

BUILDING
STEEL PROFILES



READY TO ASSEMBLE PROFILES FOR STEEL STRUCTURES

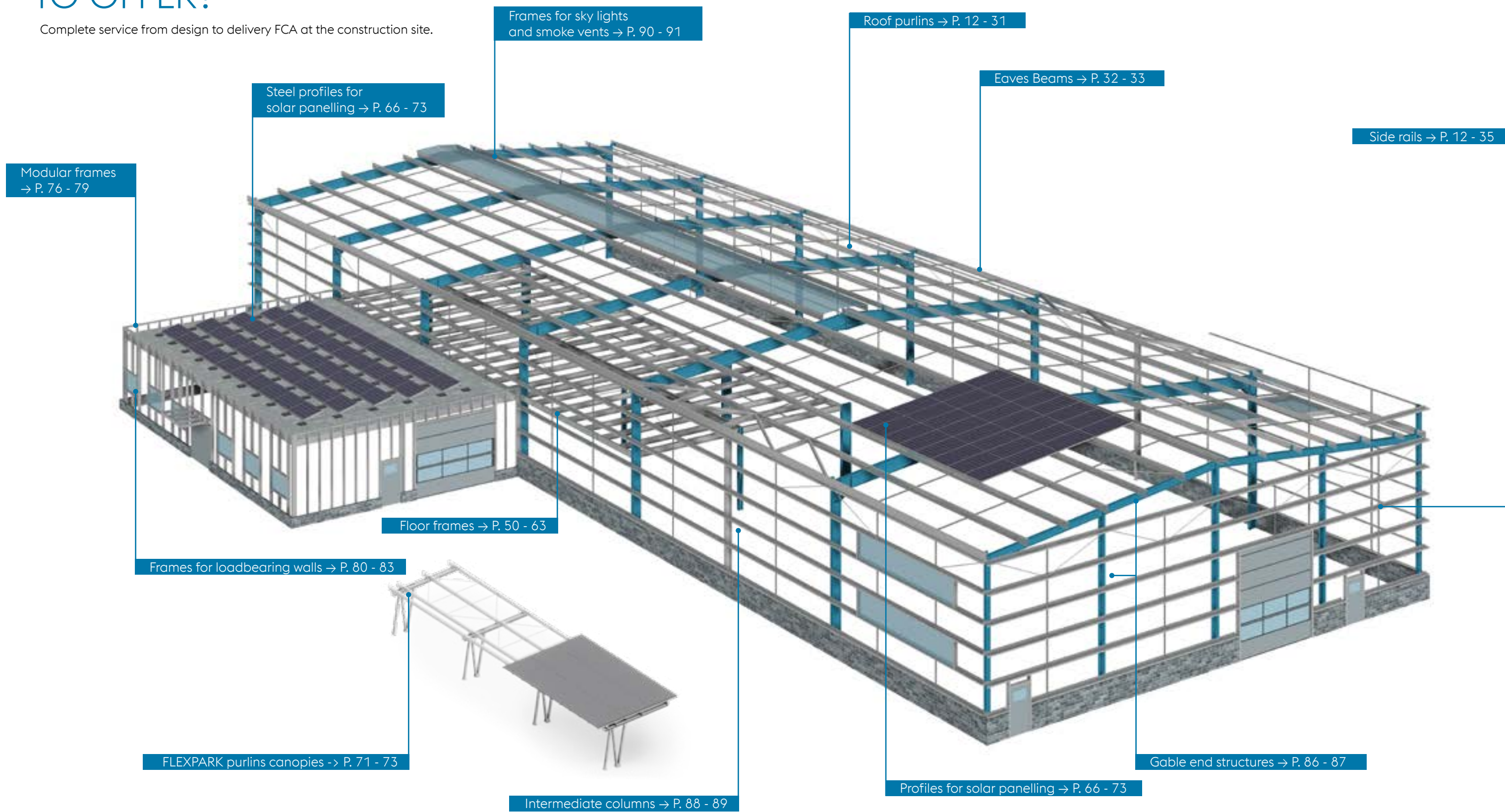
INTRODUCTION	05
ROOF PURLINS AND SIDE RAILS	11
FLOOR FRAMES	49
STEEL PROFILES FOR SOLAR PANELLING	65
MISCELLANEOUS CONSTRUCTIONS	75
BUILDING SECTIONS RANGE	99

INTRODUCTION

- WHAT HAS VOESTALPINE SADEF TO OFFER?	P.06
- WHO IS VOESTALPINE SADEF?	P.08
- WHY VOESTALPINE SADEF?	P.09

WHAT HAS VOESTALPINE SADEF TO OFFER?

Complete service from design to delivery FCA at the construction site.



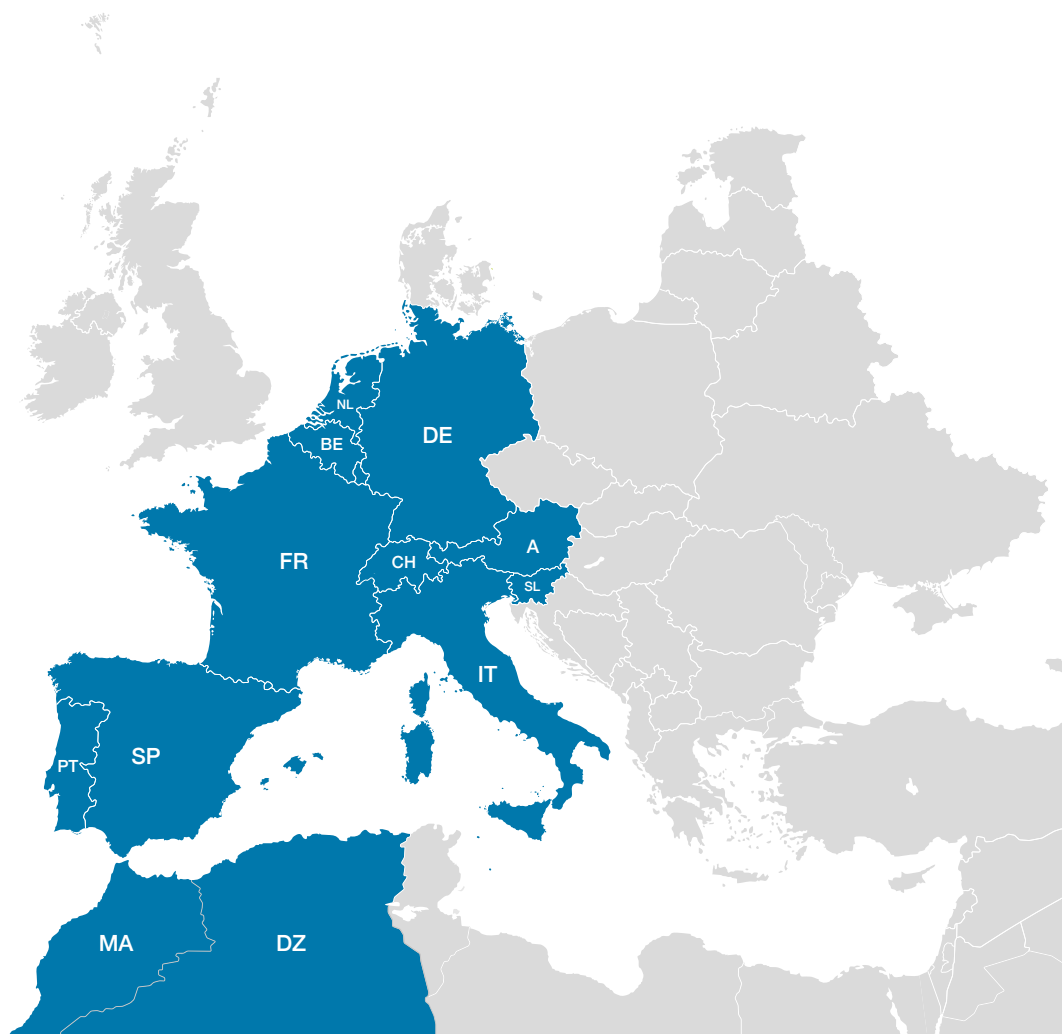


WHO IS VOESTALPINE SADEF?

FACTS AND FIGURES

- Subsidiary of the voestalpine steel group
- Over 75 years of experience in cold roll forming
- 600 employees
- 35 rolling mills and 200 km daily output of sections
- In house design & engineering department employing more than 20 enthusiastic structural engineers
- Excellent technical know-how
- CE-certified solutions
- In house surface treatment (powder coating upon request)
- Intelligent ready-to-assemble solutions

MORE THAN
70 YEARS OF
EXPERIENCE



WHY VOESTALPINE SADEF?

voestalpine SadeF Engineering

1.
Project data

2.
Stability engineering
and optimisation of
profile shapes

3.
Specification and
creation of
production data

4.
Calculation sheet

Client
Engineering

5.
Design
by the client

voestalpine SadeF Production

6.
Pre- and
postpiercing
facilities

7.
Inkjet
marking

8.
Rollforming

9.
Quality control

10.
Packing

CERTIFICATES

EN 1090

ISO 9001

ISO 14001

ISO 16949

INTRODUCTION

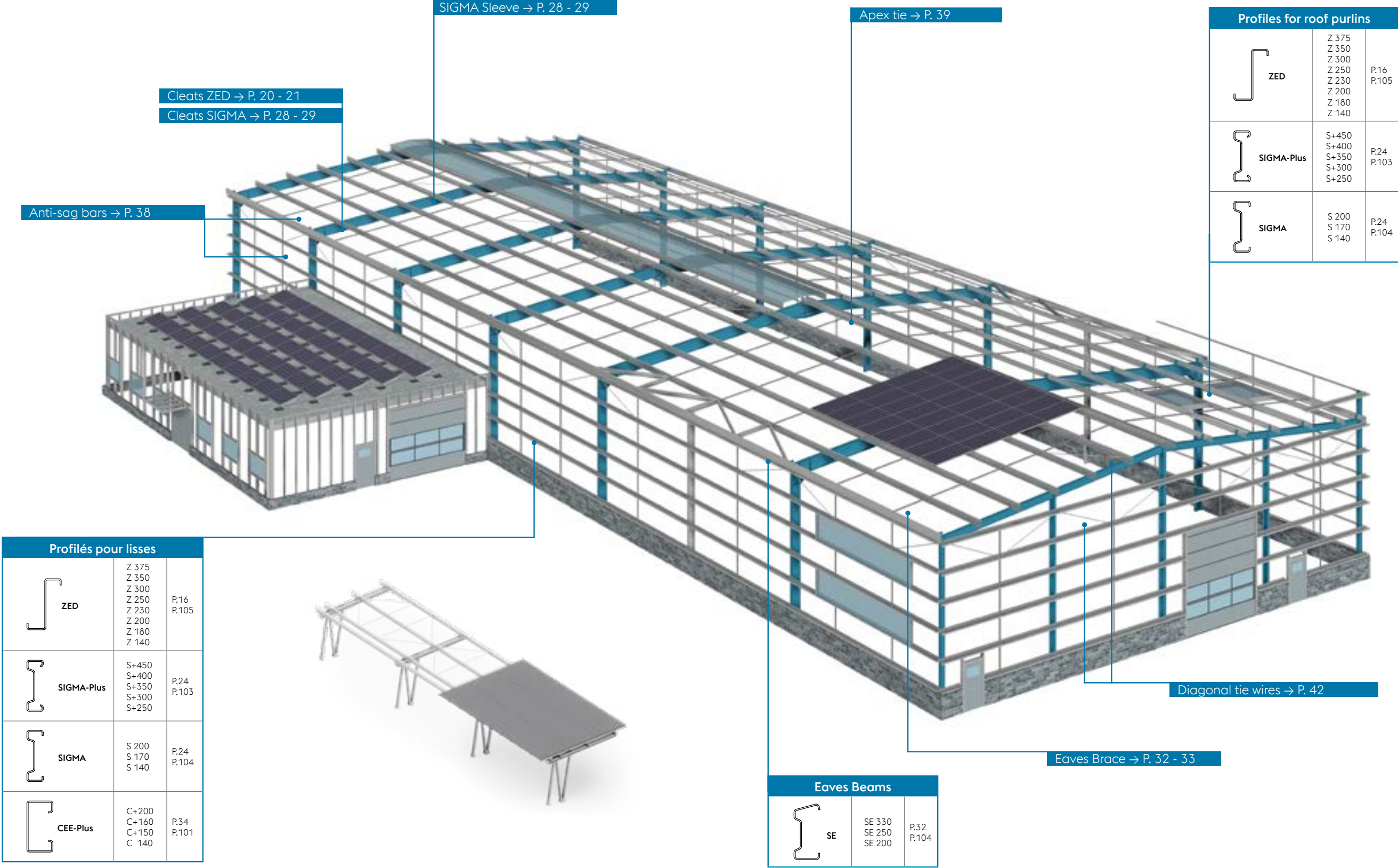
08

09

ROOF PURLINS AND SIDE RAILS

ZED	P.16 - 21
SIGMA	P.24 - 29
SE	P.32 - 33
CEE	P.34 - 35
ACCESSORIES	P.38 - 43
ONLINE OFFER CALCULATION	P.46 - 47

ROOF PURLINS AND SIDE RAILS





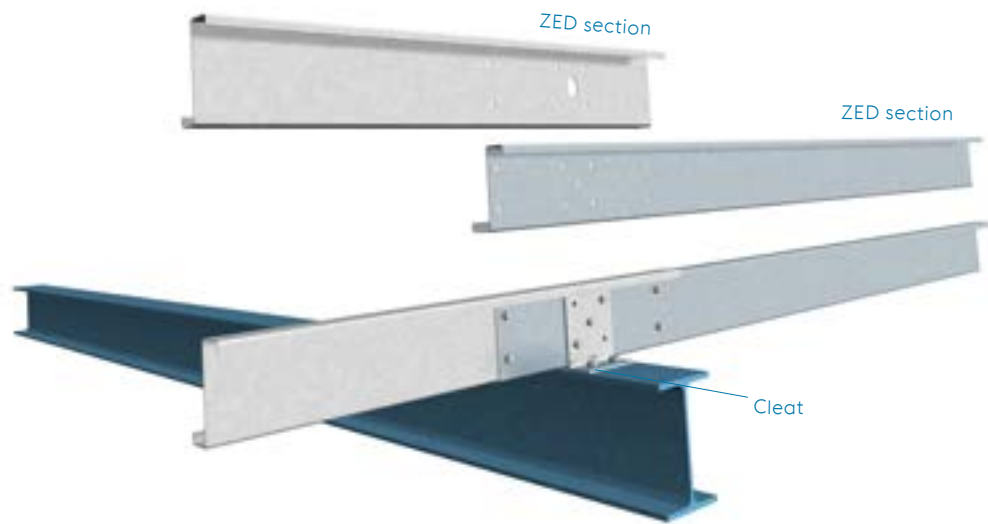
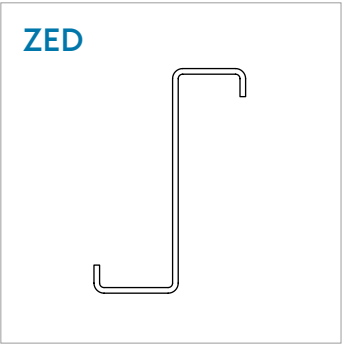
ROOF PURLINS AND SIDE RAILS

ZED - BEAM

voestalpine SadeF offers you a wide range of ZED sections for spans **up to 18 m**. The sections are suitable for any substructure.

The shape of the ZED section allows us to nest the sections, and to create an optimal beam system.

voestalpine SadeF ZED sections can be used as single span beams, double span beams or as continuous overlap beams. The **optimal beam system** is, in most cases, a continuous overlap beam. The best solution for projects with a bigger roof slope is ZED sections. voestalpine SadeF will be pleased to advise your design department.



WE OFFER A COMPREHENSIVE SERVICE INCLUDING:

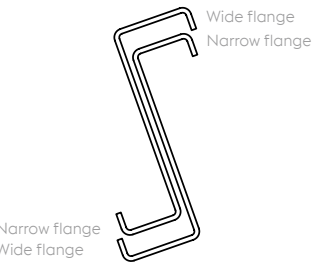
Detailed quotation according to the prevailing standards:

- Strength calculation
- Production drawings
- Assembly overview
- BIM-compatible

Tailor-made parts and components:

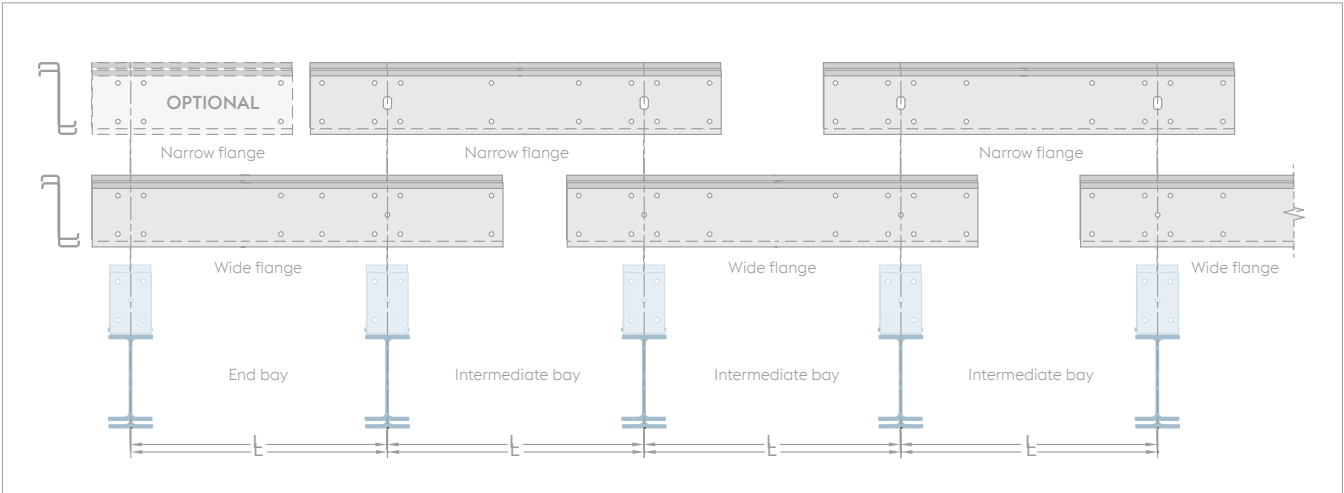
- Ready to assemble
- Delivered just-in-time
- Clear marking
- All accessories inclusive
- Professional packaging

ZED - OVERLAP



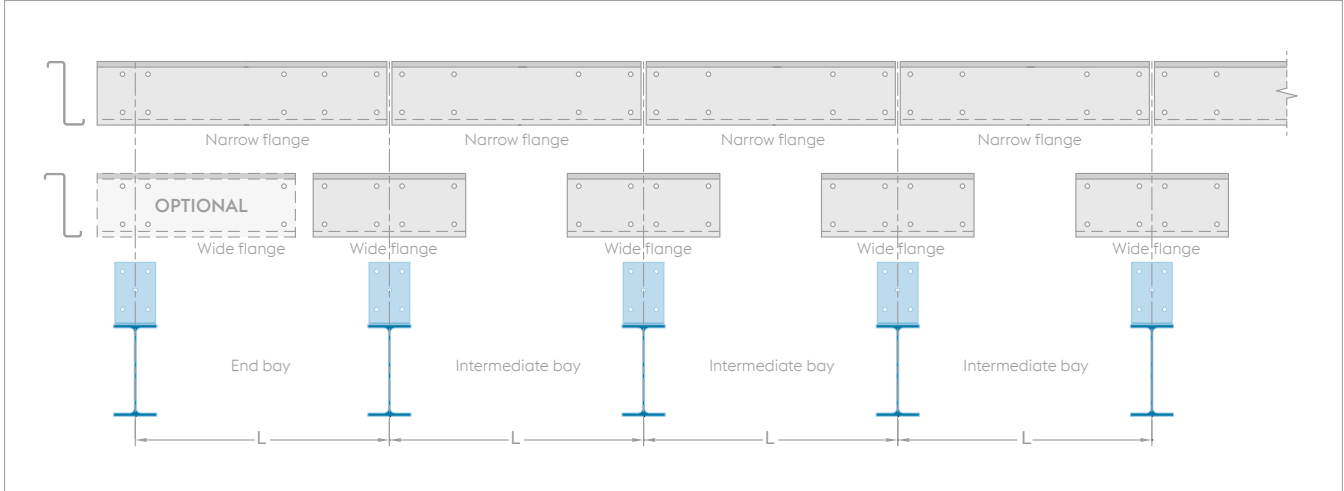
voestalpine SadeF ZED-sections have one wide and one narrow flange. Nesting the sections in an overlap system creates a continuous beam resting on the intermediate supports of the primary structure.

OVERLAP BEAM WITH QA-SYSTEM

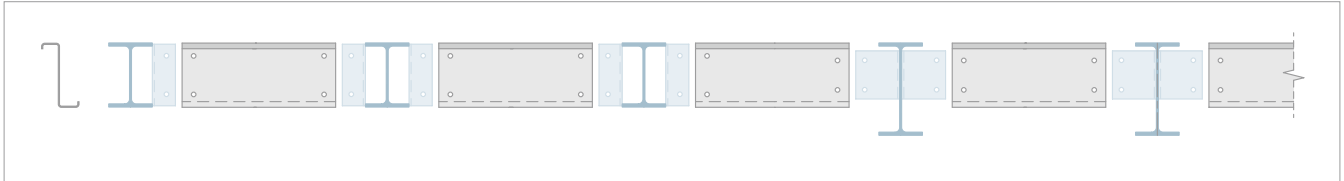


- Nesting narrow flange inside wide flange creates an overlap.
- Nesting of beams results in a double section at intermediate beam supports (where loads are to be transferred) thus ensuring that the material is used to its optimum efficiency.
- Several possibilities for optimizing the beam system: adjust the overlap length (between 5 and 15% of the span), use heavier beams or a double 'nested' beam on end bays. (**see OPTION**)
- Faster and safer assembly is achieved using the QA-system.

SLEEVE BEAM

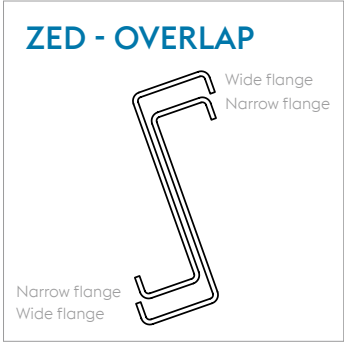


SINGLE SPAN BEAMS (ASSEMBLY BETWEEN SPANS)



ZED OVERLAPPING BEAM WITH QA-SYSTEM

voestalpine Sadef QA-system (Quick Assembly System) will **save considerable assembly time**. ZED sections are therefore fitted separately to the individual cleats and subsequently connected to the nesting purlin, without loosening the bolts of the initial assembly.



