing points for standard elements depends on the height of the application and wind pressure (minimum 9 fixings/m²).
- Care should be taken by the installer to locate and use Iso-Fixings if instruction has been given for their inclusion in the panels.
- The L-shaped corners are mechanically fixed and where PU corners and corners slips are site-applied Ø60mm washers should be used with the fixings (and plugs if onto masonry). At least 2 fixings are alternately placed on each side of the corners.
- Filling the chamber with the Gebrik PUR foam ensures the system is watertight and thermally efficient. It also contributes to securing the system to the substrate.
- Care should be taken to re-tighten fixings after PU foam expansion to ensure the façade is flat
- Slips are applied on site with cement-based adhesive and great care should be taken to ensure sufficient adhesive is applied to maintain a flat brick facade

Pointing

- Pointing can be applied traditionally or from manual/mechanical gun applicators with lime/sand/cement mortar.
- The mortar should be category M2 (cement mortar) / M3 (lime mortar) in conformity with NBN B 14001 (1985), in accordance with the processing advice of the brick and mortar manufacturer.
- Joint shade: to architects instruction subject to supplier.
- Joint type: Flush joint / raked flush joint / hollow joint / raked hollow joint / weather struck joint. NB >3mm recessed joints are not recommended
- Joint finishing: Brushed joint / polished / tapped-on joint with a hard brush / etc.

Additional construction instructions

Movement Joints

- Movement joints should follow the substrate or typically be ≤7m horizontally and ≤15m vertically.

Openings

- Cut and bonded Gebrik reveals can be supplied up to 440mm long, ie 2 bricks deep and the face length is typically 215 and 330mm long (castellated up the reveal) using FE or RE type components.
- Brick reveals can be created on site by gluing extruded/cut corner slips (type ER) and standard slips (type R) to L-shaped PU (type PUE) produced to varying lengths.
- Powder-coated aluminium or uPVC flashings/pods can be used to line openings and abut Gebrik
- Cut and bonded Gebrik lintels (type ST/RE) can be supplied to the required depth and the first brick in the soffit measures ±60mm.

External Corners

- External corners and window reveals should be created on site by gluing extruded 90deg corner slips (type ER) and standard slips (type R) to L-shaped PU (type PUE) produced to varying lengths.

Substrate

- Assess and prepare the condition of the substrate if necessary.
 - Any unevenness under 10mm over a 2m straight edge and the surface area of which is less than 1/3 of the surface area of the Gebrik element need not be filled or removed. (In such instances wooden or plastic packers between 2mm and 10mm should be used to ensure flush panel abutment).
 - Any unevenness between 10mm and 40mm are treated by either of the following methods:
 - Render
 - Lathe and plywood or cement particle board
 - Injection of mono component PU foam
 - Use of PU or PE panels with a density greater than 40kg per metre³
 - Remove projections with appropriate tools
- a) **For concrete/clay masonry:**
- Masonry or concrete to which the cladding is fixed must be structurally sound and constructed in accordance with one or more of: the designers instructions, BS/EN codes of practice (and their respective UK National Annexes) and the Building Regulations
 - If the masonry/render finish is crumbling or the joints are porous then a bonding test should be undertaken should there be any doubt.
 - Remove any loose or flaked masonry/render.
 - Extreme rough cast render may need to be smoothed with appropriate mechanical equipment to ensure a large contact area.
- b) **For light gauge galvanized steel framework:**
- The substrate should be installed by others and must be structurally sound. It should be designed and constructed in accordance with BS EN 1993-1-3 : 2006 and its UK National Annex
 - A minimum 12mm waterproof sheathing i.e. wood/cement particle board with sufficient fixing and load resistance to carry the Gebrik system (35-40kg/m² subject to brick finish) should be installed at centres in accordance with the engineers design
- c) **For timber stud framework:**
- The substrate should be installed by others and must be structurally sound. It should be designed and constructed in accordance with BS EN 1995-1-1:2004, the UK National Annex and preservative treated in accordance with BS EN 351-1 : 2007
 - A minimum 12mm waterproof sheathing i.e. wood/cement particle board with sufficient fixing and load resistance to carry the Gebrik system (35-40kg/m² subject to brick finish) should be installed at centres in accordance with the engineers design

Handling and Storage

- Gebrik is supplied shrinkwrapped and palletised on non-returnable Standard (720x1330mm) and Euro pallets (800x1200mm).
- The maximum number of panels per pallet is 28no and maximum weight per pallet is 850kg.
- Deliveries to site are stacked flat on curtain-sided articulated vehicles, unless otherwise agreed and should be off-loaded and transported on site by fork-lift or carried vertically and handled with care to avoid damage.
- The storage area should be flat and stacks of panels should not exceed 28no high.
- The storage area should be cordoned off to protect from impact damage and kept dry, protected from precipitation, direct sunlight and ground water.
- Brick slips and returns, containers of adhesive, mortars, sealants and expanding foam should be stored in dry conditions and protected from frost and excessive heat.
- Fixings, trims and rails should be protected from damp.

