BLUE ANGEL

The German Ecolabel

External Thermal Insulation Composite Systems

DE-UZ 140

Basic Award Criteria

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The Environmental Label is supported by the following four institutions:

Federal Ministry
for the Environment, Nature Conservation,
Nuclear Safety and Consumer Protection

The Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection is the owner of the label. It regularly provides information on the decisions taken by the Environmental Label Jury.

Umwelt Bundesamt

The German Environmental Agency with its specialist department for "Ecodesign, Eco-Labelling and Environmentally friendly Procurement" acts as office of the Environmental Label Jury and develops the technical criteria of the Basic Criteria for Award of the Blue Angel.

Jury Umweltzeichen

The Environmental Label Jury is the independent, decision-making body for the Blue Angel and includes representatives from environmental and consumer associations, trade unions, industry, the trade, crafts, local authorities, academia, the media, churches, young people and the German federal states.

RAL gGmbH

RAL gGmbH is the awarding body for the Environmental Label. It organises the process for developing the relevant award criteria in independent expert hearings – which involve all relevant interest groups.

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This document is a translation of a German original. In case of dispute, the original document should be taken as authoritative.

1 Introduction

1.1 Preface

In cooperation with the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, the German Environmental Agency and considering the results of the expert hearings conducted by RAL gGmbH, the Environmental Label Jury has set up these Basic Criteria for the Award of the Environmental Label. RAL gGmbH has been tasked with awarding the Environmental Label.
Upon application to RAL gGmbH and on the basis of a Contract on the Use of the Environmental Label to be concluded with RAL gGmbH, the permission to use the Environmental Label may be granted to all products, provided that they comply with the requirements as specified hereinafter.
The product must comply with all the legal requirements in the country in which it is to be marketed. The applicant shall declare that the product meets this requirement.

1.2 Background

External Thermal Insulation Composite Systems (ETICS) (also known as: EWIS – External Wall Insulation Systems (UK) or EIFS - Exterior Insulation and Finish Systems (USA)) are used for the thermal insulation of building façades. ETICS describe precisely defined materials ("components") which are connected with one another and applied to the external wall in order to improve the thermal insulation of buildings. All system components are tested, approved and supplied by one manufacturer.
In principle, an external thermal insulation composite system is constructed as follows: The insulation material in the form of panels or lamellas is fixed to the existing wall with the aid of bonding mortar or, if applicable, dowels and covered with a reinforcing layer. The insulating material can also be fixed by means of suitable rails anchored to the existing wall. The reinforcing layer consists of an undercoat (reinforcing coat) with a reinforcing mesh embedded within it. The system is completed by a final (external render) coat that may be painted or coated according to requirements or design aspects. Systems with clinker bricks or natural stone cladding as the final layer have also become established on the market.
The external thermal insulation composite system thus consists of the following layers:

- Adhesive layer and/or mechanical fixing by means of rails, dowels etc.
- Thermal insulating layer made of insulation materials of different thicknesses
- Reinforcement layer made of reinforcing coat and reinforcing mesh
- Final coat for the surface design, which also protects the external surfaces against the weather, or a ceramic / natural stone top layer
- Possibly a primer for the final coat and / or a top coating on the final coat

1.3 Objectives of the Environmental Label

External thermal insulation composite systems make an important contribution to the energy efficiency of buildings. All ETICS are climate friendly. Nevertheless, the systems differ in terms of their environmental compatibility.
In order to minimise the environmental pollution caused by the hazardous substances in the components of the external thermal insulation composite systems, the aim from an environmental and health perspective is thus to minimise the pollutant content and the release

of pollutants from these products. Therefore, the requirements for this environmental label focus not only on the substances and materials used in the manufacturing process but also on the period of use of the products. The environmental label for external thermal insulation composite systems may be awarded to products that

- are manufactured using substances and materials that place less burden on the environment within their product group,
- do not contain any harmful substances that have a detrimental impact during disposal,
- in particular, do not contain any critical flame retardants and blowing agents,
- in particular, do not contain any biocides as coating protection agents and
- provide information on the ecological impact during the production of the products.

In the case of external thermal insulation composite systems, it is not sufficient to follow an approach that exclusively focuses on testing the properties of the substances used in the products when awarding the environmental label: Components of an ETICS that are suitable from a substance perspective could be used for unsuitable structures (planning), fitted incorrectly or damaged during installation so that they neither achieve the claimed environmental goal (thermal insulation – energy savings – climate protection) nor a high level of user satisfaction. Therefore, the environmental label for external thermal insulation composite systems also defines minimum requirements for:

- Stability / durability using systems approved by the building authorities
- Guaranteeing compliance with the requirements in the Energy Saving Directive for the thermal insulation of external walls
- The provision of information for planners, workmen and building owners
- Quality assurance / workmanship in compliance with the relevant standards
- Visual properties in the form of good resistance to microbial growth

Therefore, the following benefits for the environment and health are stated in the explanatory box:

2 Scope

These Basic Award Criteria are valid for external thermal insulation composite systems for exterior façades approved according to German building law that

a) have a European Technical Assessment (ETA) that corresponds to the German technical rule "WDVS mit ETA nach ETAG 004" (ETICS with ETA according to ETAG 004) and was carried out in accordance with DIN 55699 Edition 2017-08 "Application and processing of external thermal insulation composite systems (ETICS) with insulation of expanded polystyrene (EPS) or mineral wool (MW)" or

b) have a European Technical Assessment and a national technical approval (abZ) from the DIBt (Deutsches Institut für Bautechnik - German Institute for Structural Engineering) or

c) have a national technical approval (abZ) with a general construction technique permit (aBg) from the DIBt (Deutsches Institut für Bautechnik - German Institute for Structural Engineering)[1]

In addition, the Basic Award Criteria are valid for any top coating used as a system component. The Basic Award Criteria are not valid for the plinth area (perimeter insulation systems).

