

Building elements. Guideline for SINTEF Technical Approval

1. Scope

This guideline concerns application for SINTEF Technical Approval (TG) for prefabricated building elements. The guideline is mainly aimed at element designs based on timber and steel structures.

2. Application form

A written application for SINTEF Technical Approval shall be sent to SINTEF by e-mail; certification@sintef.no (or a known contact person at SINTEF). The application form is downloaded from <https://www.sintefcertification.no/file/index/2980>

3. Approval project

An approval project with a project manager and contact person is established when SINTEF has received and registered the application. SINTEF will then send a confirmation and a project contract to the applicant. The applicant should normally be the same body as the future holder of the approval. SINTEF's project manager will be a person in one of SINTEF's technical departments in Oslo or Trondheim.

It is recommended to hold a meeting at SINTEF Certification before sending an application, mainly in order to clarify the scope of a SINTEF Technical Approval and what products and structures should be covered by the approval.

In some cases it may be useful to carry out a limited pilot project before starting an approval project. The purpose of a pilot project is to assist the applicant to clarify the scope of an approval, and how the necessary basis for an approval concerning element performance etc. may be determined.

The approval project includes a revision of the construction details for the building system, specifications of all materials and components in the elements, documentation of the relevant element characteristics and performances, initial factory production control, and drafting an approval document plus a factory production control description.

4. Basis for an approval

4.1 Product description – Construction details

The construction of standard element designs shall be described in detail by the manufacturer's own drawings, including standard connection details between the various parts of a building system. A list of construction details which is normally required is shown in **Appendix 1**. The list includes element systems to be used for multifamily buildings with sound insulation and fire resistance requirements between housing units.

All drawings must have a drawing number and a date for the last valid version. Easier communication and possible cost reduction for the approval project may be obtained if the applicant uses Appendix 1 as part of the application, and lists the relevant drawings as shown in the appendix.

4.2 Product description – Specification of materials and components

All materials and components which are part of the approved element designs shall be specified in detail. Such specifications may be reference to a particular product from a given manufacturer, or to specific products from more than one manufacturer if this is relevant. It is also possible to specify products according to European product standards with relevant product type, class or performance, but such specifications must also require special assessments for use in Norway (in particular properties related to impact on the environment).

Examples of materials and components which are typical parts of wood based element designs are shown in **Appendix 2**. An approval will normally cover the basic element design. Surface materials

like floor covering, wall tiles, paints etc. are in most cases selected individually for each building project, and are normally not part of the approval. This may also be the case for supplementary components like doors and windows. What should be considered as standard design and what does the applicant want to be covered by the approval must be settled at the start of the approval project (see cl. 3).

All materials and components covered by a harmonized European product standard must be CE-marked according to the Construction Products Regulation (CPR).

Materials and components with SINTEF Technical Approval have the advantage of being assessed by SINTEF beforehand, and are then already found fit for use.

4.3 Intended use

The approval shall describe the intended use of the elements, for example building type (residential housing, low rise buildings or multistorey buildings). In particular requirements related to fire classification, sound insulation and structural safety class depend on the intended use.

4.4 Properties and performance

Properties and performances of the standard element designs shall be given in the approval. The applicant must provide the necessary documentation to verify the relevant properties and performances. This documentation may be test reports or calculations. Test reports must be issued by an independent and competent test body accepted by SINTEF.

Product performances may to a large extent be verified by references to SINTEF Building Research Design Guides (Byggforskserien). References may also be made to CE-marking and Declaration of Performance for materials and components used in the elements.

SINTEF may on request assist the applicant to provide the necessary performance documentation for building elements. This is normally done by assignments of separate test or calculation projects.

The element designs shall in general meet the performance requirements given in the Norwegian Regulations on technical requirements for building works (TEK), taking into account the relevant intended use. Minimum preaccepted performances are given in the guidance to the regulations. In addition the element designs must also meet SINTEF's recommended minimum performance levels, given in SINTEF Building Research Design Guides and in relevant SINTEF guidelines for product approvals.

Comments to the most important element performances:

Mechanical resistance and stability

The approval document may state that the structural performance of the element design is calculated and documented for each separate building project and delivery. In order to reduce the necessary documentation in each building project it is also possible, in particular for standard element designs intended for low rise housing, to declare structural design capacities in the approval document. The load bearing performance may for example be given as maximum imposed loads on floors, maximum snow loads on roof and horizontal wind load capacity. Reference to the SINTEF Technical Approval may then be used as documentation in each individual building project.

