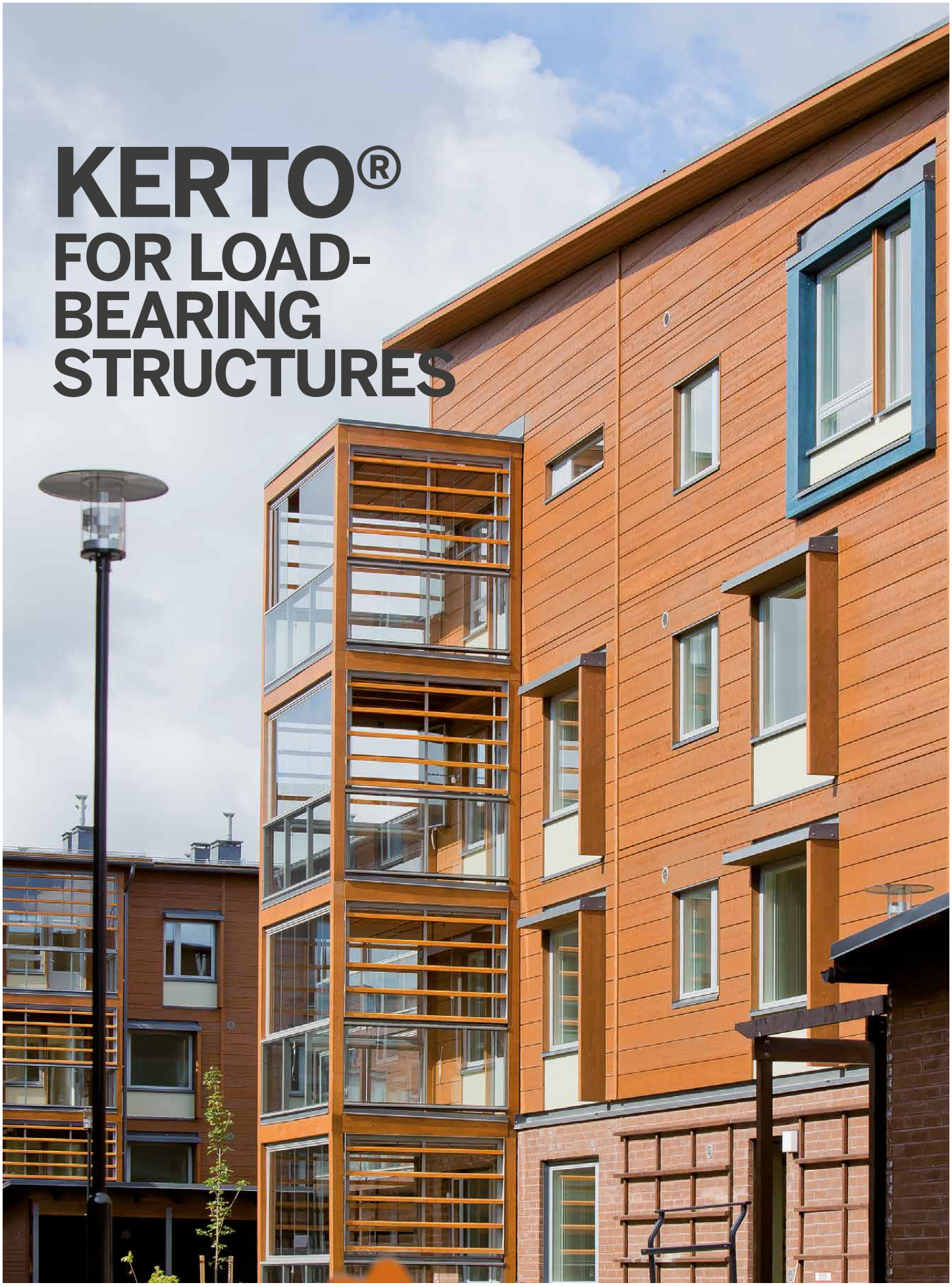
KERTO®
FOR LOAD-BEARING STRUCTURES



MetsäWood

ALL THE BENEFITS OF TIMBER, ALL THE STRENGTHS OF COMPOSITES

Kerto is a laminated veneer lumber (LVL) product used in all types of construction projects, from new buildings to renovation and repair. Kerto is incredibly strong and dimensionally stable, and it does not warp or twist. It derives its high strength from the homogeneous bonded structure.