Compliance Verification

The applicant shall submit the general construction technique permit (aBg), the national technical approval (abZ) and/or the European Technical Assessment (ETA) for the external thermal insulation composite system (Annex 10). If the ETICS has an ETA that corresponds to the German technical rule "WDVS mit ETA nach ETAG 004" (ETICS with ETA according to ETAG 004), the applicant shall present and enclose the corresponding certificate (Annex 11). The certificate submitted by the applicant confirms that the building product (components) named in the application complies with the provisions of the European Technical Assessment and also the German technical rule "WDVS mit ETA nach ETAG 004" (ETICS with ETA according to ETAG 004).

The system components, as well as any additional and suitable top coatings, shall be presented in Annex 2.

3 Requirements

The external thermal insulation composite systems named under Paragraph 2 can be labelled with the environmental label illustrated on the first page of these Basic Award Criteria if they fulfil the following requirements.

3.1 Manufacture

3.1.1 General substance requirements

The components of the external thermal insulation composite systems may not contain any substances with the following properties as a constituent component[2]:

a) Substances which are identified as substances of very high concern under the European Chemicals Regulation REACH (1907/2006/EC)[3] and which have been incorporated into the

[1] The general construction technique permits (aBg) / national technical approvals (abZ) that have been issued up to now allow for the use of a variety of insulation materials, plasters, etc. that need to fulfil certain building requirements as a complete system. ETICS based on mineral wool, polystyrene, wood fibres, wood wool, mineral foam, polyurethane, phenolic resin and aerogel can currently be used in Germany according to the aBg / abZ approvals. The aBg / abZ approvals are available from the DIBt at: https://www.dibt.de/de/Fachbereiche/Referat_II1.html.

[2] Constituent components are substances added to the product as such or as part of a mixture and remain there unchanged in order to achieve or influence certain product properties and those required as chemical cleavage products for achieving the product properties. This does not apply to residual monomers that have been reduced to a minimum.

[3] Regulation (EC) No. 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), in short REACH

list drawn up in accordance with Article 59, Paragraph 1 of the REACH Regulation (so-called "candidate list").[4]

b) Substances that according to the CLP Regulation[5] have been classified in the following hazard categories or which meet the criteria for such classification[6]:

- carcinogenic in categories Carc. 1A or Carc. 1B
- germ cell mutagenic in categories Muta. 1A or Muta. 1B
- reprotoxic (teratogenic) in categories Repr. 1A or Repr. 1B
- Acute toxicity (poisonous) in categories Acute Tox. 1, Acute Tox. 2 or Acute Tox. 3
- Specific target organ toxicity in categories STOT SE 1 or STOT RE 1
- Hazardous to water in category Aquatic Chronic 1

c) The hazard statements (H Phrases) that correspond to the hazard categories can be found in Appendix A.

d) Substances that are classified in TRGS 905[7] as:

- Carcinogenic (K1A, K1B)
- Germ cell mutagenic (M1A, M1B)
- Reprotoxic (R_F1A, R_F1B)
- Teratogenic (R_D1A, R_D1B)

e) Substances with other hazardous substances being present in concentrations that require a classification and labelling of the finished product with a GHS hazard pictogram for health and environmental hazards. Exempted are internal plasters which because of their high pH value during processing must be labelled with the GHS hazard pictogram GHS05 (corrosion) or GHS07 (exclamation mark).

Compliance Verification

The applicant shall declare compliance with the requirements in Annex 1 and submit corresponding declarations from the manufacturers/suppliers (Annex 3). In the case of system components that are considered mixtures in the sense of the chemical law (adhesive and reinforcing compounds, renders, top coatings, etc.), the safety data sheets must also be submitted (Annex 4).

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[4] The version of the list of candidates at the time of application is valid. The list of candidates in its relevant version can be found at: REACH list of candidates.

[5] Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures, short: CLP (Classification, Labelling and Packing). Supplementary legislative acts with respect to the CLP Regulation must also be observed (see e.g. https://www.reach-clp-biozid-helpdesk.de/DE/CLP/Rechtstexte/Rechtstexte_node.html))

[6] The harmonized classifications and labellings of dangerous substances can be found in Annex VI, Part 3 of the CLP Regulation. Furthermore, a comprehensive classification and labelling inventory, which also includes all of the self-classifications of hazardous substances made by manufacturers, has been made available to the public on the website of the European Chemicals Agency: ECHA classification and labelling inventory.

