Ruukki
Building your tomorrow.

Ruukki® lightweight purlins

Technical manual

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1 Ruukki lightweight purlins

1.1 ADVANTAGES OF LIGHTWEIGHT PURLINS

Ruukki offers wide range of lightweight purlins with high quality, durability and versatility of shapes and applications. Production technology and top quality raw materials assure of high load bearing capacity and stiffness leading to increase of span lengths. Purlins are widely applied as secondary roof and wall structures for almost all kind of buildings. Ruukki lightweight purlins offer several considerable advantages over alternative structures:

- The purlins are lightweight in proportion to their load bearing capacity. Thus, roof structures built using lightweight purlins are very light.
- The use of material is very efficient. Owing to the high strength of the base material, the required load bearing capacity is achieved with a smaller cross-sectional thickness, which translates into savings in materials and costs.
- Lightweight purlins produce savings in transport costs. The purlins require little space in transport, purlins for quite a large roof can be transported as a single delivery.
- Local increase of the load bearing capacity of lightweight purlins is easy, by e.g. lapping purlins inside each other without having to make changes in the structural system of the whole roof or wall. • Longer spans are possible with lightweight purlins than with alternative applicable solutions.
- Lightweight purlins are made of zinc-coated material with good corrosion resistance. This makes lightweight purlins applicable also in difficult conditions.
- Lightweight purlins are fully recyclable material. Waste steel can be reused in the roof as weather protection, and the reuse of the whole roof at the end of its service life requires only little energy.

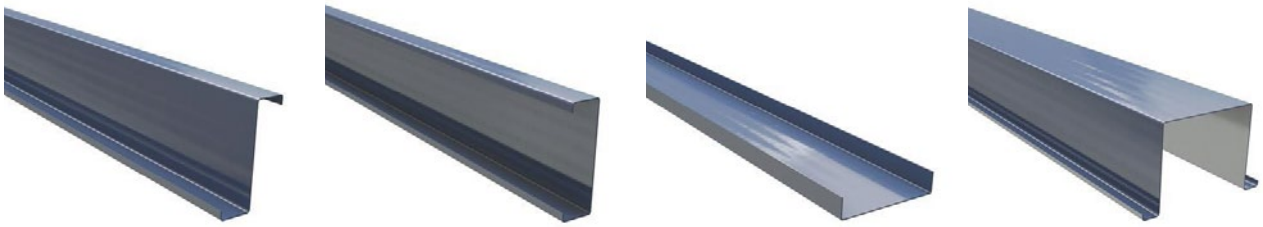
1.2 MATERIAL OF LIGHTWEIGHT PURLINS

Lightweight purlins are made of cold rolled thin gauge steel sheet, which is delivered in coils. The material of the hot dip galvanised (20 µm) thin gauge steel sheet is grade S350GD+Z275, in compliance with EN 10346. The yield strength of the steel sheet is minimum 350 N/mm².

1.3 MANUFACTURE OF RUUKKI LIGHTWEIGHT PURLINS

Lightweight purlins can be roll formed or press braked from cold rolled thin gauge steel sheet. The purlins can also be pre-punched at factory, also thermoprofile versions available for Z, C and U purlins.

1.4 CROSS-SECTIONS OF RUUKKI LIGHTWEIGHT PURLINS



Z *C* *U* *Hat*

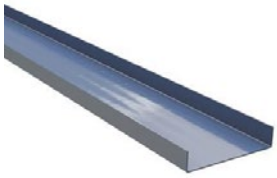
Section dimensions shown at chapter 1.6.

1.5 SECTIONS

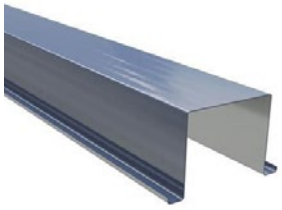
- Material thickness of sections 1.0–3.0 mm , 1.0–2.0 mm for thermo profiles
- Length of roll formed purlins 0.4–18 m, <1.6 m partially cut
- Section heights 100–350 mm (roll-formed)
- Maximum length 18 m (roll-formed)
- Max weight for hat purlins 120 kg/pc
- Tolerance standards applied to cross-sections:
  - Press braked: EN 1090-2
  - Roll formed: EN 10162

The Z section is excellently suited as a roof purlin. The major principal inertia axis is in pitched roofs with normal inclination in an approximately vertical position and thereby provides optimum load bearing capacity against the weight of structures and snow. The second moment of area about the minor axis, on the other hand, is so low that it is usually advisable to tie the sheet section on the slope of the roof to the opposite slope by a ridge moulding. The Z section is installed on the roof with the upper flange pointing toward the ridge. Z sections are applicable also as wall purlins, installed with the outer flange facing down.

C sections can be used as wall purlins or wall posts. The C section differs from the Z section by its centre of torsion, which in the C section is on the back side. Due to torsion, a vertical load acting on the section causes a transverse force component on the flange of the section, acting from the web up toward the upper flange. If C sections are used as roof purlins, they need to be installed with the upper flange pointing toward the ridge. As wall purlins, on the other hand, they are installed with the flange facing up, whereby wind pressure loads partly counteract the self-weight of the wall structure. With wind suction loads, the transverse force components strengthen one another, and tie rods may be required to counteract their influence.

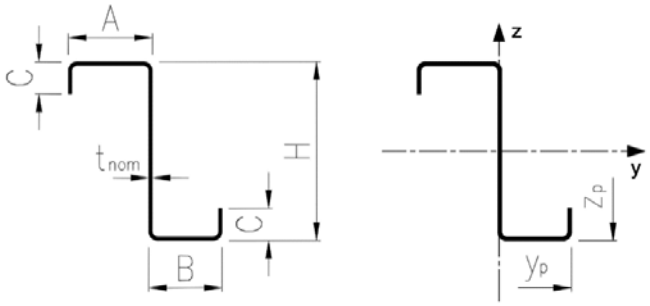


Our pre-punched purlins are quick to install and suitable for both insulated and uninsulated roofs and walls. The thickness and height of the purlin selected depend on span length and loads. Typical applications are industrial construction, hall and warehouse construction and extension construction and renovation.



The top hat section is wider than the sections referred to above. This gives it considerably higher lateral stiffness, which makes it suited to applications where the purlin is subjected to transverse loads, as well. Top hat purlins are attached directly from the flanges. They are used as roof purlins, wall purlins or, for example, as truss chords.

1.6 GEOMETRIES AND CHARACTERISTICS OF CROSS-SECTIONS



Lightweight purlin Z

Steel grade: S350GD+Z

Yield strength: f_y = 350 MPa

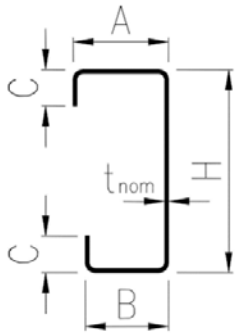
Tensile strength: f_u = 420 Mpa

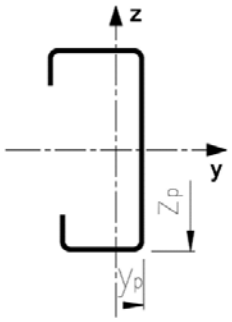
Purlin Z – Cross-section geometries

Type of purlin	Thickness	Height	Width of wide flange	Width of narrow flange	Fold	Weight	Cross section area, gross	Cross section area, effective	Center of gravity	Center of gravity
	t_{nom}	H	A	B	C	g	A_{gross}	A_{eff}	Y_p	Z_p
	mm	mm	mm	mm	mm	kg/m	cm²	cm²	mm	mm
Z100	1,00	100	45,00	39,00	16,50	1,63	2,03	1,23	40,85	51,35
	1,20		45,40	39,40	16,80	1,96	2,45	1,73	40,85	51,35
	1,50		46,00	40,00	17,20	2,45	3,08	2,42	40,85	51,35
	2,00		47,00	41,00	18,00	3,20	4,13	3,64	40,85	51,35
Z120	1,00	120	45,00	39,00	17,00	1,81	2,22	1,22	40,75	61,54
	1,20		45,50	39,50	17,20	2,17	2,68	1,72	40,75	61,54
	1,50		46,00	40,00	17,80	2,71	3,37	2,43	40,75	61,54
	2,00		47,00	41,00	18,00	3,61	4,52	3,69	40,75	61,54
Z150	1,00	150	45,00	39,00	17,00	2,04	2,50	1,21	40,55	76,75
	1,20		45,40	39,40	17,20	2,45	3,02	1,70	40,55	76,75
	1,50		46,00	40,00	17,80	3,06	3,80	2,42	40,55	76,75
	2,00		47,00	41,00	18,50	4,08	5,10	3,71	40,55	76,75
Z200	1,50	200	70,00	62,00	24,80	4,36	5,44	2,75	63,90	102,40
	2,00		71,00	63,00	25,50	5,81	7,30	4,58	63,90	102,40
	2,50		72,00	64,00	26,20	7,26	9,15	6,43	63,90	102,40
	3,00		73,00	65,00	27,00	8,71	11,00	8,40	63,90	102,40
Z250	1,50	250	70,00	62,00	24,80	4,92	6,17	2,75	64,45	127,35
	2,00		71,00	63,00	25,50	6,56	8,28	4,60	64,45	127,35
	2,50		72,00	64,00	26,20	8,20	10,39	6,49	64,45	127,35
	3,00		73,00	65,00	27,00	9,84	12,49	8,52	64,45	127,35
Z300	1,50	300	89,00	81,00	24,20	5,95	7,45	2,62	83,15	152,65
	2,00		90,00	82,00	25,00	7,93	10,00	4,55	83,15	152,65
	2,50		91,00	83,00	25,80	9,91	12,54	6,81	83,15	152,65
	3,00		92,00	84,00	26,50	11,89	15,08	9,11	83,15	152,65
Z350	2,00	350	90,00	82,00	30,00	8,97	11,20	4,74	176,20	83,60
	2,50		91,00	83,00	31,20	11,21	14,05	7,08	176,20	83,60
	3,00		92,00	84,00	31,40	13,44	16,89	9,50	176,20	83,60

Purlin Z – Cross-section characteristics

Type of purlin	Thickness	Moment of inertia, gross	Section modulus gross	Moment of inertia, effective Top flange com-pressed	Section modulus effective Top flange com-pressed	Moment of inertia, effective Bottom flange com-pressed	Section modulus effective Bottom flange com-pressed	Radius of gyration	Max. Bending moment, span Top flange com-pressed	Max. Bending moment, span Bottom flange com-pressed
	t_{nom}	I_y	W_y	I_{yeff}	W_{yeff}	I_{yeff}	W_{yeff}	i_y	$M_{b,Rd}$	$M_{b,Rd}$
	mm	cm^4	cm^3	cm^4	cm^3	cm^4	cm^3	cm	kNm	kNm
Z100	1,00	31,340	6,130	28.831	5,636	29,558	5,556	3,931	1,973	1,944
	1,20	37,831	7,384	37,100	7,332	37,828	7,384	3,931	2,566	2,584
	1,50	47,542	9,253	47,542	9,253	47,542	9,253	3,930	3,238	3,238
	2,00	63,664	12,330	63,664	12,330	63,664	12,330	3,928	4,315	4,315
Z120	1,00	48,158	7,860	42,939	6,795	43,978	6,722	4,658	2,378	2,353
	1,20	58,135	9,473	56,685	9,383	57,622	9,319	4,657	3,284	3,262
	1,50	73,064	11,877	73,064	11,877	73,064	11,877	4,656	4,157	4,157
	2,00	97,854	15,841	97,854	15,841	97,854	15,841	4,654	5,544	5,544
Z150	1,00	81,702	10,689	69,691	8,512	71,328	8,461	5,712	2,979	2,961
	1,20	98,635	12,887	92,161	11,948	93,457	11,674	5,712	4,182	4,086
	1,50	123,979	16,166	123,681	16,151	123,316	15,998	5,710	5,653	5,600
	2,00	166,071	21,584	166,071	21,584	166,071	21,584	5,707	7,554	7,554
Z200	1,50	328,860	32,197	280,475	25,583	289,171	25,867	7,774	8,954	9,054
	2,00	440,827	43,053	428,445	42,616	433,778	41,868	7,772	14,915	14,654
	2,50	552,467	53,823	550,938	53,769	552,467	53,823	7,770	18,819	18,838
	3,00	663,787	64,510	663,787	64,510	663,787	64,510	7,768	22,579	22,579
Z250	1,50	555,474	43,800	454,735	32,411	465,288	32,465	9,485	11,344	11,363
	2,00	744,681	58,603	697,620	54,143	701,539	52,625	9,483	18,950	18,419
	2,50	933,377	73,307	926,362	73,088	925,790	72,255	9,480	25,581	25,289
	3,00	1121,566	87,913	1121,566	87,913	1121,566	87,913	9,477	30,770	3,077
Z300	1,50	983,000	64,627	696,020	38,317	712,846	38,598	11,485	13,411	13,509
	2,00	1318,164	86,520	1091,556	65,222	1114,916	65,292	11,482	22,828	22,852
	2,50	1652,585	108,291	1512,011	96,256	1530,451	94,823	11,479	33,690	33,188
	3,00	1986,271	129,942	1926,815	128,114	1925,456	123,447	11,477	44,840	43,207
Z350	2,00	1956,977	110,463	1585,278	79,693	1611,873	79,741	13,217	27,893	27,909
	2,50	2453,683	138,303	2198,183	117,355	2218,1754	115,895	13,214	41,074	40,563
	3,00	2949,381	166,008	2803,870	156,077	2798,258	151,283	13,211	54,627	52,949





