Lindab Construline ™

Lindab System Solutions – Roof

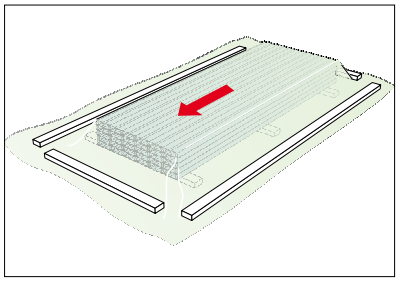
Dimensioning with assembly instructions

Roof system solutions

Before you start
The following assembly instructions give guidance in assembling different roof solutions. Lindab components can be used for prefabricated roof trusses, flat-to-pitch roof conversions, sandwich constructions and many more applications. Make sure to design and dimension your roof according to the local rules and regulations.

The profiles
Simple profiles can create advanced structures – roof trusses are built from reinforced studs and runners, the same profiles are used to create the pole setting for flat-to-pitch roof conversions which in combination with Z-profiles and trapeze sheeting gives a new roof. Slotted Z-profiles and hat-profiles are used in double skin sandwich roofing constructions – thermo roofing.

Storage
The profiles are delivered in bundles. The bundles should be stored in a dry and clean place. If the bundles are stored outside they should be placed with a slope to let rainwater run off. The profiles should be protected from dirt and dust or brushed of before installation. Dirt and dust can effect the profiles with negative thermal conductivity performance and can also start to grow mould in the future.



The bundles can be stored on top of each other

Cutting
The whole idea is to get a precut system and no cutting should be made on site. But, in case of on-site adjustments and need for a cut, use a nibbling machine.

Fasteners
For all steel constructions you should use the right fasteners. By using fasteners from Lindab you will always be sure that they will work for the application and that they will be safe to use. For Lindab light gauge constructions up to 2x1,5 mm, however, there is a universal screw developed to connect the profiles in most applications, BPSK. The screw is a standard screw, using a PH2-bit (same as for gypsum boards) but with a flat head to avoid cracks on board materials. For heavier gauges or heavy loads there are screws with higher load bearing capacities – contact your local supplier for more information about fasteners for your application.

Static Design
Lindab offers a wide range of software's to support design and static calculations for light gauge constructions. The software's will be presented briefly below – for more information and latest updates – see www.lindab.com/buildingtechnology

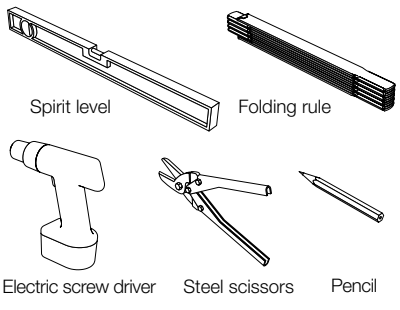
DIMroof
DimRoof is a design software for trapezoidal roof and wall cladding and purlins. Lindab's complete families of profiles are included. The software makes calculations both for ultimate limit state and serviceability limit state. The software can also be used to optimize the centre distances and section thicknesses to get the best solution for your design. The software has a special module for analysis of snow pockets.

DIMstud
DimStud is the design software for our range of beams, studs, and runners that can be used for walls, floors and roofs. It includes calculations for the slotted stud and runner range. The software presents results in ultimate limit state and serviceability limit state.

WallAnalyzer
If you are concerned about energy consumption you need to know the U-value for your exterior wall. In WALLanalyzer you can input different wall build-ups and find out the U-value. The software is based on the finite element method in two dimensions and it is calibrated after full scale tests and theories developed together with the Technical University in Lund. The software can also analyze moisture conditions with known boundary conditions.

Lindab ADT Tools
Lindab ADT Tools is an add-on application for Autodesk Architectural Desktop which considerably simplifies the work in 3D-modelling projects. No matter if it is complete light gauge systems or parts integrated in combination with other structural members. In the software there are macros for doing exterior and interior walls, floor joists and roof trusses. The software automatically generates 2D shop-drawings and material specifications from the 3D-model.

Tools



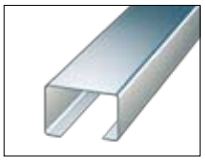
Roof system solutions

Components

FR

Reinforced stud for partition walls which also can be used as a pole in flat to pitch roof conversions and as diagonal member in roof trusses. Use software DIMstud or macro in Lindab ADT Tools to design. It is also used as bracing member in flat-to-pitch roof conversions.

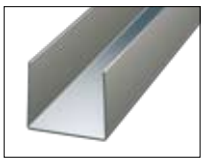
Most commonly used profiles are 70 and 95 mm, see also chapter partition walls for full assortment.



FSK 60

Reinforced runner for partition walls which also can be used as “shoe” in flat-to-pitch roof conversions and as top- and bottom chord in roof trusses.

Same dimensions used as for FR, see also chapter partition walls for full assortment.



