

# Z and C-sections

for building shell and mezzanine floor applications



Introducing  
Rapid Rail Support Systems  
Rapid fix mezzanine floor beam tie  
CE marking on all our products





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New products are highlighted in red

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# Investing in quality and service

## The Company

Metsec plc is the UK's largest specialist cold roll-forming company, providing structural steel components for the UK construction and manufacturing industries. We have been established for over 75 years and are based in Oldbury in the West Midlands.

Today, Metsec are part of the Profilform Division of voestalpine - the world's largest manufacturer of cold roll-formed sections, with a global network producing over 800,000 tonnes of cold rolled steel per annum.

We focus on adding value through expert design, precision manufacturing and on-time, in-full product delivery. Our aim is to provide excellent service and quality products that offer our customers cost effective solutions.

## Metsec systems

Metsec offer a wide range of Z, C and Mezzanine floor sections designed to provide optimal levels of structural performance in roof, wall and mezzanine floor constructions. All sections are designed in accordance with BS 5950-5:1998 and are tested by the Department of Mechanical Engineering at the University of Strathclyde.

## Quality

Metsec operates strict design and quality procedures through a Quality Management System accredited to BS EN ISO 9001:2000 which covers both our design and manufacturing operations. A key part of this is that all Metsec products leaving our site are barcoded which allows for traceability throughout the manufacturing process.

This commitment to quality ensures that we provide the highest levels of performance throughout our operations, ensuring the highest level of customer satisfaction.

## C E Marking

Our purlins are compliant and approved under the Steel Construction Certification Scheme to the highest execution class of BS EN 1090-1.

This accreditation provides you with absolute assurance that the use of our products in the construction of any structure from a warehouse to a power station will be fully compliant with the regulations.

The CE marking which you will find on all of our purlins and side rails systems will give you confidence that when specifying or using our products that the quality and safety of the finished building is ensured.



## Sustainability

### Certification

Metsec and voestalpine both regard the issue of sustainability as a core social, as well as corporate, responsibility.

This has been recognised by the award of BS EN ISO 14001:2004 for our Environmental Management System.

### Metsec were the first cold roll-forming company to be awarded the prestigious gold standard under the Steel Construction Sustainability Charter.

Additionally, Metsec recognise that environmental responsibility is both a local as well as a global issue. We were therefore pleased to be awarded the Sandwell Borough Platinum Environmental Charter Award following an audit of our Environmental management procedures and award of BS EN ISO 14001:2004.

### Design

Our market-leading MetSPEC design software provides cost effective solutions to maximise the design efficiency of structures. Comprehensive technical support is provided by our design office.

For full details on our technical support service and how to obtain a free copy of MetSPEC, please refer to page 86.

## Re-use and recycling

Since cold rolled steel sections do not lose their strength or stiffness over time, they are readily reusable once removed from the original structure.

Furthermore, steel is today one of the World's most recycled materials. According to the British Constructional Steelwork Association (BCSA), recovery rates for steel components from building demolition sites are 84% for recycling and 10% for re-use\*. This gives a total potential recovery and re-use factor of steel from buildings of an incredible 94%.

\* BCSA publication no. 35/03

### SPeAR®

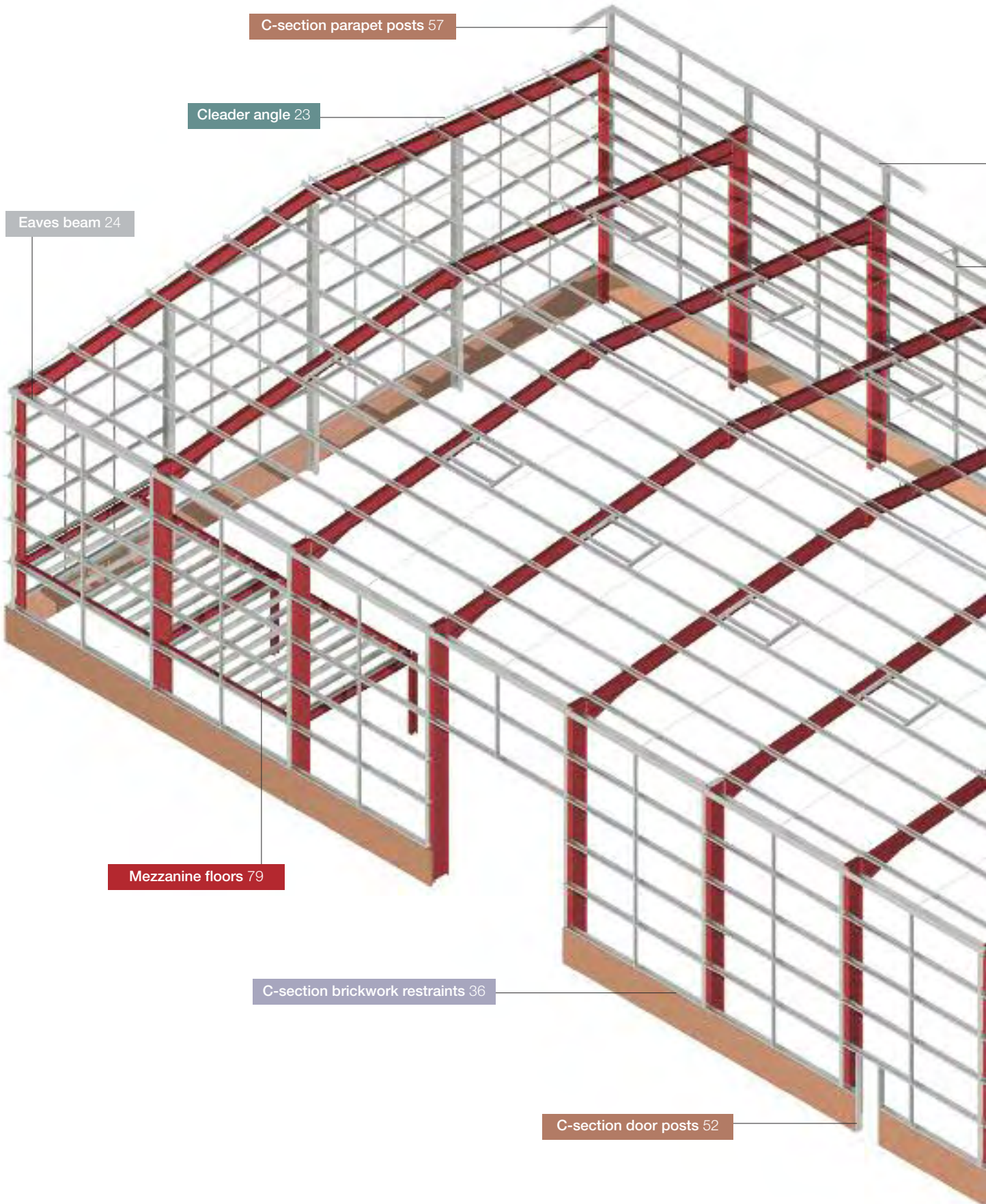
Independently, as well as with voestalpine, Metsec will continue to pursue sustainability as a key business objective. The cornerstone of this is the very thorough and detailed societal, economic and environmental sustainability review of our operations carried out in the SPeAR® (Sustainable Project Appraisal Routine) Report from Arup. This report gives us both an assessment of our current environmental position as well as identifying key areas for improvement in the future.

To quote from the report:

**"The baseline SPeAR® diagram shows a well balanced performance in terms of sustainability, and that Metsec is already meeting legislation or best practice in the large majority of areas. In some cases Metsec is starting to move beyond best practice."**



# Component applications



Metsec - UK leaders in the design and manufacture of engineered and bespoke purlin and side rail building solutions.

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# Z-section dimensions and properties

The section reference of a Z-section 232mm deep and 1.8mm thick would be 232 Z 18. The first 3 digits of the section reference indicate the depth of the section in millimetres (ie 232 equals 232mm deep).

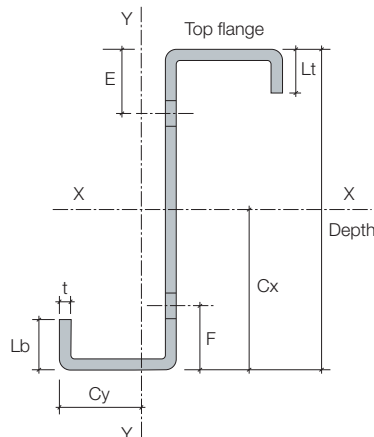
The fourth digit is a letter that signifies the profile type (ie Z for Z-section). The last two digits indicate the material thickness (ie 18 = 1.8mm).

## Sleeves

The sleeve reference is the same as the purlin it is being used in conjunction with, except that it is prefixed with 'PS' for a standard sleeve and 'HEBS' for a heavy end bay sleeve ie:

PS 232 Z 18 standard 232 Z 18 sleeve

HEBS 232 Z 18 heavy end bay 232 Z 18 sleeve.



Section depth mm	Lt mm	Lb mm	E mm	F mm
142-262	14	16	44	42
302-342	19	21	55	52

All Metsec Z-section product is manufactured from pre-hot dipped galvanised steel, G275 coating and with a minimum yield strength of 450 N/mm<sup>2</sup>

## Nominal dimensions

Section reference	Weight kg/m	Area cm <sup>2</sup>	Depth mm	Top flange mm	Bottom flange mm	t mm
142 Z 13	2.84	3.62	142	60	55	1.3
142 Z 14	3.05	3.89	142	60	55	1.4
142 Z 15	3.26	4.16	142	60	55	1.5
142 Z 16	3.47	4.42	142	60	55	1.6
142 Z 18	3.89	4.95	142	60	55	1.8
142 Z 20	4.30	5.48	142	60	55	2.0
172 Z 13	3.25	4.14	172	65	60	1.3
172 Z 14	3.49	4.45	172	65	60	1.4
172 Z 15	3.73	4.76	172	65	60	1.5
172 Z 16	3.98	5.06	172	65	60	1.6
172 Z 18	4.45	5.67	172	65	60	1.8
172 Z 20	4.93	6.28	172	65	60	2.0
172 Z 23	5.63	7.17	172	65	60	2.3
172 Z 25	6.09	7.76	172	65	60	2.5
202 Z 14	3.82	4.87	202	65	60	1.4
202 Z 15	4.09	5.21	202	65	60	1.5
202 Z 16	4.35	5.54	202	65	60	1.6
202 Z 18	4.88	6.21	202	65	60	1.8
202 Z 20	5.40	6.88	202	65	60	2.0
202 Z 23	6.17	7.86	202	65	60	2.3
202 Z 27	7.19	9.16	202	65	60	2.7
232 Z 15	4.44	5.66	232	65	60	1.5
232 Z 16	4.73	6.02	232	65	60	1.6
232 Z 18	5.30	6.75	232	65	60	1.8
232 Z 20	5.87	7.48	232	65	60	2.0
232 Z 23	6.71	8.55	232	65	60	2.3
232 Z 25	7.27	9.26	232	65	60	2.5
262 Z 16	5.11	6.50	262	65	60	1.6
262 Z 18	5.73	7.29	262	65	60	1.8
262 Z 20	6.34	8.08	262	65	60	2.0
262 Z 23	7.26	9.24	262	65	60	2.3
262 Z 25	7.86	10.01	262	65	60	2.5
262 Z 29	9.06	11.54	262	65	60	2.9
302 Z 20	7.86	10.02	302	90	82	2.0
302 Z 23	9.01	11.47	302	90	82	2.3
302 Z 25	9.76	12.44	302	90	82	2.5
302 Z 29	11.27	14.35	302	90	82	2.9
342 Z 23	9.73	12.39	342	90	82	2.3
342 Z 25	10.55	13.44	342	90	82	2.5
342 Z 27	11.37	14.48	342	90	82	2.7
342 Z 30	12.58	16.03	342	90	82	3.0

## Section properties

Ixx cm <sup>4</sup>	Iyy cm <sup>4</sup>	Zxx cm <sup>3</sup>	Zyy cm <sup>3</sup>	rx cm	ry cm	Cx cm	Cy cm	Mcx kNm	Mcy kNm
117.4	27.2	16.34	4.65	5.66	2.72	7.19	5.52	6.007	2.091
126.1	29.1	17.54	4.98	5.66	2.72	7.19	5.52	6.776	2.240
134.6	31.0	18.74	5.31	5.65	2.71	7.19	5.51	7.554	2.388
143.2	32.9	19.93	5.63	5.65	2.71	7.19	5.51	8.330	2.534
160.1	36.5	22.28	6.27	5.64	2.69	7.19	5.49	9.850	2.821
176.8	40.1	24.60	6.89	5.63	2.68	7.19	5.48	11.302	3.101
192.6	33.9	22.17	5.33	6.79	2.85	8.69	6.01	7.497	2.397
206.9	36.3	23.81	5.71	6.78	2.84	8.69	6.01	8.498	2.569
221.1	38.6	25.44	6.09	6.78	2.83	8.69	6.00	9.517	2.739
235.2	41.0	27.07	6.46	6.77	2.83	8.69	6.00	10.547	2.908
263.1	45.6	30.29	7.20	6.76	2.81	8.69	5.99	12.603	3.239
290.8	50.1	33.47	7.92	6.75	2.80	8.69	5.98	14.606	3.564
331.7	56.6	38.18	8.97	6.74	2.78	8.69	5.96	17.460	4.038
358.6	60.8	41.28	9.66	6.73	2.77	8.69	5.95	19.271	4.346
301.0	36.3	29.53	5.70	7.82	2.71	10.19	6.00	10.072	2.567
321.7	38.6	31.56	6.08	7.82	2.71	10.19	6.00	11.310	2.737
342.4	41.0	33.58	6.46	7.81	2.70	10.19	5.99	12.559	2.905
383.3	45.6	37.60	7.19	7.80	2.69	10.19	5.98	15.051	3.236
423.8	50.1	41.57	7.91	7.79	2.68	10.19	5.97	17.486	3.560
483.8	56.6	47.45	8.96	7.78	2.66	10.19	5.96	20.984	4.034
562.3	64.9	55.16	10.32	7.76	2.64	10.19	5.94	25.403	4.642
446.1	38.6	38.14	6.08	8.84	2.60	11.70	5.99	13.022	2.734
474.8	41.0	40.59	6.45	8.83	2.59	11.70	5.99	14.500	2.903
531.7	45.6	45.45	7.19	8.82	2.58	11.70	5.98	17.450	3.234
588.1	50.1	50.27	7.91	8.81	2.57	11.70	5.97	20.342	3.558
671.8	56.6	57.42	8.96	8.79	2.55	11.70	5.95	24.526	4.031
726.8	60.8	62.13	9.64	8.78	2.54	11.70	5.94	27.221	4.338
634.6	41.0	48.07	6.45	9.83	2.50	13.20	5.98	16.333	2.901
710.9	45.6	53.85	7.18	9.82	2.49	13.20	5.97	19.763	3.231
786.6	50.1	59.58	7.90	9.81	2.47	13.20	5.96	23.138	3.555
898.9	56.6	68.08	8.95	9.79	2.46	13.20	5.95	28.051	4.028
972.9	60.8	73.69	9.63	9.78	2.45	13.20	5.94	31.236	4.335
1118.9	69.0	84.75	10.96	9.76	2.42	13.20	5.92	37.442	4.930
1355.9	132.9	88.70	15.15	11.57	3.62	15.29	8.23	30.362	6.819
1551.3	150.9	101.49	17.24	11.56	3.61	15.29	8.21	38.205	7.758
1680.5	162.7	109.94	18.60	11.55	3.59	15.29	8.20	43.417	8.372
1936.1	185.6	126.66	21.27	11.53	3.57	15.29	8.18	53.561	9.573
2085.0	151.0	120.56	17.22	12.90	3.47	17.29	8.20	43.380	7.750
2259.1	162.7	130.63	18.59	12.89	3.46	17.29	8.19	49.455	8.364
2432.1	174.3	140.63	19.93	12.88	3.45	17.29	8.18	55.447	8.968
2689.4	191.3	155.51	21.91	12.86	3.43	17.29	8.17	64.227	9.858

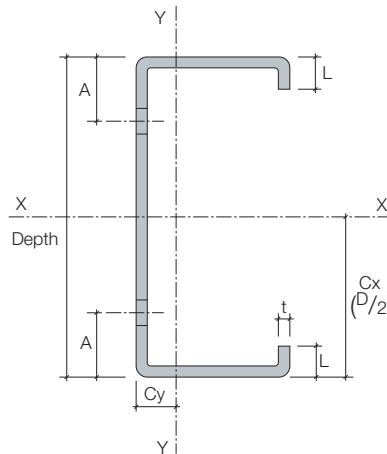
# C-section dimensions and properties

The section reference of a C-section 232mm deep and 1.8mm thick would be 232 C 18. The first 3 digits of the section reference indicate the depth of the section in millimetres (ie 232 equals 232mm deep).