QA-SYSTEM: SAFE, FAST AND EASY-TO-INSTALL

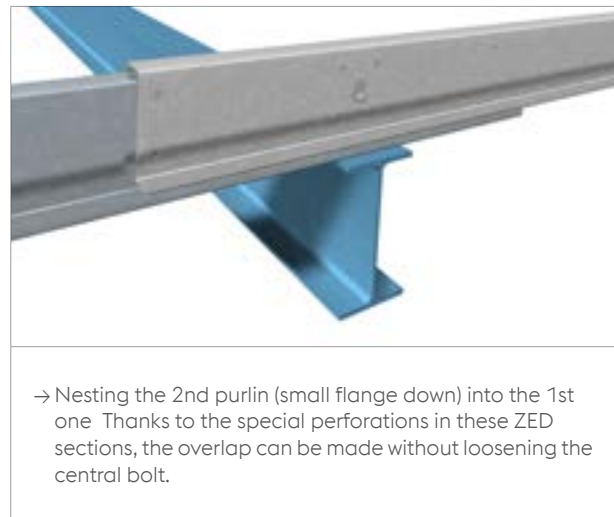
Step A



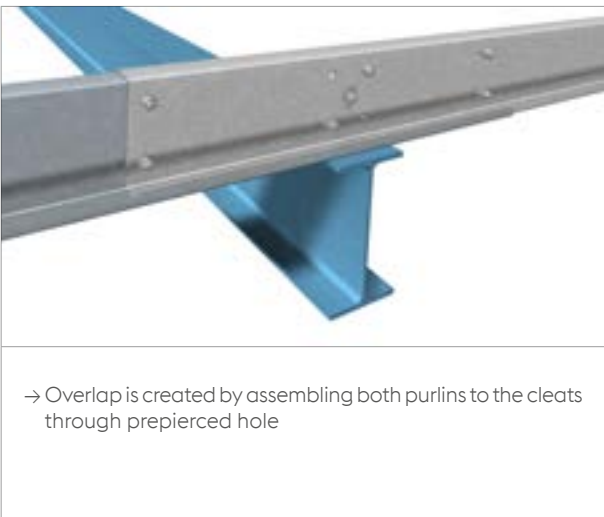
Step B



Step C

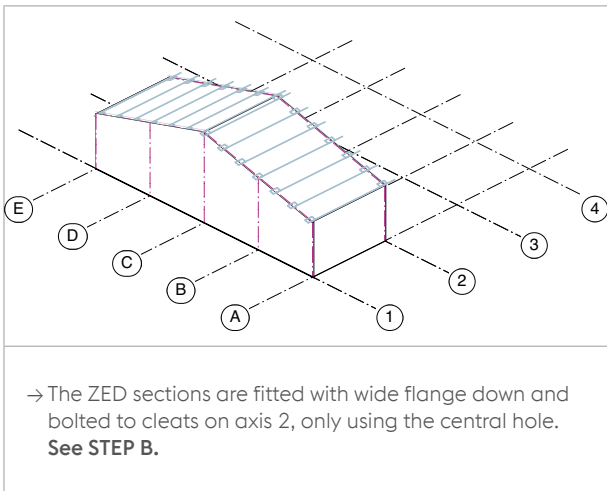


Step D

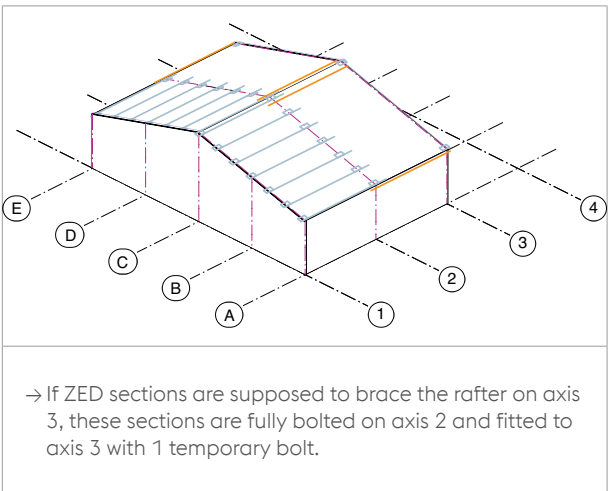


ZED - ASSEMBLY SEQUENCE

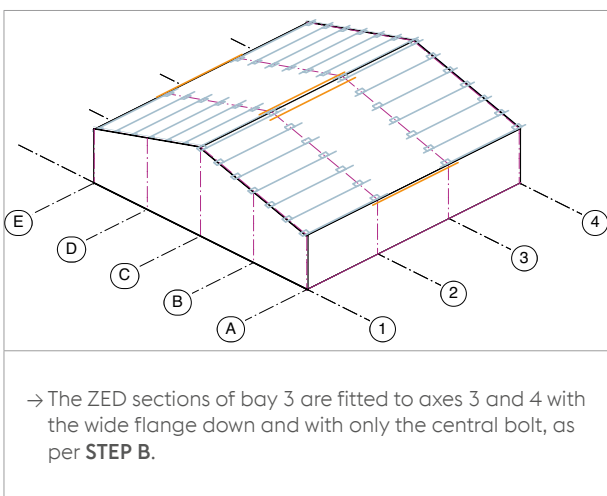
Step 1



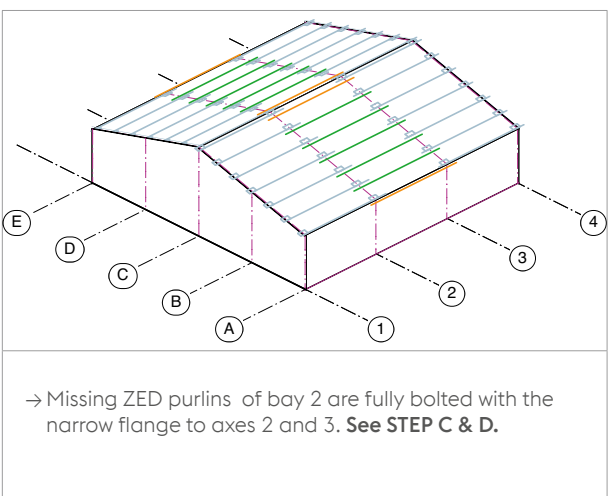
Step 2



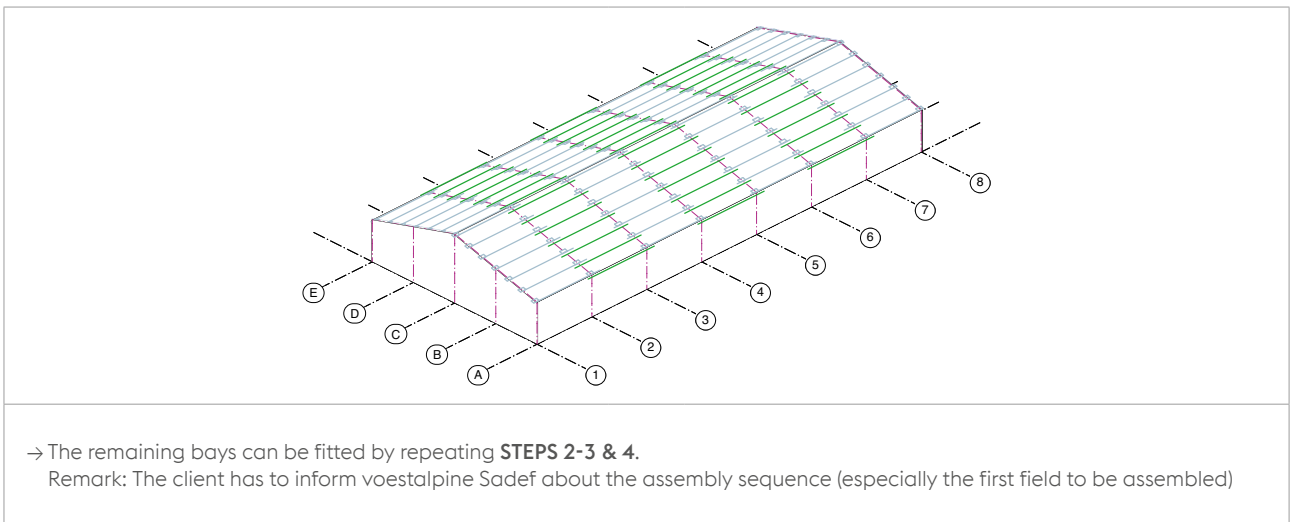
Step 3



Step 4



Step 5



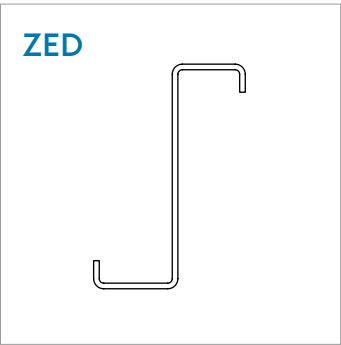
ZED - CLEATS

CLEATS

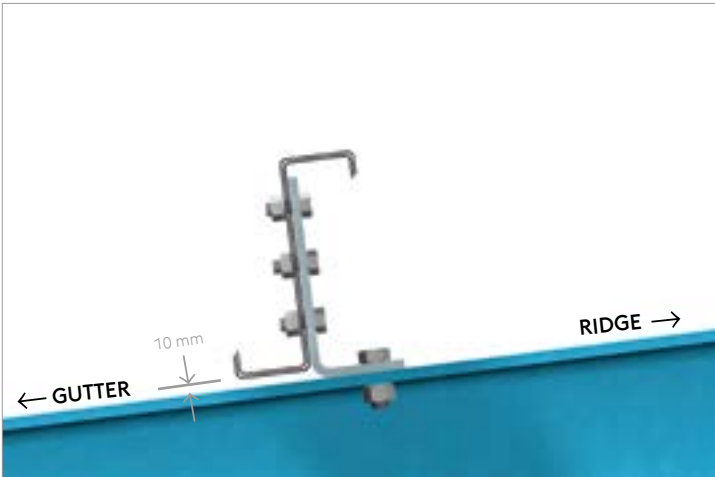
voestalpine SadeF sections are fitted to the substructure by means of cleats. ZED-purlins should be bolted to the cleats with their top flanges pointing to the roof ridge.

To avoid web crippling, a 10 mm clearance between main frame and voestalpine SadeF beams is required. This is achieved by the offset hole position in beams and cleats.

Cleats are also necessary for transmitting the roof diaphragm forces to the substructure. voestalpine SadeF-cleats are made from HSLA-steel grades and are hot-dip galvanized.

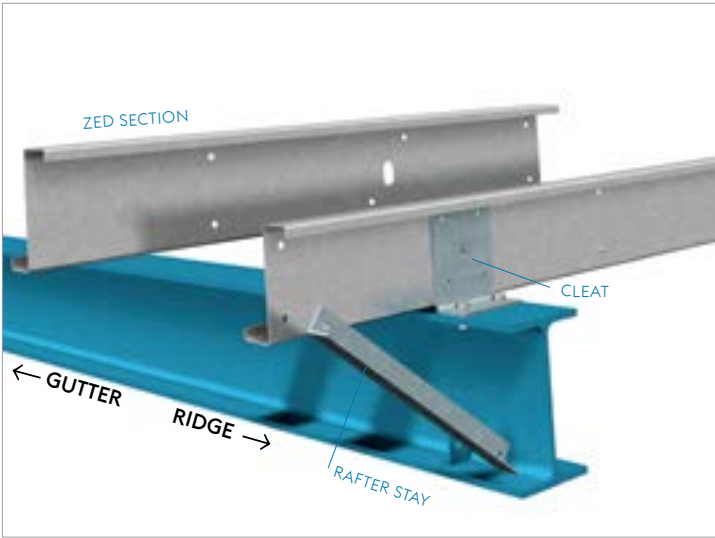


ROOF - CLEATS



+/- 10 mm clearance between voestalpine SadeF ZED sections and substructure

SIDE RAIL - CLEATS

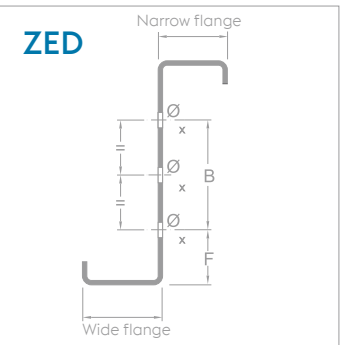


RAFTER STAYS

Rafter stays can be fixed in the holes at the end of the overlap. Please inform voestalpine SadeF if rafter stays are to be used. This element will then be taken into consideration for the strength calculations.

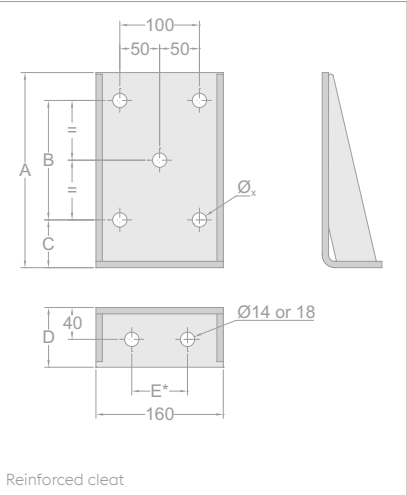
Depending on the substructure geometry either standard (EZED) or reinforced (EZEDXX) cleats can be used. Both types are suitable for the QA-system. If the customer chooses to provide the cleats himself and weld them to the rafters, this is of course possible. The forces on the supports can be specified by our design office.

ZED - CLEATS							
Type	Section name	A (mm)	B (mm)	C (mm)	D (mm)	F (mm)	Ø _s (mm)
EZED375XX	Z 375x5	365	265	65	85	60,0	18
	Z 375x4					58,0	
	Z 375x3					57,5	
	Z 375x2,5					57,0	
	Z 375x2					56,5	
EZED350XX	Z 350x4	340	240	65	85	58,0	18
	Z 350x3					57,5	
	Z 350x2,5					57,0	
	Z 350x2					56,5	
EZED300XX	Z 300x5	290	190	65	85	59,5	18
	Z 300x4					58,0	
	Z 300x3					58,0	
	Z 300x2,5					57,0	
	Z 300x2					56,5	
	Z 300x1,75					56,0	
EZED250 EZED250XX	Z 250x4	245	150	60	75	53,0	18
	Z 250x3					52,0	
	Z 250x2,5					51,5	
	Z 250x2						
	Z 250x1,75						
	Z 250x1,5						
EZED230 EZED230XX	Z 230x2,5	225	130	60	75	52,0	18
	Z 230x2					51,5	
	Z 230x1,75						
	Z 230x1,5						
EZED200 EZED200XX	Z 200x4	195	100	60	75	54,0	14
	Z 200x3					52,0	
	Z 200x2,5					51,5	
	Z 200x2						
	Z 200x1,75						
	Z 200x1,5						
EZED180 EZED180XX	Z 180x2,5	176	81,5	60	75	51,0	14
	Z 180x2						
	Z 180x1,75						
	Z 180x1,5						
EZED140 EZED140XX	Z 140x2,5	135	60	50	75	41,5	14
	Z 140x2						
	Z 140x1,75						
	Z 140x1,5						



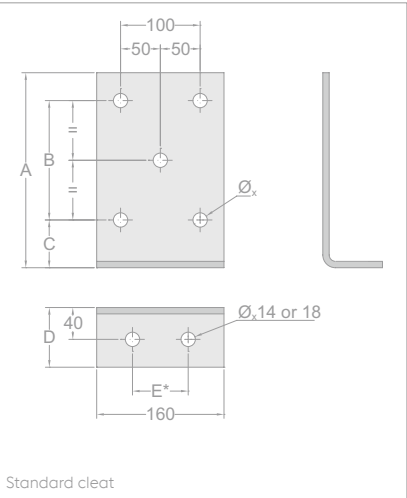
Section properties:
please turn to P.105

TYPE EZEDXX

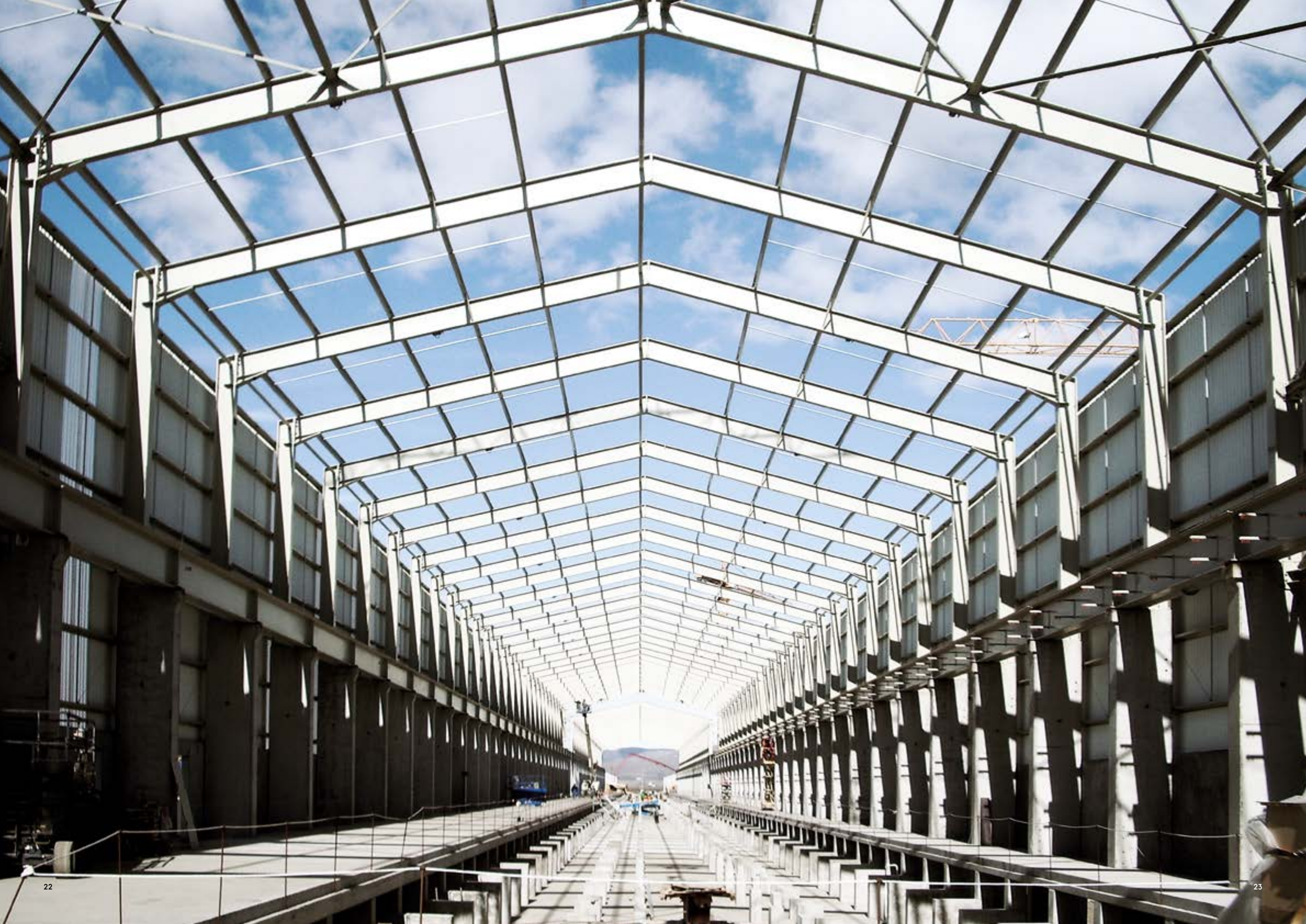


Piercing pattern is symmetrical in the bottom of the cleats. For alternative piercing patterns: please contact voestalpine SadeF.
E*: Hole distance variable from 50 to 100 mm with 70 mm (Ø 18 mm) as standard.

TYPE EZED



Piercing pattern is symmetrical in the bottom of the cleats. For alternative piercing patterns: please contact voestalpine SadeF.
E*: Hole distance variable from 50 to 100 mm with 70 mm (Ø 18 mm) as standard.



SIGMA BEAM

voestalpine SadeF offers you an extensive range of SIGMA sections for spans up to 18 m.

The sections are suitable for virtually any substructure.

voestalpine SadeF SIGMA can be used as single span beams, double span beams or as a continuous beam.

Use continuous sleeve beams for optimum deflection and strength. voestalpine SadeF will be pleased to advise your design department.



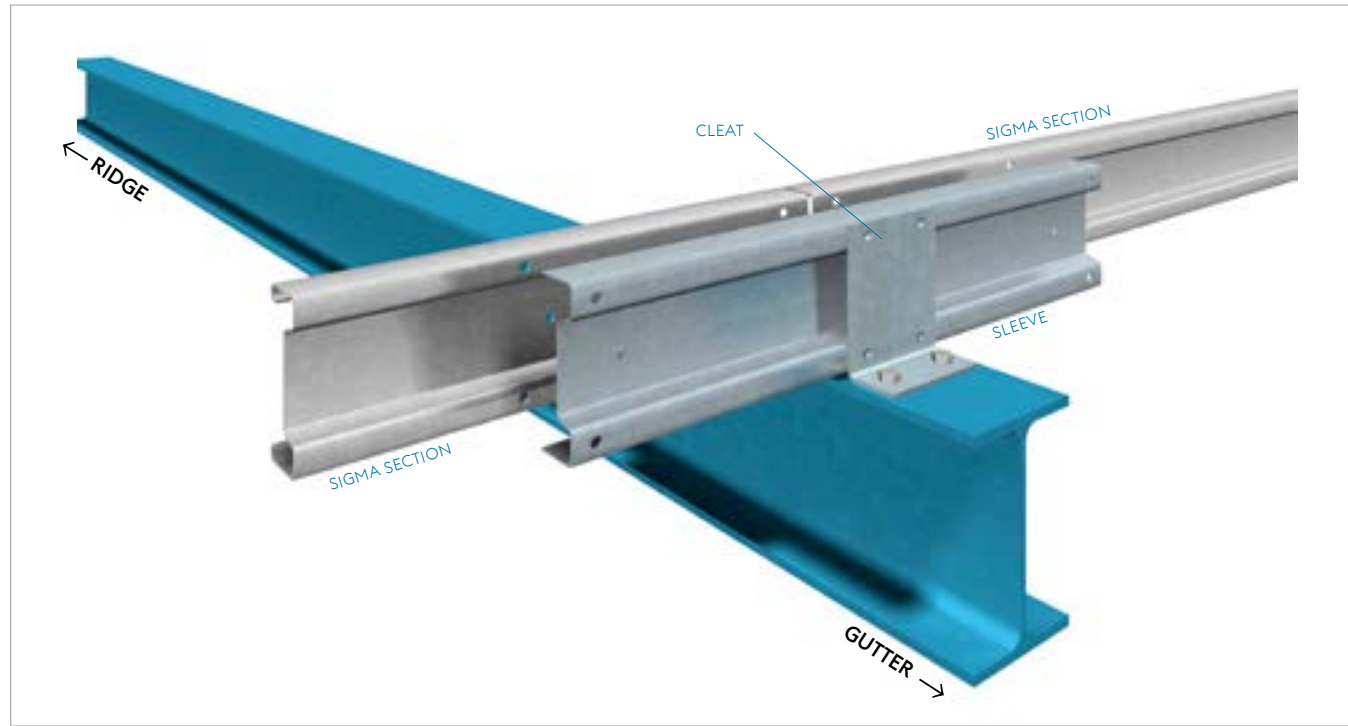
WE OFFER A COMPREHENSIVE SERVICE INCLUDING:

Detailed quotation according to the prevailing standards:

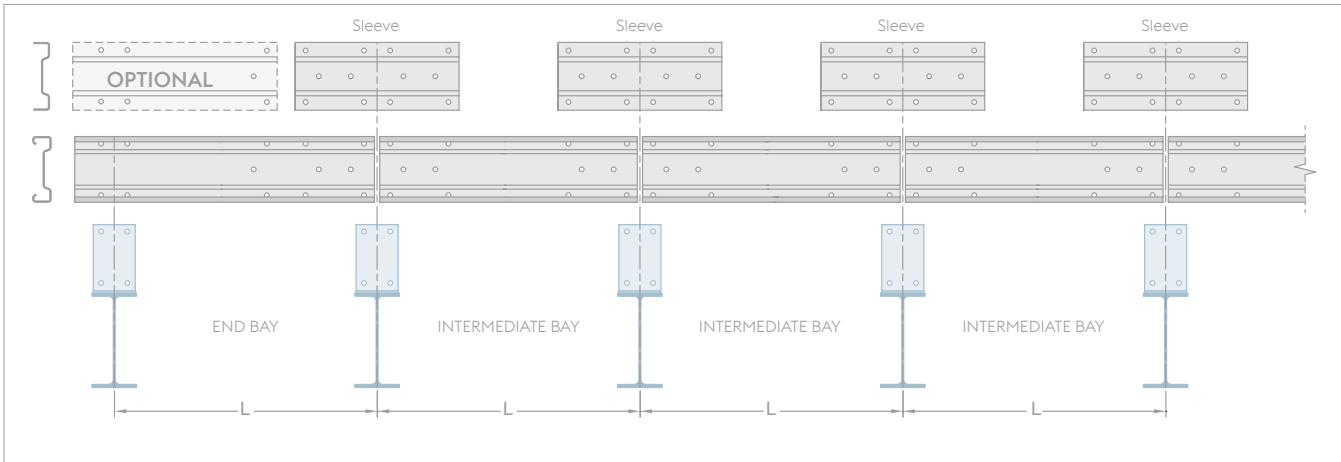
- Strength calculation
- Production drawings
- Assembly overview
- ISO certified

Tailor-made parts and components:

- Ready to assemble
- Delivered just-in-time
- Clear marking
- All accessories inclusive
- Professional packaging
- CE certified
- Notch

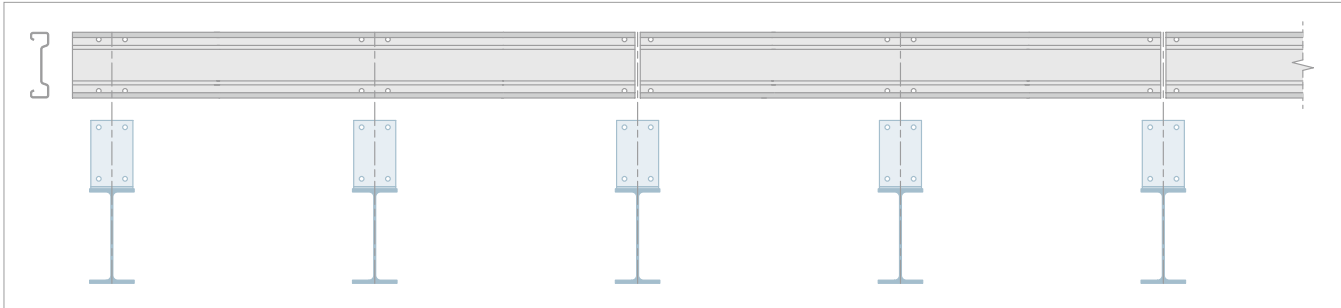


SLEEVE BEAM



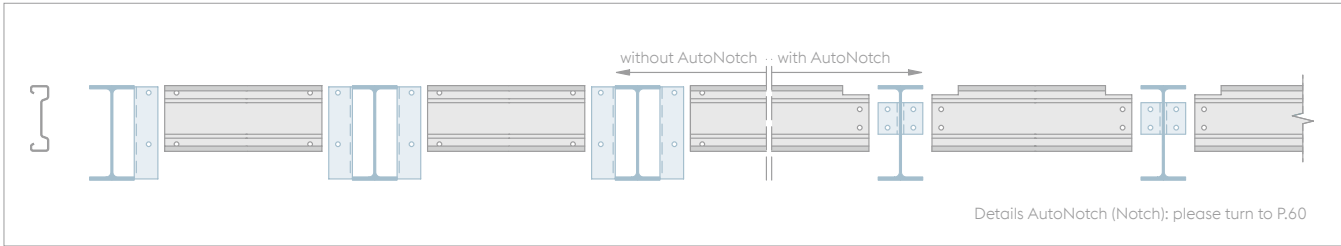
For wide spans (> 8 m), a continuous sleeve beam is usually the best solution. If necessary, the end bays can be fitted either with a thicker section or with a double beam (see OPTION). For standard voestalpine SadeF sleeves, please turn to P.29.