S7 45

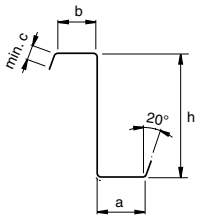
Hat profiles to carry trapeze sheeting in thermo roofs or as structural battens between roof trusses.

Roof system solutions

Components

Z-profile

The Z-profiles are used in flat-to-pitch roof conversions as the load carrying members for the trapeze sheeting. Use DIMroof to design for static wind- and snowloads.

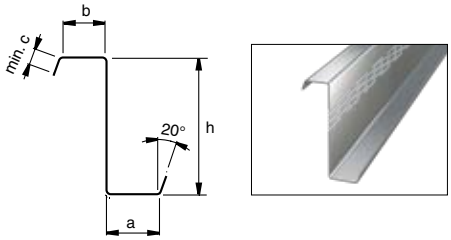


Cross section properties for Z-purlins, both flanges supported
Note: All values calculated according to Swedish Code and STBK-N5

Type	Thickness mm	a	b	h	Ieff [10^4 mm^4]	Ibr [10^4 mm^4]	Weff [10^3 mm^3]	V_{Rd} [kN]	Allowable support reaction (L=55mm)		Md [kNm]
									Mid support	End support	
Z100 (HU, SE)	1.00	47	41	100	28.7	31.7	5.28	9.50	5.10	2.60	1.85
	1.20	47	41	100	37.6	38.2	7.36	15.3	7.20	3.60	2.58
	1.50	47	41	100	48.4	48.4	9.61	24.2	10.7	5.40	3.36
	2.00	47	41	100	63.7	63.7	12.7	43.8	18.0	9.00	4.45
Z120 (HU, SE)	1.00	47	41	120	42.7	48.5	6.41	7.90	5.10	2.60	2.24
	1.20	47	41	120	56.3	58.5	9.00	14.1	7.20	3.60	3.15
	1.50	47	41	120	74.2	74.2	12.3	24.2	10.7	5.40	4.30
	2.00	47	41	120	98.0	98.0	16.3	43.8	18.0	9.00	5.70
Z150 (HU, SE)	1.00	47	41	150	69.5	82.1	8.13	6.30	5.10	2.60	2.85
	1.20	47	41	150	91.9	99.1	11.4	11.3	7.20	3.60	3.99
	1.50	47	41	150	123	126	15.9	22.4	10.7	5.40	5.58
	2.00	47	41	150	166	166	22.1	43.8	18.0	9.00	7.74
	2.50	47	41	150	212	212	28.1	69.1	26.3	13.1	9.83
Z200 (SE)	1.00	47	41	200	130	163	11.0	4.70	5.10	2.60	3.86
	1.20	47	41	200	173	197	15.5	8.50	7.20	3.60	5.41
	1.50	47	41	200	232	251	21.6	16.8	10.7	5.40	7.55
	2.00	47	41	200	325	333	31.6	41.0	18.0	9.00	11.1
Z200 (HU)	1.00	74	66	200	152	217	12.0	4.70	4.90	2.40	4.21
	1.20	74	66	200	205	264	17.1	8.50	6.90	3.40	6.00
	1.50	74	66	200	288	331	25.7	16.8	10.4	5.20	8.98
	2.00	74	66	200	430	444	41.3	41.0	17.5	8.70	14.5
	2.50	74	66	200	556	556	55.1	69.1	26.3	13.1	19.3
Z250 (HU, SE)	1.50	74	66	250	470	566	32.5	13.5	10.4	5.20	11.4
	2.00	74	66	250	709	760	52.9	32.8	17.5	8.70	18.5
	2.50	74	66	250	933	953	72.6	65.0	26.3	13.1	25.4
	3.00	74	66	250	1149	1149	91.3	101	36.8	18.4	32.0
Z300 (HU, SE)	1.50	90	82	300	745	994	40.8	11.2	10.4	5.20	14.3
	2.00	90	82	300	1162	1340	69.1	27.3	17.5	8.70	24.2
	2.50	90	82	300	1581	1680	99.4	54.2	26.3	13.1	34.8
	3.00	90	82	300	1984	2020	129	95.6	36.8	18.4	45.2

Roof system solutions

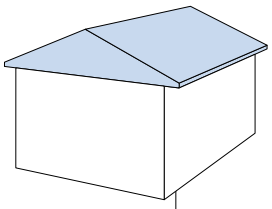
ZS-profile
Slotted Z-profiles can be used in walls as secondary structural members or in roofs as a distance for using soft shell insulation.