Lightweight purlin C

Steel grade: S350GD+Z

Yield strength: f_y = 350 MPa

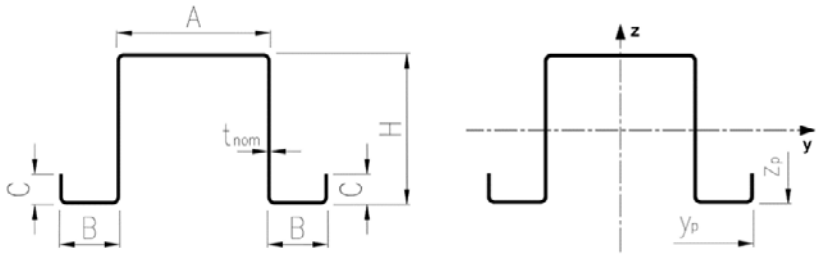
Tensile strength: f_u = 420 Mpa

Purlin C – Cross-section geometries

Type of purlin	Thickness	Height	Width of wide flange	Width of narrow flange	Fold	Weight	Cross section area, gross	Cross section area, effective	Center of gravity	Center of gravity
	t_{nom}	H	A	B	C	g	A_{gross}	A_{eff}	Y_p	Z_p
	mm	mm	mm	mm	mm	kg/m	cm²	cm²	mm	mm
C100	1,00	100	45,00	39,00	16,50	1,63	2,01	1,21	15,05	51,45
	1,20		45,40	39,40	16,80	1,96	2,43	1,70	15,05	51,45
	1,50		46,00	40,00	17,20	2,45	3,06	2,39	15,05	51,45
	2,00		47,00	41,00	18,00	3,20	4,10	3,60	15,05	51,45
C120	1,00	120	45,00	39,00	17,00	1,81	2,22	1,22	13,95	61,55
	1,20		45,50	39,50	17,20	2,17	2,68	1,71	13,95	61,55
	1,50		46,00	40,00	17,80	2,71	3,37	2,42	13,95	61,55
	2,00		47,00	41,00	18,00	3,61	4,51	3,68	13,95	61,55
C150	1,00	150	45,00	39,00	17,00	2,04	2,50	1,21	12,45	76,75
	1,20		45,40	39,40	17,20	2,45	3,02	1,70	12,45	76,75
	1,50		46,00	40,00	17,80	3,06	3,80	2,42	12,45	76,75
	2,00		47,00	41,00	18,50	4,08	5,10	3,71	12,45	76,75
C200	1,50	200	70,00	62,00	24,80	4,36	5,44	2,77	20,70	102,10
	2,00		71,00	63,00	25,50	5,81	7,30	4,62	20,70	102,10
	2,50		72,00	64,00	26,20	7,26	9,16	6,48	20,70	102,10
	3,00		73,00	65,00	27,00	8,71	11,01	8,46	20,70	102,10
C250	1,50	250	70,00	62,00	24,80	4,92	6,16	2,75	18,20	127,40
	2,00		71,00	63,00	25,50	6,56	8,26	4,58	18,20	127,40
	2,50		72,00	64,00	26,20	8,20	10,36	6,46	18,20	127,40
	3,00		73,00	65,00	27,00	9,84	12,46	8,48	18,20	127,40
C300	1,50	300	89,00	81,00	24,20	5,95	7,43	2,60	22,40	152,30
	2,00		90,00	82,00	25,00	7,93	9,97	4,52	22,40	152,30
	2,50		91,00	83,00	25,80	9,91	12,50	6,76	22,40	152,30
	3,00		92,00	84,00	26,50	11,89	15,03	9,04	22,40	152,30
C350	2,00	350	90,00	82,00	30,00	8,87	11,19	4,82	22,25	177,45
	2,50		91,00	83,00	31,20	11,08	14,04	7,17	22,25	177,45
	3,00		92,00	84,00	31,40	13,31	16,88	9,57	22,25	177,45

Purlin C – Cross-section characteristics

Type of purlin	Thickness	Moment of inertia, gross	Section modulus gross	Moment of inertia, effective Top flange com-pressed	Section modulus effective Top flange com-pressed	Moment of inertia, effective Bottom flange com-pressed	Section modulus effective Bottom flange com-pressed	Radius of gyration	Max. Bending moment, span Top flange com-pressed	Max. Bending moment, span Bottom flange com-pressed
	t_{nom}	I_y	W_y	I_{yeff}	W_{yeff}	I_{yeff}	W_{yeff}	i_y	$M_{b,Rd}$	$M_{b,Rd}$
	mm	cm^4	cm^3	cm^4	cm^3	cm^4	cm^3	cm	kNm	kNm
C100	1,00	31,179	6,097	28,681	5,608	29,531	5,566	3,936	1,963	1,948
	1,20	37,635	7,345	36,934	7,294	37,633	7,344	3,935	2,553	2,570
	1,50	47,296	9,203	47,296	9,203	47,296	9,203	3,934	3,221	3,221
	2,00	63,334	12,263	63,334	12,263	63,334	12,263	3,933	4,292	4,292
C120	1,00	48,090	7,849	42,977	6,811	44,091	6,755	4,659	2,384	2,364
	1,20	58,052	9,459	56,721	9,376	57,702	9,349	4,658	3,282	3,272
	1,50	72,961	11,859	72,961	11,859	72,961	11,859	4,656	4,151	4,151
	2,00	97,715	15,818	97,715	15,818	97,715	15,818	4,654	5,536	5,536
C150	1,00	81,702	10,689	69,841	8,540	71,541	8,499	5,712	2,989	2,975
	1,20	98,635	12,887	92,384	11,996	93,703	11,723	5,711	4,198	4,103
	1,50	123,979	16,166	123,915	16,163	123,316	15,998	5,710	5,657	5,600
	2,00	166,071	21,584	166,071	21,584	166,071	21,584	5,707	7,554	7,554
C200	1,50	328,432	32,245	282,213	25,978	289,081	25,943	7,767	9,092	9,081
	2,00	440,256	43,118	430,991	42,777	434,289	42,104	7,765	14,972	14,736
	2,50	551,755	53,904	551,755	53,904	551,755	53,904	7,763	18,867	18,867
	3,00	662,934	64,607	662,934	64,607	662,934	64,607	7,761	22,613	22,613
C250	1,50	555.167	43.686	456.312	32.529	467.097	32.597	9,494	11,385	11,409
	2,00	744.265	58.450	698.615	54.176	702.218	52.611	9,491	18,962	18,414
	2,50	932.849	73.116	927.169	72.939	926.734	72.244	9,488	25,529	15,286
	3,00	1120.925	87.684	1120.925	87.684	1120.925	87.684	9,486	30,689	30,689
C300	1,50	981,253	64,525	695,224	38,170	713,208	38,652	11,492	13,360	13,528
	2,00	1315,814	86,383	1090,689	64,990	1111,827	65,080	11,490	22,746	22,778
	2,50	1649,630	108,119	1509,905	95,805	1526,763	94,574	11,487	33,532	33,101
	3,00	1982,708	129,735	1922,029	127,271	1921,362	123,186	11,485	44,545	43,115
C350	2,00	1949,034	110,013	1599,629	80,953	1625,144	80,886	13,197	28,334	28,310
	2,50	2443,714	137,739	2211,815	118,779	2230,254	117,137	13,195	41,573	40,998
	3,00	2937,385	165,330	2811,026	157,100	2805,580	152,270	13,192	54,985	53,295



Lightweight purlin Hat

Steel grade: S350GD+Z

Yield strength: f_y = 350 MPa

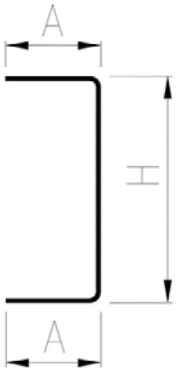
Tensile strength: f_u = 420 Mpa

Purlin H – Cross-section geometries

Type of purlin	Thickness	Height	Width of wide flange	Width of narrow flange	Fold	Weight	Cross section area, gross	Cross section area, effective	Center of gravity	Center of gravity
	t_{nom}	H	A	B	C	g	A_{gross}	A_{eff}	Y_p	Z_p
	mm	mm	mm	mm	mm	kg/m	cm²	cm²	mm	mm
H100	1,00	100	100,00	48,00	18,30	3,28	4,04	2,06	96,46	47,25
	1,20		100,00	48,00	19,30	3,95	4,88	2,94	96,47	47,25
	1,50		100,00	48,00	20,60	5,00	6,14	4,38	96,47	47,25
	2,00		100,00	48,00	23,00	6,67	8,23	6,82	96,46	47,25
H125	1,00	125	100,00	40,00	17,30	3,60	4,35	2,07	88,45	61,45
	1,20		100,00	40,00	18,20	4,32	5,25	2,93	88,45	61,45
	1,50		100,00	40,00	19,60	5,40	6,61	4,23	88,46	61,45
	2,00		100,00	40,00	22,00	7,20	8,86	6,62	88,46	61,45
H150	1,00	150	100,00	43,00	16,80	4,00	4,88	2,07	91,55	72,95
	1,20		100,00	43,00	17,70	4,80	5,89	2,94	91,55	72,95
	1,50		100,00	43,00	19,10	6,00	7,41	4,29	91,54	72,95
	2,00		100,00	43,00	21,50	8,00	9,94	6,82	91,54	72,95
H200	1,50	200	120,00	45,00	17,10	7,80	9,19	4,37	103,00	100,20
	2,00		120,00	45,00	19,50	10,50	12,32	7,05	103,00	100,20
	2,50		120,00	45,00	23,00	12,75	15,46	10,11	103,00	100,20
H250	1,50	250	120,00	50,00	19,60	9,00	10,87	4,55	108,00	122,70
	2,00		120,00	50,00	22,00	12,00	14,58	7,35	108,00	122,70
	2,50		120,00	50,00	25,50	15,08	18,28	10,63	108,00	122,70

Purlin H – Cross-section characteristics

Type of purlin	Thickness	Moment of inertia, gross	Section modulus gross	Moment of inertia, effective Top flange com-pressed	Section modulus effective Top flange com-pressed	Moment of inertia, effective Bottom flange com-pressed	Section modulus effective Bottom flange com-pressed	Radius of gyration	Max. Bending moment, span Top flange com-pressed	Max. Bending moment, span Bottom flange com-pressed
	t_{nom}	I_y	W_y	I_{yeff}	W_{yeff}	I_{yeff}	W_{yeff}	i_y	$M_{b,Rd}$	$M_{b,Rd}$
	mm	cm^4	cm^3	cm^4	cm^3	cm^4	cm^3	cm	kNm	kNm
H100	1,00	63,878	12,165	44,288	7,056	59,365	11,896	3,975	2,469	4,164
	1,20	77,130	14,662	59,244	9,911	74,808	14,525	3,975	3,469	5,084
	1,50	96,973	18,385	80,050	13,791	96,973	18,385	3,974	4,827	6,435
	2,00	129,954	24,530	116,495	20,757	129,954	24,530	3,973	7,265	8,585
H120	1,00	101,669	16,055	69,565	9,014	94,522	14,569	4,835	3,155	5,099
	1,20	122,760	19,358	92,936	12,649	122,104	19,356	4,834	4,427	6,775
	1,50	154,339	24,285	129,830	18,692	154,339	24,285	4,833	6,542	8,500
	2,00	206,821	32,427	187,274	27,829	206,821	32,427	4,832	9,740	11,345
H150	1,00	159,406	20,752	105,524	11,111	140,833	17,599	5,717	3,889	6,159
	1,20	192,486	25,029	141,322	15,587	185,618	24,660	5,716	5,455	8,631
	1,50	242,024	31,415	199,881	23,434	242,024	31,415	5,715	8,202	10,995
	2,00	324,370	41,980	295,700	36,484	324,370	41,980	5,713	12,769	14,693
H200	1,50	513.342	51.389	383.696	32.748	483.870	46.041	7,475	11,462	16,114
	2,00	688.164	68.700	594.947	55.048	687.490	68.569	7,472	19,267	24,000
	2,50	862.498	85.866	797.522	76.487	862.498	85.866	7,470	26,771	30,053
H250	1,50	912,797	71,851	646,601	42,241	830,181	62,569	9,165	14,784	21,899
	2,00	1223,877	96,168	1008,999	70,966	1182,411	93,313	9,162	24,838	32,659
	2,50	1534,196	120,341	1406,512	105,207	1534,196	120,341	9,160	36,823	42,120



Lightweight purlin U

Steel grade: S350GD+Z

Yield strength: f_y = 350 MPa

Tensile strength: f_u = 420 Mpa

Purlin U – Cross-section geometries

Type of purlin	Thickness	Height	Width of wide flange	Width of narrow flange	Fold	Weight	Cross section area, gross	Cross section area, effective	Center of gravity	Center of gravity
	t_{nom}	H	A	B	C	g	A_{gross}	A_{eff}	Y_p	Z_p
	mm	mm	mm	mm	mm	kg/m	cm²	cm²	mm	mm
U100	1,00	100	52,50	52,50	–	1,60	190,00	66,00	13,80	50,00
	1,20		52,80	52,80	–	1,92	230,00	95,00	13,90	50,00
	1,50		53,40	53,40	–	2,40	289,00	146,00	14,05	50,00
	2,00		51,80	51,80	–	3,12	388,00	248,00	14,30	50,00
	2,50		59,20	59,20	–	4,16	518,00	372,00	17,25	50,00
	3,00		51,00	51,00	–	4,56	585,00	505,00	14,80	50,00
U104	1,00	104	50,50	50,50	–	1,60	190,00	67,00	12,80	52,00
	1,20		50,80	50,80	–	1,92	230,00	95,00	12,90	52,00
	1,50		51,40	51,40	–	2,40	289,00	146,00	13,05	52,00
	2,00		49,80	49,80	–	3,12	388,00	249,00	13,30	52,00
	2,50		57,20	57,20	–	4,16	518,00	375,00	16,15	52,00
	3,00		49,00	49,00	–	4,56	585,00	508,00	13,80	52,00
U150	1,00	150	51,50	51,50	–	2,00	239,00	68,00	11,10	75,00
	1,20		51,80	51,80	–	2,40	289,00	98,00	11,20	75,00
	1,50		52,40	52,40	–	3,00	363,00	151,00	11,45	75,00
	2,00		53,20	53,20	–	4,00	487,00	261,00	11,70	75,00
	2,50		44,20	44,20	–	4,60	567,00	390,00	9,25	75,00
	3,00		48,50	48,50	–	5,64	704,00	544,00	10,80	75,00
U154	1,00	154	49,50	49,50	–	2,00	239,00	68,00	10,30	77,00
	1,20		49,80	49,80	–	2,40	289,00	98,00	10,40	77,00
	1,50		50,40	50,40	–	3,00	363,00	151,00	10,55	77,00
	2,00		51,20	51,20	–	4,00	487,00	261,00	10,80	77,00
	2,50		42,20	42,20	–	4,60	567,00	389,00	8,55	77,00
	3,00		46,50	46,50	–	5,64	704,00	544,00	10,00	77,00

