

SPANer

assistance in the selection of profiled sheets offered by
ArcelorMittal Construction.

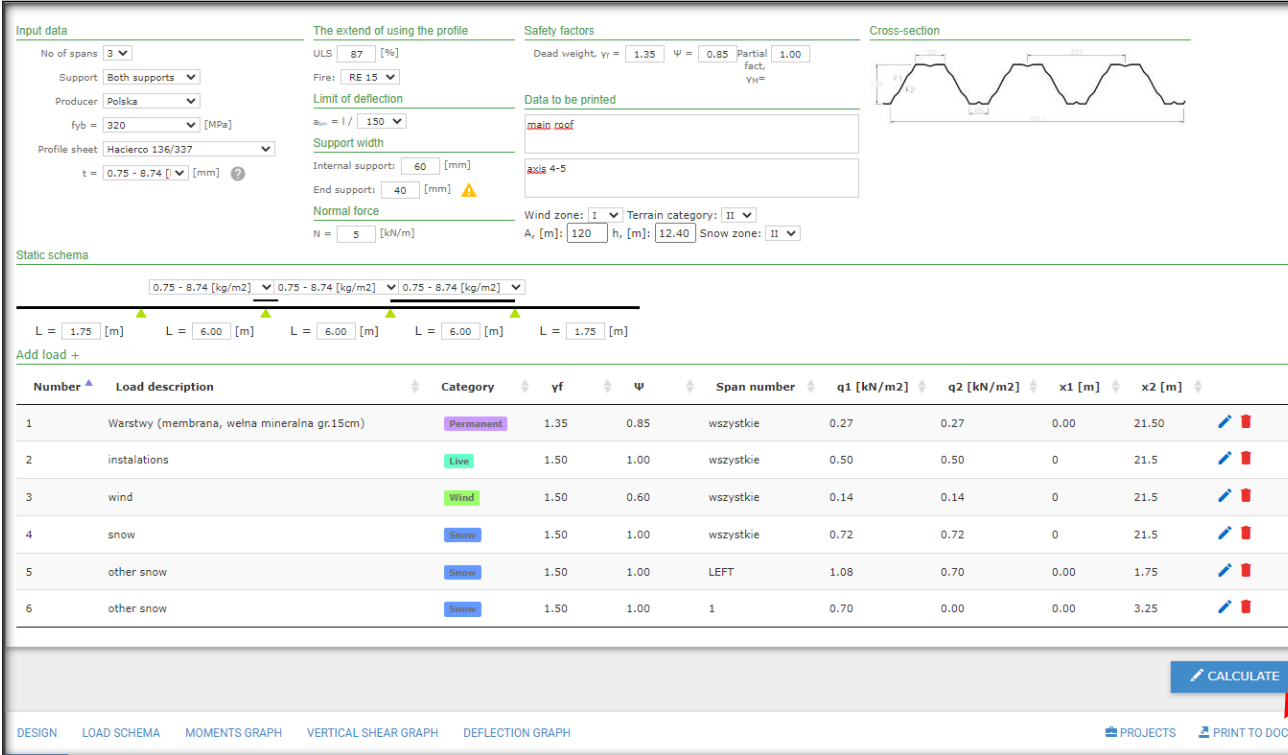
Calculation report

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SPANer – CALCULATION REPORT

GENERATION OF THE REPORT

With the calculations correctly performed, we can proceed to generate the report. This can be done in 2 ways. If we only want a report of the specific calculations, it is sufficient to select the "EXPORT TO DOC" button immediately after acceptance.



The screenshot displays the SPANer software interface with the following sections:

- Input data:** No of spans (3), Support (Both supports), Producer (Polska), f_{yb} (320 [MPa]), Profile sheet (Hacierno 136/337), t (0.75 - 8.74 [mm]).
- The extend of using the profile:** ULS (87 [%]), Fire (RE 15), Limit of deflection (s_{lim} = 1 / 150), Support width (Internal support: 60 [mm], End support: 40 [mm]), Normal force (N = 5 [kN/m]).
- Safety factors:** Dead weight, γ_f = 1.35, ψ = 0.85, Partial fact. γ_M = 1.00.
- Cross-section:** A diagram showing a three-span profile with dimensions.
- Static schema:** A diagram showing the span lengths: L = 1.75 [m], L = 6.00 [m], L = 6.00 [m], L = 6.00 [m], L = 1.75 [m].
- Add load +:** A table listing various loads.
- Buttons:** A blue 'CALCULATE' button with a pencil icon, and a 'PRINT TO DOC' button at the bottom right.