Kerto is produced from 3 mm thick, rotary-peeled softwood veneers that are glued together to form a continuous sheet. The sheet is cut to length and sawn into beams, planks or panels in the sizes that customers require.

Kerto products are CE marked and certified by VTT Technical Research Centre of Finland, no 184/03.

EXAMPLES OF USE

- Beams
- Joists
- Trusses
- Frames
- Components of roof, floor and wall elements
- Components for the door and vehicle industry
- Concrete formwork
- Scaffold planking

ENVIRONMENTALLY FRIENDLY CONSTRUCTION MATERIAL

Renewable and recyclable wood is a highly eco-effective building material throughout its life cycle. Wood raw material comes from the sustainably managed and PEFC-certified forests of Metsä Group's Finnish forest owner members, ensuring that the origin of the raw material is traceable.

The manufacture of wood products consumes small amount of energy and results in low carbon dioxide and other emissions. In addition, wooden structures operate as carbon sinks. The manufacturing is mainly based on renewable energy, and the energy and material efficiency of the production processes is continuously being improved.

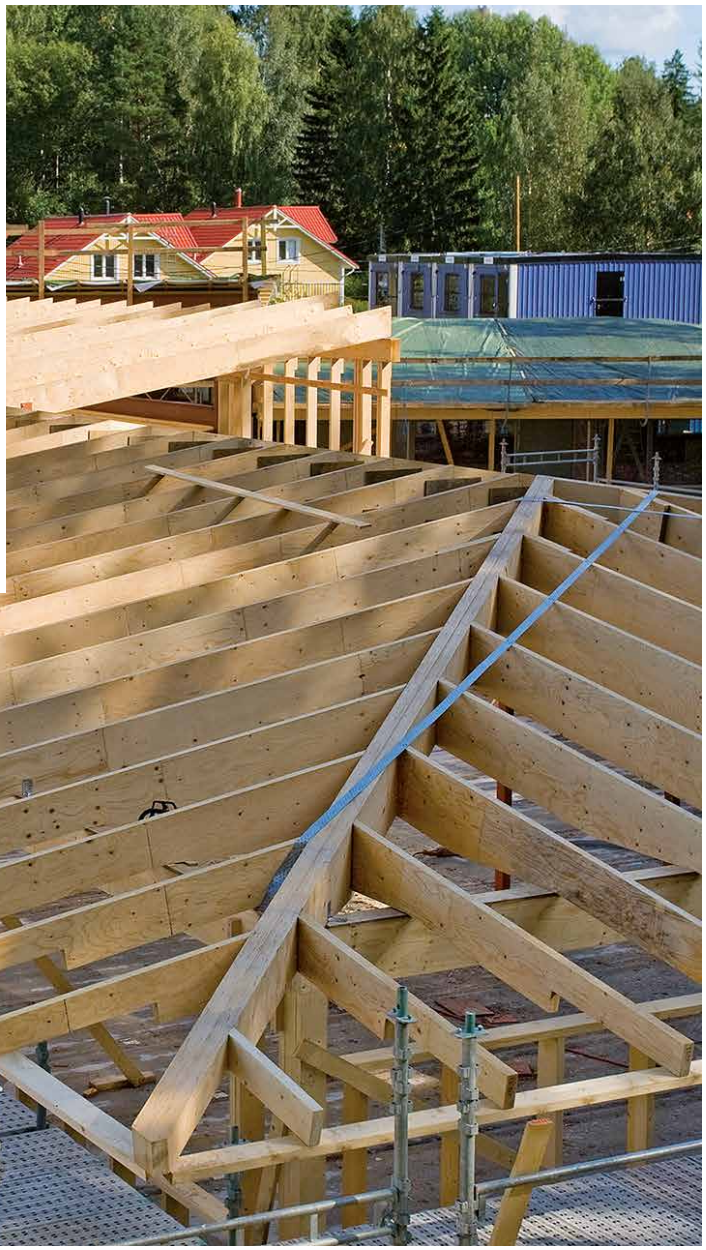
KERTO-S ENABLES LONG SPANS

One of the notable features of Kerto-S is that the grains run longitudinally through all the layers. The finished panel is cross-cut and rip-sawn to order. Kerto-S is normally supplied in the form of straight beams but it can also be specially cut and shaped as required.

Kerto-S combines excellent technical performance with ease of use. Its essential qualities include strength, dimensional precision and stability. It is the ideal choice for beams whenever long spans and minimal deflections are required.

