

BLUE ANGEL

The German Ecolabel



Low-Solvent Roof Coatings and Bitumen Adhesives

DE-UZ 115

Basic Award Criteria

Edition April 2011

Version 1.3

The Environmental Label is supported by the following four institutions:



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



The German Environmental Agency with its specialist department for "Ecodesign, Eco-Labeling 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.



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.



The 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

Bitumen products are widely used in industry and crafts, above all to prevent the penetration of moisture. As a substitute for traditional coal-tar pitch coatings these products have proved highly successful. Bitumen is obtained as a fraction of crude oil distillation. It has a high hydrocarbon content. Consequently, for the purpose of ensuring the processability, bitumen must be dissolved in aliphatic or aromatic solvents.

These solvents have, however, a great impact on our environment, since they are readily volatile and mostly environmentally hazardous. Also, the users of solvent-containing bitumen products are exposed to these solvents which may have an impact on their health.

1.3 Objectives of the Environmental Label

In order to reduce these environmental and health risks research and development have led to the manufacture of new products based on an aqueous bitumen emulsion which are safer for both the environment and the user and, at the same time, improve the quality and the serviceability properties of solvents. It is mostly the private final consumer who buys protective bitumen coatings at a do-it-yourself store and processes them as well.



2 Scope¹

These Award Criteria apply to low-solvent bitumen coatings and adhesives for outside use, especially for

- low-solvent roof coatings
- low-solvent coatings for protection of usual mineral substrates in civil engineering with and without ground contact against weather-related environmental influences (water) but not for waterproofing of buildings according to DIN 18195 and
- low-solvent cold adhesives for full-surface bonding of bitumen strips to protect the roof from moisture penetration

Excluded are plastic-modified bitumen thick coatings.

3 Requirements and Compliance Verifications

The Environmental Label shown on page 1 may be used for the labelling of low-solvent bitumen coatings and adhesives under para. 2, provided that they meet the following requirements: see Appendix F

3.1 Serviceability Requirements

3.1.1 Solids Content

The solids content of the bitumen emulsion must be > 55 weight percent, determined according to the test standard EN ISO 3251.

3.1.2 Drying behaviour

The time required to achieve complete dryness must be < 5h.

3.1.3 Heat and Cold Resistance

Heat and cold resistance must meet the requirements of Directive AIB, Edition of 1999.

3.1.4 Water Impermeability

Water impermeability must meet the requirements of Directive AIB, Edition of 1999.

Compliance Verifications regarding requirements under paras 3.1.1 to 3.1.4

Upon filing of the application the applicant shall submit test certificates according to EN ISO 3251 and Annex 1 to the Award Criteria, performed by a Materials Testing Institute (e.g. Materials Testing Institutes of Dortmund, Dresden, Karlsruhe, Munich).

3.2 Ingredients

3.2.1 Volatile Organic Chemicals

The content of volatile organic chemicals in bitumen emulsions as defined in the 31st Federal Immission Control Ordinance must not exceed 1 weight percent of the finished product.

¹ Additional products may be included in the scope of the Award Criteria by decision of the Environmental Label Jury.

Compliance Verifications:

By way of calculation the manufacturer establishes proof in terms of a mass balance (total of all volatile chemicals, see also Annex 2 to the Contract) for all substances and preparations contained in the finished emulsion.

3.2.2 Requirements for Classification and Marking of Substances²/Preparations and Finished Products

The products to be marked with the Environmental Label in terms of these Award Criteria must not contain any substances/preparations which are:

[1] listed in Annex I to Directive 67/548/EEC³ and are classified and must be marked according to Section 4a, GefStoffV⁴, (Ordinance on Hazardous Substances) as

- ♦ very toxic (T+) or toxic (T);

[2] listed in Annex I to Directive 67/548/EEC and classified according to Section 4a, GefStoffV, (Ordinance on Hazardous Substances) as

- ♦ carcinogenic in accordance with EC Category Carc. Cat.1, Carc.Cat.2 or
- ♦ mutagenic according to EC Category Mut.Cat.1, Mut.Cat.2 or
- ♦ reprotoxic according to EC Category Repr. Cat.1, Repr. Cat. 2;

[3] classified in TRGS 905⁵ as

- ♦ as carcinogenic, mutagenic or reprotoxic substances in the respective category 1 or 2;

[4] classified in the MAK Value List⁶ as

- ♦ cancerogenic working materials - Category 1 or 2;
- ♦ germ cell mutagenics - Category 1 or 2;
- ♦ teratogenic working materials in the column „pregnancy“ in group A
- ♦ or group B.

