

SINTEF Technical Approval

TG 20766

Issued first time: 12.03.2021
 Revises:
 Amended: 30.09.2024
 Valid until 12.03.2026
 Provided listed on
www.sintefcertification.no

SINTEF confirms that

Stora Enso LVL

has been found to be fit for use in Norway and to meet the provisions regarding product documentation given in the regulation relating to the marketing of products for construction works (DOK) and regulations on technical requirements for building works (TEK), with the properties, fields of application and conditions for use as stated in this document



1. Holder of the approval

Stora Enso Oyj
 Taipaleentie 15
 78201 Varkaus, Finland
www.storaenso.com

2. Product description

2.1 General

Stora Enso LVL consists of multiple layers of 3 mm veneers from spruce that are bonded together (fig. 1). The rotary-peeled veneers are scarf jointed. The glue is a water-resistant phenol formaldehyde resin applied between all layers.

2.2 Product types

Stora Enso LVL is produced in the following grades:

- Stora Enso LVL S-grade, with all veneers having the fiber direction parallel to the beam's longitudinal direction.
- Stora Enso LVL X-grade, with veneers alternately placed crosswise and parallel to the beam's longitudinal direction (fig. 2).
- Stora Enso LVL T-grade, with all veneers running in the same direction as for S-grade, but with a lighter veneer quality.

2.3 Dimensions

Stora Enso LVL S-grade and X-grade comes as beams with the following standard dimensions:

- Thicknesses from 24 mm to 75 mm
- Widths from 45 mm to 2500 mm
- Maximum length 24,5 m

Stora Enso LVL T-grade is specially designed for use as wall studs, and are available with standard dimensions:

- Thicknesses from 27 mm to 75 mm
- Widths from 45 mm to 2500 mm
- Maximum length 6000 mm for planed and 24,5 m for non-planed

Dimension tolerances measured at moisture content of 10 ± 2 %:

- Thickness: ± 1 mm for beam thickness 27 mm
 ± 2 mm for beam thickness > 27 mm and ≤ 57 mm
 ± 3 mm for beam thickness > 57 mm
- Height/width: ± 2 mm for height/width ≤ 400 mm
 $\pm 0,5$ % for height/width > 400 mm
- Length: ± 5 mm

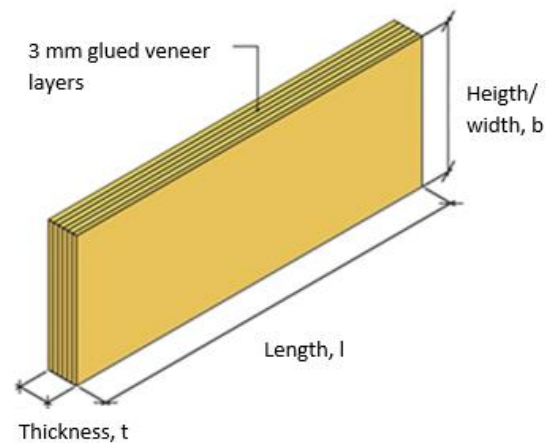


Fig. 1

Stora Enso LVL. In S-grade and T-grade all veneers has the fiber direction running parallel to the longitudinal direction. In X-grade the veneers are regularly placed crosswise and parallel to the beam's longitudinal direction

Nominal thickness mm	Number of piles	Veneer lay-up ¹⁾
22	8	- -
27	9	- -
30	10	- -
33	11	- -
39	13	- - -
45	15	- - -
51	17	- - -
57	19	- - - -
63	21	- - - - -
69	23	- - - - -
75	25	- - - - -

¹⁾ | denotes veneers with fiber direction parallel to the longitudinal direction of the beam/panel

— denotes veneers with fiber direction crosswise to the longitudinal direction of the beam/panel

Fig. 2

Veneer lay-up in Stora Enso LVL X-grade

SINTEF is the Norwegian member of European Organisation for Technical Assessment, EOTA, and European Union of Agrément, UEAtc

2.4 Weight and moisture content

Stora Enso LVL S-grade and X-grade have a density of approx. 510 kg/m³ measured according to NS-EN 323. T-grade has a density of approx. 440 kg/m³.

Stora Enso LVL is delivered with a moisture content of 8 - 10 % measured according to NS-EN 322.

3. Fields of application

Stora Enso LVL can be used in load bearing structures in service class 1 and 2 according to NS-EN 1995-1-1. The area of use applies to both types of glue.

Stora Enso LVL type X grade, S grade and T grade, can be used in buildings with hazard class 1 - 6 in fire class 1 and 2.

Use of the product in a higher fire class is not covered by the approval and must be documented specially by the responsible undertaker in each individual project. See chap. 6 special conditions for use and installation.