U200	1,00	200	49,50	49,50	–	2,35	282,00	69,00	8,70	100,00
	1,20		49,80	49,80	–	2,82	340,00	99,00	8,80	100,00
	1,50		50,40	50,40	–	3,52	428,00	153,00	8,95	100,00
	2,00		51,20	51,20	–	4,70	575,00	267,00	9,20	100,00
	3,00		49,00	49,00	–	6,86	867,00	569,00	9,70	100,00
U204	1,00	204	47,50	47,50	–	2,35	282,00	69,00	8,00	102,00
	1,20		47,80	47,80	–	2,82	340,00	99,00	8,10	102,00
	1,50		48,40	48,40	–	3,52	428,00	153,00	8,25	102,00
	2,00		49,20	49,20	–	4,70	575,00	267,00	8,50	102,00
	3,00		47,00	47,00	–	6,86	867,00	568,00	9,00	102,00
U250	1,00	250	51,50	51,50	–	2,80	335,00	69,00	8,10	125,00
	1,20		51,80	51,80	–	3,36	405,00	100,00	8,20	125,00
	1,50		52,40	52,40	–	4,20	509,00	155,00	8,35	125,00
	2,00		53,20	53,20	–	5,60	683,00	271,00	8,60	125,00
	2,50		64,20	64,20	–	7,40	911,00	420,00	11,95	125,00
	3,00		55,00	55,00	–	8,35	1039,00	586,00	9,70	125,00
U254	1,00	254	49,50	49,50	–	2,80	335,00	69,00	7,50	127,00
	1,20		49,80	49,80	–	3,36	405,00	100,00	7,60	127,00
	1,50		50,40	50,40	–	4,20	509,00	155,00	7,75	127,00
	2,00		51,20	51,20	–	5,60	683,00	271,00	8,00	127,00
	2,50		62,20	62,20	–	7,40	911,00	420,00	11,25	127,00
	3,00		53,00	53,00	–	8,35	1039,00	585,00	9,10	127,00
U300	1,00	300	61,50	61,50	–	3,36	401,00	70,00	9,40	150,00
	1,20		50,40	50,40	–	3,79	459,00	100,00	6,90	150,00
	1,50		50,80	50,80	–	4,74	578,00	156,00	7,05	150,00
	2,00		63,30	63,30	–	6,56	818,00	276,00	9,90	150,00
	2,50		64,20	64,20	–	8,40	1026,00	424,00	10,15	150,00
	3,00		51,00	51,00	–	9,36	1170,00	591,00	7,80	150,00
U304	1,00	304	59,50	63,50	–	3,36	401,00	70,00	8,80	152,00
	1,20		48,40	52,40	–	3,79	459,00	100,00	6,40	152,00
	1,50		48,80	52,80	–	4,74	578,00	156,00	6,55	152,00
	2,00		61,30	65,30	–	6,56	818,00	276,00	9,30	152,00
	2,50		62,20	66,20	–	8,40	1026,00	424,00	9,55	152,00
	3,00		49,00	53,00	–	9,36	1170,00	590,00	7,30	152,00

Purlin U – Cross-section characteristics

Type of purlin	Thickness	Moment of inertia, gross	Section modulus gross	Moment of inertia, effective Top flange com-pressed	Section modulus effective Top flange com-pressed	Moment of inertia, effective Bottom flange com-pressed	Section modulus effective Bottom flange com-pressed	Radius of gyration	Max. Bending moment, span Top flange com-pressed	Max. Bending moment, span Bottom flange com-pressed
	t_{nom}	I_y	W_y	I_{yeff}	W_{yeff}	I_{yeff}	W_{yeff}	i_y	$M_{b,Rd}$	$M_{b,Rd}$
	mm	cm^4	cm^3	cm^4	cm^3	cm^4	cm^3	cm	kNm	kNm
U100	1,00	30,628	6,190	18,976	3,010	18,976	3,010	4,011	1,054	1,054
	1,20	36,990	7,461	25,408	4,233	25,408	4,233	4,011	1,482	1,482
	1,50	46,521	9,355	34,223	5,859	34,223	5,859	4,011	2,051	2,051
	2,00	62,376	12,480	49,770	8,792	49,770	8,792	4,010	3,077	3,077
	2,50	85,043	17,015	69,334	12,337	69,334	12,337	4,053	4,318	4,318
	3,00	93,977	18,617	84,493	15,708	84,493	15,708	4,009	5,498	5,498
U104	1,00	32,514	6,316	20,454	3,140	20,454	3,140	4,133	1,100	1,100
	1,20	39,267	7,613	27,368	4,413	27,368	4,413	4,133	1,545	1,545
	1,50	49,384	9,547	37,062	6,168	37,062	6,168	4,132	2,159	2,159
	2,00	66,213	12,738	53,766	9,227	53,766	9,227	4,131	3,230	3,230
	2,50	90,474	17,406	74,909	12,937	74,909	12,937	4,180	4,528	4,528
	3,00	99,751	19,007	90,938	16,405	90,938	16,405	4,130	5,742	5,742
U150	1,00	79,400	10,625	46,725	4,801	46,725	4,801	5,762	1,680	1,680
	1,20	95,897	12,815	62,769	6,745	62,769	6,745	5,762	2,361	2,361
	1,50	120,616	16,086	89,248	10,181	89,248	10,181	5,761	3,563	3,563
	2,00	161,742	21,500	133,398	16,060	133,398	16,060	5,760	5,621	5,621
	2,50	176,795	23,579	162,065	20,645	162,065	20,645	5,584	7,226	7,226
	3,00	223,716	29,837	208,938	26,844	208,938	26,844	5,636	9,395	9,395
U154	1,00	82,247	10,719	49,014	4,933	49,014	4,933	5,865	1,727	1,727
	1,20	99,335	12,929	65,816	6,927	65,816	6,927	5,864	2,424	2,424
	1,50	124,939	16,230	93,526	10,448	93,526	10,448	5,864	3,657	3,657
	2,00	167,534	21,693	140,214	16,578	140,214	16,578	5,862	5,802	5,802
	2,50	182,750	23,740	169,793	21,225	169,793	21,225	5,677	7,429	7,429
	3,00	231,556	30,080	218,885	27,580	218,885	27,580	5,734	9,653	9,653
U200	1,00	151,994	15,279	86,415	6,610	86,415	6,610	7,344	2,314	2,314
	1,20	183,581	18,435	116,407	9,277	116,407	9,277	7,343	3,247	3,247
	1,50	230,912	23,154	166,029	13,982	166,029	13,982	7,342	4,894	4,894
	2,00	309,666	30,973	258,684	23,568	258,684	23,568	7,340	8,249	8,249
	3,00	466,691	46,446	435,016	41,760	435,016	41,760	7,337	14,616	14,616
U204	1,00	155,586	15,332	89,446	6,741	89,446	6,741	7,430	2,359	2,359
	1,20	187,918	18,500	120,442	9,455	120,442	9,455	7,429	3,309	3,309
	1,50	236,365	23,235	171,702	14,241	171,702	14,241	7,428	4,984	4,984
	2,00	316,973	31,082	267,333	23,982	267,333	23,982	7,426	8,394	8,394
	3,00	477,686	46,613	450,038	42,602	450,038	42,602	7,423	14,911	14,911

U250	1,00	271,765	21,788	143,520	8,572	143,520	8,572	9,006	3,000	3,000
	1,20	328,260	26,297	194,024	12,026	194,024	12,026	9,005	4,209	4,209
	1,50	412,923	33,039	278,105	18,129	278,105	18,129	9,004	6,345	6,345
	2,00	553,821	44,224	435,885	30,561	435,885	30,561	9,002	10,696	10,696
	2,50	774,088	61,937	641,079	46,513	641,079	46,513	9,216	16,280	16,280
	3,00	840,827	67,277	773,288	59,372	773,288	59,372	8,997	20,780	20,780
U254	1,00	276,505	21,818	147,451	8,704	147,451	8,704	9,084	3,047	3,047
	1,20	333,983	26,333	199,262	12,207	199,262	12,207	9,083	4,272	4,272
	1,50	420,118	33,085	285,489	18,390	285,489	18,390	9,082	6,437	6,437
	2,00	563,463	44,287	447,204	30,976	447,204	30,976	9,080	10,842	10,842
	2,50	788,939	62,131	658,347	47,176	658,347	47,176	9,304	16,512	16,512
	3,00	855,848	67,400	794,711	60,356	794,711	60,356	9,077	21,125	21,125
U300	1,00	466,593	31,214	220,610	10,648	220,610	10,648	10,788	3,727	3,727
	1,20	509,012	33,973	288,882	14,761	288,882	14,761	10,527	5,166	5,166
	1,50	640,318	42,694	415,164	22,228	415,164	22,228	10,525	7,780	7,780
	2,00	951,141	63,418	682,468	38,143	682,468	38,143	10,784	13,350	13,350
	2,50	1192,855	79,402	962,754	57,030	962,754	57,030	10,782	19,961	19,961
	3,00	1294,830	85,904	1204,668	77,022	1204,668	77,022	10,518	26,958	26,958
U304	1,00	473,367	31,249	225,716	10,790	225,716	10,790	10,867	3,776	3,776
	1,20	515,669	33,964	295,152	14,939	295,152	14,939	10,595	5,229	5,229
	1,50	648,688	42,682	423,994	22,482	423,994	22,482	10,594	7,869	7,869
	2,00	964,929	63,491	697,426	38,591	697,426	38,591	10,862	13,507	13,507
	2,50	1210,136	79,494	983,475	57,668	983,475	57,668	10,860	20,184	20,184
	3,00	1311,708	85,884	1228,367	77,714	1228,367	77,714	10,587	27,200	27,200

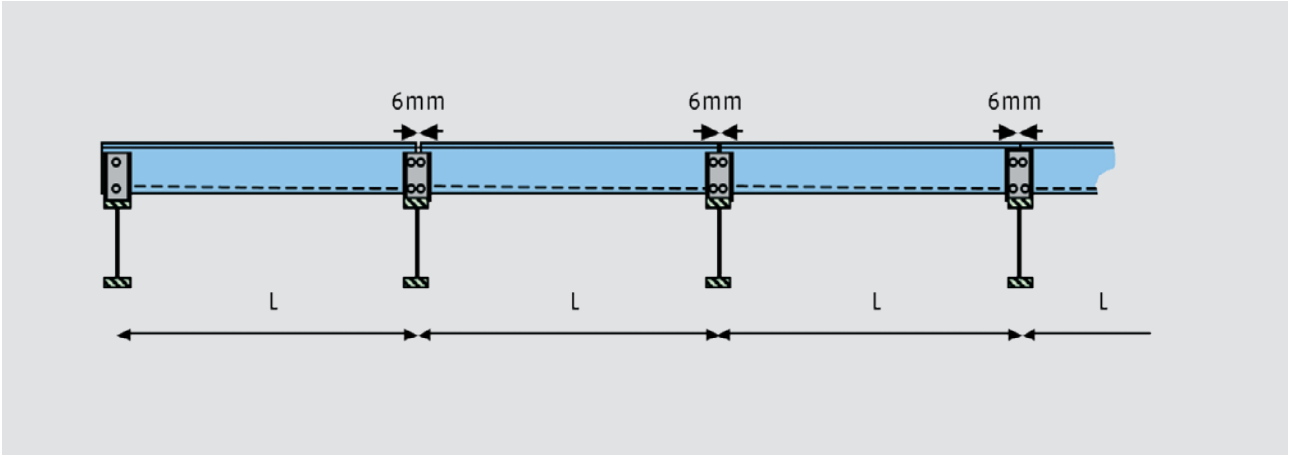
2 Structural systems

There are four alternative roof purlin systems for different applications, as well as various combinations of these systems. The properties of the systems and the selection criteria are discussed below.

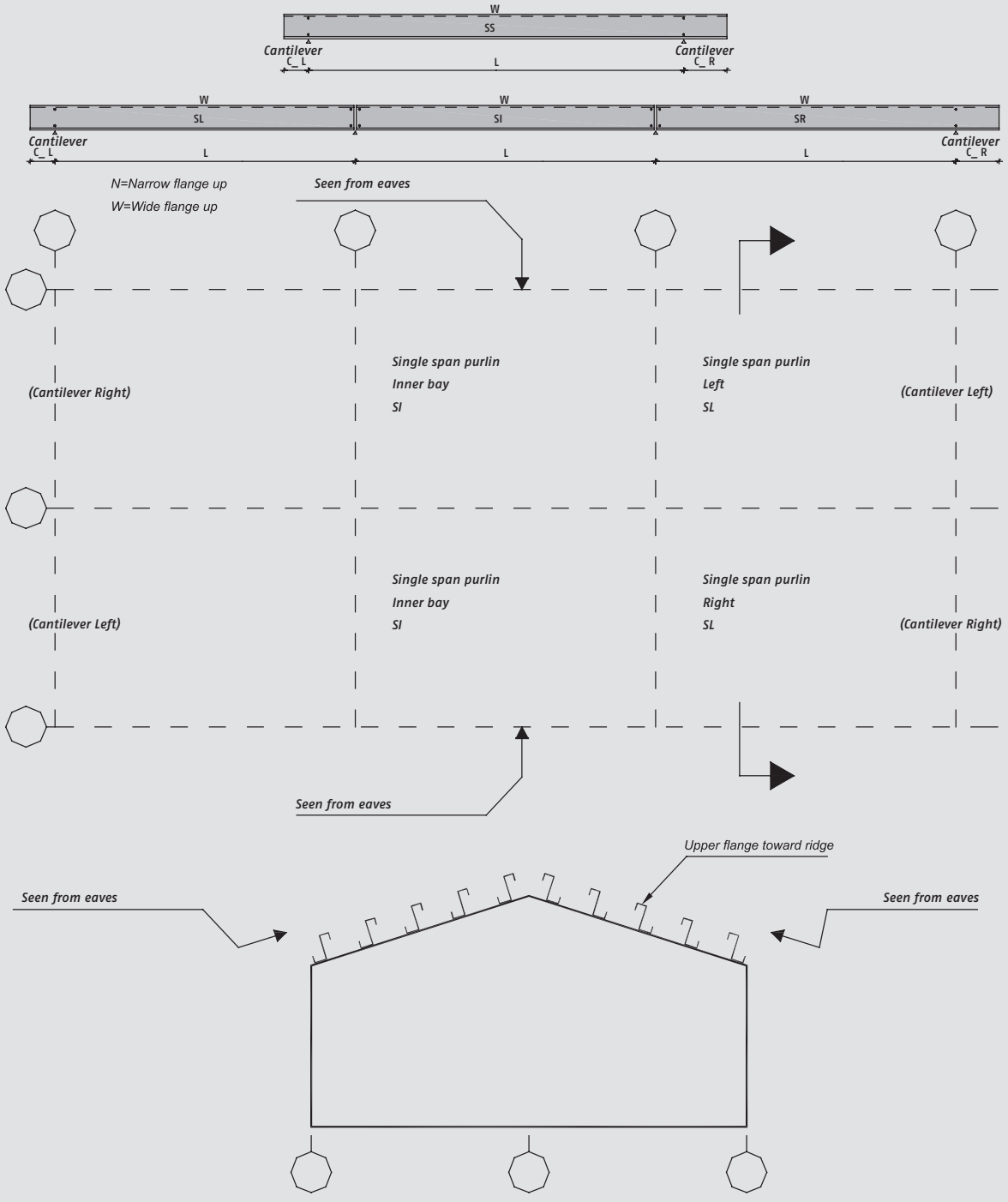
2.1 SINGLE SPAN SYSTEM

Used in walls and roofs, in moderate spans

- A simple system
- Same support reactions of primary rafters in centre bays
- Small number of joint components
- Whole roof consists of similar purlins
- Higher consumption of steel
- Higher deflections
- Can be implemented with Z, C, hat and purlins.

