SINTEF Technical Approval

TG 20702

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Revised:
Amended:
Valid until 01.12.2027
Provided listed on
www.sintefcertification.no

SINTEF confirms that

Harmet Timberhouse modules

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

Harmet OÜ
Puusepa tee 4, 76614 Kumna, Harjumaa
Estonia
www.harmet.ee

2. Product description

2.1 General

Harmet Timberhouse modules are prefabricated building modules which are assembled on site for apartment buildings, see figure 1. Fields of application is further described in chap. 3. The modules are based on timber structures in floors, walls and roof.

Standard module dimensions are 4,0 m width and 3,6 m height. The length is customized to each building project. Maximum length is 12 m.

The modules are normally delivered from the factory with outside cladding and windows and doors installed in external walls. Finished roofing may also be included. The modules are normally delivered with finished internal linings and surfaces, and partly with fixed internal furnishing and technical installations installed in the factory. Modules may have open sides for connection to other modules. The modules may include wet rooms.

2.2 Scope

The approval covers standard module constructions produced in the factory, with materials and components referred to in chap. 2.3. This includes wall, floor and roof structures with associated construction details, and details for module assembly and connections.

The approval does not cover internal surface materials, windows and doors in the modules. These components are specified specifically for each individual building project. The approval does neither cover technical installations like ventilation, heating and electrical systems, nor control of module assembly or any other work performed on the building site.

2.3 Construction details

Specifications of materials and components used in the modules are shown in table 1. Properties for these products shall be proven by the respective manufacturers.

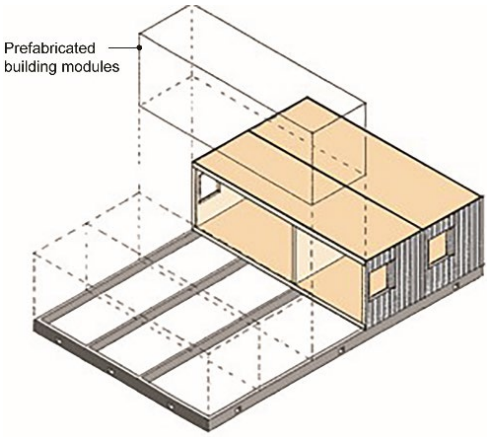


Fig. 1
Principle application of Harmet timberhouse modules

The principle design of floors, walls and roof is shown in figure 2 – 9. The detailed design of module construction and connection details are described in "Standard construction details for Harmet Timberhouse modules belonging to SINTEF Technical Approval no. 20702". The version of the construction details filed at SINTEF at any time is a formal part of the approval.

3. Fields of application

The application of Harmet Timberhouse modules in a building project must always be checked by the responsible project consultants and building company. Harmet Timberhouse modules are assessed to be in conformity with the pre accepted performance requirements for buildings in risk class 1-6 and fire class 1 and 2 according to the TEK guideline.

The building system is primarily assessed for use as housing.

The building system is only evaluated for use in the risk- and fire classes as stated here, other use is not covered by the approval. Use of the product in other buildings with stricter requirements and preaccepted performances than given for houses in TEK 17 with guideline must be considered separately in each case. See chap. 6 regarding special conditions for use and installation.

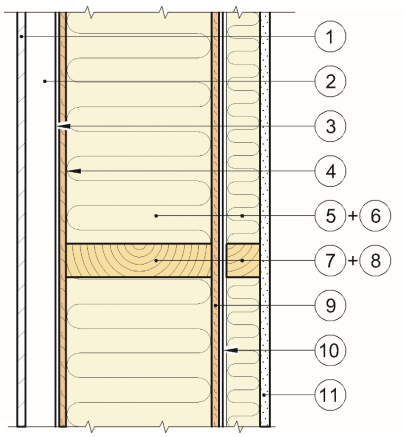
Table 1
Harmet Timberhouse modules – Material specifications

