International Standard 4180/1

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Complete, filled transport packages — General rules for the compilation of performance test schedules — Part 1 : General principles

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

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It has been approved by the member bodies of the following countries :

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Complete, filled transport packages — General rules for the compilation of performance test schedules — Part 1 : General principles

0 Introduction

This International Standard has been prepared in order to fulfil a need of organizations concerned with the compilation of test schedules for complete, filled transport packages.

Such test schedules can be as diverse as the journeys that packages undergo. Accordingly, this International Standard is intended to set guidelines for the compilation of appropriate test schedules, rather than to provide a rigid framework or to be specified by regulatory or other authorities.

It is expected that, once compiled, a particular test schedule, including the test methods and intensities to be applied, could be the subject of International Standards or would become a matter for agreement between the parties concerned, for example the package designer, the manufacturer of the contents, the transport authority, the customer, the statutory regulating body, or any combination of them.

1 Scope and field of application

This International Standard establishes general rules to be used for the compilation of performance test schedules for complete, filled transport packages intended for use within any distribution system, whether transported by road, rail, sea, air or inland waterway, or by a combination of these modes of transport.

This part states the general principles entailed in compiling test schedules.

It also gives the factors to be considered in assessing the criteria of acceptance of such packages after they have been subjected to a package performance test schedule.

ISO 4180/2 incorporates all the quantitative data necessary to establish test intensities and other quantitative features of test schedules.

The two parts are intended to be read in conjunction with one another.

2 References

ISO 2206, *Packaging — Complete, filled transport packages — Part 1 : Identification of parts when testing.*

ISO 2233, *Packaging — Complete, filled transport packages — Part 2 : Conditioning for testing.*

ISO 2234, *Packaging — Complete, filled transport packages — Part 3 : Stacking test.*

ISO 2244, *Packaging — Complete, filled transport packages — Part 5 : Horizontal impact tests (inclined plane test; pendulum test).*

ISO 2247, *Packaging — Complete, filled transport packages — Part 6 : Vibration test.*

ISO 2248, *Packaging — Complete, filled transport packages — Part 4 : Vertical impact test by dropping.*

ISO 2872, *Packaging — Complete, filled transport packages — Part 7 : Compression test.*

ISO 2873, *Packaging — Complete, filled transport packages — Part 8 : Low pressure test.*

ISO 2874, *Packaging — Complete, filled transport packages — Part 9 : Stacking test using compression tester.*

ISO 2875, *Packaging — Complete, filled transport packages — Part 10 : Water spray test.*

ISO 2876, *Packaging — Complete, filled transport packages — Part 11 : Rolling test.*

ISO 4180/2, *Complete, filled transport packages — General rules for the compilation of performance test schedules — Part 2 : Quantitative data.*

3 Definitions

3.1 performance test schedule : A single laboratory test, or series of tests, intended to ascertain the performance, under working conditions, of the subject under test.

3.2 single-test schedule : A performance test schedule, compiled of tests all by the same method, if necessary repeated with the same or different intensities and attitudes (see ISO 4180/2).

3.3 multi-test schedule : A performance test schedule compiled from some or all of a series of tests (see ISO 4180/2).

3.4 complete, filled transport package : A package, including contents, prepared for distribution.

3.5 distribution system : All the operations which take place after a package has been filled and closed, including all handling, transport and storage operations up to and including delivery to the user.

4 Distribution systems

Distribution systems exist in great variety and complexity, but, however great the complexity, they may be considered to be combinations of a number of simple elements. These simple elements are :

a) transport of packages from one point to another, with or without change of mode of transport. Transport shall be considered to include the loading and unloading operations;

b) storage.

5 Hazards

5.1 During distribution, a transport package is subjected to a number of hazards which may cause damage.

5.2 These hazards are the result of a number of factors, the most important of which are :

a) the characteristics of the distribution system;

b) the design of the package, i.e. its dimensions, mass and shape, and integral handling aids (for example handles).

