INTERNATIONAL STANDARD

ISO 21887

First edition
2007-11-15

Durability of wood and wood-based products — Use classes

Durabilité du bois et des produits à base de bois — Classes d'emploi

Reference number
ISO 21887:2007(E)

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Published in Switzerland

Foreword

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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.

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ISO 21887 was prepared by Technical Committee ISO/TC 165, *Timber structures*, Subcommittee SC 1, *Wood materials — Durability and preservation*.

Introduction

This document defines a system of use classification for wood products based on the degree of exposure to water and soil in different service conditions and the biological agents of deterioration expected in these conditions, allowing for variation among geographic regions. As of the date of publication of this International Standard, there was insufficient inter-regional trade in treated wood products to justify the development of a complete system of ISO standards for durability of wood and wood-based products. However, a unified system of use classes was anticipated to facilitate the existing level of trade and provide the foundation for a complete system of standards should this be deemed appropriate in the future. In developing this use classification system, the need for minimal conflict with existing national and regional standardization systems has been considered paramount. For more information on the application of this International Standard in national and regional standardization of the durability of wood and wood-based products, refer to Annex A.

Durability of wood and wood-based products — Use classes

1 Scope

This International Standard defines five use classes that represent different service situations to which wood and wood-based products can be exposed all over the world. Subclasses are also defined for these use classes.

NOTE These subclasses might or might not be employed in national or regional standards depending on local needs.

This International Standard applies only to preservatives and processes for pre-treatment of wood and wood products and is not intended for products and processes for remediation and eradication of existing damage to timber. The annex to this International Standard provides guidance on applying use classification to specify preservative treatments, treated wood, naturally durable and modified wood but does not provide definitive specifications.

2 Definition of use classes

2.1 General

This system of use classes is derived from basic principles used in several established durability standardization systems in various parts of the world. Use class 1 represents the least aggressive service condition with the narrowest range of biological agents of deterioration and use class 5 represents the most aggressive service condition with the largest range of biological agents. In each use class, subclasses are identified based on smaller variations in service conditions or geographic variations in biological agents that justify use of different levels of preservative treatment or natural durability, or the use of different types of treatment. Where subclasses are not indicated, all biological agents listed under the use classes listed in Table 1 can be expected.

2.2 Use class 1

Use class 1 applies to situations in which the wood or wood-based product is under cover, fully protected from the weather and not exposed to wetting. There is no potential for growth of decay fungi but attack by wood-boring insects such as lyctids, anobiids and cerambycids can be expected, and in some regions certain genera of termites. Use class 1 is separated into two subclasses with different sets of biological agents based on geographic regions. Subclass 1A is appropriate for regions where wood-boring insects are recognized as an economically significant problem. Subclass 1B is appropriate for regions where, additionally, dry-wood termites are recognized as an economically significant problem.

2.3 Use class 2

Use class 2 applies to situations in which the wood or wood-based product is under cover and fully protected from the weather but where occasional, but not persistent, wetting can occur. In addition to wood-boring beetles, disfiguring fungi also occur. Use class 2 is separated into two subclasses with different sets of biological agents based on geographic regions. Subclass 2A is appropriate for regions where decay fungi are recognized as an economically significant problem. Subclass 2B is appropriate for regions where termites are also recognized as an economically significant problem.

2.4 Use class 3

Use class 3 applies to situations in which the wood or wood-based product is not under cover and not in contact with the ground. It is either continually exposed to the weather or is protected from the weather but subject to frequent wetting. Use class 3 is subdivided into two subclasses, 3.1 and 3.2, with different degrees of exposure to weathering. Subclass 3.1 represents wood products that are clad or coated and are designed to have free-draining surfaces or are otherwise protected. Subclass 3.2 represents wood products in uses fully exposed to the weather. Wood-boring beetles, disfiguring fungi and decay fungi are always expected. Termites can be expected in some geographic regions.

2.5 Use class 4

Use class 4 applies to situations in which the wood or wood-based product is in contact with the ground or fresh water and, thus, is permanently exposed to wetting. Use class 4 is subdivided into two subclasses, 4.1 and 4.2, with different soil conditions and leaching exposures. Subclass 4.1 represents relatively uncultivated, not particularly aggressive soils. Subclass 4.2 represents highly cultivated soils where organic amendment, fertilizing and irrigation for certain crops can create a much greater level of biological activity. Soils that support strand-forming wood-decay fungi can also fall into this subclass. Subclass 4.2 also covers permanent exposure to fresh water. Wood-boring beetles, disfiguring fungi, decay fungi and soft-rot fungi are always expected. Termites can be expected in some geographic regions.