Quality of workmanship

Gebrik is designed to create the appearance of a conventional brick façade therefore it should be viewed as a whole, rather than in extreme detail. Walls should therefore be flat and bonds should be consistent but due to the nature of the material it will have natural colour and texture variation, the occasional small chip and/or uneven aris or blemish as part of its inherent character. Prevailing conditions, eg glancing sunlight will also affect the appearance of the system at certain times of the day.

There is currently no European or national Code of Practice for workmanship governing the application of the Gebrik system therefore the specifier should take influence from the codes of practice in place for judging acceptable brickwork and insulated render systems, ie PAS70 and BS EN 13914 respectively and agree this in advance with the applicator.

The appearance of brickwork is not covered in BS EN 771-1 as it is not performance-related therefore PAS 70, a Publicly Available Specification, is intended to cover aspects of aesthetics. The PAS includes the recommendations that all brickwork should be viewed from approximately 3 metres away, and deliveries of Gebrik panels and corners should be compared to a reference panel agreed by all parties at the start of work, thought to be representative of current production and quality and the 'aesthetic characteristics' should be assessed upon delivery. NHBC guidelines suggest:

- 10m as a viewing distance
- cracks should not be 'significant'
- brickwork should be viewed as a whole and not on an individual basis.

The presence of fire-cracks is not necessarily detrimental to the performance of Gebrik and they should not increase in size or affect durability. It is highly unusual to carry out any form of remedial work in these situations, however, if it is considered that the cracks are deep or extensive, the normal remedial treatment would be to replace the brick slip or fill the cracks with a compound of a cementitious/resin nature which is coloured to closely match the surrounding brickwork with the addition of various sands etc to provide a similar texture.

With regards viewing Gebrik for flatness and imperfections reference should be made to BS EN 13914 and the following extracts:

'NA.15.1 General Appearance' states:

Rendering on external walls should be reasonably consistent in texture, finish, colour and line.

However, rendering cannot be expected to provide a perfect finish and the following should be observed:

- some minor surface cracking and crazing is likely to occur, but should not affect its performance.
- some patches and daywork joints may be visible, but should not be unduly obtrusive
- some tooling marks may be visible, but should not be unduly obtrusive.

'NA.15.2 Lighting – General recommendations' states:

The intensity and angle of illumination can have a critical effect on the appearance of a finished externally rendered surface. For this reason, normal working and acceptance conditions are limited to when lighting and viewing are from positions perpendicular to the surface.

'NA.15.3 Glancing light conditions' states:

If the surface is to be assessed under glancing light conditions, this should be stated in the contract specification.

'NA.15.4 Viewing conditions' states:

When inspecting a finished externally rendered surface, it should be viewed in daylight, standing at ground level, from a generally accessible viewing position. Where possible it should be viewed at a distance of 10 m, with the sunlight, if any, not falling on the surface in a glancing direction.

'NA.15.5 Line' states:

The line of the rendered surface will largely be determined by the line of the substrate.

Labelling and marking

All panels are marked on the edge with the following information:

- *ISOSYSTEMS*
- Technical approvals incl the number of the certificate

- Date and hour of production (at the end of the production cycle)

Each pallet contains a label including the following information:

- Contact details of Isosystems
- Various technical approvals and numbers of the certificates
- Type of packed product
- Date of packing
- Type of insulation foam
- Brand (batch of production of the brick slips)
- Customer name, order number, site reference, site address
- Quantity of items on the pallet

The rear of the label provides a brief guide to the installation of the panels

PRODUCTION QUALITY CONTROL

Gebrik components are designed, manufactured and checked with the utmost care.

All panels and cut & bonded corners are manufactured in Schoppen (Belgium).

The strict quality control, competence & know-how of the production team, fully-maintained machinery, and tried & tested manufacturing processes ensure the durability of all panels and corners.

This document outlines the production checks necessary to determine the tolerance and quality of the system. It is predominantly based on the French NF P13-307 standard applied to production of the Gebrik system.

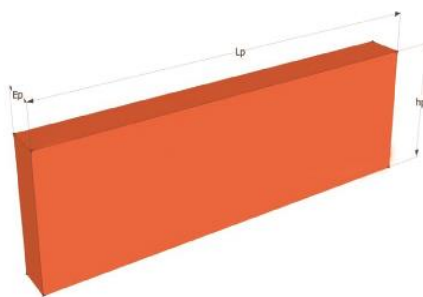
The elements are manufactured in moulds with fixed external dimensions as shown in the table below. The measurements of the manufactured brick slip series may deviate from their theoretical measurements. The following tolerances of the bricks slips are considered normal.

Table 1

Format	Nominal brick slip dimensions		Brick slip thickness	Panel Dimensions		Panel Thickness	Insulation Thickness
Tolerances	CE/FE/KI/SR -3/+1mm		± 1mm	Le : ±1.5mm		±2mm	
	VS/HW/FB -4/+1mm		±2mm	He: ±1mm			
	Lb	Hb	Tb	Le	He		
Format UK	215	65	15 to 20	1350	675	60	≥40
Format 6	240	65/66.4	15 to 20	1391	714	60	≥40
Format 61	240	65/66.4	15 to 20	1375	688	60	≥40
Format R6	215	65	15 to 20	1350	675	60	≥40
Format R5	215	50	15 to 20	1350	675	60	≥40
Format WF	215	50	15 to 20	1350	675	60	≥40
Format GC	265	127.5	15 to 20	1375	688	60	≥40

Aesthetic control of brick slips

- The brick slips are mixed in the factory in order to obtain a homogeneous colour blend.
- Some brick slips are designed to have an irregular shape to create a facade with an 'aged character'. Irregularities in the bricks or the brick surface are tolerated within the 5-10 mm per m² limits. Characteristic brick qualities such as heavy creasing, irregular arrises, colour variation (within a batch), etc. are not considered defects.