DOUBLE SPAN BEAM



Double span beams are to be placed in a staggering pattern, ensuring an even distribution of the load to the primary structure.

SINGLE SPAN BEAMS (ASSEMBLY BETWEEN SPANS)



SIGMA - SLEEVE BEAM

SIGMA sleeves can be used to create a continuous beam system. The optimum standard sleeve, depth and hole pattern of the sleeves are related to the voestalpine SadeF SIGMA sections. voestalpine SadeF has defined the optimal sleeve length for every section depth. (see also bottom of P.29)



SAFE, FAST AND EASY SLEEVE ASSEMBLY

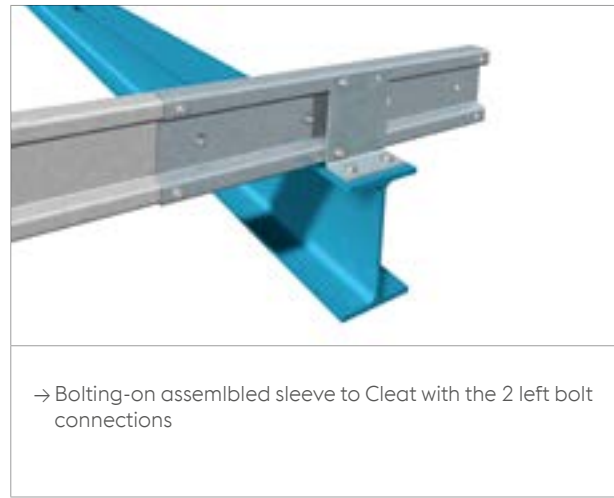
Step A



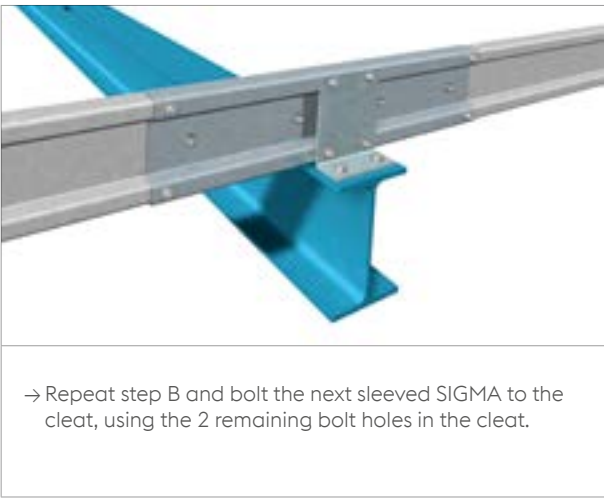
Step B



Step C

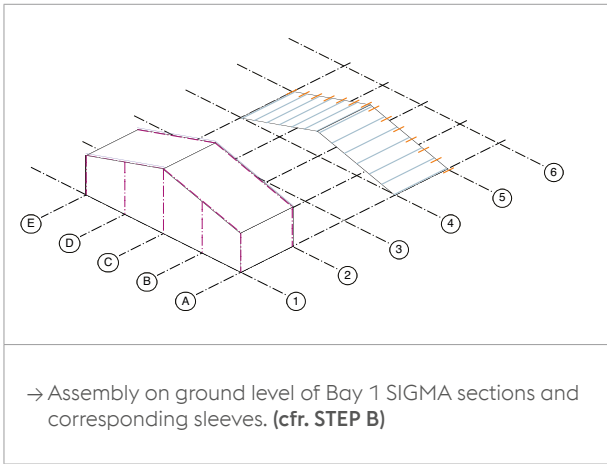


Step D

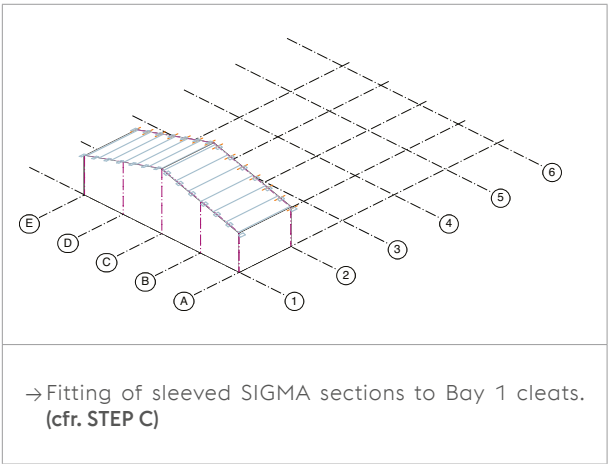


SIGMA - ASSEMBLY SEQUENCE

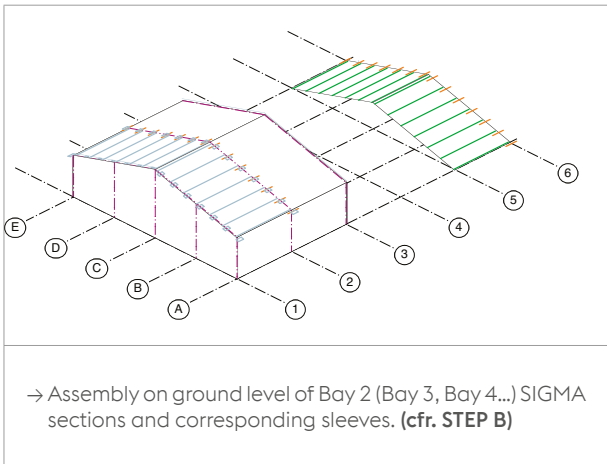
Step 1



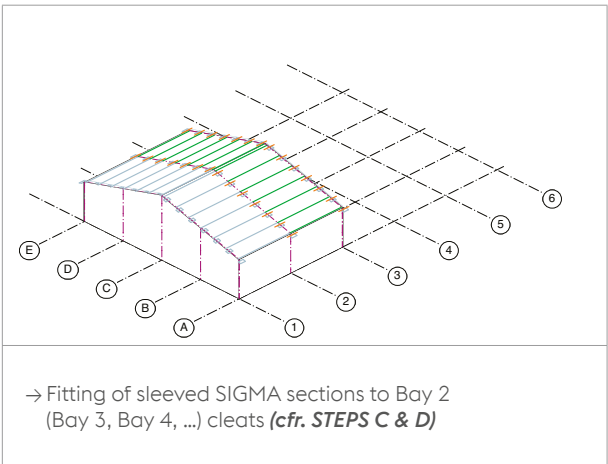
Step 2



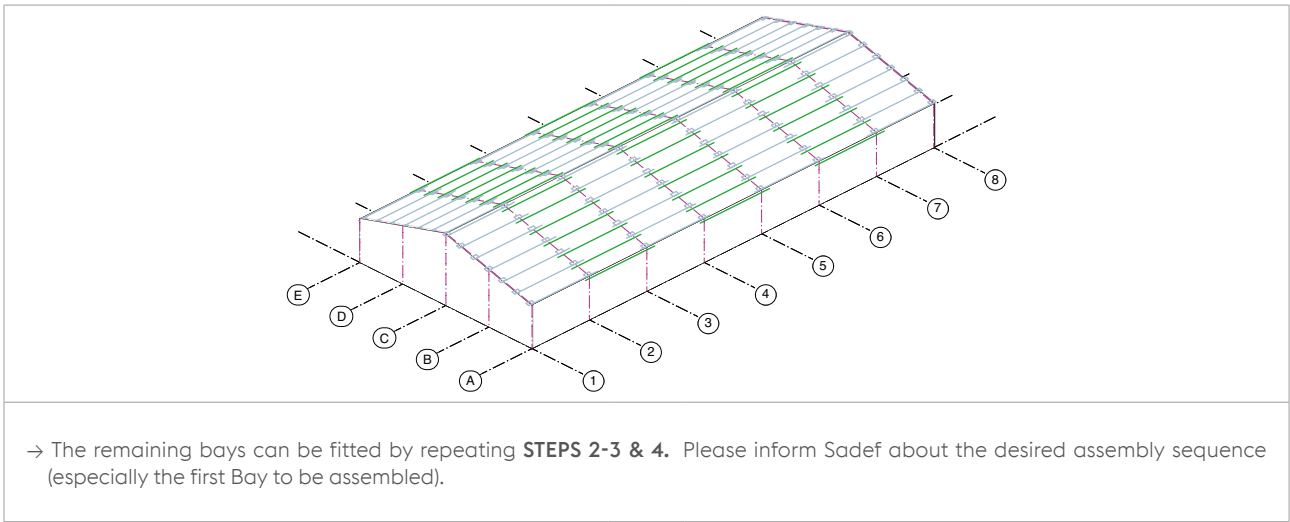
Step 3



Step 4



Step 5



SIGMA - CLEATS & SLEEVES

CLEATS

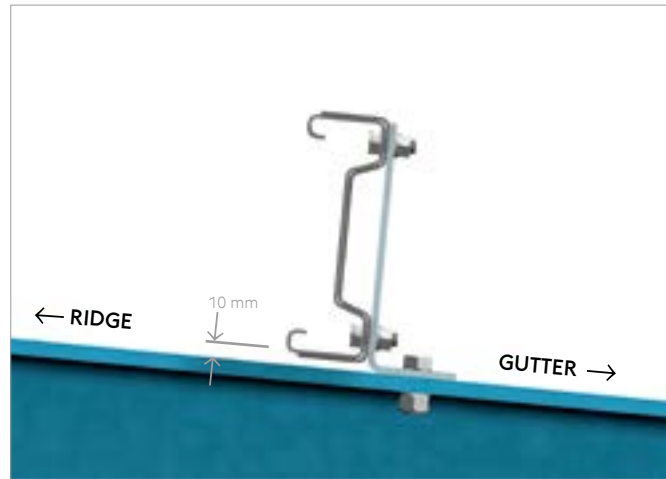
voestalpine Sadeif sections are fixed to the substructure by means of cleats.

To prevent web crippling, a 10 mm clearance between main frame and voestalpine Sadeif beams is required. This is achieved by the offset hole position in beams and cleats.

Cleats are also necessary for transmitting the roof diaphragm forces to the substructure. Standard voestalpine Sadeif cleats are made from HSLA-steel grades and are hot-dip galvanized.

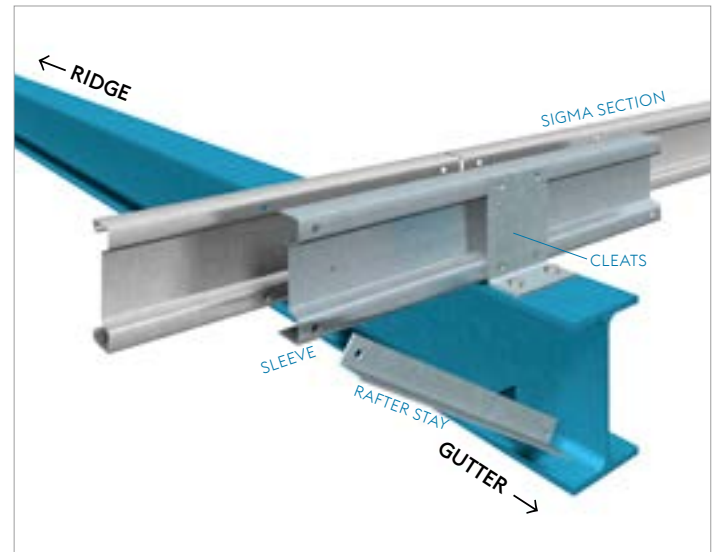


ROOF - CLEATS



+/- 10 mm clearance between voestalpine Sadeif SIGMA-sections and substructure is recommended.

SIDE RAIL - CLEATS



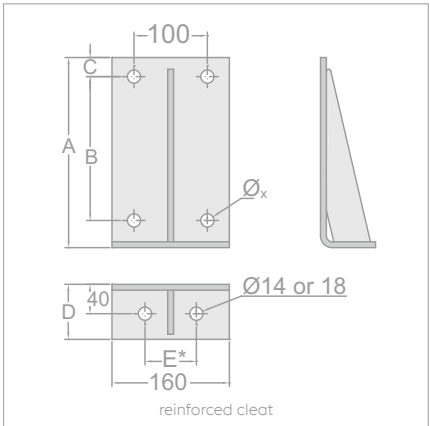
Rafter stays

Rafter stays - used for stabilizing the lower flange of the portal frames - can be fixed in the holes at the end of the sleeve. Please inform voestalpine Sadeif if rafter stays are to be used.

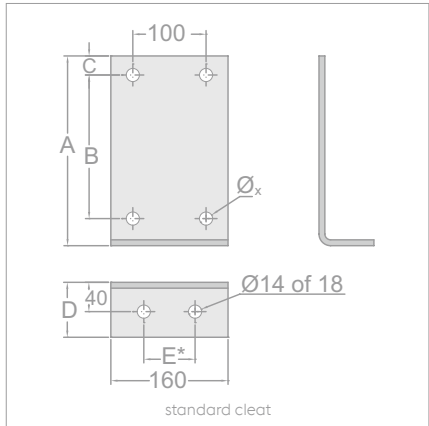
Sleeves

voestalpine Sadeif sleeves are supplied with the voestalpine Sadeif SIGMA sections just-in-time to the site ready for assembly.

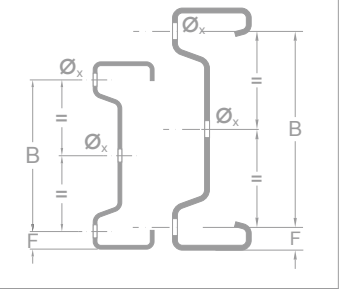
TYPE ESIGX



TYPE ESIG



SIGMA



Section properties:
please turn to pages 102 - 103 - 104

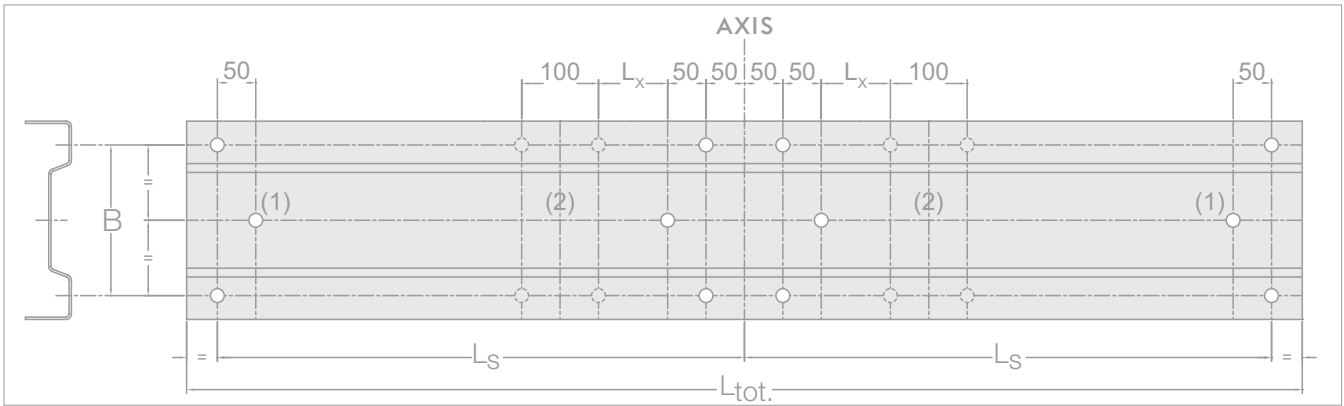
Piercing pattern is symmetrical in the bottom of cleats.
For alternative piercing arrangements, please contact voestalpine Sadeif.
E*: Hole distance variable from 50 to 100 mm with 70 mm (Ø 18 mm) as standard.
If the customer chooses to provide the cleats himself and weld them to the rafters, this is of course possible.
The forces on the supports can be specified by our design office.

SIGMA section			
Type	B (mm)	F (mm)	Ø _x (mm)
S+450	380	35	18
S+400	330	35	18
S+350	296	27	18
S+300	246	27	18
S+250	196	27	18
S 200	162	19	14
S 170	132	19	14
S 140	102	19	14

SLEEVE			
Type	L _{tot} (mm)	L _s (mm)	L _x (mm)
SL450 upon request			
SL400	2680	1300	370
SL350	2180	1050	270
SL300	1880	900	210
SL250	1580	750	150
SL200	1260	600	90
SL170	1110	525	60
SL140	960	450	30

Cleats			
Type	A (mm)	C (mm)	D (mm)
ESIG450X	459	34	85
ESIG400X	409	34	85
ESIG350X	359	26	85
ESIG300X	309	26	85
ESIG250 ESIG250X	259	26	75
ESIG200X ESIG200	209	18	75
ESIG170 ESIG170X	179	18	75
ESIG140 ESIG140X	149	18	75

SLEEVE



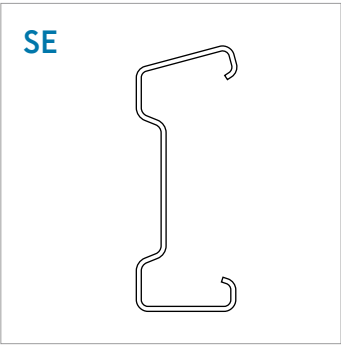
(1) Holes in web centre only for section depth > 200 mm.
(2) Holes to be used only where sleeves are placed off centre. (sleeve++ and sleeve++)



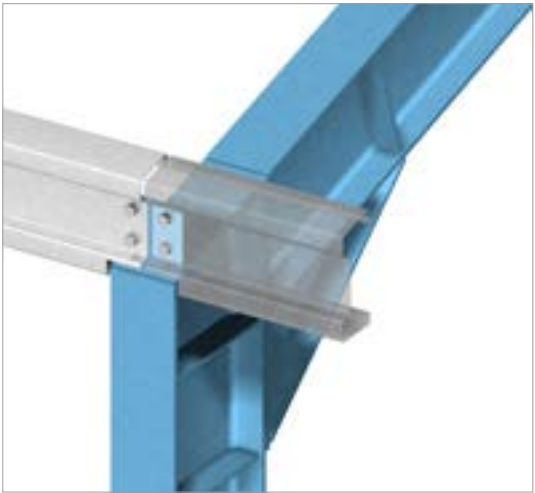
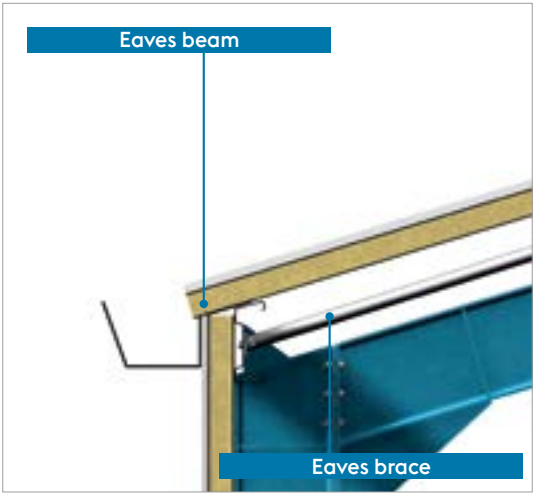
SE - EAVES BEAM

The voestalpine SadeF SE - section is both roof purlin and side rail, combined into one single section and designed to support the outside gutter.

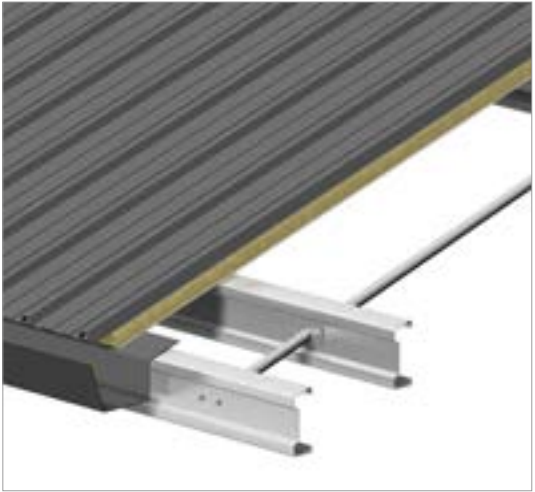
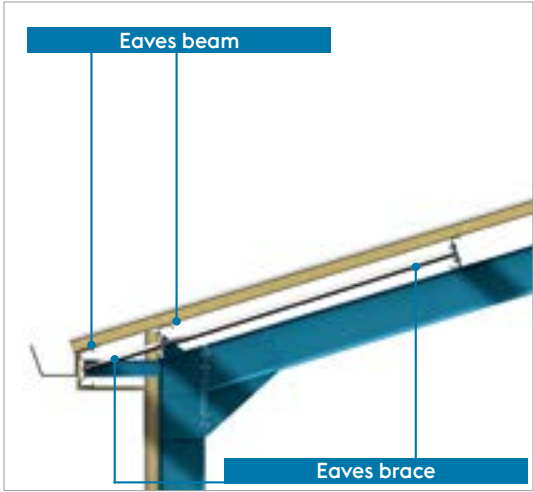
A particularly strong horizontal axis, designed for taking heavy wind loads on the side wall, is its main characteristic. Eaves braces can be used to achieve a light and cost-effective design. (For details: contact voestalpine SadeF)



OUTSIDE GUTTER FIXED ON WALL CLADDING

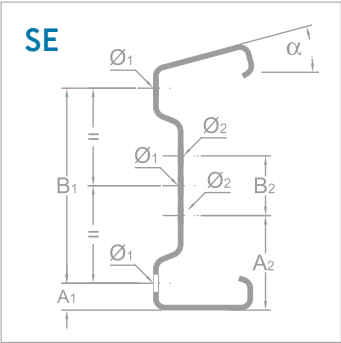


OUTSIDE GUTTER FIXED ON ROOF PROJECTION



SECTION	PREPIERCINGS						AUTONOTCH	
Type	A1 (mm)	B1 (mm)	Ø1 (mm)	A2 (mm)	B2 (mm)	Ø2 (mm)	V (mm)	W* (mm)
SE 330	27	276	18	100	130	18	45	≥ 95
SE 250	27	196	18	95	60	18	45	≥ 95
SE 200	19	162	14	70	60	18	32	≥ 95

* AutoNotches must be identical at both ends.



