SLOVENSKI STANDARD
SIST EN 131-2:1996

01-marec-1996

Lestve - Zahteve, preskušanje, označevanje

Ladders - Requirements, testing, marking

Leitern - Anforderungen, Prüfung, Kennzeichnung

Echelles - Exigences, essais, marquage

Ta slovenski standard je istoveten z: **EN 131-2:1993**

ICS:

97.145 Lestve Ladders

SIST EN 131-2:1996 **en**

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 131-2

February 1993

UDC 645.497:620.1

Descriptors: Ladders, vocabulary, schematic presentation, dimensions

English version

Ladders – Requirements, testing, marking

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This draft European Standard was approved by CEN on 1993–01–25. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Ref. No. EN 131-2 : 1993 E

Foreword

This European Standard was prepared by the Technical Committee CEN/TC 93 'Ladders', of which the secretariat is held by DIN.

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of an identical text or by endorsement, at the latest by August 1993, and conflicting national standards shall be withdrawn at the latest by August 1993.

The standard was approved and in accordance with the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom.

Introduction

The present European Standard on ladders takes to a large extent account of the Standards on ladders of the CEN Member Bodies with the aim to improve the possibilities of foreign trade.

Above all, the necessary safety aspects have been observed in the present standard.

Due to the unhomogeneity of the material wood special requirements have been appropriated on this item. For the rest, the standard has been made impartial to materials. Because of the adoption of comprehensive test methods, the calculation could be deleted.

It is planned to create a certification system for this standard. For this the interested Member Bodies will establish an appropriate Committee, where details are to be defined. The TC 93 wishes the marking of ladders according to this standard to be uniform in the Member Countries.

Ladders for special professional use have been excluded from this standard because they are frequently important in individual countries.

Dimensions in mm.

1 Scope

This European Standard specifies the general design features, requirements and test methods for ladders.

It applies to portable ladders. It does not apply to ladders for specific professional use such as fire brigade ladders and mobile ladders.

This European Standard shall be read in conjunction with EN 131-1.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard, only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 59 : 1977	Glass reinforced plastics – measurement of hardness by means of a Barcol impressor
EN 131-1 : 1993	Ladders – terms, types, functional sizes
EN 204 : 1991	Evaluation of non-structural adhesives for joining of wood and derived timber products
ISO 1030 : 1975	Coniferous sawn timber – Defects – Measurement
ISO 1031 : 1974	Coniferous sawn timber – Defects – Terms and definitions

3 Requirements

3.1 Materials

3.1.1 *Aluminium – alloy*

All parts made of aluminium alloy shall have an elongation A at rupture of minimum 5 %.

All parts made of aluminium alloy shall have a thickness of at least 1,2 mm.

3.1.2 *Steel*

If cold rolled steel or a special alloy-steel is used the ratio between 0,2 % yield-stress and ultimate strength (R_p 0,2/R_m) shall be lower than 0,92.

All parts made of steel shall have a thickness of at least 1 mm.

3.1.3 *Plastics*

When using plastics materials, ageing and temperature resistance have to be taken into account.

Glass-fibre reinforced plastics shall be protected against penetration of water and dirt. The surface shall be smooth. The fibres shall be embedded. The Barcol hardness according to EN 59 shall be at least 35.

3.1.4 *Wood*

3.1.4.1 *Species of wood*

For stiles, stanchions and cross struts species of timber shall be used which have a bulk density of at least 410 kg/m^3. Suitable species of timber are for example fir (*abies alba*), larch (*larix decidua*), spruce (*picea abies*), pine (*pinus sylvestris*), Oregon pine (*pseudotsuga menziesii*), hemlock (*tsuga heterophylla*).

For rungs and steps species of timber shall be used which have a bulk density of at least 410 kg/m^3 in the case of softwood and of at least 620 kg/m^3 in the case of hardwood. Suitable species of timber are for example spruce (*picea abies*), pine (*pinus sylvestris*), and cornelian cherry (*cornus mas*), beech (*fagus sylvatica*), ash (*fraxisnus excelsior*), oak (*quercus robur*), robina (*robinia pseudacacis*), respectively.

The above mentioned bulk densities apply to a moisture content of 15 %.

Other species of timber having at least the same quality are admissible, too.

Parana pine (*araucaria angustifolia O. Ktze.*), Hem fir (*abies magnifica*), and Corsican pine (*pinus nigra Arnold*) are excluded from the production of ladders.

3.1.4.2 *General condition*

Compression wood (in the case of softwood), defects caused by insects (as far as the mechanical strength is impaired), mistletoe fouling, reaction wood (in the case of hardwood), ring shakes, red rot (brown rot), white rot, and unsound knots are inadmissible.