Mechanical resistance and stability shall be calculated according to the structural design standards EN 1991-1 for loads, EN 1995-1-1 for timber structures and EN 1993-1-1 for steel structures, all with national annexes NA for Norway.

Structural capacities shown in SINTEF Building Research Design Guides may also be used as reference, and replace the need for other calculations where possible.

Safety in case of fire

Fire resistance shall be classified according to EN 13501-2 on the basis of tests, or calculation according to the relevant European design standard (EN 1995-1-2 for timber structures). Load bearing capacity during the declared time for fire resistance shall be verified. Reference to preaccepted fire resistance shown in SINTEF Building Research Design Guides is possible when the structure is covered by a relevant guide.

Reaction to fire for each material and component (see Appendix 2) shall normally be classified according to EN 13501-1. Classification is given in the product standard or the CE-marking for the most common products.

Properties related to impact on the environment

For each material and component (see Appendix 2) shall the following documentation be available as a minimum:

- Content of substances hazardous to health and environment
- Effect on indoor environment
- Effect on soil, surface water and ground water
- Waste treatment/recycling

A more detailed information on properties related to impact on the environment is provided by SINTEF.

Resistance against rain and air penetration

The tightness of elements against rain and air leakage is normally assessed by SINTEF on the basis of construction detail descriptions and material and component specifications mentioned in cl. 4.1 and 4.2. Testing may be required for special designs in cases where SINTEF does not have the necessary long term experience of similar technical solutions used in Norway.

Sound insulation

The expected air and impact sound insulation performance between separate dwellings in finished buildings shall be given in the approval when relevant. Reference to SINTEF Building Research Design Guides may be used to a certain extent, but in particular for multistorey buildings will test results from building projects or a pilot building normally be required. Measurements and classification is done according to EN ISO 140, EN ISO 717 and Norwegian Standard NS 8175.

Thermal insulation

U-values for building elements shall be calculated according to EN ISO 6946. U-values given in SINTEF Building Research Design Guides can normally be applied. Thermal bridge transmittance values shall be calculated if the elements have f.ex. steel or concrete components that make special thermal bridges.

Durability

Durability is normally assessed by SINTEF on the basis of construction detail descriptions and material and component specifications mentioned in cl. 4.1 and 4.2. Special investigations may be required if new materials with unknown performance are used in the element design.

Wet rooms

What is made in the factory and what is made as supplementary work on the building site must be clarified if prefabricated elements are intended for use in bathrooms or other wet rooms. When materials and components with SINTEF Certificate or SINTEF Technical Approval are applied, no additional documentation for is required, providing that the module is designed according to the conditions for use of these products.

4.4 Special conditions for use

SINTEF use primarily construction detail descriptions and material and component specifications mentioned in cl. 4.1 as a reference to installation requirements and conditions for use stated in the approval document. SINTEF shall have a copy of the manufacturer's special guides for installation, transport, storage and maintenance where applicable.

5. Production control

The manufacturer shall have a documented factory production control plan for the elements. The plan shall describe what controls are made during the production, control frequency, who is responsible, how are faults handled, and how are the results from the controls filed.

All prefabricated elements with SINTEF Technical Approval must in addition have a scheme for supervisory factory production control. This control shall be performed by SINTEF or another notified inspection body according to the Construction Products Regulation. For foreign manufacturers a national certification body from the same country as the manufacturer may be used, providing that the body is notified for certification of this type of construction products,. The supervisory factory production control is performed by factory visits at least once every year.

An initial factory inspection shall be done by SINTEF before an approval is issued for the first time (all factories if more than one manufacturing plant is to be covered by the approval). The initial factory visit shall normally be done by SINTEF together with the future supervisory inspection body in cases where SINTEF will not perform the factory inspections itself.

6. Costs

The cost for SINTEF Technical Approval is charged according to work time and expenses. The total cost depends very much on the efficiency of the communication between the applicant and SINTEF, and how efficient the applicant provides the necessary background documentation for the approval. The cost depends also on how much guidance and advice the applicant needs, both in order to provide verification of product performance and in some cases to adapt the module construction to Norwegian requirements and market. Experience shows that the expected total cost may be in the order of NOK 250.000 ex. VAT.

The use of SINTEF Building Research Design Guides and the use of materials and components with SINTEF Technical Approval as verification of properties and performance may considerably reduce work time and costs for an approval. Non-traditional and special construction methods require more work and higher costs.