Section properties:
please turn to pages 104

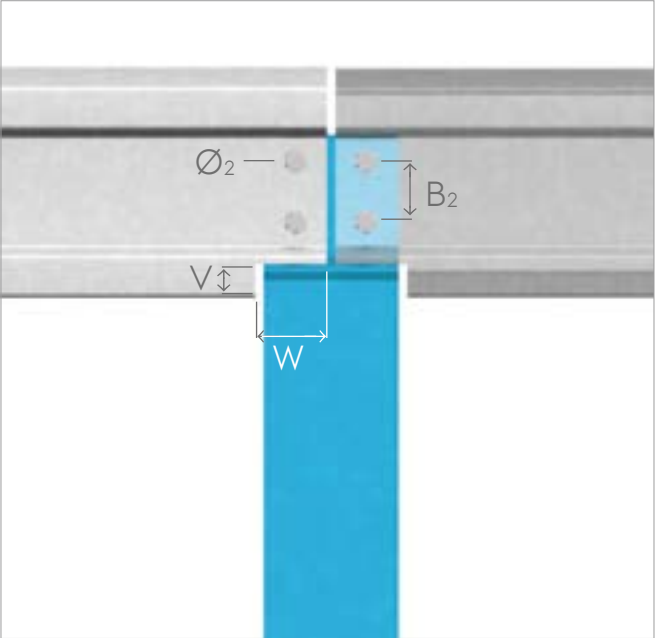
SE-section is suitable for roof slopes up to 26°

ADVANTAGES:

- Easier
- Less components
- Quick assembly
- Closing the gap between roof sheets and wall cladding panels

α - Standard angle of the upper flange	For roof slope
0°	-3° → 3°
6°	4° → 8°
10°	9° → 12°
15°	13° → 17°
20°	18° → 22°
24°	23° → 26°

AutoNotch



An AutoNotch can be made in the lower flange at the end of the eaves beams.

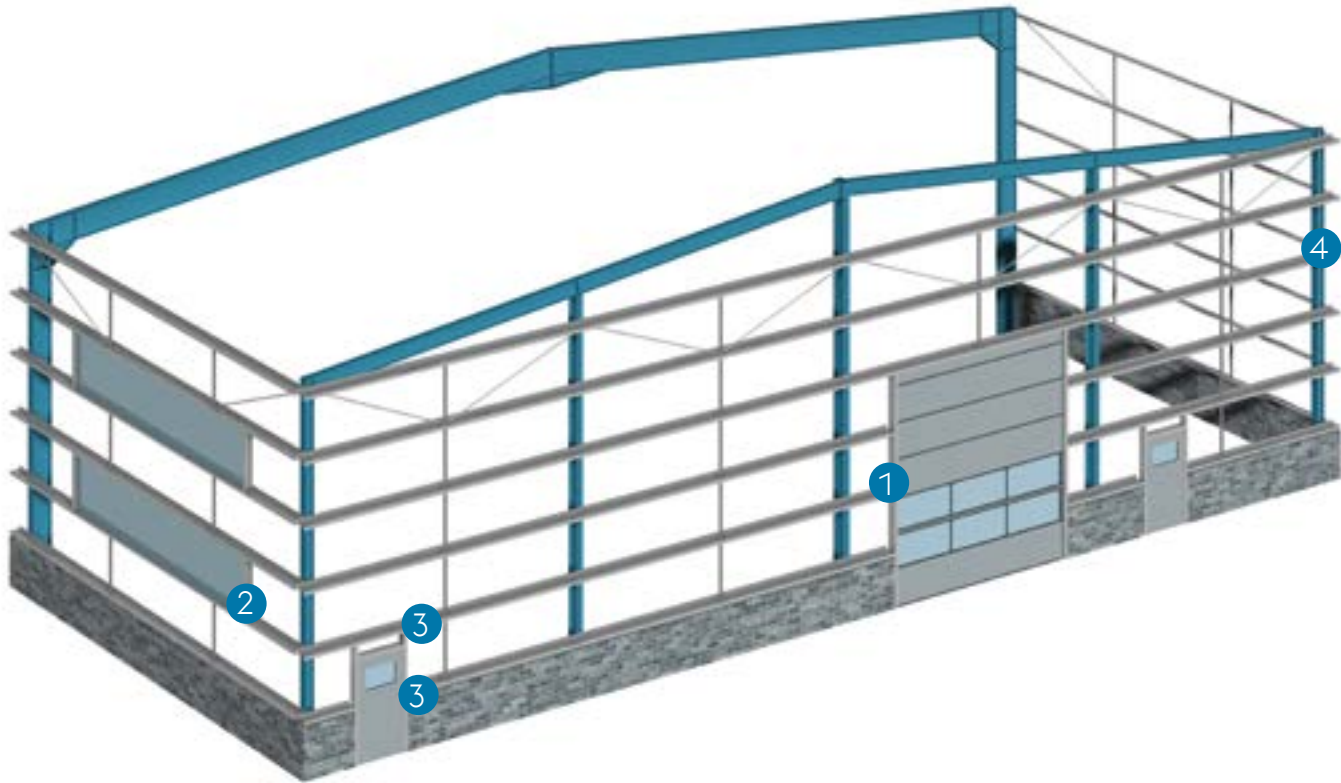
CEE-PLUS - SIDE RAILS FOR GABLES WITH WINDOWS

CEE-Plus

voestalpine Sadef building systems include a wide range of CEE-Plus sections.

They are mainly used as side rails and particularly where door- or windowframes with flush inner faces are to be incorporated. Bolting can therefore be done through the web or through the profile lips.

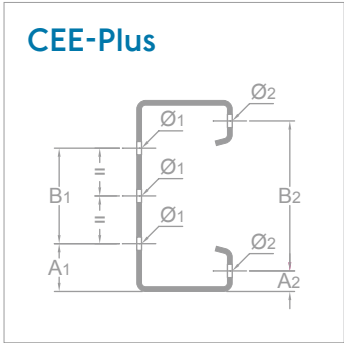
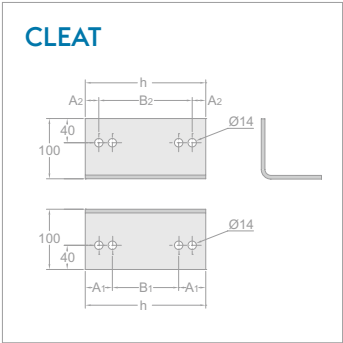
Used as side rails, they will be either single or double span beams.



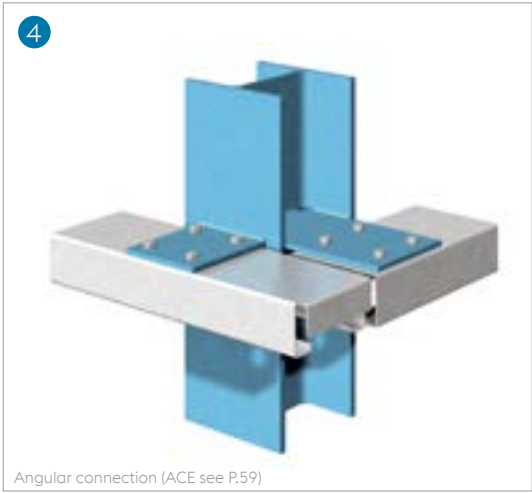
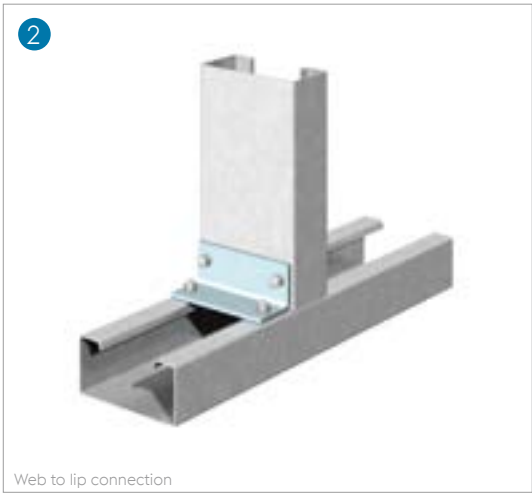
For more information, detailed piercing possibilities and the minimum production batches: please contact voestalpine Sadef.



SECTION	PREPIERCINGS					
Type	A1 (mm)	B1 (mm)	Ø1 (mm)	A2 (mm)	B2 (mm)	Ø2 (mm)
C+200	50	100	14 or 18	21,5	157	14
C+160	50	60	14 or 18	21,5	117	14
C+150	45	60	14 or 18	21,5	107	14
C 140	40	60	14 or 18	-	-	-



Section properties:
please turn to pages 101 - 106

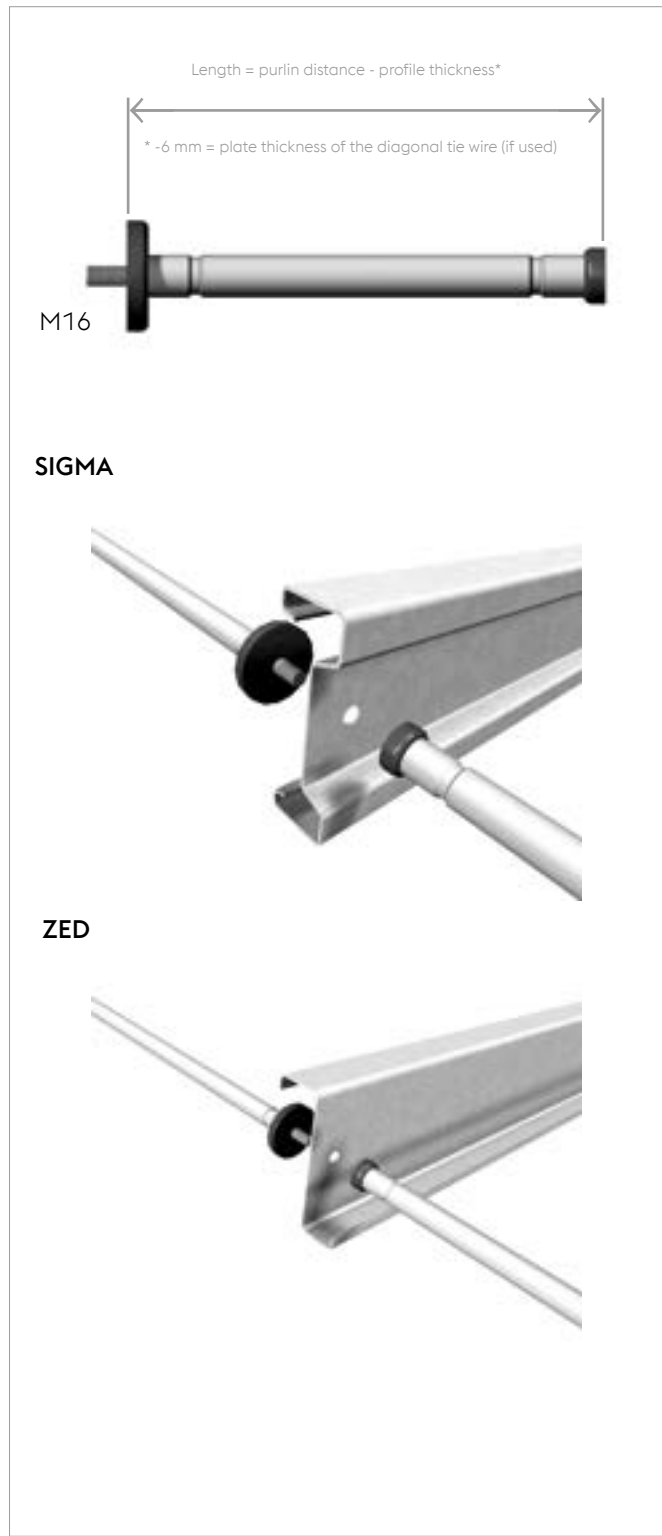




ACCESSORIES

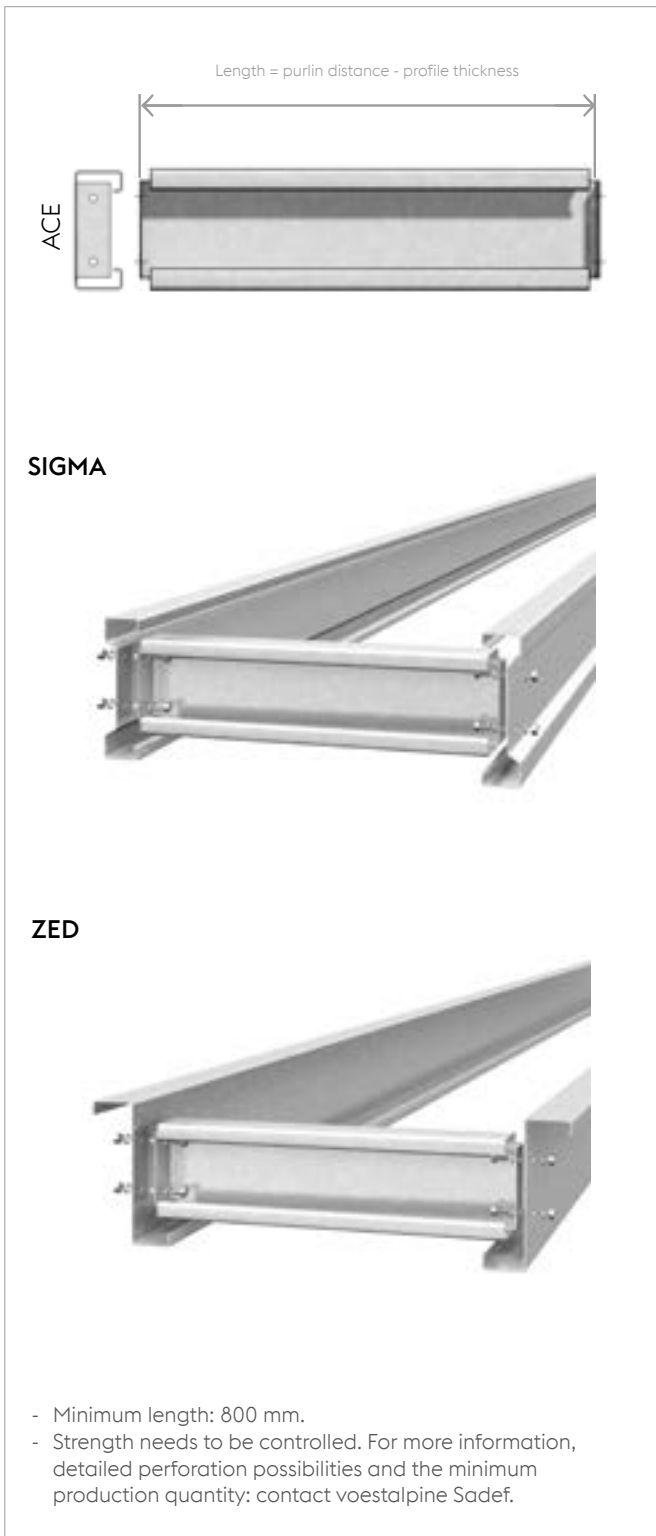
ANTI - SAG BARS

SADEF - LOCK® - ANTI-SAG BAR Ø30 OR Ø48



Other surface treatments (for higher corrosion resistance) available on request

AUTOCONNECTEND (ACE) - SAG BAR



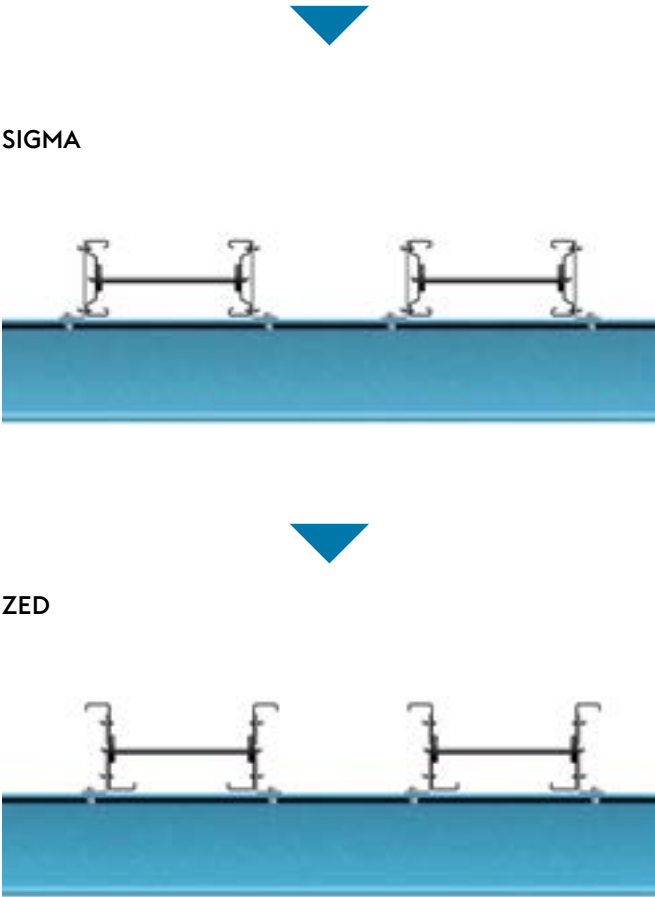
APPLICATION OF ANTI-SAG BARS

Anti-sag bars will be applied for the alignment of purlins and side-rails, or in case the roof sheeting has no stabilising capacity.

In case of important forces in the anti-sag bars, the use of diagonal tie wires is recommended.

ASSEMBLY ANTI-SAG BARS

For flat roofs (< 5% slope) and mezzanine floors the number of anti-sag bars can be reduced by assembling the purlins or joists as follow:



ACCESSORIES

APEX TIE

SADEF - LOCK® - APEX TIE Ø30



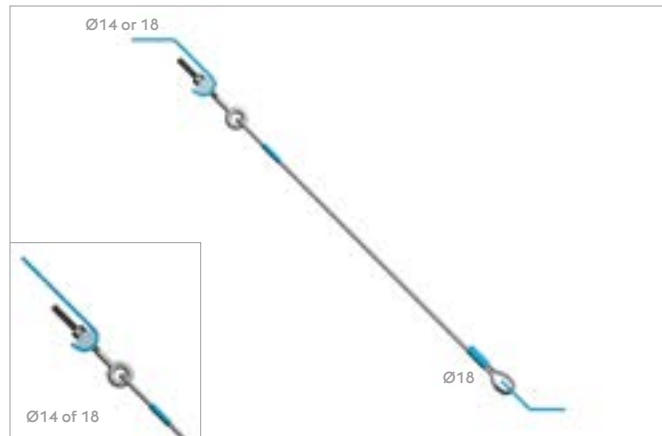
Other surface treatments (for higher corrosion resistance) available on request



ACCESSORIES

DIAGONAL TIE WIRES

SINGLE DIAGONAL TIE WIRE



SINGLE DIAGONAL TUBE



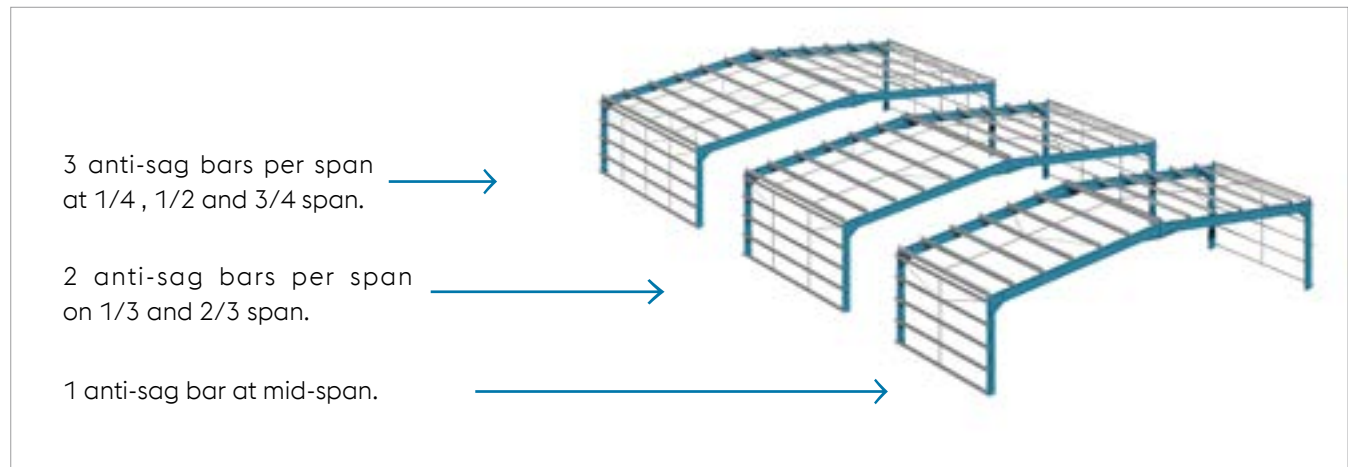
DOUBLE DIAGONAL TIE WIRE



Higher corrosion resistance on request

USE OF DIAGONAL TIE WIRES

Positioning of tie wires in function of the number of anti-sag bars.



ASSEMBLY OF ACCESSORIES



Roof purlin + Apex tie + Sadef-Lock®



Construction roof purlin + Sadef-Lock® + double diagonal tie wire.



Fitting of diagonal tie to rafter. Using the cleat hole will avoid time consuming drilling of extra holes.*



Construction detail of side rail + cleat + diagonal tie wire.



Construction detail of the roof purlin + cleat + diagonal tie wire.



Construction detail of side rail + Sadef-Lock® + double diagonal tie wire.

*Where cleats are welded to the primary structure, ø 14 mm or Ø18 mm holes should be made in the beam upper flange (specially for SIGMA 140 – 170 – 200). Contact voestalpine Sadeff for more information.



ONLINE OFFER CALCULATION IPURLIN

Use our fast quotation service “iPurlin” for detailed price quotations of your purlin and side rail projects through the internet.

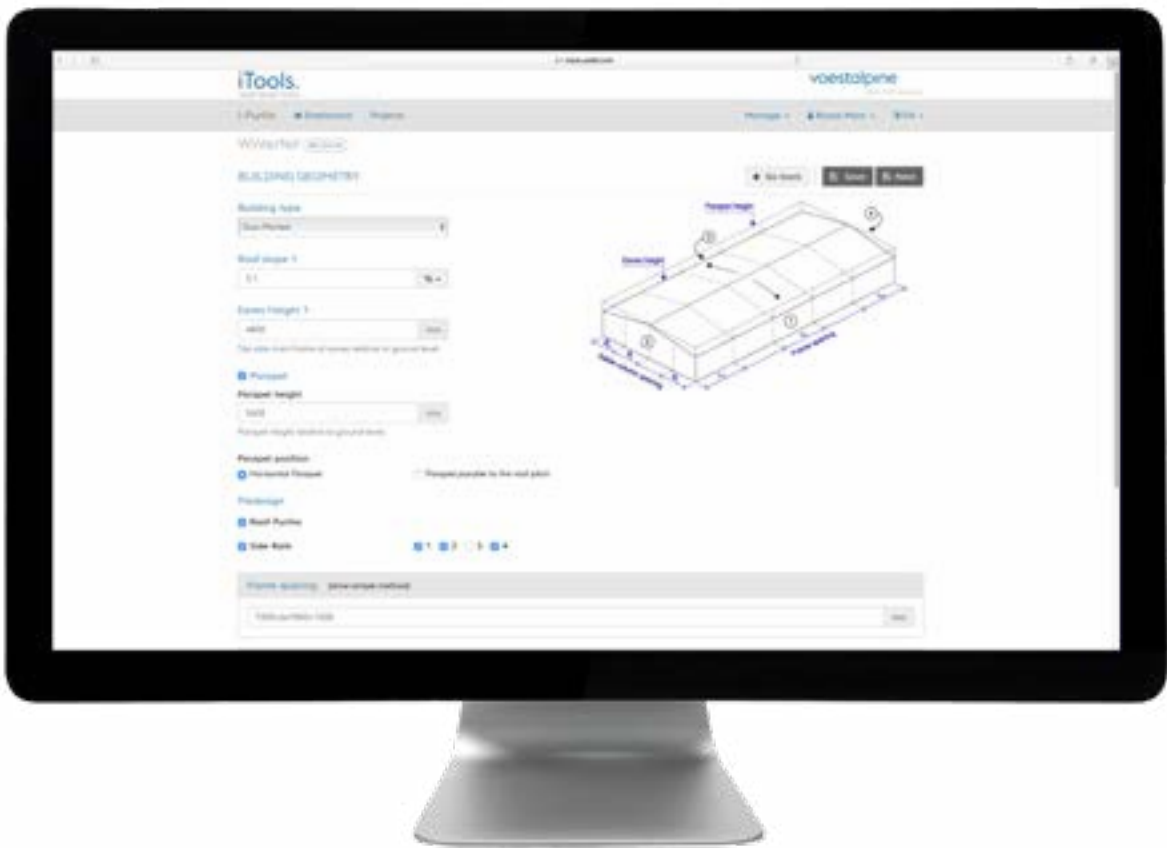
On our website www.voestalpine.com/sadef, select “iTools” first, then “iPurlin”.