Kerto-S beams are suitable for all roof shapes, also performing well as joists and lintels, in trussed constructions and frames. Kerto-S is also a widely used material in the manufacture of prefabricated components.

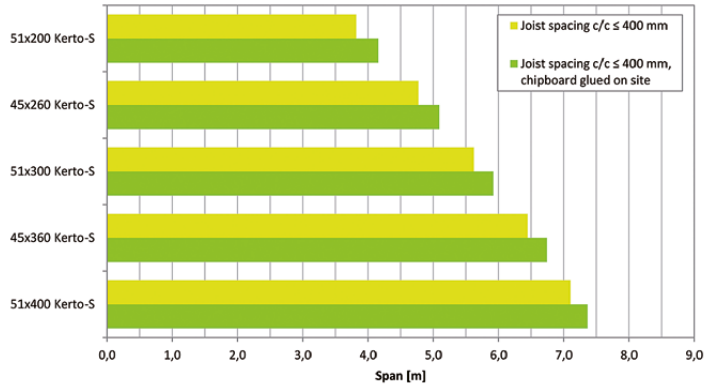
Kerto's light weight is of great advantage in repair and renovation work. Erection and installation can be carried out by fitters, without any heavy hoisting machinery, even in confined spaces. Kerto-S can be coated, to blend in with the rest of the architecture.



KERTO-S: STANDARD SIZES

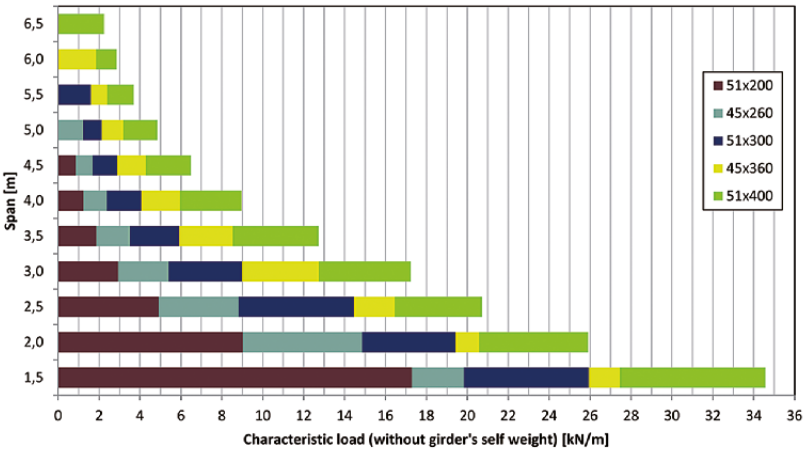
THICKNESS (mm)	HEIGHT (mm)								
	200	225	260	300	360	400	450	500	600
27	•	•							
33	•	•	•						
39	•	•	•	•					
45	•	•	•	•	•				
51	•	•	•	•	•	•			
57	•	•	•	•	•	•	•		
63	•	•	•	•	•	•	•	•	
75	•	•	•	•	•	•	•	•	•

DIMENSIONING FIGURE FOR KERTO-S FLOOR JOIST



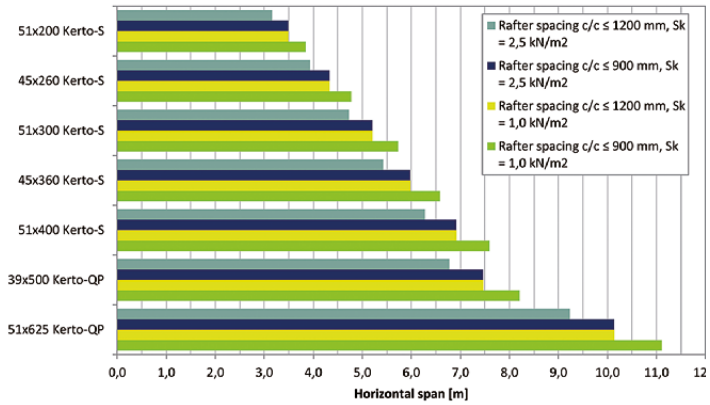
Calculations according EN 1995-1-1:2004+A1:2008 / RIL 205-1-2009 with the Finnish national annex. Dead load is 0,6 kN/m². Live load is 2,00 kN/m² (category A). Service class is 1 or 2 and the consequence class is CC2. The joist has continuous lateral torsional buckling support at top surface. Transverse bracing at center of span. When $L < 4$ m, one bracing line at center, when $L \geq 4$ m, two bracing lines at center c/c 1000. Room is square shaped and supported at four edges. A 22 mm chipboard (EN 312-6) at top surface. Site gluing gives 50 % composite action for vibration calculation. The support length is ≥ 45 mm. The instantaneous deflection $w_{inst} \leq L/400$ and the net final deflection $w_{net,\,fin} \leq L/300$. $\gamma_M = 1.2$.
Does not replace project-specific structural design.