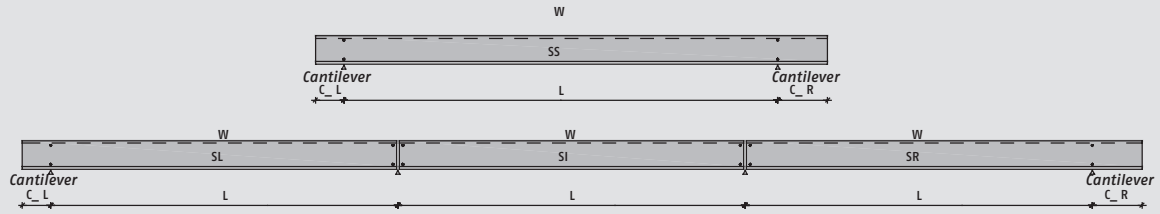


2.1.1 SINGLE SPAN SYSTEM, PURLIN DESIGNATION DIAGRAM



2.1.2 SINGLE SPAN SYSTEM, PURLINS

Note! On site the purlin is seen from the eaves



N=Narrow flange up

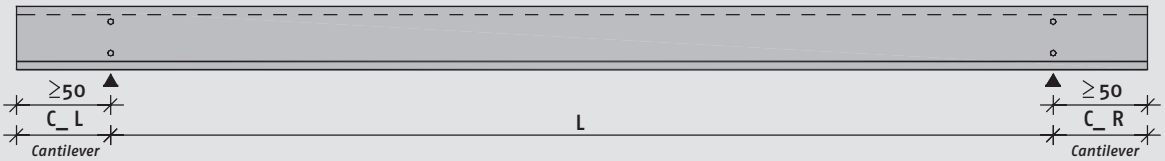
W=Wide flange up

Note! Wide flange side in vertical design of pre-punching
Reversed design to be used in reversed purlins

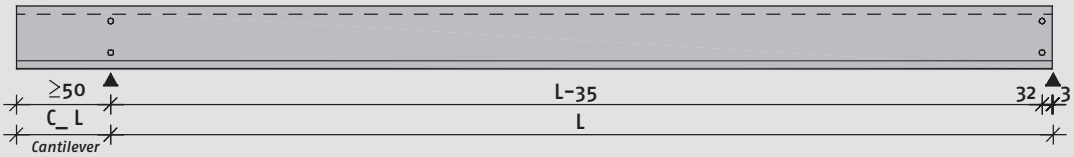
Note! In manufacturing drawings the purlin is seen with the *wide flange down and toward the reader*

L=span

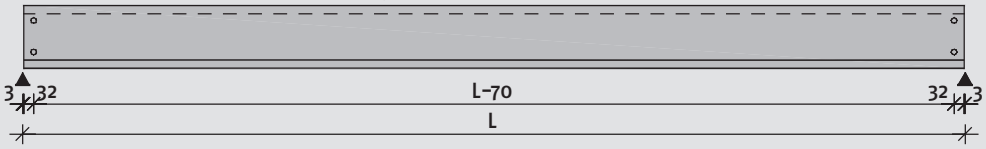
Pre-punched single span single purlin SS



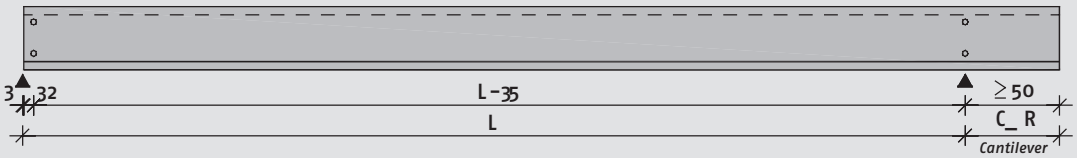
Pre-punched single span purlin, left end bay SL



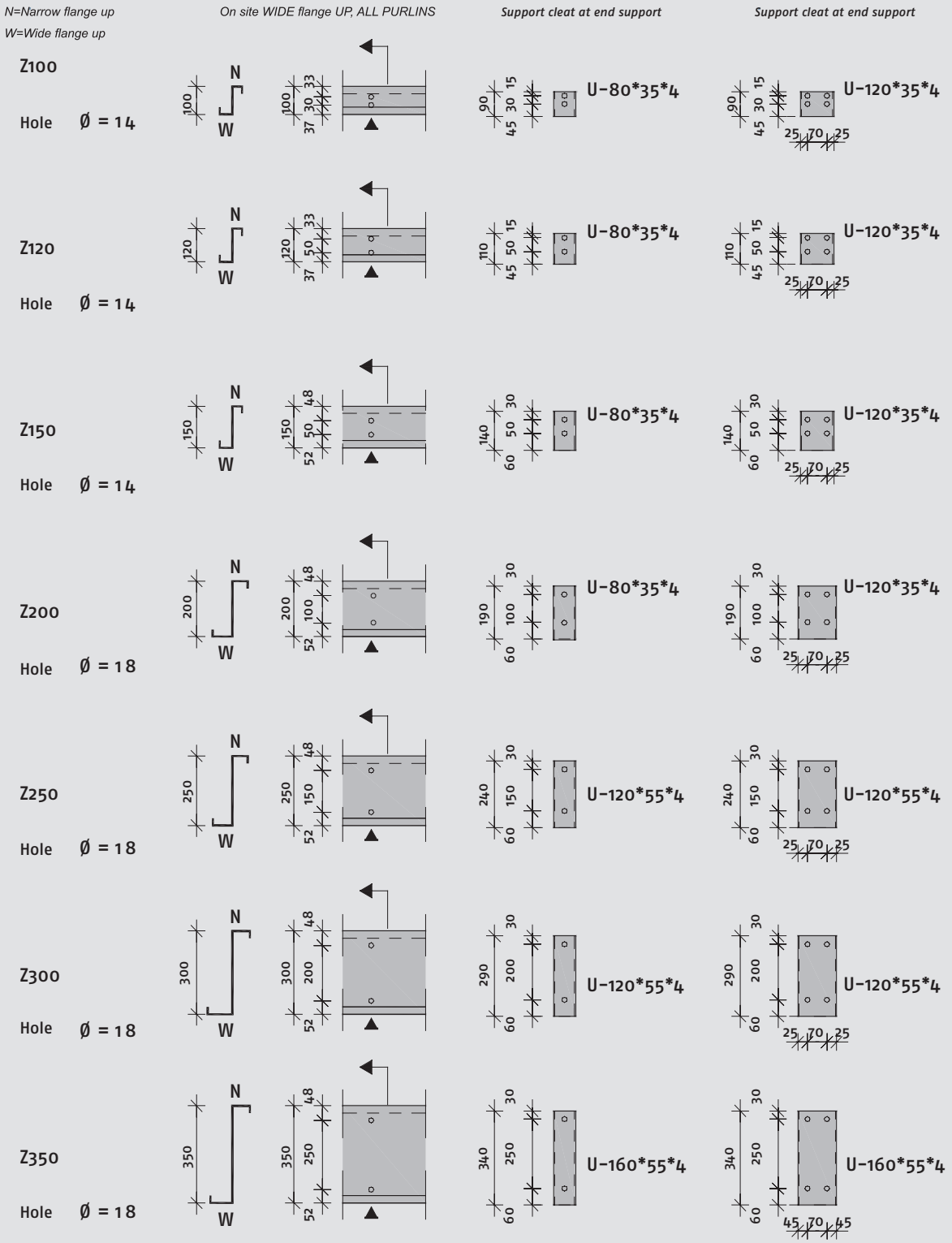
Pre-punched single span purlin, inner bay SI



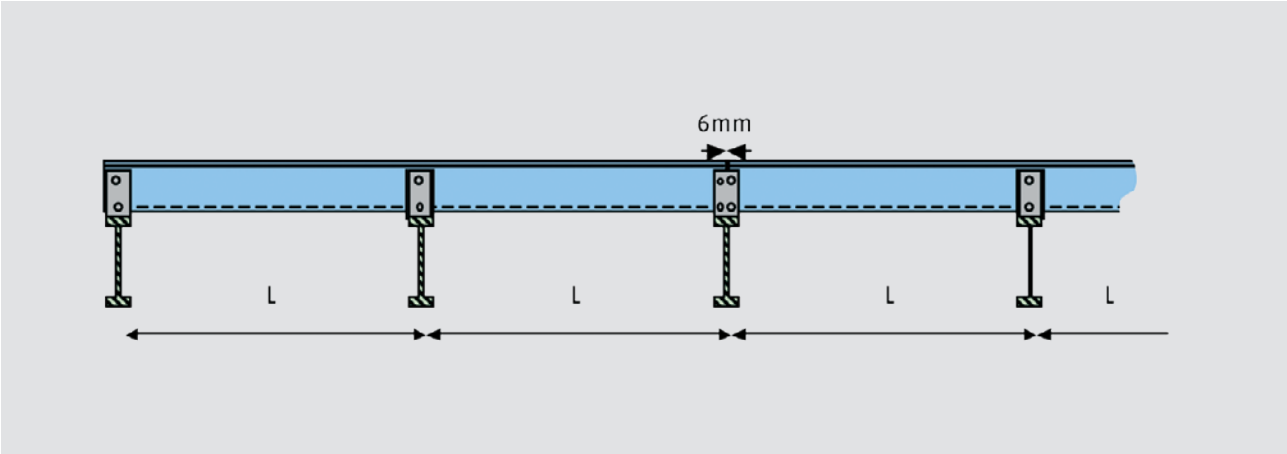
Pre-punched single span purlin, right end bay



2.1.3 SINGLE SPAN SYSTEM, SUPPORT CLEATS



2.2 DOUBLE SPAN SYSTEM



Used in walls in 4–6m spans, and in roofs in moderate spans.

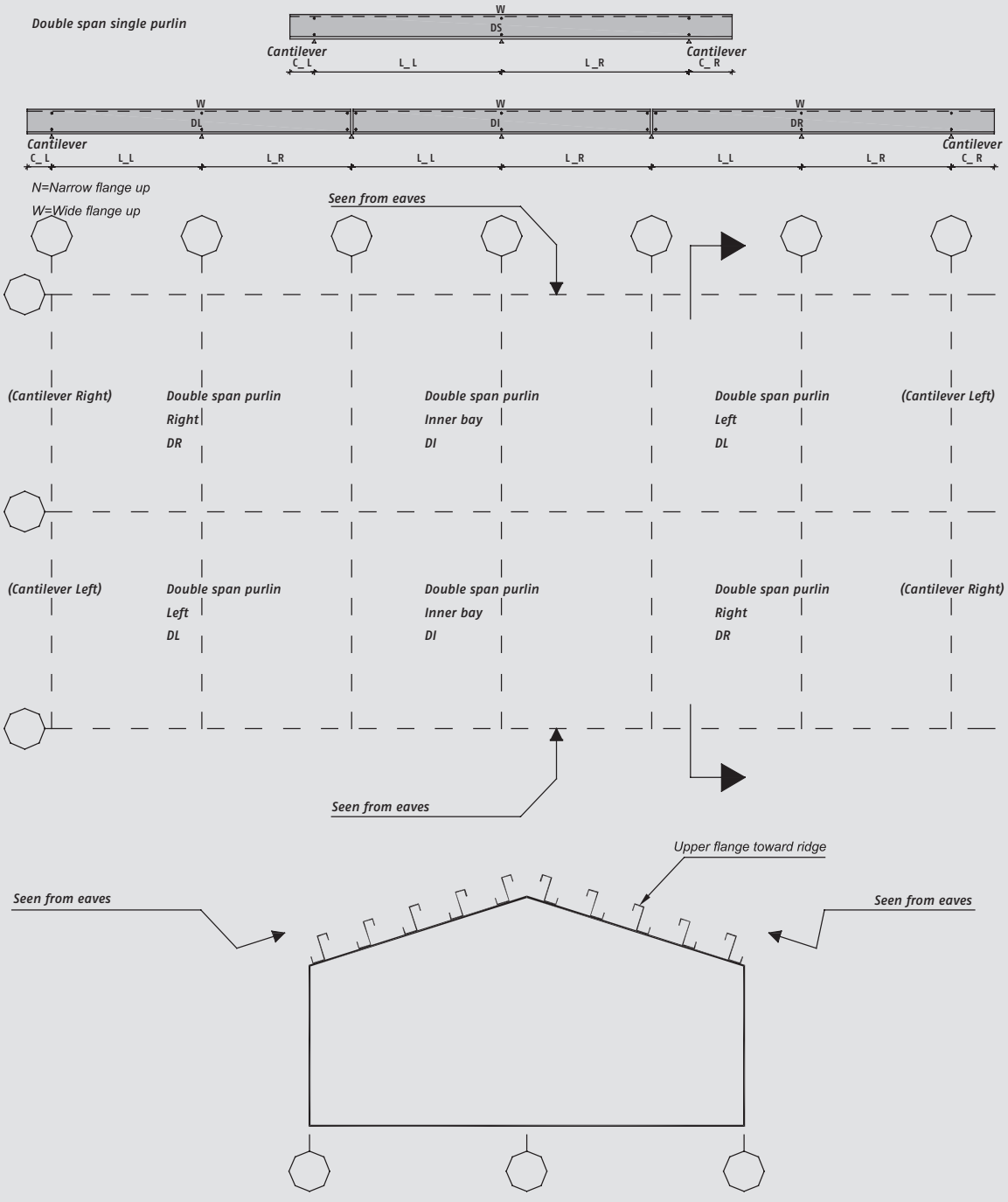
- Small deflections
- Small number of parts requiring installation
- Amount of installation work limited
- Different support reactions of principal rafters
- Long sections, more difficult to handle
- Can be implemented with Z, C, hat and purlins

It is possible to use the same support cleat at intermediate support of each 2–span purlin as at purlin joint.

A top hat purlin always has to be equipped with a brace section. The material thickness of this brace section is recommended to be the same as the material thickness of the purlin itself. The dimensions of the brace section are shown together with the cross–sectional dimensions of the top hat purlin, see section 1.6.

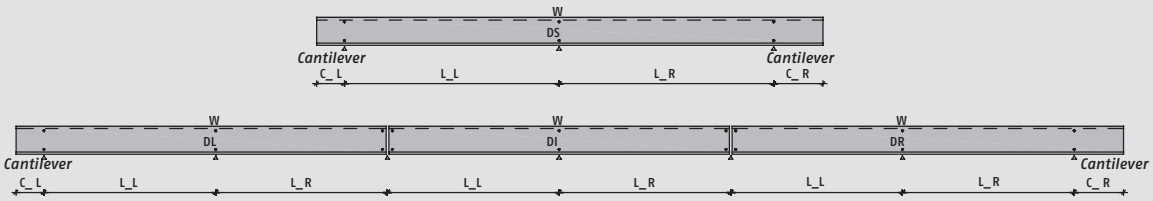
Length of brace section L>Max(3*s, 2*H), where s is the support width and H is the height of the section.