[7] TRGS 905, directory of carcinogenic, mutagenic or teratogenic substances from the Committee for Hazardous Substances (AGS): TRGS 905. The current version at the time of application is valid. The TRGS lists such CMR substances that have not received harmonised classifications up to now or where the AGS has come to a different classification.

3.1.2 General requirements for insulation materials

3.1.2.1 Flame retardants

The thermal insulation materials used in the external thermal insulation composite system may not contain any flame retardants classified as persistent, bioaccumulative and toxic (PBT) substances or as very persistent and very bioaccumulative (vPvB) substances according to the criteria of Annex XIII to the REACH Regulation 1907/2006/EC. Thermal insulation materials used in the external thermal insulation composite system may not contain any halogenated organic compounds as flame retardants. If flame retardants are used, they must be named by the applicant (name, CAS no).

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 or submit corresponding declarations from the manufacturers/suppliers (Annex 5). If the applicant cannot declare compliance with the requirement, the contents of the halogens fluorine, chlorine and bromine must be determined by means of combustion analysis in accordance with DIN EN 14582[8] and the proportion of tolerable impurities may not exceed 0.1 g/kg.

3.1.2.2 Biocides

The insulation materials used in the external thermal insulation composite system may not contain any biocides[9] as a constituent component.

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 or submit a corresponding declaration from its suppliers (Annex 5).

3.1.3 Additional requirements for special insulation materials

3.1.3.1 Mineral wool

Only those insulation materials made of mineral wool that comply with the requirements of the RAL Quality Mark for "products made of mineral wool" from the Quality Assurance Association Mineralwolle e.V.[10] may be used as components of the external thermal insulation composite system.

Compliance Verification

The applicant shall declare compliance with the requirements in Annex 1 or submit corresponding verifications from the manufacturers/suppliers (Annex 5).

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[8] DIN EN 14582: Characterization of waste - Halogen and sulfur content - Oxygen combustion in closed systems and determination methods.

[9] Biocides in the sense of these Basic Award Criteria are "substances" and "biocidal products" according to Article 3 of Regulation (EU) No. 528/2012 concerning the making available on the market and use of biocidal products.

[10] The quality mark statutes and the Quality Assurance and Test Specifications of the Quality Assurance Association Mineralwolle e.V.and other information can be found on the website of the Quality Assurance Association Mineralwolle e.V.: https://www.ral-mineralwolle.de/home.html.

Mineral fibres can have temporary, short-term effects on the skin. Therefore, insulation materials made of mineral wool must include information about the application of the materials on the packaging or the enclosed instruction leaflet, e.g. in the form of pictograms or notices.[11]

Compliance Verification

The applicant shall submit the text printed on the packaging or the enclosed instruction leaflet (Annex 9).

3.1.3.2 Foamed insulation materials

No halogenated organic compounds may be used as blowing agents (e.g. fluorinated greenhouse gases [HFCs] or chloropropane) in the production of insulation materials for the external thermal insulation composite system. In addition, the applicant must name the blowing agent used (name, CAS no.).

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 or submit a corresponding declaration from its suppliers (Annex 5).

3.1.3.3 Wood-based insulation materials

It must be ensured that all of the wood processed originates from legal sources.
In addition, at least 70% of the wood must be sourced from sustainably managed forests that can verify that they are managed in an ecological and socially responsible manner or from waste wood in waste wood categories AI and AII according to the German Waste Wood Ordinance.

Compliance Verification

The applicant shall verify the legality of the wood sources in accordance with EU Regulation no. 995/2010 in Annex 1 or submit a corresponding declaration from its suppliers (Annex 5). In order to verify the use of wood from sustainable forestry, the applicant shall submit suitable certificates from its raw materials suppliers (Annex 6). Certificates from the Forest Stewardship Council (FSC) and the PEFC (Programme for the Endorsement of Forest Certification Schemes) verifying sustainable forestry and a chain of custody (CoC) will be accepted. The applicant shall submit a record of the woods used according to Annex 7 that specifies the percentage of the certified woods used.

3.1.4 Requirements for the render, claddings and top coat

3.1.4.1 Render (adhesive, reinforcement render, final coat)

Plasters must comply with the requirements of DIN EN 998-1[12] or DIN EN 15824[13]. PUR fitting foams are not permitted as adhesives.

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[11] Comprehensive information can be found in the publication "Handling mineral wool insulation (glass wool, stone wool) - Code of practice" form the BG Bau (Employer's Liability Insurance Association for the Building Industry, 4/2015).

[12] DIN EN 998-1: Specification for mortar for masonry - Part 1: Rendering and plastering mortar. (Standard for render and plaster with mineral binders.)

[13] DIN EN 15824: Specifications for external renders and internal plasters based on organic binders.

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 or submit a corresponding declaration from its suppliers (Annex 3).

3.1.4.2 Biocides

Render (adhesive, reinforcement render, final coat, jointing mortar) may not contain any biocides to prevent microbial growth on the surface (algae, moulds and lichen). This requirement also applies to facing bricks, clinker bricks or natural stone cladding.
Actively added in-can preservatives for pasty mixtures on the list of approved in-can preservatives are allowed. (see Appendix C)
If an additional top coat is added to the external thermal insulation composite system, this coating may not contain any biocides to prevent microbial growth on the surface (algae, moulds and lichen).
Actively added in-can preservatives on the list of approved in-can preservatives are also allowed. (see Appendix C)

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 or submit a corresponding declaration from its suppliers (Annex 3).