DIMENSIONING FIGURE FOR KERTO-S MAIN FLOOR GIRDER



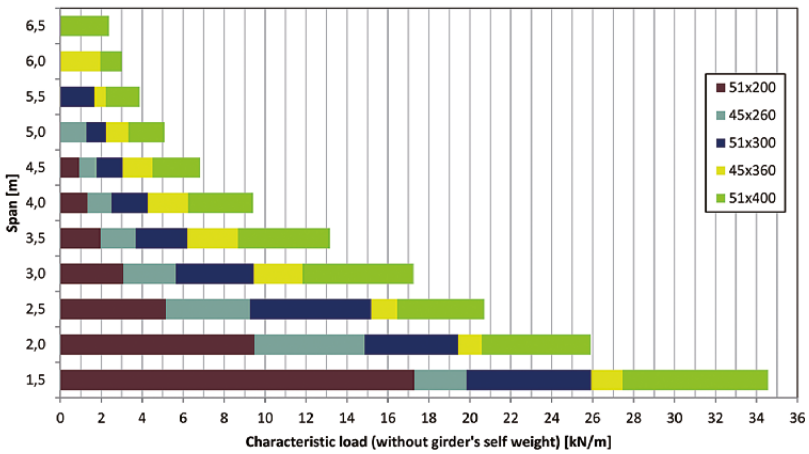
Calculations according EN 1995-1-1:2004+A1:2008 / RIL 205-1-2009 with the Finnish national annex. Dead load is 20 % of the total characteristic load. Service class is 1 or 2 and the consequence class is CC2. The girder has lateral torsional buckling support at top surface with spacing ≤ 600 mm and the loads are located at lateral torsional buckling supports. The support length shall be calculated separately. The instantaneous deflection $w_{inst} \leq L/400$ and the net final deflection $w_{net,\,fin} \leq L/300$. $\gamma_M = 1.2$.
Does not replace project-specific structural design.

DIMENSIONING FIGURE FOR KERTO-S AND KERTO-QP ROOF RAFTER



Calculations according EN 1995-1-1:2004+A1:2008 / RIL 205-1-2009 with the Finnish national annex. Roof slope is 1:3. Dead load is 0,9 kN/m². Snow load on the ground s_k is 1,00 kN/m² and 2,50 kN/m². Wind load has not been noticed. Service class is 1 or 2 and the consequence class is CC2. The rafter has lateral torsional buckling support at top surface with spacing ≤ 400 mm and the loads are located at lateral torsional buckling supports. Rafters shall be supported for buckling at mid-span. The support length shall be calculated separately. The net final deflection $w_{net,\,fin} \leq L/200$. $\gamma_M = 1.2$.
Does not replace project-specific structural design.

DIMENSIONING FIGURE FOR KERTO-S MAIN ROOF GIRDER



Calculations according EN 1995-1-1:2004+A1:2008 / RIL 205-1-2009 with the Finnish national annex. Dead load is 20 % of the total characteristic load. Snow load on the ground $s_k \leq 2{,}75$ kN/m². Wind load has not been noticed. Service class is 1 or 2 and the consequence class is CC2. The girder has lateral torsional buckling support at top surface with spacing ≤ 1200 mm and the loads are located at lateral torsional buckling supports. The support length shall be calculated separately. The net final deflection $w_{net,\,fin} \leq L/300$. $\gamma_M = 1.2$.
Does not replace project-specific structural design.

KERTO-Q STABILISES STRUCTURES

Kerto-Q is a load-bearing, bracing and dimensionally stable panel that can be used in the most demanding structures. Kerto-Q can be used in Kerto-Ripa elements that enable stiff and high-quality floor and roof structures. The elements can be equipped with holes for HVAC equipment , and the load-bearing capacity is not reduced significantly.

