



ATLAS / AVAL EXTERNAL THERMAL INSULATION COMPOSITE SYSTEMS WITH RENDERING FOR THE USE AS EXTERNAL INSULATION OF BUILDING WALLS

Owner's Building Manual

Version 1/10

Issued on 08.03.2010

Thank you for choosing to insulate your house with AVAL External Thermal Insulation Composite System (ETICS). Our ETICS will drastically reduce the cost of heating your home. Besides insulating your house, the AVAL External Thermal Insulation Composite System is finished with a weather resistant, pre-coloured rendered facade. You won't have to paint the exterior of your house for several years, while a simple power wash will keep it clean.

The ETICS on your house is built up in layers. Beginning with your outside walls, your AVAL approved contractor has applied a primer to increase the adhesive properties. The second layer is an adhesive to bond the polystyrene insulation boards to your walls. To further ensure adhesion, the insulation boards have also been mechanically fixed. A reinforcing layer consisting of two coats of a cementous polymer around a glass fibre mesh was added for strength and flexibility. Finally, a topcoat of external render has been added for a weather resistant finish. Optionally, you may have had a coat of paint added to the render or wish to have it painted in the future. AVAL acrylic render has excellent resistance to fading, chalking and yellowing and therefore tends to maintain its original appearance over time.

General Maintenance

External thermal insulation durability

According to European Technical Approvals the durability of ETICS should last minimum 25 years on condition that all system elements are used, and the installation is conducted in accordance to Manufacturer's requirements. According to ETAG 004:2000, being the guidelines to European Technical Approvals, current maintenance of the finishing layer is essential to proper durability of all system elements. As ease of maintenance the following actions are provided repairs of damaged elements and, if necessary, application of new products or paints, consistent with system elements already used.

Check of the technical conditions of elevation - recommendation

The revision of technical conditions of elevation should be conducted systematically, best in spring time, just after the end of winter, when the likeness of possible damages is the biggest and weather conditions allow quick repairs. The table below shows the list of elements that should be checked systematically and advised maintenance actions:

CHECK OF THE BUILDING ELEMENTS

Elements to be checked	Scope of check	Maintenance action*
Condition of roof covering, roof flashing, eaves, wind bents etc.	Check of tightness of joints between flashing, between flashing and building elements, occurrence of corrosion, damages caused by wind etc.	Replacement of damaged or corroded elements, sealing of joints, protecting of elements from corrosion
Condition of window flashing, window sills, balconies, attics, etc.		
Tightness of permeability of	Tightness of gutters elements	Removal of leaves and dirt,



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sewerage systems and gutters	and their joints, mechanical damages, corrosion	sealing of joints, repair of damages
Condition of sealing and construction dilatations	Occurrence of cracks in dilatations, condition and any damages in the sealants	Only after consultation with architect and specialist construction companies
Fixing of additional elements on elevation: billboards, lighting etc.	Condition of fillers round the fasteners, occurrence of runs, corrosion of metal elements	Removal of damaged fillers in accordance to manufacturers' recommendations
* Recommendations listed above are just additional and should not be treated as a part of present ease of maintenance. Please consult all actions with specialists or manufacturers.		

CHECK OF THE EXTERNAL ELEVATION LAYER – RENDERS AND PAINTS

Elements to be checked	Scope of check	Maintenance action
Condition of surface in respect of dirt	Occurrence of organic or inorganic dirt – effect of sedimentation of dust, fumes, ash, dirt etc.	<ol style="list-style-type: none"> 1. Surface cleaning 2. Surface painting (optional)
Condition of surface in respect of biological contamination	Occurrence of organic dirt: Mould (black or darkgrey deposit) Alga (green deposit) Mould & alga (green – black deposit)	<ol style="list-style-type: none"> 1. Surface cleaning 2. Removal of biological contamination with special agents 3. Surface painting (optional)
Condition of surface in respect of mechanical damages, occurrence of cracks etc.	Depth and size of cracks	<ol style="list-style-type: none"> 1. Surface cleaning 2. Filling cracks or application of a new layer 3. Surface painting (optional)
Condition of surface in respect of change of colour, fading, discolouring	Extent of change of colour, fading, discolouring	<ol style="list-style-type: none"> 1. Surface cleaning 2. Priming 3. Painting
Condition of surface in respect of runs	Location and size of runs	<ol style="list-style-type: none"> 1. Finding the reason of runs 2. Elimination of the reason of runs (e.g.