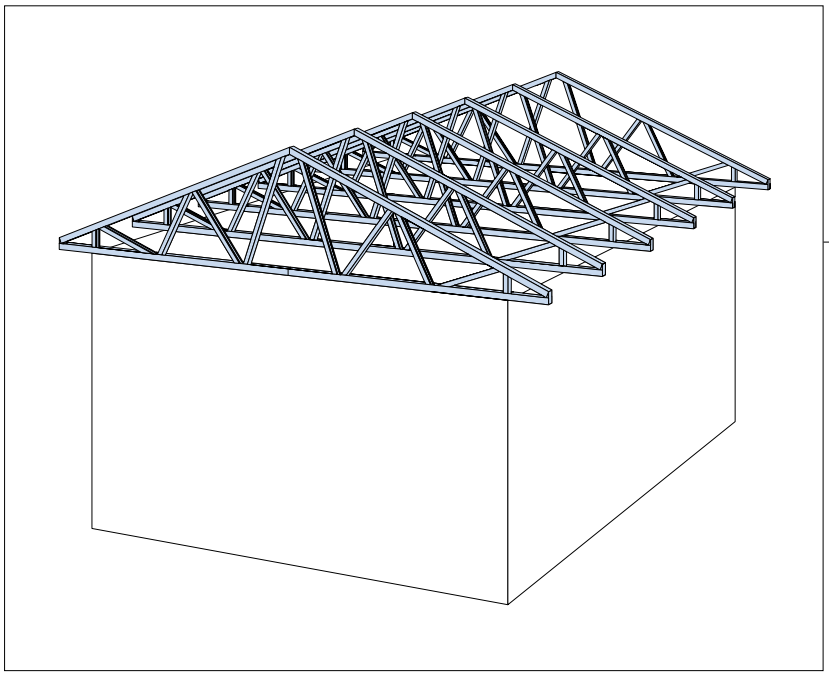
Cross section properties for slotted Z-purlins, ZS, are non linear and can not be displayed here. Use Dimroof for static design.				
Type	**Thickness mm**	**a**	**b**	**h**
Z100 (SE)	1.00	47	41	100
	1.20	47	41	100
	1.50	47	41	100
Z120 (SE)	1.00	47	41	120
	1.20	47	41	120
	1.50	47	41	120
Z150 (SE)	1.00	47	41	150
	1.20	47	41	150
	1.50	47	41	150
Z200 (SE)	1.00	47	41	200
	1.20	47	41	200
	1.50	47	41	200

DIMroof can be used to analyze statical design of different purlin systems. Overlap systems, simply supported and more advanced variants can be analyzed.

Assembly – Roof system solutions

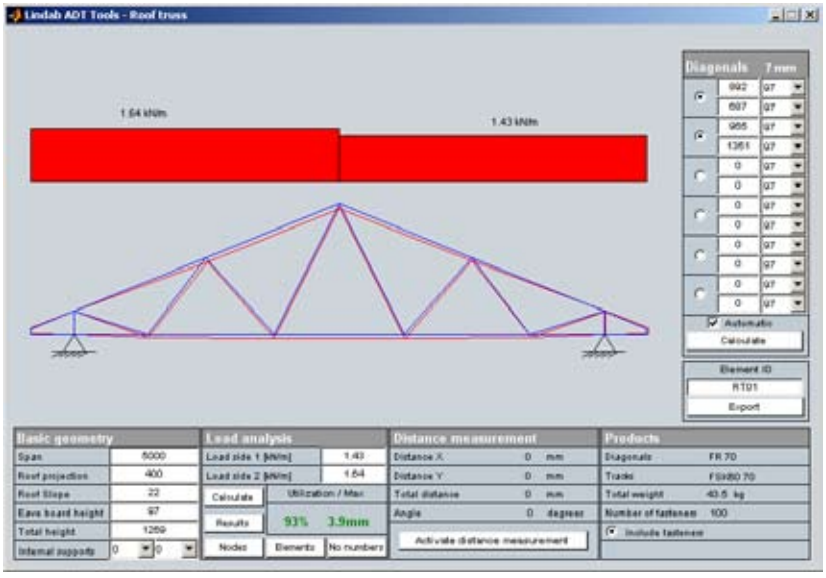


Roof Truss



The profiles used in a roof truss are FR as diagonals and FSK60 as top- and bottom chords in 70-dimension. There is no maximum limit for the free span for a roof truss but most common are spans between 3-12 meters. With built in supports the total span can increase up to 16-20 meters. The roof trusses can be designed and checked in the Lindab ADT Tools software which also gives a workshop drawing and cutting list for the production. It is also possible to design for hip roof models in the software.

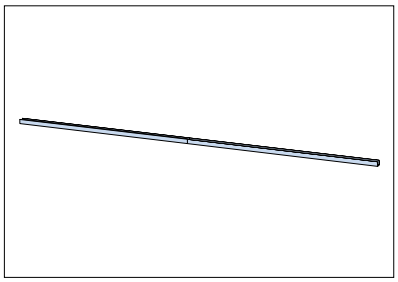
All the profiles should be ordered in pre cut lengths, roof trusses are the easy to prefabricate before installing on site.