4. Properties

4.1 General

Stora Enso LVL fulfils the requirements for laminated veneer lumber as given in NS-EN 14374.

4.2 Load-carrying capacity

Tabell 1 shows the characteristic strength, stiffness modules and density values to be used when calculating structures with Stora Enso LVL.

Table 1

Characteristic strength and stiffness modules in N/mm² plus density values for Stora Enso LVL. ¹⁾

Properties		Product		
		S-grade 24-75 mm	X-grade 24- 75 mm	T-grade 27-75 mm
Strength (5 % fractile)				
Bending strength, - edgewise ²⁾ - size effect parameter - flatwise parallel to grain - flatwise perpendicular to grain	$f_{m,0,edge,k}$	44	32	27
	s	0,12	0,12	0,15
	$f_{m,0,flat,k}$	50	36	32
	$f_{m,90,flat,k}$	-	8	-
Tensile strength, - parallel to grain ³⁾ - edgewise, perpendicular to grain	$f_{t,0,k}$	35	26	24
	$f_{t,90,edge,k}$	0,8	6	-
Compressive strength, -parallel to grain - edgewise, perpendicular to grain - flatwise, perpendicular to grain	$f_{c,0,k}$	35	26 ⁴⁾	26
	$f_{c,90,edge,k}$	6	9	-
	$f_{c,90,flat,k}$	2,2	2,2	-
Shear strength, - Edgewise - flatwise parallel to grain - flatwise, perpendicular to grain	$f_{v,0/90,edge,k}$	4,2	4,5	3,6
	$f_{v,0,flat,k}$	2,3	1,3	-
	$f_{v,90,flat,k}$	-	0,6	-
Stiffness for stability calculations (5 % fractile)				
Modulus of elasticity, - bending and axial load, parallel to grains -bending, perpendicular to face veneer grain - edgewise, compression perpendicular to grain	$E_{0,k}$	11 600	8800	8 800
	$E_{m,90,k}$	-	1700	-
	$E_{c,90,edge,k}$	-	2000	-
Shear modulus, - edgewise - flatwise parallel to grain - flatwise, perpendicular to grain	$G_{0/90,edge,k}$	400	400	-
	$G_{0,flat,k}$	-	100	-
	$G_{90,flat,k}$	-	-	-
Stiffness for calculation of deformations (mean values)				
Modulus of elasticity, - bending and axial load, parallel to grains - bending, perpendicular to face veneer grain -edgewise, compression perpendicular to grain	$E_{0,mean}$	13800	10500	10 000
	$E_{m,90,mean}$	-	2000	-
	$E_{c,90,edge,mean}$	-	2400	-
Shear modulus, - edgewise - flatwise, parallel to grain - flatwise, perpendicular to grain	$G_{0/90,edge, mean}$	600	600	-
	$G_{0,flat,mean}$	-	120	-
	$G_{90,flat,mean}$	-	-	-
Density, kg/m³				
- 5 % fractile	ρ_k	480	480	410
- mean	ρ_{mean}	510	510	440

¹⁾ Declared value according to the manufacturer's Declaration of Performance (DoP).

²⁾ For beams with heights (b) other than the reference height 300 mm, the bending strength edgewise $f_{m,k}$ must be multiplied with the correction factor k_h , as given for LVL in NS-EN 1995-1-1, where s is the declared size effect parameter.

³⁾ For beams with lengths (l) other than the reference length 3000 mm, the tensile strength $f_{t,0,k}$ must be multiplied with the correction factor k_l as given for LVL in NS-EN 1995-1-1, where s is the declared size effect parameter.

⁴⁾ In service class 2 the compressive strength parallel to grain should be divided with 1,2.

4.3 Reaction to fire

Stora Enso LVL X grade, S grade and T grade with untreated surface is classified as class D-s1,d0 according to EN 13501-1.

4.4 Fire resistance

The fire resistance of structures with Stora Enso LVL is calculated according to EN 1995-1-2 for each individual building project.

4.5 Properties related to moisture

Table 2 shows the dimensional changes that may be expected when the moisture content in the material changes. Table 3 shows the water vapour resistance factor μ .

Table 2

Declared dimensional moisture change for Stora Enso LVL

Product	Swelling and shrinkage in % per 1 % change in moisture content		
	Thickness	width	Length ¹⁾
S-grade	0,30	0,31	0,006
X-grade	0,44	0,033	0,009

Table 3

Water vapor resistance factor μ perpendicular to thickness of Stora Enso LVL, based on EN ISO 10456

Product	Water vapor resistance factor μ	
	Dry climate ¹⁾	Wet climate ²⁾
S-grade and X-grade	200	70
T-grade	180	65

¹⁾ At moisture content 0 / 50 % RH and 23 °C ("dry cup")

²⁾ At moisture content 50 / 93 % RH and 23 °C ("wet cup")

Standard Stora Enso LVL is not impregnated against fungi or rot.