3.1.4.3 *Colour*

Differences in colour, dependent on nature, which do not impair the strength of the wood (for example redheart of beech, brownheart of ash), holding red streaks of spruce and fir up to 25 % of the surface, blue stain of pine are admissible.

3.1.4.4 *Knots*

3.1.4.4.1 *Knots in stiles and supporting elements*

On the entire length of the ladder traversing splay knots[1)] are inadmissible (see figure 1).

[1)] Definitions see ISO 1031.

Figure 1. Inadmissible knot

Pin knots[2], also black ones, of not more than 5 mm diameter are admissible.

Furthermore, in the upper and lower third of the ladder, one sound, intergrown knot[1] of a diameter d[3] up to 1/5 of the width b of the stile is permitted per metre. Its minimum distance from the edges shall be 10 mm, from the ring holes, tenons and milled recess of the treads 50 mm (see figure 2).

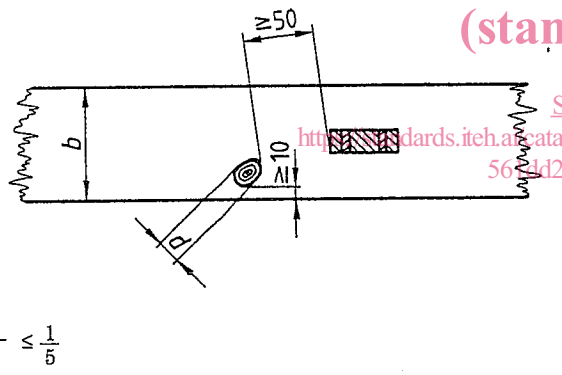

Figure 2. Admissible knot

For ladders made of laminated wood the above mentioned number, size and position of knots are allowed over the total length of the ladder.

3.1.4.4.2 *Knots in rungs, steps, braces*

Intergrown pin knots up to a maximum diameter of 3 mm are admissible.

3.1.4.5 *Pitch pockets*

Admissible up to 4 mm in width (measured radially) and a maximum length of 1.5 × width b of the stile (see figure 3).

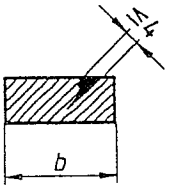

Figure 3. Admissible pitch pockets

Continuous pitch pockets are inadmissible.

3.1.4.6 *Shakes*

Continuous shakes[1] are inadmissible. Shallow shakes[1] are admissible up to a length of 100 mm.

3.1.4.7 *Slope of grain (measured by the cut annual rings)*

A deviation of the slope of grain from the longitudinal edges of the wood of 100 mm per 1000 mm maximum is admissible (see figure 4). Local deviations, e.g. at knot positions, are neglected.

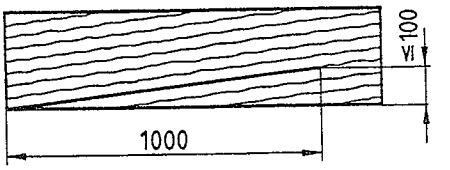

Figure 4. Admissible deviation of the slope of grain related to the longitudinal edges

3.1.4.8 *Spiral grain*

A deviation of the grain direction from the longitudinal edges of the wood of not more than 50 mm per 1000 mm, measured either with the help of shrinkage shakes or the scratching method is admissible (see figure 5). The measurement is to be carried out in two faces perpendicular to each other. The largest deviation is decisive. In the case of rungs and steps, the grain ends, with the exception of knots, shall be at the rung or step ends.

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[1] Definitions see ISO 1031.
[2] Pin knots are knots having approximately a circular cross section.
[3] Measuring according to ISO 1030.

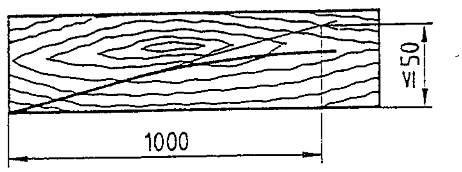


Figure 5. Admissible deviation of the grain direction related to the longitudinal edges (spiral grain)

3.1.4.9 *Moisture content*[4] *(related to the kiln-dry weight) at time of manufacture*

The moisture content of the wood is to be chosen according to the compensation moisture resulting from open air drying, e.g. max. 22 % in Great Britain, max. 18 % in Belgium and the Netherlands, max. 16 % in France and Germany, max. 20 % in Italy.

The moisture content of the rungs and steps respectively should, at the time of manufacture, be lower than that of the stiles.

3.1.4.10 *Average width of annual rings*

Admissible up to 4 mm maximum.

3.1.4.11 *Laminated wood*

The use of laminated wood is allowed for stiles if it is fabricated in accordance with recognized technical rules. The single pieces to be bonded shall be at least 2000 mm, except for single parts at the upper and lower stile end. The distance between joints shall be at least 500 mm. The outer layers shall be continuous (not fabricated in parts).