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		repairs of damaged flashing) 3. Priming 4. Painting
Condition of surface in respect of efflorescence		1. Surface cleaning 2. Priming 3. Painting

Elevation maintenance - recommendations

REMOVAL OF DIRT FROM ELEVATION SURFACE

WASHING

MECHANICAL – hydrodynamic machine washing, the water pressure from 50 up to 150 bar. This method allows to clean most of dirt, even the old one. If necessary, the use of detergents and special washing agents is allowed. The temperature of water should not be higher than 140 °C. Use of warm water gives better effects. Caution: always check the water pressure, detergent or agent on a small surface before whole elevation washing. All works should be done in accordance to health & safety procedures and manufacturers' instructions. Do not wash with water dusty and low-durable surfaces (e.g. monuments), do not wash the elevation in low temperature.

MANUAL – recommended only in case of small surfaces, use warm water with detergents or special washing agents and a brush with properly long stiff bristles.

STEAM WASHING – less effective than washing with water, but allows to prepare old, flaking paint for mechanical removal. Should be done mechanically with temperature up to 140 °C.

SANBLASTING - recommended in case of very old, strongly adherent dirt. Usually done on well maintained architectonic details and elevations with vast amount of sculptures (mainly monuments).

CHEMICAL CLEANING - recommended for the removal of strongly adhering layers of paint and graffiti. Conducted with use of special chemical agents – after application on a surface agent softens the paint layer and allows its easy mechanical or manual removal.

REMOVAL OF BIOLOGICAL CONTAMINATION FROM ELEVATION SURFACE WITH ATLAS MYKOS

Occurrence of biological contamination of elevation surface is the effect of its original dirtying. The layer of dirt creates conditions for existence of mould, lichen, alga and moss. At the beginning the contamination is on the elevation surface only (deposit, slight decolouring), but if not removed, it leads to significant changes of colour and substrate damages.

ATLAS MYKOS is a high quality fungicide designed for removal of organic contamination (fungi, mould, lichen, algae and moss) from surfaces of structural elements. It can be also used for protection of mineral surfaces – both fresh and existing (but cleaned) ones - from degrading activity of microorganisms. In case of applying the fungicide to substrates other than mineral, it is recommended to make a test on a small part of substrate.



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SUBSTRATE PREPARATION

Use ATLAS MYKOS on dry substrates. Before commencement of work, protect the surface from effects of precipitation and sunlight to prevent excessive drying of the fungicide. Eliminate all possible sources of moisture, resulting from, among others, leaky insulation, bad roof flashing and leaky water supply and sewerage systems, as well as leaky rain-water piping.

CONTAMINATION REMOVAL

Apply the appropriately prepared solution evenly on dried substrate using a brush, paint roller or by spraying. Wait a few minutes before contamination removal. Clean the substrate e.g. by scrubbing it with a brush. Finally, rinse the surface thoroughly with clean water. If the substrate contains intensive microbiological contamination, repeat all the aforementioned actions or apply undiluted ATLAS MYKOS.

MINERAL SURFACE PROTECTION

Apply the appropriately prepared solution evenly on dried and previously cleaned substrate using a brush or a paint roller or by spraying. Paint surfaces on which ATLAS MYKOS has been applied not earlier than after 48 hours from agent application. We recommend the use of silicone paints and agents, as they reduce absorptiveness of substrates and a risk of new biological contamination.

If the agent has been used indoors, the room in which it has been applied can be used not earlier than 48 hours from agent application.

Main repairs – repairs of damages, scratches and cracks of elevation

ELEVATIONS WITH TRADITIONAL CEMENT AND CEMENT-LIME PLASTER AS FINISHING COAT

The table below shows the list of most common damages to elevations and advised repair technology with sets of ATLAS/AVAL products.