2.2.1 DOUBLE SPAN SYSTEM, PURLIN DESIGNATION DIAGRAM



2.2.2 DOUBLE SPAN SYSTEM, PURLINS

Note! On site, the purlin is seen from the eaves



N=Narrow flange up

W=Wide flange up

Note! Wide flange side in vertical design of pre-punching
Reversed design to be used in reversed purlins

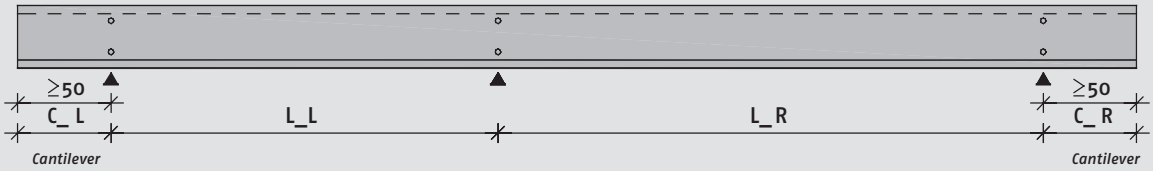
Note! In manufacturing drawings the purlin is seen with the *wide flange down and toward the reader*

L=span

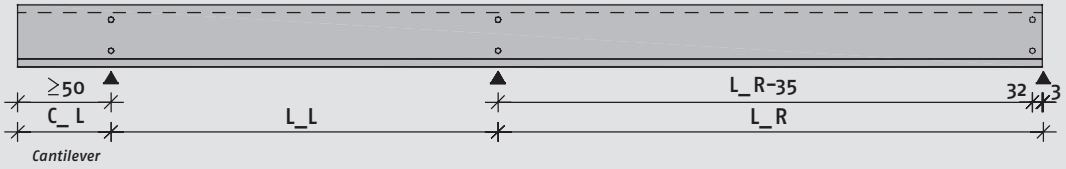
L_L=Left span length

L_R=Right span length

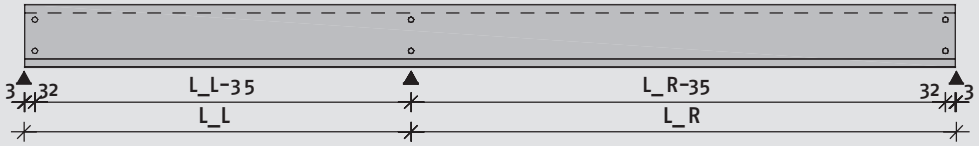
Pre-punched single span single purlin DS



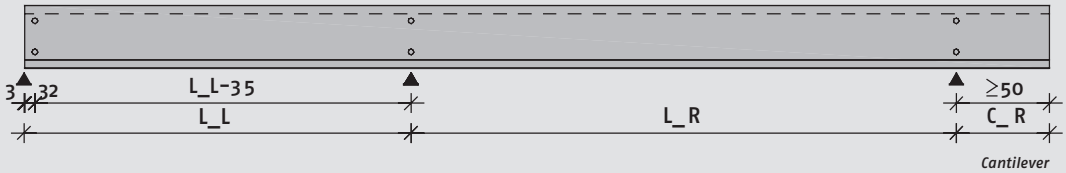
Pre-punched single span purlin, left end bay DL



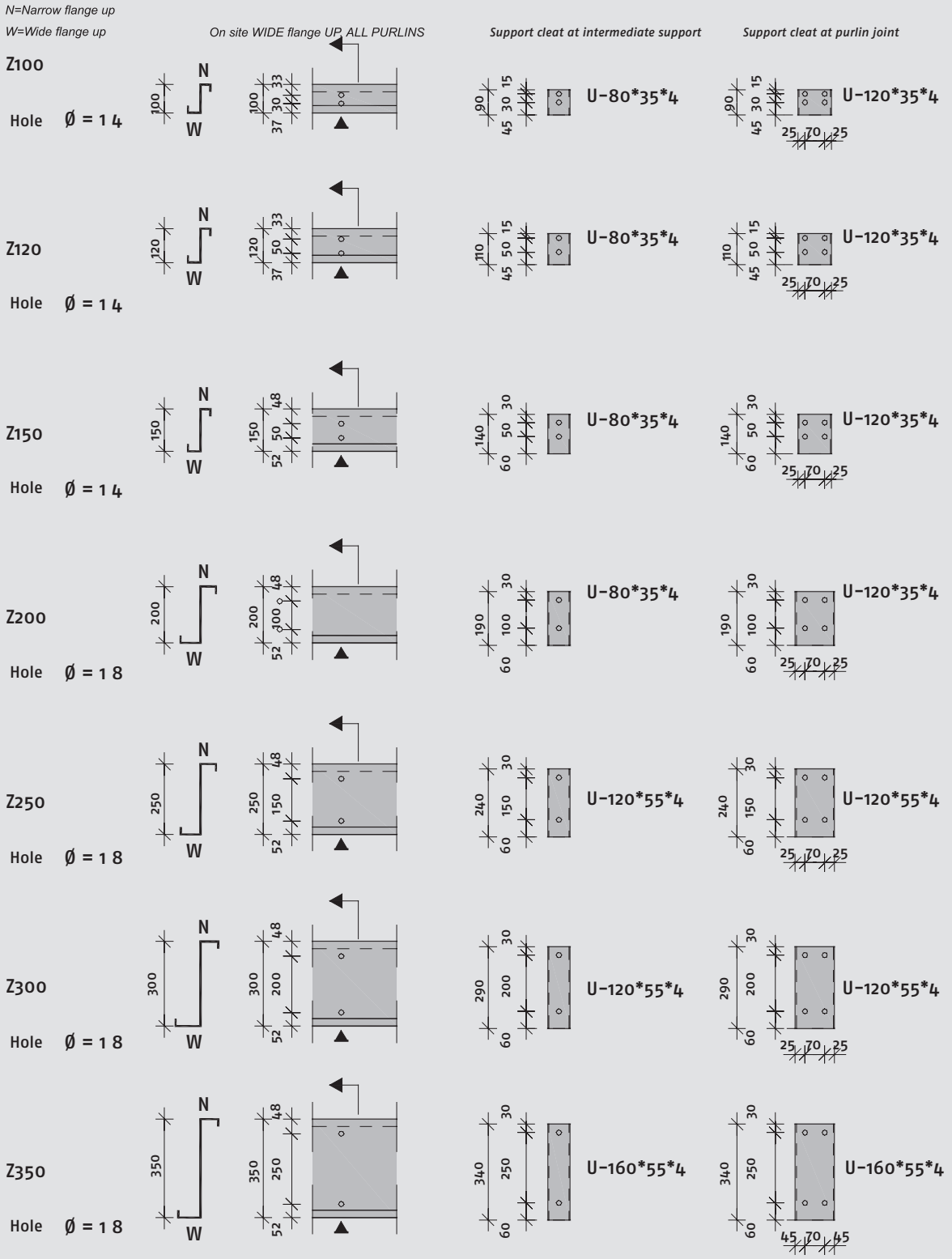
Pre-punched single span purlin, inner bay DI



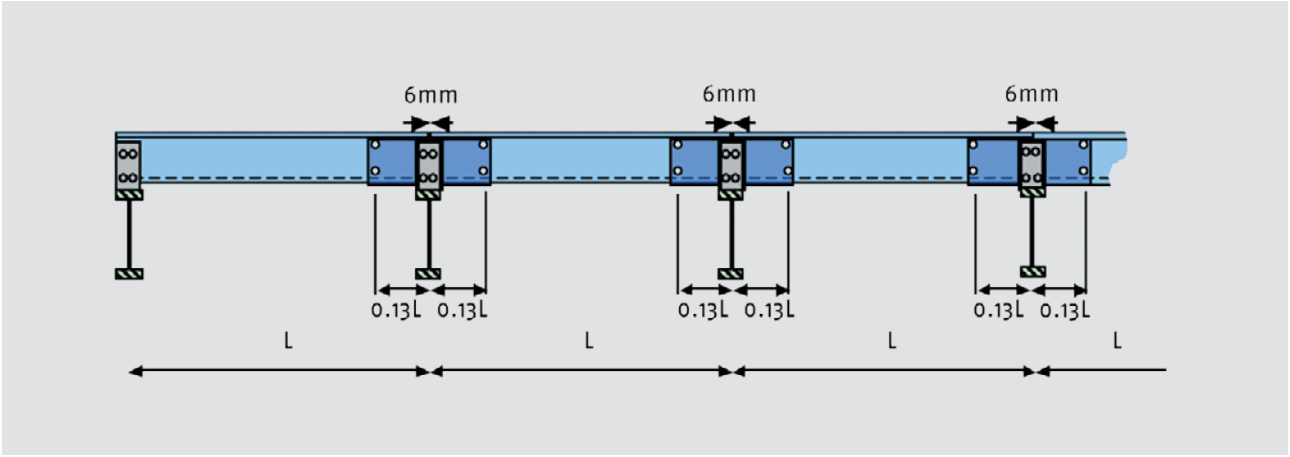
Pre-punched single span purlin, right end bay DR



2.2.3 DOUBLE SPAN SYSTEM, SUPPORT CLEATS



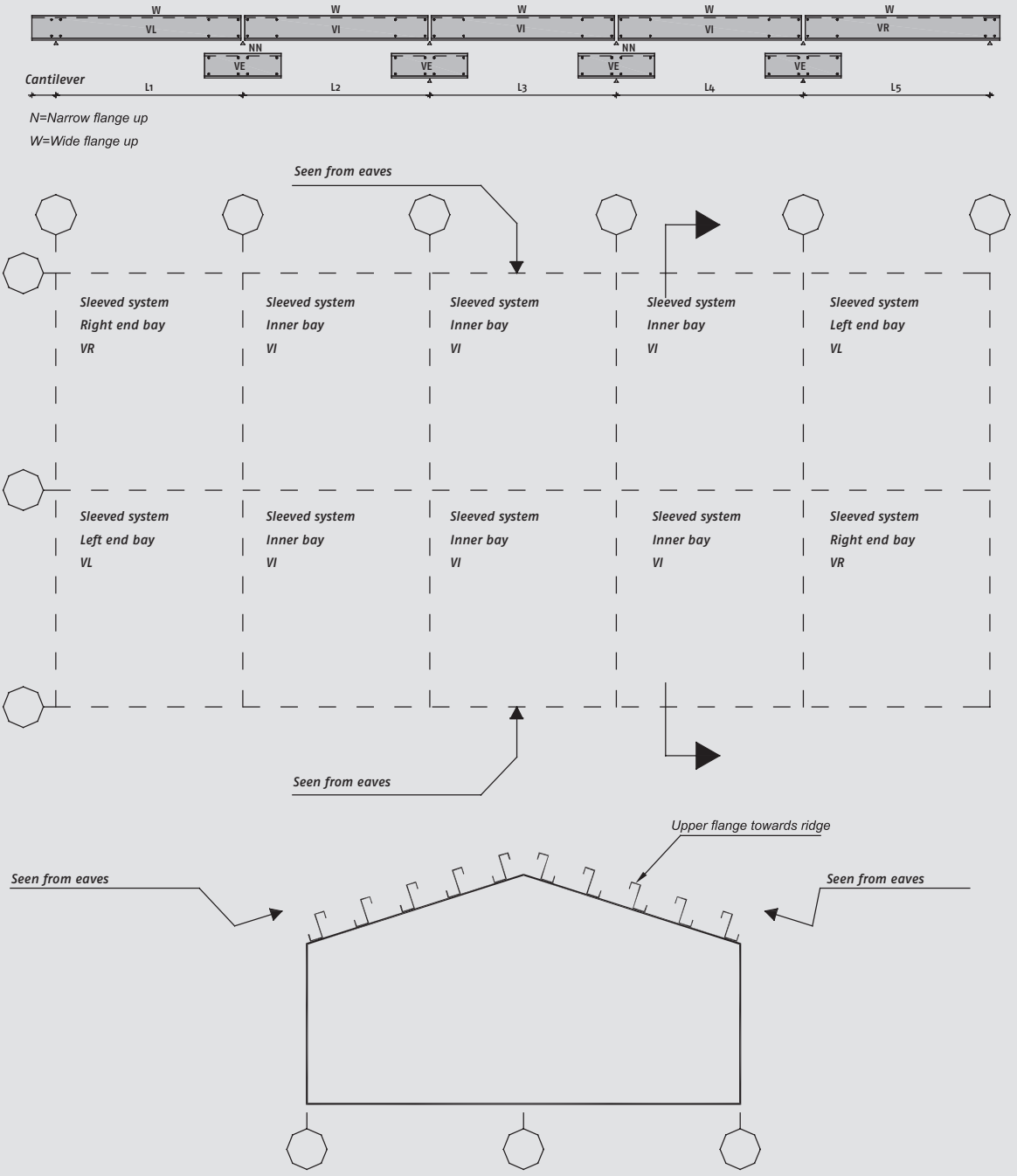
2.3 SLEEVED SYSTEM – ALTERNATIVE DESIGN WITH RUUKKI'S PURCALC SOFTWARE



Used in roof and wall structures.
System contains a special sleeve section, normally either similar gauge to basic purlin or max. 0.5 mm thicker.