Another way of fabrication is allowed if it is assured that the bond has at least the same strength as grown wood.

3.1.4.12 *Adhesives*

For wooden ladders, only glues are permissible which correspond to the requirements according to EN 204 as follows:

Connections stile – rung:	class D3
Laminated wood:	class D4

3.2 Design

Shearing points shall be avoided.

All connections shall be durable and have a strength corresponding to the strain (see also clause 4). The connections shall be designed in a manner that arising notch tensions remain low.

Screws and nuts shall be secured against self-acting slackening, e.g. by means of safety devices with a blocking effect or being positive.

Nails are allowed when their function is related to the production process, e.g. fixation during the drying of glues.

It is allowed to nail wooden parts if special nails are used, e.g. wired nails or twisted nails.

Welding of joints is permitted if welding procedures and welding personnel are suitable.

3.3 Surface finish

In order to avoid injuries, accessible edges, corners, and protruding parts shall be free of burrs, chamfered or rounded.

Metals parts susceptible to corrosion shall be protected by means of a paint coating or other coating. Aluminium alloys are not susceptible to corrosion.

Wooden parts shall be treated on all sides.

All wooden parts shall be covered on all sides by a protective coating which shall be transparent and permeable to water vapour.

3.4 Hinges (turning points)

Hinges shall connect the legs of the standing rung ladders and the standing step ladders durably. Hinges shall be designed in such a manner that no abutment of the ladder parts over the hinges is formed during use of the ladder.

The hinge pin is to be secured against unintentional loosening. The diameter of steel hinge pins shall not be less than 5.3 mm (M 6). Pins of other materials shall have at least the same strength. If the pin has several shearing points (piano hinge) there is no restriction as to the hinge pin diameter.

3.5 Opening restraints

The legs of the standing ladders shall be prevented from opening beyond the normal use configuration by means of opening restraints. If chains are used, all chain links with the exception of the first one shall be free to move.

The opening restraints shall satisfy the tests according to clause 4.8.

Standing step ladders or other ladders with handrail up to a maximum climbing height of 1,8 m shall be designed in such a way as to prevent unintentional folding of the legs during normal use.

3.6 Rungs/steps

Rungs and steps made of metal or plastics shall be made with antiskid walking surface, e.g. by profiling. A platform is regarded as a step. The contact surface of the coverings shall adhere firmly to the rungs or steps.

[4] Determination by means of hygrometer; in critical or referee cases in accordance with the oven-dry method.

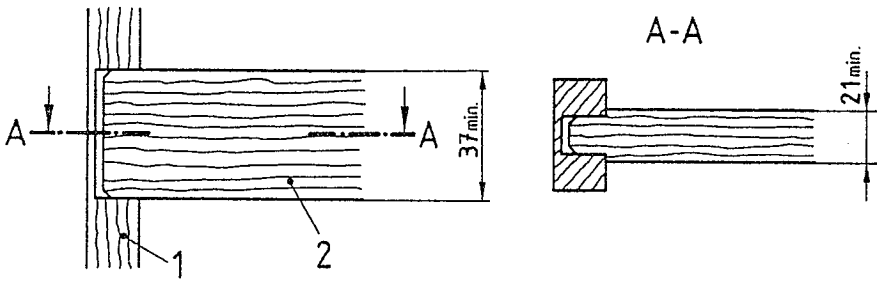
Rungs and steps shall be firmly and durably connected to the stiles.

Wooden rungs shall have a minimum rectangular cross section of 21 mm × 37 mm or any other section of at least equivalent strength.

The rungs shall be tenoned and mortised into the stiles and glued and wedged in the case of through tenon construction (see examples in figures 6, 7 and 8). Other constructions of equivalent strength are permissible.

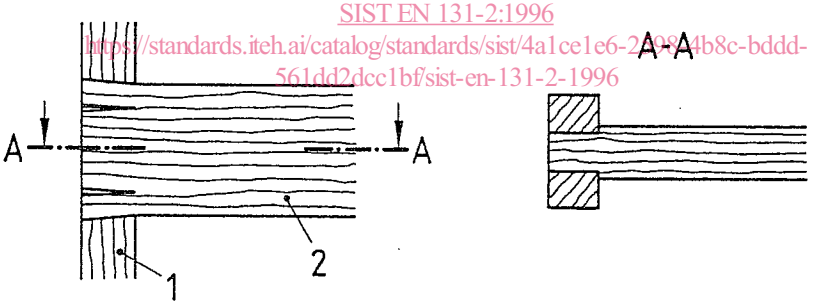
The rungs shall satisfy the tests according to clauses **4.6** and **4.7**.

Wooden steps shall have a minimum thickness of 18 mm. The steps shall satisfy the tests according to clauses **4.6** and **4.7**.