Click on the link to register www.voestalpine.com/sadef/en/i-Tools.

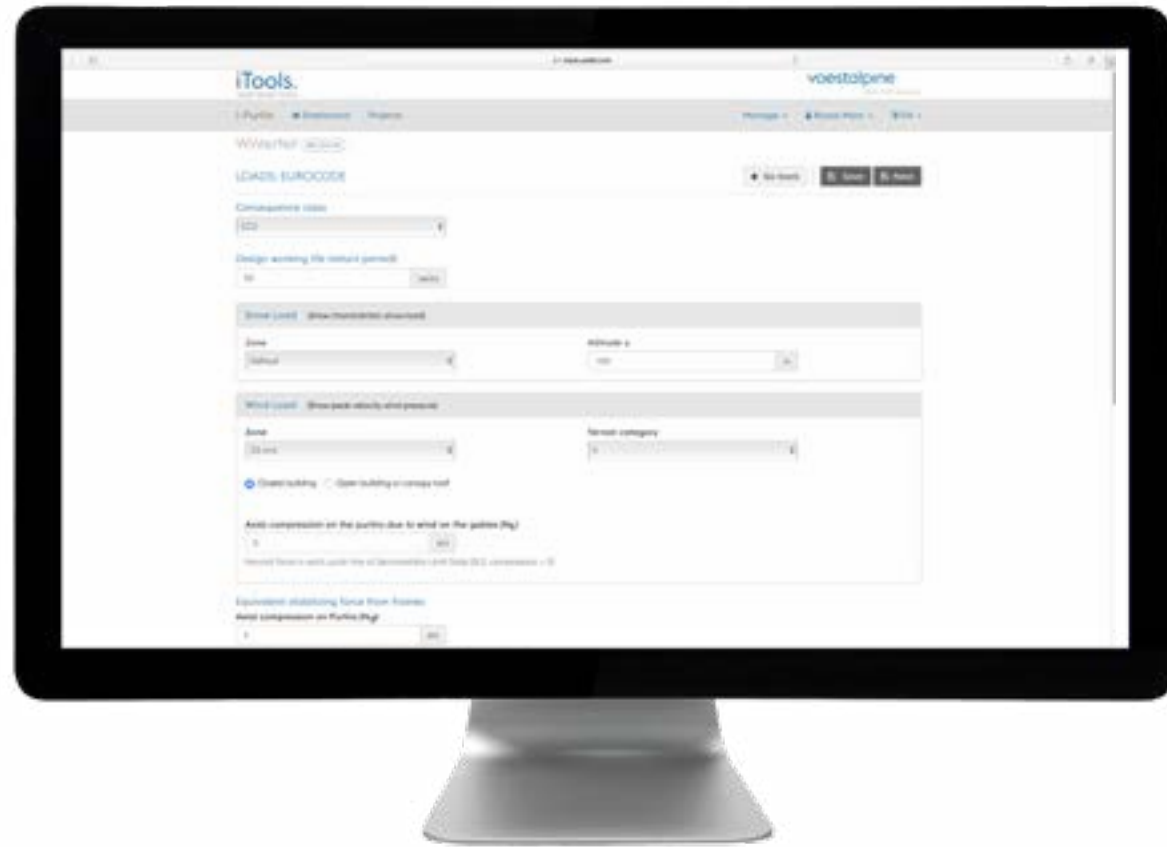
Advantages:

- User friendly
- Available in multiple languages including English, French, German and Dutch
- Your quotation in less than 5 minutes
- Variations quickly achievable
- 24/7 availability
- Quotations clearly laid-out
- National Annex to Eurocode if applicable implemented

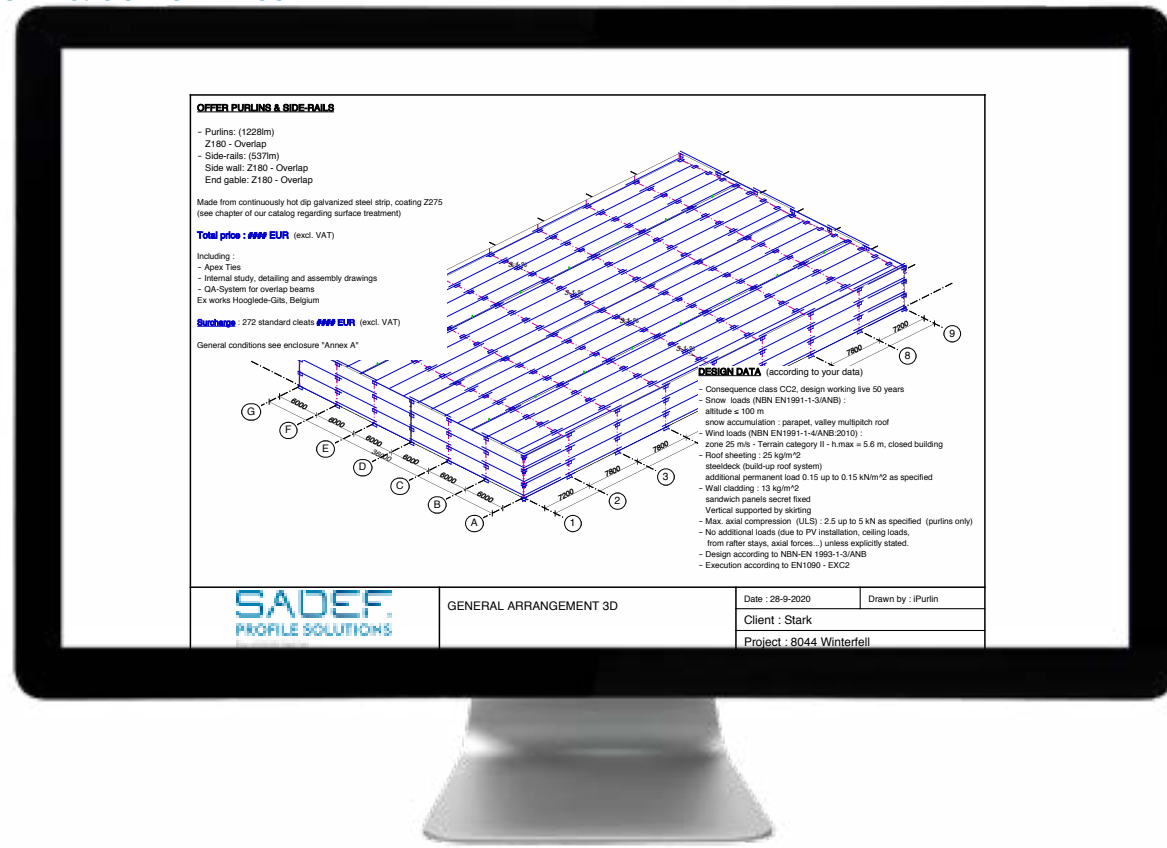
STEP 1: INPUT OF GEOMETRY



STEP 2: INPUT OF LOADS



STEP 3: OUTPUT - RESULT

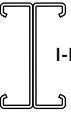
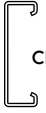


For complex projects or a more detailed quotation, please feel free to contact voestalpine Sadef Sales Dept.

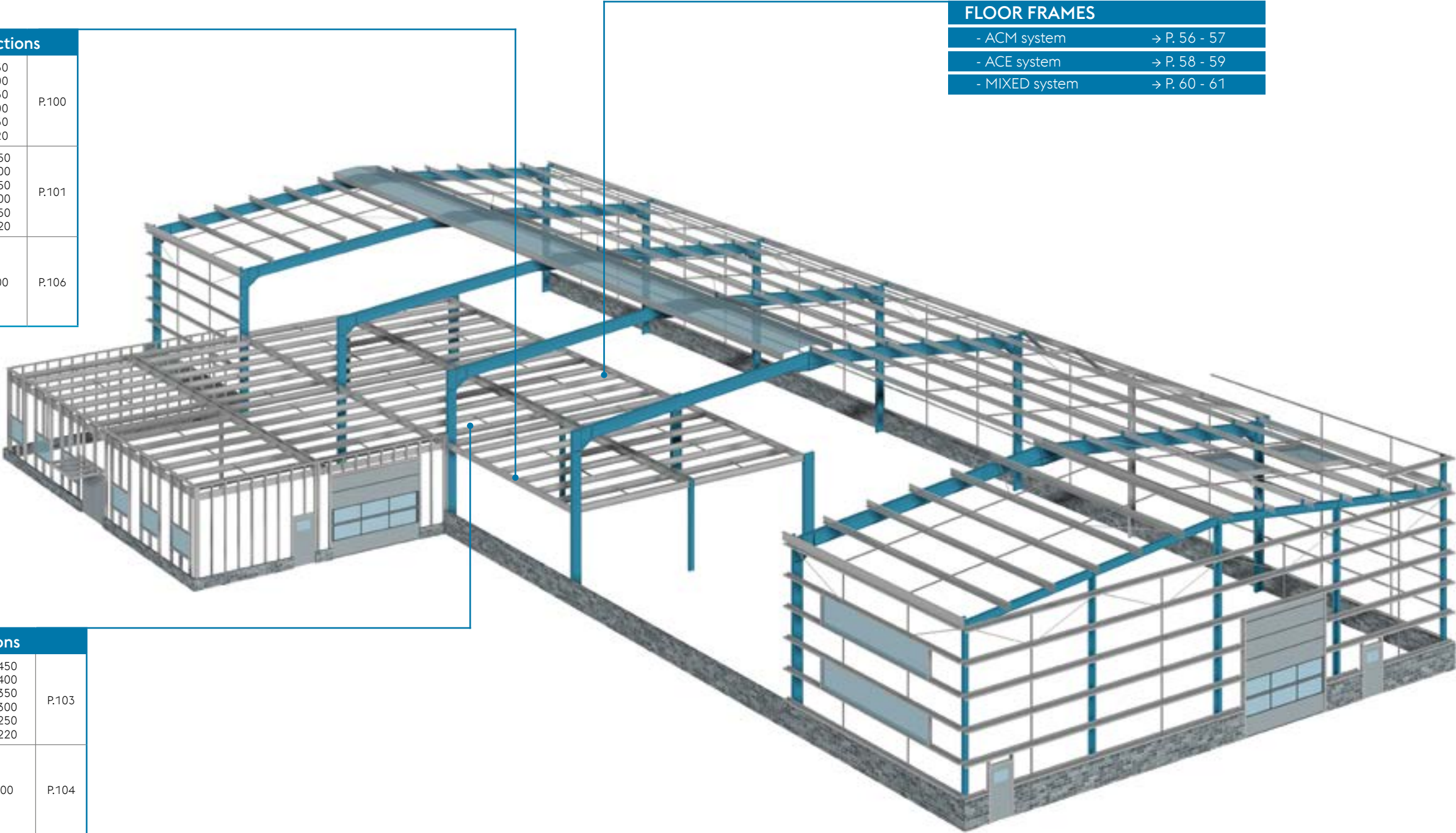
FLOOR FRAMES

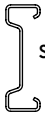
ACM SYSTEM	P.56 - 57
ACE SYSTEM	P.58 - 59
MIXED SYSTEM	P.60 - 61
FLOOR COMPOSITION	P.62 - 63

OVERVIEW

Main beam sections		
	I+450 I+400 I+350 I+300 I+250 I+220	P.100
	C+450 C+400 C+350 C+300 C+250 C+220	P.101
	C 200	P.106

FLOOR FRAMES	
- ACM system	→ P. 56 - 57
- ACE system	→ P. 58 - 59
- MIXED system	→ P. 60 - 61



Joist sections		
	S+450 S+400 S+350 S+300 S+250 S+220	P.103
	S 200	P.104
	C 170 C 150	P.106
	SE 330 SE 250 SE 200	P.104



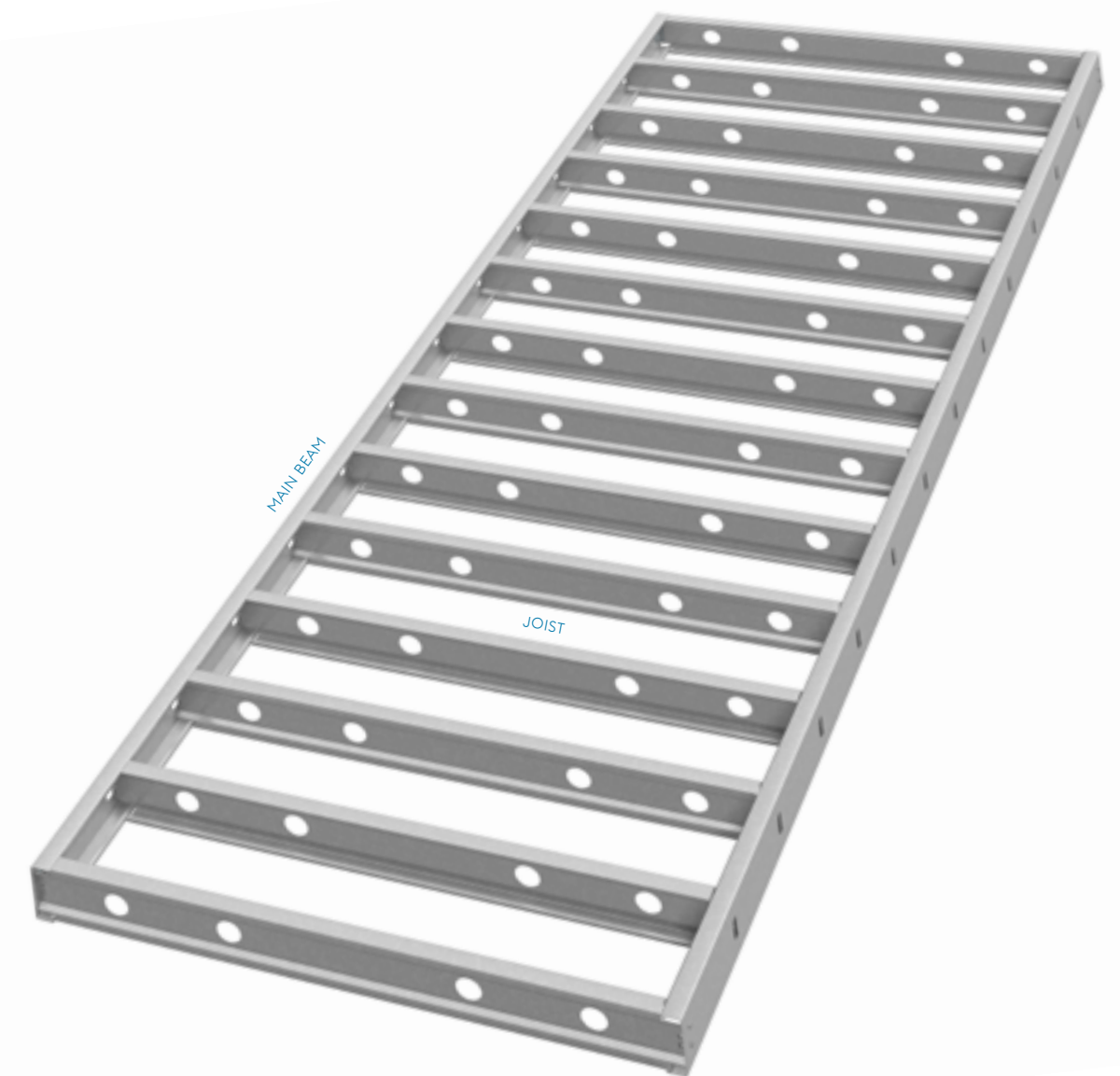


GENERAL

READY-TO-ASSEMBLE BUILDING COMPONENTS FOR FLOORING

A floor frame can be realised in an easy and competitive way by using voestalpine SadeF-building profiles:

- Made by a unique production process
- Main features:
 - No cleats required
 - Bolting reduced by 50 %
 - Fast and cost effective assembly
 - Service holes integrated on request



ACM SYSTEM

AUTOCONNECTMIDDLE STANDARD POSSIBILITIES									
MAIN BEAM				JOIST				ACM	
Section	A (mm)	B (mm)	Ø (mm)	Section	Notch	V (mm)	W (mm)	Type	P (mm)
C+450xt ₁	75	300	18	S+450xt ₂	Double	40	120	ACM200	225
				S+400xt ₂	Single			ACM200	200
				S+350xt ₂				ACM200	175
				S+300xt ₂				ACM150	150
				S+250xt ₂				ACM100	125
C+400xt ₁	75	250	18	S+400xt ₂	Double	40	110	ACM200	200
				S+350xt ₂	Single			ACM200	175
				S+300xt ₂				ACM150	150
				S+250xt ₂				ACM100	125
C+350xt ₁	75	200	18	S+350xt ₂	Double	35	100	ACM200	175
				S+300xt ₂	Single			ACM150	150
				S+250xt ₂				ACM100	125
				S+220xt ₂				ACM100	110
				S200xt ₂				ACM100	100
				C170xt ₂	ACM100			100	
C+300xt ₁	75	150	18	S+300xt ₂	Double	30*	90	ACM150	150
				S+250xt ₂	Single			ACM100	125
				S+220xt ₂				ACM100	110
				S200xt ₂				ACM100	100
				C170xt ₂				ACM100	100
C+250xt ₁	75	100	18	S+250xt ₂	Double	30*	80	ACM100	125
				S+220xt ₂	Single			ACM100	110
				S200xt ₂				ACM100	100
				C170xt ₂				ACM100	100
C+220xt ₁	55	110	14	S+220xt ₂	Double	30*	80	ACM100	110
				S200xt ₂	Single			ACM100	100
				C170xt ₂				ACM100	100
C200xt ₁	55	90	14	S200xt ₂	Double	30	80	ACM100	100
				C170xt ₂	Single			ACM100	100

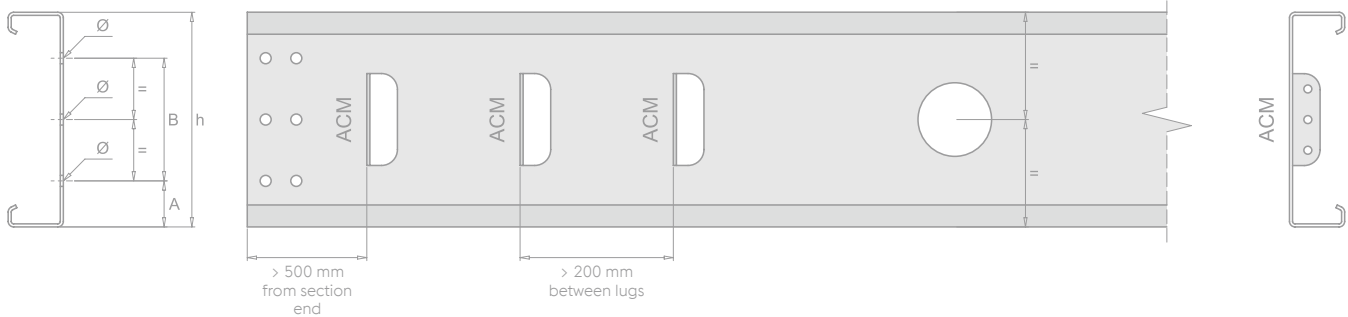
* For t₁ = 5mm; V = 35mm

PERFORATION POSSIBILITIES

- Big size holes can be pierced in webs of beams and joists. See table:

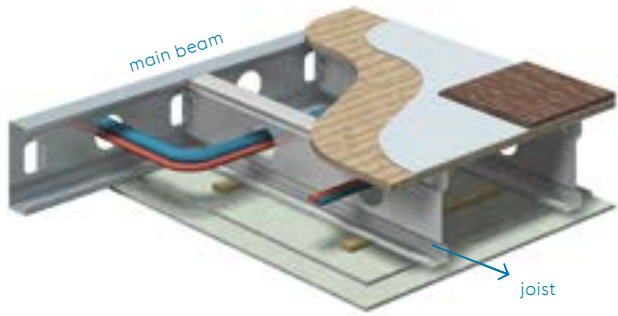
- Recommended perforations
- Minimum distance between the lugs and minimum distance between lug and the end of the profile.

LARGE PERFORATIONS	
Section depth	Hole size
h ≥ 350	Ø150
250 ≤ h ≤ 300	Ø120
h ≤ 220	100x70



ACM - AutoConnectMiddle-system

Floor frame with connections for SIGMA-joist integrated with main CEE-beam.



MAIN BEAM	JOIST	
	SMALLER THAN MAIN BEAM	SAME DEPTH AS MAIN BEAM
SADEF PATENTED	Joist length = L - (2xt₁) - (2mm) Single notch V*W	Joist length = L - (2xt₁) - (2mm) Double notches V*W
	ACM 200 Diagram showing dimensions for ACM 200 in the smaller than main beam case.	Diagram showing dimensions for ACM 200 in the same depth as main beam case.
	ACM 150 Diagram showing dimensions for ACM 150 in the smaller than main beam case.	Diagram showing dimensions for ACM 150 in the same depth as main beam case.
	ACM 100 Diagram showing dimensions for ACM 100 in the smaller than main beam case.	Diagram showing dimensions for ACM 100 in the same depth as main beam case.

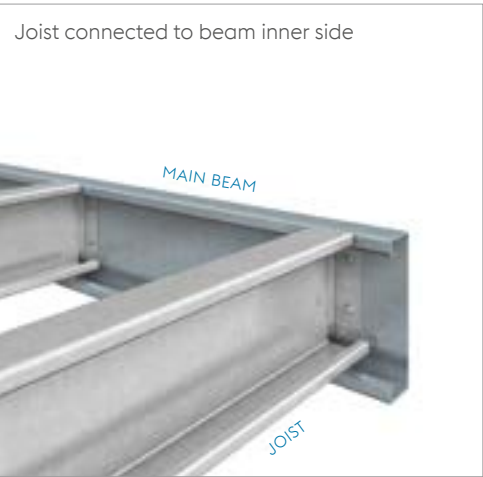
ACE SYSTEM

Sections with AutoConnectEnd (ACE):

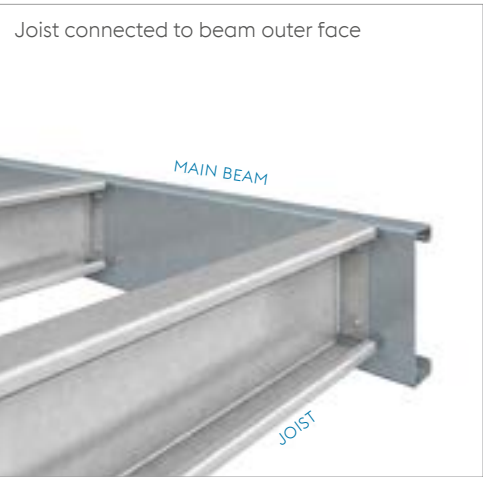
- $1.5\text{ mm} \leq t_2 \leq 4\text{ mm}$
- AutoConnectEnd (and AutoNotch) to be identical at both ends.
- Perforation of big holes in the web of the main beam and joist: See table at the bottom of P.56
- Minimum length: 800 mm.