3.1.4.3 Resistance to microbial growth

Despite being free of biocides, the system must display a high level of resistance to microbial growth and thus have good visual properties.

Compliance Verification

In an accelerated weathering test carried out according to Appendix B, the assessment of the resistance of the system based on the described assessment criteria over a test period of 100 days must not exceed the stated limits (W3 and A2). A test report shall be submitted with the application (Annex 8). The accelerated weathering test according to Appendix B must be carried out by a testing institution that fulfils the requirements for the competence of testing and calibration laboratories according to DIN EN ISO/IEC 17025.

Alternatively, manufacturers can use already completed and sufficiently documented long-term weathering tests outside (see Appendix B), correspondingly documented, tried-and-tested, representative buildings (see Appendix B) and other accelerated tests or processes for assessing the resistance to microbial growth. In order to guarantee that the evaluation of the alternative verifications is comparable to the assessment according to Appendix B, the results must be audited by a central testing institution. This central testing institution is the Fraunhofer Institute for Building Physics (IBP) in Holzkirchen. In the case of alternative verifications, an audit report from the IBP shall be submitted with the application (Annex 8).

3.2 Requirements for the thermal insulation

The insulation materials used in the external thermal insulation composite system must have an R-value (thermal resistance) of at least 4.0 m^2*K/W. This corresponds, for example, to an

insulating layer thickness ≥ 140 mm for an insulation material with a thermal conductivity[14] of 0.035 W/(m*K) or an insulating layer thickness ≥ 160 mm for an insulation material with a thermal conductivity of 0.040 W/(m*K)[15].

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 and submit the corresponding product documentation (e.g. technical data sheets, printout of the corresponding sections of the distributor's website) (Annex 9).

3.3 Environmental Product Declaration (EPD) / environmental performance parameters

The distributor must publish all of the obligatory product-specific environmental performance parameters according to the current version of DIN EN 15804[16] for the complete ETICS or for its individual components – at least the insulation materials and the renders (adhesive and reinforcing compounds, final coat). These parameters are required for the calculation and optimisation of the environmental performance of buildings and cover, amongst other things, the following environmental impacts:

- Global Warming Potential (GWP)
- Ozone Depletion Potential (ODP)
- Acidification Potential (AP)
- Euthropication Potential (EP)
- Photochemical Ozone Creation Potential (POCP)
- Use of primary energy (non-renewable and renewable presented separately, excluding the primary energy sources used for the materials)

for all obligatory life cycle stages according to the current version of DIN EN 15804.

Compliance Verification

The requirement is considered to be fulfilled if the distributor has a valid manufacturer and product-specific Environmental Product Declaration (EPD) according to DIN EN 15804 for the ETICS or for its most important components (at least the insulation materials and plasters) at the time of application.
If the distributor cannot submit a valid product-specific EPD but only an EPD for one class of its average products, all of the parameters and justifications from the EPD background report for forming the classes / average products must be submitted.
An EPD for a product group used by multiple distributors will be accepted as verification.
For plasters: Mass as dry weight/m^3 and application quantity per m^2.
The environmental performance parameters / Environmental Product Declaration must be publicly accessible, the location where they can be found shall be stated in Annex 2.

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[14] For the calculation of the R-value, the calculated value of the thermal conductivity according to DIN 4108-4 is used..

[15] R = d (layer thickness) / λ (measurement value for the thermal conductivity of the insulation material). The German Energy Saving Directive (EnEV) stipulates the maximum permissible U-values for exterior walls during the renovation of buildings.

[16] DIN EN 15804: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

3.4 Proper workmanship (quality assurance)

The external thermal insulation composite system must comply with generally accepted technical regulations (standards, manufacturer and professional association guidelines). The system must comply with DIN 55699 and DIN 18345[17]. In this context, the application instructions from the system manufacturer must describe in detail at least those requirements stipulated in DIN 55699 or the general construction technique permit (aBg) for proper workmanship.
The manufacturer must make the technical data sheets for the ETICS or its components, the detailed application instructions as well as the safety data sheets (for plasters and paints) available to the building owner, site manager, contractor etc. in the form of corporate literature or in electronic form.

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 and submit the corresponding product documentation (e.g. technical data sheets, safety data sheets, preprocessing instructions either as files or as a link to the distributor's website) (Annex 9). In addition, the applicant shall name the specific locations where they can be found in Annex 2.

3.5 Consumer information

The distributor must clearly declare the following information on the product packaging.

- Identification of the distributor,
- Product name and material,
- Information about the product / reference to the system (in electronic form),
- Traceability information, e.g. batch number,
- Building approvals.

A detailed description of the system in accordance with the requirements in Annex 3 must be made available on the Blue Angel website and also on the distributor's website.
The following information and recommendations should be enclosed in an abridged version with the product. Alternatively, the information can also be provided to the customer on request; the product itself must state how the building owner, site manager or craftsman can receive the detailed version (e.g. by requesting it from the distributor, reference to the distributor's website).