Damage	Technology of repair	ATLAS/AVAL products
Local surface scratches and cracks (the render coat adhered to substrate – no thud when knocked with a hammer)	<ol style="list-style-type: none">1. Surface washing2. Broadening the cracks with a spatula3. Priming of the cracks4. Filling of cracks5. Priming and painting to reach solid colour of elevation	UNIGRUNT/AVAL KT 17 REKORD ARKOL NX/AVAL KT 47 ARKOL N/FASTEL/AVAL KT 48/ AVAL KT 46



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<p>Broad elevation scratches and cracks (no loosening of render coat – no thud when knocked with a hammer)</p>	<ol style="list-style-type: none"> 1. Surface cleaning 2. Priming of elevation 3. Application of reinforced layer according to ETICS technology 4. Key coat application 5. Application of thin-layer plaster 	<p>UNIGRUNT/AVAL KT 17</p> <p>STOPTER K20/AVAL KT 85</p> <p>GLASS FIBRE MESH (VERTEX 145/AKE 145 or SSA-1363SM(100))</p> <p>CERPLAST/AVAL KT 16</p> <p>CERMIT mineral/AVAL mineral</p> <p>CERMIT acryl/AVAL acryl</p> <p>SILKAT ASX/AVAL KT 15</p> <p>SILKAT/AVAL silicate</p> <p>SILKON ANX/AVAL KT 76</p> <p>SILKON/AVAL silicone</p>
<p>Local loosening of render coat (visible loss of render coat, thud when knocked with a hammer)</p>	<ol style="list-style-type: none"> 1. Removal of damaged render 2. Priming of elevation 3. Application of a new plaster coat 4. Priming and painting to reach solid colour of elevation 	<p>UNIGRUNT/AVAL KT 17</p> <p>ATLAS PLASTERING MIX/ AVAL KT 111</p> <p>ATLAS LEVELLING MORTAR</p>
<p>Flaking of paint, change of colour, fading, discolouring, runs, stains</p>	<ol style="list-style-type: none"> 1. Surface washing 2. Priming and painting to reach solid colour of elevation 	<p>ARKOL E/AVAL KT 44</p> <p>ARKOL NX/AVAL KT 47</p> <p>ARKOL N/AVAL KT 48</p> <p>FASTEL/AVAL KT 46</p>

ELEVATIONS WITH EXTERNAL THERMAL INSULATION OR THIN-LAYER RENDER AS FINISHING COAT

Damage	Technology of repair	ATLAS/AVAL products
<p>Mechanical damages of thin-layer render and/or scratches and cracks of surface, reinforced layer</p>	<ol style="list-style-type: none"> 1. Removal of the thin-layer render coat 10 cm round the damage, do not harm 	<p>CERPLAST/AVAL KT 16</p> <p>CERMIT mineral/AVAL mineral</p>



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<p>complete</p>	<ol style="list-style-type: none"> the reinforced layer 2. Cleaning the substrate of dust 3. Key coat application 4. Application of a thin-layer render on the damaged part 5. Priming and painting to reach solid colour of elevation (optional) 	<p>CERMIT acryl/AVAL acryl (only on EPS or XPS ETICS)</p> <p>SILKAT ASX/AVAL KT 15</p> <p>SILKAT/AVAL silicate</p> <p>SILKON ANX/AVAL KT 76</p> <p>SILKON/AVAL silicone</p> <p>ARKOL E/AVAL KT 44 (only on EPS or XPS ETICS)</p> <p>ARKOL SX/AVAL KT 52</p> <p>ARKOL S/AVAL KT 54</p> <p>ARKOL NX/AVAL KT 47</p> <p>ARKOL N/AVAL KT 48</p> <p>FASTEL/AVAL KT 46</p>
<p>Damages of thin-layer render coat, reinforced layer and insulation material</p>	<ol style="list-style-type: none"> 1. Removal of damaged thermal insulation with the insulation layer 2. Removal of the thin-layer render coat 10 cm round the damage, remove the adhesive, leave the glass fibre mesh 3. Preparation of the thermal insulation and filling the damaged part 4. Application of the adhesive on the new thermal insulation, application of the reinforced layer (new mesh strips should overlap 10 cm the old mesh) 5. Key coat application 6. Application of a thin-layer render on the damaged part 7. Priming and painting to reach solid colour of elevation 	<p>EPS and/or XPS ETICS:</p> <p>STOPTER K20/AVAL KT 85</p> <p>HOTER U/AVAL KT 55</p> <p>GLASS FIBRE MESH (VERTEX 145/AKE 145 or SSA-1363SM(100))</p> <p>CERPLAST/AVAL KT 16</p> <p>CERMIT mineral/AVAL mineral</p> <p>CERMIT acryl/AVAL acryl</p> <p>SILKAT ASX/AVAL KT 15</p> <p>SILKAT/AVAL silicate</p> <p>SILKON ANX/AVAL KT 76</p> <p>SILKON/AVAL silicone</p> <p>Mineral wool ETICS:</p> <p>ROKER W20/AVAL KT 190</p> <p>GLASS FIBRE MESH (VERTEX</p>



