



EUROCODESTOOLS

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PRELIMINARY STUDY REPORT

Projet exemple rapport - Exemple de client

Project defined by : xxx-xxx

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This software, developed by Optimax Structures company, is provided solely for the purpose of estimation in the preliminary project phase. The client agrees to verify the results obtained with a competent structural engineer and assumes full responsibility for their use.

Please note that this document is intended only for estimation purposes to establish a project's quotation.

Under no circumstances is it allowed to manufacture or construct a structure using this document.



Version du logiciel : 03-0708



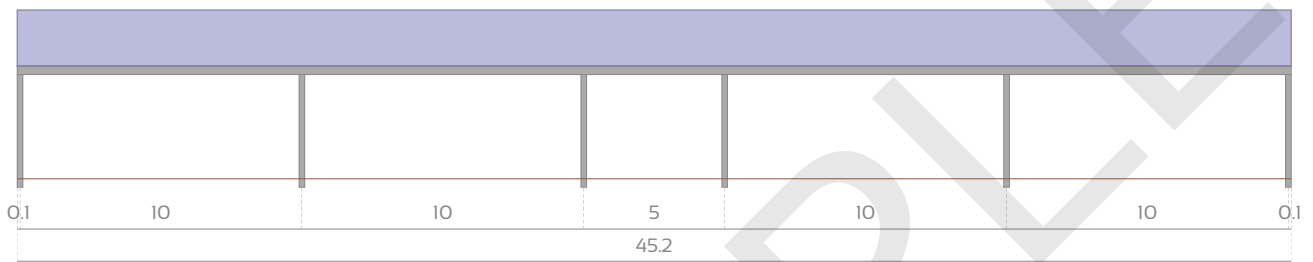
Projected budget

Estimation item	Quantity	Price
Manufactured primary steel structure (including 26.0% of joints)	1034 kg x 6 + 91 kg = 6295 kg	22033 €
Manufactured purlins	4108 kg (Entered by the user)	11502 €
Manufactured integration system	513.5 m ²	8216 €
Steel structure installation	505.7 m ²	12642 €
Excavation, foundation pouring and reinforcement	59.0 m ³	11799 €
Soil removal	73.7 m ³	738 €
Total		66930 €

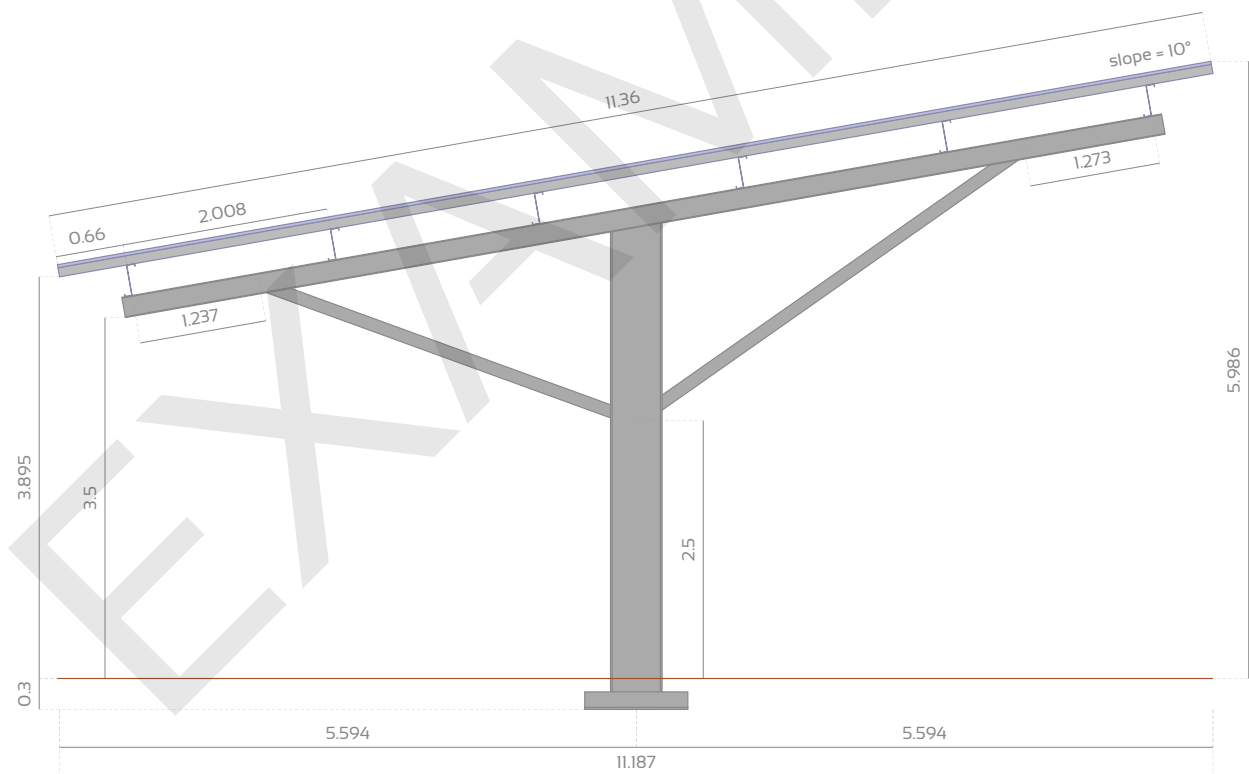
Preliminary dimensioning of main structural elements

