

Guideline Description of Offer

Supplier's description of steel deck elements



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1 Proposal for architect's tender description

This section primarily describes how best to present a product like SkanDek in your tender material. The product has unique characteristics, including fire-resistant and inorganic materials, arch height, overhangs, span widths, modular sizing and unladen weight. The following text is provided as a theoretical example, as the materials selected and functional requirements will naturally vary from case to case:

The roof must be constructed in self-supporting steel roof elements, in thin-gauge plates suitable for use over long span widths and suitable for use as part of the building's stabilising system. The roof elements must be suitable for use in overhangs of up to 3.5 m. The roof elements must be produced and supplied as a sandwich/composite construction, complete with finished or semi-finished roof and ceiling cladding.

1.1 CE labelling

The steel roof elements must be CE labelled.

1.2 Modular construction

The roof elements are supplied as large, prefabricated modules for maximum efficiency in laying and sealing. Where possible, we strive to make modules that are between 10 and 22 m long and 3.5 m wide. It is also important to maintain the roof elements' unladen weight at less than 55 - 75 kg/m².

1.3 Material requirements

The load-bearing and stabilising parts of the steel roof element must be made in inorganic and non-combustible materials. Roof and ceiling cladding must meet flammability requirements stated in the Danish Building Regulations BR08.

1.4 Flammability requirements

Steel roof elements must meet a fire-resistance requirement of up to 60 minutes (REI 60 / BS-60). Fire resistance is achieved by means of a fire-insulating layer of 20 mm rigid mineral wool on the ceiling side. Without fire insulation, steel roof elements must comply with REI 30 / BS-30.

1.5 Sound requirements

The roof elements must be supplied with complete, soundproofed ceilings, that require minimal retro-fitting on the construction site (apart from flashings (if any) along rims where the ceiling meets walls and glass panels, etc.)

1.6 Operating and maintenance requirements

The internal construction of the steel roof elements and their external surfaces must have a long useful lifetime and require minimal maintenance.

1.7 Arch height relative to use under extreme conditions

Non-supported steel elements must be constructed with an arch height that ensures that the elements do not visually appear to "hang" as a result of weight of the elements themselves and the effects of snow on the roof.

2 General construction of steel roof elements

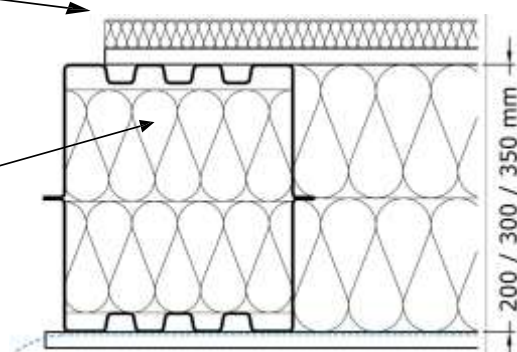
SkanDek steel roof elements can be supplied with several different types of finished or semi-finished roof and ceiling claddings. The roof element always has a profile height of 18 mm, and the internal supporting girders are available in heights 200, 300 and 350 mm, in both 1.5 and 2.0 mm thicknesses.

2.1 Roof cladding

- a) Roofing foil + TF-30 + steel trapeze plate.
- b) Roofing foil + TF-30 + steel trapeze plate.
- c) Roof felt + steel trapeze plate.

2.2 Trapeze plate, girders and insulation

- d) SD200 girders + 200 mm mineral wool.
- e) SD300 girders + 300 mm mineral wool.
- f) SD350 girders + 350 mm mineral wool.



2.3 Ceiling claddings

- g) Vapour barrier + galv. steel trapeze plate.
- h) Vapour barrier + steel trapeze plate. RAL 9002.
- i) Vapour barrier + perf. steel trapeze plate. RAL 9002.
- j) Vapour barrier + TF-20 + steel trapeze plate. RAL 9002.
- k) Vapour barrier + TF-20 + perf. steel trapeze plate. RAL 9002.
- l) Vapour barrier + 30 x 70 mm shuttering.
- m) Vapour barrier + 30 x 70 mm shuttering + 30 mm batts.
- n) Vapour barrier + 45 x 95 mm shuttering.
- o) Vapour barrier + 45 x 95 mm shuttering + 45 mm batts.

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For more information and drawings of different kinds of roof constructions, and sound-proofing and fire-resistance requirements, see Skandeks website www.skandek.dk .

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3 Distribution of planning services and responsibility for element deliveries

3.1 Coordination

There will typically be many players involved in the planning and construction phases. It is therefore crucial that a project coordinator is assigned to coordinate the many activities, schedules, organisation plans, lines of communication and decision-making processes. In most cases, the developer's advisor will be responsible for overall coordination of the project. On an equal footing with the remaining element providers, the Skandek roof element factory will provide and send material for the project coordinator's inspection. The project coordinator shall ensure coordination between the other players and element planners, and that any comments made after the inspection are cohesive and not open to misunderstanding.

