

SINTEF Building and Infrastructure confirms that

Skydmedis 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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 Lithuania
www.skydmedis.lt

2. Manufacturer

JSC Skydmedis, LT-35100 Panevėžys, Lithuania

3. Product description

Skydmedis building system encompasses composite timber frame construction elements for walls, floors and roofs. The elements are custom made to suit each individual building project. This approval encompasses standard design of the elements, including joints and connection to foundations.

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 ch. 3.2 – 3.6. Specification of individual materials and components comprising 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 Building and Infrastructure at any one time constitutes a formal part of the approval.

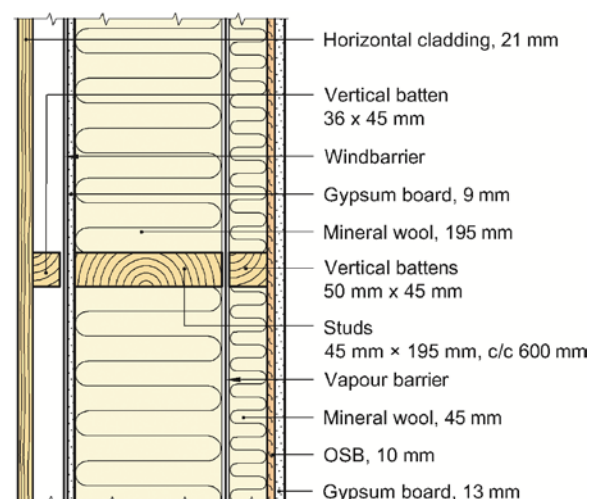


Fig. 1
 Principle design of external walls with horizontal cladding.

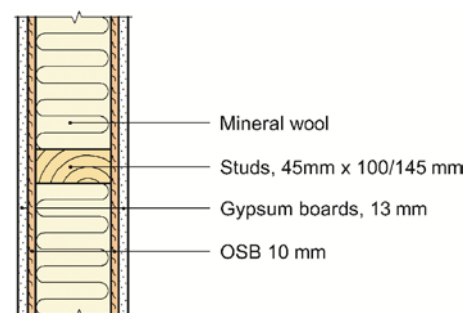


Fig. 2
 Principle design of internal loadbearing wall.

3.2 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 total thermal insulation thickness from 245 mm to 295 mm as required. Internal framing, insulation and lining inside the water vapour barrier is normally executed on site.

3.3 Internal walls

Fig. 2 shows the principle design of standard internal walls. The principle design of internal partition walls comprise 45 mm x 100 mm studs of structural timber spaced c/c 600 mm, with a layer of 12.5 mm gypsumboard and 10 mm OSB 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 requirement.

Table1
Skydmedis Building System. Material specifications

Material / component	Specification (Non-advised material dimensions are to be as specified in "Standard construction details" or as specified for each individual building project)
Load-bearing components	
Timber in walls, floors and roof	Structural timber graded to strength class C24 according to EN 338, machine graded according to EN 14081, or in accordance with specific calculations. Laminated timber according NS-EN 1194/NS- EN 14080, formaldehyde class E1, with quality rating according to specific metrics.
Prefabricated beams	- Steico I-joists in accordance with ETA 06/0238
Subfloor	- Kronoply OSB/3 22 mm according to SINTEF Technical Approval no. 2575
Roof sheathing	- Kronoply OSB/3 22 mm according to SINTEF Technical Approval no. 2575
Fastener products	
Screws, nails and metal fasteners	Screws, nails and fasteners for exterior cladding, anchoring, etc. must comply with requirements in EN 14592.
Adhesive tape	- SIGA Tapes according to SINTEF Technical Approval no. 20134
Sealing compound	Bostik Silmax sealing compound 2620
Insulation material	
Thermal insulation	Mineral wool insulation in accordance with EN 13162, with declared thermal conductivity max. $\lambda_D = 0.037$ W/mK, and fire classification A1 in accordance with EN13501-1, characterised as not combustible in compliance with EN ISO 1182.
Air and moisture barriers	
Water vapour control layer	- DuPont Airguard Smart according SINTEF Technical Approval no. 20321
Wind barrier	- GU 9 gypsumboard in accordance with EN 520, Type EH. - SIGA Majvest according to SINTEF Technical Approval no. 20131
Combined wind barrier and underlayer roof	- SIGA Majvest according to SINTEF Technical Approval no. 20131 - Tyvek Pro according SINTEF Technical Approval no. 2134
Cladding	
Exterior cladding	Wall: - 9 mm gypsumboards type A in accordance with EN 520.
Interior cladding	Roof: - 12.5 mm gypsum boards type A in accordance with EN 520. Wall: - 12.5 mm gypsum boards type A in accordance with EN 520. - 10 mm OSB boards in accordance with EN 13986. Formaldehyde class E1.
Windows/doors	
	Windows and doors installed in the elements are not covered by this approval, but must comply with thermal insulation and tightness requirements as indicated in regulations on technical requirements for building works (TEK).

3.4 Separating walls between apartments

Fig. 3 shows the principle 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 inner most gypsumboard layer which is installed on site with staggered joints.