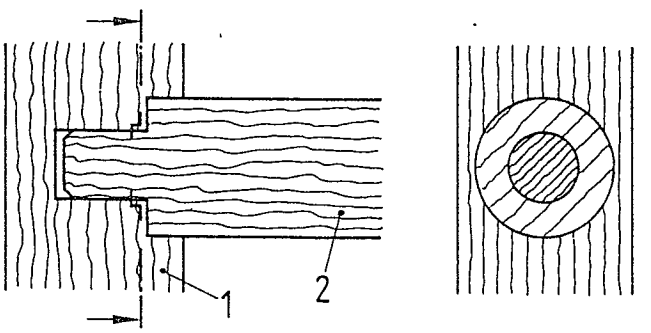
1 Style
2 Rung

Figure 6. Example of a concealed joint



1 Style
2 Rung

Figure 7. Example of a through joint



1 Style
2 Rung

Figure 8. Example of concealed round rung joint

3.7 Platform

If the topmost walking surface of a standing step ladder is designed as a platform, the latter shall be lifted up by a device when the ladder is folded.

The platform shall not kick up when it is stepped on its front edge.

3.8 Antiskid devices

Bottom-ends of the ladder shall be antiskid. Such devices include, but are not limited to, safety shoes, spurs, spikes, conformable shoes, and flat or radiussed step feet.

The ends of wood stiles are considered to be antiskid.

3.9 Extending ladders

Extending ladders are not intended for being used as standing ladders. They shall be so designed that the top angle between legs shall not be more than 10°, if the ladder is wrongly put up as a standing ladder.

3.9.1 *Resting devices/locking devices*

The ladder parts of push-up extension ladders shall be secured from unintentional closing and separation in the position of use.

Locking devices on rope-operated extending ladders shall reliably guarantee a safe catch and have two resting surfaces near to the stiles. The locking devices of rope-operated extension ladders shall be designed in such a way that the upper ladder parts can not fall down by more than one rung per ladder part if the rope loosens or breaks. This safety requirement shall apply both when the ladder is vertical and in the position of use.

During use of the ladder the rungs overlapping one another shall be in the same plane perpendicular to the stiles or in one horizontal plane or in any other plane between these.

3.9.2 *Ropes*

Ropes for extending ladders as well as the metal fittings that are used to guide the ropes shall have a minimum guaranteed breaking strength of 4000 N. Hand operated ropes shall have a minimum diameter of 8 mm. Synthetic ropes shall be stabilized against ultra violet light.

4 Testing

4.1 Generalities

For all tests the following value is permitted as uncertainty of measurement:

± 1 mm for longitudinal measurements

± 5 mm for the measurement of the distance between the supports

± 1° for the measurement of angles.

For the tests according to clauses **4.2** to **4.5** the following test conditions shall be complied with:

- The ladder shall be placed horizontally on supports situated 200 mm from each end of the ladder. Hinges of standing ladders are to be regarded as the ends of the ladders,
- the supports shall be cylindrical with diameters between 25 mm and 100 mm and shall be free to rotate,
- the test load shall be slowly applied in the middle of the ladder equally to both stiles over a length between 20 mm and 100 mm while it has to be taken care that an applying by jerks is avoided.

Supporting legs are to be tested in accordance with clauses **4.4** and **4.5**.

The tests according to this standard shall be performed on one ladder and in the order as listed below.

4.2 Strength test of the ladder

The test shall be carried out on the complete ladder. In the case of extending ladders and sectional ladders the test shall be carried out on the complete extended ladder.

A pre-load of 500 N shall be applied for a duration of one minute. The position of the ladder after removal of the pre-load is the origin for measurement.

A test load F of 1000 N (see figure 9) shall be applied for a duration of one minute. The measurement shall be taken one minute after removal of the test load. The permanent deformation f of the ladder shall not exceed 1 ‰ of the distance l between the supports.

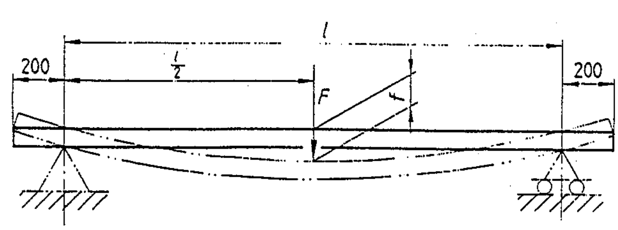


Figure 9. Strength test

4.3 Bending test of the ladder

The test shall be carried out on the complete ladder, in case of extending ladders in the fully extended position. It shall be carried out without supporting legs if these are not durably fixed to the ladder.

A pre-load of 100 N shall be applied for the duration of one minute. The position of the ladder after removal of the pre-load is the origin for measurement.