

SINTEF Technical Approval

TG 20360

SINTEF confirms that

Skymedis 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

JSC Skydmedis
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 LT-35100 Panevėžys
 Lithuania
www.skydmedis.lt

2. Product description

Skydmedis Building System encompasses composite timber and timber frame construction elements for walls, floors and roofs. The elements are custom made to suit each individual building project.

2.2 Scope

This approval encompasses standard design of the elements, including joints and connection to foundations. Fields of application is described in chapter 3.

The approval does not include surface materials, doors or windows. However, windows and doors are normally installed in the factory. The approval neither encompasses roofing, gutters and downpipes, nor supplementary structures such as e.g., stairways and balconies. Wet rooms are built on site. Suspended floor constructions above foundations are not included in the approval.

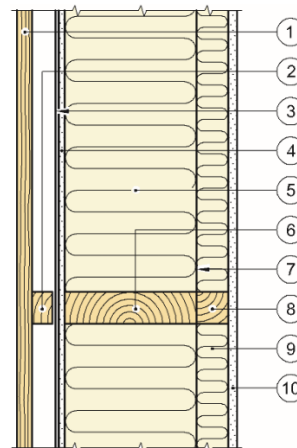
The principle design of standard elements is described in chapter 2.3 – 2.7. Specification of individual materials and components for the elements are shown in Table 1. The properties and performance of these materials and components must be documented by the respective manufacturers or suppliers.

Detailed design and construction details for the elements are shown in "Standard construction details for Skydmedis Building System pertaining to SINTEF Technical Approval 20360." The version filed at SINTEF Community at any one time constitutes a formal part of the approval.

2.3 External walls

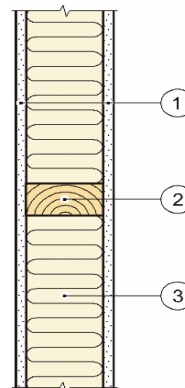
Fig. 1 shows the principle design of standard external walls. The elements are storey-high and the length is adjusted to suit the house type and/or to facilitate transport.

External wall elements are normally delivered to the building site with exterior cladding, wind barrier, insulation and water vapour barrier, and with windows and possible doors installed at the factory. The walls are made with a total thermal insulation thickness from 240mm (195+45) to 290mm (245+45) as required. Internal battens, insulation and lining inside the water vapour barrier is normally executed on the building site.



1	External cladding	6	Studs 45 mm x 195/245 mm c/c 600 mm
2	Battens c/c 600 mm	7	Vapour barrier
3	Wind barrier roll product	8	Battens
4	Wind barrier gypsum board	9	Mineral wool
5	Mineral wool	10	Internal lining

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



1	Internal lining
2	Studs 45 mm x 95/145/195 mm
3	Mineral wool

Fig. 2
 Principle design of internal load bearing wall.

SINTEF is the Norwegian member of European Organisation for Technical Assessment, EOTA, and European Union of Agrément, UEAtc