Kerto-Q is cross-bonded Kerto. This means that one fifth of the veneers are glued crosswise. This structure improves the lateral bending strength and stiffness of the panel, thus increasing the shear strength when used as a beam. With crossbonded veneers, there is an essential reduction in moisture-dependent variations across the width of the panel.

Full-length Kerto-Q is a popular material in floor and wall panels because it stabilizes the whole structure, and good fire resistance is achieved with a properly chosen thickness. Kerto-Q panels are also appreciated for their natural beauty. Kerto-Q provides a functional solution in structural components, particularly when a high shear strength is one of the requirements. Like all Kerto products, Kerto-Q is known for its strength, straightness and dimensional stability.

Kerto-Q is available in the same standard widths as Kerto-S. Additionally, the widths of 900, 1200, 1800 and 2500 mm are available. The thickness range is 21–75 mm in steps of 6 mm.

KERTO-Q: VENEER STRUCTURE

THICKNESS (mm)	qty	Veneer structure
21	7	I-III-I
21	7	II-I-II
24	8	II-II-II
27	9	II-III-II
30	10	II-IIII-II
33	11	II-IIIII-II
39	13	II-III-III-II
45	15	II-IIII-IIII-II
51	17	II-IIIII-IIIII-II
57	19	II-III-IIIII-III-II
63	21	II-III-III-III-III-II
69	23	II-IIII-III-III-IIII-II
75	25	II-IIIII-III-III-IIIII-II

I = veneer running longitudinally to main panel direction
- = veneer running crosswise to main panel direction

KERTO-QP HIGH AND RIGID ROOF BEAM

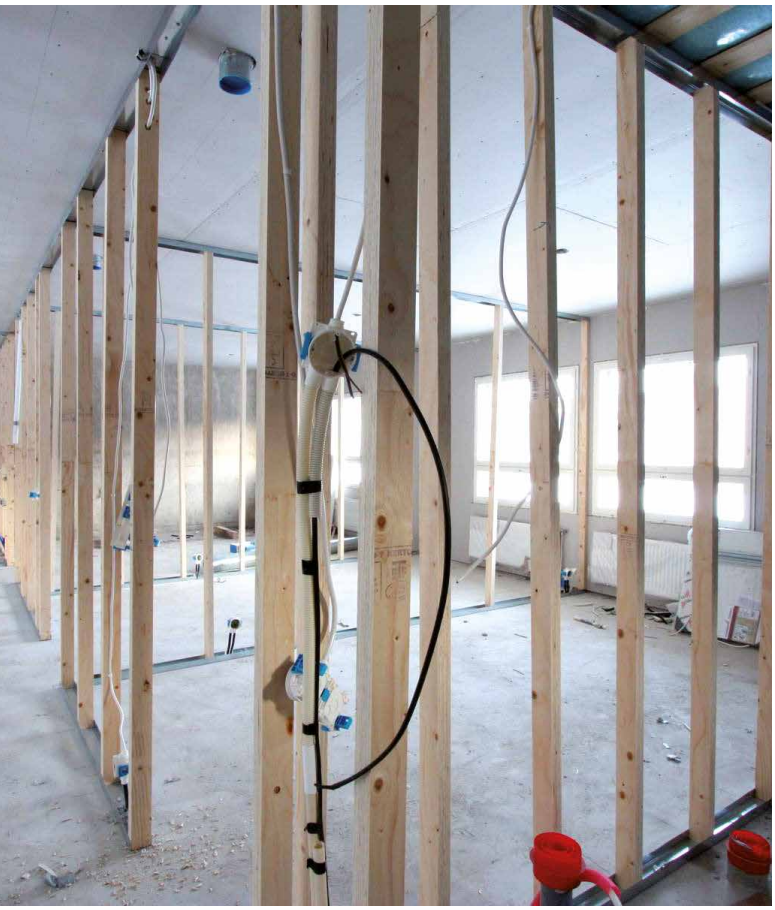
Kerto-QP is a dimensionally accurate roof beam that can be used in roof structures of new constructions and repairs. Kerto-QP beam enables spacious rooms and reduces the need for supporting lines.

The structure of Kerto-QP beam is unique: slender and high, but rigid. The beam can be produced higher than the traditional Kerto-S beam, but slenderer than Kerto-S which brings cost efficiency for the constructor. The rigidity of the cross-laid veneers minimizes e.g. swelling caused by moisture during construction period.

The product has a CE marking and a statement by VTT Technical Research Centre of Finland (VTT-S-05156-11).