[5] or which according to scientific knowledge must be classified in one of the categories under paras. 3.2.2.1. to 3.2.2.4 as either carcinogenic, teratogenic or mutagenic or have sensitizing or other chronically damaging properties or which as such or as their impurities or decomposition products are apt to cause considerable risk or considerable disadvantage for the public.

[6] According to Directive 1999/45/EC⁷ the finished products may not be classified as

² Term as defined in Section 3, Para. 1 or 4, Publication of the Revised Version of the German Chemicals Act of 20 June 2002; Official Law Gazette I, 2002, 2090

³ Council Directive 67/548/EEC of 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances; Annex I: Official Journal of the European Communities and published in: Series of documents of the Federal Institute for Occupational Safety and Health - Regulations RW 23, „List of Hazardous Substances and Preparations under Annex 1 to Directive 67/548/EEC“ (continuous publication)

⁴ Publication of the revised version of the Ordinance on Hazardous Substances, dated October 18, 1999 (Official Law Gazette. I, p. 2059)

⁵ TRGS 905, List of carcinogenic, mutagenic or reprotoxic substances (Edition: March 2001 -with subsequent amendments)

⁶ Maximum Concentrations and Biological Tolerance Values at the Workplace, Deutsche Forschungsgemeinschaft (German Society for the Advancement of Scientific Research) Senate Commission for the Testing of Health-Endangering Working Materials, Wiley-VCH, Weinheim, Current Communication No. 39 (2003) or as amended

⁷ Directive 1999/45/EC of the European Parliament and of the Council of 31 May 1999 concerning the approximation of the laws, regulations and administrative provisions of the Member States relating to

- ♦ „harmful“ and assigned the symbol Xn.
According to Directive 1999/45/EC the finished products may not be classified as
- ♦ „irritant“ and assigned marked with the symbol Xi.

Exception:

Exempted are two-component products where one component contains cement. If the product formulation includes a cement-containing component the cement must, for the protection of the user, be low in chromate content .

According to Directive 1999/45/EC the finished products may not be classified as

- ♦ „dangerous to the environment“ and assigned the symbol N.

3.2.3 Exclusion of Alkyl Phenol Ethoxylates

Products containing alkyl phenol ethoxylates must not be added to the bitumen coatings or adhesives.

Compliance Verification:

The applicant proves compliance with the requirements under paras. 3.2.2 and 3.2.3 by presentation of declarations by the manufacturers or distributors of the products used. In addition, the applicant prepares and submits a list of trade names and suppliers of all individual intermediates (raw materials) of the manufactured low-solvent bitumen coatings and adhesives.

3.3 Special Requirements

3.3.1 Preservation

The following applies to container preservation:

The required minimum quantity of preservative preparation for the purpose of container preservation shall be determined in a bioassay by means of bacteria inoculation. This value must not be exceeded in the bitumen emulsion.

Compliance Verification:

The manufacturer presents an up-to-date Material Safety Data Sheet for the preservative preparation and the result of a test according to Annex 2 to the Award Criteria.

3.3.2 Formaldehyde (contrary to para. 3.2.2)

The maximum content must not exceed 500 ppm.

