SINTEF Technical Approval

TG 20250

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Revised:
Amended:
Valid until 01.02.2027
Provided listed on
www.sintefcertification.no

SINTEF confirms that

Module Tech 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

Module Tech OÜ
Loovälja tee 9
74207 Liivamäe
ESTONIA
www.moduletech.ee

2. Product description

Module Tech Building System are factory-made building modules which are assembled on site for residential, office and school buildings. It is also available as removable modules for temporary buildings, barracks and so forth. See figure 1. Field of use is more specified in point 3. The modules are based on a support system with wooden studs and beams.

The standard modular construction has a width of 3.6 m and a height of 3.5 m. The length is adapted to each project, and can be up to 10,2 m.

The modules are delivered from the factory with exterior cladding, windows and doors mounted in external walls, and alternatively with prefabricated roofing layer. The modules are normally delivered with finished interior cladding and finishes, and partly with fixed interiors and technical installations installed in the factory. For the interconnection of several modules, these are also supplied with open longitudinal sides. The modules can include wet rooms.

2.2 Scope of approval

The approval covers the execution at the factory of the standard construction system with associated materials and components as specified in point 2.3. This includes the modules wall structures, the floor- and the roof constructions with associated construction details, as well as details for the assembly of the modules.

The approval does not cover materials installed on site. These materials are evaluated to assess that the properties for the finished construction are as specified in point 4, and that the standard construction details are in accordance with SINTEF recommendations. The approval also does not cover interior and exterior surface treatments or windows and doors. These materials and components must be specified and documented separately for each construction project in accordance with the regulation on the transaction and documentation of construction products (DOK), and be CE marked where required by the regulation.

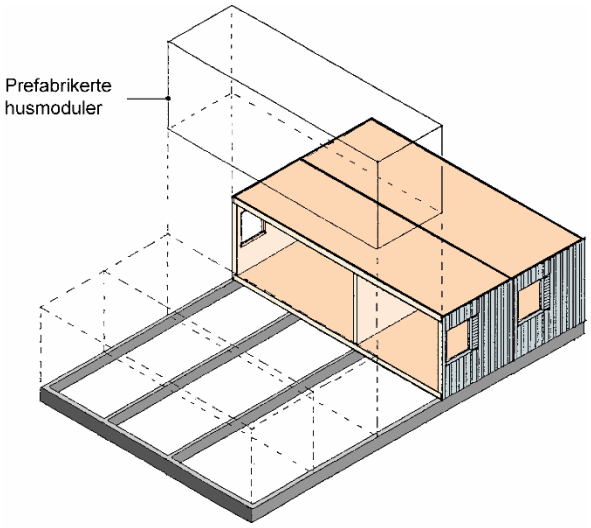


Fig. 1
Module Tech Building System

The approval also does not cover the control of on-site installation or additional building structures in the individual construction project, including technical installations such as ventilation systems, heating systems or electrical installations.

2.3 Construction details and design consideration in general

Specifications of the individual materials and components are shown in Table 1. The properties of these must be documented from the respective suppliers. Products marked with SINTEF Technical Approval must be used in accordance with the specifications of their own approval.

The basic structure of the floor, walls and roof is shown in fig. 2-7. The detailed execution of the modules and the associated joining details are described in the "Standard construction details for Module Tech Building System belonging to SINTEF Technical Approval No 20250". The version of the construction details on file with SINTEF at any time constitutes a formal part of the approval. Detailed design consideration of the characteristics and surfaces of the structures shall be carried out in each construction project in accordance with point 4.