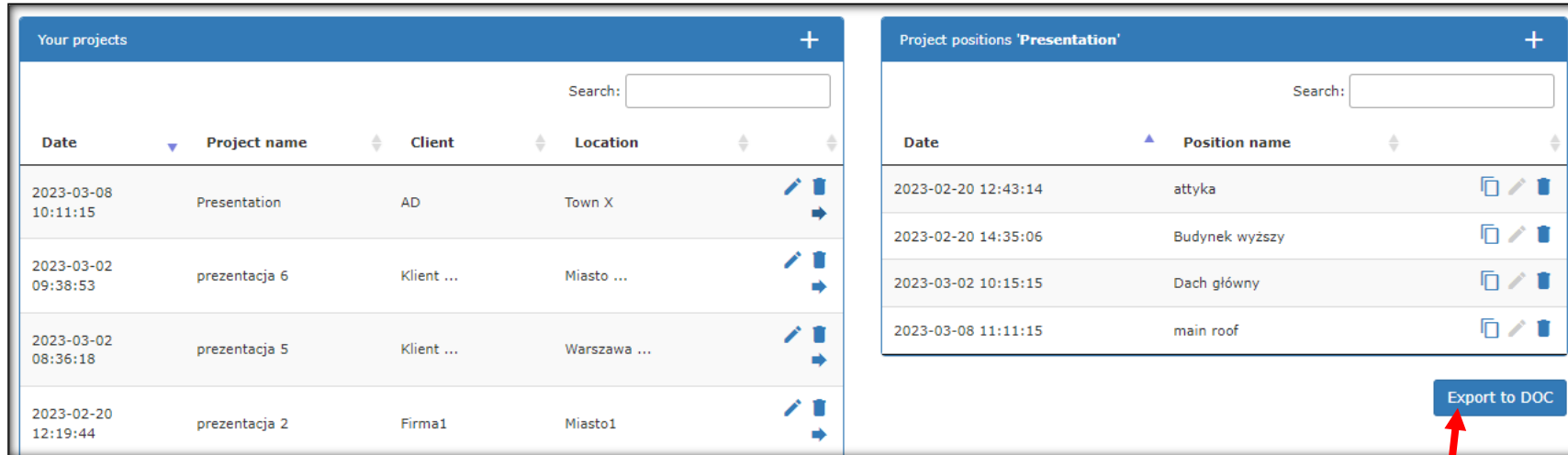
Number	Load description	Category	γ _f	ψ	Span number	q1 [kN/m ²]	q2 [kN/m ²]	x1 [m]	x2 [m]
1	Warstwy (membrana, wełna mineralna gr.15cm)	Permanent	1.35	0.85	wszystkie	0.27	0.27	0.00	21.50
2	instalations	Live	1.50	1.00	wszystkie	0.50	0.50	0	21.5
3	wind	Wind	1.50	0.60	wszystkie	0.14	0.14	0	21.5
4	snow	Snow	1.50	1.00	wszystkie	0.72	0.72	0	21.5
5	other snow	Snow	1.50	1.00	LEFT	1.08	0.70	0.00	1.75
6	other snow	Snow	1.50	1.00	1	0.70	0.00	0.00	3.25

Here we can generate a report from the example just calculated

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GENERATION OF THE REPORT

However, if we want to generate a report on the entire project (and all the positions previously saved in it), we have to do so from the PROJECT level.



The screenshot displays two side-by-side panels. The left panel, titled 'Your projects', contains a table with columns for Date, Project name, Client, and Location. The right panel, titled 'Project positions 'Presentation'', contains a table with columns for Date and Position name. A red arrow points from the 'Export to DOC' button in the bottom right of the right panel to the explanatory text below.

