SINTEF Technical Approval

TG 20480

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Amended:
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Provided listed on
www.sintefcertification.no

SINTEF confirms that

Kriaute Building System

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

UAB Kriaute
Pramones g. 8 K-25
LT-35100 Panevezys
Lithuania
www.kriaute.lt

2. Product description

2.1 General

Kriaute Building System is factory produced timber frame elements for walls, floors and roof, assembled on site for residential buildings etc. Fields of application is further described in chap. 3. The elements can be delivered in lengths of up to 13.5 m and a maximum height of 3.1 m.

Fig. 1 shows the principle design of external walls. Fig. 2 shows the principle design of internal walls. Fig. 3 shows the principle design of separating walls between house units. The wall height is normally adjusted to the room height in each project.

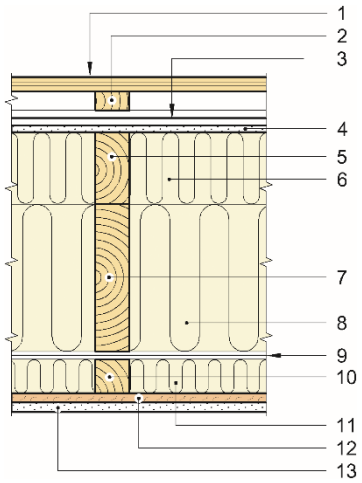
Fig. 4 shows the principle design of floor structures. Fig 5 shows the principle design of floors between house units. Standard element width is 1200 mm, and the structures are based on joists spaced c/c 300, 400 or 600 mm with dimensions and spans according to SINTEF Building Research Design Guide 522.351.

Fig. 6 and 7 show the principle designs of flat and pitched roof. Standard element width is 1200 mm, and the structures are based on joists spaced c/c 600 mm

2.2 Scope

The elements are produced with a standard construction design as described in this approval, but are otherwise customized and manufactured for each individual building project. The approval includes the standard design for walls, floor and roof, including joints between elements and connection to the foundation.

Specifications of materials and components used in the elements are shown in Table 1. Table 2 shows specifications of standard supplementary materials installed on site. These materials are not a formal part of the approval, but are specified to assess the properties of the final structures as shown in chap. 4. Environmental assessments are only performed for materials shown in Table 1.



Horizontal section

1	Horizontal wood cladding, 19mm	8	Stone wool, 195mm
2	Timber battens 45x25mm, c/c 300/400/600mm	9	Vapour barrier, 0.2mm
3	Wind barrier roll product	10	Timber battens 45x45mm, c/c 300/400/600 mm
4	Wind barrier board	11	Stone wool, 45 mm
5	Stud 45x45/95/145 mm, c/c 300/400/600 mm	12	Particleboard, 12mm, installed on site
6	Stone wool 45/95/145 mm	13	Gypsumboard, 12.5mm, installed on site
7	Stud 45x195mm, c/c 300/400/600 mm		

Fig. 1
Principle design of standard external walls with horizontal wood cladding

The approval does not cover windows and doors and other supplementary building parts such as stairs, balconies and technical installations like electrical systems, ventilation systems, sanitary equipment and roof drainage, which is designed especially for each building project.

2.3 Construction details

Standard construction details for the element design and connections are described in *"Standard Construction Details for Kriaute Building System belonging to SINTEF Technical Approval No. 20480".* The version of the construction details filed by SINTEF at any time is a formal part of the approval.