- Installation instructions and information (see Paragraph 3.4)
- Technical data sheets, safety data sheets (see Paragraph 3.4)
- Information on maintenance, as well as cleaning and care
- Information on the disposal of containers and residues in the containers (e.g. return and recycling possibilities)
- Information on noise protection and the possibility of improving it
- Information on the construction measures used to prevent or reduce any possible microbial growth on the final coat.

[17] DIN 18345: German construction contract procedures (VOB) - Part C: General technical specifications in construction contracts (ATV) - Thermal insulation composite system.

3.5.1 Additional Instructions for Marked Internal Plasters

The container/package text and the technical data sheet of internal plasters that require marking under chemical law with the hazard pictograms GHS05 (corrosion) or GHS07 (exclamation mark) shall, in addition to para. 3.2.4.1, include the following cautions/instructions in an easy-to-read form (other similar wording may be used):

- „Always wear safety glasses!"
- „In case of contact with your eyes rinse immediately with plenty of water and see an ophthalmologist."
- „Always wear heavy-duty waterproof gloves to protect your hands!"
- „Always wear long trousers!"
- „Avoid prolonged skin contact with the plaster. Rinse affected areas immediately with plenty of water."
- „The longer fresh plaster remains on your skin the greater the risk of severe skin damage."
- „Keep children away from fresh plaster!"

„Follow the manufacturer's instructions for safety and health during application."

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 and submit the corresponding product documentation (e.g. technical data sheets, the distributor's website) (Annex 9). In addition, the applicant shall name the specific locations where they can be found in Annex 1.

3.6 Advertising claims

Advertising claims must not include any information such as "biologically harmless building materials" or claims in the sense of Article 25 (4) of the CLP Regulation that could play down the risks such as e.g. "non-toxic". Labelling the system or individual components as "biocide-free" is not permitted if in-can preservatives are used; in this case, an advertising claim such as "without biocides for coating protection / film protection" would be permissible.
It is also not permitted to use the Blue Angel to advertise individual system components.

Compliance Verification

The applicant shall declare compliance with the requirement in Annex 1 and submit the corresponding product documentation (e.g. technical data sheets) (Annex 9).

4 Applicants and Parties Involved

Manufacturers of final products according to Paragraph 2 shall be eligible for application.

Parties involved in the award process are:
RAL gGmbH to award the Blue Angel Environmental Label,
the federal state being home to the applicant's production site,
Umweltbundesamt (German Environmental Agency) which after the signing of the contract receives all data and documents submitted in applications for the Blue Angel in order to be able to further develop the Basic Award Criteria.

5 Use of the Environmental Label

The use of the Environmental Label by the applicant is governed by a contract on the use of the Environmental Label concluded with RAL gGmbH.

Within the scope of such contract, the applicant undertakes to comply with the requirements under Paragraph 3 while using the Environmental Label.

Contracts on the Use of the Environmental Label are concluded to fix the terms for the certification of products under Paragraph 2. Such contracts shall run until December 31, 2027. They shall be extended by periods of one year each, unless terminated in writing by March 31, 2027 or March 31 of the respective year of extension.
After the expiry of the contract, the Environmental Label may neither be used for labelling nor for advertising purposes. This regulation shall not affect products being still in the market.

The applicant (manufacturer) shall be entitled to apply to RAL gGmbH for an extension of the right to use the ecolabel on the product entitled to the label if it is to be marketed under another brand/trade name and/or other marketing organisations.

The Contract on the Use of the Environmental Label shall specify:

- Applicant (manufacturer/distributor)
- Brand/trade name, product description
- Distributor (label user), i.e. the above-mentioned marketing organisations.

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Appendix A Assignment of hazard categories and H Phrases

The following table assigns the hazard categories in Paragraph 3.1.1 for the general exclusion of substances to the corresponding hazard statements (H Phrases) relevant for these Basic Award Criteria.

CLP Regulation (EC) No. 1272/2008		
Hazard categories	Hazard statements	
	H Phrases	Wording
Carcinogenic substances		
Carc. 1A	H350	May cause cancer.
Carc. 1B	H350	May cause cancer.
Carc. 1A, 1B	H350i	May cause cancer if inhaled.
Germ cell mutagenic substances		
Muta. 1A	H340	May cause genetic defects.
Muta. 1B	H340	May cause genetic defects.
Reprotoxic (teratogenic) substances		
Repr. 1A, 1B	H360D	May damage the unborn child.
Repr. 1A, 1B	H360F	May damage fertility.
Repr. 1A, 1B	H360FD	May damage fertility. May damage the unborn child.
Repr. 1A, 1B	H360Df	May damage the unborn child. Suspected of damaging fertility.
Repr. 1A, 1B	H360Fd	May damage fertility. Suspected of damaging the unborn child.
Acute toxicity substances		
Acute Tox. 1 Acute Tox. 2	H300	Fatal if swallowed
Acute Tox. 3	H301	Toxic if swallowed
Acute Tox. 1 Acute Tox. 2	H310	Fatal in contact with skin
Acute Tox. 3	H311	Toxic in contact with skin
Acute Tox. 1 Acute Tox. 2	H330	Fatal if inhaled
Acute Tox. 3	H331	Toxic if inhaled
Substances with specific target organ toxicity		
STOT SE 1	H370	Causes damage to organs.
STOT RE 1*	H372	Causes damage to organs through prolonged or repeated exposure.
Environmental hazards		
Aquatic Chronic 1	H410	Very toxic to aquatic life with long-lasting effects.