Date	Project name	Client	Location
2023-03-08 10:11:15	Presentation	AD	Town X
2023-03-02 09:38:53	prezentacja 6	Klient ...	Miasto ...
2023-03-02 08:36:18	prezentacja 5	Klient ...	Warszawa ...
2023-02-20 12:19:44	prezentacja 2	Firma1	Miasto1

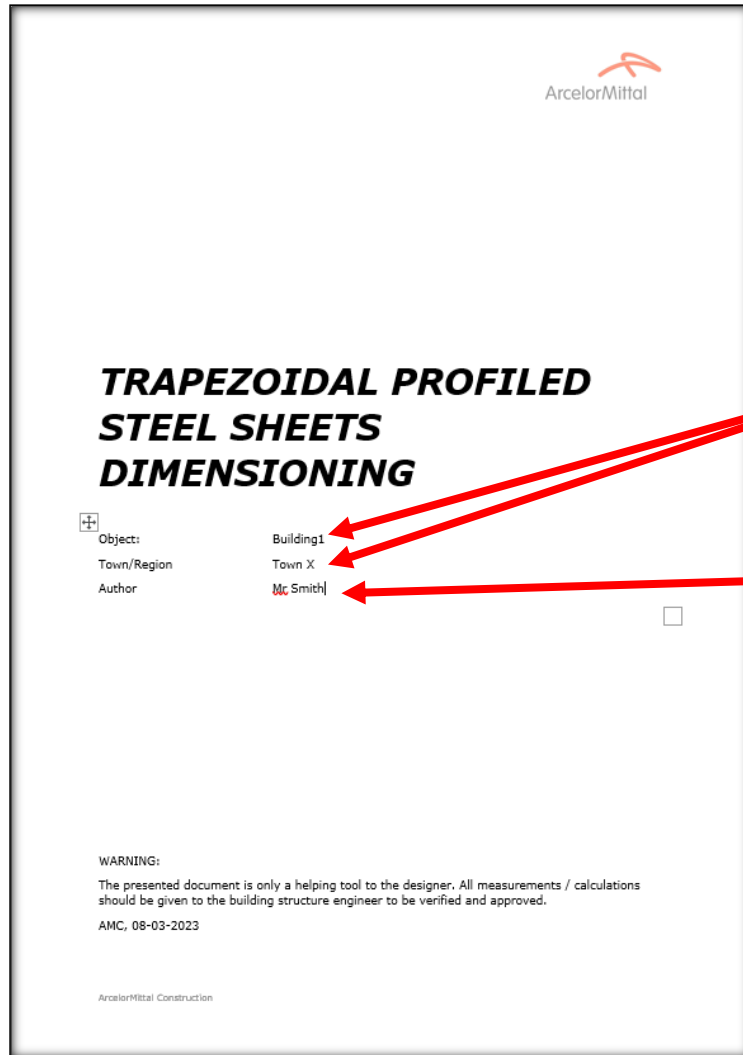
Date	Position name
2023-02-20 12:43:14	attyka
2023-02-20 14:35:06	Budynek wyższy
2023-03-02 10:15:15	Dach główny
2023-03-08 11:11:15	main roof

Export to DOC

Here, we can generate a report of all the calculation positions saved in the project.

SPANer – CALCULATION REPORT

FRONT PAGE




The language in which the report is produced depends on the current SPANer session (selectable in the top right corner of the programme).

Some of the content of the report can be completed automatically. If you run the report from within a project, SPANer automatically fills in the object name and location..

The "Author of the report" will also be completed automatically on the basis of the data provided during registration.

SPANer – CALCULATION REPORT

CONTENTS



CONTENT

TECHNICAL DESCRIPTION

- 1. ASSUMPTIONS.....

 - 1.1. Norms used to assume the loads
 - 1.2. Norms used to profiled sheet calculations.....

- 2. SUBJECT AND THE SCOPE OF THE DOCUMENT.....
- 3. ASSUMPTIONS FOR CALCULATIONS
- 4. STRUCTURAL DESCRIPTION OF THE ASSUMED PART OF THE PROJECT
- 5. STATIC CALCULATION EXTRACT.....