Table 1
Kriaute Building System - Material specifications

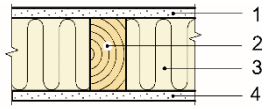
Material / component	Spesification [1]	Fire classification [2]	CE-marking [3]
Structural components			
Timber	Strength graded structural timber grade C24 or according to specific structural calculations. Moisture content max. 18 %	D-s2, d0	EN 14081-1
Glued laminated timber	Petri Puit glued laminated timber with class GL 28c, or according to specific structural calculations. Formaldehyde class E1	D-s2, d0	EN 14080
I-Joist	Steico I-joist	D-s2, d0	ETA-20/0995
Other timber conmponents	Non-treated spruce or pine timber	D-s2, d0	-
Board materials			
Floor sheathing	Products with SINTEF Technical Approval for applicable field of use	-	-
Wind barrier boards	9,5 mm Norgips GU, type E gypsum board	A2-s1, d0	EN 520
Claddings and linings			
External cladding	19 mm solid wood cladding grade A according to EN 15146	D-s2, d0	EN 14915
Thermal insulation			
Mineral wool	Paroc eXtra(Ultra) with declared conductivity λ_D = 0,035 W/mK	A1 [5]	EN 13162
Membranes and sealings			
Wind barrier, roll product	Dupont™ Tyvek® Soft 2460B	F	EN 13859-2
Roof underlay, roll product	Dupont™ Tyvek® Pro 2508B	F	EN 13859-1
Water vapour control layer	0.2 mm Isover Vapoblock from Saint-Gobain Rakennustuotteet Oy	F	EN 13984
Tape	Products with SINTEF Technical Approval for applicable field of use	-	-
Fastener products			
Nails / screws	Screws, nails and metal fastenings for external claddings etc. shall have hot dip zinc coating or equal effective corrosion protection	-	EN 14592
Miscellaneous			
Windows / doors	Windows and doors are not part of the approval, but products installed in the elements shall satisfy the requirements for thermal insulation and tightness in the technical regulations for construction works (TEK)		

[1] Dimensions not specified in the table shall be stated in "Standard construction details belonging to TG 20480" or according to specifications given for each individual building project
[2] Fire classification according to EN 13501-1, for applications according to "Standard construction details"
[3] The component shall be CE-marked according to the specified standard or ETA

Table 2
Kriaute Building System – Products delivered and installed on site

Material / component	Spesification [1]	Fire classification [2]	CE-marking [3]
Claddings and linings			
Internal lining	-12 mm particleboard class P5 -12,5 mm gypsum Board type A or F	D-s2, d0 A2-s1,d0	EN 13986 EN 520
Sound insulation floor sheating	-12,5 mm gypsum boards type A -Products with SINTEF Technical Approval for applicable field of use	A2-s1,d0 -	EN 520 -
Thermal insulation			
Mineral wool	Stone or glass wool with declared conductivity λ_D = 0,034 - 0,037 W/mK	A1	EN 13162
Membranes and sealings			
Roofing felt	Products with SINTEF Technical Approval for applicable field of use	B_{ROOF}(t2)	EN 13707
Tape	Products with SINTEF Technical Approval for applicable field of use	-	-
Fastener products			
Nails / screws	Screws, nails and metal fastenings for external claddings etc. shall have hot dip zinc coating or equal effective corrosion protection	-	EN 14592
Sound reducing accoustic profiles	Acoustic AP steel profiles	-	-

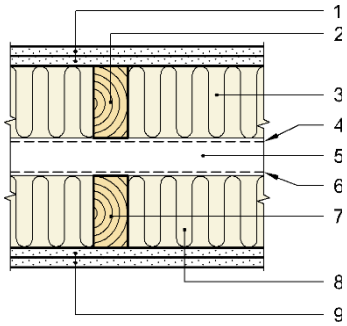
[1] Dimensions not specified in the table shall be stated in "Standard construction details belonging to TG 20480" or according to specifications given for each individual building project
[2] Fire classification according to EN 13501-1, for applications according to "Standard construction details"
[3] The component shall be CE-marked according to the specified standard



Horizontal section

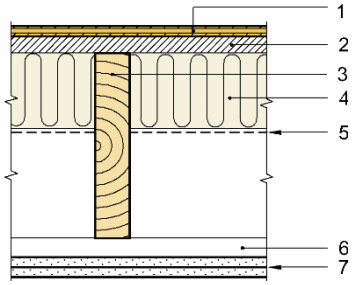
1	Gypsumboard	3	95 mm stone wool
2	Stud 45x95	4	Gypsumboard

Fig. 2
Principle design of internal walls



Horizontal section

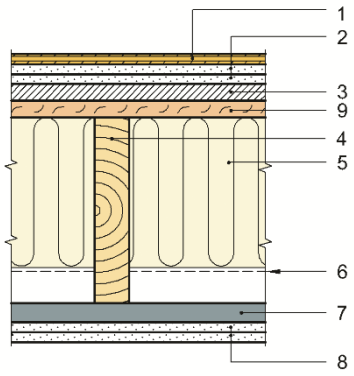
Fig.3
Principle design of separating walls between house units



