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## Environmental management systems — Guidelines for incorporating material circulation in design and development

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 207, Environmental management, Subcommittee SC 1, Environmental management systems.

## Introduction

### 0.1 Background

One of the major challenges that we all face in achieving sustainable development is the efficient use of resources and reuse of the resources repeatedly without diminishing their value, usability, etc. Internationally, the United Nations Environment Programme International Resource Panel (UNEP IRP) warns that at the current pace of production and consumption, mankind would consume 140 billion tons of natural resources in 2050, which is twice the amount consumed in 2005. Such use of natural resources, that does not consider material circulation, has already resulted in unstable resource supplies and serious adverse environmental impacts<sup>[25]</sup>.

The UN adopted 17 sustainable development goals (SDGs) in 2015 and set specific targets for each of them to be achieved over the next 15 years. SDG 9 (Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation), SDG 12 (Ensure sustainable consumption and production patterns), and SDG 13 (Climate action) are directly related to managing natural resources.

Emphasis on the transition from a linear to a circular economy in order to achieve sustainable development has been spearheaded by the European Union (EU).<sup>[24]</sup> The concept of a circular economy encompasses a wide range of topics, from the full life cycle of products to business models. The general concept of a circular economy is closing the loop between different life cycles through the application of designs that allow for the enhancement of recycling and reuse for the more efficient use of raw materials and products, limiting (or eliminating) waste. One of the methods to consider for supporting the transition to a circular economy is implementing a design that facilitates the material circulation of products and their constituent parts (see [Annex A](#)).

Considering that products are largely composed of natural resources, material circulation of products plays an important role in the sustainable use of resources. The widely-held perception is that strategy/planning for material circulation of products and their constituent parts should precede their design and development.

Material circulation can be understood as an approach integrated within the design and development by which products, parts or materials can be continually reprocessed into the same or similar products in order to achieve material efficiency and (ultimately) the environmental objectives of the organization. In order to be of benefit to the organization and to ensure that the organization achieves its material efficiency objectives, it is intended that improvement of material circulation be carried out as an integral part of the business operations of the organization. Material circulation can potentially have implications for all functions of an organization.

This document provides guidelines for strategies on material circulation to achieve material efficiency i.e., “minimize the use of natural resources, by maximizing the lifetime of products through improved design, with increased opportunities for repair, upgrade, reuse, remanufacturing and recycling by an organization”.

A material circulation improvement process takes place within an organization's design and development, and it is there where the knowledge required in carrying out and managing material circulation is to be found. However, when it is intended that material circulation be carried out under the umbrella of an environmental management system (EMS), then the person responsible for the EMS is expected to have an understanding of what this process is and how it is going to be managed and controlled. In this way, the integrity of the EMS is not jeopardized and the material efficiency and other environmental objectives for the products can be achieved.

Incorporation of material efficiency within an EMS requires knowledge related to the following:

- a) assessment the material circulation of the products in the organization;
- b) identification of appropriate material circulation strategies to improve material circulation of products and their constituent parts and support achievement of the material efficiency objectives of the organization;

- c) the design and development process, and an understanding of how material circulation improvement processes and how they are managed fit within an EMS.

## 0.2 Relation with other standards

ISO 14001<sup>[1]</sup> is a core standard that provides the organization with a framework for establishing an environmental management system (EMS). There are four key elements to support users of ISO 14001. One of them is related to “policy and organizational elements” such as those related to sustainable use of resources, and further exemplified in two complementary standards, ISO 14006<sup>[3]</sup> on ecodesign, and this document, ISO 14009 on material circulation.

ISO 14006 provides guidelines to assist organizations in establishing a systematic and structured approach to the incorporation and implementation of ecodesign within an EMS such as that described in ISO 14001.

IEC 62430,<sup>[10]</sup> on the other hand, describes principles, specifies requirements, and provides guidance for organizations intending to integrate environmental aspects into the design and development in order to minimise the adverse environmental impacts of products. IEC 62430 can be incorporated into an existing management system as indicated in ISO 14006.