The fourth digit is a letter that signifies the profile type (ie C for C-section). The last two digits indicate the material thickness (ie 18 equals 1.8mm).

## Sleeves

See page 33 for C-section sleeve references and weights.



Section depth mm	A mm	L mm
142-262	43	13
302-342	53.5	18

All Metsec C-section product is manufactured from pre-hot dipped galvanised steel, G275 coating and with a minimum yield strength of 450 N/mm<sup>2</sup>

## Nominal dimensions

Section reference	Weight kg/m	Area cm <sup>2</sup>	Depth mm	Flange mm	t mm
142 C 13	2.84	3.62	142	60	1.3
142 C 14	3.05	3.89	142	60	1.4
142 C 15	3.26	4.16	142	60	1.5
142 C 16	3.47	4.42	142	60	1.6
142 C 18	3.89	4.95	142	60	1.8
142 C 20	4.30	5.48	142	60	2.0
172 C 13	3.25	4.14	172	65	1.3
172 C 14	3.49	4.45	172	65	1.4
172 C 15	3.73	4.76	172	65	1.5
172 C 16	3.98	5.06	172	65	1.6
172 C 18	4.45	5.67	172	65	1.8
172 C 20	4.93	6.28	172	65	2.0
172 C 23	5.63	7.17	172	65	2.3
172 C 25	6.09	7.76	172	65	2.5
202 C 14	3.82	4.87	202	65	1.4
202 C 15	4.09	5.21	202	65	1.5
202 C 16	4.35	5.54	202	65	1.6
202 C 18	4.88	6.21	202	65	1.8
202 C 20	5.40	6.88	202	65	2.0
202 C 23	6.17	7.86	202	65	2.3
202 C 27	7.19	9.16	202	65	2.7
232 C 15	4.44	5.66	232	65	1.5
232 C 16	4.73	6.02	232	65	1.6
232 C 18	5.30	6.75	232	65	1.8
232 C 20	5.87	7.48	232	65	2.0
232 C 23	6.71	8.55	232	65	2.3
232 C 25	7.27	9.26	232	65	2.5
262 C 16	5.11	6.50	262	65	1.6
262 C 18	5.73	7.29	262	65	1.8
262 C 20	6.34	8.08	262	65	2.0
262 C 23	7.26	9.24	262	65	2.3
262 C 25	7.86	10.01	262	65	2.5
262 C 29	9.06	11.54	262	65	2.9
302 C 20	7.86	10.02	302	88	2.0
302 C 23	9.01	11.47	302	88	2.3
302 C 25	9.76	12.44	302	88	2.5
302 C 29	11.27	14.35	302	88	2.9
342 C 23	9.73	12.39	342	88	2.3
342 C 25	10.55	13.44	342	88	2.5
342 C 27	11.37	14.48	342	88	2.7
342 C 30	12.58	16.03	342	88	3.0

## Section properties

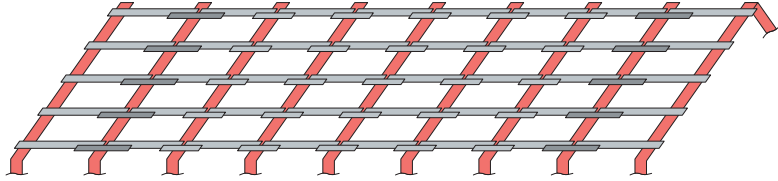
Ixx cm <sup>4</sup>	Iyy cm <sup>4</sup>	Zxx cm <sup>3</sup>	Zyy cm <sup>3</sup>	rx cm	ry cm	Cy cm	Q	Mcx kNm	Mcy kNm
119.0	17.6	16.76	4.18	5.69	2.19	1.80	0.551	6.022	1.882
127.7	18.8	17.99	4.48	5.68	2.18	1.80	0.586	6.790	2.016
136.4	20.1	19.22	4.77	5.68	2.18	1.80	0.620	7.566	2.148
145.1	21.3	20.44	5.06	5.67	2.17	1.80	0.652	8.341	2.279
162.2	23.7	22.85	5.63	5.67	2.16	1.80	0.706	9.862	2.535
179.1	26.0	25.23	6.19	5.66	2.16	1.80	0.750	11.315	2.787
194.7	22.7	22.64	4.83	6.81	2.32	1.81	0.486	7.507	2.174
209.1	24.3	24.32	5.18	6.81	2.32	1.81	0.518	8.505	2.330
223.5	25.9	25.98	5.52	6.80	2.31	1.81	0.549	9.523	2.484
237.7	27.5	27.64	5.86	6.80	2.31	1.81	0.578	10.552	2.636
266.0	30.6	30.93	6.52	6.79	2.30	1.81	0.632	12.607	2.935
294.0	33.6	34.18	7.17	6.78	2.29	1.81	0.676	14.610	3.228
335.3	38.1	38.99	8.13	6.76	2.28	1.81	0.730	17.466	3.656
362.5	41.0	42.16	8.74	6.75	2.27	1.82	0.759	19.278	3.934
303.9	25.4	30.09	5.26	7.85	2.27	1.66	0.477	10.076	2.367
324.8	27.1	32.16	5.61	7.84	2.27	1.66	0.505	11.312	2.523
345.6	28.8	34.22	5.95	7.84	2.26	1.66	0.532	12.560	2.678
386.9	32.0	38.31	6.63	7.83	2.25	1.66	0.581	15.052	2.982
427.8	35.2	42.36	7.29	7.82	2.24	1.67	0.621	17.487	3.280
488.4	39.9	48.35	8.26	7.80	2.23	1.67	0.669	20.986	3.716
567.7	45.9	56.20	9.50	7.78	2.21	1.67	0.720	25.405	4.274
449.9	28.2	38.79	5.68	8.86	2.22	1.54	0.469	13.022	2.555
478.8	29.9	41.28	6.03	8.86	2.21	1.54	0.493	14.499	2.711
536.3	33.3	46.23	6.71	8.85	2.20	1.54	0.538	17.448	3.020
593.1	36.6	51.13	7.38	8.83	2.19	1.54	0.575	20.340	3.322
677.5	41.4	58.40	8.36	8.82	2.18	1.55	0.619	24.524	3.763
733.0	44.6	63.19	9.00	8.81	2.17	1.55	0.643	27.220	4.049
639.5	30.8	48.82	6.09	9.85	2.16	1.43	0.460	16.330	2.739
716.4	34.3	54.69	6.78	9.84	2.15	1.43	0.501	19.760	3.050
792.7	37.8	60.51	7.46	9.83	2.15	1.44	0.535	23.134	3.356
905.8	42.7	69.15	8.45	9.82	2.13	1.44	0.576	28.047	3.801
980.4	46.0	74.84	9.09	9.80	2.12	1.44	0.598	31.231	4.091
1127.6	52.2	86.08	10.33	9.78	2.10	1.45	0.637	37.436	4.650
1360.3	93.0	90.09	13.97	11.59	3.03	2.14	0.474	30.351	6.285
1556.4	105.8	103.07	15.89	11.58	3.02	2.14	0.528	38.110	7.149
1686.0	114.1	111.65	17.14	11.57	3.01	2.14	0.560	43.246	7.713
1942.4	130.3	128.63	19.59	11.55	2.99	2.15	0.611	53.219	8.816
2090.8	109.3	122.27	16.05	12.92	2.95	1.99	0.492	43.256	7.224
2265.4	117.9	132.48	17.32	12.91	2.94	2.00	0.522	49.248	7.795
2438.8	126.3	142.62	18.57	12.90	2.93	2.00	0.547	55.149	8.357
2696.9	138.8	157.71	20.41	12.88	2.92	2.00	0.579	63.794	9.183

# Z-section purlin jointing arrangements

## Heavy end bay sleeved system single span lengths

For buildings with 5 bays or more and rafter spacings up to 15m, heavier gauge purlins are fitted in the end bays with **lighter purlins fitted on internal bays**. Penultimate rafter joints are fully sleeved in the same gauge material as the end bay purlins and are longer than the standard sleeve. Internal bays are sleeved at every joint with standard sleeves of the same gauge material as the inner bay purlins.

5 Bays minimum and rafter spacing up to 15m

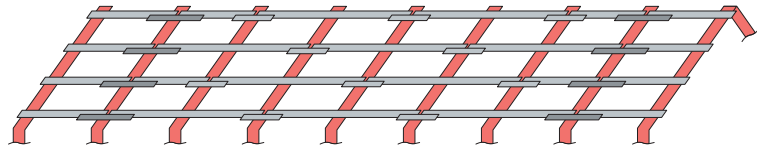


## Heavy end bay sleeved system double span lengths

As above except inner bay purlins are double span in maximum lengths of 15m.

load tables 64-68  
details 14-15

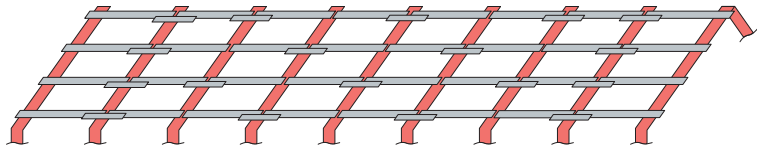
5 Bays minimum and rafter spacing up to 7.5m



## Sleeved system single span lengths

For buildings with 2 bays or more, where a heavy end bay system is precluded and rafter spacings up to 15m. Standard sleeves are fitted at all penultimate rafter connections and staggered on all internal bays.

2 Bays minimum and rafter spacing up to 15m

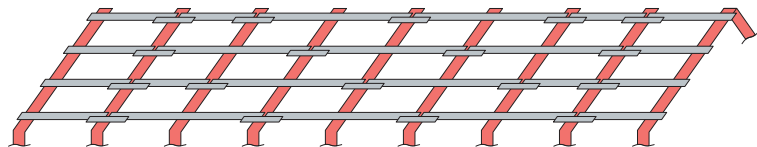


## Sleeved system double span lengths

As above, but standard sleeves are fitted at all penultimate rafter connections and staggered on all internal bays.

load tables 60-63  
details 12-13

4 Bays minimum and rafter spacing up to 7.5m

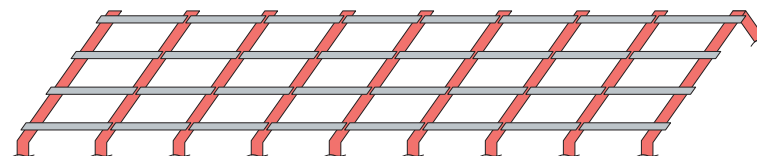


## Butt system

This system can cater for odd bays and can be used in both inset and oversail applications.

load tables 69-70  
details 11

1 Bay minimum and rafter spacing up to 12m



Computer controlled production techniques apply the client's individual mark numbers to all purlins automatically during the manufacturing process.

# Z-section butt purlin system

## Single/odd bays layout and detailing



For full cleat details, see page 57

The butt system is suitable for buildings with single bays or more, up to and including 25° roof pitch.

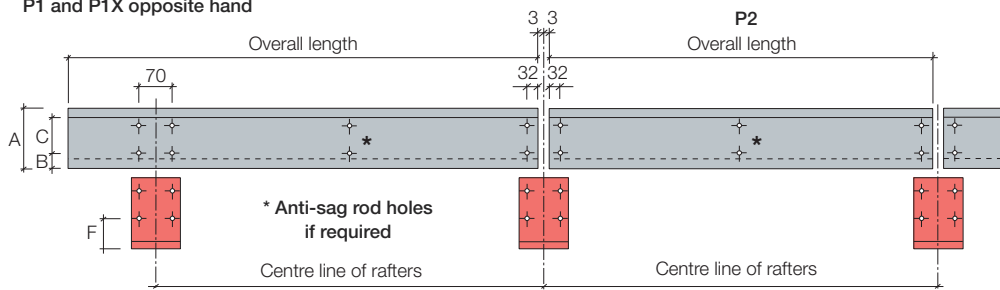
The butt system offers a simple cleat connection and is intended for smaller buildings, short or uneven spans, or light loading conditions.

The butt system caters for spans of up to 12m depending on the load to be applied and where the cladding or liner tray offers adequate lateral support by virtue of its screw fixings at 600mm maximum spacings to the purlins. This system can cater for single bays and can therefore be used in conjunction with other systems detailed in this brochure, or as a system in its own right.

Computer controlled production techniques apply the client's individual mark numbers to all purlins automatically during the manufacturing process.

### Single span system

P1 and P1X opposite hand



Butt system (mm)

A	B	C	F
142	42	56	50
172	42	86	50
202	42	116	50
232	42	146	50
262	42	176	50
302	52	195	60
342	52	235	60

Typical single span arrangement indicating the purlin positions.