Compliance Verification:

The total in-can-formaldehyde-content in the bitumen coatings or adhesives shall be determined by means of steam distillation in accordance with the Directive of the Verband der Lackindustrie (Association of the German Paint Industry) VdL-RL 03 „Determination of Formaldehyde“ of May 1997. The Manufacturer shall present the test results.

the classification, packaging and labelling of dangerous preparations (Official Journal of the European Communities, L 200, page 1)

3.4 Instructions

The container or the Technical Data Sheet shall include a note informing the user that the product is not intended for producing a waterproofing of buildings according to DIN 18195. The following information shall also be included in an easily comprehensible form (a similar wording may be used):

- „Wear suitable gloves during handling“ including a reference to a Web Site where additional information on the suppliers of appropriate gloves can be found.
- „Keep out of reach of children“
- „Avoid eating, drinking and smoking while handling this product“
- „In case of eye or skin contact, immediately flush with plenty of water“
- „Prevent entry into drains, waters or soil.“
- „Clean tools with water and soap immediately after use.“
- „Only empty containers may be offered for recycling and only dry product residues may be added to the household waste.“
- „Product contains(name(s) of the Manufacturer(s) of the active substance(s) of the preservative; Information for allergic individuals at telephone:“

Compliance Verification:

The applicant declares compliance with the requirement and submits the corresponding Technical Data Sheet and the container text.

3.5 Impact on Soil and Groundwater⁸

The applicant shall submit test reports for the products in accordance with the requirements of the Leaflet of DIBt (Deutsches Institut für Bautechnik - German Institute of Construction Engineering) (Edition November 2000⁹).

For this purpose, the following ecotoxicological tests shall be performed:

- Luminescent bacteria luminescence test according to DIN EN ISO 11348-1 to DIN EN ISO 11348-3 / Luminescent bacteria cell multiplication inhibition test according to DIN 38412-37
- Daphnia test according to DIN 38412-30 (or ISO 6341)
- Algae test according to DIN 38412-33

Details of sample application and test and measurement methods can be seen from Annex 3 to the Award Criteria.

⁸ The individual results are not yet relevant for the award of the Blue Angel, since only little experience with the products has been gained so far. The tests will be evaluated by the Federal Environmental Agency. This evaluation will be attached to the proposal for further action for the Environmental Label Jury at the end of the term of these Award Criteria

⁹ In the meantime, details of the assessment of the eco-toxicological tests have been turned into evaluation experience by DIBt (Deutsches Institut für Bautechnik - German Institute of Construction Engineering). This new experience has been taken into consideration when preparing these Award Criteria. If the occasion arises, additional experience with respect to evaluation and test volume, e.g. with respect to the need to perform a fish-egg test, shall be included after the expiry of the transitional period

Compliant Verification:

The manufacturers submit the test reports according to para. 3.5. The following conditions must be complied with:

- **Luminescent bacteria luminescence test / Luminescent bacteria cell multiplication inhibition test :**

In this test, the eluate of the material should have reached the maximum permissible inhibition of less than 20% before reaching the dilution level $G_L < 8$ in which case the test will be considered passed. If G_L is > 8 the cell multiplication inhibition test must be done as well. The test shall be considered passed if G_{LW} is < 2 .

- **Daphnia Test:**

The test shall be considered passed if $G_D = 4$ or if - in the case of lower dilution levels - one out of ten daphnia at the most is incapable of swimming. The test will be considered valid only if the results show a dose-effect relation. For this purpose, the test must be conducted till G_D 16.

- **Algae Test:**

In this test, the eluate of the building product should have reaching the maximum permissible inhibition of less than 20% before reaching dilution level 4 ($G_A \leq 4$) or already at lower dilution levels.

3.6 Testing Institutes

To prove compliance with the requirements under para. 3.5 the applicant submits test reports prepared by testing institutes.

The testing institute must prove that

- that the tests forming the basis of all test results are in compliance with the Principles of Good Laboratory (Annex 1 to the German Chemicals Act)

or

- that the testing institute has been accredited according to DIN EN 45001 or DIN EN ISO/IEC 17025 and that the tests forming the basis of the test results are part of this accreditation with regard to field of testing, test methods and specifications.

Compliance Verification:

Compliance must be proved by:

- *the certificate according to Section 19b ChemG (German Chemicals Act) (this only applies to tests that have been conducted after coming into force of Section 19b ChemG taking into account the exemption rule under Section 19a, para.5, ChemG)*

and

- *the written declaration by the testing institute stating that the test was carried out in conformity with the Principles of Good Laboratory Practice (in the case of test certificates presented prior to the entering into force of Section 19 ChemG the testing institute must prove compliance with the principles of Good Laboratory Practice)*

or

- *presentation of the Accreditation Certificate of the German Accreditation Council (DAR) or another national accreditation system that has been adopted in the Multinational Agreement (MLA).*

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, 2020. They shall be extended by periods of one year each, unless terminated in writing by March 31, 2020 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)
- Brand/trade name, product description
- Distributor (label user), i.e. the above-mentioned marketing organisations.