In Europe, standards on material efficiency assessment methods are under development to support future ecodesign requirements on, amongst others, durability, reparability, and recyclability of energy-related products. These standards are directly linked to this document. The preparation of these standards is driven by the CEN-CENELEC Joint Technical Committee 10 (CEN-CLC JTC 10) on Energy-related products — Material Efficiency Aspects for Ecodesign. Some of the JTC10 standards, EN 45556,<sup>[16]</sup> EN 45558<sup>[18]</sup> and EN 45559<sup>[19]</sup> (covering, respectively, proportion of reused components, declaration of use of critical raw materials and communication of material efficiency aspects) are published, while the other standards are under different phases of development<sup>[11-15,17]</sup>.

ISO 14001 requires an organization to identify environmental aspects and corresponding environmental impacts, taking a life cycle perspective into account. This involves considering aspects and impacts in each stage of the product life cycle, including design and development. ISO 9001<sup>[2]</sup> is focused on quality management systems, including design and development, but does not cover environmental impacts. ISO 14006 focus on management system to implement environmental conscious design by an organization. IEC 62430 assists with incorporation processes to implement environmental conscious design by an organization. Last, the CEN-CLC JTC 10 group of standards focus on assessment methods related to material efficiency and material circulation, but they do not cover environmental and business management frameworks, as described in this document.

[Figure 1](#) illustrates how ecodesign and material circulation in ISO 14006 and ISO 14009 can support an EMS as described in ISO 14001.

