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Basic environmental testing procedures - Part 2: Tests - Test J and guidance: Mould growth

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BASIC ENVIRONMENTAL TESTING PROCEDURES
PART 2: TESTS
TEST J AND GUIDANCE : MOULD GROWTH

Essais fondamentaux climatiques
et de robustesse mécanique
Deuxième partie: Essais
Essai J et guide: Moisissures

Umweltprüfungen
Teil 2: Prüfungen
Prüfung J und Leitfaden:
Schimmelwachstum

BODY OF THE HD

The Harmonization Document consists of:

- IEC 68-2-10 : 1988

This Harmonization Document was approved by CENELEC on 1988-09-13.

The English and French versions of this Harmonization Document are provided by the text of the IEC publication and the German version is the official translation of the IEC text.

According to the CENELEC Internal Regulations the CENELEC member National Committees are bound:

to announce the existence of this Harmonization Document at national level
by or before 1989-03-01

to publish their new harmonized national standard
by or before 1989-09-01

to withdraw all conflicting national standards
by or before -

Harmonized national standards are listed on the HD information sheet, which is available from the CENELEC National Committees or from the CENELEC Central Secretariat.

The CENELEC National Committees are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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NORME INTERNATIONALE
INTERNATIONAL STANDARD

CEI
IEC
68-2-10

Essai
Test J

Cinquième édition
Fifth edition
1988

Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

Essais fondamentaux climatiques et de robustesse mécanique

Deuxième partie: Essais — Essai J et guide: Moisissures

Basic environmental testing procedures

Part 2: Tests — Test J and guidance: Mould growth

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Révision de la présente publication

Le contenu technique des publications de la CEI est constamment revu par la Commission afin d'assurer qu'il reflète bien l'état actuel de la technique.

Les renseignements relatifs à ce travail de révision, à l'établissement des éditions révisées et aux mises à jour peuvent être obtenus auprès des Comités nationaux de la CEI et en consultant les documents ci-dessous:

- Bulletin de la CEI
- Annuaire de la CEI
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Revision of this publication

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Terminologie

En ce qui concerne la terminologie générale, le lecteur se reportera à la Publication 50 de la CEI: Vocabulaire Electrotechnique International (VEI), qui est établie sous forme de chapitres séparés traitant chacun d'un sujet défini, l'Index général étant publié séparément. Des détails complets sur le VEI peuvent être obtenus sur demande.

Les termes et définitions figurant dans la présente publication ont été soit repris du VEI, soit spécifiquement approuvés aux fins de cette publication.

Terminology

For general terminology, readers are referred to IEC Publication 50: International Electrotechnical Vocabulary (IEV), which is issued in the form of separate chapters each dealing with a specific field, the General Index being published as a separate booklet. Full details of the IEV will be supplied on request.

The terms and definitions contained in the present publication have either been taken from the IEV or have been specifically approved for the purpose of this publication.

Symboles graphiques et littéraux

Pour les symboles graphiques, symboles littéraux et signes d'usage général approuvés par la CEI, le lecteur consultera:

- la Publication 27 de la CEI: Symboles littéraux à utiliser en électrotechnique;
- la Publication 617 de la CEI: Symboles graphiques pour schémas.

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For graphical symbols, and letter symbols and signs approved by the IEC for general use, readers are referred to:

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Publications de la CEI établies par le même Comité d'Etudes

L'attention du lecteur est attirée sur le deuxième feuillet de la couverture, qui énumère les publications de la CEI préparées par le Comité d'Etudes qui a établi la présente publication.

IEC publications prepared by the same Technical Committee

The attention of readers is drawn to the back cover, which lists IEC publications issued by the Technical Committee which has prepared the present publication.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

BASIC ENVIRONMENTAL TESTING PROCEDURES

Part 2: Tests — Test J and guidance: Mould growth

FOREWORD

1) The formal decisions or agreements of the I E C on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
3) In order to promote international unification, the I E C expresses the wish that all National Committees should adopt the text of the I E C recommendation for their national rules in so far as national conditions will permit. Any divergence between the I E C recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

PREFACE

This standard has been prepared by Sub-Committee 50B: Climatic tests, of I E C Technical Committee No. 50: Environmental testing.

This fifth edition supersedes the fourth edition (1984) of Test J: Mould growth.