P1	P2	P2	P2	P1X
P1	P2	P2	P2	P1X
P1	P2	P2	P2	P1X
P1	P2	P2	P2	P1X
P1	P2	P2	P2	P1X
P1	P2	P2	P2	P1X

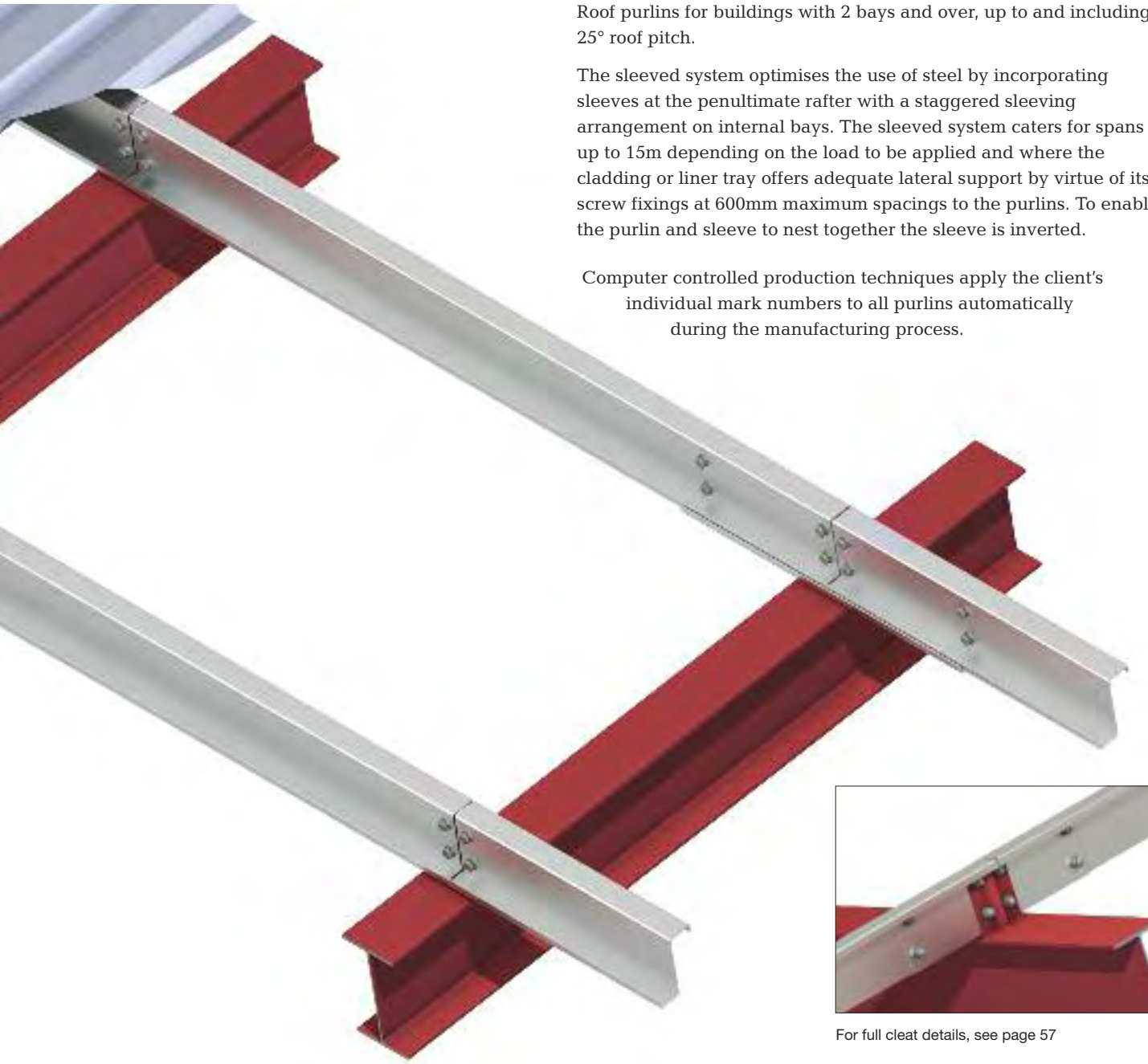


Unless otherwise stated, all required holes are 18mm diameter for M16 bolts and are normally pierced in pairs on standard gauge lines.

For 'General detailing' notes, see page 86.

# Z-section sleeved purlin system

2 bays or more (where heavy end bay system is precluded)



Roof purlins for buildings with 2 bays and over, up to and including 25° roof pitch.

The sleeved system optimises the use of steel by incorporating sleeves at the penultimate rafter with a staggered sleeving arrangement on internal bays. The sleeved system caters for spans up to 15m depending on the load to be applied and where the cladding or liner tray offers adequate lateral support by virtue of its screw fixings at 600mm maximum spacings to the purlins. To enable the purlin and sleeve to nest together the sleeve is inverted.

Computer controlled production techniques apply the client's individual mark numbers to all purlins automatically during the manufacturing process.

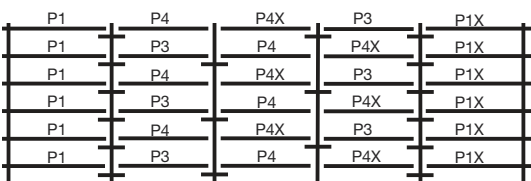
For full cleat details, see page 57

## Single span system

Single span lengths can be supplied to suit individual requirements.

Penultimate rafter connections are sleeved with a staggered sleeving arrangement on internal bays.

Typical single span arrangement indicating purlin and sleeve positions.

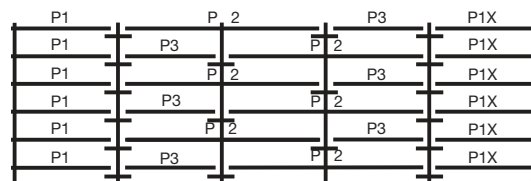


## Double span system

End bay purlins are single span, with double span purlins on internal bays. The maximum span between rafters is 7.5m, therefore maximum double span length is 15m.

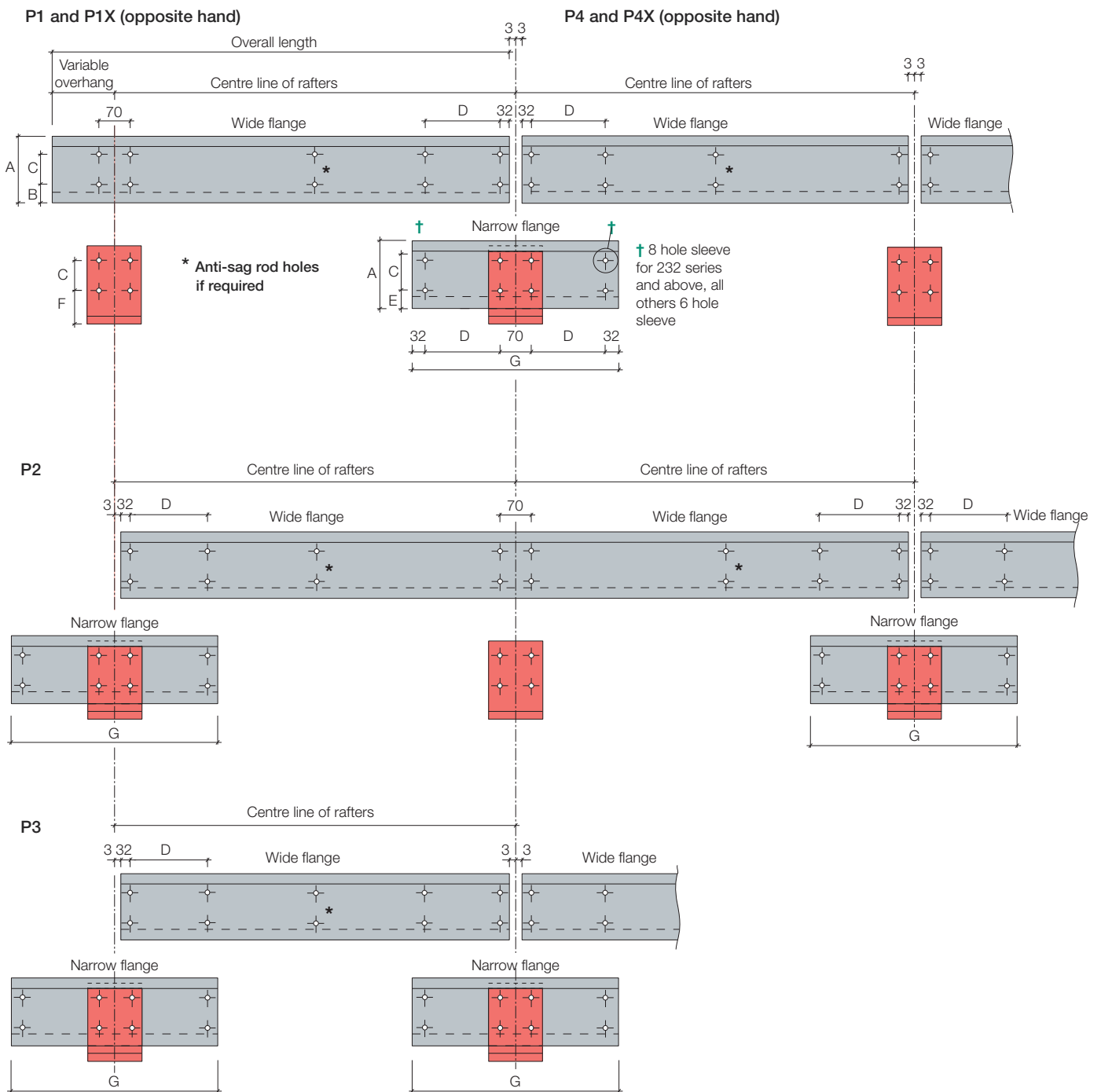
A sleeve must always occur at a joint position.

Typical double span arrangement indicating purlin and sleeve positions.



Note: consideration must be given to the handling of longer lengths





**Sleeved system (mm)**

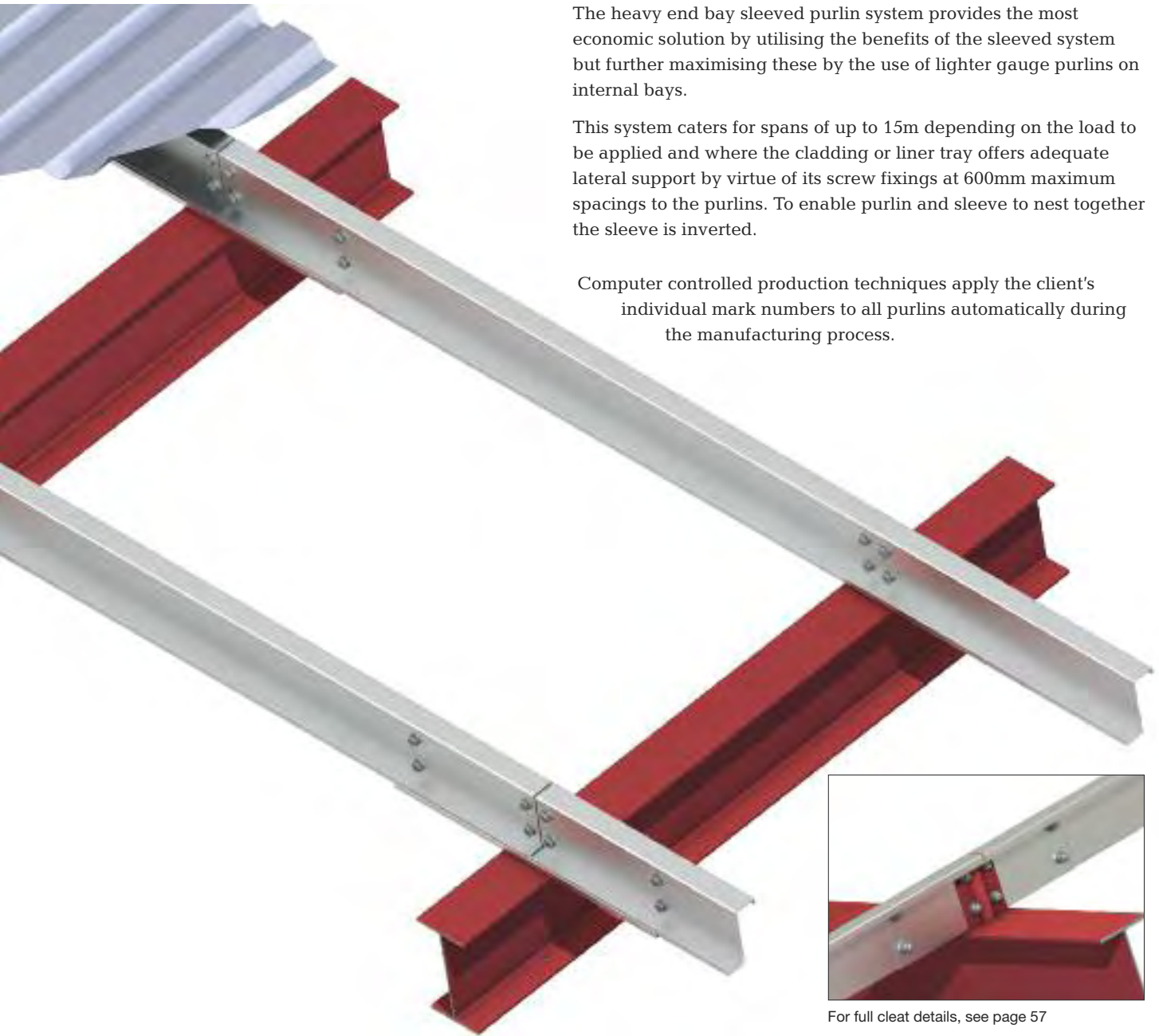
A	B	C	D	E	F	G
142	42	56	240	44	50	614
172	42	86	290	44	50	714
202	42	116	350	44	50	834
232	42	146	410	44	50	954
262	42	176	460	44	50	1054
302	52	195	610	55	60	1354
342	52	235	760	55	60	1654

Unless otherwise stated, all required holes are 18mm diameter for M16 bolts and are normally pierced in pairs on standard gauge lines.

For 'General detailing' notes, see page 86.

# Z-section heavy end bay sleeved purlin system

## 5 bays or more



The heavy end bay sleeved purlin system provides the most economic solution by utilising the benefits of the sleeved system but further maximising these by the use of lighter gauge purlins on internal bays.

This system caters for spans of up to 15m depending on the load to be applied and where the cladding or liner tray offers adequate lateral support by virtue of its screw fixings at 600mm maximum spacings to the purlins. To enable purlin and sleeve to nest together the sleeve is inverted.

Computer controlled production techniques apply the client's individual mark numbers to all purlins automatically during the manufacturing process.

For full cleat details, see page 57

### Purlin and sleeve arrangement

The arrangements (below) indicate how the end bay purlins (P1 and P1X) and penultimate rafter sleeves are of the same heavier gauge material, whereas the inner bay purlins (P2, P3, P5, P5X, P6 and P6X) and sleeves are of the same lighter gauge material.

Typical single span arrangement indicating purlin and sleeve positions.

P1	P5	P3	P5X	P1X
P1	P5	P3	P5X	P1X
P1	P5	P3	P5X	P1X
P1	P5	P3	P5X	P1X
P1	P5	P3	P5X	P1X

In the arrangements below, the correct layout is given for both single span and double span applications.