Element	Checking (It's okay if the rate is less than 100%)
Column	OK (91.8 %)
Rafter	OK (92.8 %)
Left diagonal brace	OK (79.0 %)
Right diagonal brace	OK (78.9 %)

Elevation plan



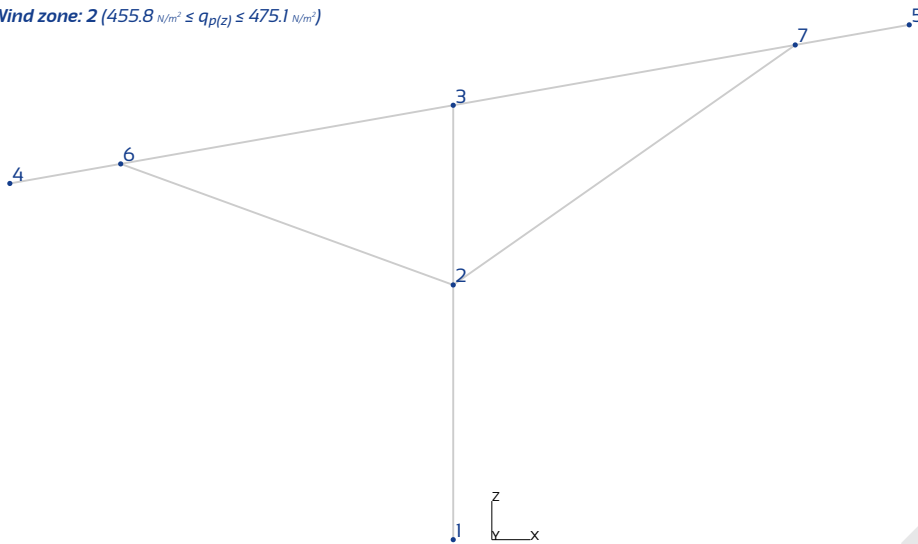
Gable plan



Loads distribution report

Snow zone: A1 ($s_n = 0.45 \text{ kN/m}^2$)

Wind zone: 2 ($455.8 \text{ N/m}^2 \leq q_p(z) \leq 475.1 \text{ N/m}^2$)



Axis	Loading width	Continuity factor
1	5.1 m	1.0
2	10.0 m	1.178
3	7.5 m	1.0
4	7.5 m	1.0
5	10.0 m	1.178
6	5.1 m	1.0

Axis 1 and 6

(Loading width: 5.1m, continuity factor: 1.0)

Node	F_x (daN)	F_y (daN)	F_z (daN)	M_x (m.daN)	M_y (m.daN)	M_z (m.daN)
Permanent loads						
1	0.0	-	-2684.7	-	-219.0	-
Normal snow						
1	0.0	-	-2054.4	-	-0.0	-
Accidental snow						
1	-0.0	-	-0.0	-	-0.0	-
Left wind sagging						
1	296.8	-	-1136.2	-	-2069.4	-
Left wind in uplift						
1	-339.8	-	2474.1	-	5073.5	-
Right wind sagging						
1	99.7	-	-1090.0	-	3977.0	-
Right wind in uplift						
1	-511.0	-	2373.6	-	-9204.4	-
Front wind sagging						
1	95.6	669.3	-542.3	-2719.9	495.4	-0.0
Front wind in uplift						
1	-339.0	669.3	1922.8	-2719.9	-1756.7	-0.0
Rear wind sagging						
1	95.6	-669.3	-542.3	2719.9	495.4	0.0
Rear wind in uplift						
1	-339.0	-669.3	1922.8	2719.9	-1756.7	0.0