Table1

Skydmedis Building System. Material specifications

Material / component	Spesification 1)	TG/PS 2)	Fire classification 3)	CE-marking 4)
Structural components				
Timber	Strength graded structural timber with class C24 or according to specific structural calculations.from Stora Enso. Moisture content max. 18 %	-	D-s2, d0	EN 14081-1
Impr. Timber	SIA Vaives,C24 Impregnated timber			
Glued laminated timber	Peetri Puit OÜ Gluelam C24, CLT, KVH or according to specific structural calculations. Formaldehyde class E1	-	D-s2, d0	EN 14080 EN-14081
Timber I-joists	Steico I-joists type SJOSB, or according to specific structural calculations	TG 20381	D-s2, d0-	ETA-06/0238
Board materials				
Floor sheathing	- 22 mm Swiss Kronos OSB/3 board	TG 2575	D-s2, d0	EN 13986
	- 22 mm Forestia Gulv particleboards	TG 2280	D-s2, d0	EN 13986
	- 36 mm Hunton Silencio / Thermo	TG 2330	D-s2, d0	EN 13986
Roof sheathing	- 22 mm Forestia Sponplate Extra	TG 2280	D-s2, d0	EN 13986
	- 22 mm Swiss Kronos OSB/3 Particleboard	TG 2575	D-s2, d0	EN 13986
Wind barrier	- 9.5 mm Saint Gobain GTS 9 gypsum board		A2-s1, d0	EN 520
Claddings and linings				
External cladding	19 mm solid wood cladding grade A in accordance with EN 15146 from Moelven or Stora Enso	-	D-s2, d0	EN 14915 EN 14519 EN-15146
Internal lining	- 12.5 mm Saint Gobain Rigips gypsum board type A		A2-s1, d0	EN 520
	- 12.5 mm Saint Gobain Rigips Pro Hydro Type H2		A2-s1, d0	EN 520
	- 15 mm Saint Gobain Rigips Pro Fire + Type DF		A2-s1, d0	EN 520
	- 12.5 mm Fermacell fibre gypsum board	TG 20122		ETA-03/0050
Thermal insulation				
Mineral wool	- Rockwool Superrock stone wool with declared conductivity $\lambda_D = 0.037$ W/mK	-	A1	EN 13162
	- Paroc Ultra stone wool with declared conductivity $\lambda_D = 0.034$ W/mK		A1	
Membranes and sealings				
Wind barrier, and subroofing roll product	- Dupont Tyvek, Tyvek Soft 2460B, wind barrier	TG 2043	E	EN 13859-2
	- Dupont Tyvek, Tyvek UV Facade 2524B	TG 2043	E	EN 13859-2
	- Dupont Tyvek, Tyvek FireCurb HouseWrap	TG 2043	E	EN 13859-2
	- Dupont Tyvek, Tyvek Supro 2506B		B-s1,d0	EN 13859-2
	- Dupont Tyvek, Tyvek Pro 2508B	TG 2143	E	EN 13859-2
	- Dupont Tyvek, Tyvek Solid 2480B			EN 13859-2
	- Siga, SIGA Majcoat	TG 20131	E	EN 13859-2
	- Siga, SIGA Majvest	TG 20131	E	EN 13859-2
Water vapour control layer	- AB Rani Plast Oym, RaniMoBar Dampsperre	TG 20201		
	- DuPont Tyvek, AirGuard SD23			
	- DuPont Tyvek, AirGuard Smart 2009B			
	- Siga, SIGA Majrex			
	- Siga, SIGA Majpell 5			
Tape	- Dupont Tyvek, Flexwrap			
	- Siga tapesystem Wigluv, Sicrall, Corvum, Fentrim 2, Rissan.	TG 20134		
	- Dupont Tyvek, Tyvek Tape Plus 2062B			
	- Dupont Tyvek, Tyvek Plastering Tape			
	- Dupont Tyvek, Tyvek Butyl Tape			
	- Dupont Tyvek, Tyvek UF Facade Tape 1312F			-
Fastener products				
Nails / screws	Screws, nails and metal fastenings for external claddings from Essve or Eurotec etc. shall have hot dip zinc coating or equal effective corrosion protection	-	-	EN 14592
Floor adhesives	Essve Sponplatelim hybrid		-	-
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 20360" or according to specifications given for each individual building project

²⁾ The component shall be in accordance with the specified SINTEF Technical Approval (TG) or SINTEF Product Certificate (PS)

³⁾ Fire classification according to EN 13501-1, for applications according to "Standard construction details"

⁴⁾ The component shall be CE-marked according to the specified standard or ETA

2.4 Internal walls

Fig. 2 shows the principal design of standard internal walls. The principal design of internal partition walls comprises 45 mm x 95 mm studs of structural timber spaced c/c 600 mm, with a layer of 12.5 mm gypsum board on each side. The elements are storey-high with lengths adjusted to suit to the house type and floor plan. The walls are normally insulated with mineral wool, and stud dimension suited for possible load bearing requirements.