 - 5.1. attyka (Hacierco 136/337 0.75mm).....
 - 5.2. Budynek wyższy (Hacierco 18/173 0.6mm)
 - 5.3. Dach główny (Hacierco 136/337 0.75mm)
 - 5.4. main roof (Hacierco 136/337 0.75mm).....

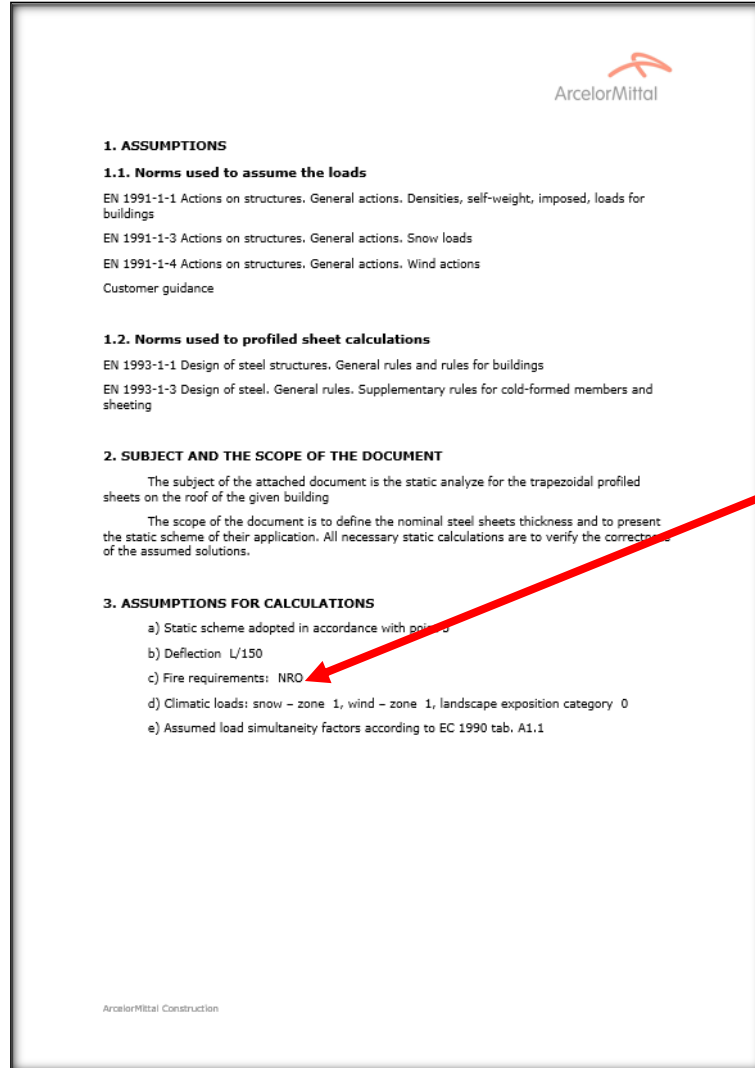
DRAWINGS

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The number of calculation items, item names or profile information is generated automatically. The order of the items remains according to the order in the project, i.e. newest/last is edited lowest. If this order does not suit us, we can edit it in Word and update the index easily.