Material / component	Specification [1]	Fire classification [2]	CE-marking [3]
Structural components			
Timber	Strength graded structural timber with class C18 or according to specific structural calculations. Moisture content max. 18 %	D-s2,d0	EN 14081
Timber I-joists	Products with SINTEF Technical Approval for the relevant	-	-
Board materials			
Floor sheathing	Products with SINTEF Technical Approval for the relevant use	-	-
	12,5 mm Norgips Floor, type IR	A2-s1,d0	EN 520
Roof sheathing	Products with SINTEF Technical Approval for the relevant use	-	-
Wind barrier boards	Products with SINTEF Technical Approval for the relevant use	-	-
	9,5 mm Knauf Weatherboard, type GM-H1	A2-s1, d0	EN 520
Claddings and linings			
External Cladding	Products with SINTEF Technical Approval for the relevant use	-	-
	21 mm solid wood cladding grade A according to EN 15146	D-s2, d0	EN 14915
Internal lining	Products with SINTEF Technical Approval for the relevant use	-	-
	13 mm Norgips GKB, type A	A2-s1, d0	EN 520
	15 mm Norgips GKF, type DF	A2-s1, d0	EN 520
	13 mm Knauf Humidboard, type GM-H1	A2-s1, d0	EN 520
Thermal insulation			
Mineral wool	Paroc eXtra with declared conductivity λD = 0,036 W/mK	A1	EN 13162
Vibrationsinsulation	Products with SINTEF Techical Approval for the relevant use	-	-
Membranes and sealings			
Wind barrier, roll product	DuPont Tyvek Soft 2460 B	E	EN 13859-2
Roof underlay, roll product	Products with SINTEF Techical Approval for the relevant use	-	-
Water vapour control layer	Products with SINTEF Technical Approval for the relevant use	-	-
Radon barrier	Products with SINTEF Technical Approval for the relevant use	-	-
Roofing felt	Products with SINTEF Technical Approval for the relevant use	-	-
Fastener products			
Tape	Products with SINTEF Technical Approval for the relevant use	-	-
Fire sealing	Fireseal Firestop 400	-	-
Floor adhesives	Kiilto 33	-	-
Nails / screws	Screws, nails and metal fastenings for external claddings etc. shall have hot dip zinc coating or equal effective corrosion protection	A1	EN 14592
Wet rooms			
Bathroom membrane	Products with SINTEF Technical Approval for the relevant use	-	-
Leveling substract	Mira X-plan	A1	EN 13813
Tiles	Tiles according to EN 14411	-	EN 14411
Water pipes	Products with SINTEF Technical Approval or SINTEF Product Certificate for the relevant use	-	-
Waste water pipes	Products with SINTEF Technical Approval or SINTEF Product Certificate for the relevant use	-	-
Floor gullies	Purusline vinyl plus – PS 3599	-	-
	Vieser one 75 and low gully 75 sluk	-	-
	Puros Joti – PS 1129	-	-
	Purus Heavy Big110P – PS 1626		
Miscellaneous			
Windows / doors	Windows and doors are not part of the approval, but products installed in the modules 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 20702" 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"

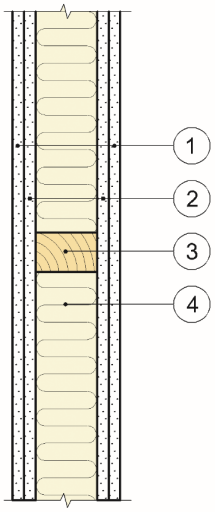
[3] The component shall be CE-marked according to the specified standard



Horizontal section

1	External cladding	7	45x220 mm studs c/c 600 mm
2	28 x 70 mm battens c/c 600 mm	8	45x45 mm battens c/c 600 mm
3	Wind barrier, roll product	9	Plywood
4	Wind barrier board	10	Water vapour control layer
5	220 mm mineral wool	11	Internal lining
6	50 mm mineral wool		

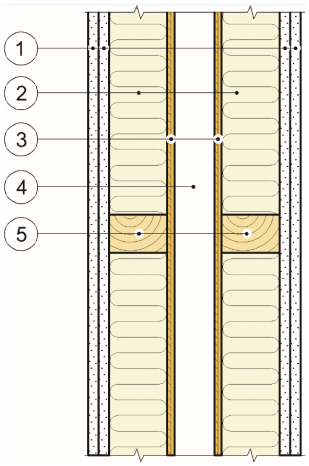
Fig. 2
Principle design of external walls