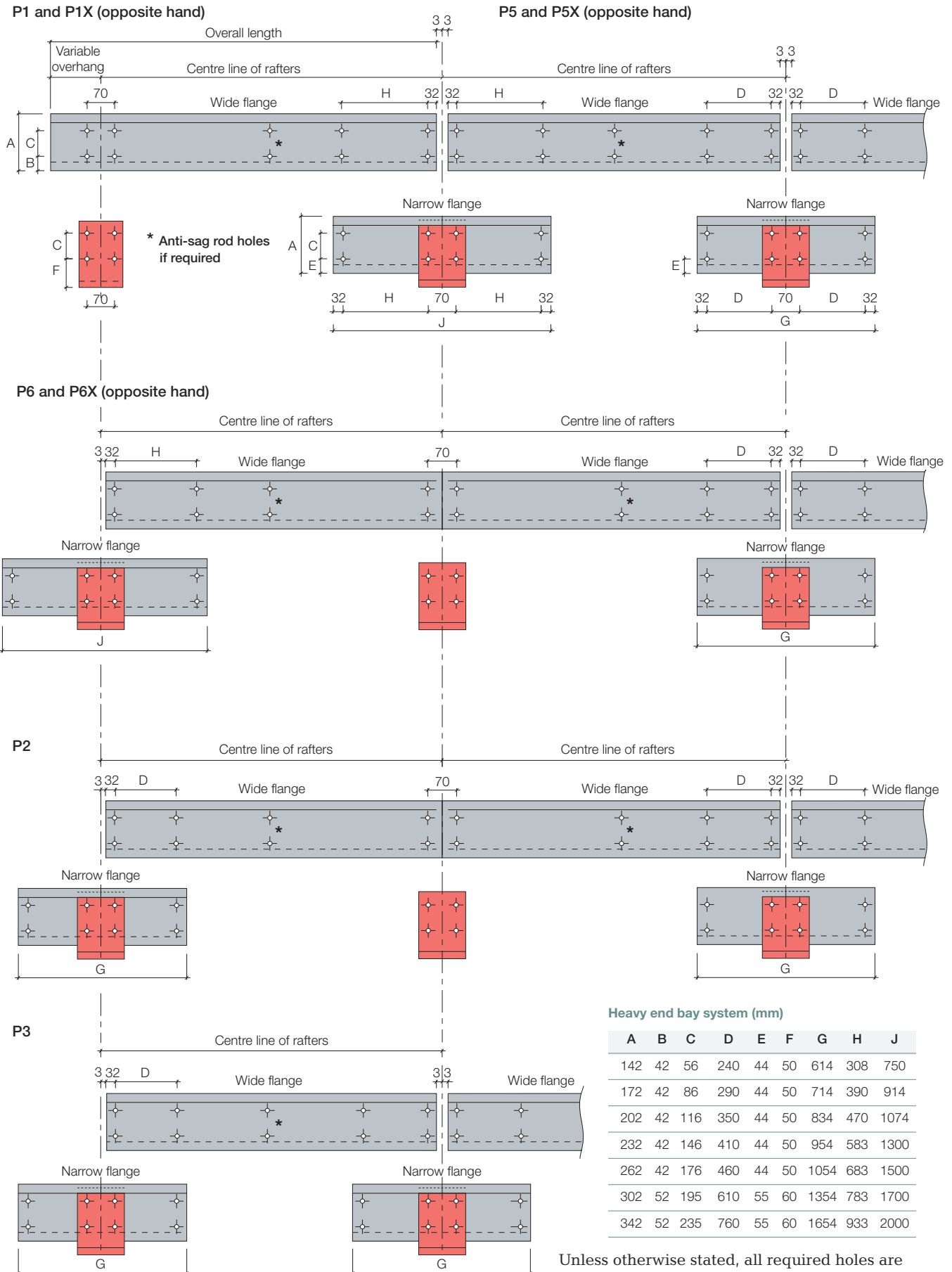
Note: a sleeve must always occur at a purlin joint position.

Typical double span arrangement indicating purlin and sleeve positions.

P1	P 6	P 2	P5X	P1X
P1	P5	P 2	P 6X	P1X
P1	P 6	P 2	P5X	P1X
P1	P5	P 2	P 6X	P1X
P1	P 6	P 2	P5X	P1X
P1	P5	P 2	P 6X	P1X



Note: consideration must be given to the handling of longer lengths



Unless otherwise stated, all required holes are 18mm diameter for M16 bolts and are normally pierced in pairs on standard gauge lines.

For 'General detailing' notes, see page 86

# Anti-sag rods and eaves braces

Metsec round lok anti-sag rods and lateral support angles are designed to restrain purlins against twist under wind uplift conditions and contribute support during sheeting.

Round lok anti-sag rods are used for 142, 172, 202, 232 and 262 series, and 45 x 45 x 2mm thick lateral support angles for 302 and 342 series. On roof pitches over 25°, purlin spacings over 2.4m or heavy cladding applications, the lateral support angles must be used on all sections.

When no anti-sag rods are used, temporary spacer bars and propping may be required during the sheeting of the roof.

Where no anti-sag rods are required for wind uplift, and for stability during erection and cladding, we recommend the inclusion of an eaves strut and apex tie.

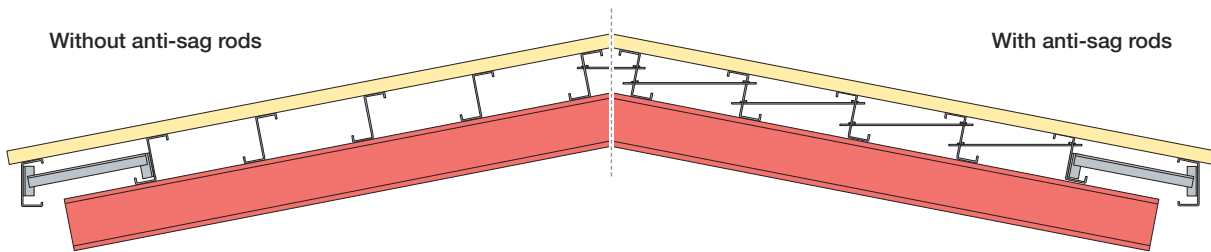
For roof pitches greater than 25°, use the MetSPEC computer design program to determine section and bracing requirements.

Whenever round lok anti-sag rods are used, the eaves brace should be included as indicated below and the rows made continuous over the apex.

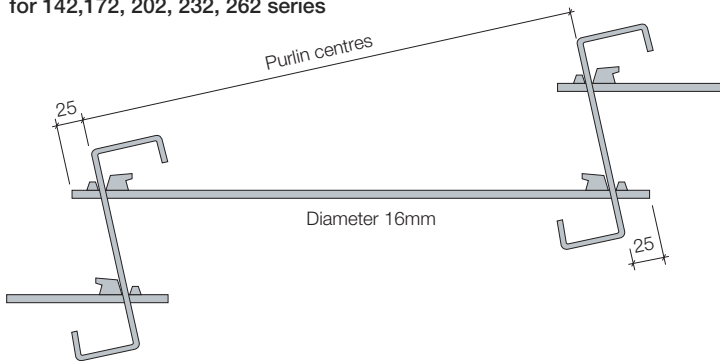
The bolted apex tie detail is adopted when using non-restraining cladding, 302 and 342 series purlins or roof pitches over 25°.

In all other cases where an anti-sag system is required, Metsec tubular sag rods and apex ties are to be used.

All eaves braces are manufactured from 45 x 45 x 2.0mm galvanised angle.



Round lok anti-sag rod for 142,172, 202, 232, 262 series



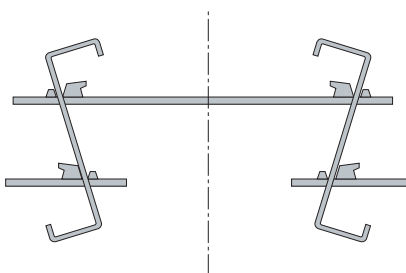
Wind uplift tables from pages 58-68 give the minimum anti-sag rod requirements for the various systems.

However, it is recommended that whatever the wind loading, the maximum span without anti-sag rods should be as shown in the tables.

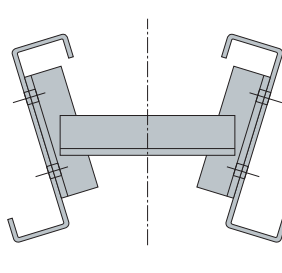
Sleeve, butt and end bays only for heavy end bay system

Purlin ref	Span (m)
142	6.1
172	6.6
202/232	7.2
262	7.6
302/342	8.1

Round lok apex tie



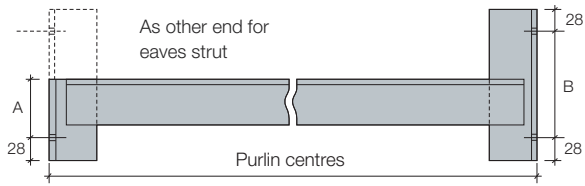
Bolted apex tie



Inner bays only for heavy end bay system

Purlin ref	Span (m)
142	6.6
172	7.2
202/232	7.6
262	8.1
302/342	8.6

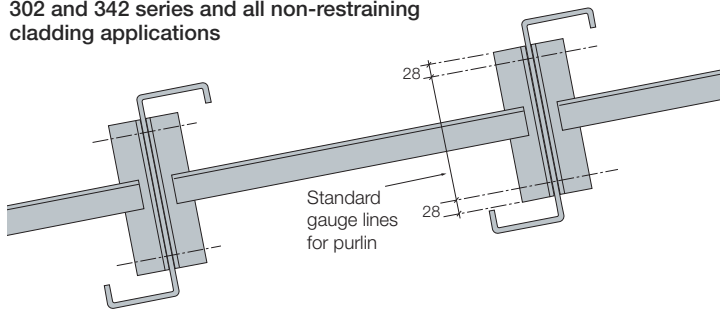
**Eaves braces**  
 142, 172, 202, 232 and 262 series as drawn. Eaves strut as noted



Section	142	172	202	232	262
A	28	43	58	73	88
B	56	86	116	146	176

All holes 18mm diameter for M16 bolts.

**Lateral support angle (sag bar)/eaves braces for 302 and 342 series and all non-restraining cladding applications**



Ricoh Arena, Coventry



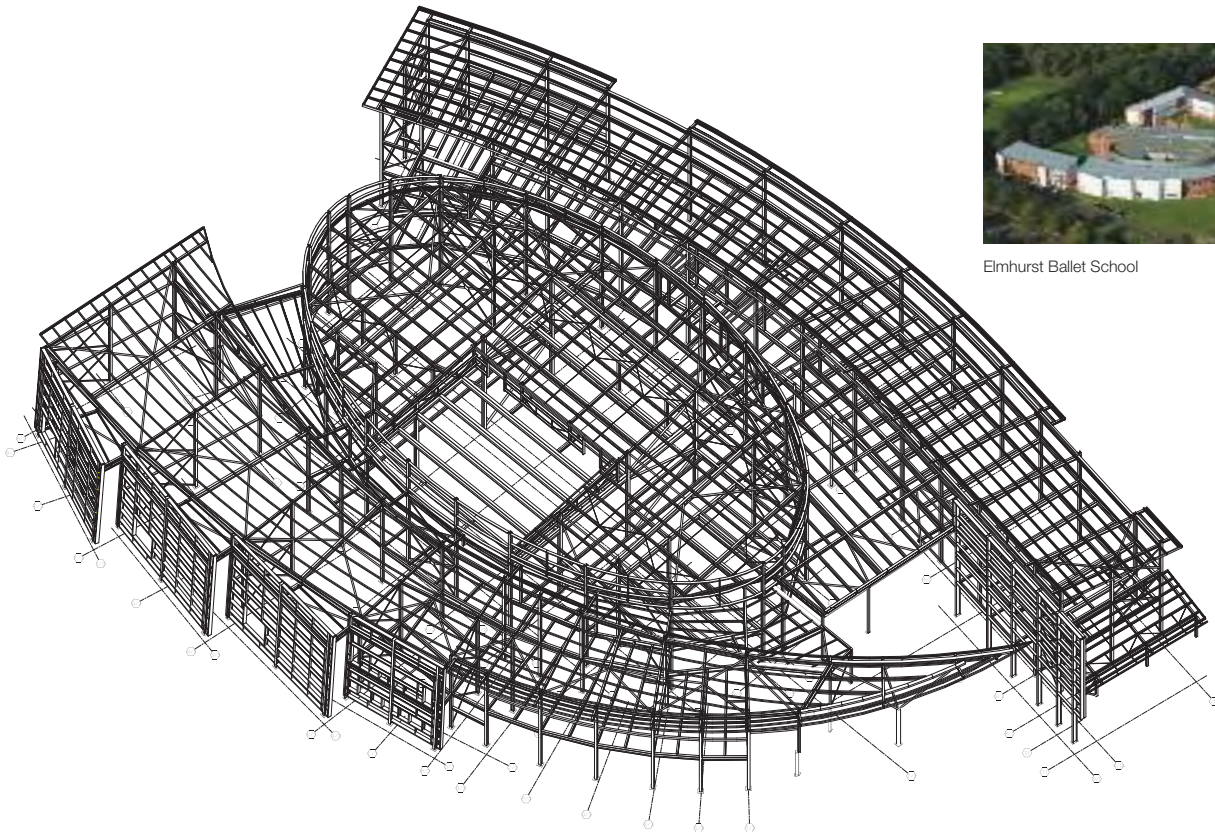
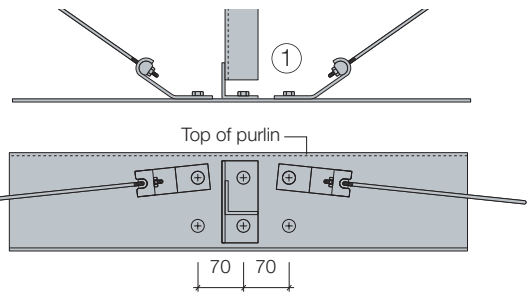
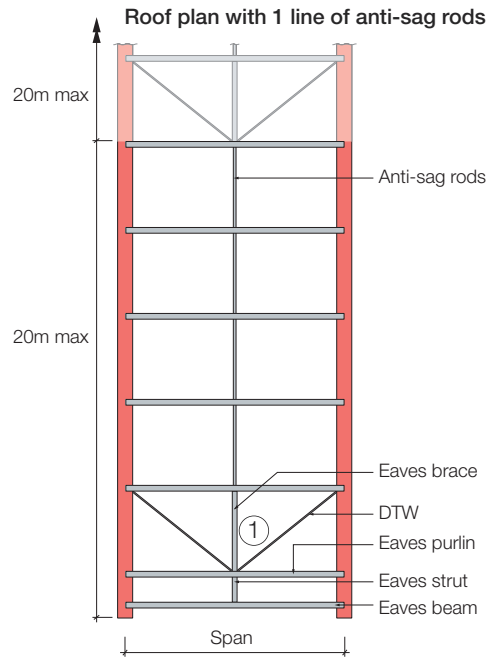
# Long roof slopes, length > 20m

1. For roof slopes less than 20m in length, diagonal tie wires can be omitted. Where no anti-sag rods are required for wind uplift and for stability during erection and cladding, we recommend the inclusion of an eaves strut and apex tie. Temporary spacer bars and propping may also be required.