The cost does also depend on the manufacturer's location, and is f. ex. influenced by travel costs for the initial factory inspection. Costs are also higher if English versions of the approval documents are needed.

The cost for the annual supervisory factory production control is charged by SINTEF according to work time and expenses. A cost estimate can only be done when the manufacturer's location is known. When SINTEF is not the supervisory inspection body will SINTEF only invoice a minor annual cost for revising a copy of the inspection report made by another inspection body.

An annual fee for the administration of the approval scheme and for publication on www.sintefcertification.no is charged in addition to the cost for the supervisory factory production control. For year 2018 the fee is NOK 16.900.

7. Examples of approval documents

Examples of approval documents for issued and valid SINTEF Technical Approval may be downloaded in PDF format from www.sintefcertification.no.

8. More information

Contact information and a general description of the approval scheme and is found on www.sintefcertification.no.

Appendix 1

Examples of standard construction details required for SINTEF Technical Approval for prefabricated building elements

The construction details are the manufacturer's own drawings. For a complete building system the drawings should normally cover the construction details listed below. Recommended drawing size is A4. The drawings should be electronically available in PDF format (or tif), and each drawing must be identified with a drawing number and a date. If necessary may more than one drawing illustrate one construction detail.

Construction detail		Drawing no.	Drawing date
External walls			
1	Vertical and horizontal section of principal standard wall design		
2	Elevation of standard structural system		
3	Principal design of structural supplements around door and windows openings (beams and sidestuds)		
4	Installation of windows and doors – Section of joints between wall and bottom, side and top frame members		
5	Horizontal section of standard element joints		
6	Horizontal section of standard corner joints		
Internal walls			
1	Vertical and horizontal section of principal standard wall design		
2	Elevation of standard structural system		
3	Principal design of structural supplements around door openings (beams and sidestuds)		
4	Horizontal section of standard element joints		
5	Horizontal section of standard corner joints		
6	Vertical and horizontal section of principal standard separating wall design between housing units		
7	Elevation of standard structural system for principal standard separating wall design between housing units		
Floors			
1	Vertical section of standard floor design over foundations		
2	Plan of standard structural floor system		
3	Design of joints in floor joists if relevant		
4	Structural design for floor openings		
5	Vertical section of element joints		
6	Vertical and horizontal section of principal standard separating floor design between housing units		
7	Plan of standard structural floor system for floors between housing units		
Roof			
1	Vertical section of standard roof design		
2	Plan of standard structural roof design		
3	Structural design of roof openings		
4	Installation of roof windows etc. - Section of joints between roof and window frame		
5	Section of standard element joints		

(continued on next page)

(Appendix 1 cont.)

Construction detail		Drawing no.	Drawing date
Connections between building parts			
1	Connection between foundation and floor and/or walls		
2	Connection between floor and external walls		
3	Connection between floor and internal walls		
4	Connection between floor and separating walls between dwellings		
5	Connection between separating floor and separating walls between dwellings		
6	Connection between internal walls and external walls		
7	Connection between external walls and separating walls between dwellings		
8	Connection between external walls and separating floor between dwellings		
9	Connection between external wall and roof (facades and gables)		
10	Connection between internal walls and roof		
11	Connection between internal walls and separating walls between dwellings		
12	Connection between roof and separating walls between dwellings		

Appendix 2

Examples of materials and components normally to be specified in SINTEF Technical Approval for prefabricated building elements based on timber structures

What materials and components to be specified in an approval depends on the construction design, and what by agreement with the approval holder shall be covered by the approval.

Examples of material and component specifications may be seen in published approval documents for building elements on www.sintefcertification.no.

Material / component	Specification (Non specified material dimensions shall be specified in "Standard construction details" or specific for each individual building project)
Structural components	
Wall studs	
Floor joists	
Roof structure components	
Load bearing panel materials	
Subfloor	
Roof sheathing	
Wind bracing wall sheathing	
Thermal insulation	
Insulation in walls, floors and roof	
Cladding and lining	
External cladding	
Internal wall lining and ceiling	
Membranes	
Water vapour control layer	
Wind barrier	
Roofing	
Joint materials	
Sealants	
Gaskets	
Tape	
Fire sealing compounds	
Fasteners and metal components	
Screws and nails	
Glue	
Anchor products	
Wet room products	
Watertight membranes	
Panel products	
Water pipes	
Drainage pipes	
Floor gully	
Joint sealant	