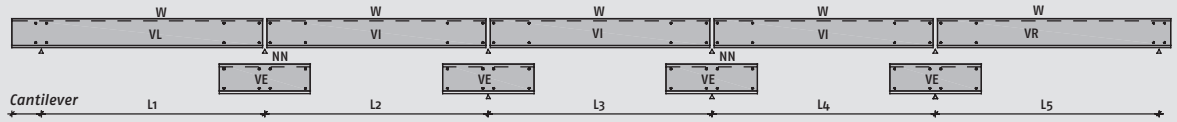
- Optimal weight
- Small deflections
- Sections easy to handle
- A larger number of components
- More installation work
- For Z sections the sleeve section is identical to the basic purlin section

2.3.1 SLEEVED SYSTEM, PURLIN DESIGNATION DIAGRAM



2.3.2 SLEEVED SYSTEM, PURLINS

Note! On site, the purlin is seen from the eaves



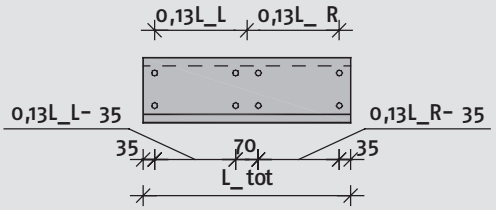
N=Narrow flange up
W=Wide flange up

Note! Wide flange side in vertical design of pre-punching
Reversed design to be used in reversed purlins

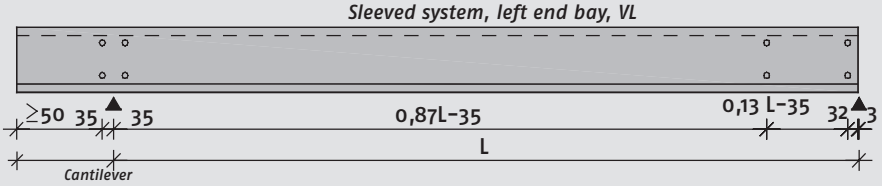
Note! In manufacturing drawings the purlin is seen with the
wide flange down and toward the reader

L=span
L_L=Left span length
L_R=Right span length
L_tot= 0.13(L_L+L_R)+70

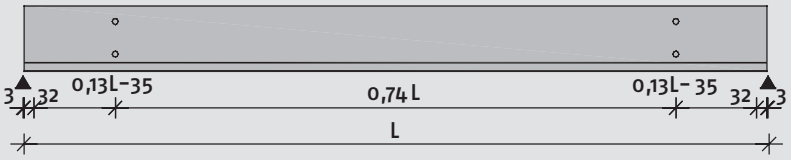
Sleeve section, VE



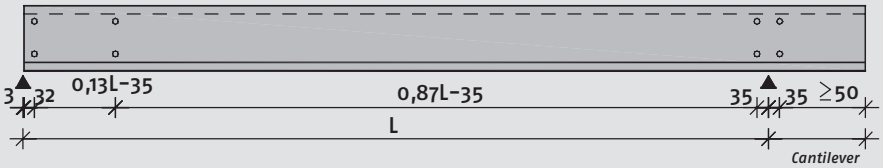
Sleeved system, left end bay, VL



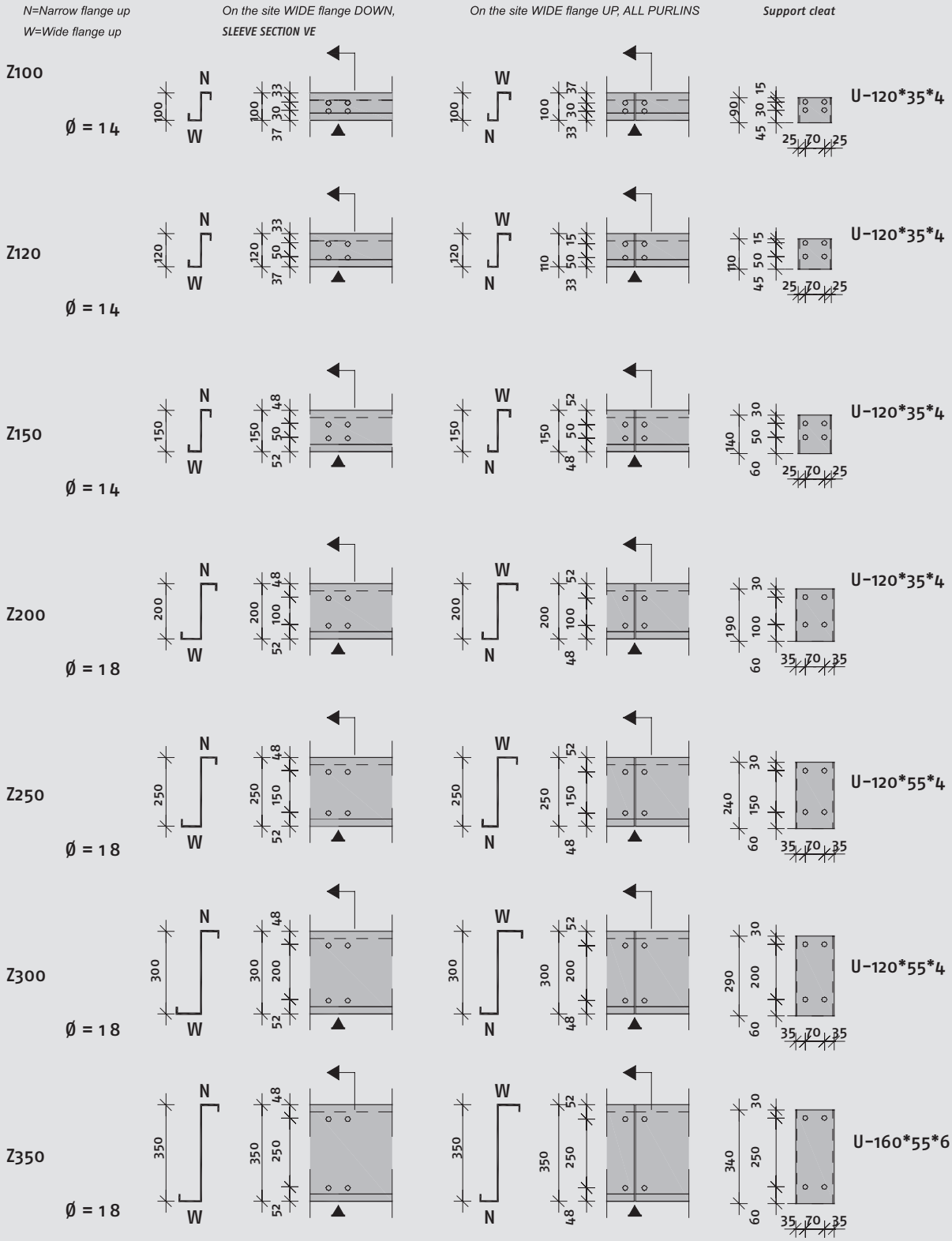
Sleeved system, Inner bay, VI



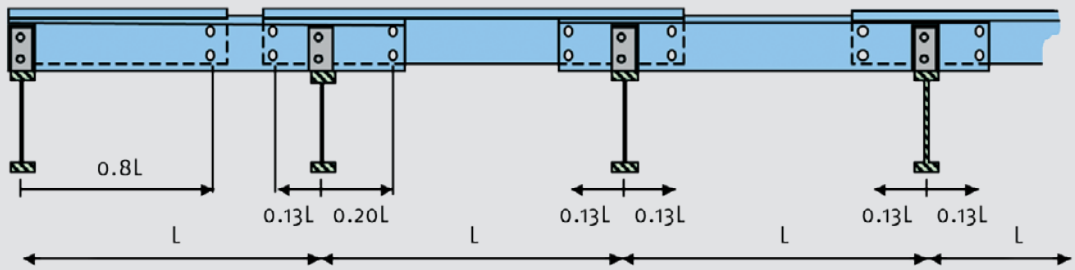
Sleeved system, right end bay, VR



2.3.3 SLEEVED SYSTEM, SUPPORT CLEATS



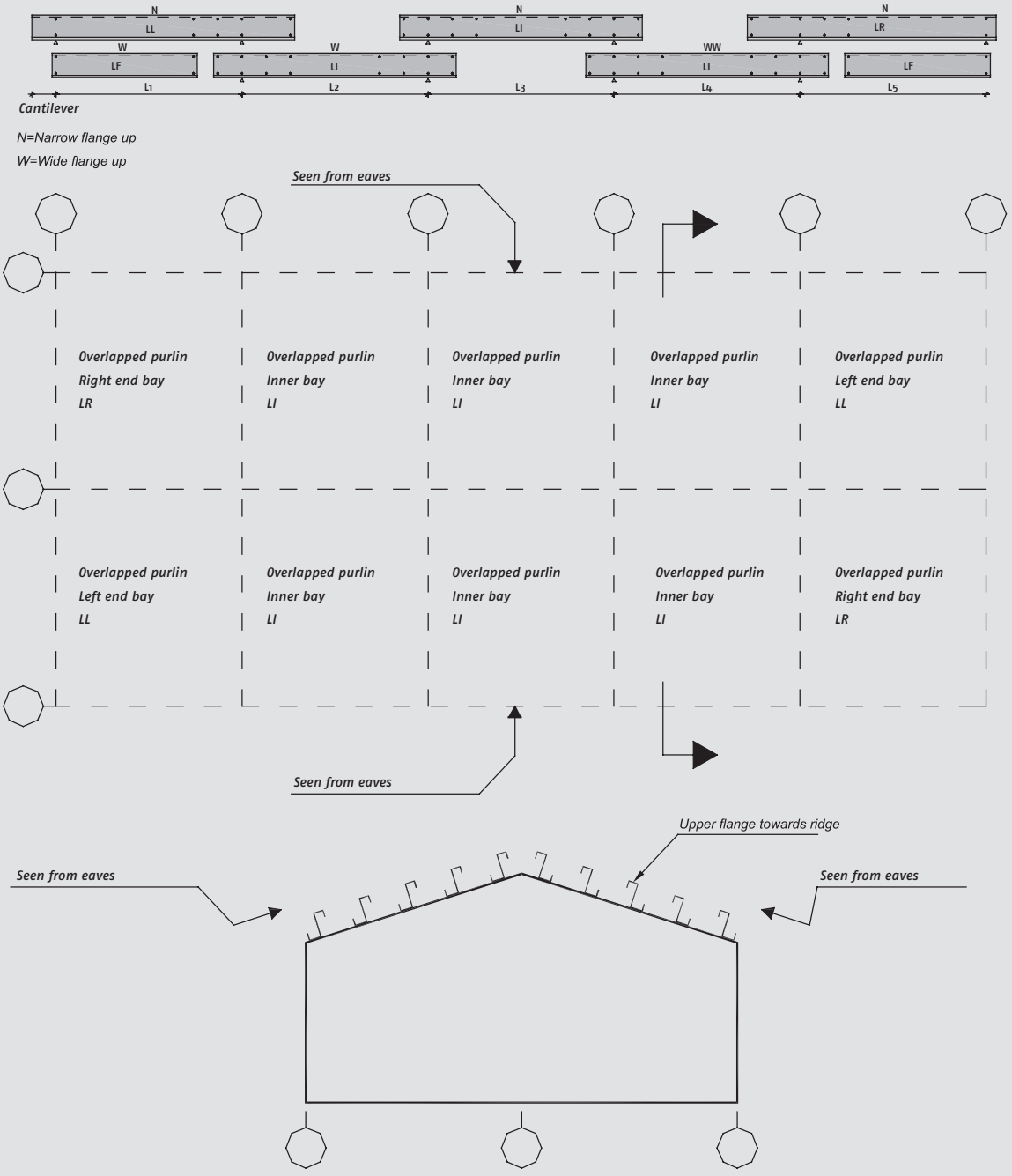
2.4 OVERLAPPED SYSTEM – RECOMMENDED BY RUUKKI



Used in roof and wall purlins, in spans of 6–10 m.
The purlins are overlapped inside one another.
A double purlin or a thicker section in end bay.

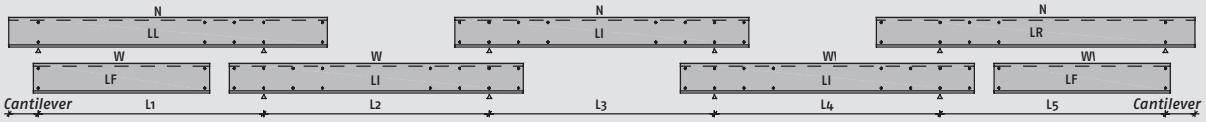
- Optimal weight
- Small deflections
- Long spans can be achieved
- A larger number of joints
- More installation work
- Can be implemented with Z sections

2.4.1 OVERLAPPED SYSTEM, PURLIN DESIGNATION DIAGRAM



2.4.2 OVERLAPPED SYSTEM, PURLINS

Note! On site, the purlin is seen from the eaves



N=Narrow flange up

W=Wide flange up

Note! Wide flange side in vertical design of pre-punching
Reversed design to be used in reversed purlins

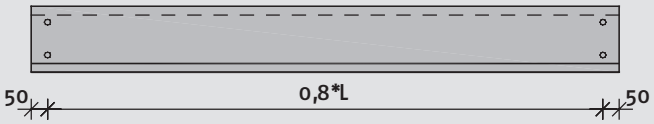
Note! In manufacturing drawings the purlin is seen with the *wide flange down and toward the reader*

L=span

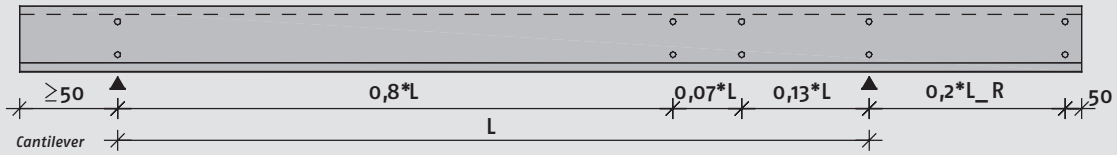
L_L=Left bay length

L_R=Right bay length

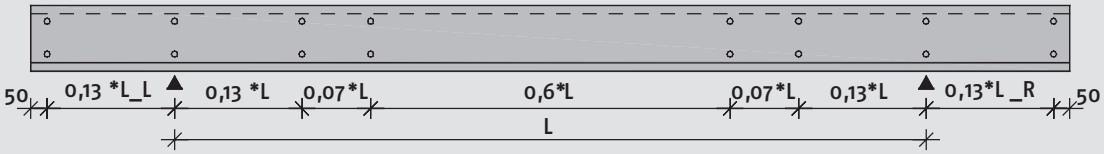
Overlapped reinforcement purlin LF, if required, in end fields