Table 1
Module Tech Building System material specifications

Material / component	Spesifikation[1)]	MS/PS [2)]	Fire classification[3)]	CE-marking[4)]
Load bearing components				
Timber	Puidudoka OÜ, construction timber with strength class C24, or according to a specific design consideration. Humidity max 18 %		D-s2,d0	EN 14081-1
Glued laminated timber	Vyshnevolotskiy Wood-processing Works, Glued laminated timber with strength classes GL24, GL28, or according to a specific design consideration. Glued laminated timber has to satisfy requirements according to formaldehyd class E1		D-s2,d0	EN 14080
	AS Palmako, Glued laminated timber with strength classes GL24, GL28, GL 32, or according to a specific design consideration. Glued laminated timber has to satisfy requirements according to formaldehyd class E1		D-s2,d0	EN 14080
Building plates				
Sub floor plates	18 – 22 mm Forestia particle boards		D-s2,d0	EN 13986
	22 mm Unilin Durelis particle boards		D-s2,d0	EN 13986
	12 – 22 mm Kronospan OSB 3		D-s2,d0	EN 13986
	Products with SINTEF Technical Approval for the actual field of use		-	-
Wind barrier plates	9,5 mm Gyproc GTS 9 gypsum plate type EH3-9,5		A2-s1,d0	EN 520
	9,5 mm Gyproc GUB Bris		A2-s1,d0	EN 520
	Products with SINTEF Technical Approval for the actual field of use		-	-
Sub roofing plates	12 – 22 mm Kronospan OSB 3		D-s2,d0	EN 13986
	Products with SINTEF Technical Approval for the actual field of use		-	-
Cladding				
Exterior cladding	19 mm cladding boards class A from Puidukoda OÜ		D-s2,d0	EN 15146
Interior lining	12,5 mm Gyproc GN 13 gypsum plasterboard		A2-s1,d0	EN 520
	15 mm Gyproc GFL 15 gypsum plasterboard		A2-s1,d0	EN 520
	11 mm Huntonit Brannit		See TG 2038	EN 13986
	9 - 11 mm Huntonit Bygningsplater		See TG 2038	EN 13986
	Products with SINTEF Technical Approval for the actual field of use		-	-
Insulation materials				
Thermal insulation	Rockwool (Flexi A-Plate), stone wool, λ_D = 0,035 W/mK		A1[5)]	EN 13162
	ISOVER Lightweight KL 33, glass wool, λ_D = 0,031-0,035 W/mK		A1	EN 13162
Barriers				
Wind barrier	Wind barrier DuPont Tyvek 2460 B		E	EN 13859-2
	Wind barrier DuPont Tyvek 2480 B		E	EN 13859-2
	Products with SINTEF Technical Approval for the actual field of use		-	-
Sub roofing	Combined sub roofing and wind barrier DuPont Tyvek 2508B		E	EN 13859-1
	Products with SINTEF Technical Approval for the actual field of use			
Vapour barrier	Rani Mo Bar Vapour barrier		-	EN 13984
	Products with SINTEF Technical Approval for the actual field of use		-	-
Roofing	Protan SE		See TG 2010	EN 13956
	Sarnafil TG 66-15 FPO roof- and waterproof membrane		See TG 2521	EN 13956
	Sikaplan VGWT-12 and -15 PVC roofing layer		See TG 2057	EN 13956
Fixing material				
Tape, interior use	SIGA tighting system		See TG 20134	
	Products with SINTEF Technical Approval for the actual field of use		-	
Tape, exterior use	SIGA tighting system		-	
	DAFA UV Tape		-	
	Products with SINTEF Technical Approval for the actual field of use		-	
Nails / screws	Screws, nails, and other metal fittings for fixing of exterior cladding shall be hot dipped galvanized or have another similar corrosion protection.		-	EN 14592
Wet room				
Membran	Tarko Dry wet room membrane		See TG 2598	
	Products with SINTEF Technical Approval for the actual field of use		-	
Innvendig kledning	Fibo Trespo wet rom panel		See TG 2289	
	Products with SINTEF Technical Approval for the actual field of use		-	
Vannrør	Uponor Sanitary water system PEX		-	
	Products with SINTEF Technical Approval for the actual field of use			
Avløpsrør	Uponor HTP grey water system		-	
	Products with SINTEF Technical Approval for the actual field of use			
Sluk	Vieser Floor drain	0441	-	
	Products with SINTEF Technical Approval for the actual field of use			
Diverse				
Vinduer / dører	Windows and doors are not a part of the approval, but products which shall be used in these modules have to satisfy requirements for heat loss and tightness which is described in the Norwegian regulation (TEK)			EN 14351-1

[1)] Not mentioned material dimensions shall be like described in the "Standard constructions details" or as design considered for each single project
[2)] Product has a SINTEF Environment certificate (MS) or a SINTEF product certificate (PS)
[3)] Classified according to EN 13501-1 for Reaction to fire, used according to "Standard constructions detail catalogue"
[4)] Components shall be CE-marked according to shown product standard, technical specification or ETA
[5)] For building units which shall have fire resistance, see to point 6 Conditions for use

3. Field of application

Module Tech Building system can be used for buildings in risk class 1-6 in fire classes 1 and 2.