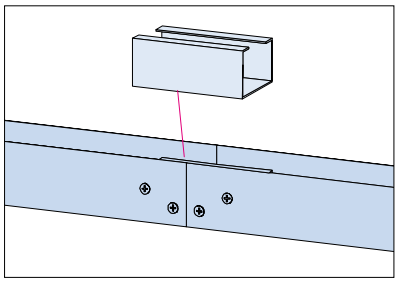
In Lindab ADT Tools roof trusses can be designed, the calculations are based on FEM-analyzes. A 3D-object is generated from the 2D-view in the macro – the 3D object contains full material specification.

Assembly – Roof system solutions

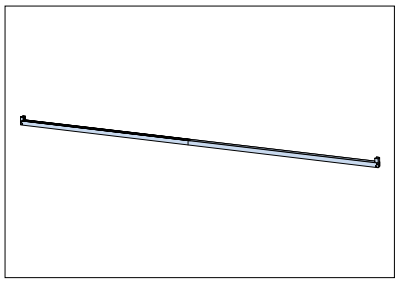
The frame



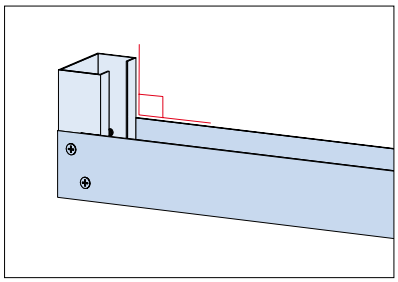
Place the bottom chord runners on an even underlay.



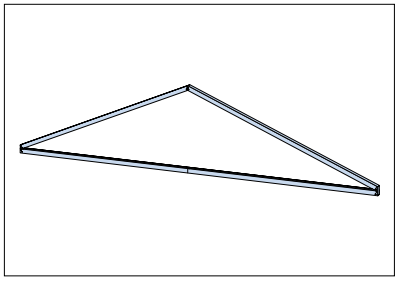
For larger spans the runners are split into half – the joint is done by using a short stud which will fit into the runners. Join them together with screws according to the workshop drawing.



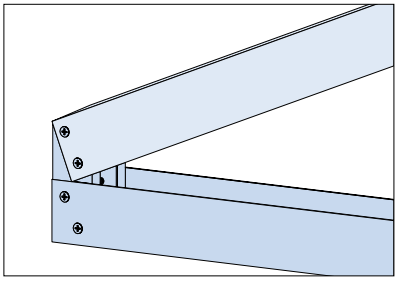
Fasten the short end pieces of FR at the trussends.



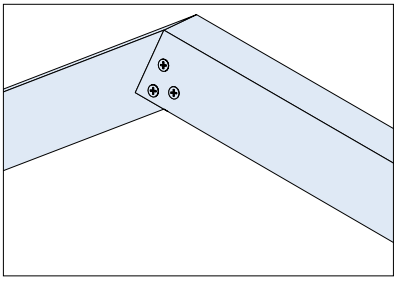
Make sure they are perpendicular to the runner.



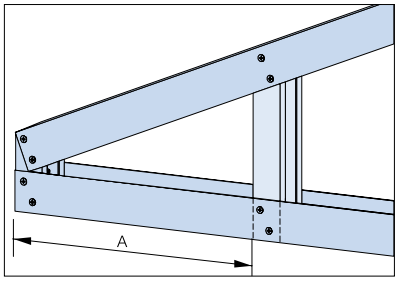
Assemble the top chord runners to close the frame.



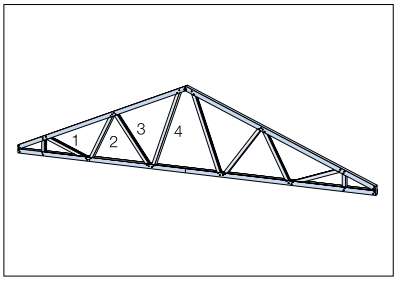
Use screws in each junction according to the workshop drawing.



The diagonals

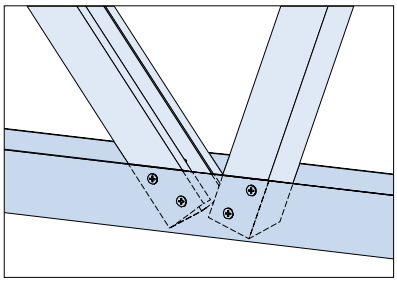


Place the first perpendicular diagonal at a distance from the gable according to the workshop drawing.

