SINTEF Technical Approval

TG 2365

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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
Bogavegen 7
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 6 000 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 2 400 mm to 5 700 mm long and finger jointed with moisture resistant EPI glue to 6 000 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. Additionally, beams with finger joints of the full beam section are produced with lengths up to 12 m.

The beams are delivered in plastic, and with 14 ± 2 % moisture content. 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 load-bearing timber structures in service class 1 and 2 according to EN 1995-1-1.

The beams can be used in risk class 1 to 6 and 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. See cl. 6.6 regarding special conditions for use.

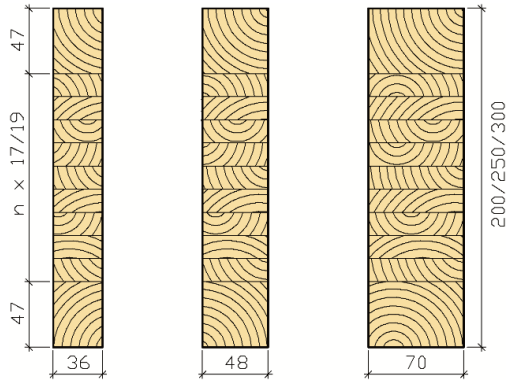

Fig. 1
K-Beam is delivered in three standard widths and three standard heights as shown in the figure. Measures in mm. K-Beam Plus is delivered only in one size, 48 mm x 300 mm

4. Properties

4.1 Strength and stiffness

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

4.2 Reaction to fire

K-Beam and K-Beam Plus are not classified according to EN 13501-1.

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.

Table 1
Characteristic strength and stiffness properties [N/mm²] and densities [kg/m³] for K-Beam and K-Beam Plus

Properties	Test method	K-Beam[1)]	K-Beam Plus[1)]
Strength			
Bending strength - on edge and flatwise, f_{mk}	EN 408	24,0	33,0[2)]
Tensile strength - in length of the beam, $f_{t,0,k}$ - perpendicular on fibres, $f_{t,90,k}$	- -	14,0 0,4	14,0 0,4
Compression strength - in length of the beam, $f_{c,0,k}$ - perpendicular on fibres, $f_{c,90,k}$ Shear strength, $f_{v,k}$	- - NS-EN 14080	21,0 5,3[3)] 3,5	21,0 5,3[3)] 3,5
Stiffness for calculation of stability			
Modulus of elasticity - bending and axial load, $E_{0,05}$	EN 408	7 400	9 400
Stiffness for calculation of deformations			
Modulus of elasticity - bending and axial load, $E_{0,m}$ - perpendicular on beam edge, $E_{90,m}$ Shear modulus, $G_{0,m}$	EN 408 - -	11 000 370 690	14 000 370 690
Density[4)]			
- characteristic, ρ_k - mean, ρ_m	EN 408 EN 408	428 460	450 470

[1)] The control limit indicates the lowest value for the internal control and audit testing.
[2)] K-Beam Plus with finger joints of the full beam section has bending strength 30 N/mm²
[3)] For calculation of support capacity according to Treteknisk Report no. 86, February 2013.
[4)] For the calculation of embedment strength, see cl. 6.3.

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 09.05.2022. 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/. An environmental declaration (EPD) has not been worked out for K-Beam Plus.

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 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 clear spans in the table shall be multiplied with a factor 0.89.

A table for timber floor structures with cross bracing is given in cl. 6.5.

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.

The use of depth factor is prohibited. A material factor γ_M = 1.15 can be used.

Load capacity for notched beams must be specially assessed.

6.3 Structural design of fasteners
For the calculation of embedment strength, a characteristic density of ρ_k = 400 kg/m³ can generally be assumed for K-Beam and K-Beam Plus.

For fasteners located only in the outer laminations (47 mm thickness), a density of ρ_k = 428 kg/m³ can be assumed for K-Beam and ρ_k = 450 kg/m³ for K-Beam Plus.

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*.

Beams with a height of 300 mm can be delivered with a hole diameter of 170 mm. Holes in beams will be made in the factory and requires hole reinforcement with plywood sheet and specific location for the hole.

6.5 Cross bracing
Table 3 shows the maximum spans for selected beam types of K-Beam and K-Beam Plus with a cross bracing/nogging at mid-span. It is assumed that a continuous board with a minimum dimension of 36 mm x 73 mm is attached to the bottom side of the cross bracing, as shown in Fig. 2. Both the cross bracing and the underlying board must meet strength class C24 in accordance with EN 338. Additionally, it is assumed that both the underlying board and the subfloor are glued and screwed to the cross bracing to achieve sufficient composite action.

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

Beam dimension	Maximum net span in meter [3)]											
	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												
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

[1)] Spans are clear spans i.e. between supports
[2)] See cl. 6.1 for table corrections
[3)] 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.

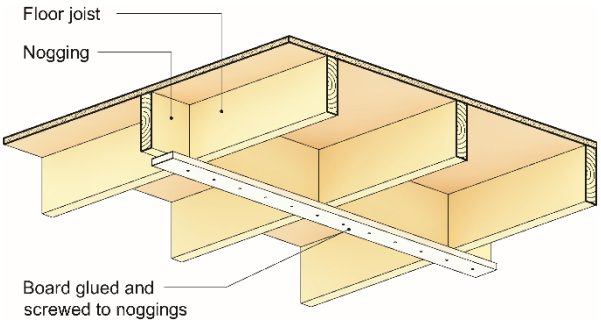

Fig. 2
Cross bracing with noggings and underlying bords.

6.6 Safety in case of fire
K-Beam and K-Beam Plus must be covered to prevent exposure to fire so that they are not part of the visible surface in the fire compartment and do not contribute to fire development.

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

Table 3
Maximum span[1)] (m) for K-Beam and K-Beam Plus with cross bracing/nogging and underlying boards in the center of the span[2)3)].

Beam dimension	Beams over single span[4)]		
	Beam spacing, mm		
mm x mm	300	400	600
K-Beam			
36 x 250	4,42	4,14	3,78
36 x 300	5,10	4,74	4,30
48 x 200	4,04	3,79	3,41
48 x 250	4,74	4,44	4,04
48 x 300	5,40	5,08	4,62
K-Beam Plus			
48 x 300	5,83	5,43	4,94

[1)] Spans are clear spans i.e. between supports
[2)] Only SINTEF's comfort criteria has been assessed, see cl. 6.1.
[3)] The total dead load of the floor, minus any additional screed, can be a maximum of 700 N/m². The table also applies to beam systems with up to 5 cm of reinforced screed (with a density of 2450 kg/m³).
[4)] Assumes continuous full length beams without holes.

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 evaluation of K-Beam and K-Beam Plus is based on reports owned by the holder of the approval.

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
Approval Manager