2.6 Use class 5

Use class 5 applies to situations in which the wood or wood-based product is permanently or regularly submerged in salt water. For the above-water parts, wood-boring insects, disfiguring fungi, decay fungi and soft-rot fungi can be expected. In addition, for the below-water parts, marine borers are expected. Use class 5 is separated into three subclasses with different sets of biological agents based on geographic regions. Subclass 5A is appropriate for regions where teredinids and *Limnoria* are recognized as economically significant problems. Subclass 5B is appropriate for regions where teredinids, *Limnoria* and creosote-tolerant *Limnoria* are recognized as economically significant problems. Subclass 5C is appropriate for regions where teredinids, *Limnoria* (including creosote-tolerant species) and pholads are recognized as economically significant problems.

2.7 Protected

"Protected" in the context of this International Standard refers only to protection from direct weathering or any other direct water contact (for example, by design or by application and maintenance of surface coatings).

3 Application of use classes in national and regional standards

Annex A describes how this class system can be applied as existing regional and national standardization systems use classification in different ways[1]. Use classes might or might not be used to determine what evaluation methods should be applied to new preservative treatments or newly imported, naturally durable species for each class. Use classes might or might not be used to mark treated products to indicate suitability for different uses. Use classes might or might not imply a certain design life.

1) It is necessary to contact representatives of national or regional standardization authorities to determine how this system of use classes is being applied.

Table 1 — Use classes and subclasses, typical uses and occurrence of biological agents

Class	Service conditions		Typical uses	Biological agents		
1	Interior, dry		Framing Roof timbers	Insects	**A**	Wood-boring beetles
					B	As 1A plus dry-wood termites
2	Interior, damp		Framing Roof timbers	Wood boring beetles Disfiguring fungi Termites	**A**	As 1A plus decay fungi
					B	As 2A plus termites
3	**3.1**	Exterior, above-ground protected from the weather	Exterior joinery	Wood boring beetles Disfiguring fungi Decay fungi Termites		
	3.2	Exterior, above-ground unprotected from the weather	Cladding Deck boards			
4	**4.1**	In-ground	Fence posts Landscape timber	As 3 plus soft rot fungi		
	4.2	In-ground, severe, fresh water	Cooling tower fill			
5	Marine		Boat hulls Marine Piles Jetties	As 4 plus marine borers	**A**	Teridinids plus *Limnoria*
					B	As 5A plus creosote-tolerant *Limnoria*
					C	As 5B plus pholads
A higher use class may be assigned if it is anticipated that service conditions can arise that result in a higher risk to the timber than that normally experienced by the typical uses listed.						
NOTE It might not be necessary to protect against all biological agents listed, as they might not be present or economically significant in all service conditions in all geographic regions.						

Annex A
(informative)

An international framework for classifying wood products' durability based on use classes

A.1 General

The World Trade Organization Agreement on Technical Barriers to Trade, the TBT Code, obliges signatory countries not to raise non-tariff barriers to trade, such as standards. The TBT Code states that the standardization body of any signatory country should ensure that standards are not prepared, adopted or applied with a view to, or with the effect of, creating unnecessary obstacles to international trade. Thus, alignment of national standards with any equivalent International Standard becomes a nation's responsibility within the TBT Code if, otherwise, there is a risk of creating barriers to trade. Exceptions can be justified if there are "fundamental climatic or geographical factors" that make their alignment inappropriate or ineffective. In the case of wood-preservation standards, such factors are likely to have a major influence on their application. However, local or geographical regional variations, for example, can be accommodated by the application of the International Standard through a guidance or framework document.

This annex describes the mechanisms by which wood preservatives and treated wood or naturally durable wood are specified for domestic and international trade within and among the major trading regions of the world, in accordance with the TBT Code.

Whilst some of the procedures developed in the different regions have features in common, distinct differences often have evolved in response to particular local geographical, climatic or end-use needs. Well established practices in different regions are often embodied in codes and standard specifications that themselves are either part of or integrated into national or regional regulations.