2.5 Separating walls between apartments.

Fig. 3 shows the principal design of walls between separate apartments, based on storey-high wall elements installed as double walls. The elements are assembled in the factory, apart from the outermost gypsum board layer which is installed on the building site with staggered joints.

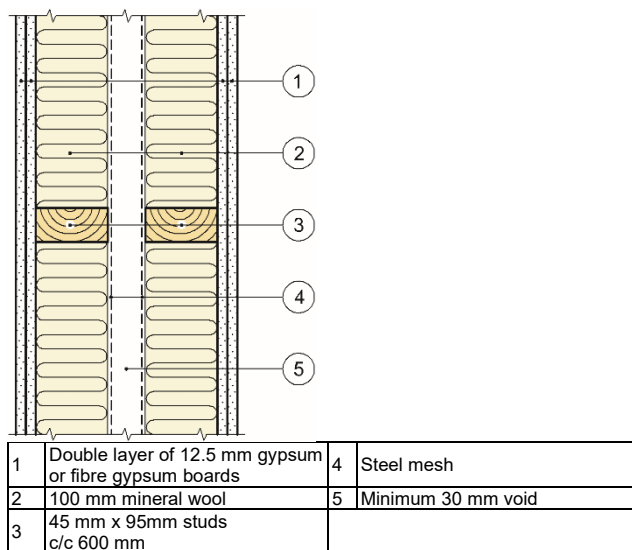


Fig. 3
Principle design of separating wall housing units

2.6 Floors

Fig. 4 shows the principle design of floating floors inside the same housing unit. Standard element width is 2.4 m. The length is adjusted to suit the house width. The elements are normally delivered on-the building site with joists, floor sheathing (subfloor) and to some extent insulation, while further completion is carried out on the building site. For floors between separate apartments, see fig 5, the elements are supplemented with a floating floor on top and a ceiling construction as recommended in SINTEF Building Research Design Guide 522.511 *Lydisolerende etasjeskillere med trebjelkelag i boliger*.

Standard floors are designed for stiffness in accordance with SINTEF Building Research Design Guide 522.351 *Trebjelkelag. Dimensjonering og utførelse* unless no other specification is made for each specific building project.

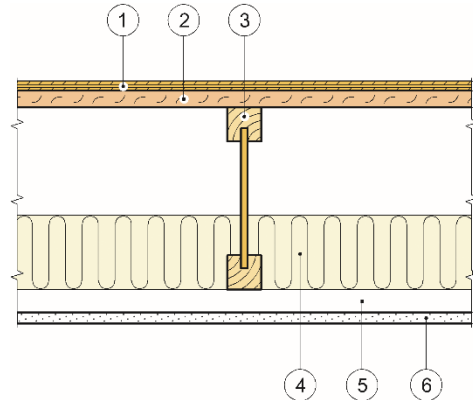
2.7 Roof elements

Fig. 6 shows the principle design of roof elements. The load-bearing structure is based on rafters of I-beams or structural timber 300/350 +45 c/c 600 mm, alternatively on rafters made of glue laminated timber as indicated in Table 1.

The roof elements are normally delivered on the building site with battens, counter battens, combined roofing underlay and wind barrier, thermal insulation and water vapour barrier.