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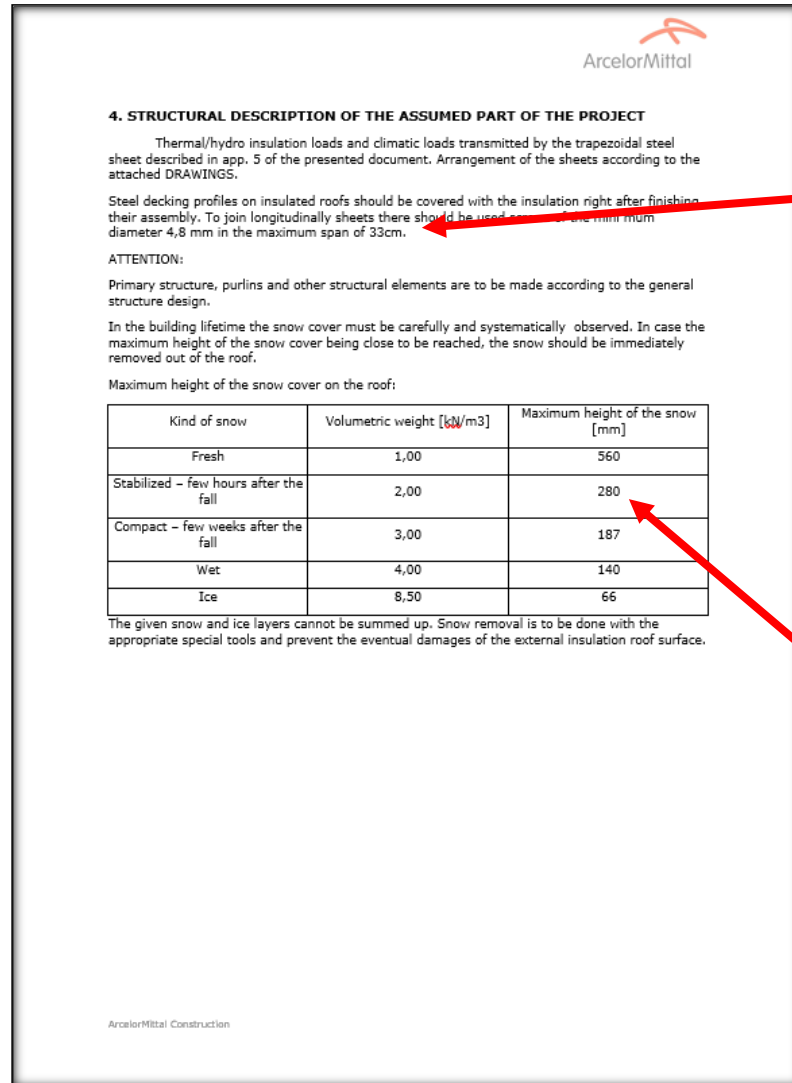
ELEMENTS OF THE REPORT




The majority of the entries on this page constitute universal documentation content so that a possibly complete project can be easily handed over to someone else. The elements of point 3, however, are completed automatically on the basis of the data filled in earlier in the programme in the section "Data to be printed".

SPANer – CALCULATION REPORT

DESCRIPTION




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4. STRUCTURAL DESCRIPTION OF THE ASSUMED PART OF THE PROJECT

Thermal/hydro insulation loads and climatic loads transmitted by the trapezoidal steel sheet described in app. 5 of the presented document. Arrangement of the sheets according to the attached DRAWINGS.

Steel decking profiles on insulated roofs should be covered with the insulation right after finishing their assembly. To join longitudinally sheets there should be used screws of the minimum diameter 4,8 mm in the maximum span of 33cm.

ATTENTION:
Primary structure, purlins and other structural elements are to be made according to the general structure design.

In the building lifetime the snow cover must be carefully and systematically observed. In case the maximum height of the snow cover being close to be reached, the snow should be immediately removed out of the roof.

Maximum height of the snow cover on the roof:

Kind of snow	Volumetric weight [kN/m ³]	Maximum height of the snow [mm]
Fresh	1,00	560
Stabilized – few hours after the fall	2,00	280
Compact – few weeks after the fall	3,00	187
Wet	4,00	140
Ice	8,50	66

The given snow and ice layers cannot be summed up. Snow removal is to be done with the appropriate special tools and prevent the eventual damages of the external insulation roof surface.

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The permissible spacing of the longitudinal stitching may be restricted if fire requirements are introduced. Here we rely on the classification made for our sheets. However, it is advisable to make sure if you are calculating for a different classification that the requirements are not more stringent.

The permissible snow cover thickness is also automatically completed based on the snow load zone defined in the programme. Of course, these values can also be edited if other assumptions have been made in the design.