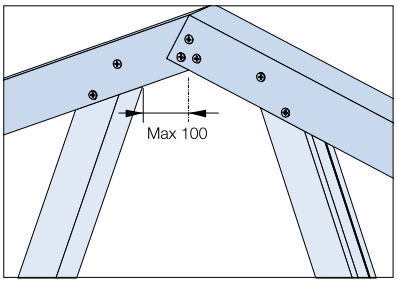


Mount the rest of the diagonals to fill up the frame, Make sure to mount the profiles with the open web upwards (back of the profile should be turned downwards)

Assembly – Roof system solutions

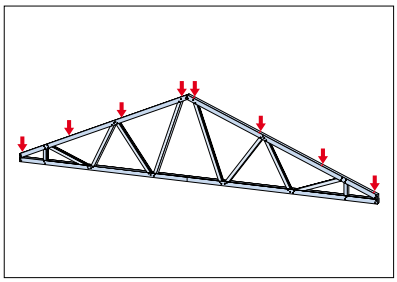


The diagonals should have contact in the joint. Use the amount of screws shown in the workshop drawing.

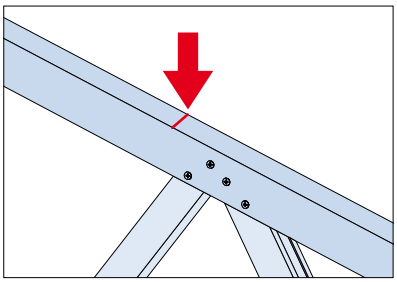


Top diagonal should end maximum 100 mm from the center of the top chord.

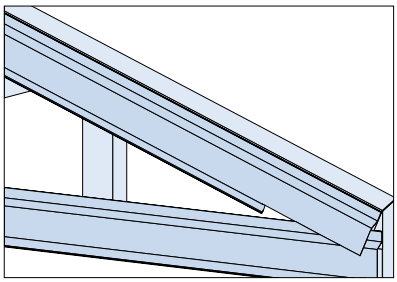
Battens preparation



Mark out the battens before installing the roof truss on site.

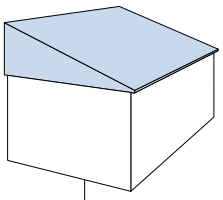


Battens should be placed closed to the joints to transfer the loads optimal.

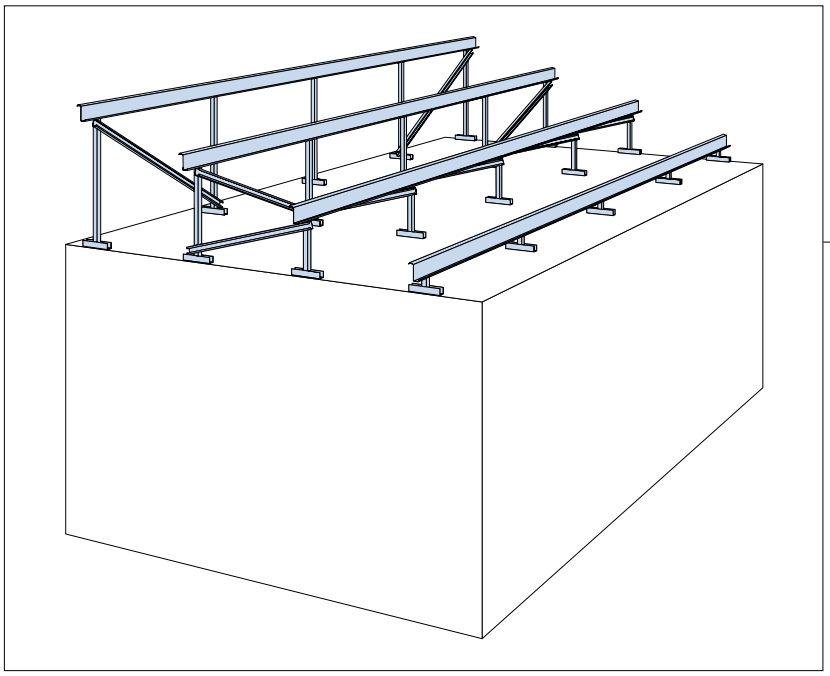


Gable trusses can have battens assembled along the frame before installing.

Assembly – Roof system solutions



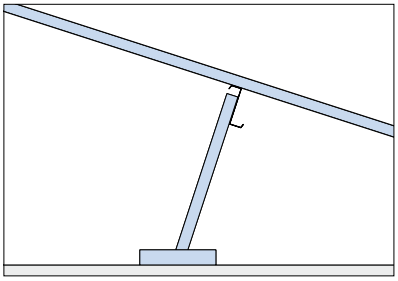
Flat-to-pitched roof conversion



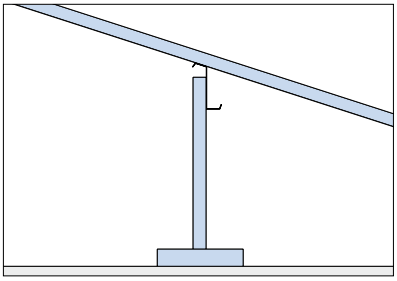
Lindab can offer two types of flat to pitch roof conversions. Both of them work in the same way but have different advantages.