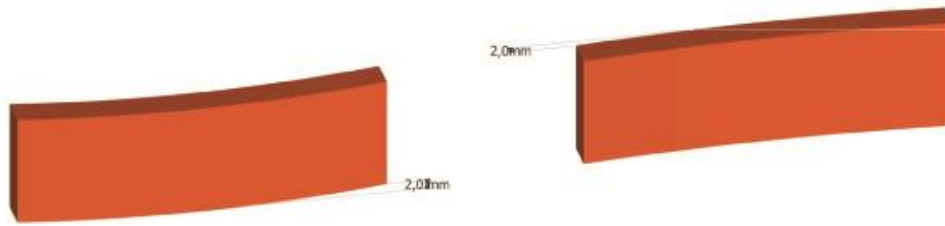
dimension

- the number of affected slips is no greater than 10% of the total number of brick slips per panel.

In this event, a request for exemption will be addressed to the customer. With its request, a panel sample can be prepared so that the customer can examine it and evaluate the aesthetical impact of the defect.

- Dimensions and tolerances on the length, the height and the thickness of the clay brick slips are indicated in Table 1 subject to the panel type
- If slips are too long they are systematically rejected as being too large for inclusion within the moulds.
- If slips are too short i.e. the nominal dimension is lower than the nominal dimension minus 2 mm, it may still be accepted if the following conditions are met simultaneously:
 - the measured dimension is no less than 4 mm of the nominal

Flatness of the clay brick slips



- The acceptable tolerance is of a curve or torsion no greater than 2mm.

Quality Control Procedure

Prior to production, the following checks are typically carried out daily:

a) Checking the polyurethane

- Characteristic temperatures
- Density
- Mixing report
- Fire-resistance test B2 in conformity with DIN (4102 (German standard))

These values are also stated in the reports provided by the PUR supplier.

b) Checking the brick slips

- Dimensions
- Strength
- Colour
- Damage
- Flatness

The following checks are typically made of panels:

a) Internal (factory) tests

- Edges of the panels
- Thickness of the PUR
- Density of the PUR
- Percentage of closed cells
- Testing the fire-resistance of the PUR, B2 in conformity with the German DIN 4102 standard
- Lambda value of the fresh PUR, after 9 weeks and after 25 weeks
- Measurements of the panels
- Compression tests (> 400 N)
- Testing the bonding strength of the brick slips in the PUR (tensile strength > 0.1 Mpa or 0.1 N/mm²)

b) External (third party) tests

Brick slips

- Water absorption: Tests are carried out in conformity with the EN-ISO 10545-3 standard 1997 (CSTC-Limelette)
- Frost-resistance: Tests are carried out in conformity with the EN-ISO 10545-12 standard 1997 (CSTC-Limelette)

Polyurethane (CSTC Limelette; FIW MOnchen)

- Measuring the lambda value (FIW MOnchen)
- Volume mass (FIW MOnchen)
- Content of ash(FIW MOnchen)
- Percentage of closed cells (FIW MOnchen)
- Compression at 10% (FIW MOnchen)
- Analysis of the blowing agent (FIW MOnchen)

Testing the entire system

- Dimensional variations (ULG Liege)
- Tensile force of the brick slips (ULG Liege; CSTC Limelette)
- Fire-resistance in conformity with German DIN 4102 and in conformity with French CSTB standard (CSTC Marne la Vallee)
- Resistance to external shocks (CSTC Marne la Vallee)
- Resistance to downpour under pulsating air pressure (CSTC Limelette)
- Water vapour transmission (ULG Liege)
- Exterior measurements (CSTC Marne la Vallee)
- Pressure on the spots of the drilling holes (CSTC Limelette)

GUARANTEE AND MAINTENANCE

When the Gebrik system is installed correctly it is maintenance free. The brick slips will obtain a natural weathering, which will give the building more character.

The Gebrik panels are supplied with a 10-year insurance-backed guarantee provided they are installed in accordance with the manufacturer's instructions by a certified installer.

Disclaimer

The working methods described in this document are merely recommendations based on our knowledge and latest insights. These recommendations are not representations of issues and characteristics that are binding by law. We cannot be held liable for the representations in this document because there are many different types of substrate and building types. We cannot therefore accept liability for the content herein and the legal provisions for product liability do not apply.

The recommendations do not discard the buyer's and fitters own obligations and responsibilities, especially with regard to taking into consideration other important technical guidelines, local regulations and laws.

Older publications of this manual are no longer valid when a new issue of this manual is available as a result of new developments in the technical field.