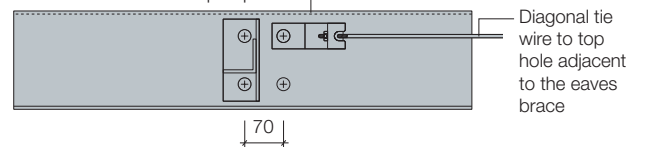
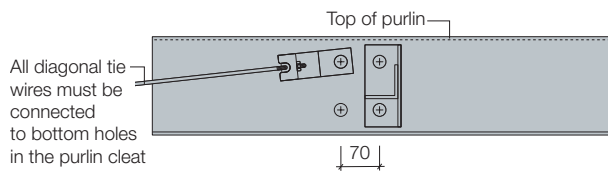
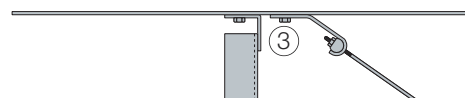
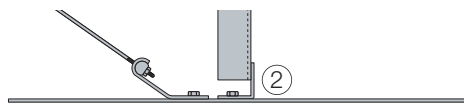
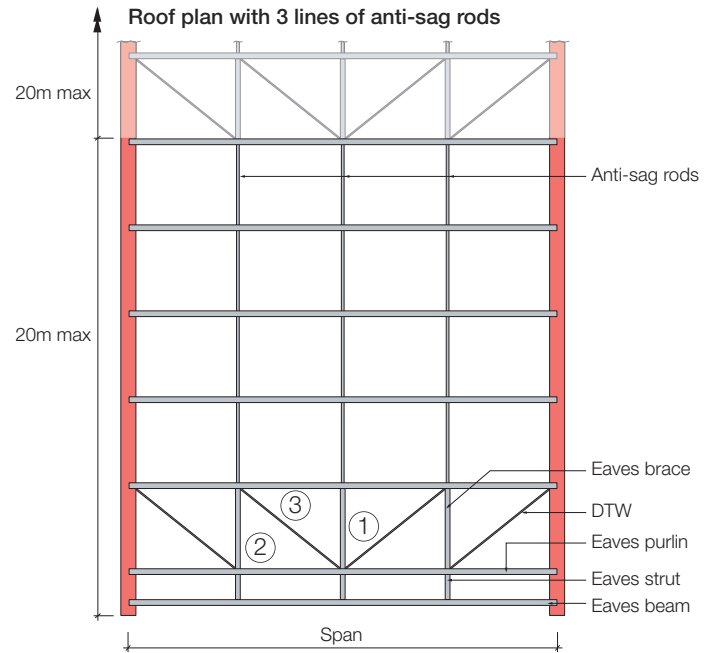
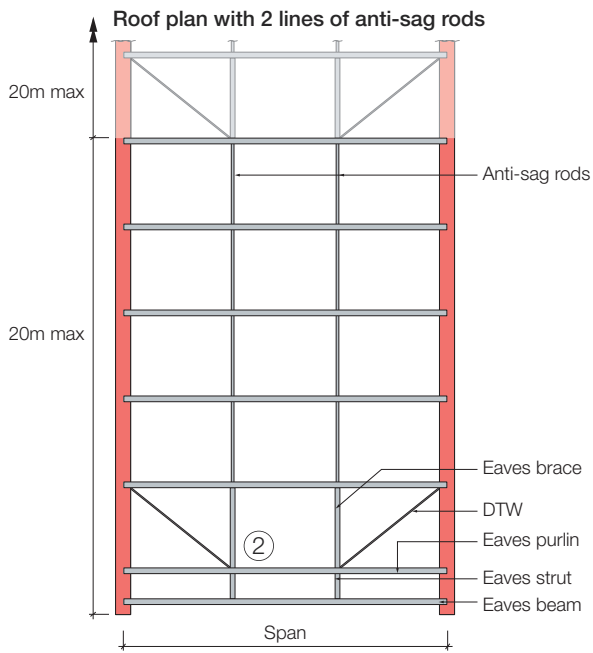
2. The details shown on this page assume that adequate restraint to the purlins is provided by the cladding or liner tray screw fixings at 600mm maximum spacings to the purlins. Additional screws may be necessary to zones of high local wind loads such as eaves and verges.

Note: an eaves strut may also be required to suit the design of the Metsec eaves beam.

Restraint fixing details should be similar to page 39-41 for vertical cladding.



Elmhurst Ballet School



TAG, Farnborough Airport

# Roof variations

## Non-restraining cladding

When using cladding which is not fixed in accordance with the detail shown in note 2 on page 18, it is necessary to provide permanent lateral restraint to the purlins. The MetSPEC purlin design software will provide a comprehensive design solution to any non-restraining cladding application.

Note: bolted apex struts and 45mm x 45mm lateral support angles must be used throughout.

## Steep slopes >25° pitch

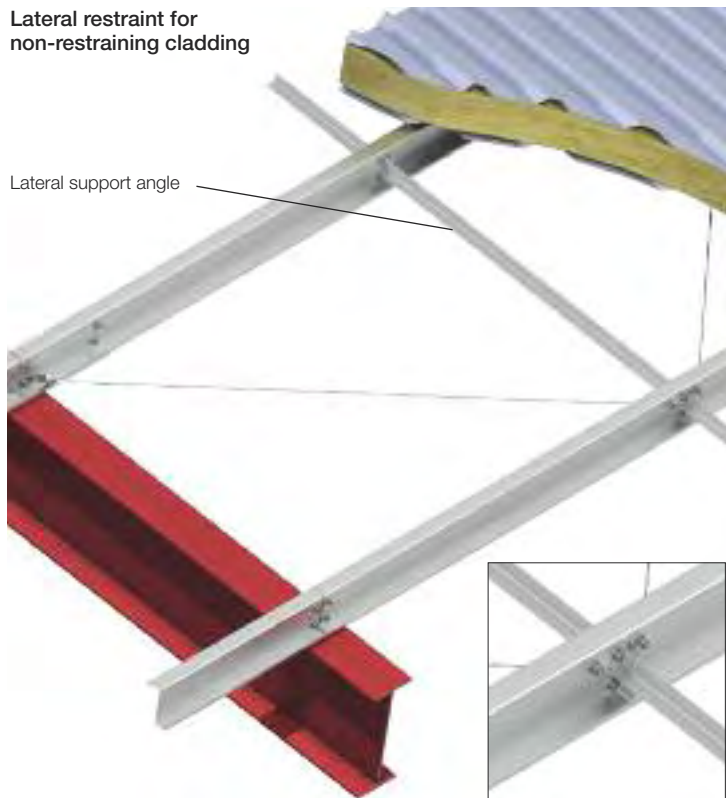
The sheeting and fixings are deemed adequate in carrying the component of load in the plane of the roof slope on pitches up to 25°. For roof pitches greater than 25°, the purlins are designed for the downslope roof loads. The MetSPEC purlin design software will quickly determine the purlin section and bracing requirements for any application.

Note: bolted apex struts and 45mm x 45mm lateral support angles must be used throughout in lieu of round lok anti-sag rods, as page 16-17.

## Mono-pitched roofs <25° pitch

For mono-pitch roofs which are discontinuous at the high eaves level, diagonal tie wires and braces must always be used as shown on pages 18-19.

However, if a structural member of adequate strength is available at the high eaves level, a threaded rod or eaves brace may be used, thereby avoiding the use of diagonal tie wires.



## Curved and barrel vault roofs

The relevant bracing requirements shown below will apply to the corresponding curved roof applications, provided that the cladding or liner tray offers adequate lateral support by virtue of its screw fixings at 600mm maximum spacings to the purlins.

## Bracing requirements check list

Component	Duo-pitch ≤ 25°		Mono-pitch ≤ 25°	Steep slopes >25° <small>and Purlin spacings &gt;2.4m in heavy cladding applications</small>	Tiled roofs	Non-restraining cladding
	Slope length ≤20m	>20m				
DTW	✓ Every 20m		✓ Every 20m	✓	✓	✓
Eaves brace	✓	✓	✓	✓	✓	✓
Anti-sag rods	✳	✳	✳			
Round lok apex tie	✓	✓				
45 x 45mm lateral support				✓	✓	✓
Bolted apex strut				✓	✓	✓

\* May be required for wind uplift or temporary support during sheeting see recommendations tabulated on page 16.

**Tiled roofs**

The Metsec lateral support angle, as shown, should be used in the roof plane and wherever possible, should be tied across the apex, or fixed to a laterally rigid component. In addition to this, diagonal tie wires must be installed as shown.

Bolted apex struts and 45mm x 45mm lateral support angles must be used throughout.

The MetSPEC purlin design software can be used to quickly determine the purlin section and bracing requirements for any application.

**Flat roofs**

The recent and more onerous requirements of Approved Document L of the Building Regulations relating to energy conservation have shifted the emphasis for thermal efficiency from the building structure to the building envelope.

Cladding contractors now demand tighter tolerances on purlins and side rails to ensure that the building is airtight and weathertight.

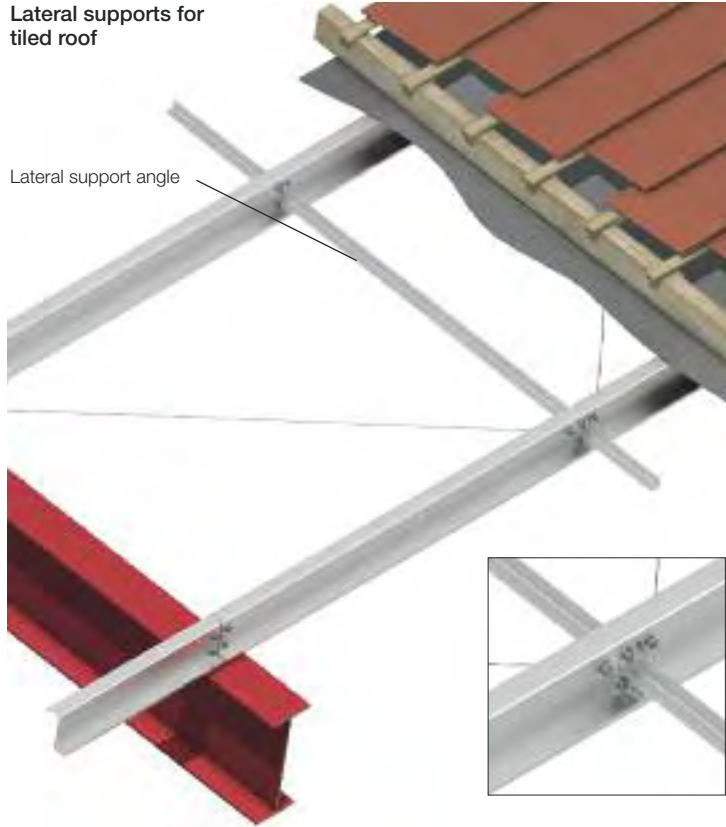
The National Federation of Roofing Contractors and the Metal Cladding and Roofing Manufacturers Association recommend a maximum allowable displacement of 10mm and 20mm for composite panels and built-up systems respectively, to ensure adequate fixings to the top flange of the purlin.

For this reason, the lateral displacement of the purlin due to its own weight after erection, should be considered for low pitched roofs <math>5^\circ</math>, where restraints (struts) are not provided.

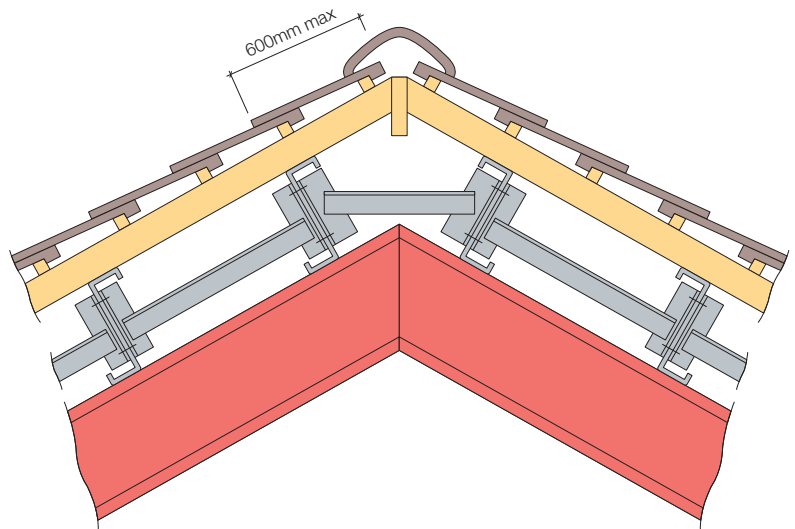
Whilst this may be relatively small, when added to the manufacturing tolerance of  $L/500$ , the resultant displacement may be outside the recommendations.

A check facility is provided on MetSPEC once the preferred purlin system has been selected.

Lateral supports for tiled roof



Section through ridge detail



Typical purlin arrangement (apex detail as above)

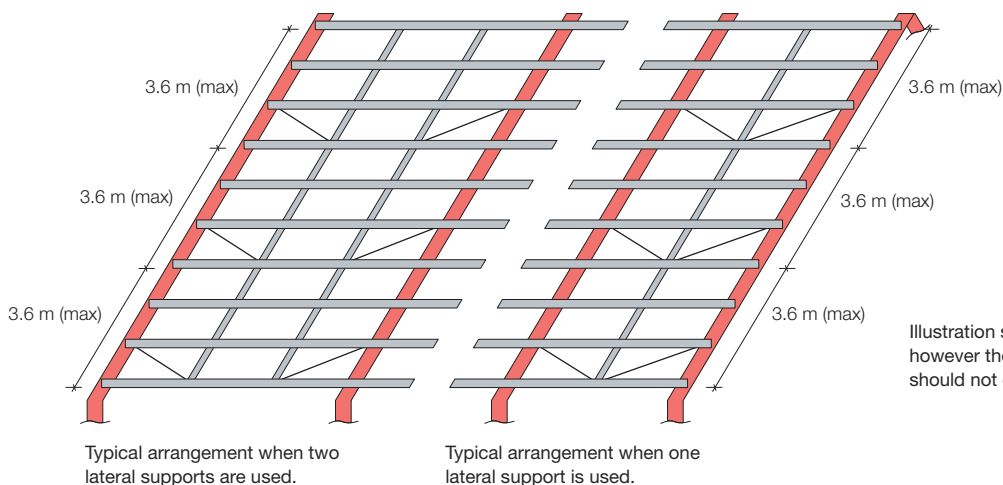
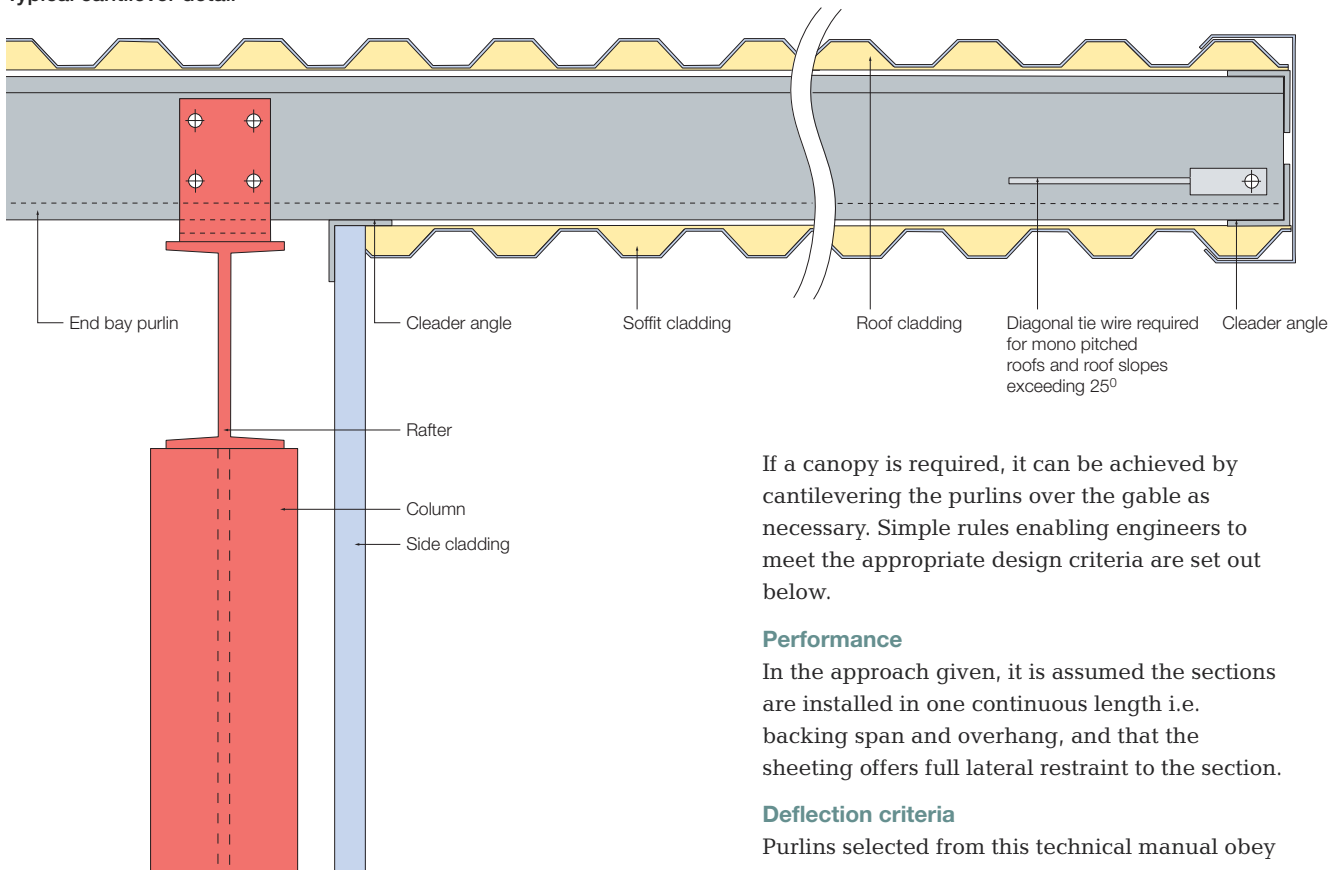


Illustration shows purlins at 1.2m centres, however the maximum purlin centres should not exceed 1.8m.