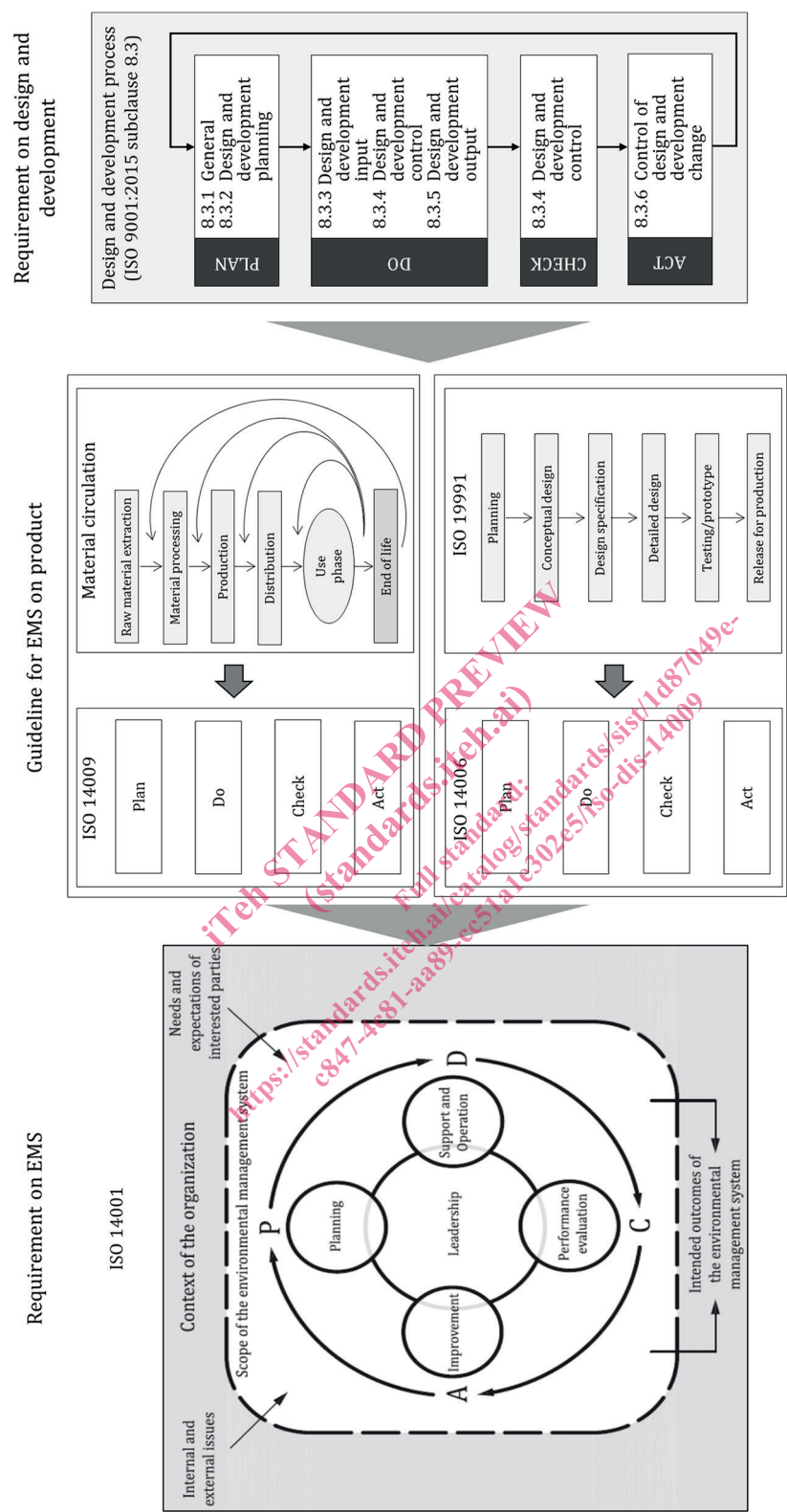


Figure 1 — The relationship between ISO 14001, ISO 14006 and ISO 14009

0.3 Overview



This document is a type B management system standard and provides guidelines related to ISO 14001, a type A management system standard and that follows the identical structure to ISO 14001. This standard places priority on the ISO 14001 clauses for planning ([clause 6](#)) and operation ([clause 8](#)):

- [Clauses 4, 5, and 7](#) cover aspects related to environmental management system.
- Establishment of material circulation strategies for products is considered in [clause 6](#). Creating material circulation solutions, design considerations for material circulation, and ensuring operational planning and control are provided in [clause 8](#).

Additionally, ISO 14009 contains also the following annexes to assist users in understanding material circulation:

- [Annex A](#) shows the relationship between the circular economy and material circulation;
- [Annex B](#) addresses examples and explanation of interested parties;
- [Annex C](#) illustrates material flow in material circulation and the link with material efficiency; and
- [Annex D](#) describes a case study on the redesign of existing products.

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# Environmental management systems — Guidelines for incorporating material circulation in design and development

## 1 Scope

This document provides guidelines to assist organizations in establishing, documenting, implementing, maintaining and continually improving material circulation in their design and development in a systematic manner, using an environmental management system (EMS) framework.

These guidelines are intended to be used by those organizations that implement an EMS in accordance with ISO 14001. The guidelines can also help in integrating material circulation strategies in design and development when using other management systems. The guidelines can be applied to any organization regardless of its size or activity.

This document provides guidelines for design strategies on material circulation to achieve the material efficiency objectives of an organization, by focusing on the following aspects:

- Type and quantity of materials in products
- Product lifetime extension
- Recovery of products, parts, and materials

In design and development, many aspects are considered, such as safety, performance, and cost. Although important, they are not addressed in this document.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

### 3.1 Terms related to organization and leadership

#### 3.1.1 management system

set of interrelated or interacting elements of an *organization* (3.1.5) to establish policies and *objectives* (3.2.21) and *processes* (3.3.3) to achieve those objectives

Note 1 to entry: A management system can address a single discipline or several disciplines (e.g. quality, environment, occupational health and safety, energy, financial management).

Note 2 to entry: The system elements include the *organization's* (3.1.5) structure, roles and responsibilities, planning and operation, performance evaluation and improvement.

Note 3 to entry: The scope of a management system can include the whole of the *organization* (3.1.5), specific and identified functions of the *organization* (3.1.5), specific and identified sections of the *organization* (3.1.5), or one or more functions across a group of *organizations* (3.1.5).

[SOURCE: ISO 14001:2015, definition 3.1.1]

### 3.1.2

#### **environmental management system**

part of the *management system* (3.1.1) used to manage *environmental aspects* (3.2.19), fulfil *compliance obligations* (3.2.32), and address *risks and opportunities* (3.2.33)

[SOURCE: ISO 14001:2015, definition 3.1.2]

### 3.1.3

#### **environment**

surroundings in which an *organization* (3.1.5) operates, including air, water, land, natural resources, flora, fauna, humans and their interrelationships

Note 1 to entry: Surroundings can extend from within an organization to the local, regional and global system.

