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Performance standards in building — Contents and format of standards for evaluation of performance

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*Normes de performance dans le bâtiment — Contenu et format des
normes pour l'évaluation des performances*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 7162 was prepared by Technical Committee ISO/TC 59, *Building construction*, Sub-Committee SC 3, *Functional/user requirements and performance in building construction*.

Annex A of this International Standard is for information only.

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Introduction

All parts (components, assemblies, subsystems, etc.) that together constitute a building each have to fulfil certain defined functions for the building to satisfy the needs of its users. When these parts are to be specified in terms of the required functions, ISO 6240 gives the correct formulation of their performance requirements, stating that each requirement shall have specified methods of assessment or verification. These methods serve either to predict the performance that a part will have, thereby enabling the designer to choose what is appropriate for the building, or to verify that the user's needs are met by the completed building. Annex A to this International Standard discusses such considerations more fully.

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Performance standards in building — Contents and format of standards for evaluation of performance

1 Scope

This International Standard establishes some rules for the contents and presentation of standards for evaluation of performance in buildings.

It is intended for application by international and national standards committees when preparing standards for evaluation of the performance of whole buildings, of parts of buildings (components, assemblies and subsystems) and of spaces within and around buildings.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 5725:1986, *Precision of test methods — Determination of repeatability and reproducibility for a standard test method by inter-laboratory tests.*

ISO 6240:1980, *Performance standards in building — Contents and presentation.*

ISO 6241:1984, *Performance standards in building — Principles for their preparation and factors to be considered.*

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 6241 apply.

4 Clauses for inclusion in standards for evaluation of performance

4.1 A standard for the methods of evaluation should include the following clauses:

a) Scope

State the item and the performance for which the standard gives evaluation method(s). List the properties on which the performance assessment is to be based. Indicate whether performance is to be assessed before use, and whether this will be by test, calculation or expert judgement, or to be verified after the item is in use in a building.

Indicate any limitations of the applicability of the standard or its parts.

b) References

List any relevant standards, particularly existing test methods.

c) Definitions

Define all new and specialized terms used in the standard, using existing standard definitions where possible.

d) Principle

Describe the principle(s) of the method of evaluation.

e) Equipment

List all the test equipment that will be needed. Indicate the required accuracy of any measuring devices.

f) Condition of test piece(s)

Define the intended state of the items to be tested, for example their temperature and moisture content, and the state of the environment in which they are to be tested.

g) Procedure

Describe the operations and the sequence to be followed during a test, indicating the number of measurements to be made and the arrangement of test equipment. Give any other details needed to safeguard the intended quality of results.

h) Precision of results

Indicate the precision to be expected, preferably in terms of repeatability and reproducibility, in accordance with the principles given in ISO 5725.

i) Presentation and interpretation of results

List the items that are required to be stated in the evaluation report. Indicate whether results are to be expressed numerically or graphically and whether values are to be rounded.

NOTE 1 In the clauses listed in 4.1, particular attention should be given to:

- a) Expression of the accuracy to be expected or the required accuracy in probabilistic terms. The standards should include those rules which are necessary to safeguard the quality of the results (for example, validity, accuracy) which the evaluation aims to provide.
- b) Rules necessary for processing or interpreting test results if special methods are needed, for example, statistical calculations, comparison with standard values or curves, grades of values.

Special conditions for approval or verification which are not a necessary part of a meaningful presentation of the test results should not be included.

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Annex A (informative)

Guidance on methods for performance evaluation

A.1 Selection of methods for evaluation

Performance evaluation may be for prediction or for verification of performance achieved.

The evaluation methods can be divided roughly into test, calculation and expert judgement. These methods are often used in combination.

In some cases the evaluation may be carried out separately and independently for each function and by the help of one method for each function. In other cases different methods are needed for different levels of performance.

An overall evaluation may be carried out with the help of property profiles or weighted properties. As a rule such problems should not be dealt with in a test standard but rather in a standard concerned with the performance itself.

As judgement by experts is often inevitable in the evaluation of performance, the judgement should be as objective as possible by the application of strict rules. The decision-making process, the procedure used and the factors taken into account should be documented in such a way that this process can be reconstructed if necessary.

Performance standards should generally refer to methods of test, but some of the points made in this annex will also apply to other techniques.

A.2 Development of methods

Often traditional methods of evaluation are not sufficiently performance-related and committees wish to seek or develop better methods. This calls for close cooperation between committees concerned with performance itself (composed of members who are experts in the design, production and use of buildings and building parts) and committees responsible for evaluation methods.

Frequently a theoretically ideal solution seen from the point of view of performance cannot be found, and a balance between different concerns must be sought. In such cases, committees should consider particularly the intended use of the standard(s) in question, and the system of control and acceptance of which the evaluation method sought will be a part.