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Appendix A to the Award Criteria DE-UZ 115

Serviceability Testing of Low-Solvent Bitumen Coatings and Adhesives by analogy with the Test Directive of Deutsche Bahn (German Railways) AIB¹⁰

Test: Heat and Cold Resistance

A defatted strip of brass sheet, 100 mm long, 30 mm wide and 0.2 mm thick is coated once with cold liquid coating material and then dried. The sheet strips are heated to 70° while hanging vertically in the drying oven for two hours. The coating material must not drip from the strip.

Coatings made under the same conditions as those made for the testing of heat resistance will be cooled for ½ hour in an adequate cold bath to +4°C. Cold liquid coating materials are bound around a round rod 4 mm thick, paste-like ones are bound around a round rod 20 mm thick within 3 seconds at an angle of 180°. The coating may neither crack nor chip off.

Test: Water Impermeability

A circle-shaped bronze wire netting (wire size: 0.065 mm, clear mesh size: 0.102mm; Test sieve 0.102 DIN 1171) with a diameter of about 15 cm is soldered on an about 1 mm thick tinplate ring with an external diameter of 230 mm and an internal diameter of 113 mm (area of the sector of the circle = 100 cm²). The defatted wire netting is - if necessary - coated with an appropriate primer and after 24 h the covering coating material is applied:

Cold liquid coating materials are applied to the vertically positioned wire netting - paste-like coatings are applied in a layer 3 mm thick - and such application will be repeated after 24 h and following a rotation of the netting by 180°.

Coating and Drying must be done at 20°C.

The disk is to be fitted into a water impermeability testing device with the coated side on the side of the water pressure. At the same time, a wide-meshed wire netting is to be installed on the non-water side to preserve the integrity of the bronze wire netting.

Testing time is 8 hours at a water pressure of 0.20 bar for cold liquid coating materials or 0.50 bar for paste-like coating materials.

Testing: Drying Time

The drying time is determined on coatings which have been applied to smooth glass plates. During drying the glass plates are placed vertically. Low-viscosity and viscous coating materials are brushed on once, paste-like ones are applied in a layer 2 mm thick. Base coatings require about 250g/m² while top coatings require about 305 g/m². A coating is considered completely dry as soon as dry washed sand spread on the coating can be easily and

¹⁰ Waterproofing of Buildings, Useful Information on Waterproofing of Buildings (AIB), Edition: 1 September 1999. Further details can be seen from said directive

completely removed by use of a hair brush. The grain size of the sand shall be so selected that the sand passes through a sieve with testing sieve netting 0.3 DIN 1171 without leaving any residues and does not pass through a sieve with 0.15 DIN 1171.

Appendix B to the Award Criteria DE-UZ 115

Biocide Test: Determination of the Minimum Quantity of Preservative Preparation

Laboratory method for the determination of the required preservative concentration in low-solvent bitumen coatings and adhesives

1 Scope

The method can be used to test the effectiveness of preservatives in preventing growth and survival of damaging organisms in low-solvent bitumen coatings and adhesives.

2 Health Note

Before starting on any test make sure that the national public health regulations and the EC Directive 90/679/EEC on the 'Protection of Workers from the Risks related to Exposure to Biological Agents at Work' are complied with. When using and handling products and biocides the recommendations in the corresponding Material Safety Data Sheets and product information brochures should be followed for safe product use and handling.