System one is with standard Z-purlins and studs perpendicular to the new roof. This is the most optimized technically but gives less useful space between the stud rows.

System two is with customized Z-purlins (ZL) and vertical studs. This gives a more useful space under the new roof but is not optimal for the studs and at the same time more expensive since the custom-made Z-purlins are roughly twice the price as for system one.
The pitched roof system and its components are described in following picture.



Leaning stud design, system two

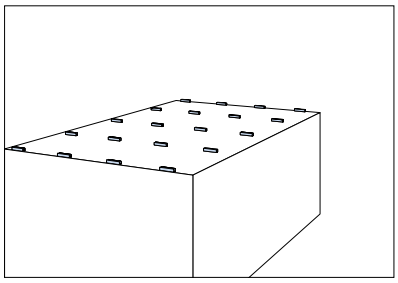


Vertical stud design, system one

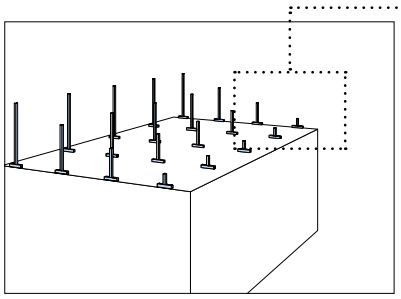
1. Check existing construction! Can the new design transfer the loads to the existing construction? It is especially important to check the condition of the under laying construction as well, many contractors have bad experiences from old materials which don't have the same properties for fasteners as given in old prescriptions.
2. Check for air outlets and other roof transitions
3. Make sure that the new roof pitch is enough to make the water fall of the roof.
4. Design sheeting, studs and Z-purlins
5. Check fasteners and connections to the old construction
6. Design cross bracings

Assembly – Roof system solutions

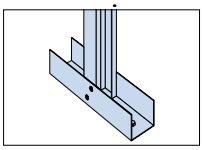
Vertical stud design



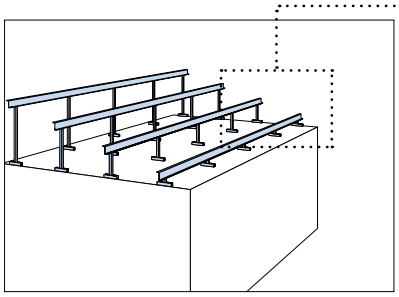
Mount the Lindab FSK60 base runners with fasteners approved for the underlay. Place them according to your dimensional drawing.



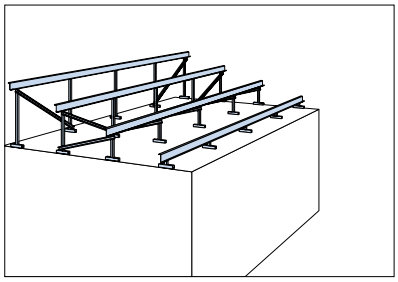
Fasten the Lindab FR studs on the runners in vertical position.



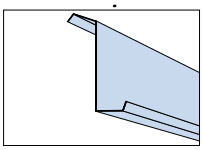
Place minimum two screws on each side.



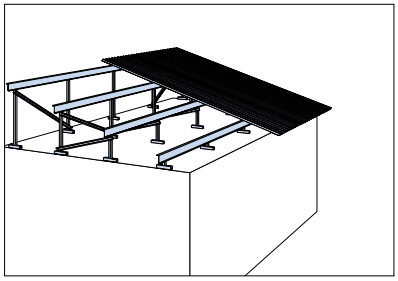
Mount the customised Z-purlins on the studs.



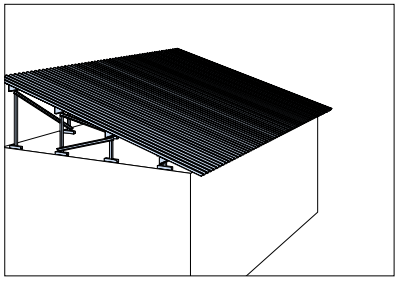
Make sure to stabilise the construction with cross bracings.



The customised Z-purlin is designed with a flange according to the roof pitch.

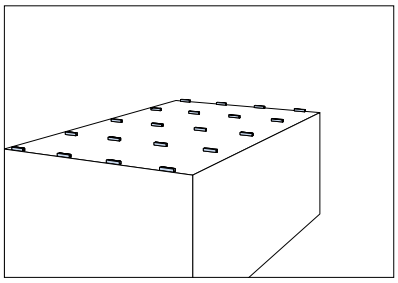


Cover the construction with the Lindab LTP20 or LTP45 roof.