The text of this standard is based upon the following documents:

Six Months' Rule	Reports on Voting
50B(CO)251 50B(CO)263	50B(CO)257 50B(CO)265

Full information on the voting for the approval of this standard can be found in the Voting Reports indicated in the above table.

BASIC ENVIRONMENTAL TESTING PROCEDURES

Part 2 : Tests — Test J and guidance : Mould growth

1. General

1.1 This test covers the inoculation of assembled specimens with a selection of mould spores followed by a period of incubation under conditions which promote spore germination and the growth of mould.

Two variations of the test are given. Variant 1 specifies direct inoculation of the specimen with the mould spores whereas variant 2 specifies the pre-conditioning of the test specimen with nutrients which support mould growth.

1.2 When assembled, specimens must operate where they will be exposed to airborne mould spores, and where climatic conditions will be conducive to the growth of moulds; this test procedure may be used to assess the extent to which mould will grow and/or the operational deterioration which may be expected from this source.

1.3 It is advisable to use established mycological testing procedures to assess the vulnerability to damage by mould contamination of the constructional materials used, and to use only materials which are immune from serious attack.

1.4 Assembled specimens which do not have to operate under conditions of exposure to mould spores may have to be stored or transported where a temporary exposure is experienced, and in these cases also the test procedure will be found useful.

1.5 Surface contamination in the form of dusts, splashes, condensed volatile nutrients or grease may be deposited upon assembled specimens. This can be brought about by storage and use or transport with the assembled specimens exposed to the atmosphere or handled without protective covering. This surface contamination can cause an increased colonization by fungi and may lead to greater growth and damage. An assessment of the effect of such contamination can be given by the application of test variant 2.

1.6 Where assembled specimens will be protected from such exposure, even though operating in a region where mould spores are abundant, ability to withstand the severe procedure of this test is not necessary.

1.7 Due to the difficulty of maintaining the necessary conditions in a very large chamber, a large composite equipment will normally be tested as a number of sub-units. This will in any case minimize the cost of the test since several sub-units may be so similar in construction that only one of them need be tested.

2. Health hazards to operators

2.1 This test procedure requires the use of viable mould spores and the provision of ambient conditions which promote mould growth.

2.2 Therefore before any attempt is made to handle mould cultures, or to carry out steps of the test subsequently described, it is important that the appendices of this standard be studied.

Reference: Appendix A — Danger to personnel.
Appendix B — Inoculation methods.
Appendix C — Recommended safety precautions.
Appendix D — Decontamination procedures.

3. Object

To investigate unforeseen causes of deterioration in assembled specimens, whether or not constructed from mould-resistant materials by the application of test variant 1 and/or test variant 2 using the required severity given in the relevant specification.

a) Test variant 1: by assessing the extent of mould growth after 28 days' incubation and any physical damage caused thereby, and if required by the relevant specification, by checking the effect on functioning of the specimen after incubation extended to a total of 84 days.

b) Test variant 2: by assessing the extent of mould growth after 28 days' incubation following quasi-contamination with nutrients and any physical damage caused thereby, and by checking the effect on the functioning of the specimen.

The relevant specification shall state the required test variant and severity.

4. Reagents and materials

4.1 *Cultures or spores — Supply and condition*

4.1.1 The following cultures shall be used for performing the test. The nature of the attack to be expected from each culture is indicated for guidance, but all spores are used together, whatever the nature of the specimen.

The research centre supplying these cultures or spores for test purposes shall certify that they are as specified.

4.1.2 Cultures from a recognized mycological research centre shall be supplied in suitable containers with the date of seeding thereon.

4.1.3 Cultures and freeze-dried spores shall be handled and stored in accordance with the recommendations of the supplier. These recommendations shall require the date of seeding to be marked on the containers of cultures prepared by the user from freeze-dried spores.