ACE + AUTONOTCH (AN)						
MAIN BEAM	JOIST					
Section	Section	A (mm)	B (mm)	V (mm)	W1 (mm)	Ø (mm)
C+450xt ₁	C+350xt ₂	75	200	40	120	18
	C+300xt ₂		150			
	C+250xt ₂		100			
C+400xt ₁	C+350xt ₂	75	200	40	110	18
	C+300xt ₂		150			
	C+250xt ₂		100			
C+350xt ₁	C+300xt ₂	75	150	35	100	18
	C+250xt ₂		100			
C+300xt ₁	C+250xt ₂	75	100	30*	90	18
	C+220xt ₂		110			14
	C 200xt ₂		90			
	C 170xt ₂		60			
C+250xt ₁	C+220xt ₂	55	110	30*	80	14
	C 200xt ₂		90			
	C 170xt ₂		60			
C 220xt ₁	C 170xt ₂	55	60	30	80	14
C 200xt ₁	C 170xt ₂	55	60	30	80	14
	C 150xt ₂		40			

* only for beams where t1 ≤ 4mm



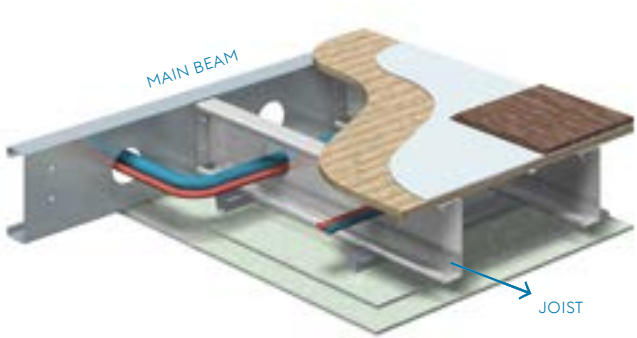
AUTOCONNECTEND (ACE)						
MAIN BEAM	JOIST					
Section	Section	A (mm)	B (mm)	V (mm)	W2 (mm)	Ø (mm)
≥ C+350xt ₁	C+350xt ₂	50	250	5+t ₂	17+t ₂	18
≥ C+300xt ₁	C+300xt ₂	50	200	5+t ₂	17+t ₂	18
≥ C+250xt ₁	C+250xt ₂	50	150	5+t ₂	17+t ₂	18
≥ C+220xt ₁	C+220xt ₂	50	120	5+t ₂	17+t ₂	14
≥ C+200xt ₁	C+200xt ₂	50	100	5+t ₂	17+t ₂	14
≥ C+150xt ₁	C+150xt ₂	45	60	5+t ₂	17+t ₂	14
≥ C200xt ₁	C 200xt ₂	50	100	5+t ₂	17+t ₂	14
≥ C 170xt ₁	C 170xt ₂	50	70	5+t ₂	17+t ₂	14
≥ C 150xt ₁	C 150xt ₂	50	50	5+t ₂	17+t ₂	14
≥ C 100xt ₁	C 100xt ₂	25	50	5+t ₂	17+t ₂	14



ACE - AutoConnectEnd-system

Floor system with integrated connection piece in the CEE-Plus joists.

Both main beams and joists are CEE-profiles.



MAIN BEAM	JOIST	
AutoConnectEnd (ACE) + AutoNotch (AN)		
AutoNotch (Notch with length W_1), cut-out in top flange only. * Possibility of an additional hole for section depth > 200 mm. ** Optional : extra holes for beam to column connection.		
AutoConnectEnd (ACE)		
* Additional hole for section depth > 200 mm.		

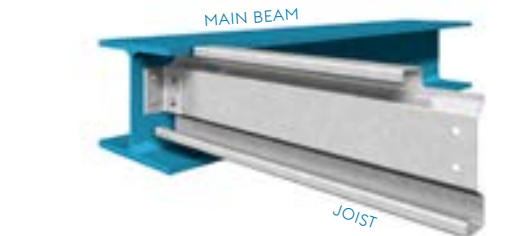
MIXED SYSTEM

MAIN BEAM	JOIST							AutoNotch	
	S/SE 200	I+/S+220	I+/S+250	I+/S+300	I+/S+350	I+/S+400	I+/S+450	AutoNotch	
								V (mm)	W (mm)
HEA/HEB 200	✓	-	-	-	-	-	-	35	120
HEA/HEB 220	✓	✓	-	-	-	-	-	35	120
HEA/HEB 240	✓	✓	-	-	-	-	-	35	125
HEA/HEB 260 → 280	✓	✓	✓	-	-	-	-	35	145
HEA/HEB 300	✓	✓	✓	✓	-	-	-	35	145
HEA/HEB 320 → 340	-	-	✓	✓	-	-	-	50	145
HEA/HEB 360	-	-	✓	✓	✓	-	-	50	145
HEA/HEB 400	-	-	✓	✓	✓	✓	-	50	145
HEA/HEB 450 → 700	-	-	✓	✓	✓	✓	✓	50	145
HEA/HEB 800 → 1000	-	-	✓	✓	✓	✓	✓	50	145
IPE 200	✓	-	-	-	-	-	-	35	55
IPE 220	✓	✓	-	-	-	-	-	35	55
IPE 240	✓	✓	✓	-	-	-	-	35	65
IPE 270	✓	✓	✓	-	-	-	-	35	65
IPE 300 → 330	✓	✓	✓	✓	-	-	-	35	80
IPE 360	✓	✓	✓	✓	✓	-	-	35	90
IPE 400	✓	✓	✓	✓	✓	✓	-	35	90
IPE 450	✓	✓	✓	✓	✓	✓	✓	35	90
IPE 500 → 600	✓	✓	✓	✓	✓	✓	✓	35	105
UPN 200	✓	-	-	-	-	-	-	25	85
UPN 220 → 240	✓	✓	-	-	-	-	-	25	85
UPN 260	✓	✓	✓	-	-	-	-	25	85
UPN 280	✓	✓	✓	-	-	-	-	30	100
UPN 300 → 320	✓	✓	✓	✓	-	-	-	30	100
UPN 350 → 360	✓	✓	✓	✓	✓	-	-	30	100
UPN 400	✓	✓	✓	✓	✓	✓	-	35	100

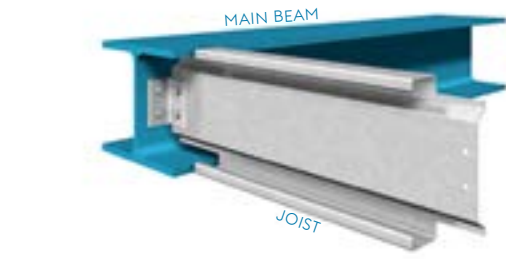
RECOMMENDED PERFORATION JOIST						
Section height h	A1 (mm)	B1 (mm)	Ø1 (mm)	A2 (mm)	B2 (mm)	Ø2 (mm)
450	75	300	18	125	200	18
400	75	250	18	125	150	18
350	75	200	18	100	150	18
330				115	100	18
300	75	150	18	100	100	18
250	75	100	18	100	50	18
220	55	110	14	75	70	14
200				75	50	14

Big size holes can be preperced in webs of main beams and joists: please turn to P.56.

SIGMA-JOIST

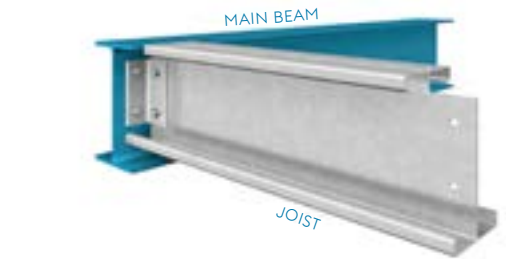


Main beam deeper than joist



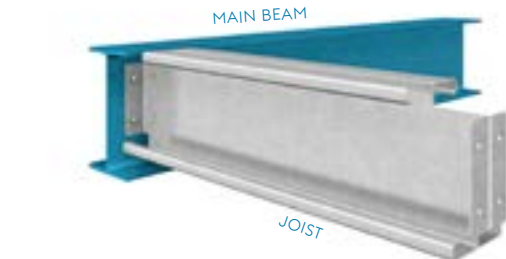
Main beam and joist have about the same depth

CEE-PLUS / I-PLUS - JOIST



Main beam deeper than joist

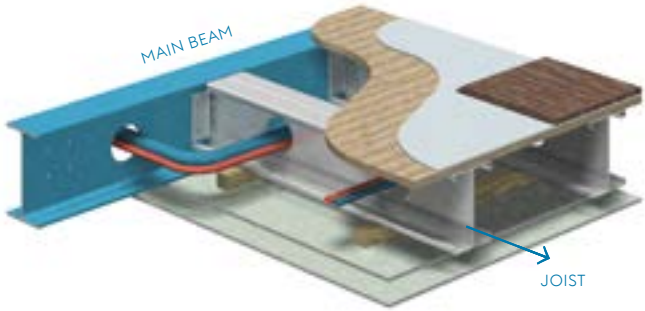
CEE-PLUS / I-PLUS - JOIST WITH AUTOCONNECTEND (ACE)

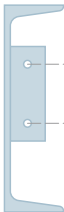
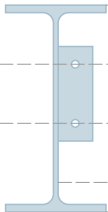
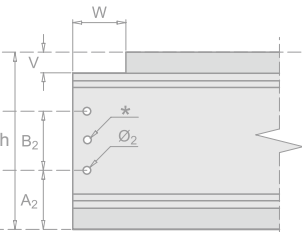
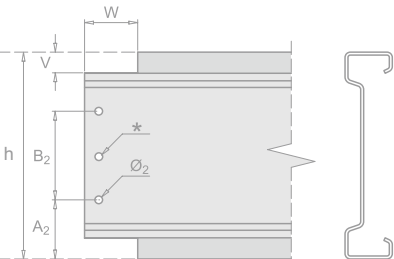
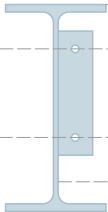
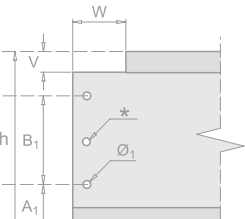
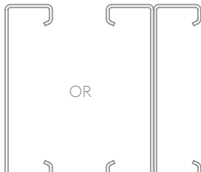
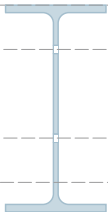
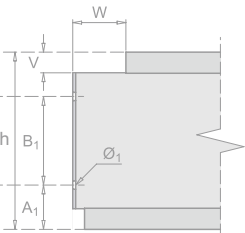
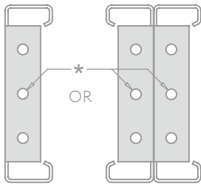


Main beam deeper than ACE-joist

MIXED-SYSTEM

Floor framing consisting of hot rolled main beams and cold rolled side beams.



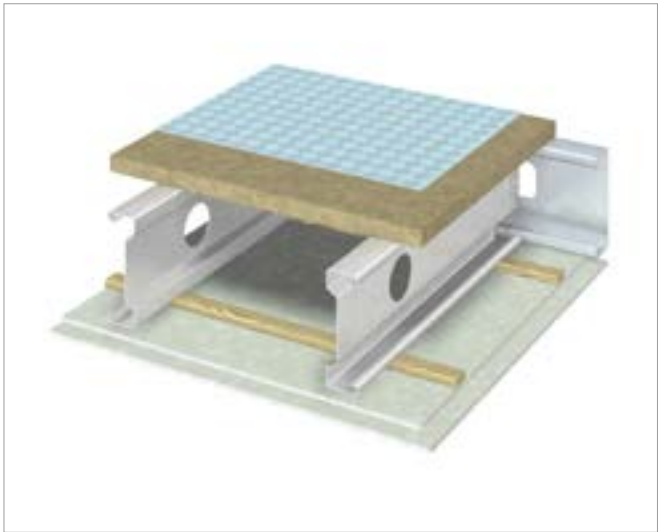
MAIN BEAM		JOIST	
Hot rolled		Smaller than main beam	Same depth as main beam
 UPN	 IPE HEA HEB		
		Single notch	Double notches
 UPN	 IPE HEA HEB		
		Single notch	OR
 UPN	 IPE HEA HEB		
		Single notch	OR
		AutoNotches to be identical on both profile ends. * Additional hole for section depth > 200 mm.	

AutoNotches to be identical on both profile ends.
* Additional hole for section depth > 200 mm.

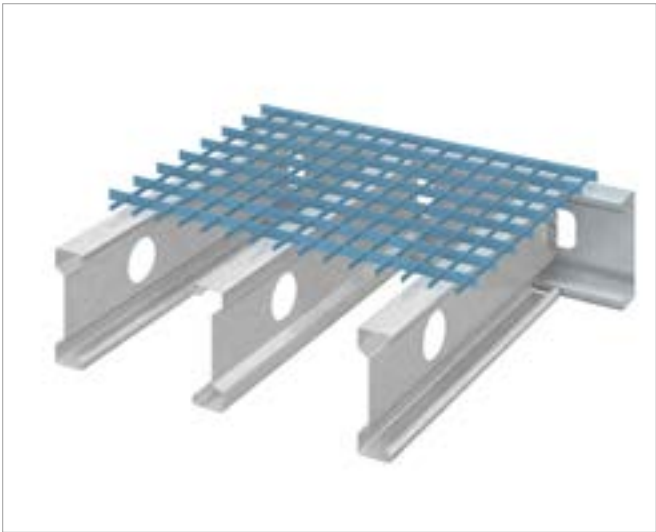


FLOOR COMPOSITION

FLOOR MATERIALS FOR INDUSTRIAL BUILDINGS

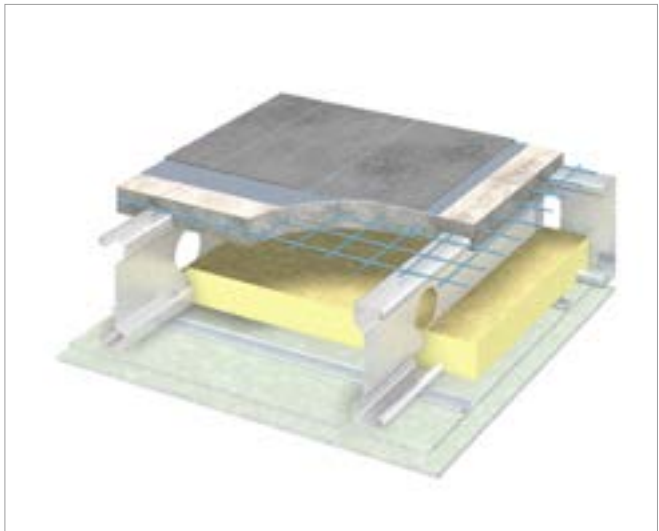


HD-Chipboard combined with fire resistant ceiling.

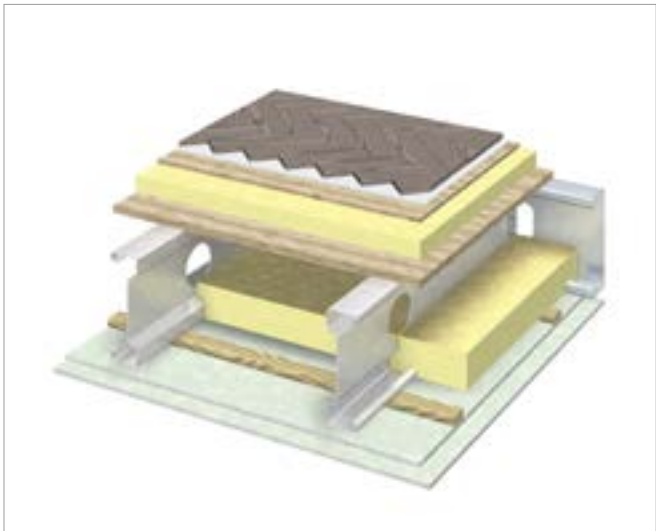


Steel gratings.

FLOOR MATERIALS FOR HOUSES AND OFFICES



Integrated concrete floor (see P.78).



Floating floor for high acoustic performance in case of floor built up with light weight materials.

Maximum stability and strength will be achieved by screwing (or nailing...) at regular intervals of flooring material to upper flanges of beams and joists.

STEEL PROFILES FOR SOLAR STRUCTURES

- FASTSLIDE	P.66 - 67
- FLEXROOF®	P.68 - 69
- FLEXPARK®	P.70 - 71
- TAILOR-MADE ROOF TOP STRUCTURES	P.72
- TAILOR-MADE GROUND STRUCTURES	P.73



FASTSLIDE® PATENTED SYSTEM

FastSlide®

voestalpine SadeF has developed an ingenious slide-in profile to have assembly of the solar panels take place more quickly, while fewer accessories are required for assembly. The FastSlide profile is compatible with all our standard purlins and can consequently be used for all types of structures, irrespective of the truss spacing.

Advantages:

- Panel assembly up to 2 panels/minute
- No clamps required
- Prevent micro-cracks in the panels
- Less loss of space between the panels
- Compatible with solar panels with panel heights of 30 mm to 50 mm



CARPORTS





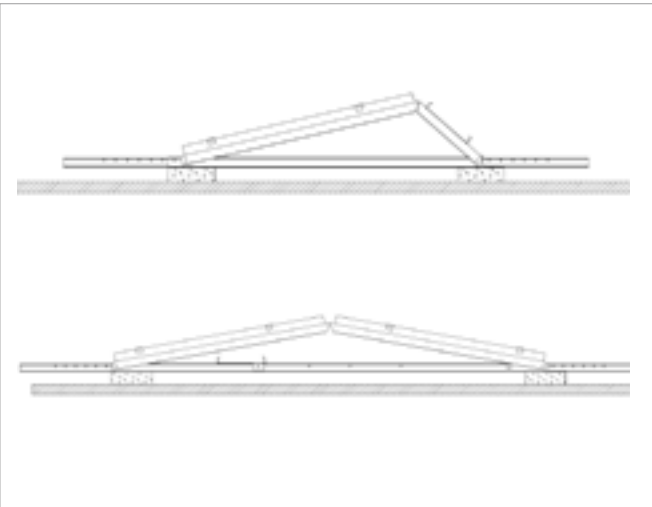
FLEXROOF®

Flexroof®

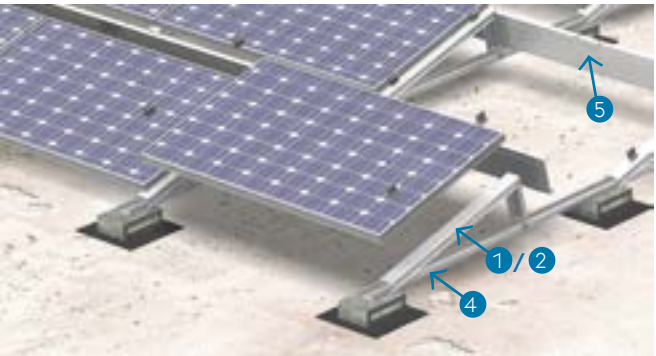
The light weight Flexroof® was developed for fitting solar panels on existing roofs. A limited number of components will build a maximum of configurations.

Features:

- Ready-to-assemble concept
- Standard solutions
- Fast delivery
- high corrosion protection galvanization profiles
- User friendly design software
- Distribution through system partner



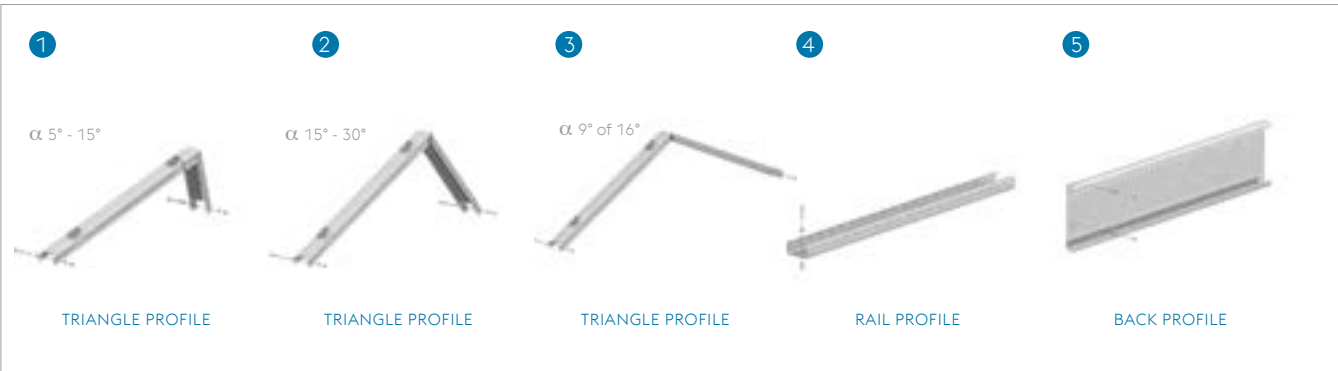
NORTH - SOUTH



EAST - WEST



STANDARD BUILDING COMPONENTS



For additional information: please contact voestalpine Sadef.



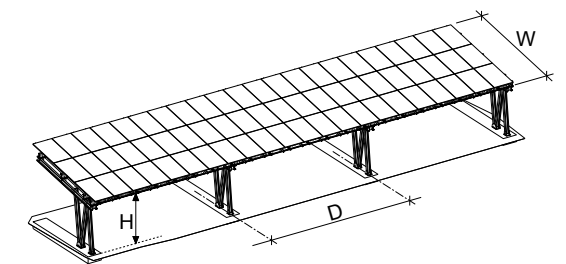
FLEXPARK FIX

Flexpark®

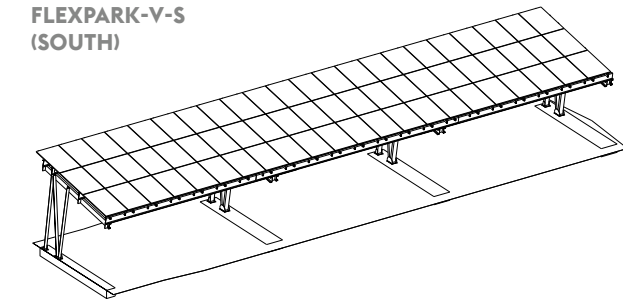
Flexpark® system was developed for private parking bays. Flexpark® system allows a continuous expansion with double or multiple bay carports. A limited number of components will build a maximum of configurations.

Advantages:

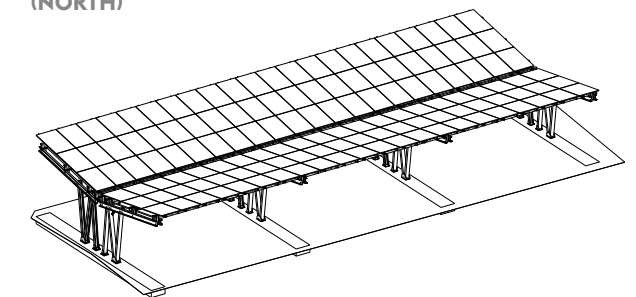
- Ready-to-assemble concept
- Standard solutions
- Fast delivery
- Corrosion resisting HDG profiles
- Modular concept
- Distribution through system partner



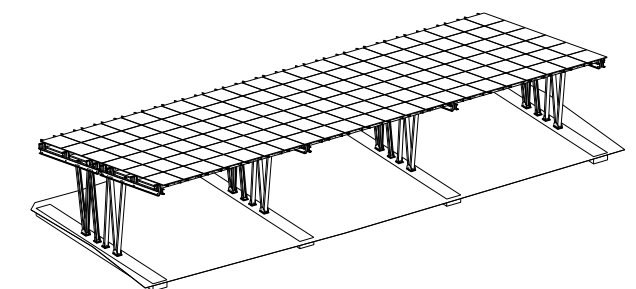
**FLEXPARK-V-S
(SOUTH)**



**FLEXPARK-V-N
(NORTH)**



**FLEXPARK-V-DP
(DUOPITCH)**



**FLEXPARK-V-DS
(DOUBLE SOUTH)**

FLEXPARK VARIABLE

Advantages:

- » Easy access
- » No obstructions
- » Fast, simple, and efficient installation

Caractéristiques :

- » Modular system
- » Parking bay width ranging from 2.4 to 2.8 m
- » Variable frame spacing: every 2 or 3 parking spaces
- » Drive-through height: 2.8 m
- » Roof width: 5.0 m + optional eave max. 0.6 m
- » Suitable for all PV modules, both portrait and landscape
- » Modular design with parking bays (from 2.4 to 2.8 m wide)

For additional information: please contact voestalpine Sadeff.