Axis 2, 3, 4 and 5

(Loading width: 10.0m, continuity factor: 1.178)

Node	F_x (daN)	F_y (daN)	F_z (daN)	M_x (m.daN)	M_y (m.daN)	M_z (m.daN)
Permanent loads						
1	0.0	-	-4834.2	-	-592.5	-
Normal snow						
1	0.0	-	-4743.6	-	-0.0	-
Accidental snow						
1	-0.0	-	-0.0	-	-0.0	-
Left wind sagging						
1	559.0	-	-2623.3	-	-5079.5	-
Left wind in uplift						
1	-910.9	-	5712.6	-	11413.1	-
Right wind sagging						
1	351.3	-	-2516.8	-	9471.8	-
Right wind in uplift						
1	-1058.9	-	5480.5	-	-20963.6	-
Front wind sagging						
1	220.8	669.3	-1252.0	-2719.9	1143.9	-0.0
Front wind in uplift						
1	-782.8	669.3	4439.7	-2719.9	-4056.1	-0.0
Rear wind sagging						
1	220.8	-669.3	-1252.0	2719.9	1143.9	0.0
Rear wind in uplift						
1	-782.8	-669.3	4439.7	2719.9	-4056.1	0.0

Additional actions to consider for columns adjoining span containing the stability system (roof bracing beam):

Position	F_x (daN)	F_y (daN)	F_z (daN)	M_x (m.daN)	M_y (m.daN)	M_z (m.daN)
Front wind sagging and Front wind in uplift						
Axis 4	44.8	-	7.9	-	214.1	-
Axis 3	-44.8	-	-7.9	-	-214.1	-
Rear wind sagging and Rear wind in uplift						
Axis 3	44.8	-	7.9	-	214.1	-
Axis 4	-44.8	-	-7.9	-	-214.1	-



Preliminary dimensioning of the foundations

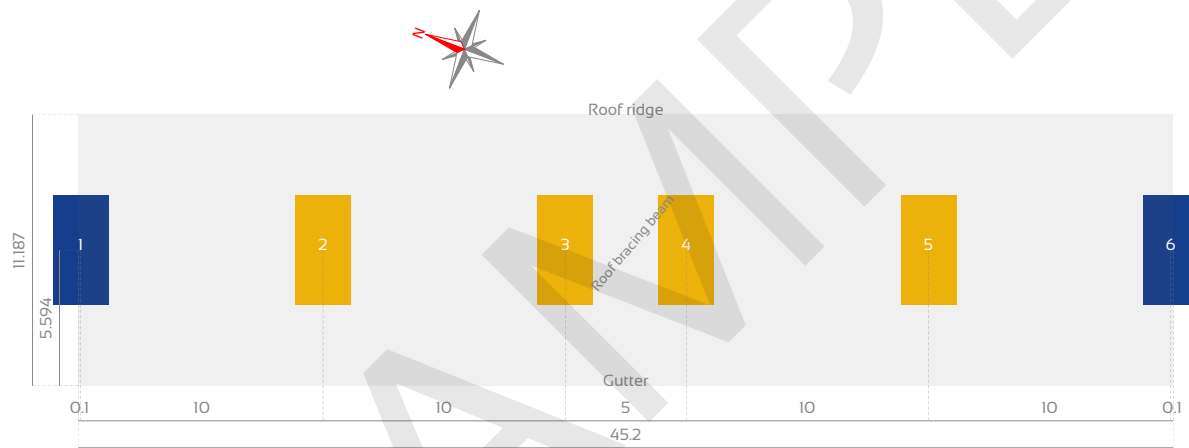
This parallelepiped surface foundation is calculated in accordance with Eurocode 7 (EC7). Its unit volume is **9.832 m³** (the specific dimensions of the foundation can be provided in an execution study carried out by our design department and calculated using the soil survey).

The foundation is essentially dimensioned by the overturning moment. The design is based on the most heavily loaded portal frame, then duplicated at the foot of all the portal frames to facilitate site work. This approach ensures uniformity and efficiency in construction.