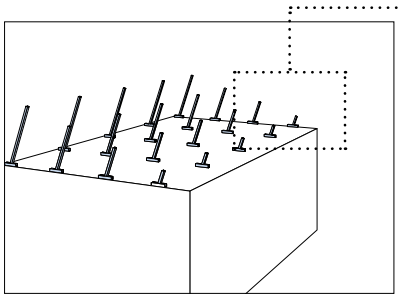


Assembly – Roof system solutions

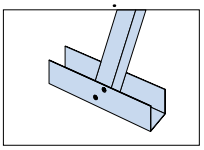
Leaning stud design



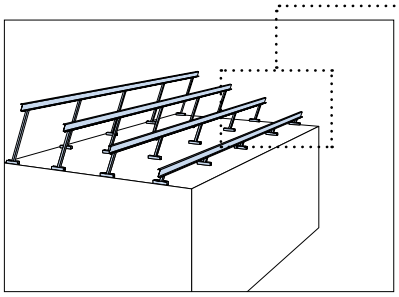
Mount the Lindab FSK60 base runners with fasteners approved for the underlay. Place them according to your dimensional drawing.



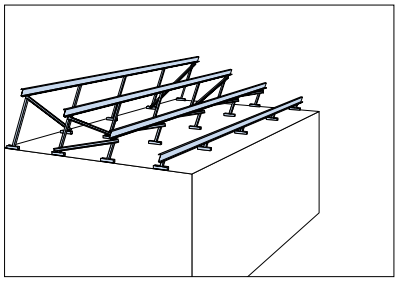
Fasten the Lindab FR studs on the runners in a leaning position.



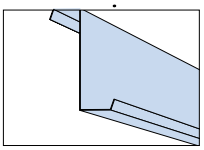
Place minimum two screws on each side.



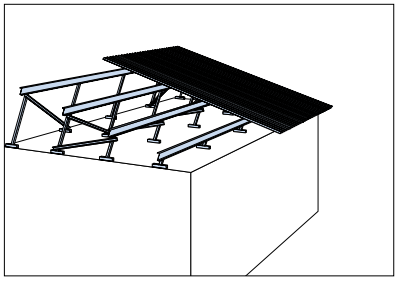
Mount the standard Z-purlins on the studs.



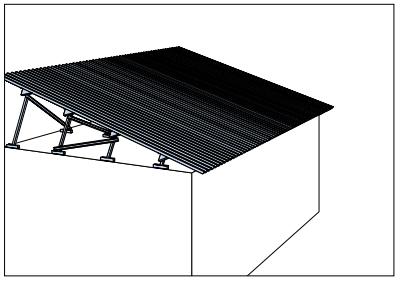
Make sure to stabilise the construction with cross bracings.



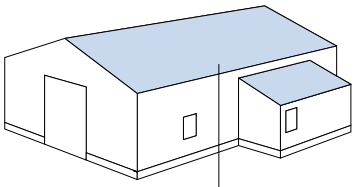
A standard Z-purlin can be used thanks to the leaning stud. The flange will be perpendicular to the roof cover.



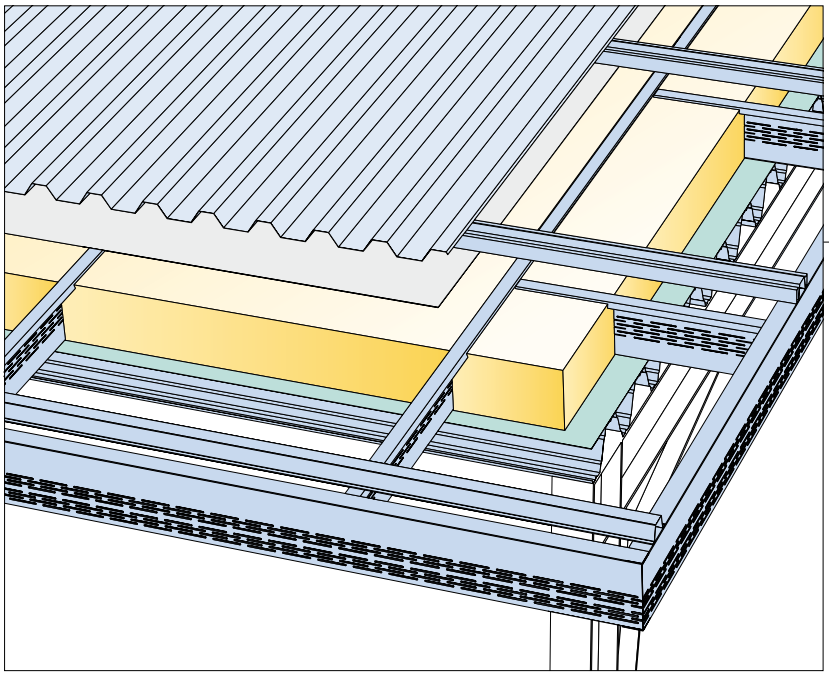
Cover the construction with the Lindab LTP20 or LTP45 roof.



