INTERNATIONAL STANDARD

ISO 16103

First edition
2005-07-01

Packaging — Transport packaging for dangerous goods — Recycled plastics material

Emballages — Emballages de transport pour marchandises dangereuses — Matériaux plastiques recyclés

Reference number
ISO 16103:2005(E)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 16103 was prepared by Technical Committee ISO/TC 122, *Packaging*, Subcommittee SC 3, *Performance requirements and tests for means of packaging, packages and unit loads (as required by ISO/TC 122)*.

Introduction

The aim of this International Standard is to specify sufficiently the necessary controls for the use of recycled plastics materials as identified in the *United Nations Recommendations on the Transport of Dangerous Goods*, by selection into batches. Packagings produced from each batch of recycled plastics material undergo mechanical testing as in design type testing.

These Recommendations are given legal entity by the provisions of a series of modal agreements for the international transport of dangerous goods:

— the *European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)* (see [1] in the Bibliography);

— the International Civil Aviation Organization's *Technical Instructions for the Safe Transport of Dangerous Goods by Air* (see [2] in the Bibliography);

— the *International Maritime Dangerous Goods Code* (see [3] in the Bibliography);

— the *Regulations concerning the International Carriage of Dangerous Goods by Rail (RID)* (see [4] in the Bibliography).

The application of this International Standard needs to take account of the requirements of these international agreements and the relevant national regulations for domestic transport of dangerous goods.

Packaging — Transport packaging for dangerous goods — Recycled plastics material

1 Scope

This International Standard specifies the requirements and test methods for the production of recycled plastics materials to be used for packagings for the transport of dangerous goods. This includes guidance on the quality assurance programme.

NOTE The quality assurance programme for the production of packagings is described in ISO 16106 (see [5] in the Bibliography).

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles*

ISO 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics*

ISO 1133, *Plastics — Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics*

ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pyknometer method and titration method*

ISO 12048, *Packaging — Complete, filled transport packages — Compression and stacking tests using a compression tester*

ISO 16101, *Packaging — Transport packaging for dangerous goods — Plastics compatibility testing*

ISO 16104, *Packaging — Transport packaging for dangerous goods — Test methods*

United Nations Recommendations on the Transport of Dangerous Goods — Model Regulations, ST/SG/AC. 10/1/Rev.13: United Nations, ISBN 92-1-139090-7

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
recycled plastics material
material recovered from used industrial packagings that has been cleaned and prepared for processing into new packagings

3.2
batch of recycled plastics materials
defined quantity, maximum 25 t, of homogeneous material with known parameters (melt flow rate, density and tensile stress at yield)

3.3
competent authority
national regulatory body or authority designated or otherwise recognized as such for any purpose in connection with the regulations specified in the Bibliography

4 General framework

The specific properties of recycled plastics material used for production of new packaging shall be assured and documented as part of a quality assurance programme. This record shall be maintained under the following headings:

a) collection of packagings;

b) incoming inspection;

c) process control;

d) final quality control;

e) mechanical testing of packagings;

f) documentation.

NOTE Where regulatory requirements apply, this may require recognition by the competent authority.

5 Requirements

5.1 Collection

5.1.1 The collection shall be restricted to industrial packagings, e.g. drums, jerricans, large packagings, and intermediate bulk containers (IBCs).

5.1.2 All packagings shall have the following characteristics:

a) have evidence of previous contents, including identification of dangerous goods;

b) be embossed with the accepted international material code symbol (see Annex A) or be identified by other means;

c) be marked with the month and year of manufacture.

5.1.3 Uncleaned packagings which are UN-marked shall

a) display the required hazard identification labels, if applicable;

b) be closed suitable for transport;

c) be empty, i.e. all residues that can be removed by the emptier have been removed using the practices commonly employed to remove residues from that type of packaging (pouring, aspirating, shaking, scraping, chipping, etc. or, if necessary, a combination of these).

5.2 Incoming inspection

An incoming inspection shall be carried out in order to ensure that the requirements of collection (listed in 5.1) have been met.

Different types of plastics materials shall not be mixed.

Packagings produced from different manufacturing processes (e.g. extrusion blow moulding, rotational moulding, injection moulding) should not be mixed.

5.3 Packagings excluded

5.3.1 All packagings displaying the characteristics shown in 5.3.2 to 5.3.7.

All packagings shall be segregated by their material code symbol.

5.3.2 Packagings having contained products which have affected the plastics material (e.g. certain highly oxidizing substances), making it unsuitable for reprocessing.

5.3.3 Packagings that have contained certain specific substances hazardous to health and safety and/or the environment, listed in Division 6.1 Toxic substances, Division 6.2 Infectious substances and Class 7 Radioactive material of the *United Nations Recommendations on the Transport of Dangerous Goods — Model Regulations*, and all substances with toxic secondary risks.