Horizontal section

1	Internal lining (1 or 2 layers)
2	Internal lining (2 layer)
2	45 x 70 mm studs c/c 600 mm
3	70 mm mineral wool

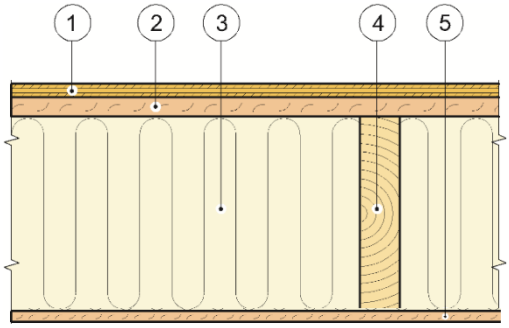
Fig. 3
Principle design of internal walls in modules



Horizontal section

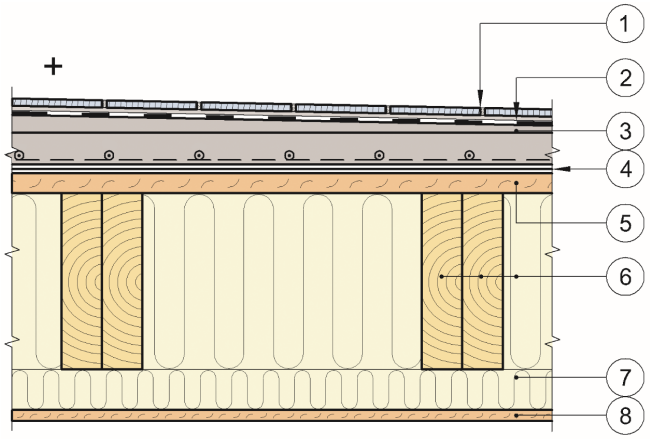
1	Double layer of Internal lining	4	Minimum 50 mm void
2	100 mm mineral wool	5	45 x 95 mm studs c/c 600 mm
3	9 mm OSB/3 board		

Fig. 4
Principle design of separating walls between modules



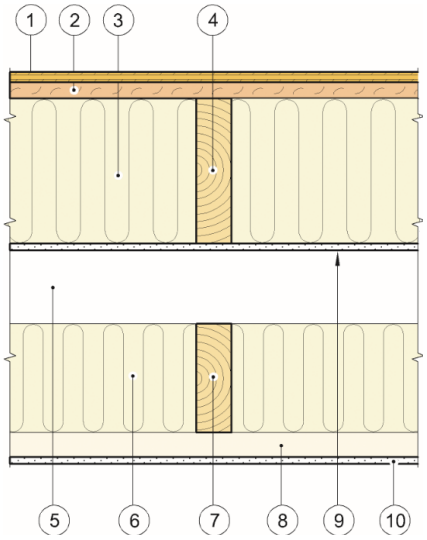
1	Flooring	4	45 x 220 mm joist c/c 600 mm
2	Floor sheathing	5	Wind barrier board
3	220 mm mineral wool		

Fig. 5
Principle design of floor above foundations



1	Ceramic tiles	5	Floor sheathing
2	Membrane	6	2 x 45x195 joists c/c 600 and 200 mm mineral wool
3	Screed	7	50 mm mineral wool
4	Primer	8	Internal lining

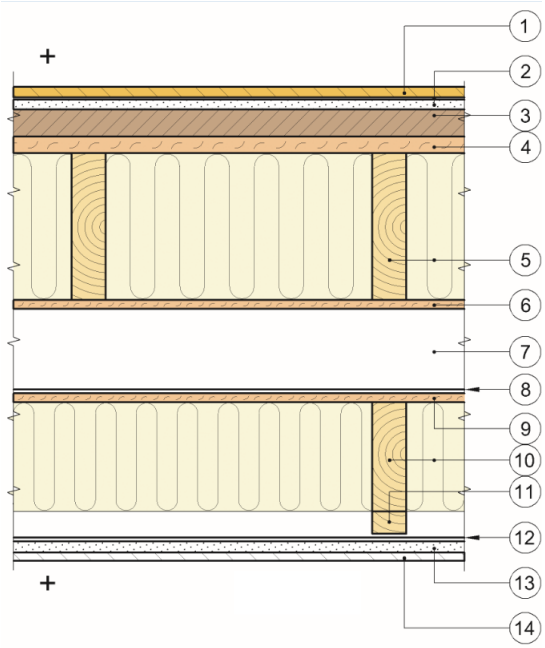
Fig. 6
Principle design of floor in wetroom