TAILOR-MADE ROOFTOP STRUCTURES

For every project, voestalpine SadeF has the possibility to design and produce specific, tailor made, roof structures for solar panelling and to deliver just-in-time.

Advantages:

- Tailor-made concept
- Light weight
- User friendly
- Sustainable
- 100% recyclable

Ask for our specific Solar brochure.

GLUTTERPROFILE FOR COUNTERWEIGHT



WITH COUNTERWEIGHT



ANCHORED TO MAIN STRUCTURE



ANCHORED BY BONDING



SOLARPANELS MOUNTED DIRECTLY TO PURLINS



TAILOR-MADE GROUND STRUCTURES

“RAMMED IN” TABLES



TABLES ON CONCRETE PADS



MISCELLANEOUS CONSTRUCTIONS

COMPONENTS FOR:	
- FLEXBUILD	P.76 - 77
- 2D MODULAR	P.78 - 79
- LOAD BEARING WALLS	P.80 - 83
- EXPORT-FRIENDLY TRUSSES	P.84 - 85
- GABLE END STRUCTURES	P.86 - 87
- INTERMEDIATE GABLE COLUMNS AND BRACING	P.88 - 89
- SMOKE VENTS AND SKY LIGHTS	P.90 - 91
TAILOR-MADE PROFILES	P.94 - 95
SURFACE TREATMENT	P.96 - 97



FLEXBUILD™

Advantages

Our 3D prefabricated modular frame is the better option when it comes to fast, weather independent and cost effective building.

Features:

- Optimised concept-solutions
- Weather independent building
- Load bearing frame suitable for any type of cladding
- Integrated service holes
- Well suited for “topping up” of existing buildings



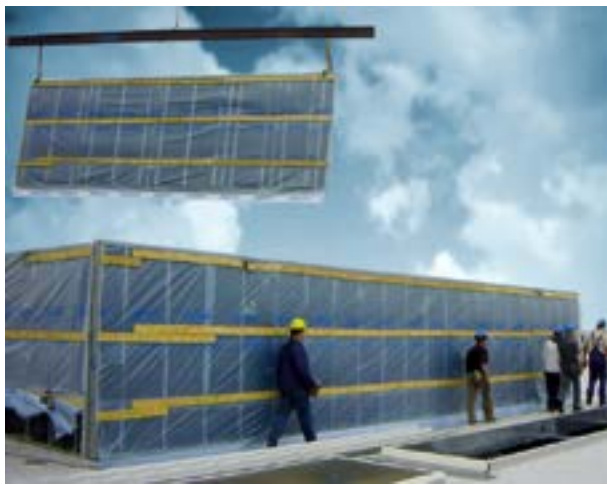
For additional information: please contact voestalpine SadeF.

2D MODULAR

2D ROOF ELEMENTS



2D WALL ELEMENTS



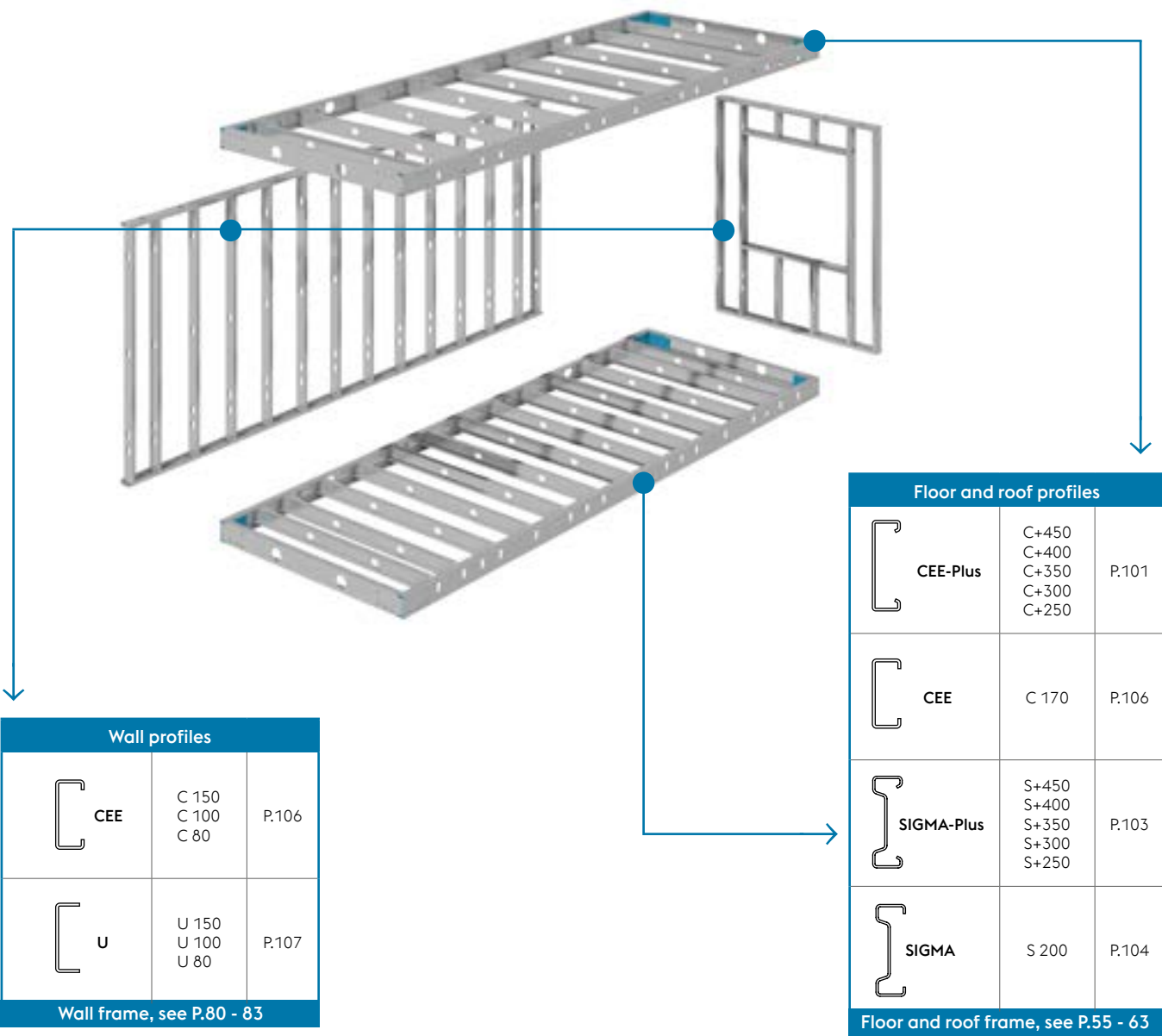
2D FLOOR ELEMENTS



Prefabricated modular 2D building elements are the better option when it comes to fast, weather independent and cost effective building.

Features:

- Fast building on site
- Independent of weather circumstances
- High standard and yet low cost production
- Consistent quality
- Compact transport
- No scrap on site



For additional information, piepiercing possibilities and minimum production batches; please contact voestalpine SadeF.



LOAD BEARING WALLS

Our wall framing elements are specially developed for external walling and for internal load bearing partition walls.

Standard piercing patterns CW (Cluster Web) and CF (Cluster Flange) for fast and safe assembly. Piercing at predetermined positions will result in pre-engineered components.

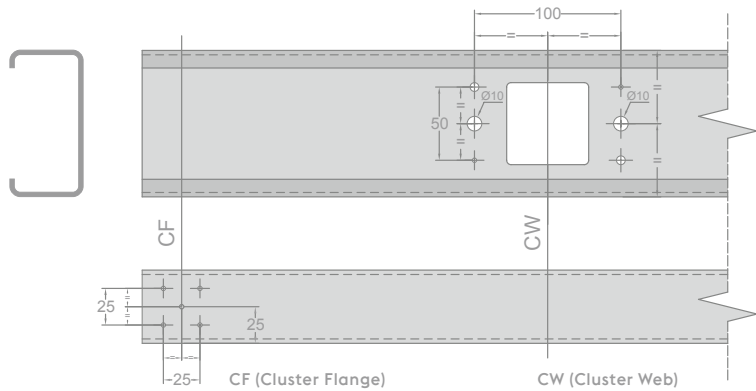
Features:

- Applicable for vertical load bearing partitions and wind pressure loaded external walls.
- Integration of service holes for transit pipelines

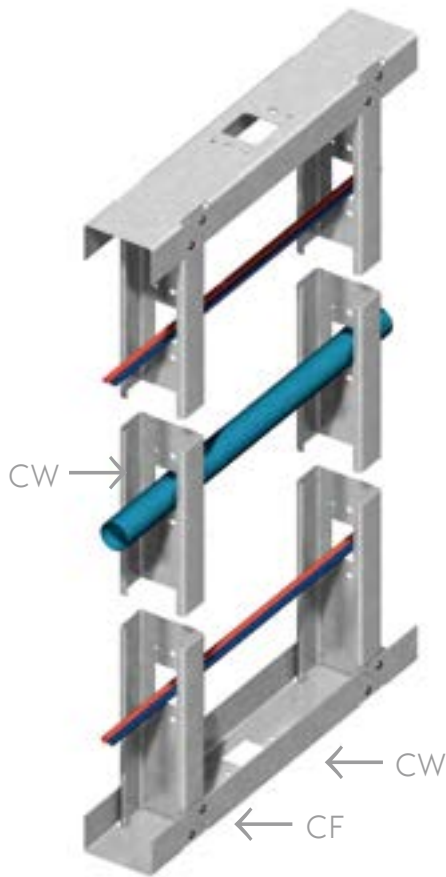
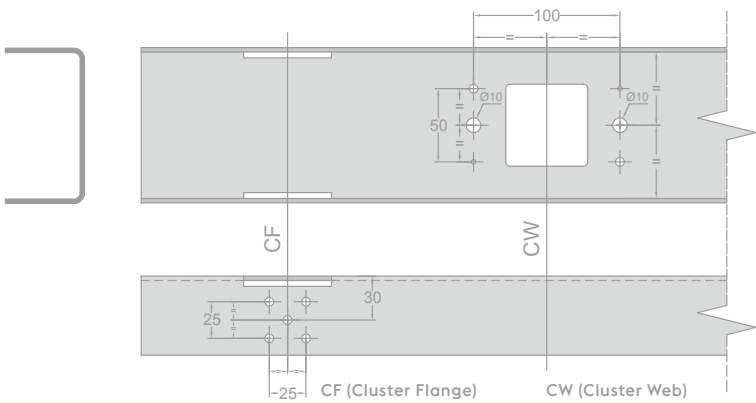
STUD PROFILE		
	CEE C 150 C 100 C 80	P.106

TRACK PROFILE		
	U U 150 U 100 U 80	P.107

STUD PROFILE



TRACK PROFILE



For additional information, prepiercing possibilities and minimum production batches; please contact voestalpine Sadef.



LOAD BEARING WALLS

CONTINUOUS WALL PROFILES



WALL ASSEMBLY

Wall frame consisting of CEE-studs and bottom U-channels can be placed. The CF (CLUSTER FLANGE) prepiercing in the bottom channel web ensures a perfect transfer of loads to the ground. Angle cut outs allow the stud to sit on the channel bottom.



For additional information, prepiercing possibilities and minimum production batches: please contact voestalpine SadeF.





EXPORT - FRIENDLY TRUSSES

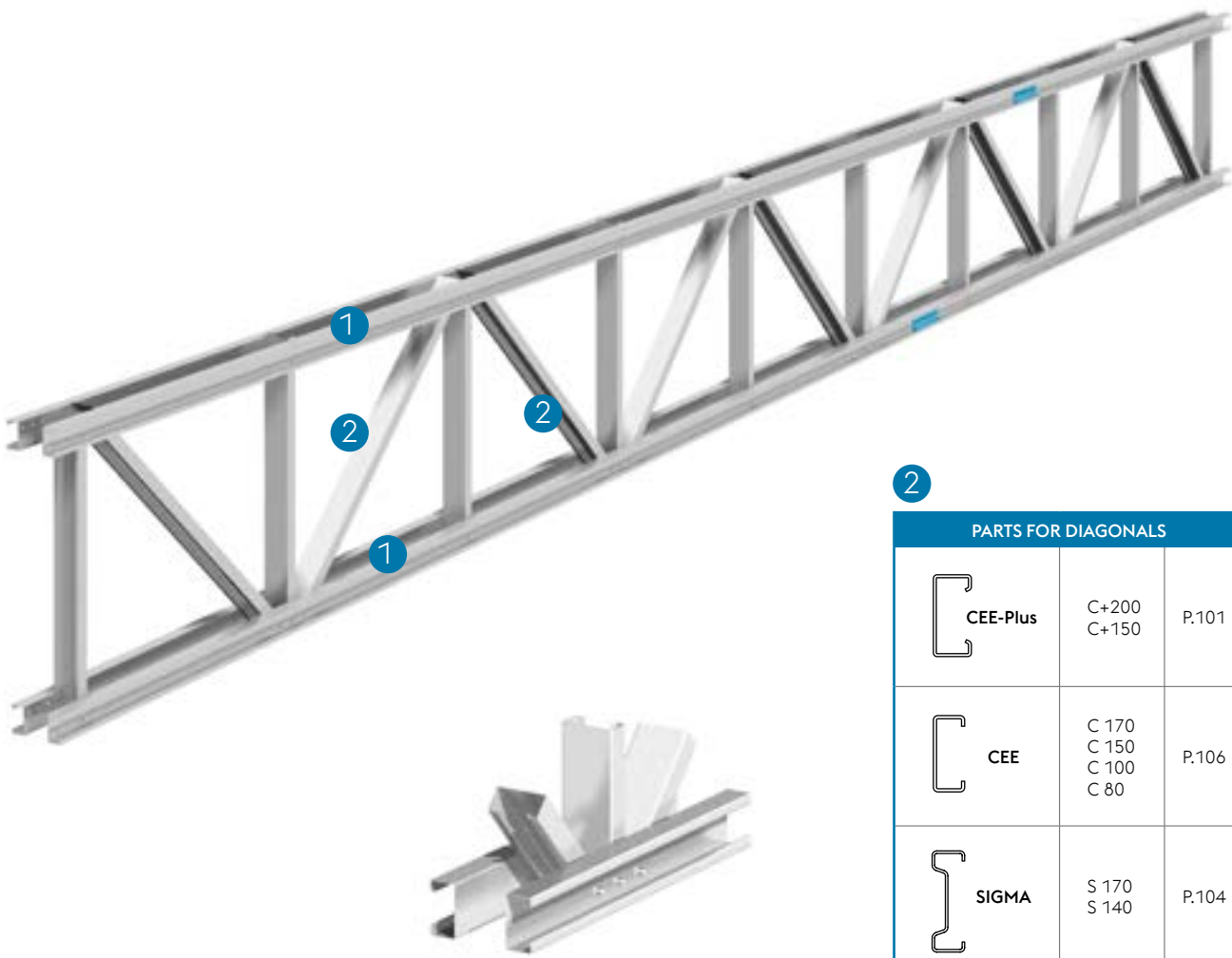
Trusses built by assembly of cold rollformed profiles are well suited for overseas building projects.

- Optimum use of material leading to cost-effective design
- Pregalvanised material
- Light weight
- Compact volume
- Kit of parts easy to assemble
- No skilled labour required
- Bolted connections – No welding
- Wide spans

Top and bottom beams consist of double CEE or CEE-Plus profiles. SIGMA, CEE or CEE-Plus profiles can be used as diagonals.

1

PARTS FOR TOP AND BOTTOM BEAMS		
CEE-Plus	C+350 C+300 C+250 C+220 C+200 C+150	P.101
CEE	C 200 C 170 C 150 C 100 C 100 C 80	P.106



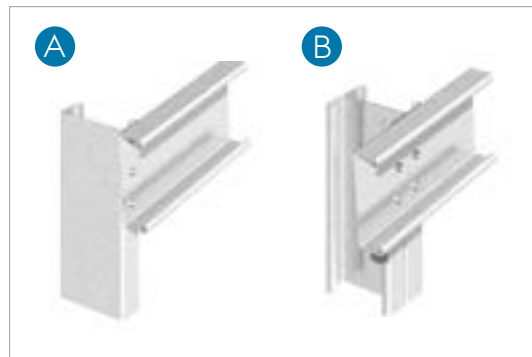
2

PARTS FOR DIAGONALS		
CEE-Plus	C+200 C+150	P.101
CEE	C 170 C 150 C 100 C 80	P.106
SIGMA	S 170 S 140	P.104

For additional information, prepiercing possibilities and minimum production batches: please contact voestalpine SadeF.

GABLE END STRUCTURES

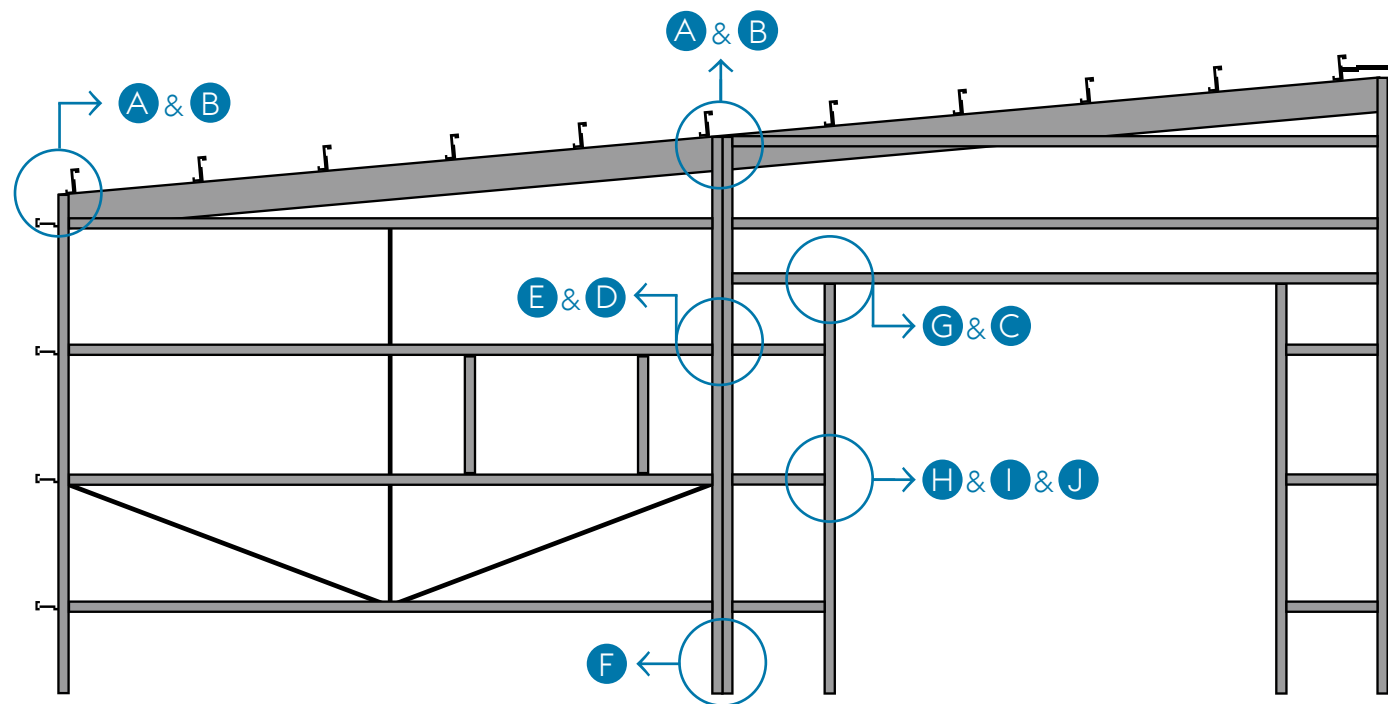
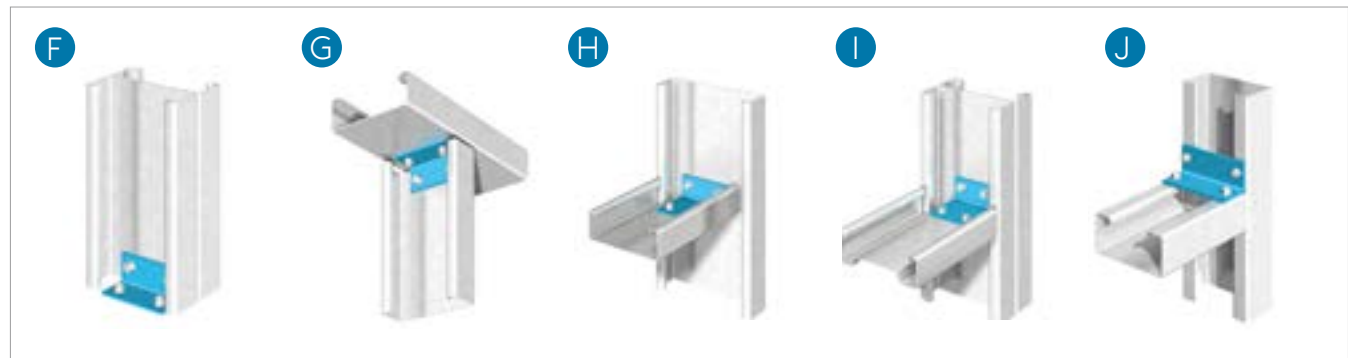
DIRECT CONNECTION



INTEGRATED CONNECTION



CLEATED CONNECTION

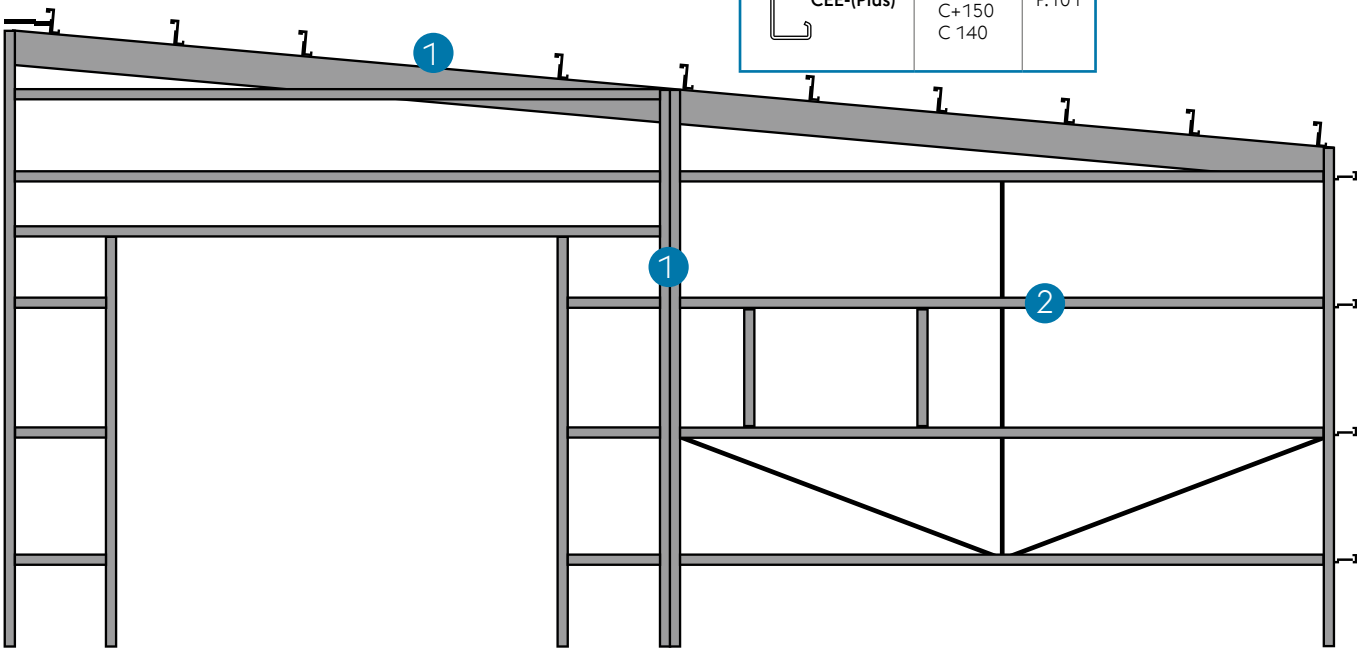


voestalpine sadeb profiles can be used to assemble lightweight front facade frames. these front facade frames are ideal for repetitive construction projects, allowing the advantages to be fully exploited.