SPANer – CALCULATION REPORT

STATEMENT OF THE CALCULATION

5. STATIC CALCULATION EXTRACT

5.1. attyka (Hacierno 136/337 0.75mm)

Assumed profile **Hacierno 136/337 0.75 mm** in the static scheme 3 span pro-longed continuity for the minimum width of the extreme support 40mm for the minimum width of the intermediate / extreme support 60mm

Overlapping on both sides on the prop no:2
Overlapping length ul = 60cm
Overlapping length up = 60cm
Minimum load capacity of a group of fasteners = 1.91kN

At the beginning and end of the overlapping, use a group of fasteners with a shear resistance above 1.91 kN

0.75 - 8.74 [kg/m²] 0.75 - 8.74 [kg/m²] 0.75 - 8.74 [kg/m²]

L = [1.75] [m] L = [6.00] [m] L = [6.00] [m] L = [6.00] [m] L = [1.75] [m]

Geometric data

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As mentioned earlier, the order of the calculation positions is determined by the time of writing in the design. In the report, the information on the profile used and the sheet thickness is automatically completed. If different thicknesses, double layouts etc. are used, this information may need to be edited if we would like it to contain complete information.

Another piece of information is the width of the supports. This is given individually in the individual calculation positions, which is helpful for example in the case of more complex buildings. It can also be useful if you want to quickly check whether the calculations are still valid if there have been any changes to the documentation in the meantime, e.g. in terms of the girders to be supplied.

If our example contains extensions on one or both sides, an additional field will appear containing information on the number of the support over which the extension is applied, the length of the overlap (according to the sketch) and the required load capacity of the group of connectors. If the extension is on several supports, the lengths of the overlaps will be given for these in sequence.

In the case of extensions, a pre-selection of the coupling is also made for ease of use (as there are many manufacturers and a huge number of products on the market, it is always possible to make your own selection based on the specified force value). If the introduced arrangement results in a breaking force, a connector for the support will also be proposed.

The rest of the data provides a schematic representation of the geometry adopted, making it easier to find your way around the report



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STATEMENT OF THE CALCULATION

The following pages contain a summary of the loads assumed, load diagram, forces, reactions, graphs and calculations, i.e. everything that is necessary and contained in the programme after the calculation has been performed. A similar summary will be provided for the subsequent calculation positions. As the report is supplied in doc format, new comments can be added at any time or otherwise divided up on the page according to our own needs.

Equally distributed loads

No	Description load	Type of load	qk [kN/m ²]	ψ	qk · ψ [kN/m ²]	Y	qd [kN/m ²]
1	Self weight of profiled sheet	Self weight	0.12	1.00	0.12	1.35	0.14
2	Worstwy (membrana, wełna mineralna gr.15cm)	Permanent load	0.27	0.85	0.27	1.35	0.31
3	zostawiacz	Live load	0.50	1.00	0.50	1.50	0.75
4	wiecie	Wind load	0.14	0.60	0.08	1.50	
5	śnieg	Snow load	0.72	1.00	0.72	1.50	
SUM:							1.69

Irregularly distributed loads

No	Description load	Span number	ψ	Y	q1 [kN/m ²]	q2 [kN/m ²]	x1 [m]
1	niekierowa śniegowina. Snow load directly at the obstacle equals 1.08 kN/m ² and decreases to 0.70 kN/m ² on a length of 1.75 m	0	1.00	1.50	1.08	0.70	0.00
2	niekierowa śniegowina. Snow load directly at the obstacle equals 0.70 kN/m ² and decreases to 0.00 kN/m ² on a length of 1.25 m	1	1.00	1.50	0.70	0.00	0.00

The maximum strength for the Ultimate Limit State (ULS) is 108%
The maximum strength for the Serviceability Limit State (SLS) is 33%

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Load schema

Cross-sectional forces

Span	L [m]	VEd max [kN/m]		MEd max [kNm/m]		Deflection [mm]	
		x = 0	x = L	Prop (x=0)	Span (x=L)		
1	6.00	7.99	-7.91	-5.81	4.38	-8.84	13.08
2	6.00	7.43	-6.77	-8.84	2.82	-6.86	5.56
3	6.00	7.91	-6.89	-6.86	5.83	-3.78	10.89

Reaction

Prop	1	2	3	4
Reaction	14.47	15.34	14.68	11.20

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Moments graph

Vertical shear graph

Deflection graph

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Sagging bending resistance (39%)
 Span 1: $M_{Ed} / M_{Rd,Ed} = 4.38 / 11.12 = 0.39 \leq 1.00$
 Span 2: $M_{Ed} / M_{Rd,Ed} = 2.82 / 11.12 = 0.25 \leq 1.00$
 Span 3: $M_{Ed} / M_{Rd,Ed} = 5.83 / 22.24 = 0.26 \leq 1.00$