Vertical section

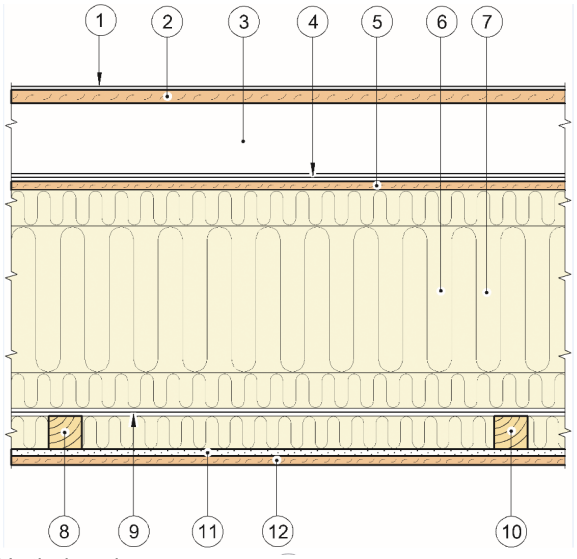
1	Flooring	6	150 mm mineral wool
2	Floor sheathing	7	2x45x145 mm joist c/c 600 mm
3	200 mm mineral wool	8	28 x70 mm battens c/c 600 mm
4	45 x 220 mm joist c/c 600 mm	9	Wind barrier board
5	100 mm void	10	Internal lining

Fig. 7
Principle design of floor between modules within one house unit



1	Flooring	8	Roof underlay, roll product
2	13 mm gypsum board	9	12 mm OSB board
3	36 mm soft fibreboard	10	45 x145 mm joist c/c 600 mm 150 mm stonewool
4	Floor sheathing	11	30x45 mm battens c/c 600
5	45x195 mm joist c/c 400 200 mm mineral wool	12	Vapour barrier
6	12 mm OSB board	13	Internal lining
7	112 mm void	14	Internal lining

Fig. 8
Principle design of floor between modules with separate house units



Vertical section

1	Roofing felt	7	250 mm mineral wool
2	18 mm particle board	8 and 10	45 x 45 mm battens c/c 600 mm + 50 mm mineral wool
3	95 mm airgap	9	Vapour barrier
4	Roof underlay	11	Gypsum board
5	12 mm OSB/3	12	Particle board
6	45 x 245 beam c/c 600 mm		

Fig. 9
Principle design of roof structure

4. Properties

4.1 Structural capacity

Structural capacity of load-bearing module structures is calculated specifically for each individual building project, see chap. 6.2.

Floor structures shown in chap. 2 are designed for imposed load category A according to EN 1991-1-1, i.e. 2,0 kN/m^2 uniformly distributed load, and in accordance with the stiffness requirements recommended in SINTEF Building Research Design Guide 522.351.

4.2 Reaction to fire

Reaction to fire classifications according to EN 13501-1 for products included in Harmet timberhouse modules are given in Table 1. The classification is valid for the current field of application.

4.3 Fire resistance

The fire resistance for the elements are given in Table 2. The fire resistance is determined by calculations based on the handbook Brandsäkra Trähus versjon 3 and EN 1995-1-2. The given fire resistance is only valid for the specified constructions as given in figure 2 – 12, "Standard construction details for Timbeco Building System" and materials as given in Table 1.
For constructions not mentioned in table 2, fire resistance must be calculated according to Brandsäkra Trähus versjon 3 and EN 1995-1-2 or retrieved from relevant and valid SINTEF design guides.

The fire resistance is determined for one-sided fire exposure from the inside for external walls, and fire exposure from below for floors and roofs. For internal walls the fire resistance is determined for one-sided fire exposure, unless otherwise stated in Table 2.