The building system is only evaluated for use in the risk classes and fire class as stated here. Other use is not covered by this approval. Use of the product in other buildings with stricter requirements and pre accepted performances than given for houses in TEK 17 with guideline must be considered separately in each case. See point 6

Before Module Tech Building system is selected for use in a project, it must also be checked whether the project requires more stringent or different properties than those specified.

4. Properties

4.1 Load bearing properties

The structural capacity of load-bearing elements needs to be calculated separately in full for each individual building project as shown in point 6.1.

4.2 Properties related to reaction to fire

Reaction to fire classifications according to EN 13501-1 for products included in Module Tech Building systems 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 is given in Table 2. The fire resistance is determined by calculations based on the handbook Brandsäkra Trähus version 3 and EN 1995-1-2. The given fire resistance is only valid for the specified constructions as given in figure 1 – 6, "Standard construction details" and materials as given in Table 1.

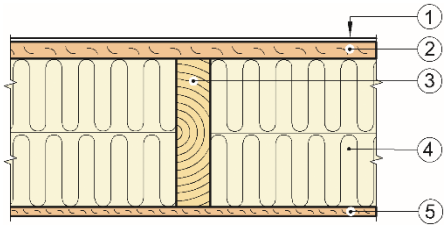
The fire resistance is determined for one-sided fire exposure from the inside for external walls, and fire exposure from below for floors and roofs. For internal walls the fire resistance is determined for one-sided fire exposure, unless otherwise stated in Table 2.

Fire resistance for structures not described in Table 2 shall be documented in accordance with the relevant and applicable instructions in the SINTEF Building Research Design Guide, fire resistance tests or recognised calculation methods, for example EN 1995-1-2:2004 or Brandsäkra trähus versjon 3.

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.

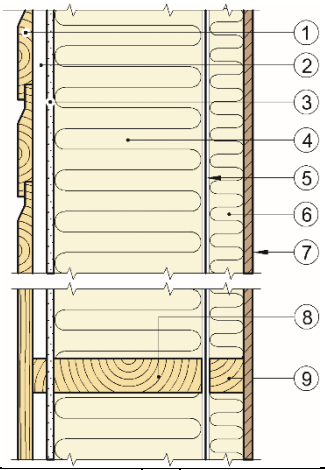
The insulation in the roof/floor constructions is in some cases assumed to be held in place. See point 6.2 Safety in case of fire related to Special conditions for use.

It is assumed that the main bearing system is dimensioned and projected for respectively R 30 or R 60 in each case.



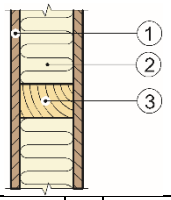
1	Flooring	4	Thermal insulation
2	22mm OSB-Plate	5	9 mm OSB Plate
3	Beams c-c 600 mm		

Fig. 2
Principle design of floor element right over basement



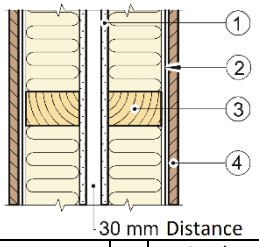
1	min. 19 mm ext. cladding	6	45 mm Thermal insulation
2	Battens c/c 600 mm	7	Internal lining
3	Wind barrier	8	Studs c/c 600 mm
4	Thermal insulation	9	45 x 45 mm battens
5	Vapour barrier		

Fig.3
Principle design of external walls with horizontal cladding.



1	Internal lining	3	Studs c/c 600 mm
2	Thermal insulation		

Fig. 4
Principle design of internal walls.