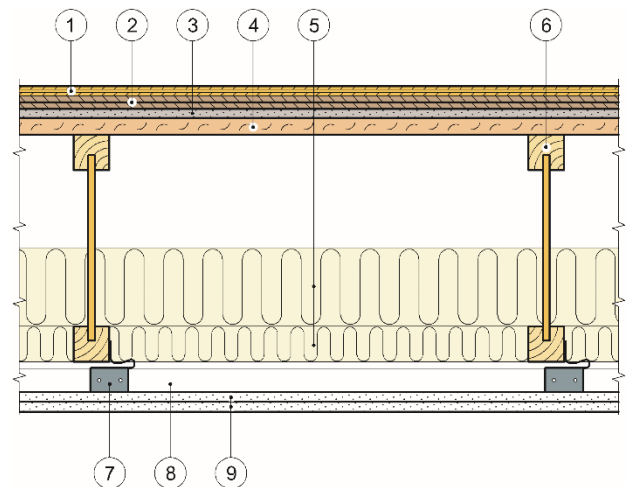
2.8 Construction details in general

It is presumed that assembly and construction details for Skydmedis elements which are not covered by "Standard construction details for Skydmedis Building System pertaining to SINTEF Technical Approval TG 20360" are in accordance with the relevant recommendations in the SINTEF Building Research Design Guides.



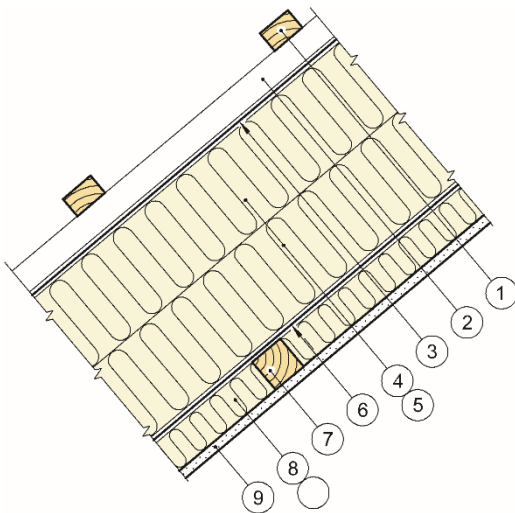
1	Flooring	4	Mineral wool
2	Floor sheathing	5	Battens
3	Joist c/c 600 mm	6	Ceiling lining

Fig. 4
Principle design of suspended floor inside a housing unit



1	Flooring	6	Joist c/c 600 mm
2	Floor sheathing	7	Acoustic profile
3	Mineral wool	8	Battens c/c 600 mm
4	Joist c/c 600 mm	9	Internal lining 2 layers of gypsum boards
5	Mineral wool		

Fig. 5
Principle design of separating floor between housing units



1	Battens	6	Vapour barriers
2	Battens	7	Battens
3	Combined roofing underlay and wind barrier	8	Mineral wool
4	Mineral wool	9	Internal lining
5	Rafters		

Fig. 6
Principle design of insulated roof elements

3. Fields of application

The building system is primarily for use as housing.

Skydmedis Building System can be used for buildings in risk class 1-6 in fire class 1, and residential buildings with 3 stories if each residential unit has direct access to the terrain without having to escape via stairs or staircases.

The building system is only evaluated for use in the risk classes and fire class as stated here, other use is not covered by the 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 chap. 6 regarding special conditions for use and installation.

4. Properties

4.1 Load-bearing capacity

The structural capacity of load-bearing elements is calculated separately in full for each individual building project in accordance with NS-EN 1995-1-1 with national annex NA, and NS-EN 1991-1-1, 3 and 4 with national annexes NA for imposed loads, snow loads and wind loads.

4.2 Fire resistance

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

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 for Skydmedis Building System" 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.

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 fastening of the boards must be in accordance with the supplier's instructions.

Table 2

Skydmedis Building System – Fire resistance and design load capacity for limit state fire