* If the classification and toxicological evaluation of the substance is based on the classification of the respirable fraction of the substance (dusts) and does not relate to the substance in general, classification as STOT RE 1 does not represent a criterion for exclusion in accordance with Paragraph 3.1.1 "Exclusion of Substances". Asbestos-containing dust is excluded from this exemption.

Appendix B Accelerated weathering (test specifications) and alternative verifications for resistance to microbial growth

1 Selection of the systems to be tested

The test must be carried out on a representative system configuration. This means a complete, typical system composition (containing all layers and components for a functioning ETICS) as recommended by the manufacturer and conforming to the regulations, which has been produced according to the application instructions provided by the manufacturer. The system must not contain any unusual materials or coating combinations or any that are not explicitly recommended by the manufacturer.

2 Accelerated weathering

An accelerated weathering process has been developed by the Fraunhofer Institute for Building Physics (IBP) that incorporates real-life environmental conditions [1-4]. The framework conditions for the process are described below.

2.1 Climate

The accelerated weathering process is based on the conditions experienced during an average autumn day in the town of Valley (post code: 83626) as the most comprehensive data from field studies on microbial growth was available for this location. Figure 1: shows the dew-point temperature, surface temperature and air temperature during the selected daily cycle. The test samples are sprayed with water for a period of 4 hours over a 7-day cycle. 15 cycles are completed so that a test period of 100 days is achieved.

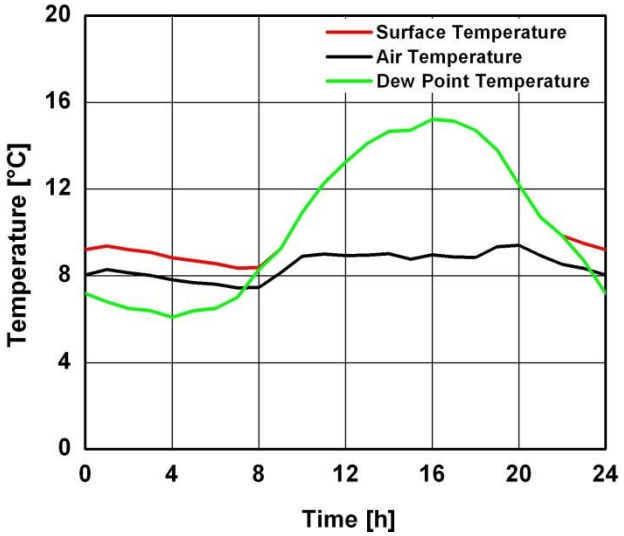

Figure 1:
The climate for the selected daily cycle in the weathering chamber (air temperature, dew-point temperature and surface temperature of the standard test sample). (©Fraunhofer IBP)

2.2 Accelerated weathering chamber

The test system shown in Figure 2: consists of a stainless steel chamber whose rear wall can be cooled to lower the surface temperature of the façade coatings placed in the chamber to below the dew-point temperature and thus form dew on the test samples. The temperature falls below the dew point by 1.5 K for a period of approx. 8 hours. Openings on the side of the chamber allow conditioned air to be fed into the chamber to create the selected test climate. Decalcified tap water is used for the spraying process which is applied via nozzles on the front of the chamber. In order to prevent any cross-contamination of the samples as the water runs off them, drainage gutters have been fitted under each series of samples. Two lamps have been fitted on the doors at the side for lighting purposes, which expose the samples to a day-night cycle with an illuminance of 650 (400-1000) Lux.

Figure 2:
Photograph of the accelerated weathering chamber during operation (left) and a screenshot of the monitoring program (right). (©Fraunhofer IBP)

2.3 Test samples and preparation of the test samples

The material to be tested (ETICS coating) is applied to polystyrene sheets and allowed to harden in accordance with the manufacturer's instructions. For the test, 5 test samples (10 x 10 cm2) are cut and separated from the polystyrene sheets and subjected to a pre-treatment process in which the in-can preservative and salts present on the surface are removed. The test samples are sprayed with water three times for 24 hours and dried between spraying processes at 40 °C in a recirculating air chamber for 24 hours. Until the start of the accelerated weathering test, the samples are stored at a constant temperature of 23°C and a constant humidity of 50%. The test samples are sealed at the rear using self-adhesive aluminium foil and then attached in this state to the cooled rear wall of the accelerated weathering chamber so that the heat can be transferred optimally.

The test samples are arranged at random in the accelerated weathering chamber. A parallel sample is not inoculated in each case and serves as a control.