Skandek prepares all drawings in CAD software based on the advisors' digital drawings.

3.2 Drawing material that must always be drawn up by the advisors

- Construction drawings (layout, section and details in AutoCAD format).
- Architect drawings (layout, section and details in AutoCAD format).
- Static calculations for the construction (load plans and descriptions).
- Description of claddings, flammability requirements, fitting heights, etc.

3.3 Drawing material provided by Skandek

- Steel element production drawings.
- Numbered steel element plans.
- Joining details for Skandek elements, based on the advisor's drawings.

3.4 Responsibility for dimensioning

- Stringers and stringer forces: By agreement with Consultant Engineer (*e.g. peripheral stringers around the roof shearing field(s)*)
- Fitting down into concrete: By agreement with Consultant Engineer. (*e.g. concrete anchorage*)
- Fitting down into const. steel: By agreement with Skandek (*e.g. staples down into the steel girder or moulded steel.*)
- Fitting down into wood surface: By agreement with Consultant Engineer. (*NB: Note re shearing of thin-gauge plate constructions on wooden surface in BK1 DS446, pp. 23 – 24 (1986).*)
- Fixture into Skandek: By agreement with Skandek (*e.g. self-tapping screws*).
- Internal joints: By agreement with Skandek (*e.g. locking plates and loose steel trapeze plates for closures between roof elements*).
- External joints: By agreement with Consultant Engineer (*e.g. brackets on side of roof element to transfer shearing fields and lateral support*).

4 Statics

Skandek's steel deck elements are dimensioned in accordance with European and Danish standards:

4.1 Basis standards

- EN 1990/Eurocode 0: Safety / Basis of structural design.
- EN 1991/Eurocode 1: Loads / Actions on structures.
- EN 1993/Eurocode 3: Steel constructions / Design of Steel.
- DS 446:2000: Thin-gauge steel plate constructions (*demonstration of roof diaphragm geometry. See explanation below*).

When thin-gauge steel plate materials are included in the roof diaphragm, there are in accordance with DS446:2000 a number of geometrical requirements for skylights, rim zone sizes and diaphragm lengths that must be complied with so that shearing effects can be calculated for the construction. In accordance with EC 3, these regulations are relaxed as the requirements are stated thus: "*Openings up to 15% of the relevant area are acceptable if justified by detailed calculations.*" In Skandek's experience, there are seldom problems with the diaphragm shearing in relation to the old DS 446 regulations and if these are complied with, further detailed indication of the load-bearing capacity of the diaphragm should not be necessary. However, if these regulations are not complied with, a more detailed and complex calculation will be required as evidence of the diaphragm/shearing effect in the Skandek elements.

4.2 Stability of roof diaphragm

The Skandek steel roof elements can be included as part of the building stabilising system as they can absorb shearing forces along with the roof's load-bearing constructions. Under normal conditions, the roof elements in the roof plane can absorb a calculated diaphragm shearing force of 5 kN/m in the roof plate itself and up to max. 10 kN/m with a corresponding unperforated steel trapeze plate on the ceiling side.

The diaphragm shearing forces are transferred to the underlying load-bearing constructions which must absorb push and pull forces (stringer forces). If there is a shear effect on the Skandek girder tension direction, the roof elements can absorb limited axial forces.

4.3 Static preconditions

The consultant engineer shall ensure that the diaphragm shear effect conditions are present in compliance with EN1993/EC 3: Design of Steel and DS 446:2000, and refer to the building's static system and provide static values.

Conditions that may affect the shearing effect of the roof:

- Long and/or narrow diaphragm geometry can lead to horizontal movements that may exceed the deformation capacity of the substructure. For example, DS 446:2000 states that the length of the diaphragm in a thin-plate construction must not exceed 4 x diaphragm width.
- Dimensions and positioning of openings can also diminish the diaphragm function.

5 Contractual limitations on roof element delivery

Distinction is made between tasks that are naturally part of the calculations and delivery of the roof elements on the one hand, and parts/constructions which for practical reasons fall within the scope of the fitting contract, and thus related to other deliveries and contracts on the other. For this reason, we work with the terms *internal* and *external* joints:

- **Internal joints include the following:** Locking plates between the roof elements, (internally) binding the elements to each other to achieve diaphragm stability, and the screws in the static joints that must be screwed into the steel roof element. Angle brackets located *on* the roof element when it is delivered from the factory.
- **External joints include the following:** All types of rim stringers around the roof diaphragm. Transverse or small short angle brackets that are designed to function as joints to transfer forces and lateral supports in e.g. end walls. All kinds of underlying, load-bearing constructions.

