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BSI Standards Publication

# Timber structures — Timber connections and assemblies — Determination of yield and ultimate characteristics and ductility from test data

# National foreword

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# Timber structures — Timber connections and assemblies — Determination of yield and ultimate characteristics and ductility from test data

*Structures en bois — Assemblages et composants bois — Détermination des caractéristiques limites et ultimes et de la ductilité à partir des données d'essai*

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# Foreword

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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).

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This document was prepared by Technical Committee ISO/TC 165, *Timber structures*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.


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# Introduction

Timber shows generally brittle failure in tension and bending. This characteristic of wood may cause serious damage to buildings due to the lack of energy dissipation during an earthquake. To avoid such damage, it is expected that the joints connecting wooden members dissipate seismic energy instead of the members themselves. Ductility of a structure is one of the most important factors in dissipating seismic energy. In this technical report, the definitions of yield point, ultimate characteristics and ductility factor used in various test standards are reviewed and methods of determining these characteristics from quasi-static and reversed-cyclic loading test data are compared.

Better fits to envelope curves derived from testing, such as more detailed piecewise linearization are permissible, and indeed desirable for whole building design. The derived load-deflection inputs to structural analysis programs of the various structural elements are only applicable to the case of assessing the maximum connection forces under earthquake loading and provide no guarantee that a structure will remain stable beyond the ultimate strength of the system.

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# Timber structures — Timber connections and assemblies — Determination of yield and ultimate characteristics and ductility from test data

## 1 Scope

The purpose of this document is to extract the methods for determining the yield and ultimate characteristics and ductility of joints and assemblies from test data by reviewing existing standards in Europe, North America and Far East Asia and to provide the basic data for unifying the evaluation methods of parameters by clarifying their similarities and differences.

These parameters are applied for determining the seismic performance of timber structures. This document deals with the method for determining the mechanical properties of individual joints and assemblies, and it does not refer to the seismic performance of the entire structure.

## 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 terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

**3.1**
**envelope curve**
locus of extremities of the load-displacement hysteresis loops, either obtained separately for the positive and negative loading directions, or obtained by averaging the absolute values of load and displacement of the corresponding positive and negative envelope points for each cycle in the case of a reversed cyclic loading test (see Clause 5)

**3.2**
**stiffness**
$K_e$
resistance to deformation of a specimen in the elastic range, which can be expressed as a slope measured by the ratio of the resisted load, $F_1$, to the corresponding displacement, $V_1$ (see Clause 6)

**3.3**
**elastic range**
stress range in which a material, upon unloading, will recover the deformation caused by the application of a stress or force

**3.4**
**yield point**
point at which a joint or an assembly begins to deform plastically

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