Table 2
Fire resistance and load capacities at limit state fire for module structures

Structure, internal lining and stud dimension	Fire resistance [1]	Design load capacity [2]
External walls, fig. 2		
-10 mm chipboard -45 mm battens -50 mm stonewool -13 mm gypsumboard type A -45x220 mm studs - 220 mm stronewool	REI 15 REI 30 REI 60	Full capacity 20,1 kN/m 7,8 kN/m
Internal load bearing walls fig.3 [3]		
-13 mm gypsumboard type A	R 15	Full capacity
-2 pcs 13 mm gypsumboard type A -45x70/120/145 studs -stronewool	R 30	Full capacity
-2 pcs 15 mm gypsumboard type F -45x145 studs -150 mm stronewool	R 60	138 kN/m
Seperating walls, fig. 4		
-11 mm chipboard -2 pcs 13 mm gypsumboard type A - 2x45x95 m studs -100 mm stronewool - 9 mm OSB -Min 30 mm air gap	REI 30 REI 60	Full capacity 2,1 kN/m [3]
-11 mm chipboard -2 pcs 13 mm gypsumboard type A - 2x45x95 m studs -100 mm stronewool - 9 mm OSB - min 30 mm air gap	REI 60	43,8 kN/m [3]
Floor between house units, fig. 6		
- 11 mm Chipboard - 13 mm gypsumboard type A - 45x145 mm beams C24 - 150 mm stonewoolll - 12 mm osb- - 112 mm air gap - 12 mm OSB - 2x45x195 mm beamsC24 - 200 mm stonewolll - 22 mm chipboard - 13 mm gypsumboard type A	REI 30 REI 60	Full capacity 3,9 kNm [4]
Roof, fig. 7		
11 mm chipboard + 13 mm gypsumboard type A -45x45 battens -50 mm stonewoll -45x45 battens -50 mm stonewoll -45x245 mm beams - 250 mm stonewool	REI 30 REI 60	7,2 kNm 2,6 kNm

[1] Fire resistance equivalent to classification according to EN 13501-2. Properties for EI and R is given in minutes.

[2] Design load capacity for the structure after 15-, 30- and 60-minutes fire exposure. "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

[3] Fire exposure from two sides

[4] Capacity for each single wall structure

[5] The mineral wool must be kept in place with steel mesh

Design load capacity for limit state fire is given as maximum centric axial load per metre wall (kN/m with c/c 600 mm between the studs). Design load capacity for limit state fire for single span floors and roofs is given as maximum bending moment (kNm) per beam. Full capacity means that the cladding protects the structural timber from charring during the fire exposure period. The design for the load-bearing structure determined for the ultimate and serviceability limit states will therefore be decisive.

The insulation in roof/floor must in some cases be held tight. See chap. *6.3 Safety in case of fire* regarding special conditions for use and installation.

4.4 Sound insulation

Table 3 shows the expected sound insulation performances for completed house constructions, providing the use of standard separation structures and connections shown in Figures 2-9 and in "Standard Construction Details for Harmet Timberhouse modules belonging to SINTEF Technical Approval no. 20702".

Table 3
Expected sound insulation in completed houses [1]

Structure	Airborne sound reduction $R'_w + C_{50\text{-}3000}$	Impact sound pressure level $L'_{n,w} + CI_{50\text{-}5000}$
Floors between house units (fig. 8)	≥ 55 dB	≤ 53 dB
Separating walls between house units (fig. 4)	≥ 55 dB	≤ 53 dB [2]

[1] According to EN ISO 16283 and EN ISO 717-1

[2] Horizontal impact transmission

The values in Table 3 satisfy sound insulation class C in NS 8175:2019 and the recommended requirements for sound insulation between house units, including spectrum adaptation term for enlarged frequency range. The sound insulation depends also on the installation of technical service components like pipes, ducts etc., and must be assessed case by case in each building project.

4.5 Thermal insulation

Table 4 shows thermal transmittance values, U-values, for standard module designs described in chap. 2, calculated according to EN ISO 6946. U-values for external walls are based on 12 % timber proportion, and do not include thermal loss due to extra timber around door and window openings.

Table 4
Thermal transmittance, U-value, for Harmet timberhouse modules.

Structure	Insulation thickness [1] mm	U-value W/m2K
External wall (fig. 2)	220	0,18
	250	0,16
Floor above foundations (fig. 5)	220	0,18
	300	0,13
Roof (fig. 9)	350	0,13

[1] Mineral wool with thermal conductivity λ_D = 0,036 W/mK

4.6 Durability

The module design satisfies SINTEF's recommended requirements concerning tightness and durability of the external building envelope.