3 Instruments and Nutrient Media

- Suitable sterile screw cap bottles (100ml);
- Sterile measuring pipettes, nominal volume 1.0 ml and 5.0 ml (according to DIN 12687);
- Sterile glass or plastic petri dishes, diameter 90 or 100 mm;
- Sterile diluent; e.g. distilled water (for agar) pursuant to ISO 3696,
- Physiological saline (to rinse and dilute bacterial cultures);
- Scales;
- Pipette and 0.1 cm³ sterile tips;
- Bunsen burner;
- Incubator, thermostatically controlled (30°C +/-2°C);
- Autoclave;
- Sterile inoculating loops or needles;
- Sterile spatulas;
- Water bath or thermostat;
- Sterile nutrient media for the corresponding micro-organisms
- Composition and production (see Appendix C);
- pH meter;
- Bacterial stock cultures;
- Culture tubes;

4 Test Organisms

The following bacteria should be used for the bacterial load test:

Bacteria:

- *Alcaligenes faecalis* DSM 6174 or ATCC 35655
- *Escherichia coli* DSM 787 or ATCC 11229
- *Pseudomonas aeruginosa* DSM 939 or ATCC 15442
- *Pseudomonas putida* DSM 291^T or ATCC 12633
- *Pseudomonas stutzeri* DSM 5190^T or ATCC 17588

Other bacteria of practical relevance or bacteria that continuously lead to infections may be used in the inoculation suspension.

5 Method

5.1 Inoculation Suspension - Preparation

Prepare separate suspensions of each bacterium by wetting the grown surface of the agar slant cultures following a 24 or 48 hour incubation at 30°C +/- 2°C with the sterile diluent, e.g. distilled water (for agar) or physiological saline (to rinse and dilute bacterial cultures) and carefully wash off the plant cover with a sterile inoculating loop.

[1] Determine the number of organisms in each suspension using a haemocytometer or determine the microbial content by another appropriate method. (e.g. Koch's pour plate method, ISO 7218 or Miles and Misra Method).

[2] The cell count of the individual bacteria suspensions should be

$$10^8 - 10^9 \text{ CFU/cm}^3.$$

The prepared inoculation suspension must be used the same day and should be kept in the refrigerator until used.

[3] In order to prepare a mixed suspension identical volumes of each bacterial suspension are added together and mixed
The cell count shall also be

$$10^8 - 10^9 \text{ CFU/cm}^3.$$

5.2 Bacterial Load Test

[1] Weigh suitable portions (e.g. 50 or 100g) of low-solvent bitumen coatings or adhesives into sterile screw cap bottles.

[2] Add the preservative in appropriate concentration series, mix well and keep the samples for at least two days at room temperature.

[3] Two non-preserved samples shall serve as control samples. One sample is inoculated (positive control) while the other one remains uninoculated (negative control = retained sample).

[4] Inoculate each sample (except for the negative control) with the same volume of the mixed suspension equivalent to 1.0 percent of the sample weight.
The sample is well mixed with a sterile spatula. Finally, the cap is screwed onto the bottle.

[5] Determine the microbial initial load of the inoculated non-preserved sample. For this purpose, streak a sample on an agar plate (see Appendix D). Then incubate the plate at 30°C +/- 2°C for no more than 3 days. Finally, determine the cell count (using an appropriate method).

[6] Incubate the preserved sample at 30°C +/- 2°C for a period of 7 days.

[7] Determine the death rate of microbial contamination in the preserved samples. For this purpose, streak samples on agar plates in accordance in with Appendix D. Determine the cell counts after an incubation of the plates at 30°C +/- 2°C for no more than 3 days.

[8] Evaluate the microbial growth on the nutrient agar plates using the following scale:

0	No growth
1	1-10 CFU
2	11-100 CFU
3	101-1.000 CFU
4	>1.000 CFU

[9] Repeat steps 5.2.4 to 5.2.8 at weekly intervals until 6 inoculation cycles have been completed.
Infected samples should not be subjected to further inoculation cycles.

[10] To determine relative destruction rates by preservative concentrations additional streaks can be performed and evaluated, for example, after 1 and 3 days following the inoculation.

Appendix C to the Award Criteria DE-UZ 115

Nutrient Medium

Nutrient Agar

Nutrient agar is a universal substrate for the cultivation of non-fastidious micro-organisms. The substrate is in line with the recommendations of Section 35 „Lebensmittel- und Bedarfsgegenständegesetz“ (LMBG) (Food and Consumer Goods Act).