KERTO-QP, DIMENSIONS

39 x 500 mm, length max 20 m
51 x 625 mm, length max 20 m



KERTO-T FOR WALL STUDS

Kerto-T is just like Kerto-S, but it is made from lighter veneers. Its straightness and dimensional stability is equally comparable with Kerto-S. This makes it ideal for studs to be used as load-bearing and non-bearing structures in external and internal walls.

With Kerto-T it is easy to construct high walls, which can be counted on to remain straight. Kerto-T can be used with any sheet materials that are easily fixed without special tools.

KERTO-T: TYPICAL SIZES

THICKNESS	WIDTH	LENGTH
mainly 39–63 mm	mainly < 200 mm	mainly < 12 m

KERTO FOR INDUSTRIAL APPLICATIONS

Because of its strength, straightness and incredible dimensional accuracy, Kerto is an excellent material to use in a wide variety of industrial applications.

- Roofing and flooring panels for the construction industry
- Components for the pre-fab housing industry
- Door frames
- Composite windows
- Floor, wall and roof battens
- Scaffolding planks
- Concrete form beams
- Vehicle industry
- Stair stringers

DESIGN VALUES AND PHYSICAL PROPERTIES FOR KERTO PRODUCTS

PROPERTY	SYMBOL	KERTO-S [1] 21-75 mm	KERTO-QP [2] 39-51 mm	KERTO-Q 21-24 mm	KERTO-Q [1] 27-75 mm	KERTO-T [3]	UNIT
Bending strength							
Edgewise (depth 300 mm)	$f_{m,0,edge,k}$	44.0	36.0	28.0	32.0	$(300/h)^s \cdot 27.0$	N/mm²
Size effect parameter	s	0.12	0.12	0.12	0.12	0.15	-
Flatwise, parallel to grain	$f_{m,0,flat,k}$	50.0	36.0	32.0	36.0	32.0	N/mm²
Flatwise, perpendicular to grain	$f_{m,90,flat,k}$	-	7.5	8.0 [5]	8.0	-	N/mm²
Tensile strength							
Parallel to grain (length 3000 mm)	$f_{t,0,k}$	35.0	28.0	19.0	26.0	$(3000/L)^{s/2} \cdot 24.0$	N/mm²
Perpendicular to grain, edgewise	$f_{t,90,edge,k}$	0.8	3.0	6.0	6.0	-	N/mm²
Compressive strength							
Parallel to grain	$f_{c,0,k}$	35.0	28.0	19.0	26.0	26.0	N/mm²
Perpendicular to grain, edgewise	$f_{c,90,edge,k}$	6.0	6.0	9.0	9.0	4.0	N/mm²
Perpendicular to grain, flatwise	$f_{c,90,flat,k}$	1.8	1.8	2.2	2.2	1.0	N/mm²
Shear strength							
Edgewise	$f_{v,0,edge,k}$	4.1	4.1	4.5	4.5	2.4	N/mm²
Flatwise, parallel to grain	$f_{v,0,flat,k}$	2.3	1.3	1.3	1.3	1.3	N/mm²
Flatwise, perpendicular to grain	$f_{v,90,flat,k}$	-	-	0.6	0.6	-	N/mm²
Modulus of elasticity							
Parallel to grain, along	$E_{0,mean}$	13,800	11,700	10,000	10,500	10,000	N/mm²
Perpendicular to grain, edgewise	$E_{90,edge,mean}$	430	430	2,400	2,400	-	N/mm²
Perpendicular to grain, flatwise	$E_{90,flat,mean}$	130	130	130	130	-	N/mm²
Parallel to grain, across	$E_{90,mean}$	-	2,000	1,200 [5]	2,000	-	N/mm²
Shear modulus							
Edgewise	$G_{0,edge,mean}$	600	600	600	600	400	N/mm²
Flatwise, parallel to grain	$G_{0,flat,mean}$	600	220	60	120	400	N/mm²
Dimensional variation coefficient [4]							
Thickness		0.0024	0.0024	0.0024	0.0024	0.0024	-
Width / Height		0.0032	0.0032	0.0003	0.0003	0.0032	-
Length		0.0001	0.0001	0.0001	0.0001	0.0001	-
Other properties							
Characteristic density	ρ_k	480	480	480	480	410	kg/m³
Mean density	ρ_{mean}	510	510	510	510	440	kg/m³
Moisture content (on mill delivery)		10 %	10 %	10 %	10 %	10 %	-
Performance in fire, charring rate	β_n	0.7	0.7	0.7	0.7	0.75	mm/min
Euroclass with regard to reaction to fire		D-s1,d0	D-s1,d0	D-s1,d0	D-s1,d0	D-s1,d0	-