Structure, in accordance with: "Standard construction details for Skydmedis Building System belonging to SINTEF Technical Approval nr. 20360"		Fire resistance ¹⁾	Design load capacity for limit state fire ²⁾
External walls, Fig. 1			
Alt. A	- 12.5 mm gypsum plasterboard type A - 195 mm stone wool insulation	REI 15	Full capacity
Alt. B	- 12.5 mm gypsum plasterboard type A - 195 mm stone wool insulation	REI 30	19 kN/m
Alt. C	- 2 layers 12.5 mm standard gypsum plasterboards type A - 195 mm stone wool insulation	REI 30	Full capacity
Internal load-bearing walls, Fig. 2			
Alt. A	- 12.5 mm gypsum plasterboard type A - 100-150 mm stone wool insulation	R 15	Full capacity
Alt. B	- 2 layers 12.5 mm standard gypsum plasterboards type A - 100-150 mm stone wool insulation	R 30	Full capacity
Separating walls between residential units, Fig. 3			
Alt. A	- 2 layers 12.5 mm standard gypsum plasterboards type A - 100 mm stone wool insulation	REI 30	Full capacity ³⁾
Floor above foundation, Fig.4			
Alt. A	- 12.5 mm gypsum plasterboard type A - 200 mm stone wool insulation	R 15	Full capacity
Floor between residential units, Fig.5			
Alt. A	- 2 layers 12.5 mm standard gypsum plasterboards type A - 200 mm stone wool insulation	REI 30	Full capacity
Roof with rafters Fig.6			
Alt. A	- 12.5 mm gypsum plasterboard type A - 300 mm stone wool	REI 15	Full capacity
Alt. B	- 2 layers 12.5 mm standard gypsum plasterboards type A - 300 mm stone wool	REI 30	Full capacity

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.

4.3 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 for Skydmedis Building System pertaining to SINTEF Technical Approval TG 20360", 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
Estimated sound insulation performance in completed houses

Structure	Estimated, weighted apparent sound reduction index $R'w$	Estimated weighted normalised impact sound pressure level $L'_{n,w}$
Floors between apartments	≥ 55 dB	≤ 53 dB
Separating walls between apartments	≥ 55 dB	≤ 53 dB -

The values 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.

5.4 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 11 % timber proportion, 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 transmittance values, U-values

Structure, with structural timber spaced c/c 600 mm	Total insulation thickness ¹⁾ mm	U-value $W/(m^2K)$
External wall		
Studs-		
- 45 mm x 195 mm + 50 mm framing	245	0,17
- 45 mm x 245 mm + 50 mm framing	295	0,14
Roof elements		
Rafters		
-- 300 + 50 mm framing	345	0,13
- 350 + 50 mm framing	395	0,11

¹⁾ Mineral wool with thermal conductivity $\lambda_D = 0,037$ W/mK

5. Environmental aspects

5.1 Substances hazardous to health and environment

Skydmedis 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.

5.2 Effect on indoor environment

Skydmedis Building System 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.

5.3 Waste treatment/recycling

Skydmedis 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.

5.4 Environmental declaration

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

6. Special conditions for use and installation

6.1 Structural design

For each delivery a full structural calculation of the necessary load-bearing capacity of the elements shall be worked out and documented according to NS-EN 1995-1-1 with loads according to EN 1991-1. Capacity in the case of fire shall be worked out and documented according to NS-EN 1995-1-5.

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 fitting 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.*

Shafts for technical installations must be designed with fire resistance equivalent to the required fire resistance for the building, or with a fire rated penetration seal in the fire separating building part.

6.3 Insulation

Beyond what is stated in cl. 5.4 the necessary thermal insulation and U-values according to TEK shall be determined and verified for each individual building project.

6.4 Installation

The elements shall be installed as shown in "Standard construction details for Skydmedis Building System pertaining to SINTEF Technical Approval TG 20360."

Anchoring to foundations and connections between the elements shall be carried out according to the structural design for the required wind load resistance in the specific building project. Special attention must be paid to temporary load situations during erection of the building that may lead to reduced load-bearing capacity or other functions.

6.5 Transport and storage

Finished elements must be protected from exposure to precipitation during both transport and storage.

7. Factory production control

Skydmedis Building System is produced by JSC Skydmedis, Pramonės g. 5, LT-35100 Panevėžys, Lithuania

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

The manufacturing of Skydmedis 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 evaluation of Skydmedis 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 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 Skydmedis Building System belonging to SINTEF Technical Approval TG 20360". The approval mark for SINTEF Technical Approval No. 20360 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