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**Plastics — Guidelines for the recovery  
and recycling of plastics waste**

*Plastiques — Lignes directrices pour la valorisation et le recyclage des  
déchets plastiques*

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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.

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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 15270 was prepared by Technical Committee ISO/TC 61, *Plastics*.

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## Introduction

This International Standard has been developed to assist all plastics industry stakeholders in the development both of a sustainable global infrastructure for plastics recovery and recycling, as well as of a sustainable market for recovered plastics materials and their derived manufactured products.

For the reduction of plastics waste and in support of the objectives of sustainable development, the first priority should be given to the reduction of material and energy resource use, in general, and to optimization of the use of plastics raw materials, in particular, on a product life-cycle basis. Options involving the beneficial re-use of plastics products and the integration of plastics recovery processes are important downstream components of sustainable development.

The selection of methodologies and processes for the management of plastics waste available from pre-consumer sources and end-of-life products may be approached using various strategies, all of which should include a preliminary analysis of the available recovery options. In general, plastics recovery technologies can be divided into two classes:

- a) material recovery (mechanical recycling, chemical or feedstock recycling, and biological or organic recycling);
- b) energy recovery in the form of heat, steam, or electricity generation using plastics waste or derived fuels as substitutes for primary fossil fuel resources.

As the optimal recovery option depends on many prevailing circumstances, life-cycle analysis should be applied to decide, depending on the type and composition of the plastics waste, which options are environmentally more favourable and sustainable. In the case of commingled plastics waste, energy recovery and some feedstock recycling processes often represent the optimal choice. Moreover, plastics waste may be managed utilizing a hierarchical framework comprising life-cycle strategies for prevention and minimization both of the volume of waste, as well as of its potentially adverse environmental impact as described in ISO 17422. The possible presence of regulated substances in plastics, in the form of either additives or contaminants, should be considered at each stage of the recovery process.

**NOTE 1** If special monomers or other feedstocks are to be recovered, effective and efficient collection of the corresponding polymers is necessary. For mechanical recycling, and indeed all plastics recovery operations, proper process monitoring and control procedures are required. These procedures can include the establishment of specific guides and specifications covering recovered plastics which can include rules for traceability and assessment of conformity.

**NOTE 2** This International Standard is intended to provide a valuable resource that is globally relevant, no matter which particular legislative or regulatory framework for plastics recovery and recycling governs its application. In order to facilitate adoption of the standard within the contexts of diverse national and regional legislative and regulatory environments, the following considerations are emphasized:

- a) The subject of plastics recovery and recycling, being often presented within the perspective of solid-waste management, frequently applies terminology, technology, economics and infrastructure that are based on solid-waste management concepts. These concepts have consequently tended to define the legislative and regulatory environments referred to above.
- b) Alternative perspectives for plastics recovery and recycling that are more comprehensive than those inherent to the solid-waste management model are available based on the concepts of integrated resource management (see Annex B) and sustainable development. Integrated resource management focuses on more extensive systems than solid-waste management. It applies life-cycle analysis to achieve better understanding of the resource conservation and eco-efficiency implications of resource management strategies and policies. In this approach, the management of both energy and material resources are viewed within an integrated perspective. The concept of sustainable development, while also applying life-cycle thinking to waste and resource management, is more comprehensive than integrated resource management in that it requires consideration of the so-called three pillars of sustainable development, viz. ecological benefit, economic growth and social progress.

NOTE 3 Although plastics recovery and recycling is a relatively new and emerging industry, significant national and regional efforts have been undertaken to provide legislative and regulatory frameworks applicable to one or more market sectors. The existence of such legal and regulatory frameworks must be kept in mind by users of this International Standard. In the interest of ensuring global relevance, an effort has been made to avoid terminology and definitions that appear to promote one legislative or regulatory framework over another. The intent is that terminology and definitions included in this International Standard embrace, rather than exclude, differing interpretations. A specific example is the question of whether or not a material must be defined as waste before it can be recovered. There is no universal agreement on this point and the standard attempts to accommodate a range of current and possible future definitions and interpretations of the term “waste”.

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# Plastics — Guidelines for the recovery and recycling of plastics waste

## 1 Scope

This International Standard provides guidance for the development of standards and specifications covering plastics waste recovery as well as other means of plastics waste reduction, including recycling. The standard establishes the different options for the recovery of plastics waste arising from pre-consumer and post-consumer sources as illustrated diagrammatically in Annex A. The standard establishes the quality requirements that should be considered in all steps of the recovery process, and provides general recommendations for inclusion in material standards, test standards and product specifications. Consequently, the process stages, requirements, recommendations and terminology presented in this International Standard are intended to be of general applicability.

## 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 472:1999, *Plastics — Vocabulary* <https://standards.iteh.ai/catalog/standards/sist/b5bf307a-0f08-4f28-94ef-4ea9f60a1461/iso-15270-2006>

ISO 14021, *Environmental labels and declarations — Self-declared environmental claims (Type II environmental labelling)*

ISO 17422, *Plastics — Environmental aspects — General guidelines for their inclusion in standards*

ASTM D 5033, *Standard Guide for Development of ASTM Standards Relating to Recycling and Use of Recycled Plastics*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472 and the following apply.

### 3.1

#### **agglomerate**

shredded and/or granulated plastics material in the form of particles which cling together

### 3.2

#### **baling**

process in which plastics waste is compacted and secured as a bundle to facilitate handling, storage and transportation

### 3.3

#### **batch**

quantity of material regarded as a single unit, and having a unique reference

NOTE Batch is primarily a processing term.