[1] VTT certificate 184/03

[2] VTT-S-05156-11

[3] VTT-C-1781-21-07

[4] Dimensional change of cross-section due to change of moisture content (change of moisture content% x dimensional variation coefficient x dimension)

[5] For the lay-up I-III-I the values 14.0 and 3300 can be used instead of 8.0 and 1200

TOLERANCES OF KERTO PRODUCTS (WITH MOISTURE CONTENT OF 10 %)

KERTO-S, KERTO-Q , KERTO-QP AND KERTO-T

	Size (mm)	Min	Max
Thickness	≤ 27 mm	- 1.0 mm	+ 1.0 mm
	27 < t ≤ 57 mm	- 2.0 mm	+ 2.0 mm
	> 57 mm	- 3.0 mm	+ 3.0 mm
Height / Width	< 400 mm	- 2.0 mm	+ 2.0 mm
	≥ 400 mm	- 0.50 %	+ 0.50 %
Length	all	- 5.0 mm	+ 5.0 mm

FURTHER PROCESSING

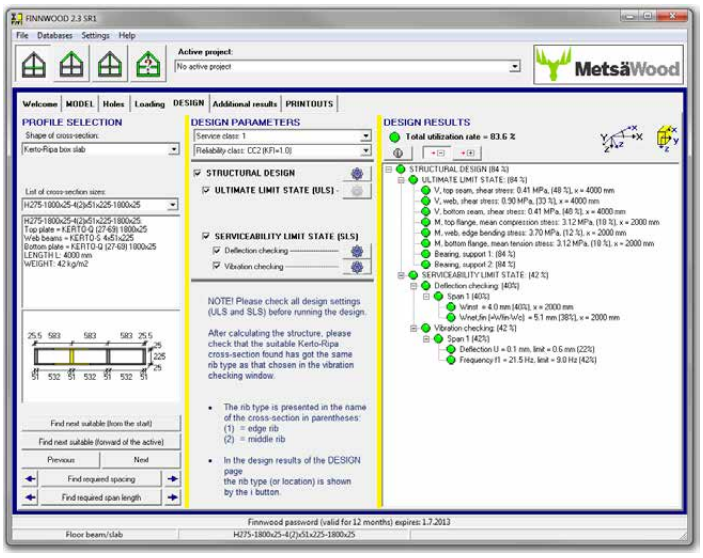
Kerto can be further processed in many different ways according to its end-use and the customer's particular wishes. The further processing service is an integral part of the customer service and supply chain. Further processing takes place at the production plant or at a service centre in a particular country, whichever is more competitive and economically efficient for the customer.

- Sanding: optical or calibrating
- Profiling of the beam edge, e.g, tonguing and grooving
- Special sawing: both straight and tapered shapes
- Gluing: re-gluing for increased thicknesses
- CNC machining: drilling, end sloping, edge easing, notching
- Build-up, e.g, box slabs and roof trusses
- Protective treatments, e.g, against mould