Note 2 to entry: Surroundings can be described in terms of biodiversity, ecosystems, climate or other characteristics.

[SOURCE: ISO 14001:2015, definition 3.2.1]

### 3.1.4

#### **environmental policy**

intentions and direction of an *organization* (3.1.5) related to *environmental performance* (3.4.11), as formally expressed by its *top management* (3.1.6)

[SOURCE: ISO 14001:2015, definition 3.1.3]

### 3.1.5

#### **organization**

person or group of people that has its own functions with responsibilities, authorities and relationships to achieve its *objectives* (3.2.21)

Note 1 to entry: The concept of organization includes, but is not limited to sole-trader, company, corporation, firm, enterprise, authority, partnership, charity or institution, or part or combination thereof, whether incorporated or not, public or private.

[SOURCE: ISO 14001:2015, definition 3.1.4]

### 3.1.6

#### **top management**

person or group of people who directs and controls an *organization* (3.1.5) at the highest level

Note 1 to entry: Top management has the power to delegate authority and provide resources within the *organization* (3.1.5).

Note 2 to entry: If the scope of the *management system* (3.1.1) covers only part of an *organization* (3.1.5), then top management refers to those who direct and control that part of the *organization* (3.1.5).

[SOURCE: ISO 14001:2015, definition 3.1.5]

### 3.1.7

#### **interested party**

person or *organization* (3.1.5) that can affect, be affected by, or perceive itself to be affected by a decision or activity

EXAMPLE Customers, communities, suppliers, regulators, non-governmental *organizations* (3.1.5), investors and employees.

Note 1 to entry: To “perceive itself to be affected” means the perception has been made known to the *organization* (3.1.5).

[SOURCE: ISO 14001:2015, definition 3.1.6]

### 3.1.8

#### **circular economy**

systemic approach to the design of business models, enabling the sustainable management of resources in *products* (3.2.4)

Note 1 to entry: This document focuses on the environmental perspective of the circular economy with attention to the design and development of a product.

[SOURCE: BS 8001:2017, definition 2.11 modified – removed ‘and services’ and added note 1 to entry]

## 3.2 Terms related to planning

### 3.2.1

#### **design and development**

*process* (3.3.3) that transforms requirements into a *product* (3.2.4)

Note 1 to entry: Design and development usually follow a series of steps e.g. starting with an initial idea, transforming that into a formal specification, through to the creation of a new *product* (3.2.4), its possible redesign and consideration of end-of-life.

Note 2 to entry: Design and development can include taking a *product* (3.2.4) idea from planning to *product* (3.2.4) provision and review of the *product* (3.2.4). It can include considerations on business strategies, marketing, research methods and design aspects that are used. It includes improvements or modifications of existing *products* (3.2.4).

[SOURCE: IEC/ISO 62430:2019, definition 3.1]

### 3.2.2

#### **redesign**

design of a product based on existing product design to improve targeted characteristics of the product

Note 1 to entry: Examples of targeted characteristics are reducing the use of raw materials, enhancing the use of recycled contents, reducing the use of hazardous substances, energy saving, improving material recyclability, etc.

### 3.2.3

#### **ecodesign**

systematic approach which considers *environmental aspects* (3.2.19) in *design and development* (3.2.2) with the aim to reduce adverse *environmental impacts* (3.2.20) throughout the *life cycle* (3.2.17) of a *product* (3.2.4)

Note 1 to entry: Other terminology used worldwide includes Environmentally Conscious Design (ECD), Design for Environment (DfE), green design and environmentally sustainable design.

[SOURCE: ISO/DIS 14006, definition 3.2.2]

### 3.2.4

#### **circular readiness**

potential of the product and their constituent parts for material circulation

### 3.2.5

#### **product**

any goods or service

[SOURCE: ISO/DIS 14006, definition 3.2.3 modified – deleted note 1, 2, and 3 to entry]