The soil stress under the surface foundation used for this design is 0.168 MPa, equivalent to 1.68 bar (rather poor quality soil). No soil investigation has been taken into account in this pre-dimensioning, and it will be necessary to verify the validity of the load-bearing capacity assumption.

Consequence class CC2 according to Eurocode 0 (EC0) is appropriate for this project, and structural class S4 has been chosen for the foundations. The latter corresponds to an indicative project service life of 50 years.

Layout plan



Assumptions for calculations

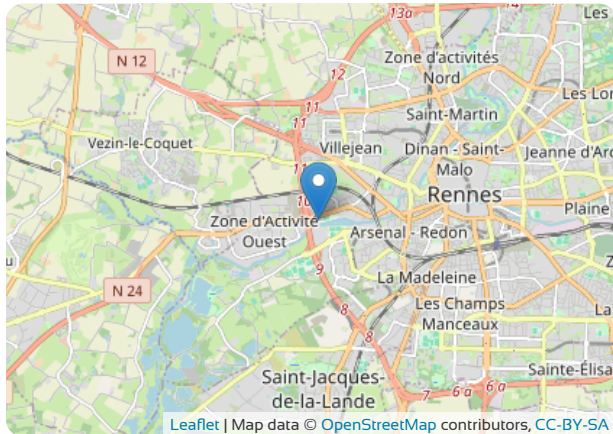
Dead loads

Name	Type	Intensity
Self-weight of steel structures	density	7698 daN/m ³
Solar panels	uniformly distributed load	20.0 kg/m ²
Purlins	uniformly distributed load	8.0 kg/m ²
Gutter	linear load at the bottom edge	10.0 kg/m

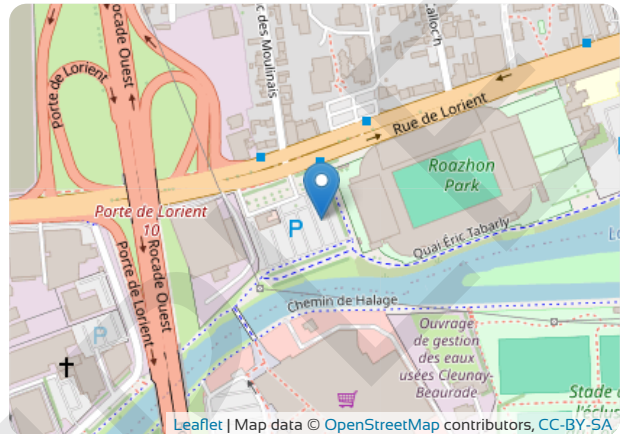
Location



Coordinates in World Geodetic System 1984 (WGS84) :

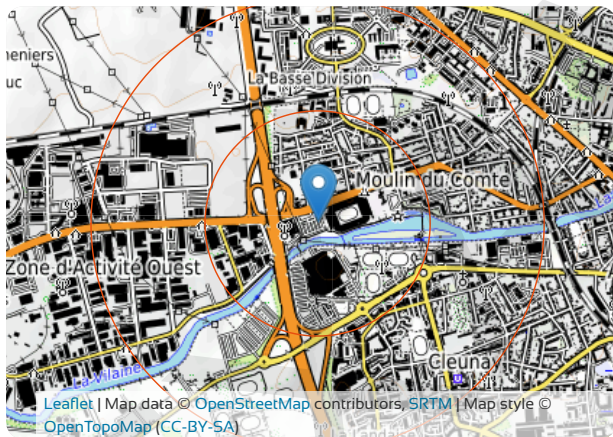


48.10711776 , -1.71473623



Address : Quai Éric Tabarly, 35043 Rennes, Bretagne

Elevations



Distances / Direction	At the place of construction	500 m	1000 m
North	26 m	32 m	40 m
Northeast		33 m	43 m
East		24 m	24 m
Southeast		24 m	30 m
South		25 m	30 m
Southwest		23 m	25 m
West		26 m	26 m
Northwest		29 m	39 m

source : European digital elevation model Copernicus 25m

Snow (NF EN 1991-1-3/NA (05/2007) + AI (07/2011))

On the ground

Zone : AI ($s_{R,0} = 0.45 \text{ kN/m}^2$) Criteria for zoning : ILLE-ET-VILAINE (35)