Typical composition	(g/L)
Meat extract 'Lab-Lemco'	1.0
Yeast extract	2.0
Peptone	5.0
Sodium chloride	5.0
Agar	15.0
pH	7.4 +/- 02

Preparation

28 g of nutrient agar shall be suspended in 1 L of diluent (e.g. distilled water), heated until fully dissolved and autoclaved for 15 minutes at 121°C.

Description

Nutrient agar is a base substrate for the sub-culturing of micro-organisms for strain maintenance or isolation preceding the biochemical or serological examination. Nutrient agar is used in a semi-solid state as agar plates or agar slants to keep control strains. Nutrient agar contains 1.5% of agar so that up to 10% of blood or other biological liquids may be added for the preparation of special substrates. Without any additives nutrient agar can be used for the cultivation of non-fastidious bacteria.

Storage and Durability of Dried Substrate

Storage:

- ♦ in tightly sealed original containers,
 - ♦ shielded from light,
 - ♦ at a temperature of about 25 °C
 - ♦ Ready-to-use plates: at temperatures from 2 – 8 °C
-
- Durability: see Label

Appendix D to the Award Criteria DE-UZ 115

Preparation of Agar Plates

6 Materials

- Sterile 10µl inoculating loops
- Petri dishes with appropriate nutrient media (nutrient agar)
- Samples

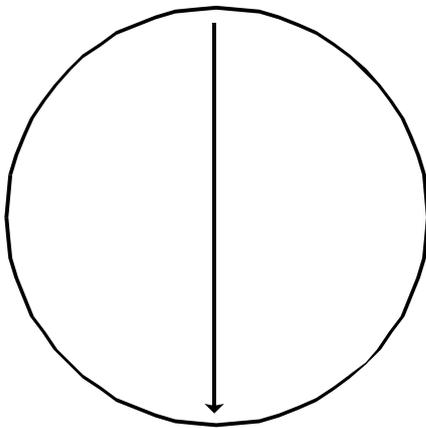
7 Methods

Sterile streak technique

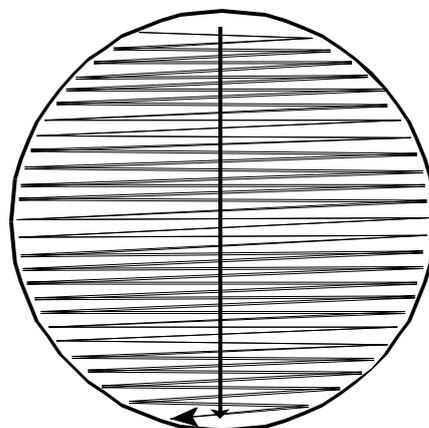
[1] After thoroughly mixing the sample immerse a 10µl inoculating loop into the sample.

[2] Create a diagonal streak (a) across the substrate.

[3] Use the same loop for additional streaking (b) in order to distribute the sample on the entire agar surface as uniformly as possible.



(a)



(b)

[4] Make streakings of each sample.

[5] Used inoculating loops are to be disposed of in compliance with current safety and environmental regulations.

Appendix E to the Award Criteria DE-UZ 115

Conditions and Evaluation of the Testing of the Impact on Soil and Groundwater

Coating the Glass Plates with the Product

For the purpose of testing one side of the glass plates is coated by the testing institutes.

Plate size: 20 cm x 20 cm

Coated area: 14 cm x 14 cm, in the middle of the plates

Number of plates: 6 pieces

Layer thickness: product typical, corresponding to the technical product description

Storage of the plates

at the testing institutes: 28 d until leaching , at 23° C, 50 % relative humidity

Eluate Preparation

Two plates each per product are eluted in a chromatographic tank with synthetic diluting water or treated water (see DIN 38412-30) at 20°C ± 2°C for 24 hours by stirring at a medium stirring speed (thorough mixing in a chromatographic container). The surface-volume ratio is about 1:8 so that a coating surface of two times 196 cm² results in 3136 ml. After 24 h the plates are removed and the eluate is used for the tests (stored in glass bottles in the refrigerator until testing is done).