Vertical section

1	Wood flooring, installed on site	5	Steel wire mesh
2	Particleboard, 22 mm	6	Timber battens 25x45/60 mm, c/c 300mm
3	Joists 45X245, c/c 300/400/600 mm	7	Gypsum board, 2 x 12.5 mm
4	Stone wool, 100 mm		

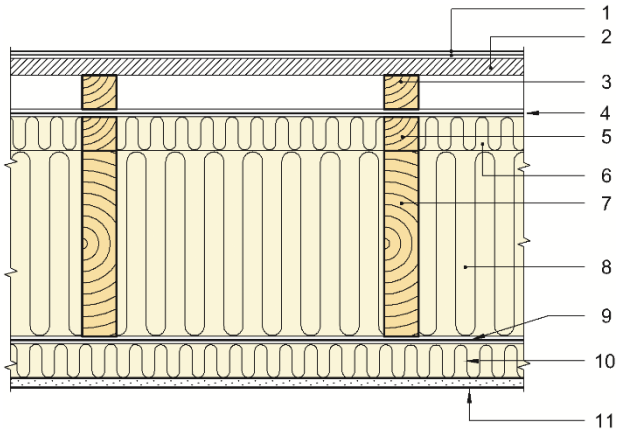
Fig.4
Principle design of standard floor within the same house units



Vertical section

1	Wood flooring, installed on site	6	Steel wire mesh
2	Gypsum board, 2 x 12,5 mm	7	Acoustic profiles c/c 400 mm, installed on site
3	Hunton Silencio 36 fibreboard	8	Gypsum board, 2 x 12,5 mm, installed on site
4	Joists 45X245, c/c 300/400/600 mm	9	Particleboard, 22 mm
5	Stone wool, 200 mm		

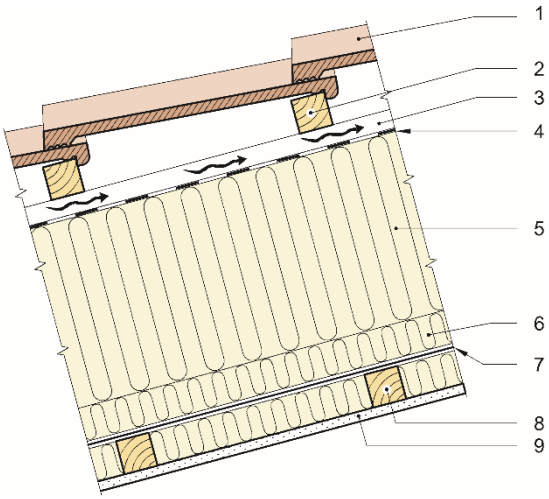
Fig.5
Principle design of standard separating floors between house units



Vertical section

1	Roofing membrane, installed on site	7	Timber beams. 45 x 245 mm, c/c300/400/600mm
2	Particleboard, 22 mm	8	Stone wool, 2 x 100 + 42 mm
3	Sloped timber battens, min. 45 x 45 mm, c/c 300/400/600 mm	9	Water vapour barrier
4	Wind barrier	10	Stone wool, 45 mm and timber battens 45 x 45mm, c/c 400 mm
5	Timber battens, 45x45 mm c/c 300/400/600 mm	11	Gypsum board, 12,5 mm
6	Mineral wool, 45 mm		

Fig.6
Principle design of standard flat roof



Vertical section

1	Roof tiles, installed on site	6	Timber battens 45 x 45/95/145 + stone wool 45 mm
2	Timber battens, 45 x 45 mm	7	Water vapour barrier
3	Timber counterbattens, 25 x 45 mm	8	Timber battens 45 x 45 mm c/c 600 mm + stone wool 45 mm
4	Roof underlay	9	Gypsum board, 12,5 mm, installed on site
5	Timber rafters 45 x 245 mm, c/c 300/400/600 mm + stonewool 245 mm		

Fig. 7
Principle design of standard pitched roof

3. Fields of application

The appliciation of Kriaute Building System in a building project must always be checked by the responsible project consultants and building company. Kriaute Building System is assessed to be in conformity with the pre accepted performance requirements for buildings in fire class 1 and 2 according to TEK guideline.

Applications of Kriaute Building System for buildings with other fire classes must be separately documented by the responsible consultants/builders for each individual building project. A check concerning possible fire requirements different from pre accepted performance in a building project must also be done before the application of Kriaute Building systems.