Establishment of a standard method of evaluating performance requires the following stages:

- a) an understanding of all natural and man-made phenomena originating from the environment, the design and the use which govern the performance (e.g. humidity, wear, compatibility);
- b) an understanding of the mechanisms by which the product develops and loses its performance for the requirement in question (e.g. resistance to bending, thermal transmittance, mechanism of degradation);
- c) provisional determination of an evaluation method, together with an agreed definition of its field of applicability (e.g. to groups of products with particular constructional or material characteristics, to particular geographical zones, to particular conditions of use);
- d) verification of the assumed correlation between the results of the provisional method and the performance achieved to provide a confirmed method (with further successive improvements as necessary);
- e) a definition of the interpretation procedure and the reporting of data.

A.3 Prediction of future performance

Committees or other bodies who are establishing methods of performance evaluation are always concerned with the problem of predicting performance over time, for example:

- a) by reviewing past experience, during their activity of correlating their proposed method(s) with results in practice;
- b) by establishing methods which simulate predictable future degradation of the product (e.g. by tests which accelerate mechanical wear, or other forms of degradation by extra agents as listed in ISO 6241:1984, table 4).

Where committees are dealing with a product forming part of a larger system within the building, or when they are dealing with only one or a few of the properties of a product, they should establish an

appropriate level of concern for performance over time, similar to that applied to other related product standards, or to other properties of the same product.

A.4 Uses of standard methods of performance evaluation

Standard methods of performance evaluation may have several uses, including those listed below. These uses may have different implications for the best choice of method, in terms of its cost, convenience, degree of significance, ease of interpretation, accuracy and bias. Committees or other bodies who are standardizing evaluation methods are advised to confirm the likely principal uses, liaising with any other standards committees who may wish to refer to this work later on.

Principal uses include:

- a) confirmation of acceptability/rejection under building regulations or other legal controls;
- b) evaluation by suppliers in order to describe a product in their range;
- c) evaluation by purchasers to establish the suitability of a product
 - for a specific job, or
 - for a continuing series of work.

Less frequent uses may include:

- d) establishment of an International Standard reference method to which local methods of evaluation may be related;
- e) performance evaluation during the development of new or improved products;
- f) use of performance evaluation methods for control of the consistency of quality in a product during manufacture, although suitability for this use is coincidental;
- g) reference to standard evaluation methods in cases of dispute over the adequacy of products supplied.

A.5 Test specimens and sampling

Sampling, preparation of test specimens, number of tests, etc. may differ depending on the object to be evaluated. Therefore as a rule these problems should not be dealt with in the evaluation standard. However, the following should be considered.

When the intention is that the standard is used in connection with evaluation of prototypes or routine testing, rules are needed concerning the test specimen. In most cases rules are needed concerning the state of the specimen during testing (e.g. temperature, moisture content). For prototype evaluation, the size(s) of the prototype(s) should be given and, in some cases, a statement of the other sizes for which the evaluation is valid.

When only parts of a product are used as test specimens (e.g. cut from the product), rules should be given on how to produce the specimen. When the test specimens are considered a sample of a population, rules concerning the sampling may be needed; if not, general sampling rules suffice.

When more than one property is tested, it must be decided whether the same specimen should be tested for only one property or not; in the latter case the order of tests may be important.

A.6 Accuracy of performance tests

Committees establishing methods for performance evaluation are always concerned to achieve the best balance between the accuracy of the method and its simplicity, convenience and cost, bearing in mind the dominant uses of the method, as indicated in A.4; the product(s) to which it will be applied; and the significance of the performance(s) under test.

Where a method is to be the subject of an International Standard, it is more than usually important to establish that it is repeatable on separate occasions, and reproducible in a sufficiently wide variety of situations, without an unacceptable loss of accuracy in the results. A specific statement on the accuracy to be achieved should be included in the standard (referring for example to ISO 5725). The drafting committee should review the sensitivity of the method to variations in climate, test personnel, etc. (See also ISO/IEC Guide 25.¹⁾)

A.7 Classification and interpretation of results

It is difficult to determine a standard presentation for the results of a method of performance evaluation or for the consequential classification of products in order that valid interpretations can be made about preferential uses in different circumstances. This is particularly so when interpretation calls for a number of results to be judged in combination.

Determination of the best ways of presenting results and of interpreting them calls for dialogue between those expert in evaluation techniques and those primarily concerned with interpretation and applica-

1) ISO/IEC Guide 25:1990, *General requirements for the competence of calibration and testing laboratories.*

tion. Committees establishing evaluation methods should liaise with those preparing performance standards for products, who may need to refer to their work with reference to the potential uses of the method, as indicated in A.4. Particular care will be needed where the validity of the method is relatively limited, or where the implications of failure may be

serious. The standard may need to contain warnings. It may be advisable for standards dealing with evaluation methods to include any sections on the presentation and interpretation of results as a separately published part, to allow for easier amendment in the light of later feedback, or for future uses of the method.

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