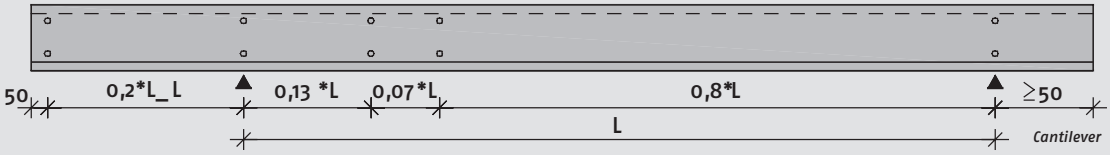
Overlapped purlin LL, left end bay



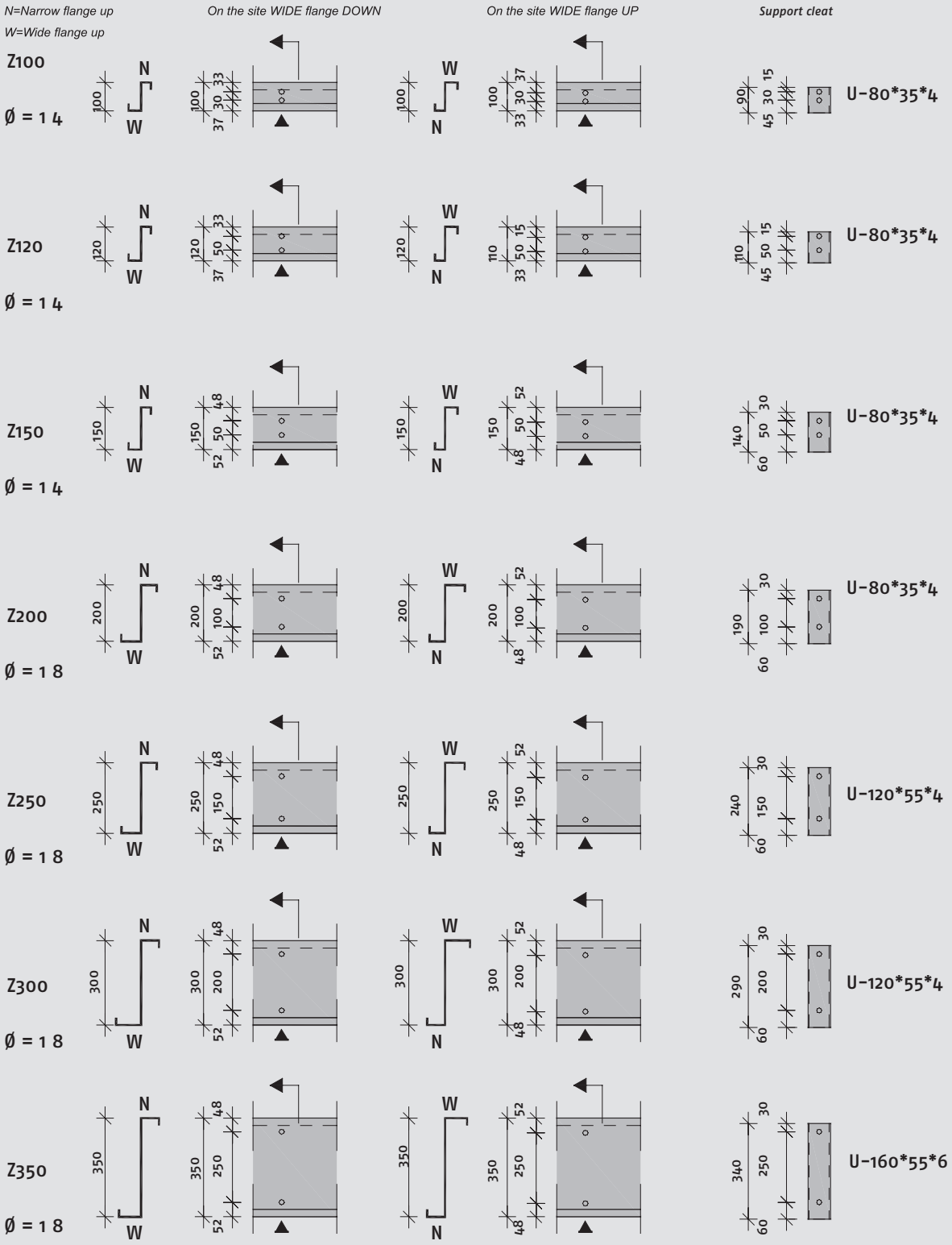
Overlapped purlin LI, inner bay



Overlapped purlin LR, right end bay



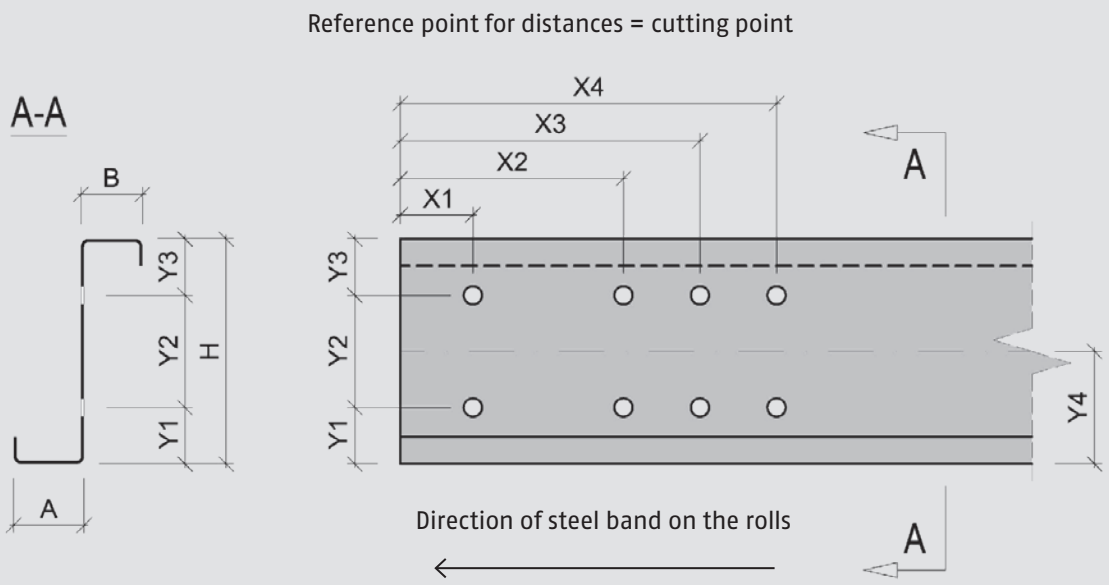
2.4.3 OVERLAPPED SYSTEM, SUPPORT CLEATS



2.5 HOLE DESIGN PRINCIPLE FOR MANUFACTURE

Standard pre-punching is used for each purlin system. The pre-punching dimensions are given with the lower flange toward the viewer and the wider flange of the section as the lower flange. The longitudinal location of the holes is given as a distance from the cutting point, from left to right. The dimensioning of holes for fixing screws is standardised.

Pre-punching is implemented using punches of different sizes and forms. The selection of punches varies depending on the production plant and the section manufacturing method. The standardised sizes and locations of holes for fixing screws are presented below. Additional information about the pre-punching possibilities can be obtained by contacting us.



A – wide flange
B – narrow flange

2.6 TYPES OF HOLES

Holes are made during production at continuous line – information:

- max. material thickness 3 mm (for ø 60 mm max. material thickness 2mm),
- holes can be made in a row,
- oval and rectangular holes can be rotated by 90°.

Table 1. Perforation tools for the press brake products

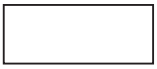
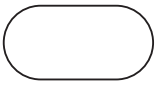
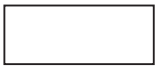
Shape	Diameter / dimensions (mm)	Quantity	Turn
	3	2	
	3,5	2	
	5	2	
	6	2	
	7	2	
	8	2	
	9	2	
	10	2	
	12	2	
	14	2	
	16	2	
	18	2	
	20	2	
	22	2	
	26	2	
	35	2	
	5x16	2	90°
	6,5x30	2	90°
	9x15	2	90°
	12x30	2	90°
	14x30	1	90°
	16x30	2	90°
	18x25	2	90°
	18x35	2	90°
	20x40	2	90°
	5x30	2	90°
	5x45	1	90°
	5x49	1	90°
	10x10	2	90°
	15x15	2	90°
	23x23	2	90°
	35x35	2	90°
	45x45	1	90°

Table 2. Perforation tools for roll forming machine

Shape	Diameter / dimensions (mm)	Quantity	Turn
	3		
	3,6		
	5		
	7		
	10		
	12		
	14		
	16		
	18		
	20		
	22		
	26		
	60		
	12x24		90°
	14x24		90°
	16x35		90°
	18x32		90°
	18x35		90°
	20x35		90°
	5x25		90°
	45x45		90°
	50x50		90°

No limitation in number of holes during production.

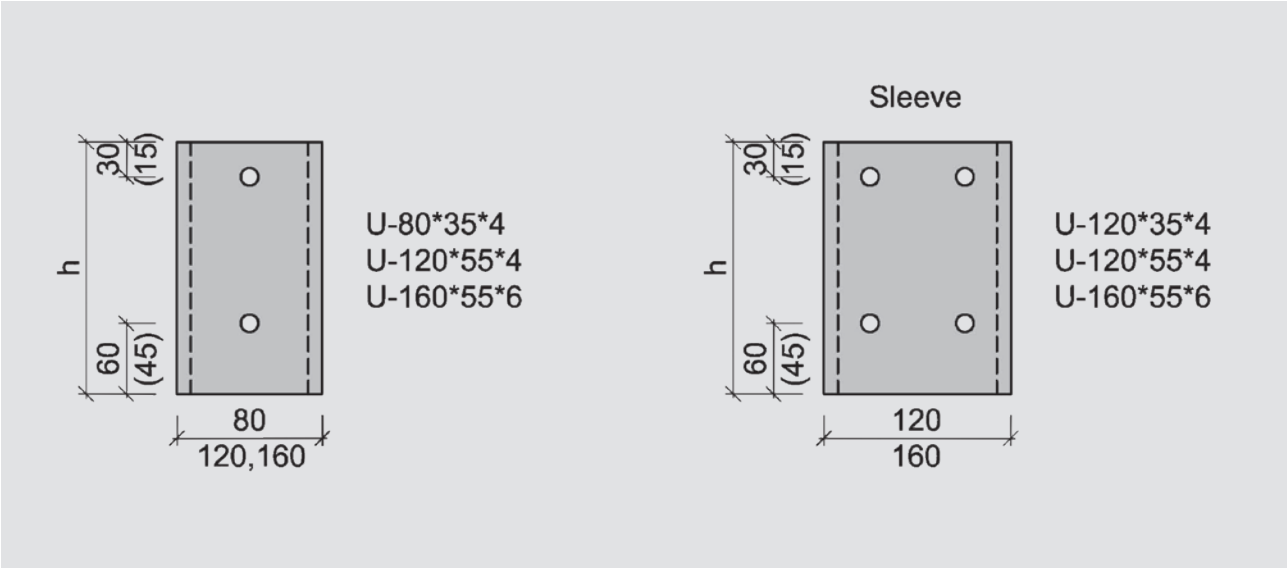
2.7 SUPPORT CLEATS

Purlin systems utilise support cleats attached to the primary beams of the building frame. The purlins are fixed to these support cleats from the web with screw joints. In Ruukki systems the support cleats are U sections made of at least steel grade S235. In the design of the support cleats, the tying of the section sheet on the roof ridge with a ridge moulding is taken into account. If a ridge moulding is not used, the dimensioning of the U section and its fixing to the primary rafter must be separately checked due to the stresses caused by the load component acting in the direction of the roof slope.

When screw joints are used, the support cleats are delivered with pre-drilled holes for hexagon screws, diameter either 14 mm or 18 mm depending on the size of the purlin. The sizes and the distances are shown in the purlin diagram. A sleeved system features two vertical rows of fixings, an overlapped system either one or two rows depending on selected support cleats. Single and double span systems have one or two rows, depending on the location of the support cleat and on the selection of support cleat. The program PurCalc for purlin dimensioning also determines the required number of fixings.

If self-drilling screws are to be used for some reason, the support cleat is not pre-drilled. However, it should be noted that screw joints must always be used if the material thickness of the purlin exceeds 1.5 mm, due to joint ductility requirements.

Examples of support cleats:



C and Z purlins are supported from their web to the primary rafter using the following U sections at low roof slopes, and when the section sheet is tied to the opposite slope sheet with a ridge moulding. Otherwise the fixing sections have to be dimensioned specifically for loads acting in the direction of the slope plane.

H<	U-Section
200	U-80*35*4
300	U-120*55*4
350	U-160*55*6

3 Factors to be considered in the use of lightweight purlins

3.1 TORSIONAL RIGIDITY

Lightweight purlins exhibit an open cross-section and low torsional rigidity in proportion to their bending rigidity. Due to the low torsional rigidity the lateral buckling resistance of an unsupported purlin restricts the load bearing capacity significantly.

3.2 IMPROVING TORSIONAL RIGIDITY

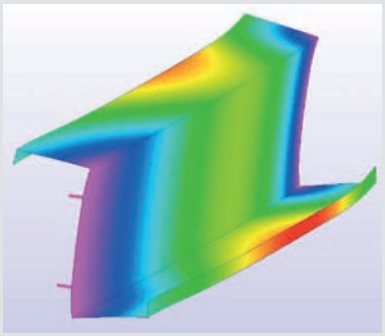
Torsional rigidity can be improved by fixing the purlin to a form plate or corresponding that provides transverse support to the upper flange of the purlin. The bending rigidity of the form plate also increases the rotational rigidity of the purlin.

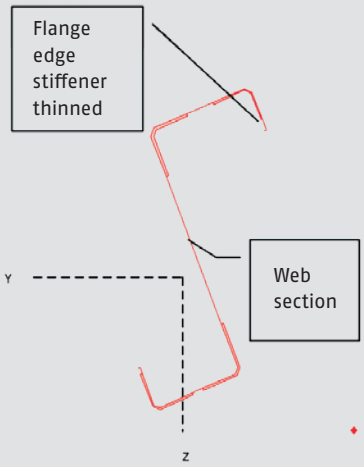
3.3 LOCAL BUCKLING

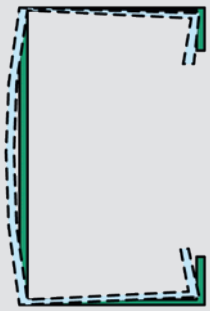
The resistance of a thin gauge sheet cross-section is restricted due to buckling of plate-like cross-sectional parts under compression, or by buckling under compression of plate-like stiffeners that resist buckling. A plane section does not loose its load bearing capacity completely; in fact, a plane section often retains a considerable part of its capacity in this state. This is modelled in calculations by removing a part under the most stress from the plane section, or by thinning the edge stiffener and the part of the plane section considered to be part of it.

3.4 DISTORTION OF SECTION

In cross-sections of certain shapes, distortion of the section also restricts the load bearing capacity.