5. Environmental aspects

5.1 Chemicals hazardous to health and environment

The modules 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 modules 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.

5.3 Waste treatment/recycling

During demolition the module components 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 declaration

No environmental declaration (EPD) has been worked out for Harmet Timberhouse modules.

6. Special conditions for use and installation

6.1 Products with SINTEF Technical Approval and Product Certificate

Products with SINTEF Technical Approval and Product Certificate included in the modules must be used in accordance with the respective product approvals.

6.2 Structural design

For cases not covered by declared structural capacities in chap. 4.1 the performance of load-bearing timber components in the module shall be specifically calculated for each building project according to EN 1995-1-1 with national annex NA. Loads shall be determined according to EN 1991 with national annexes NA.

6.3 Safety in case of fire

For each building project, the required fire resistance according to TEK shall be determined specifically for building parts that shall have load-bearing and/or fire separating properties. The required design load capacity at limit state fire must be controlled against the capacities given in Table 2. Choice of construction is made based on the required fire resistance.

Products for internal and external surfaces, behind ventilated claddings, insulation etc. must be chosen based on pre-accepted performances given in the guideline to TEK. The need for special measures to prevent spread of fire on facades must be evaluated for each building project.

Cladding for internal lining shall be installed according to the suppliers fitting instructions and the principles in SINTEF Building Research Guide 543.204. At transitions between building parts with fire resistance, joints between interior cladding must be sealed with fire sealant or supported and sealed with wooden battens behind.

Penetrations through building parts with fire resistance, and connections between building parts, must not reduce the fire resistance performance of the building parts. See SINTEF Building Research Guide 520.342.

The insulation in roof and floor that does not reach full design load capacity must be held tight by a wire with minimum diameter of 1,5 mm, and minimum tree wires per insulation board and max distance c/c 350 mm. Alternatively, a wire net with wire diameter minimum 1,5 mm can be stretched out up under the beams. The wire net must be fastened with minimum 50 mm long cramps.

6.4 Thermal insulation design

The required energy efficiency according to TEK shall be determined for each building project. The U-values shown in chap. 4.5 may be used to check the minimum requirements for thermal insulation performance in TEK. The total energy loss for each individual building must be calculated with a specific calculation program.

6.5 Foundations

The modules shall be placed on a basement, a perimeter wall or an open foundation which meets the module manufacturer's requirements concerning tolerances on dimensions and planarity.

The foundation must be in accordance with the recommended principles for ventilation under the modules and prevention of moisture damage in wood materials as shown in SINTEF Building Research Design Guides.

6.6 Installation

The modules shall be installed and connected according to the details shown in "Standard Construction Details for Harmet timberhouse modules belonging to SINTEF Technical Approval no. 20702", and specific installation details worked out for each individual project.

6.7 Wet rooms

Bathrooms and other wet rooms shall fulfill the pre-accepted requirements in the guideline to TEK, and designed and completed in accordance with the principles and the recommendations in SINTEF Building Research Design Guides and the construction industry's Wet Room Standard (BVN). The application and installation of the specified materials and components shown in Table 1 shall be in accordance with the respective certificates and technical approvals for the products.

6.8 Transport and storage

The modules shall be protected from precipitation under transport and storage with a watertight cover until the modules are protected by a watertight roof. During transport and storage the modules must be placed on supports with positions equivalent to what is presumed in the structural design of the modules.

7. Factory production control

Harmet Timberhouse modules are produced at:

- Harmet OÜ, Puusepa tee 4, 76614 Kumna, Harjumaa, Estonia

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

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

Harmet OÜ is certified in accordance to EN ISO 9001 and EN ISO 14001.

8. Basis for the approval

The approval is based on assessments of the standard construction details for the module system, and the documentation of product properties and performance for the specified materials and components used in the modules.

9. Marking

Harmet Timberhouse modules are CE-marked in accordance with ETA 10/003.

Documents following each delivery shall as a minimum include name of the manufacturer, project identification, specific installation specifications for the individual project, and construction details with all relevant details in according to "Standard Construction Details for Harmet Timberhouse modules belonging to SINTEF Technical Approval no. 20702". The approval mark for SINTEF 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

Susanne Skjervø

Susanne Skjervø
Approval Manager