# Cantilever details

Typical cantilever detail



If a canopy is required, it can be achieved by cantilevering the purlins over the gable as necessary. Simple rules enabling engineers to meet the appropriate design criteria are set out below.

### Performance

In the approach given, it is assumed the sections are installed in one continuous length i.e. backing span and overhang, and that the sheeting offers full lateral restraint to the section.

### Deflection criteria

Purlins selected from this technical manual obey a deflection criteria of span/180 for conventional steel decking.

The end deflection of a cantilever should be compatible with this criteria and we recommend that the cantilever should not exceed 28% of the backing span to meet this requirement.

### Stability

With cantilevers, it is recommended that the ends are braced together to provide stability and prevent rotation. Various details are used for this purpose with a typical example shown.

A cleader angle fixed to the top and the bottom of the purlin will offer sufficient restraint as well as providing a base for fixing the sheeting and flashing. Cleader angles should be positively fixed across the apex to prevent downslope movement.

### Mono pitched roofs and roof slopes exceeding 25°

Diagonal tie wire systems are to be included. Alternatively, a suitable fixing to a structural member must be included at the top of the slope to resist downslope movement.

Diagonal tie wires must be fixed back to the bottom holes in the purlin cleat.

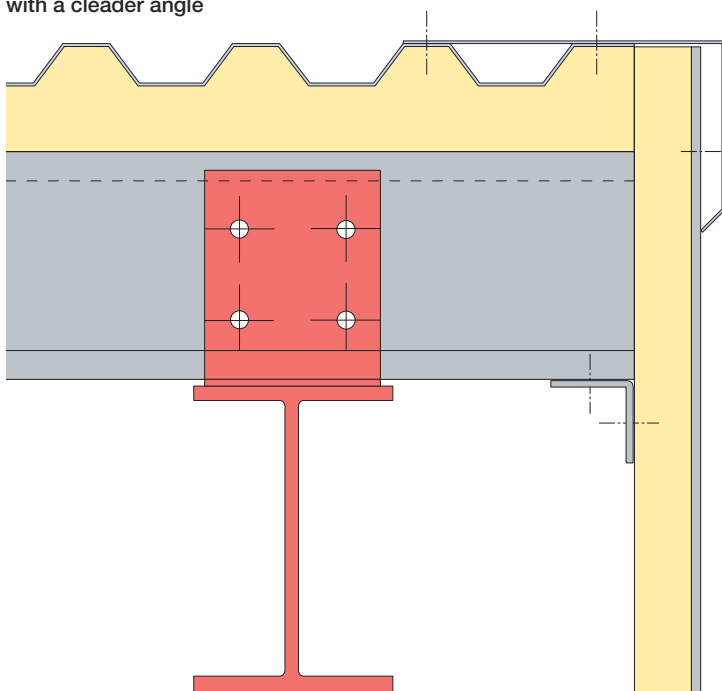
Note: for other specialist cases or heavier cladding systems (i.e. tiles and battens), consult our design office for advice.



St. Pancras, London

# Cleader angles and rafter stays

Typical detail showing the side cladding fixed to the purlin with a cleader angle



Rafter stays supplied by Metsec are normally 45 x 45 x 2mm thick angle. On deep sections or lattice trusses, it may be necessary to increase the size of the angle section used to suit the individual contract requirements. Please refer to MetSPEC for further details.

### Cleader angles

Metsec cleader angles are manufactured from pre-hot dipped galvanised steel angle. They are used to provide a sheeting face for cladding along gable rafters or at roof hip intersections.

Two sizes of cleader angle are available:

- 45 x 45 x 2mm thick = 1.37 kg/m
- 100 x 100 x 2mm thick = 3.17 kg/m
- Maximum length = 7.5m

We suggest that the 45 x 45 x 2mm cleader angle is used on purlin centres up to and including 1.8m. Above this, the 100 x 100 x 2mm cleader angle should be used.

The illustrations below show cleader spanning over two purlin spacings, however multiple spacings can be readily accommodated. Providing the thickness of the cleader angle does not present any problems, a simple overlap can be used. The overall length would therefore be the purlin centres plus 28mm each end.

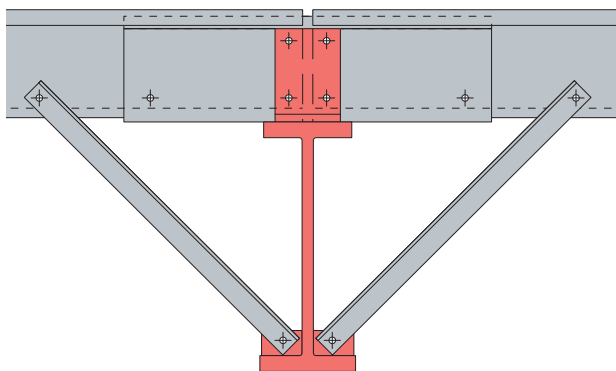
The cleader angle can be fitted to either the top or bottom purlin flange to suit the required detail.

### Rafter stays

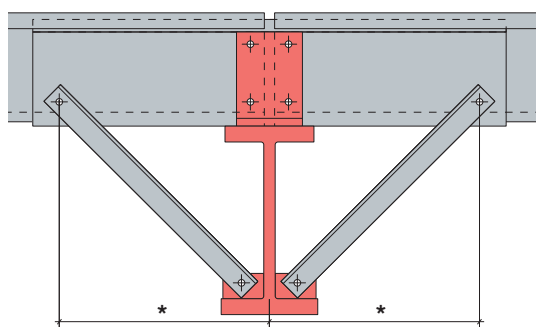
Where the supporting steelwork is constructed using deep universal beam sections, lattice trusses, etc., rafter stay fixing holes can be added to suit individual requirements. The ideal angle for rafter stays is 45°.

Where possible, the standard sleeve fixing holes may be used for rafter stay fixings, providing the inclination of the stay is not too steep.

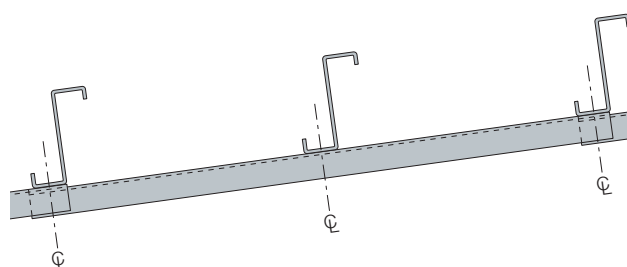
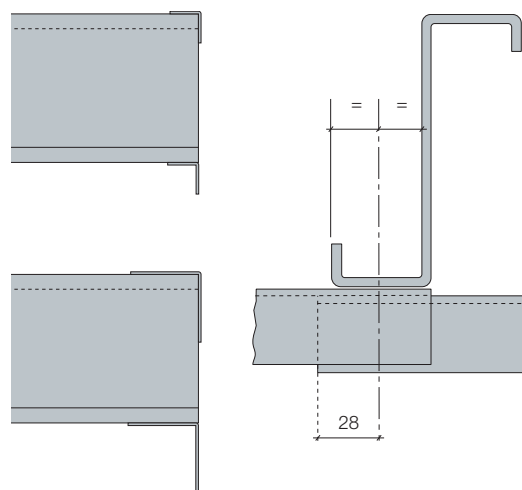
Positioning of rafter stay holes on deeper rafters



Sleeve fixing hole positions



\*Dimension to suit standard sleeve piercing



# Eaves beams

## Dimensions and properties

The Metsec eaves beam is a purpose-designed profile for use as an eaves purlin, top sheeting rail and gutter support.

### Maximum span

The Metsec eaves beam caters for spans up to 15m depending on the load to be applied.

### Performance

Metsec eaves beams are designed as single span beams with combination loading in accordance with BS 5950: Part 5: 1998.

The load tables on page 76 represent their performance under the conditions stated but cannot cover all of the many functions possible. For this reason, and to help the designer, comprehensive geometrical design data is given in the physical properties table, below.

### Specification

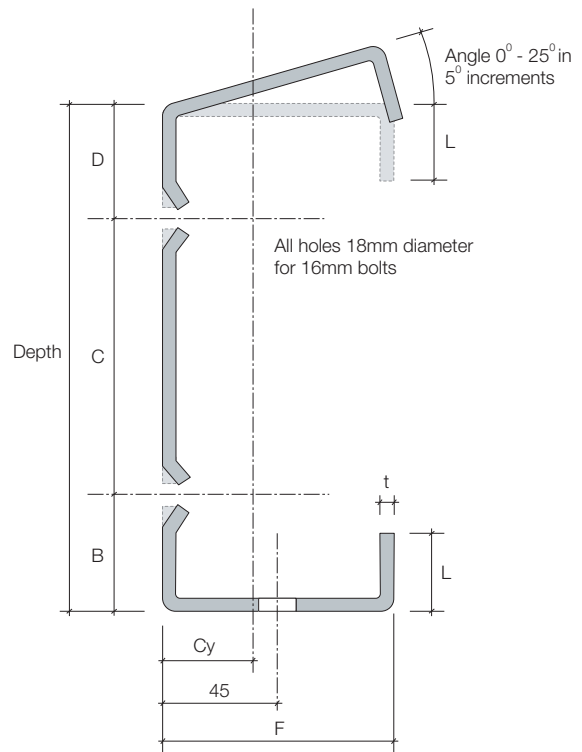
Eaves beams are manufactured from pre-hot dipped galvanised steel, G275 coating and with a minimum guaranteed yield strength of 450 N/mm<sup>2</sup>.

### Capacity

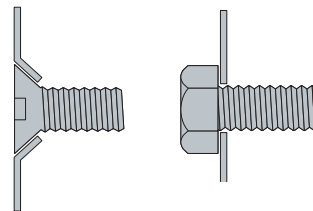
Based on single span condition.

Web holes can be plain or counterformed to suit the fixing requirement.

Note: for bracing requirement see page 16-19.



### Web hole options



### Nominal dimensions

Section Reference	Weight kg/m	Area cm <sup>2</sup>	Depth mm	Flange mm	L mm	t mm	Dim B mm	Dim C mm	Dim D mm
170 E 20	5.89	7.50	170	90	19	2.0	42	86	42
170 E 23	6.73	8.58	170	90	19	2.3	42	86	42
230 E 20	6.83	8.70	230	90	19	2.0	42	146	42
230 E 25	8.47	10.79	230	90	19	2.5	42	146	42
270 E 25	9.76	12.44	270	100	22	2.5	47	176	47
270 E 29	11.27	14.35	270	100	22	2.9	47	176	47
330 E 30	12.58	16.03	330	90	22	3.0	47	235	48

### Section Properties

Ixx cm <sup>4</sup>	Iyy cm <sup>4</sup>	Zxx cm <sup>3</sup>	Zyy cm <sup>3</sup>	rx cm	ry cm	Cy cm	Q	Mc,x kNm	Mc,y kNm
368.1	84.0	43.31	13.93	6.96	3.32	2.97	0.621	16.538	6.268
420.4	95.5	49.45	15.84	6.95	3.31	2.97	0.698	20.548	7.128
734.6	92.5	63.88	14.41	9.14	3.24	2.58	0.542	23.001	6.485
909.3	113.5	79.07	17.69	9.11	3.22	2.58	0.646	32.501	7.960
1429.2	162.0	105.87	22.55	10.65	3.59	2.81	0.582	40.623	10.147
1646.6	185.5	121.97	25.82	10.63	3.57	2.82	0.648	50.634	11.619
2558.9	156.2	155.09	22.99	12.54	3.10	2.20	0.597	63.283	10.347



TAG, Farnborough Airport

**Fixing details**

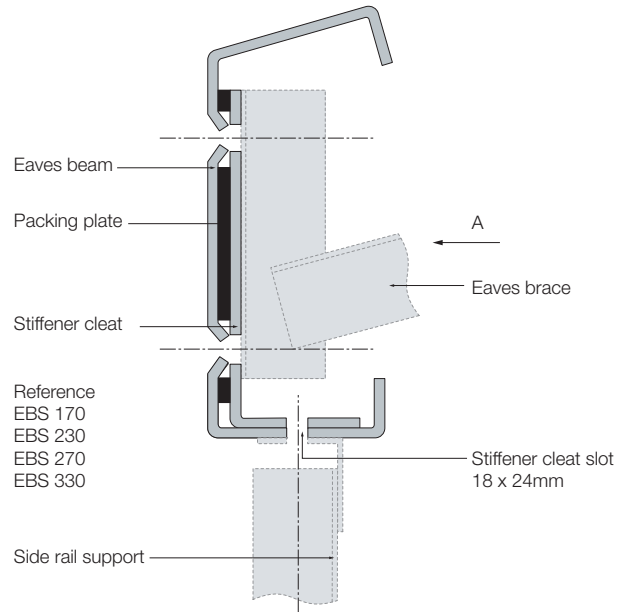
Metsec eaves beams are designed to provide an unobstructed side sheeting face by the use of counterformed web holes that accept 16mm diameter countersunk set screws.

The packing plate accommodates the counterforming and enables standard eaves braces to be fitted, though the overall length of the eaves brace needs to be reduced by 6mm.

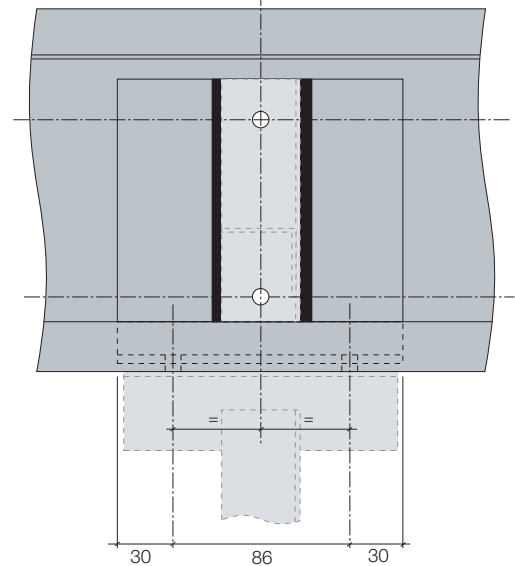
Plain web holes can be supplied and in such cases, the packing plate is not required and conventional 16mm diameter XOX bolts are used.