Hogging bending resistance (64%)
 Prop 1: $M_{Ed} / M_{Rd,Ed} = 5.81 / 10.73 = 0.54 \leq 1.00$
 Prop 2: $M_{Ed} / M_{Rd,Ed} = 8.84 / 21.46 = 0.41 \leq 1.00$
 Prop 3: $M_{Ed} / M_{Rd,Ed} = 6.86 / 10.73 = 0.64 \leq 1.00$
 Prop 4: $M_{Ed} / M_{Rd,Ed} = 3.78 / 21.46 = 0.18 \leq 1.00$

Pressure to the support resistance (73%)
 Prop 1: $R_{Ed} / R_{Rd,Ed} = 14.47 / 20.00 = 0.72 \leq 1.00$
 Prop 2: $R_{Ed} / R_{Rd,Ed} = 15.34 / 40.00 = 0.38 \leq 1.00$
 Prop 3: $R_{Ed} / R_{Rd,Ed} = 14.68 / 20.00 = 0.73 \leq 1.00$
 Prop 4: $R_{Ed} / R_{Rd,Ed} = 11.20 / 40.00 = 0.28 \leq 1.00$

Interaction on the internal support (108%)
 Prop 1: $M_{Ed,Ed} / M_{Rd,Ed} + R_{Ed} / R_{Rd,Ed} = 5.62 / 13.42 + 14.47 / 25.00 = 1.00 \leq 1.00$
 Prop 2: $M_{Ed,Ed} / M_{Rd,Ed} + R_{Ed} / R_{Rd,Ed} = 8.62 / 26.84 + 15.34 / 50.00 = 0.63 \leq 1.00$
 Prop 3: $M_{Ed,Ed} / M_{Rd,Ed} + R_{Ed} / R_{Rd,Ed} = 6.66 / 13.42 + 14.68 / 25.00 = 1.08 > 1.00$
 Prop 4: $M_{Ed,Ed} / M_{Rd,Ed} + R_{Ed} / R_{Rd,Ed} = 3.65 / 26.84 + 11.20 / 50.00 = 0.36 \leq 1.00$

Vertical shear resistance at the beginning and end of the overlapping (34%)
 Prop 2 on the left side: $V_{Ed} / V_{Rd,Ed} = 6.49 / 19.28 = 0.34 \leq 1.0$
 Prop 2 on the right side: $V_{Ed} / V_{Rd,Ed} = 6.01 / 19.28 = 0.31 \leq 1.0$

Bending resistance at the beginning and end of the overlapping (45%)
 Prop 2 on the left side: $M_{Ed} / M_{Rd,Ed} = 4.52 / 10.73 = 0.42 \leq 1.0$
 Prop 2 on the right side: $M_{Ed} / M_{Rd,Ed} = 4.81 / 10.73 = 0.45 \leq 1.0$

The maximum strength for the Ultimate Limit State (ULS) is 108%

Deflection (33%)
 Left cantilever: $(L_{Ed} = 276.76): a / a_{lim} = -1.66 / 23 = 0.07 \leq 1.00$
 Span 1: $(L_{Ed} = 276.76): a / a_{lim} = 13.08 / 40 = 0.33 \leq 1.00$
 Span 2: $(L_{Ed} = 276.76): a / a_{lim} = 5.56 / 40 = 0.14 \leq 1.00$
 Span 3: $(L_{Ed} = 553.52): a / a_{lim} = 10.89 / 40 = 0.27 \leq 1.00$
 Right cantilever: $(L_{Ed} = 553.52): a / a_{lim} = -6.60 / 23 = 0.29 \leq 1.00$

The maximum strength for the Serviceability Limit State (SLS) is 33%

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SPANer – CALCULATION REPORT

We encourage you to use our programme free of charge. Should you have any problems, our technical team will be happy to clarify any doubts.

We are constantly developing our software. We believe that the accessibility, intuitiveness, functionality and clarity of SPANer will make your work easier and enable you to make the best possible selection of the profiled sheets offered by ArcelorMittal Constuction.

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