2.4 Inoculating the test samples

An inoculation cocktail comprising a suitable selection of primary colonisers (moulds and algae) on structural surfaces, which show sufficient growth in the culture, is produced and used for the regular inoculation of the samples. Examples of suitable test organisms are shown in Table 1 and Table 2. At least 4 strains should be selected from each list for the test so that a total of 8-10 strains of the test organisms are used for the test. If necessary, other or additional test organisms can be used, although these deviations should be justified in the test report.

Table 1 Gives examples of suitable test moulds.

Table 1: Examples of suitable test moulds

Ulocladium chartarum
Alternaria alternata
Cladosporium herbarum
Epicoccum purpurascens
Phoma herbarum

In addition, common algae from primary succession are added to the inoculation suspension (at least 4 strains from table 2).

Table 2: Examples of suitable test algae

Chloroidium ellipsoideum (Chlorella ellipsoidea)
Coelastrella vacuolata (Chlorella fusca)
Klebsormidium flaccidum
Nostoc commune
Stichococcus bacillaris

The inoculation suspension is produced based on the process described in section 8.2.1 of the EN ISO 846 [5] standard.

Hygienic requirements are fulfilled when applying the organisms, i.e. wearing suitable personal protective equipment. The process involves applying a watery suspension containing species and mould that are found particularly frequently on buildings.

The samples are inoculated after the first spraying process and this is repeated five times at 2 weekly intervals in each case.

The weathering period is 100 days. Experience has shown that algae are not yet visible to the naked eye after this period of time without technical aids, the development of the test algae is assessed at the end of the test using a stereomicroscope and then evaluated in the same way as for the moulds.

3 Evaluating the accelerated weathering test

3.1 Assessing the microbial growth

An important part of evaluating the risk of microbial growth, is assessing the microbial growth on the test samples over time. In order to assess the growth quantitatively, in addition to any dirt, a visual rating scale [1] in modified form [2] (Table 3) is used. The ratings 1 to 3 (very low to medium) at the lower end of the scale are more differentiated in order to also observe smaller differences during the test. In this process, individual spots of dirt that are just perceptible to the naked eye are investigated. In the case of heavier microbial growth, the scale primarily measures the "coverage rate" of the growth. Experience has shown that complaints about coatings on buildings are generally received at ratings from 3 - 5. Therefore, rating 3 on the scale is highlighted graphically by a dotted red line (lowest level of microbial growth which can already result in complaints when critically examined).

Rating	Microbiological growth covering examined area on an average of
10	**Very intense**, almost the whole area is overgrown, >87.5% - 100% of the total area covered by clear surface growth or soiling
9	Surface growth / soiling **between intense and very intense**, >75% - 87.5% of the total covered by aufwuchs or soiling
8	**Intense** surface growth / soiling, >62.5% - 75% of the total area overgrown or soiled
7	Surface growth / soiling **between clear and intense,** >50% - 62.5% of the total area overgrown or soiled
6	Surface growth / soiling **clear,** >37.5% - 50% of the total area overgrown or soiled
5	Surface growth / soiling **between moderate and clear,** numerous dots or marks, overgrown area >25% - 37.5%
4	**Moderate** surface growth, numerous dots or sparse spots, >5% - 25% of the total area affected by surface growth and soiling
3	**Low** surface growth, some dots or marks, in all less than 5 %
2	**Very low** surface growth, Two to few single spots (clearly visible but in all less than 5 %)
1	**Minimal** surface growth, 1-3 small single spots
0	0 % - No visually recognisable surface growth

Table 3:
Rating scale for the visual assessment of microbial growth on the test samples.

While the general/total microbial growth is continuously recorded, algae growth is only evaluated after the conclusion of the test because the test samples need to be removed and examined under a stereomicroscope for this purpose. This is not possible during the ongoing test without removing the test samples from the chamber and thus interrupting the environmental conditions for the test for a long period of time.

3.2 Assessing the resistance, evaluation

The resistance of the variants to microbial growth is assessed based on 5 grades:

W1 High: The microbial growth remained below rating 3 on the assessment scale over the 100 days

W2 Good to medium: The microbial growth slightly exceeded rating 3 on the assessment scale but only towards the end of the test cycle

W3 Medium: The microbial growth exceeded rating 3 on the assessment scale but only developed relatively late on in the test cycle and did not reach a serious level

W4 Medium to low: clear development of microbial growth

W5 Low: Significant microbial growth developed relatively quickly and reached a high level by the end of the test cycle

Algae was generally only able to grow in very small colonies over the 100 days. Therefore, the level of resistance can be split into 3 ratings:

A1 High: No growth of algae visible
A2 Medium: Algae only visible under a stereomicroscope
A3 Low: Algae visible with the naked eye at the end of the accelerated weathering test

Note: As a result of the accelerated conditions in the weathering chamber and due to the experience gained using the process in different projects and in individual tests, the test samples were assessed a little differently to the surfaces weathered naturally outside in accordance with the already described process (mould growth may develop more quickly, homogeneously and intensively on susceptible materials than with natural weathering outside; algae is assessed separately; see also [3]).