**Use of stiffener cleats**

Side rail support systems up to a sheeting height of 10m (see page 39 for recommendations) can be suspended from the bottom flange of the eaves beam. In such cases, a stiffening cleat (galvanised finish) must be included and the eaves brace overall length reduced by a further 6mm (cleat thickness).

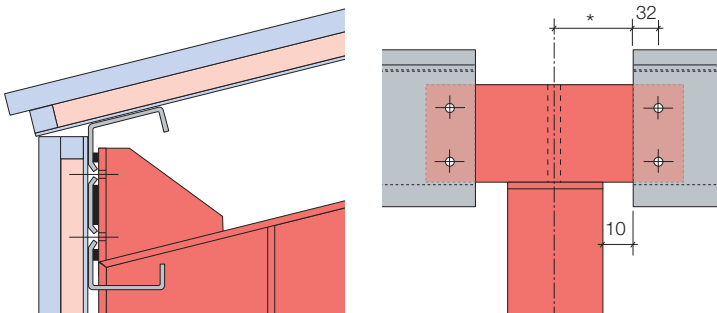


View in direction of arrow A



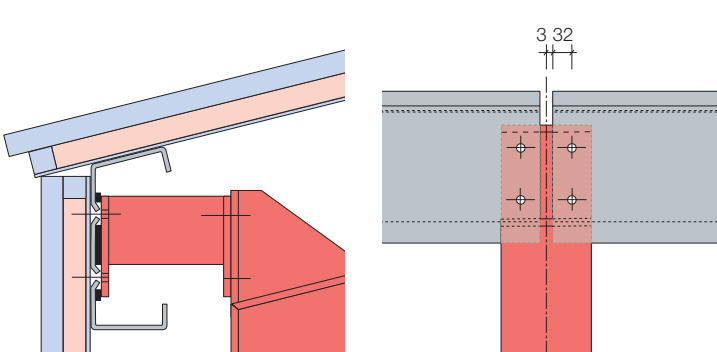
**Cladding flush with column face**

\* Overall length of eaves beam is column centres less half column width each end less 20mm (i.e. 10mm each end).



**Cladding outside column face**

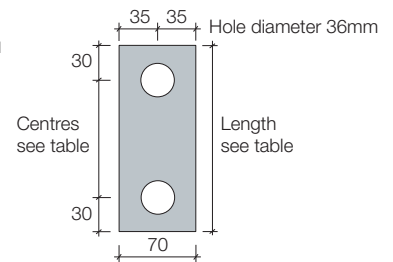
Overall length of eaves beam is column centres less 6mm (i.e. 3mm each end).



End fixing cleat (supplied by others) bolted or welded to column.

**Packing plate**

Material - 6mm mild steel galvanised finish

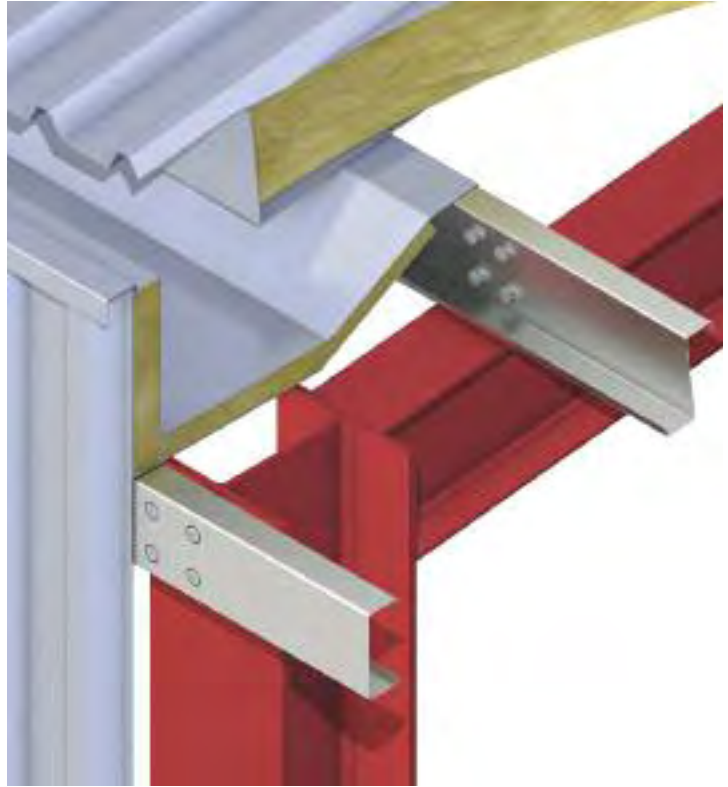


Ref No.	Section series	Centres mm	Length mm
PP 142	142	56	116
PP 172	172/170	86	146
PP 202	202	116	176
PP 232	232/230	146	206
PP 262	262/270	176	236
PP 302	302	195	255
PP 342	342/330	235	295

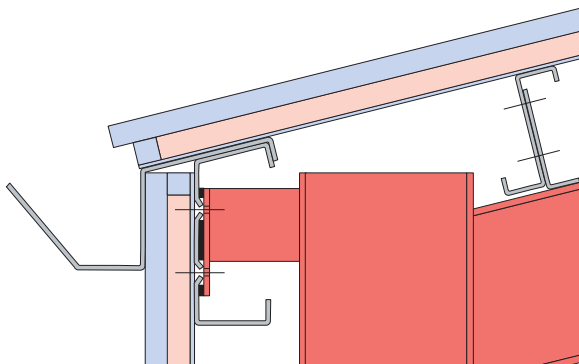
# Gutter details

Eaves beams and purlins should be selected from their respective load tables.

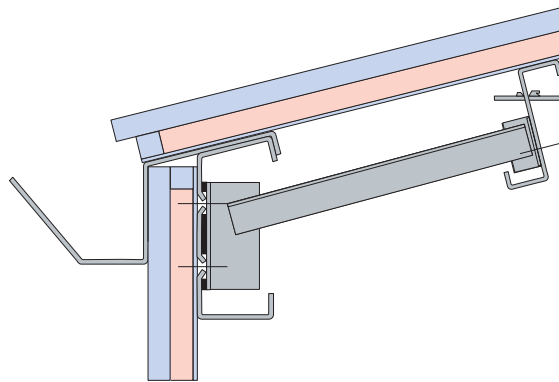
If necessary, non-standard eaves braces can be fabricated to suit individual cases. It is essential to use bolted web connections when fixing eaves beams to stanchions. The use of an eaves brace is necessary within the span of the eaves beam to resist horizontal wind loading and torsion from eccentric gutter loads. When braced to the first purlin, as shown in the details below, such forces are dispersed through the diaphragm action of the roof. It is assumed that the compression flange of the eaves beam is fully restrained by the sheeting.



## Exposed eaves gutters

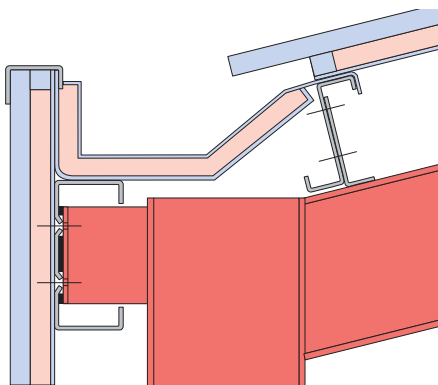


Detail at column

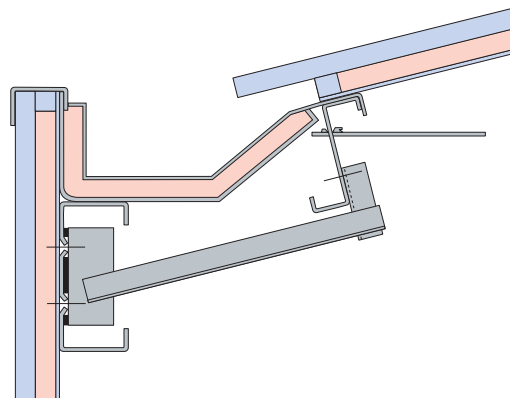


Detail within span

## Concealed eaves gutter details



Detail at column



Detail within span

### Curved eaves detail

The purlin and side rail systems can be used to provide support to roof and side cladding using the appropriate load table for the system in question.

Eaves braces and the side rail support system should be used dependent on span and loading requirements.

### Concealed eaves gutter

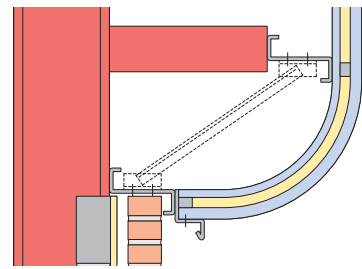
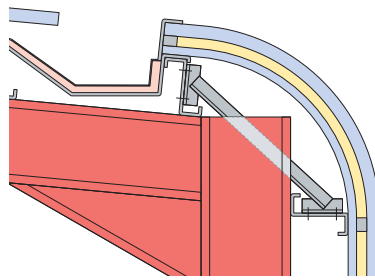
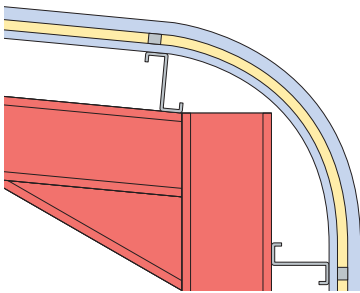
The concealed gutter is accommodated in conjunction with the curved eaves detail with support given to the lower roof purlin by the sloping eaves purlin support shown and the rainwater gutter.

The special sloping eaves purlin support can be supplied by Metsec if required. The side rail support system should be used dependent on span and loading requirements.

### Curved base detail

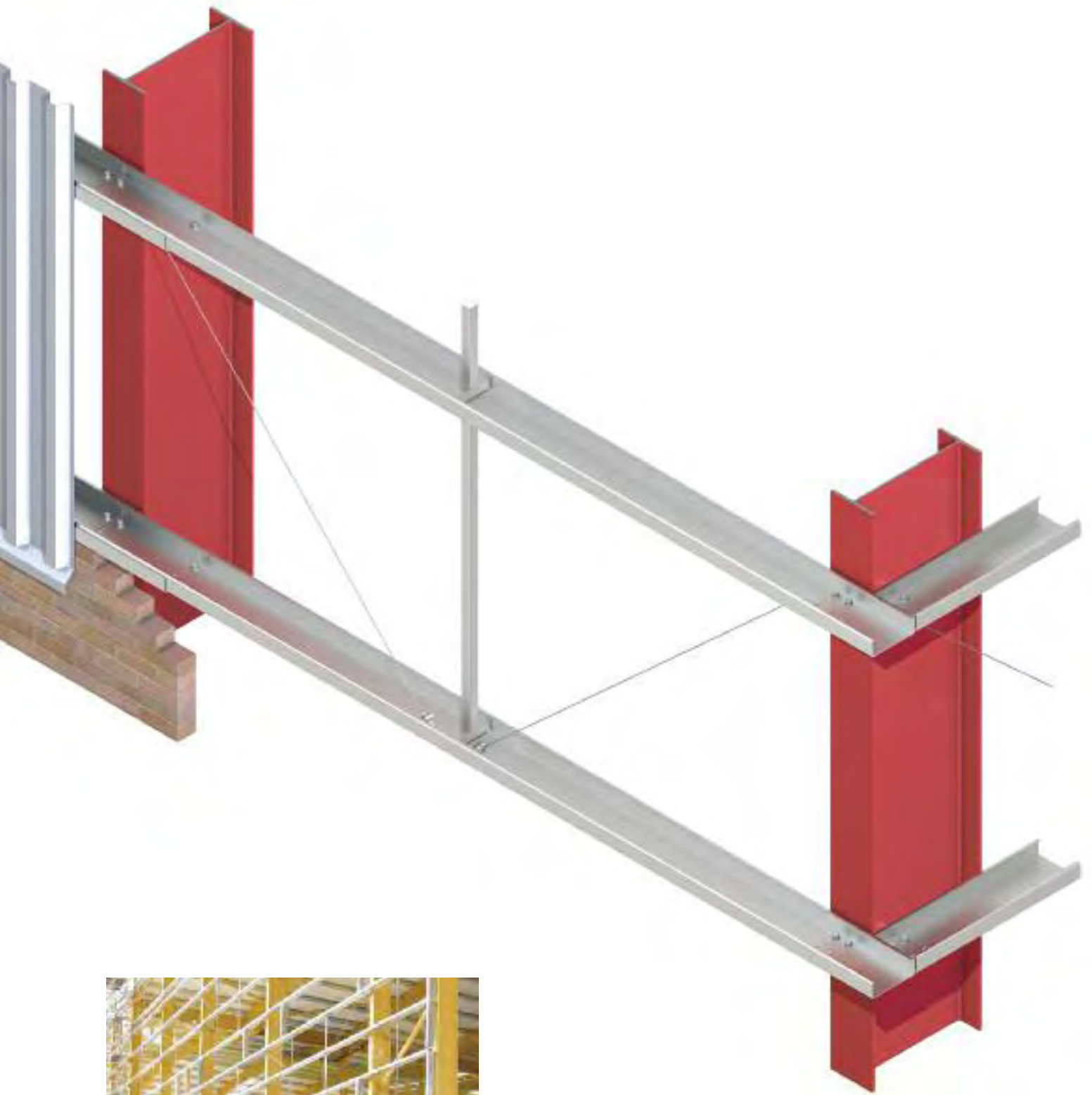
To complement the curved eaves detail, a support system should be included at the base of the side cladding as shown. The sloping side rail support member being included is dependent upon span and loading requirements.

If support can be taken from the masonry, the sloping side rail support may be omitted.