No.	Name	Strain	Typical culture (for guidance only)	Nature
1	Aspergillus niger	V. Tieghem	ATCC, 6275	Grows profusely on many materials and is resistant to copper salts
2	Aspergillus terreus	Thom.	PQMD, 82j	Attacks plastic materials
3	Aureobasidium pullulans	(De Barry) Arnaud	ATCC, 9348	Attacks paints and lacquers
4	Pœcilomyces variotii	Bainier	IAM, 5001	Attacks plastics and leather
5	Penicillium funiculosum	Thom.	IAM, 7013	Attacks many materials especially textiles
6	Penicillium ochrochloron	Biourge	ATCC, 9112	Resistant to copper salts and attacks plastics and textiles
7	Scopulariopsis brevicaulis	(Sacc.) Bain Var. Glabra Thom.	IAM, 5146	Attacks rubber
8	Trichoderma viride	Pers. Ex. Fr.	IAM, 5061	Attacks cellulose textiles and plastics

4.1.4 The cultures shall be used for preparing the test suspension when they have been exposed to room temperature for a period of not less than 14 days and not more than 28 days from the date of seeding marked on the container.

4.1.5 If the cultures are not for immediate use, they shall be stored in a refrigerator at a temperature between 5 °C and 10 °C, for a continuous period of not more than six weeks commencing not earlier than 14 days and not later than 28 days from the date of seeding given on the container.

4.1.6 The closures shall not be removed until the mould suspension is about to be made, and only one suspension shall be made from the opened container. A fresh container shall be used for each batch of suspensions made.

Note. — See Appendix C for recommended safe method of carrying out the subsequent test procedures.

4.2 *Preparation of mould suspensions*

4.2.1 The suspension shall first be prepared in distilled water, to which has been added 0.05% of a wetting agent. An agent based on N-methyl taurine or on dioctyl sodium sulphosuccinate has been found to be suitable. The wetting agent shall not contain substances which support or inhibit mould growth.

4.2.2 Ten millilitres of the water containing the wetting agent is added gently to each culture. A platinum or nichrome wire is sterilized by heating to red heat in a flame and allowed to cool. This wire is then used to scrape gently the surface of the culture to liberate spores. The liquid is slightly agitated to disperse the spores without detaching mycelial fragments, and the suspension is then gently decanted into a flask in which all separate suspensions are collected.

4.2.3 The flask is then shaken vigorously to mix the eight spore extracts thoroughly and break up any clumps of spores. The suspension shall be left to stand for at least 30 min and then filtered to remove mycelial fragments, lumps of agar and clumps of spores : good quality, fast flow, cellulose filter papers have been found suitable.

4.2.4 Centrifuge the filtered spore suspension and discard the supernatant liquid. Resuspend the residue in 50 ml of distilled water and centrifuge again. Wash the spores in this manner three times. Dilute the final washed residue in accordance with the following requirements.

4.2.4.1 Test variant 1 : Dilute the final residue in 100 ml of distilled water.

4.2.4.2 Test variant 2 : When the specimens are to be pre-conditioned as in Clause 8 prior to inoculation by spraying, the final residue shall be diluted in 100 ml of distilled water.

When specimens are to be inoculated by painting or dipping, the suspension may be prepared by using the nutritive solution given in Sub-clause 4.3.2 in place of distilled water.

If a nutritive solution spore suspension is used for inoculation, the pre-conditioning procedure given in Clause 8 is omitted.

4.2.5 The suspension may be diluted with distilled water or nutritive solution, as relevant, to a maximum volume of 500 ml. It shall be used on the day of preparation.

4.3 *Control strips*

4.3.1 The control strips called for in the test shall consist of strips of pure white filter paper or unproofed cotton textile.

4.3.2 The nutritive solution called for in preparing the control strips shall consist of a solution of the following reagents in distilled water and shall be used on the day of preparation. The quantities are amounts per litre of water.

— Potassium dihydrogen orthophosphate (KH_2PO_4)	0.7 g
— Potassium monohydrogen orthophosphate (K_2HPO_4)	0.3 g
— Magnesium sulphate ($MgSO_4\ 7H_2O$)	0.5 g
— Sodium nitrate ($NaNO_3$)	2.0 g
— Potassium chloride (KCl)	0.5 g
— Ferrous sulphate ($FeSO_4\ 7H_2O$)	0.01 g
— Sucrose (saccharose)	30.00 g

4.3.3 The strips shall be placed in a small dish and covered with the nutritive solution. The strips shall be removed from this solution and allowed to drain free of drips immediately before use.

4.3.4 The strips shall be freshly prepared on the day on which they will be used for the test.

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5. Description of test apparatus

5.1 *For small specimens*

5.1.1 Containers of glass or plastics, with close-fitting lids, provided with means for mounting specimens, shall be used.