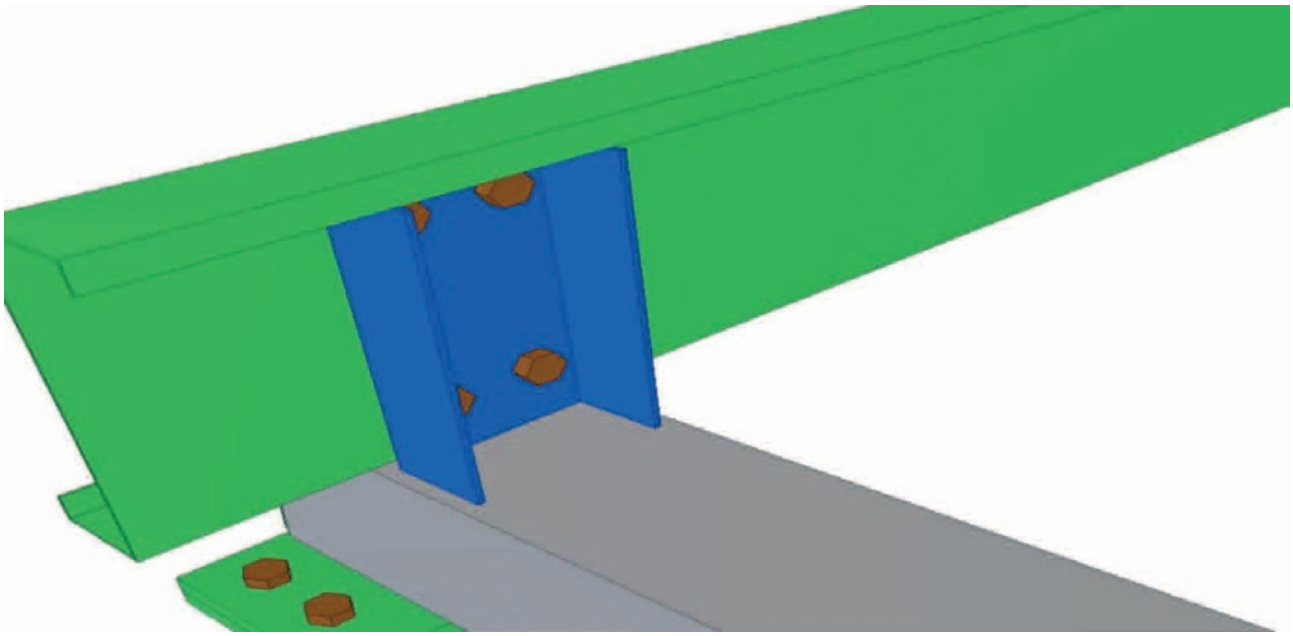






3.5 RESISTANCE TO SUPPORT REACTIONS

Buckling of the plane section is also possible in the support cleat, whereby the web of the purlin as a result of the support reaction tends to deviate from its plane, which restricts the load bearing capacity of the purlin. For reinforcement, a support cleat is normally used, e.g. a U section that is fixed from its back to the web of the purlin so that the support cleat alone transmits the support reaction to the rafter.



3.6 PURLINS THAT ARE SUPPORTED AT THE FLANGE

Top hat purlins are always provided with a brace piece (cf. cross-sectional dimensions of top hat purlins), which is fixed together with the basic purlin through its flanges directly to the primary rafter. The resistance to the support reactions is then produced by the top hat purlin and the brace section together.

3.7 TRANSVERSE RIGIDITY

The rigidity of thin gauge sheet purlins in the direction of the minor axis is low. This causes bending at the roof slope plane, unless the slope has sheet rigidity. This could be the case, for example, if the sheet seams from the ridge toward the eaves are not fixed. However, it is recommended that the section sheets of the slopes are tied together with a ridge moulding. In practice, this will prevent the bending of the purlin in the direction of the roof slope, and at the same time essentially reduce the stresses acting on the support cleats.

3.8 UNSUPPORTED LOWER FLANGE

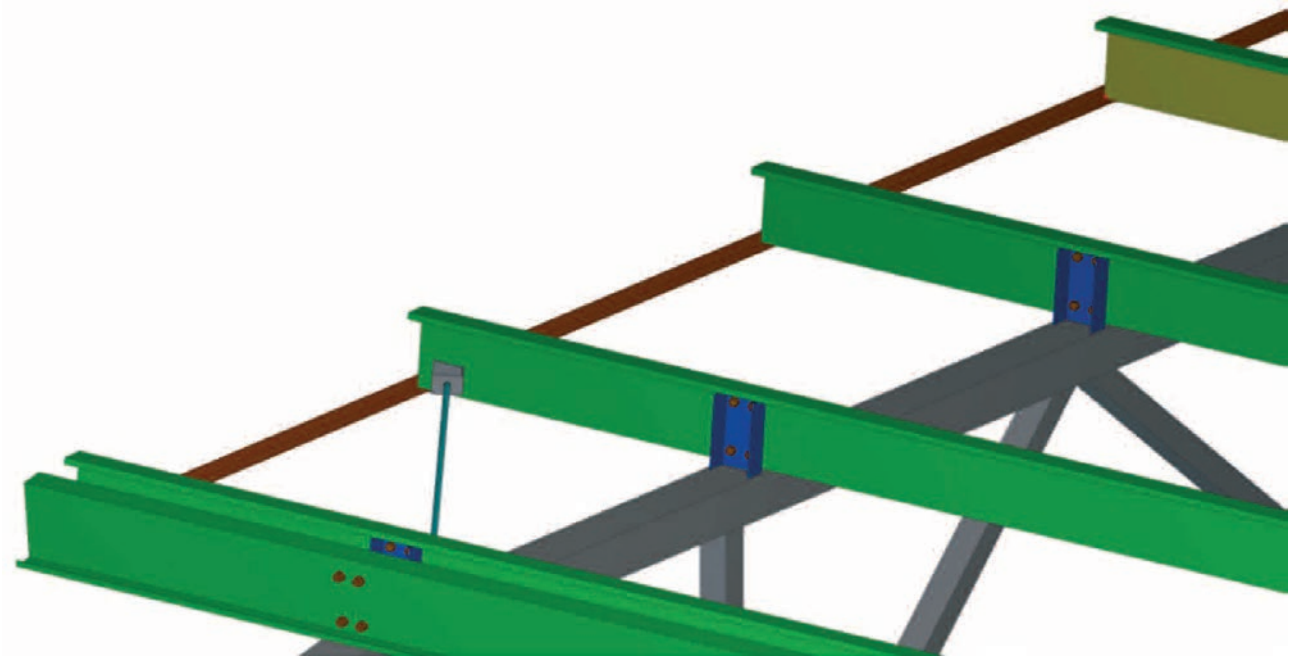
In single span purlins the unsupported lower flange of the purlin may be under compression due to wind uplift, whereby it can buckle in the transverse direction. This applies particularly to wall purlins, in which the self-weight of the structure does not counteract the suction pressure, as is the case in roof structure.

3.9 UNSUPPORTED LOWER FLANGE UNDER COMPRESSION

In continuous purlins the unsupported lower flange of the purlin is under compression at the brace moment, whereby it tends to buckle. This restricts the load bearing capacity of the purlin.

3.10 CANTILEVER PURLIN

The load bearing capacity of cantilever purlins is low, but it can be increased to some extent by fixing the cantilever end rigidly to the face section.



If distortion of the end of a cantilever purlin is prevented using e.g. a U section of the same height as the purlin, fixed from its flanges to the flanges of the cantilever purlin, the following shall be valid for the end support:

$$N_{sd} / A_{eff} + M_{y, Sd} / W_{eff, y} \leq M_{c, Rd,V} / W_{eff, y}$$

where

N_{sd} is the design value of normal force

A_{eff} i s the effective area of the cross-section in axial compression

$M_{y, Sd}$ is the design value of the moment with an end support

$W_{eff, y}$ is the effective bending resistance of the crosssection against bending about the y axis

$M_{c, Rd,V}$ is the bending resistance, when account is taken of the influence of shear force

Otherwise the following shall be valid

$$N_{sd} / A_{eff} + M_{y, Sd} / W_{eff, y} \leq 2M_{c, Rd,V} / 3W_{eff, y}$$

Minimum dimensions of the section that joins the free flanges of a cantilever purlin (upper flanges of the cantilever purlin are provided with continuous support by a form plate)

Purlin height	L-section
max 150	45*45-1.5
max 200	70*70-1.5
max 300	70*70-2.0
max 350	70*70-2.5

4 PurCalc purlin design software

Design with PurCalc software enables the most economical solution for cold-formed purlin-based roof structure.

The software includes Ruukki's offering of Z, Hat, U and C purlins The options included in the software enables following calculations methods:

- Calculation of purlin structure based on Eurocode, when purlins are restrained with load bearing sheeting
- Calculation of purlin structure based on Eurocode, when purlins are restrained by Ruukki's roof sandwich panel
- Calculation of purlins structure is made according to Eurocode's test based method when purlins are restrained with load bearing sheeting and certain conditions met.

Language options in the software are; English and Finnish.

5 Handling, transport and storage of lightweight purlins

5.1 HANDLING

All necessary health and safety precautions have to be taken into account when handling the purlins. When handling the products, it is recommended to use protective clothing and cut resistance gloves. When cutting the products, please use also respirator as cutting may release dust and small particles.

Also special care shall always be exercised to prevent any damages to purlins itself. Even small dents and deflections may impair the load bearing capacity of the purlin significantly. Scratches on the zinc coating of the components be avoided.

The materials shall be sufficiently protected against moisture and damages at various stages of their handling. If components are handled manually, appropriate protective gloves shall be worn to prevent injuries.

5.2 TRANSPORT

The purlins and the fixing components are at the production plant packed in packages that are easy to handle. Purlins are bundled together and small components are packed in separate packages. The content is clearly marked on each package to ensure they are transported to the correct site. On the site the materials should be carefully checked to ensure the correct quantity and condition of the products. The supplier shall be informed in writing of any deficiencies and transport damages immediately. Damaged products are not allowed to install without Ruukki's approval.

5.3 STORAGE

Materials should be stored as closed as possible to the final installation location indicated in the installation diagrams to avoid unnecessary liftings and transports.

Purlins shall be stored in a dry place protected against rain and snow, on a level base. The dry storing conditions will prevent white rust on galvanised surface. Products shall be supported at regular intervals to prevent deformation. It is recommended that products are supported in a slightly inclined position (1:20), to ensure that possible water leaking onto the purlins will be drained. The packages should be raised above ground to allow ventilation of the bottom side of the packages. Materials should not be piled on top each other, as this may damage the sections.

If purlins get wet in rain, they must be separated and dried to eliminate the possibility of white rust. If required, sufficient support shall be provided for the packages to prevent them from tipping or falling over.

6 Installation of lightweight purlins

All necessary health and safety precautions have to be taken into account when handling the purlins. When handling the products, it is recommended to use protective clothing and cut resistance gloves. When cutting the products, please use also respirator as cutting may release dust and small particles.

The installation of lightweight purlins is swift and easy. The purlins are primarily fixed with hexagon screw joints using pre-drilled holes, or sometimes with self-drilling screws. It should be noted that purlins with a thickness of more than 1.5 mm must not be fixed to support cleats or to each other with self-drilling screws, but hexagon screw joints must be used. The low cost of installation is based on the swiftness of the work and on prefabricated structural parts. The small weight and the small space requirements of the structural parts reduce transport costs.

Lightweight purlins are installed according to an installation diagram drawn up by the designer.

The installation specification should contain at least the following information:

- project data
- designer
- installation technician
- material list and layout diagram
- storage of components on site
- handling of transport packages on site
- installation equipment
- installation stages
- screw joints
- temporary bracing during installation
- installation tolerances
- qualification of structures and quality control

Structural parts must not be forced in place so that they are deformed or subjected to stresses. Thin gauge sheet structures are sensitive to local damage, and for this reason special attention shall be paid in installation to preventing the parts from being dented or otherwise damaged.

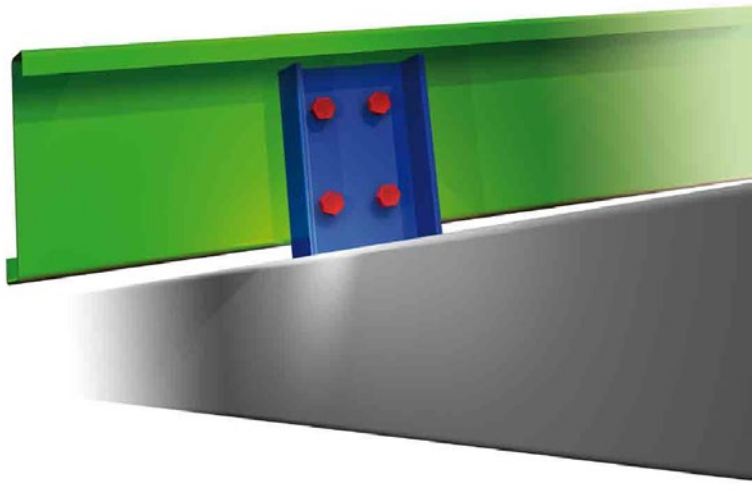
Roof purlins do not usually require temporary bracing during installation, but this shall be verified when longer spans or higher slopes are concerned. Z roof purlins shall always be installed with the upper flange toward the ridge, cf. the Figure. In addition, the lower flange of a Z purlin must be installed at a distance of ca. 10 mm from the upper chord of the truss or the beam.

The work specification, the drawings, the installation plan and the quality control plan shall be studied before installation is started. The acceptance inspection of the materials, accessories, installation parts and lightweight purlins shall include an inspection of waybills, dispatch notes, transport damages and handling damages. It is important to verify that the materials and accessories comply with standards or are delivered with certified product declarations.

It is recommended that during installation, attention is paid to the following factors:

- location of structures
- straightness of structures
- angles
- joints between components
- main dimensions
- other dimensions
- handling, lifting and storage of materials, accessories and parts
- scaffolding
- tightening and locking of screws and nuts

The installation sequence shall be determined before the purlins are installed. The bundles of purlins are lifted in the correct locations according to the installation diagram drawn up by the designer. Purlins with the wide flange down are installed first.



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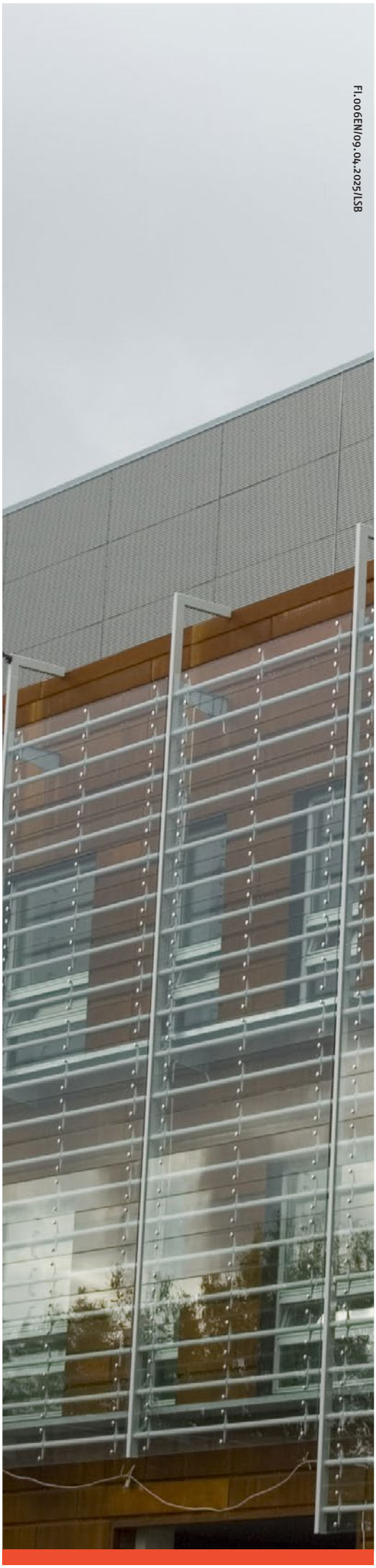

FI.006EN/09.04.2025/LSB

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