4. Properties

4.1 Structural capacity

The load capacity of all structural components is determined specifically for each individual building project, see cl. 6.2.

4.2 Reaction to fire

Fire classificiation according to EN 13501-1 for products applied in Kriaute Building System is shown in Table 1 and 2.

4.3 Fire resistance

Fire resistance for element structures is shown in Table 3. The fire resistance has been calculated on the basis of the calculation methods in the handbook Brandsäkra Trähus version 3 and in EN 1995-1-2:2004. The declared fire resistances apply to construction structures as shown in figure 1 - 7 and in “Standard construction details for Kriaute buildings systems belonging to SINTEF Technical Approval no. 20480”, with materials as described in Table 1 and 2.

The fire resistance given in Table 3 assumes one sided fire exposure from the inside of external walls and from the underside of floors and roof. The fire resistance for internal walls assumes also onesided fire exposure, unless specified otherwise in Table 3.

Design load capacity for walls at limit state fire is given as maximum centric axial load per meter wall (kN/m). Design load capacity for floors and roof with single span is given as maximum bending moment (kNm) per jost or rafter. "Full capacity" means that no charring of load-bearing material will take place during the specified fire resistance time. Hence the design capacities determined for ultimate and serviceability limit states are applicable also in case of fire.

Table 3
Fire resistance for Kriaute Building System structures with fire separating properties

Building structure. Internal lining and insulation	Fire resistance [1]	Load capacity at fire [2]
External wall, fig. 1		
12.5 mm gypsum board type A + 12 mm chipboard Stonewool	REI 30	23 kN/m
	REI 60	8.8 kN/m
Internal wall [3], fig.2		
12.5 mm gypsum board type A	REI 15	Full capacity
2 layers of 12.5 mm gypsum board type A	R 30	Full capacity
Separating wall between house units [4], fig.3		
2 layers of 12.5 mm gypsum board type A Stonewool	REI 30	Full capacity
2 layers 12.5 mm gypsum board type F+ A Stonewool	REI 60	2,1 kN/m
Separating floor between house units, fig. 5		
2 layers of 12.5 mm gypsum board type A Stonewool	REI 30	Full capacity
2 layers of 12.5 mm gypsum board type F Stonewool	REI 60	4.0 kNm
Roof, fig. 6 and 7		
12.5 mm gypsum board type A	REI 15	Full capacity
12.5 mm gypsum board type A	REI 30	5.7 kNm
2 layers of 12,5mm gypsum board type F + A Stonewool	REI 60	3.2 kNm

[1] Fire resistance equivalent to classification according to EN 13501-2. Wallheight max 2,4m
[2] Design load capacity for structure after 15, 30 and 60 minutes fire exposure
[3] Fire exposure from two sides
[4] Capacity for each single wall structure

4.4 Sound insulation

With separating wall and floor designs, construction details and connections as described in chap. 2, and connections between building components as specified in *"Standard construction details for Kriaute Building System belonging to SINTEF Technical Approval no. 20480"*, the expected sound insulation properties in accordance with EN ISO 16283-1 and -2 as well as EN ISO 717-1 and -2 are as shown in table 4 for completed houses. The values correspond to sound insulation class C in accordance with NS 8175 for residential houses.

Table 4
Expected sound insulation in completed houses

Construction	Apparent sound reduction index $R'_w + C_{50\text{-}3000}$	Impact sound pressure level $L'_{n,w} + C_{I,50\text{-}5000}$
Separating floor between house units (fig. 5)	≥ 55 dB	≤ 53 dB
Separating walls between house units (fig. 3)	≥ 55 dB	≤ 53 dB [1)]

[1)] Applies to sideways impact sound insulation

4.5 Thermal insulation

Table 5 shows the thermal transmittance, U-values, for standard elements described in chapter 2, calculated according to EN ISO 6946. Thermal loss due to extra timber used around door- and window openings, are not included. See otherwise cl. 6.5 on thermal insulation design.

Table 5
U-values for standard constructions

Structure	Total thermal insulation thickness [1)] mm	U-value W/m²K
External walls, fig. 1, stud spacing c/c 600 mm	285 335 385	0.15 0.13 0.11
Roof, fig. 6 and 7, rafter spacing c/c 600 mm	335	0.12

[1)] Mineral wool with declared conductivity λ_D = 0.035 W/mK

4.6 Durability

Kriaute Building System satisifies SINTEF's recommended requirements concerning tightness and durability of the external building envelope.

