SINTEF Technical Approval

TG 2365

Issued first time: 18.06.2003
Revised: 03.10.2019
Amended: 06.01.2023
Valid until 01.10.2024
Provided listed on
www.sintefcertification.no

SINTEF confirms that

K-Beam and K-Beam Plus

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

InnTre Kjeldstad AS
7725 Steinkjer
Norway
www.Inntre.no

2. Product description

K-Beam and K-Beam Plus are rectangular glued laminated timber beams made of boards from Nordic spruce or pine. The cross section has 47 mm thick outer boards and 17 or 19 mm thick inner boards, see fig. 1. The boards are glued together with moisture resistant EPI glue.

Outer boards are normally 6000 mm long and finger jointed with phenol-resorcinol glue. Outer boards in K-Beam have strength grade C24 according to EN 338, and grade C40 in K-Beam Plus.

Inner boards are 2400 to 5700 mm long and finger jointed with moisture resistant EPI glue to 6000 mm length. Inner boards are graded as G4-2 according to EN 1611-1.

The beams are produced in nine standard dimensions as shown in fig. 1. Beam length 6.0 m. Beams with finger joints of the full beam section are produced with lengths up to 12 m.

The beams are delivered in plastic wrapping, and with 14 ± 2 % moisture content. Mean density is approx. 460 kg/m³. The dimensional tolerance of the cross section is ± 1 mm at 14 ± 2 % moisture content.

3. Fields of application

K-Beam and K-Beam Plus can be used as structural members in timber construction in service class 1 and 2 according to EN 1995-1-1. The beams can be used in risqué class 1 to 6 in fire class 1 and 2 according to Regulations on technical requirements for construction work (TEK). For other use the safety in case of fire must be documented by analytical fire design.

4. Properties

4.1 Strength and stiffness

Characteristic strength and stiffness properties for calculation of loadbearing performance are shown in Table 1.

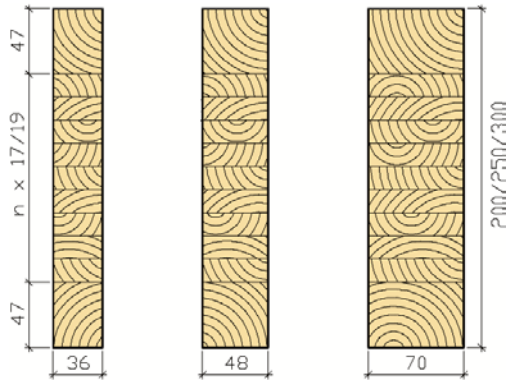

Fig. 1
K-Beam is delivered in three standard widths and three standard heights. Measures in mm

Table 1
Characteristic strength and stiffness properties in N/mm² for K-Beam and K-Beam Plus

		K-Beam	K-Beam Plus
Strength			
Bending strength			
- on edge and flatwise	$f_{m,k}$	24,0	33,0 [2]
Tensile strength			
- in length of the beam	$f_{t,0,k}$	14,0	14,0
- perpendicular on fibres	$f_{t,90,k}$	0,4	0,4
Compression strength			
- in length of the beam	$f_{c,0,k}$	21,0	21,0
- perpendicular on fibres	$f_{c,90,k}$	5,3 [1]	5,3 [1]
Shear strength	$f_{v,k}$	3,5	3,5
Stiffness for calculation of stability			
Modulus of elasticity			
- bending and axial load	$E_{0,05}$	7400	9400
Stiffness for calculation of deformations			
Modulus of elasticity			
- bending and axial load	$E_{0,m}$	11000	14000
- perpendicular on beam edge	$E_{90,m}$	370	370
Shear modulus	$G_{0,m}$	690	690

[1] For calculation of support capacity according to Treteknisk Report no. 86, February 2013

[2] K-Beam Plus with finger joints of the full beam section has bending strength 30 N/mm²

4.2 Reaction to fire
K-Beam and K-Beam Plus are classified as D-s2,d0 according to EN 13501-1. Fire resistance can be calculated as for glued laminated timber according to EN 1995-1-2.