4.6 Sound insulation

When calculating sound insulation performance of constructions with Stora Enso LVL, the same properties as for solid wood constructions with same weight may be applied.

4.7 Thermal insulation

The design thermal conductivity is $\lambda_d = 0,13 \text{ W}/(\text{m}\cdot\text{K})$ for beams, panels and studs according to EN ISO 10456.

5. Environmental aspects

5.1 Substances hazardous to health and environment

Stora Enso LVL contains no hazardous substances with priority in quantities that pose any increased risk for human health and environment. Chemicals with priority include CMR, PBT or vPvB substances.

5.2 Effect on indoor environment

The product is not regarded as emitting any particles, gases or radiation that have a perceptible impact on the indoor climate, or to have any significant impact on health.

5.3 Waste treatment/recycling

For disposal the product shall be sorted as wood material, and delivered to an authorized waste treatment plant for energy recovery.

5.4 Environmental declaration

Environmental product declaration (EPD) according to EN 15804 has been issued for Stora ENSO LVL. The declaration number is S-P-01730 www.environdec.com.

6. Special conditions for use and installation

6.1 Calculation of load-bearing capacity

The load-bearing capacity of Stora Enso LVL shall be calculated according to EN 1995-1-1 with the characteristic values given in table 1.

6.2 Design of fasteners

Fasteners should be designed according to the rules for laminated veneer lumber given in EN 1995-1-1.

6.3 Joists in residential buildings, offices etc.

The stiffness of floor joists in order to avoid annoying vibrations in normal use must be considered. Table 4 shows recommended maximum spans for joists in residential buildings, offices etc. The table are based on calculations according to SINTEF's recommended comfort criterium. In addition the load-bearing capacity has been controlled according to EN 1991-1-1 and EN 1995-1-1 with national annexes.

Table 4

Recommended maximum spans for floors with max 3,0 kN/m² imposed loads and added loads from light partition walls (residential buildings, offices etc.) ¹⁾

Joist dimension mm x mm	Maximum span in meters		
	Joist spacing c/c in mm		
	300	400	600
39 x 200	3,65	3,45	3,15
39 x 225	4,05	3,80	3,50
39 x 260	4,55	4,30	3,95
45 x 200	3,80	3,55	3,25
45 x 225	4,15	3,95	3,60
45 x 260	4,70	4,45	4,05
51 x 200	3,90	3,65	3,35
51 x 225	4,25	4,05	3,70
51 x 260	4,80	4,55	4,15

¹⁾ The values also applies for joists with 5 cm reinforced casting and max. self-weight incl. cast of 2,6 kN/m², assuming maximum imposed loads of 2,0 kN/m² (single occupancy residential buildings) without added loads from partition walls. If the casting is used across large areas special considerations must be made.

Corrections of table values must be done according to SINTEF Building Research Design Guide 522.351 *Trebjelkelag. Dimensjonering og utførelse*.

For sound insulated floors, where the self weight is increased by 0,4 kN/m², the span values must be multiplied with 0,89.

6.4 Holes in beams

Holes in beams can be performed according to SINTEF Building Research Design Guide 522.351 *Trebjelkelag. Dimensjonering og utførelse*.

6.5 Safety in case of fire

When used in buildings with requirements for fire resistance the fire resistance of the finished structures must be designed, and any need for additional cladding or protection of the LVL members must be determined.

6.6 Transport and storage

During transport and storage Stora Enso LVL shall be protected against precipitation and contact with water.

7. Factory production control

Stora Enso LVL is produced in Varkaus, Finland.

The holder of the approval is responsible for the factory production control to ensure that the product is produced in accordance with the preconditions applying to this approval.

The manufacturing of Stora Enso LVL is subject to continuous surveillance of the factory production control in accordance with the contract regarding SINTEF Technical Approval.

8.

Basis for the approval

The evaluation of Stora Enso LVL is based on reports owned by the holder of the approval.

9. Marking

Stora Enso LVL shall be CE-marked in accordance with EN 14374. The marking shall include product type and production number.

The approval mark for SINTEF Technical Approval, TG 20766, may also be used.

10. Liability

The holder/manufacturer has sole product responsibility according to existing law. Claims resulting from the use of the product cannot be brought against SINTEF beyond the provisions of Norwegian Standard NS 8402.

for SINTEF



Hans Boye Skogstad
Approval Manager