5. Environmental aspects

5.1 Substances hazardous to health and environment

The elements 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 soil, surface water and ground water

The leaching properties of the elements are evaluated to have no negative effects on soil or ground water.

5.3 Handling of waste

The elements shall be sorted as wood, metal, gypsum, residual waste or other appropriate waste fractions and delivered to an authorized waste treatment plant for material recovery, energy recovery or disposal.

5.4 Environmental product declaration

No environmental declaration (EPD) has been worked out for Kriaute Building System.

6.0 Special conditions for use and installation

6.1 Products with SINTEF Technical Approval

Products with SINTEF Technical Approval that are a part of the elements shall be used according to their respective approvals.

6.2 Structural design

The structural design of each element shall be in accordance with NS-EN 1995-1-1 (timber structures) and NS-EN 1991-1 (loads) with national annexes NA. The structural design shall comprise vertical and horizontal load capacity of walls, floors and roof, and include anchoring to the foundations.

For low rise houses may structural design generally also be performed by references to recommendations in SINTEF Building Research Design Guide.

Floors must be designed according to the stiffness criteria in SINTEF Building Research Design Guide 522.351.

6.3 Safety in case of fire

The required fire resistance for the elements with loadbearing and /or fire separating properties shall be determined specially for each building project according to the building regulations (TEK). The required design load capacity at limit state fire must be decided and checked towards the capacities shown in Table 3.

Products for internal and external surfaces, behind ventilated claddings, insulation etc. must be used according to pre accepted performances given in the guideline to TEK. Necessary measures to prevent spread of fire along surfaces must be assessed for each building project.

Board materials for internal lining shall be installed according to the principles in SINTEF Building Research Design Guide 543.204.

Penetrations through building parts with required fire resistance, and connections to other building parts, must be made in a way which do not reduce the fire resistance performance. See SINTEF Building Research Design Guide 520.342.

For keeping mineral wool insulation in floors and roof in place during a fire the thread diameter of steel wire or steel mesh shall be minimum 1,5 mm, and fixed to the beams with minimum 50 mm long staples spaced maximum 350 mm. Minimum three wires under each insulation board.

6.4 Design of sound insulation in buildings with several house units

When used in buildings with several house units, the elements must have separating floors and supporting external and internal walls adapted to reduced sound transmission as specified in "*Standard construction details for Kriaute Building System belonging to SINTF Technical Approval no. 20480"*. Elastic connections and transitions must be established towards all walls and penetrations.

Penetrations for water pipes, ventilation ducts or other installations placed in the sound insulation structures should be avoided as far as possible.

6.5 Thermal insulation design

For each delivery must the necessary energy efficiency according to TEK be determined for the relevant building project. U-values shown in cl. 4.5 can be used for control of minimum thermal insulation requirements in TEK. Calculations of total heat loss for each individual building must be done with a relevant calculation program.

6.6 Foundations
Moisture transport from the foundations to the building elements shall be prevented by a capillary breaking layer. Elements shall be placed on a foundation that satisfies the requirements on dimensions and flatness tolerances for the building project.

6.7 Installation
The elements shall be installed and connected according to the details shown in *"Standard Construction Details for Kriaute Building System belonging to SINTEF Technical Approval No. 20480", and* specific installation details that may have been worked out for each individual project.

6.8 Transport and storage
The elements must be protected from precipitation during transportation and storage with a watertight covering and placed on a substrate which do not cause damage to the elements.

7. Factory production control
The elements are produced by UAB Kriaute, Pramones 8, LT-35100 Panevezys, Lithuania.

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

The manufacturing of Kriaute Building System 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 approval is based on assessment of the construction details for Kriaute Building System, and documented properties of the matrials and components thar are used in the element designs.

The evaluation of design and technical solutions are also based on recommendations given in SINTEF Building Research Design Guides.

9. Marking
Each delivery must be accompanied by documents comprising as a minimum the manufacturer's name and address, project identification, time and date of manufacture, assembly instructions, as well as specific construction details and assembly instructions that comply with the *"Standard Construction Details for Kriaute Building System belonging to SINTEF Technical Approval TG 20480".* The approval mark for SINTEF Technical Approval No. 20480 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