SLOVENSKI STANDARD

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Aluminij in aluminijeve zlitine ï Okoljski vidiki aluminijevih proizvodov ï Splošne smernice za njihovo vključ itev v standarde

Aluminium and aluminium alloys - Environmental aspects of aluminium products - General guidelines for their inclusion in standards

Aluminium und Aluminiumlegierungen - Umweltaspekte von Aluminiumerzeugnissen - Allgemeine Leitlinien für ihre Berücksichtigung in Normen

Aluminium et alliages d'aluminium - Aspects environnementaux des produits d'aluminium - Lignes directrices générales pour leur intégration dans les normes

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Contents

Page

Foreword

This document (EN 15530:2008) has been prepared by Technical Committee CEN/TC 132 “Aluminium and aluminium alloys”, the secretariat of which is held by AFNOR. Within its program of work, Technical Committee CEN/TC 132 entrusted CEN/TC 132/WG 14 “General support” to prepare this document.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2008, and conflicting national standards shall be withdrawn at the latest by July 2008.

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Introduction

European standards often deal with aspects of trade, quality, health and the safety of products, processes or services. By additionally considering environmental aspects, European standardization is extended to the frame of sustainable development.

General guidance for the inclusion of environmental aspects in product standards is given by CEN Guide 4. This Guide covers the consideration of environmental aspects in standards dealing with aluminium products and is intended for standard writers. The aim of CEN Guide 4 is to provide a helpful tool for technical experts in the production chain of the aluminium product, who are involved in standardization, but are not necessarily environmental experts.

The purpose of CEN Guide 4 is:

a) to describe the environmental aspects in product standards;

b) to outline the relationship between product standards and the environment;

c) to help avoid provisions in product standards that may lead to adverse environmental impacts;

d) to emphasize that addressing environmental aspects during the development of product standards is a complex process and requires balancing competing priorities;

e) to recommend the use of life cycle thinking and recognized scientific techniques when addressing environmental aspects of a product being standardized.

CEN Guide 4 states that it is supplemented by sectorial guides in order to reflect the diversity of environmental impacts that products may have. This European Standard may be considered as such a sectorial guide, as it considers aluminium products as a product sector for different applications (e.g. vehicles, building, packaging etc.). It is based on the expertise of representatives of the aluminium industry with environmental knowledge.

Depending on the way a European Standard is written, the provisions included and those omitted, the environmental impact of those products and processes may be influenced. The experts writing or revising European Standards should be aware of the relevance of environmental aspects and possible environmental impacts. In order to achieve this, guidance on how to take environmental issues systematically into account should be given.

1 Scope

This European Standard gives guidelines for standard writers who draft standards dealing with aluminium products or dealing with semi-finished products which are intended to be used for aluminium products. It applies to all applications of aluminium products

It provides a structure on how to identify and consider environmental aspects and potential environmental impacts of aluminium products throughout their life cycle, when writing standards taking into account the specific properties of aluminium and specific aspects of the life cycle of aluminium products.

It gives guidance on how the life cycle of aluminium products should be taken into account, considering the provisions given in EN ISO 14044.

It also explains cases where restrictions on aluminium products, which are motivated by environmental considerations, are not appropriate and gives guidance on how to avoid unnecessary requirements.

This European Standard does not include health and safety aspects related to the production, use or recycling of aluminium products.

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.

EN 12258-1:1998, *Aluminium and aluminium alloys — Terms and definitions — Part 1: General terms*

EN ISO 14044:2006, *Environmental management — Life cycle assessment — Requirements and guidelines (ISO 14044:2006)*

CEN Guide 4:2005, *Guide for the inclusion of environmental aspects in products standards*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12258-1:1998 and the following apply.

3.1
aluminium product
product which contains a significant portion of aluminium in metallic form in order to achieve the desired functions

NOTE Aluminium products can be offered to a consumer or delivered to further downstream manufacturing.

3.2
standard writer
any person taking part in the preparation of European Standards

[CEN Guide 4:2005]

3.3
environmental aspect
element of an organization's activities or products or services that can interact with the environment

NOTE A significant environmental aspect has or can have a significant environmental impact.

[EN ISO 14001:2004]

3.4
environmental impact
any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspect

[EN ISO 14001:2004]

3.5
life cycle
consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to their final disposal

[EN ISO 14044:2006]

4 General guidance

4.1 Practical procedure on how to introduce provisions dealing with environmental aspects into European Standards

4.1.1 Many European Standards about aluminium products exist without any provisions to make the user aware of environmental aspects and potential environmental impacts. This need not lead directly to products which are less environmentally friendly, because the designer has other incentives to consider environmental aspects, such as economic considerations, legal requirements etc. However, the inclusion of environmental provisions encourages the consideration of environmental aspects in cases where such incentives do not exist.