Scope of Testing

The following summation parameters and substances are determined:

- TOC (total organic carbon),
- PAH (polycyclic aromatic hydrocarbons),
- Phenols

The test will be considered passed if the results remain under the insignificance levels for PAH and Phenols: PAH¹¹ 0.2 µg/l (naphthalene 2 µg/l); phenols 20 µg/l.

(Note: thresholds of insignificance are the test values of „Länderarbeitsgemeinschaft Wasser“ (LAWA) (Working Group of the Federal States on Water) and “Bundesbodenschutz- und Altlastenverordnung” (Federal Soil Protection and Contaminated Sites Ordinance) for the assessment of (insignificant) substances discharged into groundwater and soil).

¹¹ Total of polycyclic aromatic hydrocarbons without naphthalene and methylnaphthalene, usually determined by means of the sum of 15 individual substances according to US EPA (US Environmental Protection Agency)

Description of the Eco-Toxicological Test Methods and Evaluation Standards

- **Luminescent bacteria luminescence test / Luminescent bacteria cell multiplication inhibition test**

The luminescent bacteria luminescence is determined in accordance with DIN EN ISO 11348-1 to DIN EN ISO 11348-3. The cell multiplication inhibition is determined according to DIN 38412-37, provided that the criterion of the luminescent bacteria test hereinbelow does so require. According to the DIN standard one starts out from a non-acute toxicity if the inhibition effects remain under 20 %. The dilution level of the original eluate required for a less than 20 % inhibition (dilution level G_L for luminescence and G_{LW} for growth) is determined.

Evaluation: In this test, the eluate of the product should have reached the maximum permissible inhibition of less than 20% before reaching the dilution level $G_L < 8$ in which case the test will be considered passed. If G_L is > 8 the cell multiplication inhibition test must be done as well. The test shall be considered passed if G_{LW} is < 2 .

- **Daphnia Test**

The non-acute toxicity on daphnia is determined in accordance with DIN 38412-30 (or ISO 6341). According to the DIN standard one starts out from a non-acute toxicity if no more than one out of ten daphnia is unable to swim. Evaluation of the test is to be made after 24h and after 48h. The results determined after 48h shall be used for assessment. The required dilution of the original eluate (so-called dilution level G_D) will be determined.

Evaluation: The test shall be considered passed if $G_D = 4$ or if - in the case of lower dilution levels - no more than one out of ten daphnia is unable to swim. The test will be considered valid only if the results show a dose-effect relation. For this purpose, the test must be conducted till $G_D 16$.

- **Algae Test**

Algae toxicity is determined in accordance with DIN 38412-33. According to the DIN standard an inhibition of the cell multiplication of green algae of 20 % or more is considered as acute toxicity. The dilution level of the original eluate (dilution level G_A) required for a less than 20 % inhibition is determined.

Evaluation: In this test the eluate of the building product should have the maximum permissible inhibition of less than 20% before reaching dilution level 4 ($G_A \leq 4$) or already at lower dilution levels.

Appendix F H and R Phrases applicable to the Award of the Blue Angel Eco-Label

Regulation (EC) 1272/2008 (GHS Regulation))	Directive 67/548/EWG (Dangerous Substance Directive)	Phrase
Toxic Substances:		
H300	R28	Fatal if swallowed
H301	R25	Toxic if swallowed
H310	R27	Fatal in contact with skin
H311	R24	Toxic in contact with skin
H330	R26	Fatal if inhaled
H331	R23	Toxic if inhaled
H370	R39/23/24/25/ 26/27/28	Causes damage to organs
H372	R48/23/24/25	Causes damage to organs
Carcinogenic, Mutagenic and Reprotoxic Substances:		
H340	R46	May cause genetic defects.
H350	R45	May cause cancer.
H350i	R49	May cause cancer by inhalation.
H360D	R61	May damage the unborn child.
H360F	R60	May damage fertility.
H360FD	R60/61	May damage fertility. May damage the unborn child.
H360Df	R61/62	May damage the unborn child. Suspected of damaging fertility.
H360Fd	R60/63	May damage fertility. Suspected of damaging the unborn child.