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		<p>145/AKE 145 or SSA-1363SM(100))</p> <p>CERPLAST/AVAL KT 16</p> <p>CERMIT mineral/AVAL mineral</p> <p>SILKAT ASX/AVAL KT 15</p> <p>SILKAT/AVAL silicate</p> <p>SILKON ANX/AVAL KT 76</p> <p>SILKON/AVAL silicone</p>
Loosening of thin-layer render, reinforced layer complete	<ol style="list-style-type: none"> 1. Removal of the thin-layer render with a spatula 2. Cleaning the substrate of dust 3. Priming 4. Filling the surface with a cement-based adhesive 5. Key coat application 6. Application of a thin-layer render 7. Priming and painting (optional) 	As above
Small scratches and micro-cracks of the surface	<ol style="list-style-type: none"> 1. Surface washing 2. Priming and painting (paint with good covering properties) 	<p>ARKOL NX/AVAL KT 47</p> <p>ARKOL N/AVAL KT 48</p> <p>FASTEL/ARKOL KT 46</p>
Regular cracks of the elevation surface (straight vertical and horizontal cracks), cracks structure the same as the structure of insulation boards joints	<ol style="list-style-type: none"> 1. Surface washing 2. Application of a new reinforced layer on the whole elevation 3. Key coat application 4. Render coat application 5. Priming and painting (optional) 	<p>STOPTER K20/AVAL KT 85</p> <p>GLASS FIBRE MESH (VERTEX 145/AKE 145 or SSA-1363SM(100))</p> <p>CERPLAST/AVAL KT 16</p> <p>CERMIT mineral/AVAL mineral</p> <p>CERMIT acryl/AVAL acryl (only on EPS or XPS ETICS)</p>



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		SILKAT ASX/AVAL KT 15 SILKAT/AVAL silicate SILKON ANX/AVAL KT 76 SILKON/AVAL silicone
Flaking of paint, change of colour, fading, discolouring, runs, stains (render coat complete)	<ol style="list-style-type: none"> 1. Surface washing 2. Filling of defects (if necessary) 3. Key coat application 4. Render coat application 5. Priming and painting to reach solid colour of elevation 	ARKOL E/AVAL KT 44 ARKOL NX/AVAL KT 47 ARKOL N/AVAL KT 48 FASTEL/AVAL KT46

Hydrophobisation of substrate with Atlas Silstop

ATLAS SILSTOP is a colourless solution of silicone dispersion in an organic solvent. After application, it reacts with components of air and with water in pores of the construction material. This reaction reduces absorptive degree of the primed material; therefore the protected surface is not contaminated easily and precipitation water runs down freely on the surface providing additional cleaning. ATLAS SILSTOP penetrates the material, at the same time providing great permeability of water vapour. It is resistant to alkalis, acid rain, UV radiation, aggressive urban environment and temperatures from – 20°C to +80°C.

ATLAS SILSTOP is designed for hydrophobisation and protection of absorptive stone elements, substrates made of ceramic (e.g. brick walls) and lime-sand materials, concrete and mineral plasters from adverse effect of external environment. It is perfect for priming substrate under silicone paints. It can also be used for hydrophobisation of old façade paint coats tightly adhering to the substrate and thin-layer mineral and acrylic plasters. It is suitable for indoor and outdoor use.

CAUTION: Do not use the agent on substrates layers of which (at the depth of agent penetration) contain materials not resistant to organic dissolvent e.g. foamed polystyrene located under the reinforcing layer of the thermal insulation system.

SUBSTRATE PREPARATION

The substrate should be dry, structurally sound and free from dust, dirt, oil, grease and wax.

APPLICATION



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Apply the undiluted emulsion over the substrate with a roller or paintbrush. Application of another layer (on very absorptive substrates) or painting, e.g. ATLAS ARKOL N/AVAL KT 48 silicone paint, can be started when the first layer has completely dried i.e. after 6 hours.

PAINTING (optional)

Depending on needs painting with silicone paint ATLAS ARKOL N/AVAL KT 48 or ATLAS FASTEL/AVAL KT 46 is possible. In such case the layer of ATLAS SILSTOP becomes a priming layer for this type of paints.