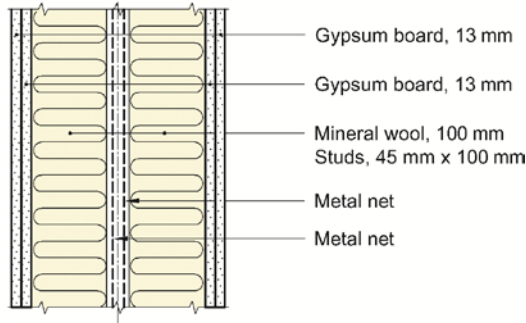


Fig. 3
Principle design of separating wall between apartments

3.5 Floors

Fig. 4 shows the principle design of suspended 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-site with joists, floor sheathing (subfloor) and to some extent insulation, while further completion is carried out on site. For floors between separate apartments the elements are supplemented with a floating floor on top and a ceiling construction as recommended in SINTEF Building Research Design Guide 522.511. See fig. 5.

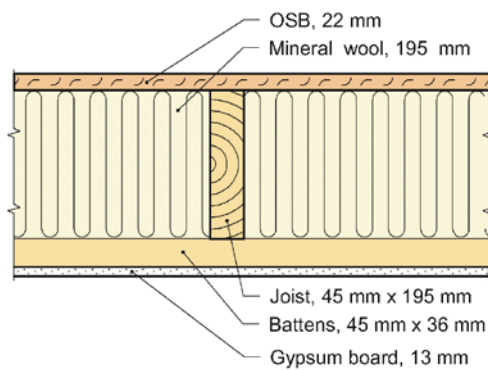


Fig. 4
Principle design of suspended floor inside a housing unit

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

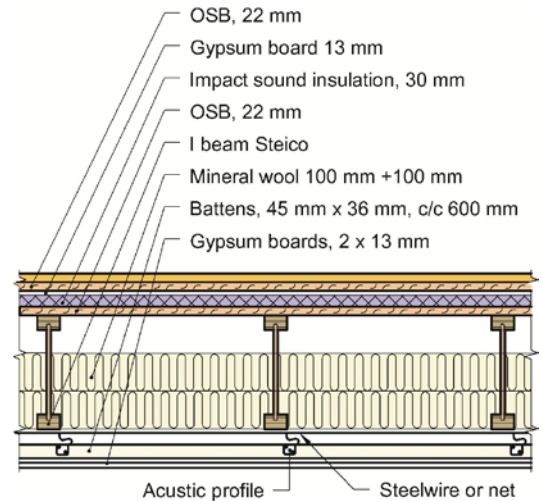


Fig. 5
Principle design of separating floor between housing units

3.6 Roof elements

Fig. 6 shows the principle design of roof elements. The load-bearing structure is based on 45 mm x 295 mm structural timber rafters spaced c/c 600 mm, alternatively on rafters made of glue laminated timber as indicated in Table 1.

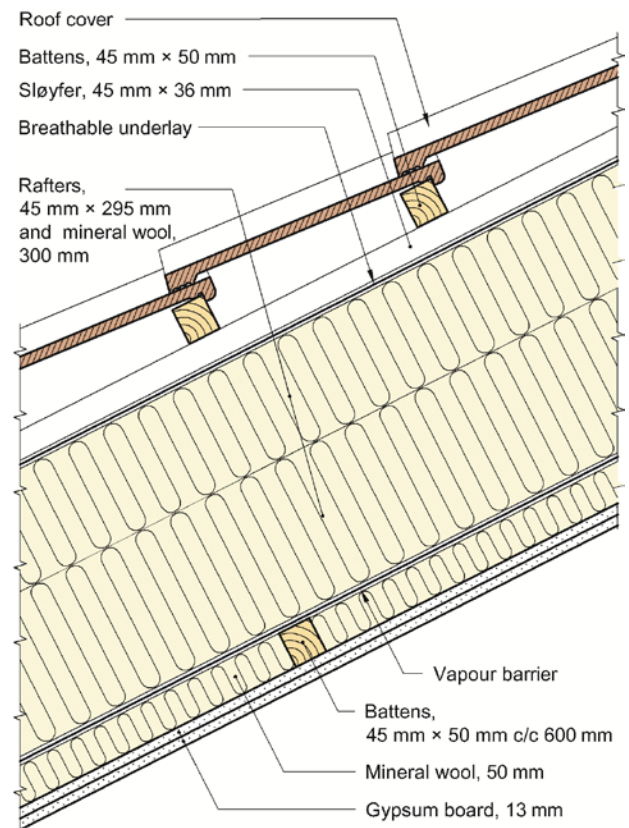


Fig. 6
Principle design of insulated roof elements

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

3.7 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.

4. Fields of application

Skydmedis Building System can be used in single family houses, semi-detached/split-level houses and cabins, restricted to fire class 1 according to TEK. See also cl. 5.2 concerning fire resistance and special conditions for use in cl. 7.

5. Properties

5.1 Load-bearing capacity

The structural capacity of load-bearing elements are 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.