6 Tests

6.1 Laboratory tests on transport packages aim to simulate or represent the distribution hazards.

6.2 Appropriate application of tests requires :

a) a knowledge of the stresses arising from these hazards;

b) the capability of reproducing these stresses by a particular test or, alternatively, of producing damage identical to that observed in practice.

6.3 The levels of intensity selected for the tests will depend on the above factors (see 5.2 and 6.2) and on :

a) the degree of assurance that the package should give from the aspect of protection and containment of the contents or pollution of the environment;

b) the nature of the contents and the frequency and value of the consignment.

7 Performance test schedules

7.1 Performance test schedules are used for a number of purposes :

a) for functional evaluations — will the package be adequate in performance ?

b) for investigation — what causes damage and how can it be corrected ?

c) for comparison — is package A better than package B ?

d) for determination of compliance with statutes, regulations, or an International Standard.

7.2 Multi-test schedules are generally used for functional evaluations in the context of a complete distribution system.

Single test schedules are generally used for functional evaluations in the context of a particular hazard or for investigations. Either type of schedule may be used for comparisons.

Statutes, regulations, or International Standards may specify the test schedule.

NOTE — In carrying out multi-test schedules or single-test schedules, the schedules may be applied in their entirety to one or more of the packages under test or, alternatively, each test may be applied to separate replicates.

7.3 In compiling test schedules, in addition to the above factors, the following should be considered :

a) the time available for conditioning and testing;

b) the cost of testing relative to other factors;

c) the number of packages available for test;

d) past experience of the particular packages or of similar packages.

8 Standardization of test methods and order of tests

8.1 Relevant test methods that are the subject of International Standards are listed in ISO 4180/2. They should be used in compiling both single-test and multi-test schedules.

8.2 In compiling a multi-test schedule, the step-by-step procedure outlined in clause 12 should be used and the tests selected placed in the order given below. Where exceptional circumstances require a different order, this should be reported.

The recommended sequence is :

a) conditioning for testing[1] (ISO 2233);

b) stacking (ISO 2234);

c) impacts (ISO 2248 and ISO 2244);

d) climatic treatment[2] (ISO 2875);

e) vibration (ISO 2247);

f) stacking (ISO 2234);

g) impacts (ISO 2248 and ISO 2244).

A resonant frequency test should be carried out between test b), stacking, and test c), impacts, in order to discover whether resonant vibrations are a likely cause of damage when the complete, filled package is transported through the distribution system. However, this test may be omitted if previous experience indicates that damage from resonant vibrations is unlikely.

Other tests may be interposed in the test schedule as appropriate.

8.3 The number of individual tests applied to a package should relate to its intended use, for example single-trip or multiple-trip use.

8.4 Values of intensities of tests appropriate to the different modes of transport (road, rail, sea, and air) and storage are given in ISO 4180/2. The values given are "basic" values associated with common distribution systems and have been based on consideration of a package of "average" mass and size.

8.5 Modifying factors may be applied to the basic values of intensity to take account of the points listed in 5.2 and 6.3. These factors are detailed in ISO 4180/2.

9 Selection of test intensities

Test intensities should be selected according to the hazards of the distribution system, the nature of the goods involved and the particular mode of transport used.

10 Modification of basic values of intensity

10.1 Test intensity modifying factors

Modifying factors may need to be applied to the basic values of intensity because of known features in the distribution system (which might be of a temporary nature), or features of the package (i.e. mass and size) which differ from those quoted above, or features of the package or contents known to lead to justifiable modification of the intensity.

10.2 Selection of test intensity modifying factors

Hard and fast rules cannot be used regarding the selection of modifying factors as, although many may be due to facts known about the distribution system, others may be due to human causes. More detailed guidance regarding the circumstances of use and values of test intensity modifying factors is given in ISO 4180/2.

Other adjustments to test intensities may be required under certain circumstances, for example to allow for shortage of time available for testing or assorted loads in stacking.

10.3 Combination of test intensity modifying factors

The combination of test intensity modifying factors should be based on considerations as to whether one factor has overriding significance. If no one factor has such significance, the value of the modifying factor selected should be the highest value of the factor in the set considered.