Painting

Painting can be the last phase of renovation or maintenance of elevation surface, or a separate action bringing back the elevation beauty. Painting serves as:

- decorative action – gives the elevation a fresh, homogenous and attractive look
- technical action – creates a layer protecting the elevation against weather conditions, levels surface absorbability and fills in micro - cracks.

SUBSTRATE PREPARATION

The substrate should be dry, stable, even and structurally sound i.e. strong enough; it should be free from anything that may weaken adhesion, in particular dust, dirt, fat and wax.

PAINT SELECTION

In case of renovation painting the choice of paint is very important. For example, the silicate paint should be used for renovation painting of surfaces already painted with a silicate paint or silicate render coats. The Table below presents the recommendations concerning the paint selection:

Type Name	Acrylic ARKOL E AVAL KT 44	Dry acrylic CERTON	Silicate ARKOL S AVAL KT 54	Silicone ARKOL N AVAL KT 48	Silicone FASTEL AVAL KT 46
Substrate type					
Concrete/ Reinforced concrete	***	***	*	***	***
Plaster (cement and cement-lime)	***	***	***	***	***
Lime	-	***	-	-	-



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plaster					
Thin-layer mineral render	*	***	***	*	***
Thin-layer acrylic render	***	*	-	***	***
Thin-layer silicate render	*	*	***	*	*
Thin-layer silicone render	*	*	-	***	***
Asbestos-cement plates	***	-	-	***	***
Properties					
Covering	***	***	**	***	***
Steam permeability	*	**	***	**	**
Water fastness	***	**	**	***	***
Dirt resistance	**	*	**	***	***
Biological factors resistance	**	*	**	***	***

*** - high level

** - medium level

* - basic level

PRIMING



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Priming of substrate strengthens and evens substrate absorptivity and increases adhesion of paints. In case of renovation painting priming is even more important than in primary painting, as the substrate has been weakened by outdoor conditions.

PAINTING

Apply thin and even layer of ATLAS/AVAL paint on prepared and primed substrate. Use a roller or brush, or paint by spraying. Apply one or two layers depending on substrate absorptivity and structure. Plan technological gaps in advance e.g. in corners or building angles, under rainwater pipes, etc. Apply paint continuously (with the "wet on wet" method) on the planned surface, avoiding any breaks in work and preventing coat application on partially dried paint. Protect the painted surface during work and when it dries from direct sunlight, wind and precipitation. The drying time depends on the substrate, temperature and relative humidity of air and is from ca. 2 to 6 hours. Note: to avoid differences in colour shades in case of colour paints, apply paint of the same production date on one surface. Applied paint slightly smoothes substrate texture in a natural manner. In case of painting surfaces differing in respect of texture and technical parameters, different colour shades of the same paint may result.

Final remarks

All recommendations listed in this ease of maintenance set the basic repair and maintenance rules. All works should be done in accordance to health & safety procedures and manufacturers' instructions. When in doubt please make contact to professional maintenance companies or ATLAS technical advisors

Do's and Don'ts

Follow maintenance guide for general cleaning and repair.

Should I have my home painted?

ETICS does not require painting. If you would like to change the colour, your local AVAL Distributor can provide the correct paint. You should avoid purchasing paint from a supplier which is not approved by AVAL.

Matching your colour: Matching your current colour may be difficult to do, since renders will fade slightly from the sun exposure. Your local AVAL Distributor can match the exact original colour.

What do I need to know about making repairs to ETICS?

Ladders: Be careful using ladders against your ETICS walls. The surface will dent if the ladder has a sharp or hard, angled edge.

Do not use: Do not use paint thinner, solvents, solvent-based cleaners or mineral spirits on ETICS rendered walls. Do not use abrasive or hard-bristle bushes.

Temperature: Do not repair render if temperature falls below 5°C or above 25°C. Review product specifications to confirm this and other possible application do's and don'ts.

Keep heat away from acrylic render: Be sure your barbecue is well away from your rendered exterior – your ETICS insulation board may melt and/or crack if the heat source is too close.



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What should I do about removing mould from the exterior of my rendered home?

Remove with gentle pressure and the right cleaning solutions. Mild, pressurized warm water (see maintenance schedule) is best. Do not use harmful acidic/alkaline cleaners (ie: bleach).

How do I hang flower baskets, lights, a hose wheel, etc. on an ETICS wall?