**3.4 biodegradation**  
degradation caused by biological activity, especially by enzymatic action, leading to a significant change in the chemical structure of a material

[ISO 16929:2002]

**3.5 biological recycling**  
aerobic (composting) or anaerobic (digestion) treatment of biodegradable plastics waste under controlled conditions using microorganisms to produce stabilized organic residues, carbon dioxide and water in the presence of oxygen or to produce stabilized organic residues, methane and water in the absence of oxygen

**3.6 collection**  
logistical process of moving plastics waste from its source to a place where it can be recovered

**3.7 commingled plastics**  
mixture of materials or products consisting of different types of plastic

NOTE Mixed plastics is a synonym.

**3.8 contaminant**  
unwanted substance or material

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NOTE Impurity is a deprecated synonym of contaminant and should not be used.

**3.9 converter**  
specialized operator capable of shaping plastics raw material to make a usable semi-finished or finished product

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**3.10 depolymerization**  
chemical reversion of a polymer to its monomer(s) or to a polymer of lower relative molecular mass

[ISO 472:1999]

**3.11 energy recovery**  
production of useful energy through controlled combustion

NOTE Solid-waste incinerators producing hot water, steam and/or electricity are a common form of energy recovery.

**3.12 environmental aspect**  
element of an organization's activities or products or services that can interact with the environment

[ISO 14001:2004]

**3.13 environmental impact**  
any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects

[ISO 14001:2004]



**3.14****feedstock recycling**

production of new raw materials by changing chemical structure of plastics waste through cracking, gasification or depolymerization, excluding energy recovery and incineration

NOTE Feedstock recycling and chemical recycling are synonyms.

**3.15****flake**

plate-like regrind

NOTE The shape of regrind depends both on the plastics being processed and the manner of processing.

**3.16****fluff**

filament-like regrind

NOTE Common usage of the term “fluff” also includes shredder residue fractions produced in the commercial recycling of durable goods such as automobiles.

**3.17****homogenizing**

processing to improve the degree to which a constituent and/or property is uniformly distributed throughout a quantity of plastics material

[EN 14899:2005]

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**3.18****landfill**

waste disposal site for the deposit of waste on to or into land under controlled or regulated conditions

[ISO 15270:2006](#)

**3.19****lot**

definite quantity of some commodity manufactured or produced under conditions that are presumed uniform

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[ISO 472:1999]

NOTE Lot is primarily a commercial term.

**3.20****material recovery**

material-processing operations including mechanical recycling, feedstock (chemical) recycling and organic recycling, but excluding energy recovery

**3.21****mechanical recycling**

processing of plastics waste into secondary raw material or products without significantly changing the chemical structure of the material

NOTE Plastics secondary raw material is a synonym of recyclate.

**3.22****micronizing**

process by which a plastics material is ground into a fine powder

**3.23****organic recycling**

controlled microbiological treatment of biodegradable plastics waste under aerobic or anaerobic conditions

NOTE The term “biological recycling” is used synonymously.

**3.24**

**post-consumer**

descriptive term covering material, generated by the end-users of products, that has fulfilled its intended purpose or can no longer be used (including material returned from within the distribution chain)

NOTE The term “post-use” is sometimes used synonymously.

**3.25**

**pre-consumer**

descriptive term covering material diverted from the waste stream during a manufacturing process

NOTE 1 This term excludes re-utilized material, such as rework, regrind or scrap that has been generated in a given process and is capable of being reclaimed within that same process.

NOTE 2 The term “post-industrial material” is sometimes used synonymously.

**3.26**

**purge material**

material resulting from the passing of polymer through plastics processing equipment for the purpose of cleaning the equipment, or when changing from one polymer to another, or when changing from one colour or grade of polymer to another

**3.27**

**recovered material**

plastics material that has been separated, diverted or removed from the solid-waste stream and then re-used or recycled

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NOTE See also ISO 14021.

**3.28**

**recovery**

processing of plastics waste material for the original purpose or for other purposes, including energy recovery

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**3.29**

**recyclate**

plastics material resulting from the recycling of plastics waste

NOTE Plastics secondary raw material and recycled plastics are synonyms of “recyclate”. The term “regenerate” is also used.

**3.30**

**recycling**

processing of plastics waste materials for the original purpose or for other purposes, excluding energy recovery

**3.31**

**regrind**

shredded and/or granulated recovered plastics material in the form of free-flowing material

NOTE The term “regrind” is frequently used to describe plastics material in the form of scrap generated in a plastics processing operation and re-used in-house. This term is also used to describe fine plastics powder used as filler in the recovery of plastics.

**3.32**

**re-use**

use of a product more than once in its original form

NOTE In view of the fact that a re-used product has not been discarded, re-use does not constitute a recovery option.

**3.33****shredding**

any mechanical process by which plastics waste is fragmented into irregular pieces of any dimension or shape

NOTE Shredding usually signifies the tearing or cutting of materials that cannot be crushed by fragmentation methods applicable to brittle materials, as typically carried out in a hammer mill.

**3.34****waste**

any material or object which the holder discards, or intends to discard, or is required to discard

**4 Sources****4.1 General**

Plastics material for recovery may be obtained from various sources, including the following:

**4.2 Pre-consumer sources of materials**

## a) Plastics producers:

- off-grade materials.

## b) Plastics processors:

- processing purge material and scrap;
- scrap products, parts and semi-finished products.

## c) Others:

- industrial and commercial products made of, or containing, plastics, including packaging and containers.

**4.3 Post-consumer sources of materials**

## a) Disposables:

- personal goods;
- packaging films and containers.

NOTE Such disposables may be recovered by sorted municipal-collection systems or by specific consumer-incentive systems involving cash deposits on containers.

## b) Durable goods:

- domestic appliances;
- electronic equipment;
- automobiles;
- construction products.