4.1.2 In many cases it is sufficient to include the necessary provisions when revising European Standards about aluminium products by the inclusion of a new clause or subclause where the relevant environmental aspects are formulated.

EXAMPLE In EN 13981-1:2003 requirements and guidance on aluminium profiles for railway application are formulated, without mentioning possible environmental aspects. For the next revision of this European Standard it would be advisable to include an additional clause stating that mass savings generate savings of electricity or diesel during the whole use stage of the railway car of about 30 years. Each weight reduction of 1 kg in a railway car saves about 60 kg to 80 kg CO_2 equivalents of green-house gas for long distance trains and 100 kg to 150 kg CO_2 equivalents of green-house gas for short distance trains, trams and subway trains [1], [2]

4.1.3 Environmental impacts related to a product can be affected due to product standardization. This aspect should be balanced against other factors, such as:

— product function;

— performance;

— safety and health;

— cost;

— marketability;

— quality;

— legal and regulatory requirements.

4.2 Life cycle approach for aluminium products

4.2.1 Any inclusion of environmental aspects into product standards shall consider the life cycle of the product. This means that all stages of the life cycle of the relevant aluminium product, including

— production of the product from raw material,

— use of the product,

— end-of-life of the product,

should be considered by a systematic procedure in order to identify significant environmental aspects: see Annex B.

4.2.2 Standard writers should be aware of the consequences of the provisions, based on environmental considerations, which they include in European Standards. Especially, it makes no sense to require a high content of recycled aluminium in an aluminium product, because recycled aluminium usually has the same inherent properties as primary aluminium and would be missing in another product. Instead, standard writers should consider design for (end-of-life) recycling, i.e. make sure that a high portion of the aluminium is recycled.

4.2.3 Guidance how to treat aluminium in LCAs, based on EN ISO 14044, with special regard to recycling issues, is given in Annex A.

4.3 Techniques for identifying and assessing environmental impacts

4.3.1 For the design of aluminium products, the guidance given in ISO/TR 14062 should be considered.

4.3.2 For the most important sectors where aluminium is used, i.e. transport, building and packaging, the most important environmental aspects to be considered are specified in Clause 5.

4.3.3 In accordance with CEN Guide 4, additional environmental aspects, specific for the relevant design and product life cycle, shall be identified by screening procedures as laid down in Annex B.

4.3.4 If a proposed measure has both positive and negative consequences on the environment (trade-offs), then resulting environmental provisions should be based on life cycle assessments.

4.4 Heavy metals and other hazardous substances

4.4.1 There is a need to protect the environment against heavy metals such as lead, cadmium and mercury, since they have ecotoxic effects including bioaccumulation. However, if such metals exist as impurities in aluminium, they are present in solid solution in the metallic grid or as dispersed constituents of a size smaller than 1 µm. Such impurities do not leach out when aluminium is exposed to atmosphere or neutral water during its use or in rare cases where it is littered or land-filled after the end-of-life of a product.

NOTE Aluminium is not considered as a hazardous substance by European legislation.

4.4.2 Standard writers should consider that too strict limitations of impurities can hamper the recycling of aluminium.

EXAMPLE Mixed shredded scrap can easily be recycled into foundry alloys when the lead limit for such alloys is 0,35 % by mass: see EN 1676. With lower limits, aluminium recycling is hampered.

4.4.3 Hexavalent chromium is a hazardous substance which can be used for the pre-treatment of aluminium surfaces before coating. Standard writers should consider that for higher intended life times of the aluminium product, substitutes according to the state of the art can compromise the total life time of the product.

NOTE The term “hexavalent chromium” is not applicable for the chemical analysis of metals as specified in EN 573-3 or EN 1676.

4.4.4 Other hazardous substances are possible in converted aluminium products and are specified in the relevant literature, e.g. in EN 13428 for packaging applications and in the public pages of [3] for transport applications.

5 Overview of environmental aspects of aluminium products in different applications

5.1 General

5.1.1 Environmental aspects shall be considered in European Standards mainly for cases where requirements are specified for aluminium products with a clearly defined application. It is difficult to include environmental aspects in European Standards which specify properties of semi-finished products for general applications.

5.1.2 As an example, weight saving, i.e. the avoidance of unnecessary material, should be a general requirement for the design stage of a product. Environmental benefits of weight saving are higher for vehicles and moved parts of machines, as well as for products which are frequently transported, e.g. freight containers

5.1.3 As another example, aluminium is characterised by design flexibility which enables integrated solutions, e.g. complex profile sections including cables or air exchange systems besides the main task of being a curtain wall. This reduces the overall consumption of material used, which results in a lower overall environmental impact of the final product, e.g. the building.