External fixtures may be attached to your ETICS wall provided the correct fixings are used. Fixings should not be attached through the insulation panels only. Screws with wall anchors that are attached directly into the concrete, block or brick substrate to a depth of 60mm are recommended. Therefore, if 100mm of insulation has been used in your ETICS, 160mm screws should be anchored into the original wall. Use appropriate size and type of drill bit to provide the correct depth and diameter of hole. If in doubt, contact your ETICS installer.

Technical Support

Wide range of information concerning ATLAS/AVAL ETICS is easy of attainment on official ATLAS GROUP website:

www.atlas.com.pl (Polish version)

<http://www.atlas.com.pl/en/katalog/> (English version)

<http://www.atlas.com.pl/aval/katalog/> (English version, AVAL brand)

The official website offers the following data:

- Technical data sheets of products
- ETICS detailed description (properties, products, installation, maintenance)
- Patterns of colours of renders and paints
- Certificates, technical approvals etc.
- Company data
- Contact

All technical data sheets, technical approvals and system descriptions can be easily downloaded in a pdf. file version.

ATLAS offers also a direct technical support to architects, installers, contractors and distributors in a form of phone technical services:

ATLAS FOREIGN MARKET TECHNICAL ADVISE CENTER:

+48 58 522 08 20 (Polish speaking)

fax: +4858 522 08 22

+48 42 714 08 02 (English speaking, Polish speaking)

Fax. +48 42 714 0807



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+48 800 168 083 – 24h help desk (Polish speaking)

+48 607 781 018 – 24h help desk (English speaking)

In case of more detailed issues one may be requested for an official inquiry in writing. In such case the following e-mail addresses are valid:

export@atlas.com.pl

mgoslowski@atlas.com.pl

dareks@atlas.com.pl

In Ireland your Local ATLAS/AVAL Distributors are:

MBC PROJECT, 11 Ash Lawns, Clonbalt Woods, Longford, +353 857 866 089.

CJ Imports/ Munster Green Homes, 6 Lissanalta Close, Dooradoyle, Limerick +353 851 348 877

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Appendix

Impact Design

While the manufacturer of your External Thermal Insulation Composite System has endeavoured to make the surface of your insulation system as strong as possible, it is not impervious to damage do to impact. Examples of unacceptable impacts include, but is not limited to the following: Impact from vehicles, thrown or kicked objects such as bottles and balls and sharp objects such as knives.

- Category II Impact Resistance is required for a zone liable to impacts from thrown or kicked objects, but in public locations where the height of the system will limit the size of the impact; or at lower levels where access to the building is primarily to those with some incentive to exercise care. (ie: a house with a private garden)
- Category I Impact Resistance is required for a zone readily accessible at ground level to the public and vulnerable to hard impacts but not subject to abnormally rough use. (ie: schools and buildings directly on the foot path)

BER Information Statement

Insulation

Type	Manufacturer	Thickness	Thermal Conductivity
Graphite enhanced expanded polystyrene	Swisspor	100mm	0.031 W/mK
Graphite enhanced expanded polystyrene	Swisspor	10mm/ 20mm ¹	0.031 W/mK
Hydrophobic expanded polystyrene	Swisspor	50mm ²	0.035 W/mK
Lamella mineral wool	Rockwool	100mm ³	0.042 W/mK

Notes:

1 Insulation for door/window reveals; thickness is dependent upon space between reveal and window

2 Insulation at and below DPC

3 Insulation for fire barriers

*There are several manufacturers of insulation that meet the EN standards, ATLAS Spółka z o.o., the manufacturer of the AVAL External Thermal Insulation Composite System does not recommend one manufacturer of polystyrene or mineral wool insulation over another. The choice of the above named brands is based solely upon the discretion of the Irish distributor and may change due to availability.

U-value Information Statement

Fill out blank forms below

Front Elevation:

U-value after external wall insulation

Material	Thermal Cond. (W/mK)	Thickness	Resistance (m ² K/W)

Rtotal = _____

U-value is the inverse of Rtotal

1/ _____ = **U-value** _____ W/m²K

Back Elevation: Tick box if same as above

U-value after external wall insulation

Material	Thermal Cond. (W/mK)	Thickness	Resistance (m ² K/W)

Rtotal = _____

U-value is the inverse of Rtotal

1/ _____ = **U-value** _____ W/m²K