Assembly – Roof system solutions



Thermo roof



Lindab Thermo roof is a double skin roof which can use soft insulation. The roof build up is a floor deck profile (LTP 115 or LTP 150) in the bottom, vapour barrier, 150 or 200 mm slotted Z-profile, ZS, insulation, and on top of that a wind breaker hold in place by a secondary system (S7 45) and trapeze sheeting, LTP 20 or any other roof profile. Use DIMroof to design the floor deck profile hence the ZS-profile is just a distance there is no need for a static design for the ZS-profile. The ZS-profile is mounted from ridge to eave to give support for the hat profile, S7 45.

The system allows architectural roof overhangs even on industrial halls built with floor deck profiles.

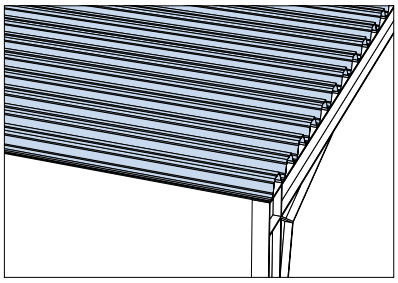
Design

The roof is built up with a floor deck profile. On top of the profile a vapour barrier is placed. It is important to keep the vapour barrier intact with no rips or holes.

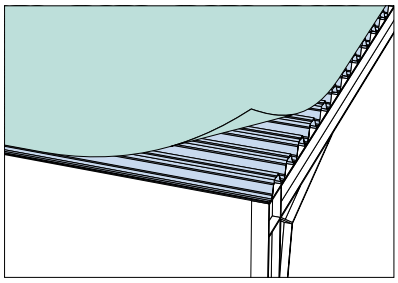
On top of the vapour barrier the ZS-profiles are installed at 1200 mm centre distance (or at a centre distance to fit with the insulation), fill up with insulation in between the ZS-profiles (a 200 mm ZS must have 200 mm insulation). Cover with a wind breaker and assemble the secondaries at a centre distance to fit with the selected roof profile. Put on the roof according to your selection.

Assembly – Roof system solutions

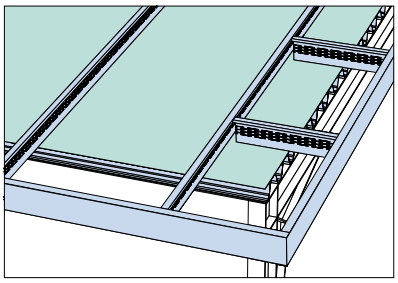
Order of assembly



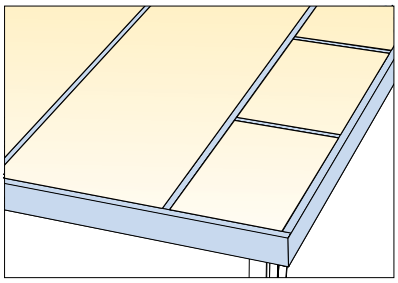
The underlay to build the thermo roof is a floor deck profile.



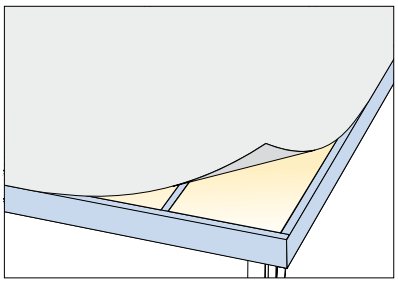
Place a vapour barrier on top of the deck profile.



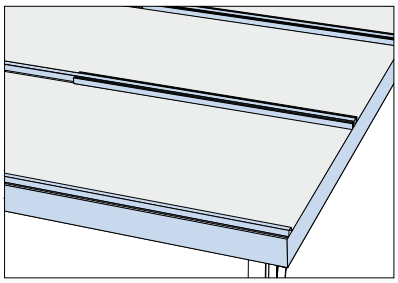
Build up the frame with slotted Lindab SZ-studs. Optional as shown in picture its possible to build with a roof overhang.



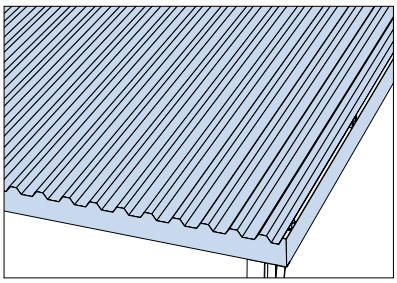
Fill up with insulation between the compartments. Important to use same insulation height as the height of the studs.



A wind breaker is placed on top of the insulation.



Use the Lindab hat profiles S7 45 as secondaries for the roof chosen roof profile.



Assemble the roof profile on top, and cover with flashings.

Lindab Profile is a business area within the Lindab Group that develops, manufactures, and markets efficient, economical and aesthetic steel and sheet-metal solutions for the building industry.

We offer everything from complete building systems to individual building components for all types of housing, as well as commercial and industrial buildings.

Lindab Profile is represented in over 25 countries throughout Europe. Our head office is in Förslöv, in the south of Sweden.

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