Characteristic value of snow on the ground at the relevant site : $s_{R,26 \text{ m}} = 0.45 \text{ kN/m}^2$

Ground snow load with a return period of 50 years : $s_{50 \text{ years}} = 0.45 \text{ kN/m}^2$

On the roof

Name	Type	Characteristic value	Roof form factor	Design value (horizontal projection)
Normal snow	uniformly distributed load	45.0 daN/m ²	0.8	35.45 daN/m ²

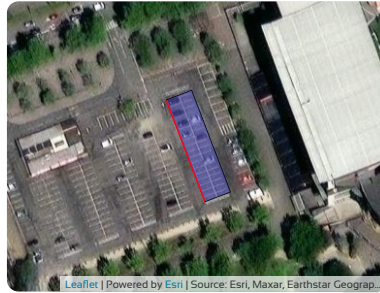


Terrain categories



Sectors	s1	s2	s3	s4
Categories	IV	IIIb	IIIb	IIIb

Radius R of the angular sector : 300 m



Low edge oriented towards the sector : s3

Wind - Peak velocity pressure

Zone : 2 ($v_{b,0} = 24.0 \text{ m/s}$) Criteria for zoning :ILLE-ET-VILAINE (35)

Zone c_{dir} : 2

Sectors	s1	s2	s3	s4
Sector definition	from 24° to 114°	from 114° to 204°	from 204° to 294°	from 294° to 24°
Fundamental value of the basic wind velocity $v_{b,0}$	24.0 m/s			
Shape parameter K	0.2			
Exponent n	0.5			
Annual probability of exceedence p	0.02			
Probability factor c_{prob}	1.0			
Directional factor c_{dir}	1.0	1.0	1.0	1.0
Basic wind velocity v_b	24.0 m/s	24.0 m/s	24.0 m/s	24.0 m/s
Reference roughness length $z_{0,II}$	0.05 m			
Roughness length z_0	1.0 m	0.5 m	0.5 m	0.5 m
Terrain factor k_r	0.234	0.223	0.223	0.223
Height above ground z	5.986 m			
Minimum height z_{min}	15.0 m	9.0 m	9.0 m	9.0 m
Roughness factor $c_{r(z)}$	0.635	0.645	0.645	0.645
Orography factor* $c_{o(z)}$	1.0	1.0	1.0	1.0
Mean wind velocity $v_{m(z)}$	15.2 m/s	15.5 m/s	15.5 m/s	15.5 m/s
Turbulence factor k_t	0.854	0.923	0.923	0.923
Standard deviation of the turbulence σ_v	4.804 m/s	4.943 m/s	4.943 m/s	4.943 m/s
Turbulence intensity $I_{v(z)}$	0.315	0.319	0.319	0.319
Air density ρ	1.225 kg/m ³			
Exposure factor $c_{e(z)}$	1.292	1.347	1.347	1.347
Peak velocity pressure $q_{p(z)}$	455.8 N/m ²	475.1 N/m ²	475.1 N/m ²	475.1 N/m ²
Peak wind velocity for Serviceability Limit States $v_{p(z),SLS}$	98.2 km/h	100.3 km/h	100.3 km/h	100.3 km/h
Peak wind velocity for Ultimate Limit States $v_{p(z),ULS}$	120.3 km/h	122.8 km/h	122.8 km/h	122.8 km/h

* Ici, le coefficient d'orographie est calculé selon la procédure 1, pour une orographie constituée d'obstacles de hauteurs et de formes variées. Ce type d'orographie est le plus fréquemment rencontré, mais si le bâtiment est dans un cas d'orographie constitué d'obstacles bien individualisés (collines isolées ou en chaîne, falaises et escarpements), le coefficient d'orographie doit être calculé selon la procédure 2. Conformément à EN 1991-1-4 §4.3.3(1), le coefficient d'orographie calculé (1.0) n'est pas pris en compte car il n'augmente pas les vitesses du vent de plus de 5%.



Earthquake (Code de l'environnement - Article D563-8-1 (09/01/2015) + JORF n°0248 du 24/10/2010 texte N°5)

Zone : 2 ($a_{gR} = 0.7 \text{ m/s}^2$) Criteria for zoning :ILLE-ET-VILAINE (35)

Importance class defined by the contracting authority: I - Buildings of minor importance for public safety, agricultural buildings, etc.