5.2 Aluminium products for transport application

5.2.1 Energy savings by light-weighting

5.2.1.1 Usually, the main potential environmental impacts of products for transport application are related to the energy consumption and the emissions in the use stage. The energy consumption of a vehicle depends on its mass. Each weight reduction of 1 kg in a vehicle saves between 20 kg and more than 150 kg of green-house gases during its life time, for fast ferry-boats even 1 000 kg. Over the life time of an aircraft, a weight reduction of 1 kg achieves green-house gas savings of 10 t to 20 t of CO_2 equivalents [1], [2].

5.2.1.2 For the use stage, standard writers should apply appropriate models which consider:

— use patterns (e.g. average number of km per vehicle and year);

— physical interrelations describing the energy consumption, e.g. influence of air friction which does not depend on mass;

— sensitivity analyses, e.g. by use of different scenarios.

5.2.1.3 An important requirement for appropriate models for the use stage is the transparency of the assumptions used.

5.2.1.4 For light-weight construction of vehicles, thin-walled castings and wrought products of high-strength alloys with complex shape, high stiffness and good fatigue properties are required. Standard writers should consider the mechanical properties and the formability of the alloys.

5.2.1.5 Because of energy consumption in the use stage, vehicle weight savings obtained by narrow thickness tolerances are of added importance. Wide tolerances mean extra mass in the case of positive deviations from the specified minimum gauge. European Standards on dimension tolerance should specify

narrow tolerance ranges, as far as technically and economically feasible. Such tolerance ranges may be smaller than those specified in European Standards for general applications.

5.2.1.6 For products where a choice between different materials, e.g. different aluminium alloys, is possible, the environmental advantages of a light-weight solution should be considered.

5.2.2 Recycling

5.2.2.1 Recycling usually consists of four steps, namely dismantling, shredding, sorting and remelting. Standard writers should be aware of the details of these recycling steps for the relevant type of vehicle and should adapt underlying LCA studies accordingly.

5.2.2.2 In order to facilitate dismantling, European Standards dealing with joining of aluminium parts of a vehicle with parts consisting of other materials should consider easy dismantling in the recycling phase.

5.2.2.3 If shredding is an intended recycling step, standards dealing with joining of aluminium parts of a vehicle with parts consisting of other materials should consider that shredding should separate the different materials and a minimum of shredded pieces which consist of different materials should occur. Dismantled components of vehicles can still consist of different materials, in addition to aluminium. If such additional materials are cast iron, steel, glass, ceramics and plastics, they can be removed by shredding followed by magnetic sorting, eddy-current sorting and sink-float sorting. Special care for design for recycling is necessary when aluminium is combined with other non-ferrous metals.

5.2.2.4 It should be intended to recycle components of vehicles to wrought alloys, if they are fabricated from wrought alloys. For this purpose, European Standards should consider that dismantled components should be made of one single alloy, i.e. fit into one of the scrap categories as defined in EN 13920-2 or EN 13920-4. If this is not feasible, they should be made of different alloys of the same alloy class, i.e. fit into the scrap category as defined in EN 13920-5.

5.2.2.5 Further guidance about scrap management is given by EN 13920-1, EN 13920-3, EN 13920-6, EN 13920-7, EN 13920-8, EN 13920-9, EN 13920-10, EN 13920-11, EN 13920-12, EN 13920-13, EN 13920-14, EN 13920-15, EN 13920-16.

5.3 Aluminium products for building and construction

5.3.1 Construction and use stage

5.3.1.1 Aluminium is often used for building components such as window frames, façades, roofing which are easy to assemble and are intended to be replaced after a use stage which is shorter than the intended life time of the complete building. Standard writers should consider that increasing the life time of the component reduces the environmental burdens, because more frequent recycling means additional extraction of energy resources, emissions and waste.

5.3.1.2 The life time of such components mainly depends on their surface treatment, especially if a decorative surface is required. Temporary surface protection for the aluminium surfaces should be required, in order to avoid damages on the construction site. Increasing energy efficiency as required by more demanding energy regulations is another reason to replace building components or to demolish buildings.

5.3.1.3 When specifying the choice of alloys and surface treatment including pre-treatment, standard writers should consider the intended location of the building, e.g. a location at the sea-shore or in humid tropical areas, and the intended use.

5.3.1.4 For anodised products special care is necessary when specifying the thickness of oxide layers. The environmental aspects of the electricity consumption and waste formation of the anodising process and the metal loss by oxidation depend on the oxide layer thickness and should be considered. Yet, the environmental view should not overrule the fitness for use.