The wall elements may be regarded to provide acceptable lateral wind bracing for low-rise houses of maximum two stories. However, for two-storey houses the wind bracing resistance should be examined more closely if the length of the façade is more than 2.5 times the total length of walls parallel to the wind at ground floor, minus openings for windows and doors.

5.2 Fire resistance

Fire resistance and load-bearing capacity for load-bearing structures is given in table 2. The structural capacity of load-bearing elements in fire situation must be calculated for each individual project according to NS-EN 1995-1-2 with national annex NA. The load-bearing capacity for the given fire exposure time must be checked against the design load for each specific project according to relevant parts of NS-EN 1991.

Fastener lengths necessary for fastening internal boards: 1 layer of 13 mm gypsum boards, fastener length 23 mm. 2 layers of 13 mm gypsum boards, fastener length 35 mm. The fastening of the boards must be in accordance with the supplier's instructions.

5.3 Sound insulation

With separating wall and floor construction as described in chap. 3, 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 NS-EN ISO 140-4 and -7 as well as NS-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 2

Fire resistance and load-bearing capacity after given fire exposure time for fire separating and load-bearing structures in Skydmedis Building System

Structure, with structural timber spaced c/c 600 mm	Fire resistance equivalent to	Load-bearing capacity per beam/stud
External wall. See Fig. 1		
- 45mm x 195mm + 50 mm - Gypsumboard 12.5 mm - OSB-board 10 mm	REI 30 ¹⁾	120 kN
Internal wall. See Fig. 2		
- 45mm x 145mm - Gypsum 12.5 mm - OSB-board 10 mm	REI 30 ⁴⁾	44 kN
Internal separating wall. See Fig. 3		
- 45mm x 100 mm - Gypsum 12.5 mm - OSB-board 10 mm	REI 30 ²⁾	41 kN
Floor. See Fig. 4		
- 45mm x 195mm - Gypsum 12.5 mm	REI 15 ³⁾	4 kNm
Separating floor. See Fig. 5		
- Steico SJ60/240 + 50 mm - 2xGypsum 12.5 mm	REI 30 ³⁾	- ⁵⁾
Roof. See Fig. 6		
- 45x295 + framing - Gypsum 12.5 mm	REI 30 ³⁾	11 kNm

1) One sided fire exposure on the inside

2) One sided fire exposure

3) One sided fire exposure from underneath

4) Two sided fire exposure

5) Load-bearing capacity not reduced after 30 minutes of fire exposure

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	-

5.4 Thermal insulation

Table 4 shows U-values for the elements in accordance with EN ISO 6946. The values apply to a spacing of c/c 600 mm for studs, joists and rafters.

Table 4

U-values for Skydmedis Building System, with mineral wool having thermal conductivity $\lambda_D = 0.037$ W/(mK) and standard design as described in chapter 3.

Structure, with structural timber spaced c/c 600 mm	Total insulation thickness mm	U-value W/(m ² K)
External wall		
Studs		
- 45mm x 145mm + 50mm framing	195	0.22
- 45mm x 195mm + 50mm framing	245	0.18
Roof elements		
Rafters		
- 45x245 + 50mm framing	295	0.15
- 45x295 + 50mm framing	345	0.13

6. Environmental aspects

6.1 Substances hazardous to health and environment

The product 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.

6.2 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.

6.3 Waste treatment/recycling

The product shall be sorted as wood, metal, gypsum, residual waste or other appropriate waste fractions on the building/demolition site. The product shall be delivered to an authorized waste treatment plant for material recovery, energy recovery and disposal.

6.4 Environmental declaration

No environmental declaration (EPD) has been worked out for the product.

7. Special conditions for use and installation

7.1 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 1995-1-2.

For floors between separate apartments it is recommended to design for high floor stiffness in accordance with SINTEF Building Reserach Design Guide No. 522.351.

7.2 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.

7.3 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.

Transport and storage

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

8. Factory production control

The factory production of Skydmedis Building System is subject to supervisory factory production and product control according to contract with SINTEF Building and Infrastructure concerning SINTEF Technical Approval.

9. Basis for the approval

This approval is primarily based on assessments of the manufacturer’s construction design details as well as material and component specifications. Properties are determined on the basis of the following:

- SINTEF Byggforsk’s Design Guide No. 471.010-013 (thermal insulation).
- SINTEF Byggforsk’s Design Guide Nos. 520.321 and 322 (fire resistance).
- SINTEF Byggforsk’s Design Guide No. 522.511-512 (sound insulation).
- SINTEF Byggforsk’s Design Guide No. 524.325 (sound insulation).
- SINTEF Byggforsk Project Memo dated 2013-06-17 (Fire calculations)
- SINTEF Byggforsk Evaluation report 102000691-3 (environmental evaluation)

10. 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.



Approval mark

11. 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

12. Technical management

Project manager for this approval is Daniel Hallingbye, SINTEF Building and Infrastructure, dep. Materials and structures, Trondheim, Norway.

for SINTEF Building and Infrastructure

A handwritten signature in blue ink that reads "Hans Boye Skogstad".

Hans Boye Skogstad
Approval Manager