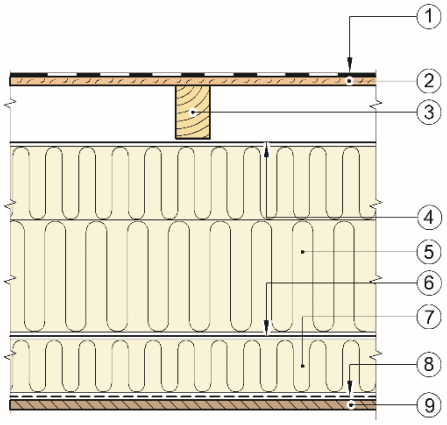
1	Gypsum plasterboard	3	Studs c/c 600 mm and thermal insulation
2	Vapour barrier	4	Internal lining

Fig. 5
Principle design of apartment unit separating walls.

Table 2
Fire resistance for building units with fire cell separation or load bearing functions.

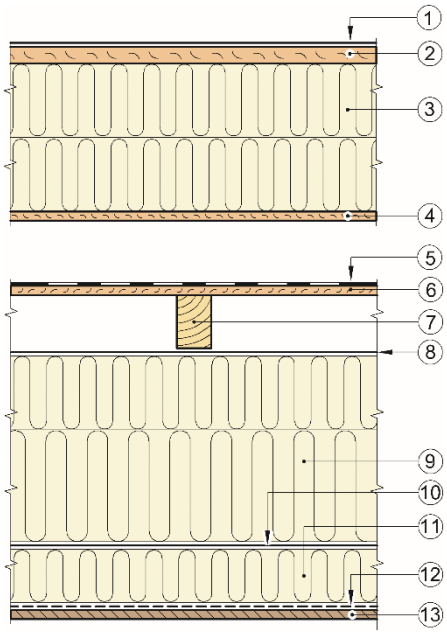
Building unit and internal lining	Fire-resistance[1]	Design load capacity for limit state fire[2)]
(Self)supporting exterior wall, height ≤ 2,4 m		
Type: EWP-01P 15 mm gypsum type F/45 x 145 mm studs C24/145 mm mineral wool	REI 30	24,2 kN/m
Type: EWP-01FiP 2 x 15 mm gypsum type F/45 x 195 mm studs C24/50 + 195 mm mineral wool	REI 60	335 kN/m
(Self)supporting inetrnal wall, height ≤ 2,4 m, single sided fire exposure		
Type: InW-05P 12,5 mm gypsum type A/45 x 70 mm stender C24/70 mm mineral wool	REI 30	1,4 kN/m
Type: InW-04GP_GP 15 mm gypsum type F/12,5 mm gypsum type A/45 x 95 mm studs C24/95 mm mineral wool	REI 60	36 kN/m
Apartment unit separating walls		
Type: EW-04GP + EW-04GP 15 mm gypsum type F/12,5 mm gypsum Type A/45 x 95 mm studs C24/95 mm mineral wool	REI 60	36 kN/m [3)]
Floors between modules		
Type: R-02* + F01 2 x 12,5 mm gypsum type A/45 x 195mm studs C24/70 + 195 mm mineral wool	REI 30	Full capacity
Type: R-02FiFI + F01 11 mm Huntonit Brannit/15 mm gypsum type F/70 mm mineral wool/15 mm gypsum type F/195 mm mineral wool	REI 60	1,4 kNm [4)]
Type: R-02GG*+ F01 11 mm Huntonit Brannit/12,5 mm gypsum type A/70 mm stone wool/12,5 mm gypsum type A/195 mm stone wool	REI 60	Full capacity
Roof construction		
Type: RP-01FiP / RP-02FiP 11 mm Huntonit Brannit/70 mm mineral wool/15 mm gypsum type F/195 mm mineral wool	REI 30	Full capacity
Type: RP-03GP / RP-04GP 11 mm Huntonit Brannit/70 mm stone wool/12,5 mm gypsum type A/195 mm stone wool	REI 30 REI 60	Full capacity 2,9 kNm [4)]
Type: RP-05FIP / RP-06FiP 2 x 15 mm gypsum type F/70 mm mineral wool/15 mm gypsum type F/ 195mm mineral wool	REI 60	2,3 kNm [4)]
Type: RP-07GP / RP-08GP 11 mm Huntonit Brannit/12,5 mm gypsum type A/70 mm stone wool/ 12,5mm gypsum type F/195 mm stonewool	REI 60	2,3 kNm [4)]