Seismic verification condition

In France, no seismic analysis is required for buildings in importance class I.

EXAMPLE

Additional comments

The results presented above are given as a preliminary study and are not certified.
On request, we can provide you with a complete certified calculation report.

[Order execution study](#)

This service also includes the optimization of the geometry of the structure, the cross-sections of the elements and the joints.

Summary of the structural analysis design report:

- A - General information
 - B - Data and summary of results
 - B 1 - Sketches and dimensions of the photovoltaic shelter
 - B 2 - Summary of checkings according to Eurocodes
 - C - Loads distribution report
 - D - Structural behavior and construction principles
 - D 1 - Purlins
 - D 1.1 - Recommended minimum thickness
 - D 1.2 - Normal forces required for the design of cold-formed purlins
 - D 2 - Rafter
 - D 3 - Column
 - D 4 - Assemblies
 - D 4.1 - Column base and anchorages
 - D 4.2 - Column top end plate
 - D 4.3 - Diagonal braces gussets
 - D 4.4 - Roof cross-bracing gussets
-
- Annex 1 - Model features
 - Annex 1.1 - Nodes
 - Annex 1.2 - Elements
 - Annex 1.3 - Cross sections and materials
 - Annex 2 - Loadings
 - Annex 2.1 - Dead loads
 - Annex 2.2 - Maintenance imposed loads
 - Annex 2.3 - Climatic loads
 - Annex 2.3.1 - Location
 - Annex 2.3.2 - Elevations
 - Annex 2.3.3 - Building
 - Annex 2.3.4 - Terrain categories
 - Annex 2.3.5 - Snow (NF EN 1991-1-3/NA (05/2007) + A1 (07/2011))
 - Annex 2.3.5.1 - On the ground
 - Annex 2.3.5.2 - On the roof
 - Annex 2.3.6 - Wind (NF EN 1991-1-4/NA (03/2008) + A1 (07/2011) + A2 (09/2012) + A3 (04/2019))
 - Annex 2.3.6.1 - Wind - Peak velocity pressure
 - Annex 2.3.6.2 - Degree of blockage under the roof
 - Annex 2.3.6.3 - Surface pressures on the roof
 - Annex 2.3.6.4 - Friction on the elements
 - Annex 2.3.6.5 - Structural factor c_{s,c_d} (NF EN 1991-1-4/NA (03/2008) 56)
 - Annex 2.4 - Thermal actions (NF EN 1991-1-5/NA (02/2008))
 - Annex 2.4.1 - Temperatures
 - Annex 2.4.2 - Expansion
 - Annex 2.5 - Earthquake (Code de l'environnement - Article D563-8-1 (09/01/2015) + JORF n°0248 du 24/10/2010 texte N°5)
 - Annex 2.5.1 - Construction data
 - Annex 2.5.2 - Seismic verification condition
 - Annex 2.6 - Loads tables
 - Annex 2.6.1 - Loads due to self-weight
 - Annex 2.6.2 - Concentrated loads
 - Annex 2.7 - Loadings combinations ()
 - Annex 2.7.1 - Ultimate Limit States
 - Annex 2.7.2 - Serviceability Limit States
 - Annex 3 - Mechanical calculation results
 - Annex 3.1 - Normal forces N_x
 - Annex 3.2 - Shear forces V_z
 - Annex 3.3 - Bending moments M_y
 - Annex 3.4 - Shear forces V_y
 - Annex 3.5 - Bending moments M_z
 - Annex 3.6 - Nodes displacements
 - Annex 3.6.1 - Horizontal translations U_x
 - Annex 3.6.2 - Horizontal translations U_y
 - Annex 3.6.3 - Vertical translations U_z
 - Annex 4 - Detailed checkings of the elements ()



- Annex 4.1 - Column
- Annex 4.2 - Rafter
- Annex 4.3 - Diagonal braces
- Annex 5 - Longitudinal stability system ◊
 - Annex 5.1 - Roof cross-bracing
- Annex 6 - Detailed checkings of the connections ◊
 - Annex 6.1 - Column base and anchorages
 - Annex 6.2 - Column top end plate
 - Annex 6.3 - Diagonal braces gussets
 - Annex 6.4 - Roof cross-bracing gussets

The considered system for installing purlins is: unknown (with or without sleeve)

EXAMPLE