In considering the cumulative effect of the factors selected, the total departure from the basic value of test intensity should not exceed 2 steps in the appropriate preferred range of test intensity values, except in the instance of vertical impact drop height (see ISO 4180/2). This may be amended if specific knowledge of the distribution system exists, indicating that a change of a greater number of steps is appropriate.

Where a particular hazard is likely to occur frequently during distribution, it may be necessary to increase the number of times a given test is performed.

11 Selection of package attitude

11.1 The package attitude(s) selected for use in a test should be the attitude(s) of the package whilst it encounters the hazard(s) simulated or represented by the test, i.e. the normal transit attitude(s).

1) Conditioning at the commencement of the schedule in no way precludes conditioning to other conditions required as part of an individual test.

2) Further tests for climatic treatment will be the subject of future International Standards.

11.2 Other considerations in the selection of package attitude(s) should be :

a) no single sample of a package should be subjected to an excessive number of individual tests in different attitudes, for example, for a single trip package, a reasonable number of individual tests might be five for impact tests, and one for other tests;

b) duplication between horizontal and vertical impact tests, for example both tests applied to the same face, should be avoided;

c) consideration of the package symmetry should be used, where possible, to avoid duplication of tests.

12 Compilation of test schedules

Consideration of the distribution system in terms of the simple elements of which it is constituted (see clause 4) will determine the tests to be carried out in the test schedule. (If a particular hazard does not exist at a significant level, the test appropriate to this hazard may be omitted.)

The step-by-step procedure is as follows :

a) identify the simple elements in the distribution system;

b) decide what hazards these elements involve;

c) decide which tests are necessary to represent or simulate these hazards (including, for example, decisions concerning appropriate conditioning, package attitude(s), interposed hazards, and number of impacts);

d) decide what are the basic values of the test intensities associated with the particular package and distribution system combination concerned;

e) decide what test intensity modifying factors, if any, should be applied to the normal values of test intensity;

f) place the tests thus identified into the order given in 8.2.

Examples that illustrate this procedure are given in ISO 4180/2.

13 Determination of criteria of acceptance

The criteria of acceptance for a complete, filled transport package may be determined by the reduction of quality of the package and/or its contents, by the extent of loss of package contents, by the extent of deterioration of the package and/or its contents, or by whether the damaged package represents a hazard or potential hazard in subsequent distribution, including storage. These factors should, if practicable, be expressed in quantitative terms (see the annex).

In determining the extent of damage that is acceptable the following factors should be considered :

a) the unit value of the contents;

b) the number of units in the complete, filled transport package;

c) the number of complete, filled transport packages in the consignment;

d) the cost of distribution;

e) whether the contents are :

1) non-dangerous;

2) dangerous to personnel;

3) hazardous to other commodities.

Annex

Methods of quantifying damage to a package and/or its contents

The extent of damage may be quantified as follows :

a) by loss of content by number, volume or mass (loss by leakage is also related to time);

b) by damage to contents measured by appropriate test methods, for example moisture content of biscuits; the calibration of an instrument;

c) by other damage to the package and/or its contents by :

1) changes in dimension;

2) dimensions of damage (for example, length of splits, area of corrosion);

3) time or cost of repair.

Scoring systems, in which score points are allotted for degrees of different types of damage and which take into consideration the relative importance of the different types of damage, may be used to provide a quantitative assessment. Two examples are given in the table below.

Table — Examples of quantification of damage using a scoring system

Example	Content	Method of quantification	Allocation of score points	
			Diameter mm	**Score points**
1	Apples	Measurement of bruise diameter	< 10	0
			10 to 15	1
			15 to 20	2
			20 to 25	4
			25 to 30	7
			> 30	11
			Severity of damage	**Score points**
2	Radio sets	Assessment of severity of damage	No damage.	0
			Damage requiring repair :	
			a) under normal pre-sale servicing;	1
			b) by return to factory.	4
			Not worth repairing.	10