[1)] Fire resistance equivalent to classification according to EN 13501-2. The fire resistance for separating (EI) and load bearing (R) elements is given in minutes.
[2)] Vertical design load capacity at accidental limit state in case of fire. "Full capacity" means no reduction in capacities determined at limit state fire. Wall height maximum 2.4 m.
[3)] Design load capacity for each individual wall leaf.
[4)] Thermal insulation needs to be fixed.



1	Roofing layer	6	Vapour barrier
2	OSB-Plate	7	Thermal insulation
3	Bevelled beams (ventilation)	8	Steel mesh
4	Combined sub roof and wind barrier.	9	Internal cladding
5	Thermal insulation		

Fig. 6
Principle design of module roof



1	Flooring	8	Combined subroof and wind barrier
2	22mm OSB-Plate	9	Thermal insulation
3	Thermal insulation	10	Vapour barrier
4	9 mm OSB-Plate	11	Thermal insulation
5	Roofing layer	12	Steel mesh
6	OSB-Plate	13	Internal lining
7	Bevelled beams (ventilation)		

Fig. 7
Principle design of a horizontal module separation

4.4 Sound insulation

With separating wall and floor construction as described in chap. 2, and with construction details for connections as indicated in "Standard construction details", the sound insulation properties in accordance with EN ISO 16283-1 and -2 as well as EN ISO 717-1 and -2, are expected to be as indicated in Table 3 for completed house constructions. This corresponds to sound insulation class C in accordance with NS 8175.

Table 3
Expected sound insulation in the finished construction

Construction	Airborne apparent sound insulation R'w	Impact apparent sound insulation L'n,w
Floor between units (fig. 5)	59 dB[1)]	54 dB[1)]
Separation wall between apartment units Type EW-04GP + EW-04GP	≥ 55 dB	≤ 53 dB

[1)] measured on site

Values for impact apparent sound insulation on floors does not satisfy the minimum requirement between dwellings according to Norwegian regulation (TEK) without additional measures. Partial construction with for example floating floor systems with proven sound insulation values is recommended. To satisfy SINTEF's recommended requirements for sound insulation between dwellings, we refer to solutions in SINTEF Building Research Design Guide 522.511 Lydisolerende etasjeskillere med trebjelkelag i bolig. Sound insulation also depends on the installation of technical installations, which must be assessed in each individual building project.

4.5 Thermal insulation

Table 4 shows thermal transmittance values, U-values, for standard module designs described in point 2, calculated according to EN ISO 6946. U-values for external walls are based on 16 % timber proportion, for horizontal building units 10 %, and do not include thermal loss due to extra timber around door and window openings. The values apply to a spacing of c/c 600 mm for studs, joists and rafters.

Table 4
Thermal insulation transmittance, U-values, for Module Tech Bulding system

Building unit		Insulation-thickness [1)] mm	U-value W/m²K
External wall (fig. 2)			
Stud 45x195 mm	+ batten + 45 x45 mm	250	0,18
Floor over basement (fig. 6)			
Floor beam 45 x 240 mm		250	0,16
Roof (fig. 4)			
Rafter 45 x 240 mm	+ batten + 45 x 70 mm	310	0,13

[1)] Mineral wool with thermal conductivity λ_D = 0,033 W/mK

4.6 Durability

Module Tech Building System satisfies the general requirements recommended by SINTEF in terms of building envelopes durability when modules intended for permanent construction.

The modules intended for temporary construction have little roof slope and limited ventilation of the roof structure and exterior panel. It is therefore to be expected that ice may form on the roof during periods, and that the lifetime of the external envelope may be somewhat shorter than what is expected for buildings intended for more than temporary use.

5. Environmental aspects

Substances hazardous to health and environment

Module Tech Building System contains 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. The health and environmental evaluation do not include the surface treatment of outdoor wood panelling.

Effect on indoor environment

The product is 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.