4.3 Sound insulation
Constructions with K-Beam and K-Beam Plus can be regarded to have equivalent sound insulation properties as constructions with solid wood beams of the same weight.

4.4 Thermal insulation
Design thermal conductivity λ_d for the wood in K-Beam and K-Beam Plus is 0,13 W/(m·K) according to EN ISO 10456.

4.5 Durability
For the fields of application given in cl. 3 are constructions with K-Beam and K-Beam Plus regarded to have the same durability as equivalent constructions with solid wood beams.

5. Environmental aspects

5.1 Chemicals hazardous to health and environment
The beams contain 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 beams are assessed according to SINTEF Technical Approval – Requirements for health and environmental properties, version 09.02.2022. The beams are 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. The beams satisfy requirements in BREEAM-NOR v6.0 Emissions from construction products according to Hea 02 Indoor air quality.

5.3 Waste treatment/recycling
For disposal the beams shall be sorted as wood material, and can be delivered to an authorized waste treatment plant for material or energy recovery.

5.4 Environmental declaration
An environmental declaration (EPD) according to EN 15804 has been worked out for K-Beam. For the full environmental declaration see EPD no. NEPD-1384-455-NO, http://epd-norge.no/.

Table 2
Maximum span for K-Beam used in ordinary timber floor structures [1)]

Beam dimension	Maximum net span in meter [2)]											
	Imposed load 2,0 kN/m² and supplementary load from light partition walls (residential houses etc.)						Imposed load 3,0 kN/m² and supplementary load from light partition walls (offices etc.) [1)]					
	Beams over single span			Beams continuous over two equal spans			Beams over single span			Beams continuous over two equal spans		
	Beam spacing, mm			Beam spacing, mm			Beam spacing, mm			Beam spacing, mm		
	300	400	600	300	400	600	300	400	600	300	400	600
K-Beam												
36 x 200	3,45	3,25	2,95	3,60	3,40	3,10	3,45	3,25	2,85	3,60	3,30	2,85
36 x 250	4,15	3,90	3,55	4,35	4,10	3,75	4,15	3,90	3,55	4,35	4,10	3,60
36 x 300	4,80	4,50	4,15	5,00	4,75	4,35	4,80	4,50	4,15	5,00	4,75	4,35
48 x 200	3,65	3,45	3,10	3,80	3,60	3,30	3,65	3,45	3,10	3,80	3,60	3,15
48 x 250	4,35	4,15	3,80	4,60	4,35	3,95	4,35	4,15	3,80	4,60	4,35	3,95
48 x 300	5,05	4,80	4,40	5,30	5,05	4,65	5,05	4,80	4,40	5,30	5,05	4,65
70 x 200	3,90	3,70	3,40	4,10	3,90	3,55	3,90	3,70	3,40	4,10	3,90	3,55
70 x 250	4,70	4,45	4,10	4,90	4,65	4,30	4,70	4,45	4,10	4,90	4,65	4,30
70 x 300	5,40	5,15	4,75	5,70	5,40	5,00	5,40	5,15	4,75	5,70	5,40	5,00
K-Beam Plus												
36 x 200	3,65	3,45	3,10	3,85	3,60	3,25	3,65	3,45	3,10	3,85	3,55	3,10
36 x 250	4,40	4,15	3,75	4,60	4,35	3,95	4,40	4,15	3,75	4,60	4,35	3,90
36 x 300	5,05	4,80	4,40	5,30	5,05	4,65	5,05	4,80	4,40	5,30	5,05	4,65
48 x 200	3,85	3,65	3,30	4,05	3,80	3,50	3,85	3,65	3,35	4,05	3,80	3,40
48 x 250	4,65	4,40	4,00	4,85	4,60	4,20	4,65	4,40	4,00	4,85	4,65	4,20
48 x 300	5,35	5,10	4,70	5,65	5,35	4,90	5,35	5,10	4,70	5,65	5,35	4,90
70 x 200	4,15	3,95	3,60	4,35	4,15	3,80	4,15	3,95	3,60	4,35	4,15	3,80
70 x 250	5,00	4,75	4,35	5,25	4,95	4,55	5,00	4,75	4,35	5,25	4,95	4,55
70 x 300	5,75	5,50	5,05	6,05	5,75	5,30	5,75	5,50	5,05	6,05	5,75	5,30