FINNWOOD SOFTWARE

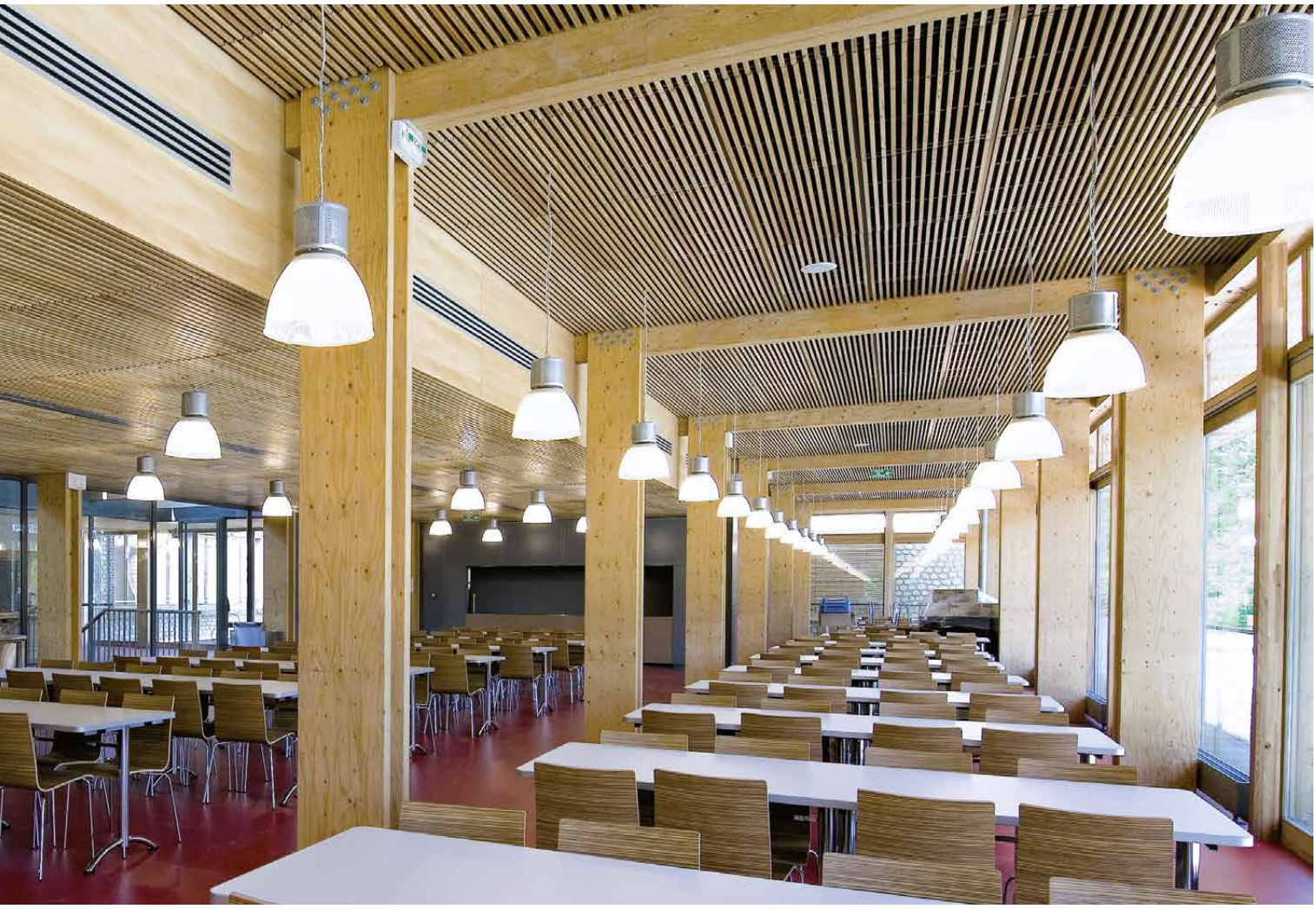
Individual structures made of Kerto and other Metsä Wood products can be planned and optimized with Finnwood software.
The user-friendly interface makes designing structural members such as floor joists and roof beams fast and effective. Finnwood designs according to Eurocode 5, and its national annexes.

Finnwood can be obtained free of charge from the country websites of Metsä Wood.



IDEAS FOR INSPIRATION

Cafeteria of Jean-Baptiste Corot school in Savigny-sur-Orge, France



Base ball stadium, Kuopio, Finland

Kindergarden and school Leskenlehti, Helsinki, Finland

Martin Nadaud gymnasium, Saint Pierre des Corps, France

The versatility of Kerto makes it an ideal material for the construction industry. Examples of innovative uses have been gathered from around the world during the thirty-year history of Kerto.

FIND MORE INSPIRING IDEAS FROM OUR WEBSITE

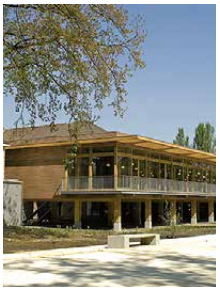
WWW.METSAWOOD.COM/REFERENCES

MetsäWood

Commercial and office buildings

Industrial and agri-cultural buildings

Residential buildings and gardens



Schools and daycare centres

Special constructions

Metsä Wood provides competitive and ecologically sound wood-based solutions for industrial building, the construction industry, homebuilders, and other housing use. We manufacture products from Nordic wood, a sustainable raw material of premium quality. Our turnover was 897 million euros in 2014, and we employ about 2,300 people. Metsä Wood is part of Metsä Group.

For more information and contacts:

WWW.METSAWOOD.COM/CONSTRUCTION

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