Included in roof element delivery	NOT included in roof element delivery
<ul style="list-style-type: none"> • Steel roof and deck elements. Max. 3.6 m wide and 22 m long. • Hired hoisting equipment. • Roof covering according to Delivery Agreement: underlying roof felt or roofing foil. Locking plates and screws for longitudinal joints. • Parts that are standard stock items, e.g. steel trapeze plates, screws, thin-plate angles and soft/hard mineral wool, depending on the roof's limitations (approx. 1 m), corresponding to thickness of roof module. • Rigid TF mineral wool to level out longitudinal joints. Self-tapping screws for use in static joints in the steel roof module itself. • Ceiling cladding acc. to Delivery Agreement, e.g. shuttering, perforated steel trapeze plates, REI 30, REI 60, etc. • Overhang elements for overhang 	<ul style="list-style-type: none"> • All abutments, such as steel and concrete girders, columns, blocking up, wedges, milled profiles, wood and steel arches, external angles for transferring shear forces and side support. • Concrete anchorages, staples and screws into abutments. • Profile, gutter bracket, junctions, dowling, wall capping, fascia reestablishment, fascia cladding, thermal bridge insulation. • Roof valley wedges, wedge-cut insulation on horizontal roofing, drainpipe holes, skylights, attic windows, filling ribbed girders • Underlying roof felt for shredding, profile covering, roofing foil for sealing ridge, wall capping and flashings, etc. • Corrugated plating, fasteners and brackets for metal roofing, profile covering. • Shuttering, ducts, holes for spots, extra vapour barrier.

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6 Tolerances and abutments

Appropriate fitting tolerances in tandem with proficient self-inspection will ensure that element fitting is fast, easy and problem-free.

6.1 Fitting tolerances on regular new buildings

As a rule of thumb, you should allow 25 mm free space from the steel roof element into fixed parts of the building.

6.2 Fitting tolerances on refurbishments and slanting/diagonal buildings

As a rule of thumb, you should allow 50 mm free space from the steel roof element into fixed parts of the building.

6.3 Abutments

Due to the profile of the Skandek girder, at least 100 mm abutment is required for load transfer and to allow space for fitting using a staple gun at the girder end.

7 Element fitting

See also the general SkanDek fitting instructions and terms and conditions of sales and delivery. For more detailed information, please visit www.skandek.dk

7.1 Preparation

Tools: Control measurement and coordination of schedules and access conditions.

The fitter should work with the site manager/developer's advisor, and check in good time that the load-bearing constructions have been completed and are correctly buttressed, in accordance with the descriptions. Check that the access paths are OK and that there are no projections or unevenness in the abutments (see next point). It will often be advisable to use a laser ruler on the internal walls to check that the fitting delivery specifications are met. On long buildings, it will often be an advantage to mark measurement points on the abutments in order to maintain uniformity.

7.2 Condition of abutments

The roof element fitter and the developer's advisor are entitled to reject the underlying parts of the construction if these are unsuitable for fitting roof elements. The abutments must not, for example, be obstructed by exposed bolt heads, welded ribs or concrete slag on moulded steel parts. If projections or other obstructions are too large, these must never under any circumstances diminish the stability of the finished building. Visible unevenness due to projections in the abutments shall either be rejected or approved by the developer's advisor before the construction is sealed/fitted and finished.

7.3 Buttressing

Any buttressing of the underlying constructions shall not be removed until the steel roof elements have been secured to the internal and external joints and that they are completely anchored to the abutments /underlying load-bearing constructions.

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7.4 Hoisting and fitting work

Tools: Goods reception inspection sheets, process inspection sheets and photographic documentation (if any).

- Staple fitting work: All stapling fitting shall be performed in accordance with the descriptions prepared by the developer's advisor, Skandek and the staple gun manufacturer.
- Underlying roof felt: Roof elements that are supplied with underlying felt for subsequent shredding can be used as temporary cover in the construction phase. The underlying felt often has UV-resistance of up to one year but is, of course, not as strong as the surface roofing foil. As a rule of thumb, after three weeks, perform a regular visual and physical inspection of areas affected by wind (along fascia and wall capping) to ensure that there are no leaks from joints affected by the wind. Refer also to TOR instructions.
- Roofing foil: Roofing foil can be welded using hot air, even when the surface of the foil itself is damp. However, in isolated cases, adhesion may be difficult to achieve if the underside of the roofing foil has become wet. In such cases, you should wait to weld until the underside has dried out or you can try to dry the foil using hot air. Flashings must be sealed so that they do not blow up (thus possibly causing water damage).
- Vapour barrier: Roof elements are normally supplied with a vapour barrier layer at least 25 cm thick. The roof elements' internal longitudinal joints must be sealed with butyl tape in accordance with Skandek's instructions. Along ceiling limits, the vapour barrier must be sealed in accordance with the architect's instructions.

7.5 Night closure and roof covering

Tools: Process inspection sheets and photographic documentation

Roof element fitters, craftsmen, roofers etc. must never leave the construction site until night closure has been completed. Water leaking into uncovered ends and sides of steel roof elements can cause damage to the mineral wool and wood shuttering (if any).

7.6 Delivery phase

Tools: Final inspection sheets, deviation reports, diary entries.

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