5.3.4 Packagings that are more than 10 years old.

5.3.5 Packagings that show signs of deterioration, e.g. by the effect of UV radiation causing degradation.

5.3.6 Packagings produced from material that cannot be reprocessed (e.g. cross-linked polyethylene).

5.3.7 Packagings marked with the symbol 'REC'.

5.4 Process control

5.4.1 All closures and gaskets shall be excluded.

5.4.2 All labels made of materials other than those indicated by the material code symbol from the container body shall be totally removed.

5.4.3 The packagings shall be cleaned in such a way as to remove all residues from the inside and the outside.

NOTE Such cleaning may be undertaken by using, for example, one of the following methods:

a) physical measures (e.g. drip-dry through ventilation);

b) cleaning of the packaging (e.g. triple rinsing);

c) chemical alteration of the residue (e.g. chemical passivation).

5.4.4 The packagings shall be size reduced, e.g. by shredding, regrinding or re-pelletizing, and homogenized sufficiently to give consistent material properties throughout the batch.

5.5 Final quality control

5.5.1 Verification

It shall be verified that each batch of the recycled plastics material has the specified melt flow rate, density, and tensile yield strength. These three parameters shall be tested to the following standards:

— ISO 1133 for melt flow rate;

— ISO 1183-1 for density;

— ISO 527-1 and ISO 527-2 for tensile yield strength/elongation at break (testing speed: 50 mm/min).

Sufficient samples shall be taken from each batch to demonstrate homogeneity and repeatability of these parameters, i.e. at least three samples representative of the whole batch. The determined values shall not deviate from the specifications laid down in the test report of the design type by more than

— ± 30 % for melt flow rate;

— ± 5 kg/m^3 for density.

The tensile elongation at break shall not be less than 75 % of the original value.

NOTE Additional methods may be used to verify the recycled material is free from contamination, e.g. analytical methods such as differential scanning calorimetry (DSC) (see ISO 11357-1 and ISO 11357-3).

5.5.2 Mechanical design type testing of packagings

Packagings produced from each batch of recycled plastics material shall undergo mechanical testing as specified in ISO 16104. The stacking test in ISO 16104 may be replaced with dynamic compression testing according to ISO 12048. The scheme is shown in Table 1.

Table 1 — Mechanical testing of recycled plastics material

Packaging type	Drop test	Stacking test	Leakproofness test	Hydraulic pressure test
For solids, inner packagings or articles	Yes	Yes	No	No
For liquids	Yes	Yes	Yes	Yes

5.5.3 Compatibility

Issues concerning the compatibility of each batch of recycled plastics material with the packaged substance shall be taken into account, in accordance with ISO 16101.

5.6 Documentation

All tests and results of the collection process control incoming inspection and final quality control shall be documented and kept for a minimum period of five years with the batch identifications.

The period for the retention of documentation should take account of packaging still in transit more than five years after manufacture.

5.7 Marking

In addition to any marking that is required by the *United Nations Recommendations on the Transport of Dangerous Goods*, Chapter 6.1.3, packagings produced from recycled plastics material shall be marked with the symbol “REC” and the relevant symbol as shown in Annex A.

NOTE Packagings may be marked with the statement ‘Not for food or drink’, unless otherwise authorized by the competent authority.

Annex A
(normative)

International material code symbols

Marking shall be as the international material code symbol, shown below for simplicity.

Polyethylene terephthalate (PET or PETE)

High-density polyethylene (HDPE)

Vinyl (polyvinyl chloride or PVC)

Low-density polyethylene (LDPE)

Polypropylene (PP)

Polystyrene (PS)

Other

Bibliography

[1] *European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)*, United Nations, Geneva, Switzerland, ISBN 92-1-139070-2 and ISBN 92-1-139071-0

[2] *Technical Instructions for the Safe Transport of Dangerous Goods by Air*, TI DOC 9284, AN/9055: International Civil Aviation Organization (ICAO), Montreal, Canada

[3] *International Maritime Dangerous Goods Code (IMDG)*: International Maritime Organization, London, United Kingdom, ISBN 92-801-5090-1

[4] *Regulations concerning the International Carriage of Dangerous Goods by Rail (RID)*: Intergovernmental Organisation for International Carriage by Rail (OTIF)

[5] ISO 16106[1)], *Packaging — Transport packages for dangerous goods — Dangerous goods packagings, intermediate bulk containers (IBCs) and large packagings — Guidelines for the application of EN ISO 9001*

[6] ISO 11357-1, *Plastics — Differential scanning calorimetry (DSC) — General principles*

[7] ISO 11357-3, *Plastics — Differential scanning calorimetry (DSC) — Part 3: Determination of temperature and enthalpy of melting and crystallization*

1) To be published.

ICS 13.300; 55.020

Price based on 8 pages