- Features:**
- Easy assembly
 - Light weight components
 - Bolted connection - no welding required
 - Galvanised profiles
 - Finish identical to cladding rails

1 COLUMNS + UPPER BEAM		
	CEE-Plus	P.101
	C+450	
	C+400	
	C+400	
	C+350	
	C+300	
	C+250	
	C+220	
	C+200	
	C+150	

2 SIDE RAILS		
	ZED	P.105
	Z 375	
	Z 350	
	Z 300	
	Z 250	
	Z 230	
	Z 200	
	Z 180	
	SIGMA-Plus	P.103
	S+350	
	S+300	
	S+250	
	SIGMA	P.104
	S 200	
	S 170	
	S 140	
	CEE-(Plus)	P.101
	C+200	
	C+160	
	C+150	
	C 140	



For additional information, prepiercing possibilities and minimum production batches: please contact voestalpine Sadeb.



INTERMEDIATE GABLE COLUMNS AND BRACING

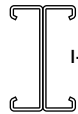
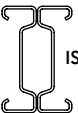
For large industrial buildings it may be advisable to widen the frame spacings to 10 - 18 m, which could then lead to additional columns being required in the long walls.

These can be supported on the foundation and fitted to the eaves beams. In these instances a horizontal bracing system placed between first and second roof purlin (as per sketch below) will transfer the horizontal wind loads to the portal frames.

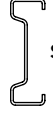
Columns and bracing diagonals are voestalpine SadeF-sections featuring:

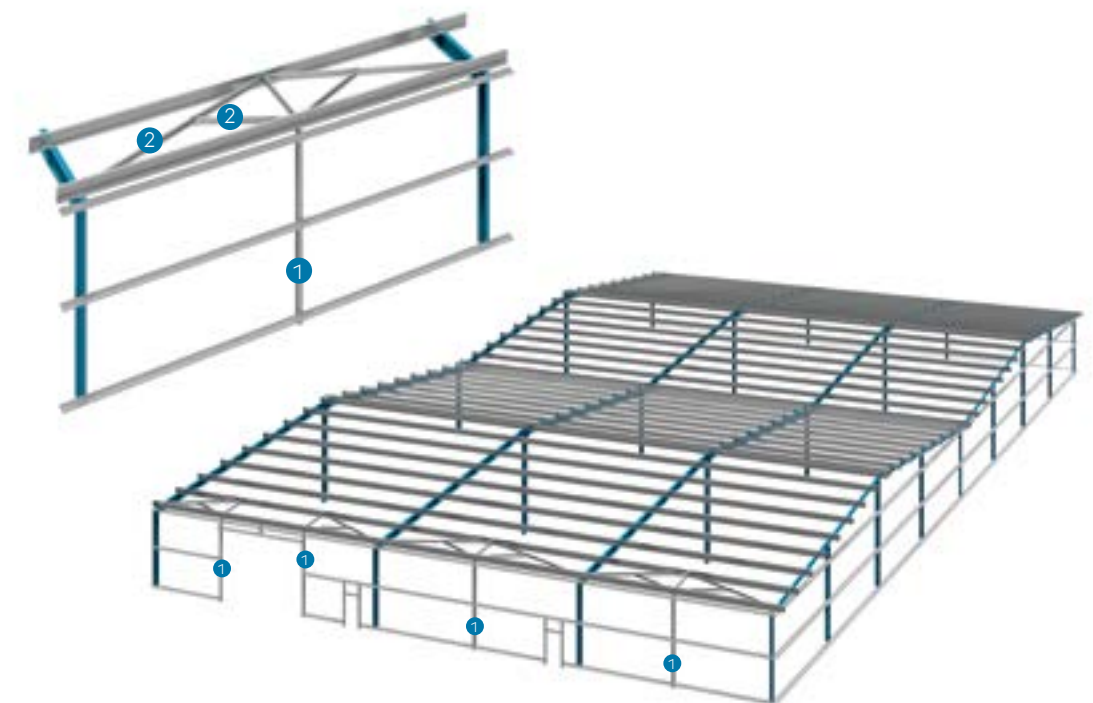
- Light weight
- Integrated connections → fewer components
- Finish identical to purlins and side rails

1

INTERMEDIATE COLUMNS		
	I+450 I+400 I+350 I+300 I+250 I+220	P.100
	IS+450 IS+400 IS+350 IS+300 IS+250 IS+220	P.102

2

DIAGONALS		
	S 200 S 170 S 140	P.104
	C 200 C 170 C 150 C 100	P.106



For additional information, prepiercing possibilities and minimum production batches: please contact voestalpine SadeF.

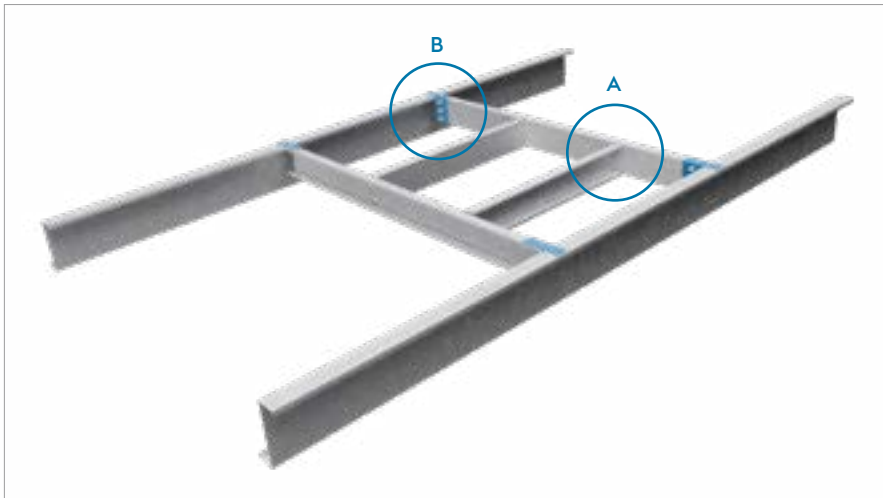


SMOKE VENTS AND SKYLIGHTS

Smoke vents an sky lights

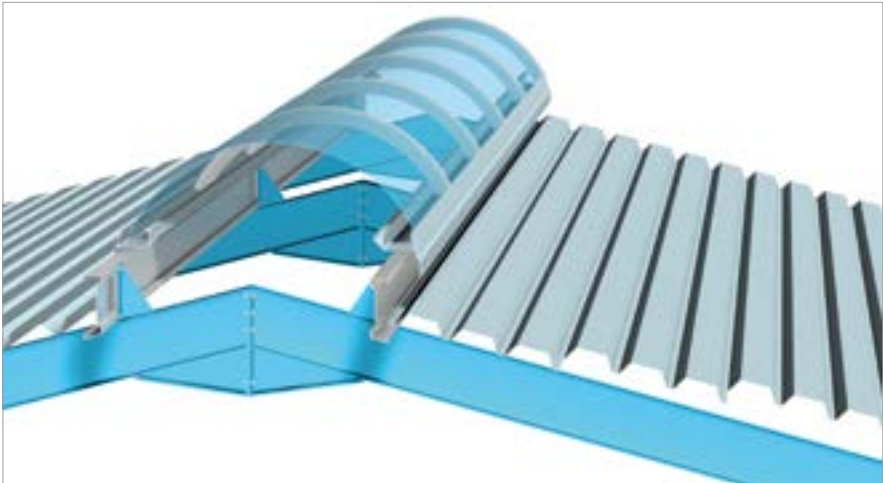
Standard voestalpine SadeF components will create easy to assemble and cost effective supporting structures for smoke vents and/or skylights.

- Specific requirements for sprinkler systems can be taken into account.
- Very often these structures can be placed in a roof sheet corrugation.



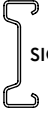
Sky lights

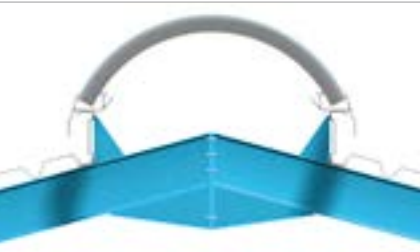
Skylights can be supported by voestalpine SadeF profiles. Eaves beam sections fitted with their angled flange to the portal frame will create a flat base for supporting the skylight.



COMPONENTS FOR SMOKE VENTS AND SKY LIGHTS		
 CEE	C 200 C 170 C 150 C 100	P.106



COMPONENTS FOR SKY LIGHTS		
 CEE-Plus	C+450 C+400 C+350 C+300 C+250	P.101
 SIGMA-Plus	S+450 S+400 S+350 S+300 S+250	P.103
 SE	SE 350 SE 250 SE 200	P.104



For additional information, prepiercing possibilities and minimum production batches; please contact voestalpine SadeF.



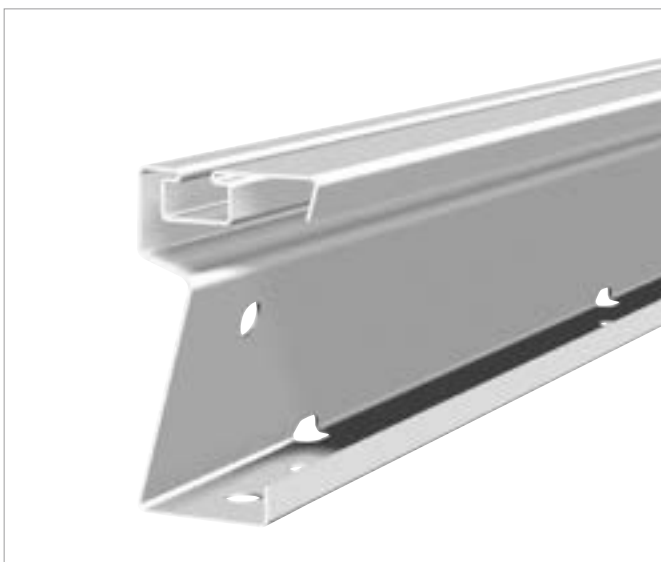
TAILOR MADE PROFILES

CUSTOM-MADE SECTIONS

voestalpine Sadef is your best solution for any specific profile shape that may be required for your building project. Our know-how and experience in the field of cold rollforming are valuable assets in the design and optimising of your specific profile.

- 35 production Lines
- Open and closed profile shapes
- Steel thickness 0.4 → 11 mm
- Pre- and postpiercing of virtually any hole patterns, notches, inserts etc.
- Various steel grades and surface treatment
- Over 5000 profile shapes already designed and produced

IF YOU CAN DREAM IT, WE CAN MAKE IT

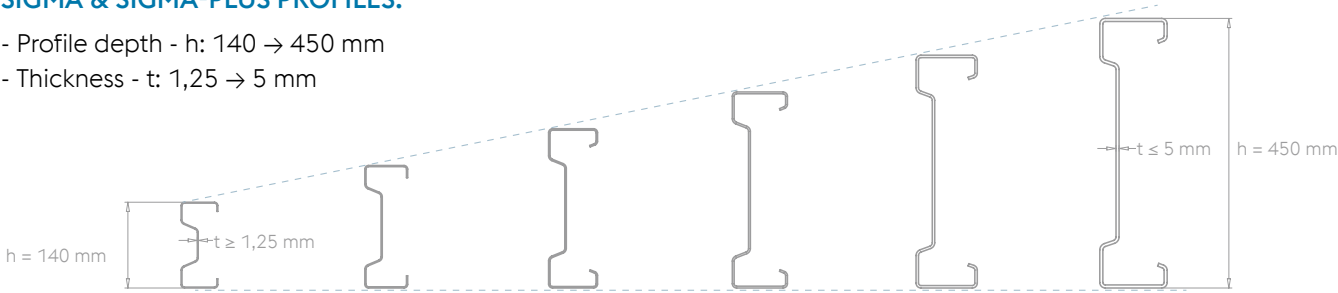


DIFFERENT DIMENSIONS of SIGMA, ZED AND CEE-PROFILES

In large-scale and/or repetitive projects any building profile may be, in consultation with the client, developed within the following limitations:

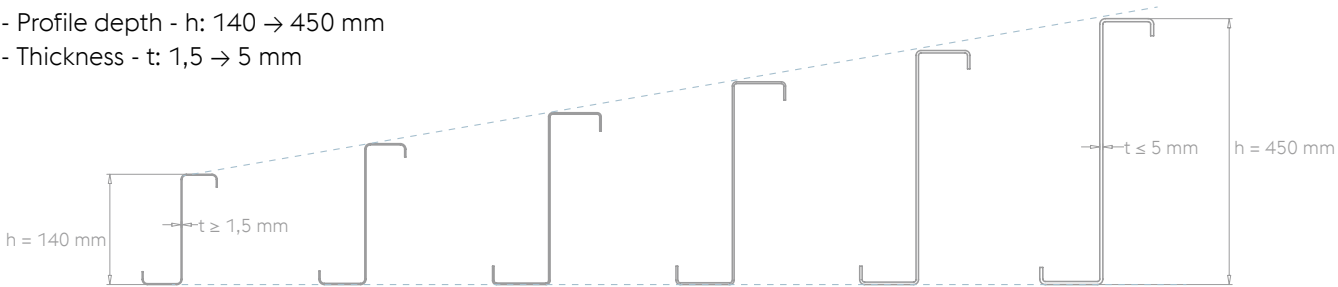
SIGMA & SIGMA-PLUS PROFILES:

- Profile depth - h: 140 → 450 mm
- Thickness - t: 1,25 → 5 mm



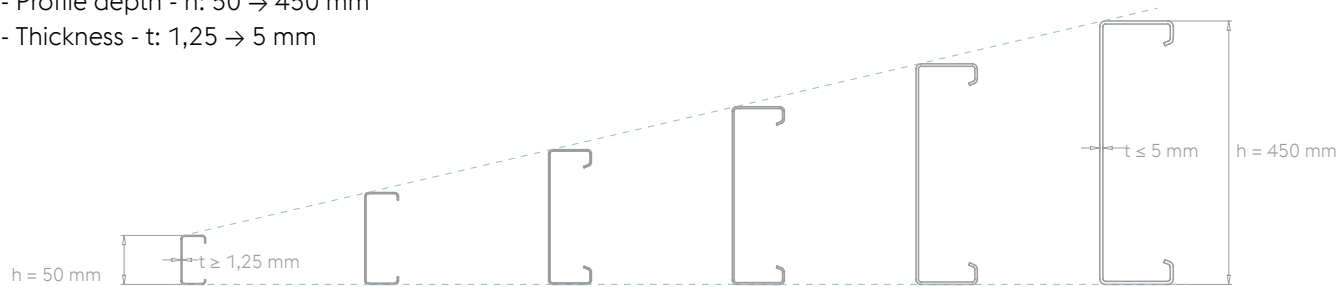
ZED PROFILES:

- Profile depth - h: 140 → 450 mm
- Thickness - t: 1,5 → 5 mm

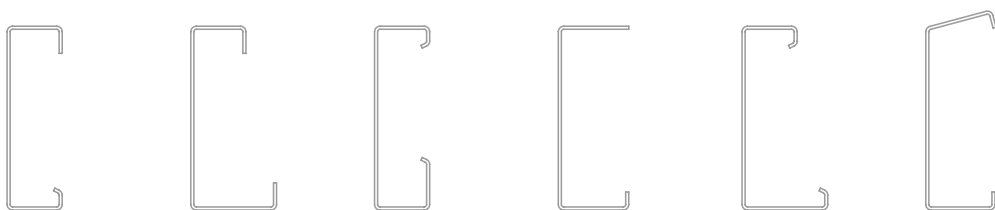


CEE & CEE-PLUS PROFILES:

- Profile depth - h: 50 → 450 mm
- Thickness - t: 1,25 → 5 mm



ASYMMETRIC PROFILES:



For additional information, prepiercing possibilities and minimum production batches; please contact voestalpine Sadef.

SURFACE TREATMENT

To protect steel against environmental influences, different surface treatments are available.

PRE-GALVANIZING (EN10.346)

(Continuous hot dip galvanized coil)

- Galvanized before rollforming
- Standard: Z275 (275 gr. zinc/m² - average 19 µ zinc layer)
- On request:
- Zn-coatings up to Z1200 (average 80 µ)
- ZnMg: ZM310 (average 25 µ) or ZM430 (average 35 µ)
- On request, a higher corrosion resistance can be provided by galvanizing with ZnMg: ZM310 or ZM430 (Magnelis galvanized)



HOT DIP GALVANIZING (EN-ISO 1461)

- After rollforming of the pickled material, profiles can be galvanized by dipping in a zinc bath
- Minimum coating to EN-ISO 1461: see table below

AVERAGE MINIMUM COATING (EN-ISO 1461)	
STEEL THICKNESS	MEAN COATING THICKNESS (MINIMUM) µm
steel > 6 mm	85 µm
3 mm < steel ≤ 6 mm	70 µm
1,5 mm ≤ steel ≤ 3 mm	55 µm



Electrostatic powder coating

- Applied after rollforming
- Coating process: pre-galvanized or hot dip galvanized + powder coating
- Polyester, epoxy or PU-coating
- Electrostatic powdercoating in any RAL-colour
- Colour and coating thickness to be specified

Duplex powder coating

- Applied after rollforming
- Coating process: pre-galvanized or hot dip galvanized + powder coating



Lifetime

Lifetime of galvanized steel depends on the degree of corrosivity of the environment a.o. This is spread over 5 corrosivity degrees. (EN-ISO 12944-2)

With galvanized profiles the EN-ISO 12944-2 defines the annual zinc decrease as followed:

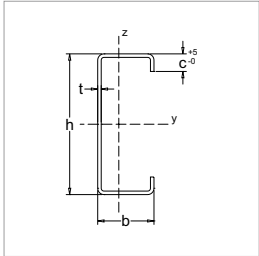
DURABILITY				
environment category	thickness loss (after first year of exposure)		Examples of typical environments in a temperate climate (informative only)	
	Zinc thickness loss * µm	Zinc magnesium thickness loss µm	Exterior	Interior
C1 very low	≤ 0,1	≤ 0,4	-	Heated buildings with clean atmospheres e.g. offices, shops, scholls, hotels.
C2 low	0,1 to 0,7	< <0.4	Atmospheres with low level of pollution. Mostly rural areas.	Unheated buildings where condensation may occur, e.g. depots, sport halls.
C3 medium	0,7 to 2,1	<0.4	Urban and industrial atmospheres, moderate sulfur dioxide pollution. Coastal areas with low salinity.	Production rooms with high humidity and some air pollution, e.g. food-processing plants, laundries, breweries, dairies.
C4 high	2,1 to 4,2	<0.4	Industrial areas and coastal areas with moderate salinity.	Chemical plants, swimming pools, coastal ship- and boatyards.
C5-I very high (Industrial)	4,2 to 8,4	0.4	Industrial areas with high humidity and aggressive atmosphere.	Building or areas with almost permanent condensation and with high pollution.
C5-M very high (Marine)	4,2 to 8,4	tbd	Coastal and offshore areas with high salinity.	Buildings or areas with almost permanent condensation and with high pollution.

* Extract from EN-ISO 12944-2

BUILDING SECTIONS RANGE

I-PLUS	P.100
CEE-PLUS	P.101
IS-PLUS	P.102
SIGMA-PLUS	P.103
SIGMA	P.104
SE	P.104
ZED	P.105
CEE	P.106
U	P.107

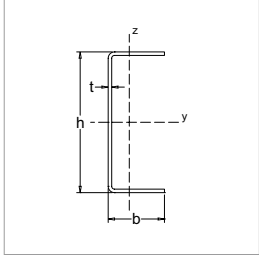
CEE



SECTION								GROSS CROSS SECTION PROPERTIES				
Section Type	Section name	h (mm)	b (mm)	c (mm)	t (mm)	G (kg/m)	A _{paint} (m ² /m)	A (cm ²)	I _y (cm ⁴)	W _y (cm ³)	I _z (cm ⁴)	W _z (cm ³)
C 200	C 200x4**	200	80	25	4,00	11,91	0,79	15,03	908,6	92,72	125,33	23,64
	C 200x3				3,00	9,09		11,45	704,1	71,48	99,16	18,56
	C 200x2,5				2,50	7,64		9,60	595,0	60,25	84,90	15,78
	C 200x2				2,00	6,16		7,71	481,4	48,63	69,16	12,84
	C 200x1,5				1,50	4,66		5,78	363,2	36,59	52,65	9,73
C 170	C 170x3	170	60	15	3,00	6,97	0,62	8,79	374,3	44,82	37,22	8,87
	C 170x2,5				2,50	5,87		7,39	317,9	37,96	32,16	7,63
	C 170x2				2,00	4,75		5,95	258,5	30,77	26,57	6,27
	C 170x1,75				1,75	4,17		5,21	227,3	27,02	23,54	5,54
	C 170x1,5				1,50	3,60		4,47	195,7	23,23	20,41	4,79
C 150	C 150x2,5	150	50	12	2,50	4,97	0,52	6,26	204,5	27,73	17,80	5,01
	C 150x2				2,00	4,02		5,05	166,9	22,55	14,83	4,15
	C 150x1,75				1,75	3,54		4,42	147,0	19,83	13,19	3,68
	C 150x1,5				1,50	3,05		3,79	126,7	17,07	11,48	3,19
C 140	C 140x4**	140	90	32	4,00	11,10	0,72	14,00	440,1	64,72	163,06	31,21
	C 140x3			28	3,00	8,29		10,44	338,4	49,40	121,44	22,55
	C 140x2,5			26	2,50	6,89		8,67	284,7	41,40	100,51	18,38
	C 140x2			26	2,00	5,56		6,97	230,8	33,45	81,99	14,94
C 100	C 100x2,5	100	50	12	2,50	3,99	0,42	5,04	78,8	16,16	15,60	4,79
	C 100x2				2,00	3,24		4,07	64,6	13,19	13,00	3,96
	C 100x1,75				1,75	2,85		3,57	57,0	11,61	11,50	3,51
	C 100x1,5				1,50	2,46		3,06	49,3	10,01	10,07	3,05
C 80	C 80x2,5	80	40	12	2,50	3,20	0,35	4,04	39,5	10,20	8,20	3,26
	C 80x2				2,00	2,61		3,28	32,6	8,37	6,90	2,72
	C 80x1,5				1,50	1,99		2,48	25,1	6,38	5,38	2,10

Base material: S390 GD + pregalvanised Z275 (Following EN 10346)
Alternative grades or coating available on request

U



SECTION							GROSS CROSS SECTION PROPERTIES				
Section Type	Section name	h (mm)	b (mm)	t (mm)	G (kg/m)	A _{paint} (m ² /m)	A (cm ²)	I _y (cm ⁴)	W _y (cm ³)	I _z (cm ⁴)	W _z (cm ³)
U 150	U 150x2,5	156	54	2,50	4,98	0,52	6,25	220	28,65	16,58	3,96
	U 150x2	155	55	2,00	4,02		5,03	177	23,19	14,08	3,30
	U 150x1.75			1,75	3,53		4,40	156	20,32	12,37	2,89
	U 150x1.5	154	56	1,50	3,05		3,78	133	17,50	11,16	2,56
U 100	U 100x2,5	106	54	2,50	4,00	0,42	5,02	89	17,20	14,74	3,77
	U 100x2	105	55	2,00	3,24		4,05	72	13,92	12,50	3,14
	U 100x1,75			1,75	2,84		3,55	63	12,22	10,99	2,75
	U 100x1,5	104	56	1,50	2,46		3,05	54	10,51	9,90	2,44
U 80	U 80x2	85	45	2,00	2,61	0,35	3,27	37	9,05	6,72	2,08
	U 80x1,5		44	1,50	1,95		2,42	28	6,71	4,79	1,50

Effective cross section properties: on demand
Detailed perforation possibilities, see pag. 35, 56-61, 81

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