4 Tried-and-tested, representative buildings

4.1 Criteria for the buildings being assessed

The buildings should be tested individually. The type of ETICS must conform to the regulations and function perfectly; the composition of the system must be representative of the ETICS being tested. The building must be in a location with representative climatic conditions for Germany (neither unusually cold or unusually hot) and the ETICS must have been installed for at least 3 - 5 years. For the test, it is necessary to exclude façade surfaces that are facing in the main direction of the sun's rays (these are usually south facing façades). A representative surface of sufficient size and with a homogeneous coating and a representative weathering load (depending on the area, priority should be given to an east, north or west-facing façade) should be selected. Any highly protective or negative influences must be excluded, such as particularly large roof overhangs, "heat-giving" lighting, thermal bridges, trees and shrubs directly in front of the ETICS, interruptions to the façade surface (windows, roof drainage, ledges, corners and similar) or areas exposed to spraying or dripping water.

4.2 Testing the surfaces / assessment criteria

The test should be carried out on three different, representative areas of the wall surface (each measuring approx. 30 x 30 cm) by a trained expert in accordance with the assessment scale used for the IBP process ([1], [6], [7]), a highest rating of 5 for 3 -5 years; a highest rating of 6 from 5 years upwards. Alternatively, an assessment according to ASTM D3274 – 09(2017) [8] is possible; a highest rating 8 for 3 -5 years; a highest rating 6 from 5 years.

5 Long-term weathering test outside

5.1 Criteria for the long-term weathering tests outside

At least 3 test samples with identical, completely (from the insulation outwards, depending on the design, a rear sealing plate and edge sealing is recommended) representative system composition with a suitable size (at least 30 x 30 cm) should be subjected to natural weathering outside for at least 3-5 years. The extent of the microbial growth must be regularly assessed and documented (at least quarterly) and the climate data (amount of precipitation, air temperature, relative humidity, duration of driving rain) continuously recorded. A typical example can be found in Figure 3.

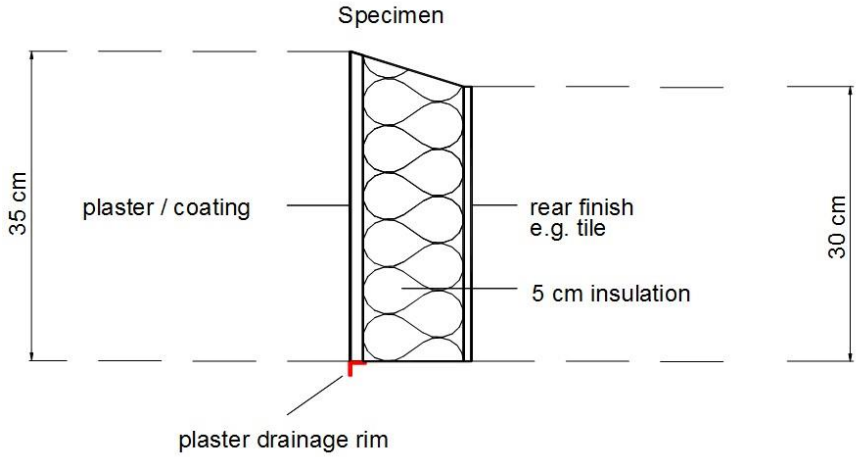

Figure 3: Schematic example of a suitable set up for the test sample. (©Fraunhofer IBP)

5.2 Testing the surfaces / assessment criteria for the samples weathered naturally outside

Assessment of the development of microbial growth by a trained expert in accordance with the assessment scale used for the IBP process ([1], [6], [7]), a highest rating of 4 for 3 -5 years; a highest rating of 5 from 5 years upwards. Alternatively, an assessment according to ASTM D3274 – 09(2017) [8] is possible; a highest rating 8 for 3 -5 years; a highest rating 6 from 5 years.

6 Literature

[1] Hofbauer, W.; Fitz, C.; Krus, M.; Sedlbauer, K.; Breuer, K.: Prognoseverfahren zum biologischen Befall durch Algen, Pilze und Flechten an Bauteiloberflächen auf Basis bauphysikalischer und mikrobieller Untersuchungen (Process for forecasting biological attacks from algae, mould and lichen on building surfaces on the basis of building physics and microbial tests). Publisher: Fraunhofer Institute for Building Physics –IBP-, Holzkirchen; Bauforschung für die Praxis Band 77 (Building research for practical application Volume 77) (2006). IRB-Verlag. (IRB Publishing House) ISBN 978-3-8167-7102-9.

[2] Sedlbauer, K.; Krus, M.; Hofbauer, W.; Breuer, K.; Fitz, C.: Neue Erkenntnisse zum mikrobiellen Bewuchs auf Außenoberflächen (New findings about microbial growth on exterior surfaces). WKSB 56 (2006), P. 10-18.

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[4] Krueger, N, Hofbauer W.K., Thiel, A., Ilvonen, O. (2018): Resilience of biocide-free ETICS against microbiological growth in a rapid weathering test. Building and Environment (in progress).

[5] DIN EN ISO 846: 1997: Plastics - Evaluation of the action of microorganisms.

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[8] ASTM D3274 – 09(2017): Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Fungal or Algal Growth, or Soil and Dirt Accumulation. ASTM International, West Conshohocken, PA.

Appendix C List of approved in-can preservatives

The List of "approved in-can preservatives" is published seperately in the technical documents (https://www.blauer-engel.de/en/certification/technical-documents).