1) See cl. 6.1 for table corrections

2) The table is also valid for timber floor structures with 5 cm reinforced concrete screed and self-weight 2,6 kN/m², provided the imposed load is max. 2,0 kN/m² and without supplementary load from partition walls (residential houses etc.). If a concrete screed is used over large areas a separate assessment of vibrations and comfort properties must be done.

6. Special conditions for use and installation

6.1 Floor structures in residential houses, offices etc.

The structural design of floor structures must have stiffness properties that for normal use will prevent unacceptable vibrations. Table 2 shows recommended maximum spans (net spans) for floors in residential houses, offices etc.

Table 2 is based on calculations according to SINTEF's recommended comfort criteria shown in Building Research Design Guide 522.351 *Timber floors. Structural design and execution*. In addition has the load-bearing capacity been controlled according to NS-EN 1991-1-1 and NS-EN 1995-1-1 with national annexes.

Table corrections must be done as specified in Building Research Design Guide 522.351 *Timber floors. Structural design and execution*. For sound insulated floor constructions with higher self-weight than ordinary timber floor structures the spans in the table shall be multiplied with a factor 0.89.

6.2 Structural design in general

Structural design of K-Beam and K-Beam Plus is done according to NS-EN 1995-1-1, using the characteristic strength and stiffness properties shown in Table 1. The same modification factors as for glued laminated timber can be applied.

Depth factor is not used. A material factor γ_M = 1.15 can be used.

Load capacity for beams with end-notches must be specially assessed.

6.3 Structural design of fasteners

The characteristic density of K-Beam and K-Beam Plus can be assumed to be ρ_k = 428 kg/m^3.

6.4 Holes in beams

Holes in floor beams can be made according to the recommendations in Building Research Design Guide 522.351 *Timber floors. Structural design and execution*.

6.5 Transport and storage

During transport and storage the beams shall be protected against precipitation and free water.

7. Factory production control

K-Beam and K-Beam Plus are produced by InnTre Kjeldstad AS, Steinkjer, Norway.

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

The manufacturing of the beams and the manufacturer's system for factory production control (FPC) are subject to continuous surveillance in accordance with the contract regarding SINTEF Technical Approval.

8. Basis for the approval

The approval is primarily based on testing which is documented in the following reports from the Norwegian Institute of Wood Technology:

- Project report no. 310343 of 19.05.2003 (bending tests)
- Project report no. 310343 of 02.06.2003 (shear tests)
- Laboratory report no. 311058-LM01 of 23.01.2009
- Laboratory report no. 310441 of 24.08.2011 (assessment of strength of K-Beam from split "mother beam")
- Laboratory report no. 310441-2 of 19.12.2011 (assessment of glue-line shear strength of K-Beam from split "mother beam")
- Laboratory report no. 360249-LM02 of 01.09.2011 (test of K-Stud og K-Beam. Adhesive Prefere 6182/6682)
- Report 86. Design of timber construction. Compression perpendicular to fibres. February 2013.
- Laboratory report no. 380057 – LM01 of 13.07.2017 (test of K-Beam Plus)

Table 2 is calculated by SINTEF.

9. Marking

Every K-Beam and K-Beam Plus shall be marked with the type of beam and a production number in addition to the name of the manufacturer. The approval mark for SINTEF Technical Approval TG 2365 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

Hans Boye Skogstad
Approval Manager