The value of world-wide exports for sawn timber, wood-based panels and round-wood such as poles, piles and posts is about US $50 billion per year. While international trade in preservative treated timber represents only a fraction of this value, it is expected to increase steadily over the next decade. This necessitates the application of the TBT Code in order to minimize any potential barriers to trade arising from differing national or regional specifying practice. Removal of actual or potential barriers to trade includes addressing harmonization of the codes and standard methods used for specification. However, the scope, extent and pace of the inevitable changes this implies requires that the full range of costs, as well as benefits, be taken into account relative to the scale of the trade itself.

A.2 Biological hazards to timber

Wood preservatives are used to enhance any natural resistance of timbers or confer suitable resistance against biological wood attacking agencies that can arise as a consequence of the particular circumstances of use. Different end-use situations are characterized by different local environmental conditions, in particular the extent of exposure to moisture. These different end-use situations represent different ecological niches (habitats) for individual and groups of biological agencies. Often, there are very specific individuals or types of organisms that colonize in particular situations. This is because the combination of moisture, temperature and food material determines which biological organisms are present, depending on their particular preferences.

Whilst some organisms occur widely throughout the world, many more are very specific to particular climatic regions, soils or waters. For example, the wood-destroying termites differ from region to region around the world and often display varying degrees of aggressiveness against different wood commodities.

A further aspect of the natural world that impacts on specifying preservatives and treatments is the type of wood used. The trees from which wood is cut vary enormously in different regions, and different organisms have different abilities and preferences for attacking different timbers.

A.3 Use class

The “use class” system is a means for defining different in-service environments within which wood and wood-based products are used. In practically every major established specification system in the world, the concept of in-service use class is used, though definitions and interpretations vary. Use classes not only describe the distinct circumstances of end-use (service situations) but also reflect different classes of biological hazards likely to be encountered. On this basis, commodities can be assigned to a use class which in turn prescribes the distinct preservation requirements necessary to provide adequate resistance to the organism(s) which prevail in that situation (use class).

The use class classification systems that have been developed around the world have much in common, deriving from adoption of similar basic principles. However, issues at a local level, including those with important economic consequences, have led to the development of specific classes or subclasses.

In each of the different use class systems, class 1 (see 2.2) represents the least biologically demanding situation in terms of wetness sufficient to permit fungal decay. Consequently the lower use classes (1 and 2 and any sub-divisions; see 2.2 and 2.3) generally provide for in-service circumstances where there may be significant risks of attack by some wood-boring insects such as lyctids, anobiids, cerambycids and some genera of termites, but little or no fungal hazard.

The intermediate use classes (3 and any sub-divisions; see 2.4) provide for in-service circumstances where timber is out of ground contact, exposed to wetting, and can have varying degrees of protection or shelter. The main biological hazards are decay, some wood-boring insects and termites.

The higher use classes (4 and 5 and any subclasses; see 2.5 and 2.6) provide for service situations in contact with the ground, or with fresh or salt water. In these classes the biological hazards are diverse and may be extreme.

A.4 Design and service considerations

Subclasses can be identified based on variations in service conditions or geographic variations in biological agents that justify use of different levels of preservative treatment or the use of different types of treatment.

In principle, it is accepted internationally that assignment of a commodity or building component to a particular use class is complemented by good design use and maintenance of the construction. A higher use class may be assigned if it is anticipated that service conditions can arise that result in a higher risk to the timber than that normally experienced by the typical uses listed. Similarly, a higher use class may be assigned if there is a particularly critical aspect to the treated commodity or component’s end use when judged over the entire service life of the construction. A specifier or user may, therefore, opt for a somewhat higher level of assurance through adopting the preservation requirements related to a higher use class situation.

In addition to biological use classification and design considerations, other service factors exist related to safety (criticality of end-use; see previous paragraph), as well as economic and service life requirements. It is necessary that these factors be taken into account by specifiers or users when making a judgement on the need for preservative treatment and the level of protection. In addition, it is necessary to balance the extra costs of preservative pre-treatment or the use of timbers of sufficient natural durability against the future costs of remediation or repair of failed components. For example, some timber components can have a shorter required service life or can be relatively simple and inexpensive to replace. Under such circumstances, the costs of preservation or higher durability timber might not be justified. Conversely, where remediation or repair is expensive, or where deterioration can lead to serious structural weakening or collapse, which can compromise safety, then it is necessary to specify an appropriate level of durability, either by using naturally durable timber or through preservative treatment.