Effect on soil, surface water and ground water

The leaching properties of the products which are included in Module Tech Building System are evaluated to have no negative effects on soil or ground water.

Effect on drinking water

Products in Module Tech Building System are assessed not to release compounds to drinking water in an amount that is deemed to cause taste, odour or health hazards.

Waste treatment/recycling

Module Tech Building System shall be sorted as wood, metal, gypsum, residual waste or other appropriate waste fractions. The product shall be delivered to an authorized waste treatment plant for material recovery, energy recovery or disposal.

Environmental declaration

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

6. Special conditions for use and installation

6.1 Structural design

For each delivery a full structural calculation of the necessary loadbearing capacity of the elements shall be worked out and documented according to NS-EN 1995-1-1 (for timber constructions) with loads according to EN 1991-1 including national annexes.

6.2 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' mounting instructions and the principles in SINTEF Building Research Design Guide 543.204 Montering av gips-, spon- og trefiberplater på vegger og himlinger.

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 Design Guide 520.342 Branntetting av gjennomføringer.

The insulation in roofs and in the floor slabs which does not reach the full residual capacity of the load-bearing capacity need to be fixed with steel wire of minimum 1,5 mm diameter, minimum three steel wires per insulation plate and maximum spacing c/c 350 mm. Alternatively, a steel wire mesh with a minimum diameter of 1,5 mm can be strung under the beams, fastened with minimum 50 mm long staples.

6.3 Design consideration of sound properties of buildings with several dwellings

For use in buildings with several dwellings, the elements/modules must be executed, included floor elements, and supporting external- and internal walls adapted to reduced sound transmission as specified in "Standard construction details".

Resilient supports terminations and penetrations must be provided against all walls and transitions.

Vibration-damping components shall be placed between the sill of the upper floor elements are rested on. Ceiling construction shall be rested on a separated top sill. Vibration elements shall be dimensioned for the actual load. Any temporary covering of the canopy elements must be removed prior to installation of the joist elements.

In general, care should be taken when installing water pipe penetrations. Ventilation ducts or other installations in sound insulating partition structures.

6.4 Design consideration of thermal insulation

For each delivery, the required energy efficiency according to TEK must be considerated for the actual construction project. The U-values given in section 4.5 can be used for checking the minimum requirements in TEK. Calculation of the total heat gain for each building need to be done with a specific calculation program.

6.5 Foundation

Module Tech Building System shall be placed on a basement, ringfoundation or open foundations which satisfies manufacturers requirement for tolerances for distances and levelling.

It is assumed that the foundation satisfies the principles of ventilation under the modules and protection against moisture ceilings in three materials as shown in the SINTEF Building Research Design Guide.

6.6 Mounting

Module Tech Building System shall be mounted according to “Standard construction details” and specific mounting details, performed for each separate project.

6.7 Wet room

Wet rooms must be designed and constructed in such a way that they at least satisfy the minimum requirements for preaccepted solutions given in the guidance to TEK.

Wet rooms must be designed and constructed in accordance with the principles described in the SINTEF Building Research Design Guide and Byggebransjens Våtromsnorm (BVN) as well as product certificates and technical approvals for the materials and components used in the wet room, see Table 1.

6.8 Transport and storage

The Module Tech Building System must be protected against precipitation during transport and storage with a suitable wrapping. Also during transport and storage, the Module Tech Building System must be placed on a level surface with support in the same places as required for foundations in general.

7. Factory production control

The product is produced of Module Tech OÜ, Loovälja tee 9, 74207 Liivamäe, Estonia.

The holder of the approval is responsible for the factory production control in order to ensure that Module Tech Building System is produced in accordance with the preconditions applying to this approval.

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

8. Basis for the approval

The evaluation of Module Tech Building System is based on reports owned by the holder of the approval.

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

9. Marking

Each delivery of the elements/modules must be accompanied by delivery documents containing at least the name and address of the manufacturer, project identification and installation specifications for the current construction project. The construction details shall be in accordance with the details given in the "Standard construction details for product name belonging to SINTEF Technical Approval No 20250". It can also be marked with the approval mark for SINTEF Technical Approval; TG 20250.

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