Chill Factor, Manchester

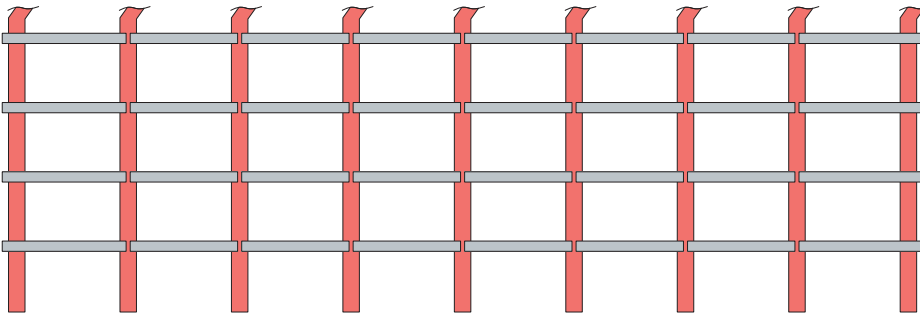
# Side rail systems



# C and Z-section side rail systems

## Jointing arrangements

1 bay minimum and column spacing up to 15m

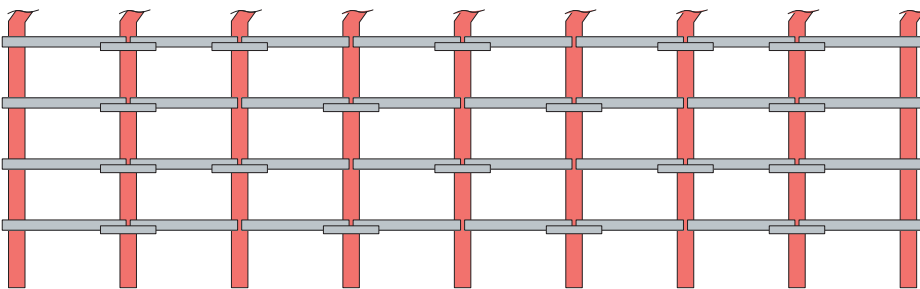


### Butt system

This system can cater for odd bays and can be used in both inset and oversail applications.

load tables 74-76
C-section details 30
Z-section details 31

2 bays minimum and column spacing up to 15m

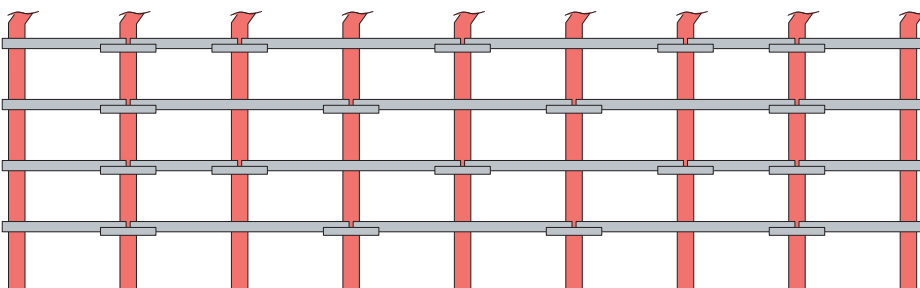


### Sleeved system single span lengths

Sleeves are fitted at penultimate column connections and staggered on internal bays.

load tables 71-73
C-section details 32-33
Z-section details 34-35

4 bays minimum and column spacing up to 7.5m

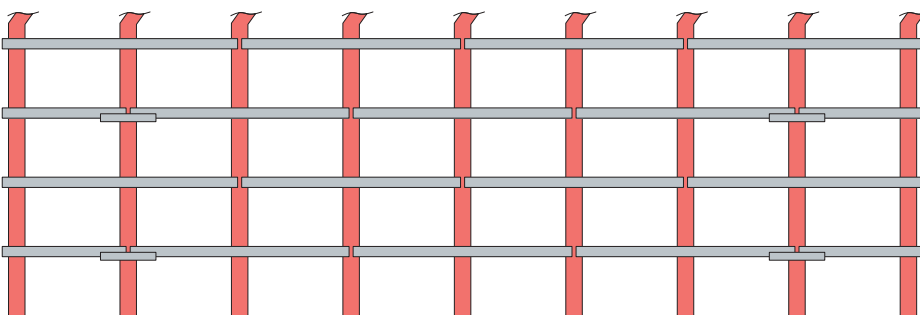


### Sleeved system double span lengths

Sleeves are fitted at penultimate column connections and staggered on internal bays.

load tables 71-73
C-section details 32-33
Z-section details 34-35

2 bays minimum and column spacing up to 7.5m



### Double span system window and brickwork restraints only

This system is used when deflection is critical i.e. glazing supports and brickwork restraints.

The sleeve is only included when an odd number of bays is encountered.

load tables 77
C-section details 36-37

# C-section butt side rail system

Side rails - C-section butt system suitable for buildings with single bays or more

The butt system offers a simple cleat connection and is intended for smaller buildings, short or uneven spans, or light loading conditions.

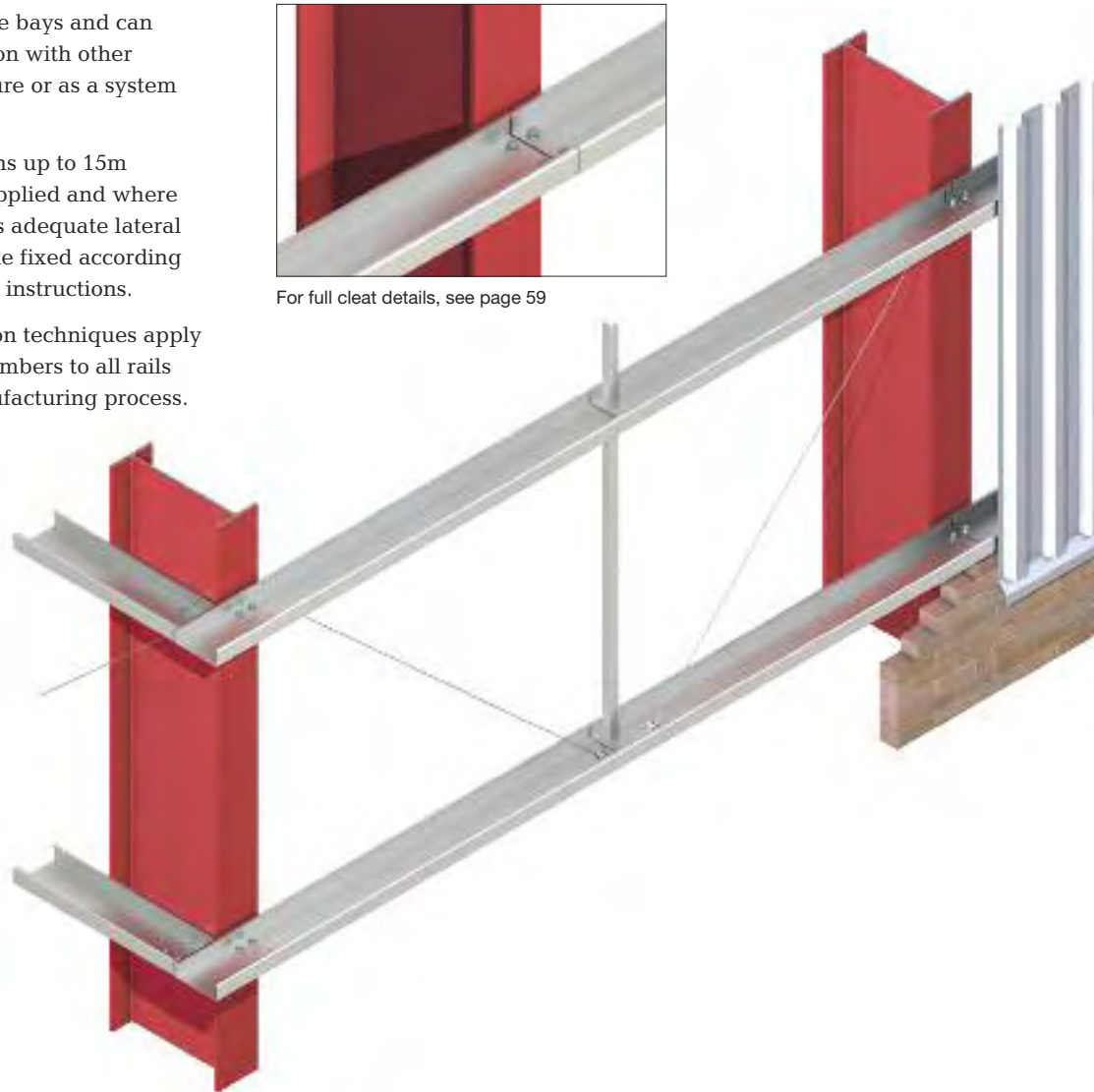
This system can cater for single bays and can therefore be used in conjunction with other systems detailed in this brochure or as a system in its own right.

The butt system caters for spans up to 15m depending on the load to be applied and where the cladding or liner tray offers adequate lateral support by virtue of its fixing: ie fixed according to the cladding manufacturer's instructions.

Computer controlled production techniques apply the client's individual mark numbers to all rails automatically during the manufacturing process.



For full cleat details, see page 59



## Single span layout

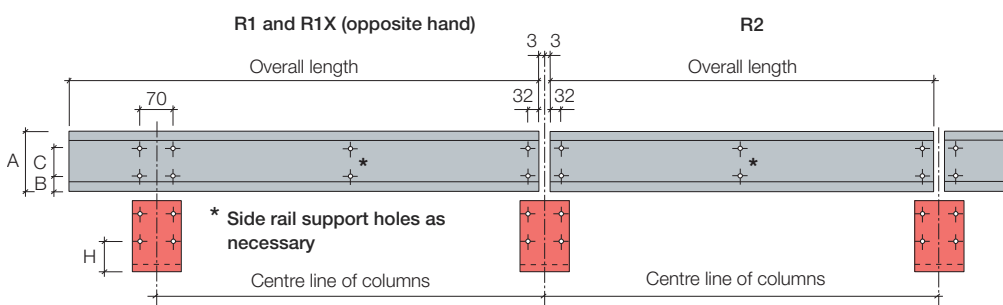
Single span lengths plus a variable overhang at each end

R1	R2	R2	R2	R1X
R1	R2	R2	R2	R1X
R1	R2	R2	R2	R1X
R1	R2	R2	R2	R1X
R1	R2	R2	R2	R1X
R1	R2	R2	R2	R1X



Unless otherwise stated, all required holes are 18mm diameter for M16 bolts and are normally pierced in pairs on standard gauge lines.

For 'General detailing' notes, see page 86.



Butt system (mm)

A	B	C	H
142	43.0	56	50
172	43.0	86	50
202	43.0	116	50
232	43.0	146	50
262	43.0	176	50
302	53.5	195	60
342	53.5	235	60

# Z-section butt side rail system

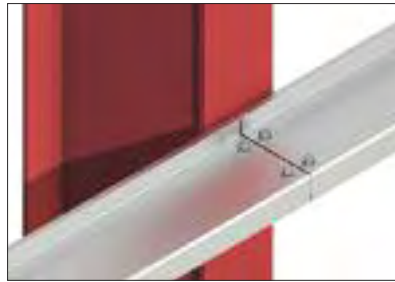
Side rails - Z-section butt system suitable for buildings with single bays or more

The butt system offers a simple cleat connection and is intended for smaller buildings, short or uneven spans, or light loading conditions.

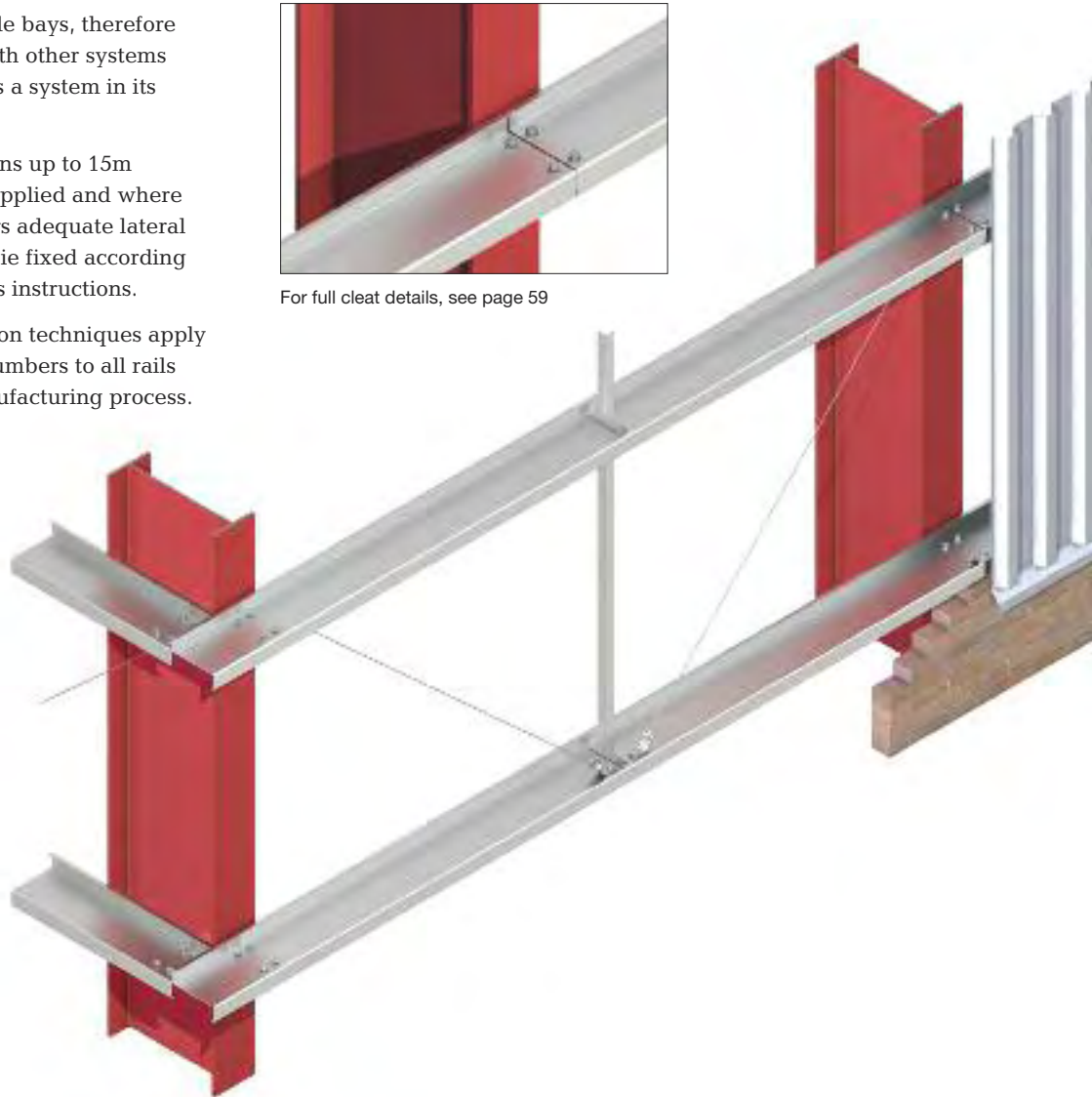
This system can cater for single bays, therefore can be used in conjunction with other systems detailed in this brochure, or as a system in its own right.

The butt system caters for spans up to 15m depending on the load to be applied and where the cladding or liner tray offers adequate lateral support by virtue of its fixing: ie fixed according to the cladding manufacturer's instructions.

Computer controlled production techniques apply the client's individual mark numbers to all rails automatically during the manufacturing process.



For full cleat details, see page 59



## Single span layout

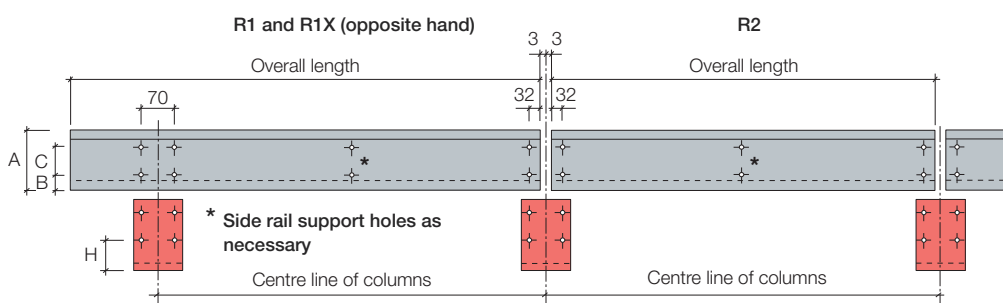
Single span lengths plus a variable overhang at each end

R1	R2	R2	R2	R1X
R1	R2	R2	R2	R1X
R1	R2	R2	R2	R1X
R1	R2	R2	R2	R1X
R1	R2	R2	R2	R1X
R1	R2	R2	R2	R1X



Unless otherwise stated, all required holes are 18mm diameter for M16 bolts and are normally pierced in pairs on standard gauge lines.

For 'General detailing' notes, see page 86.



Butt system (mm)

A	B	C	H
142	42.0	56	50
172	42.0	86	50
202	42.0	116	50
232	42.0	146	50
262	42.0	176	50
302	52.0	195	60
342	52.0	235	60

# C-section sleeved side rail system

## For buildings with 2 bays or more

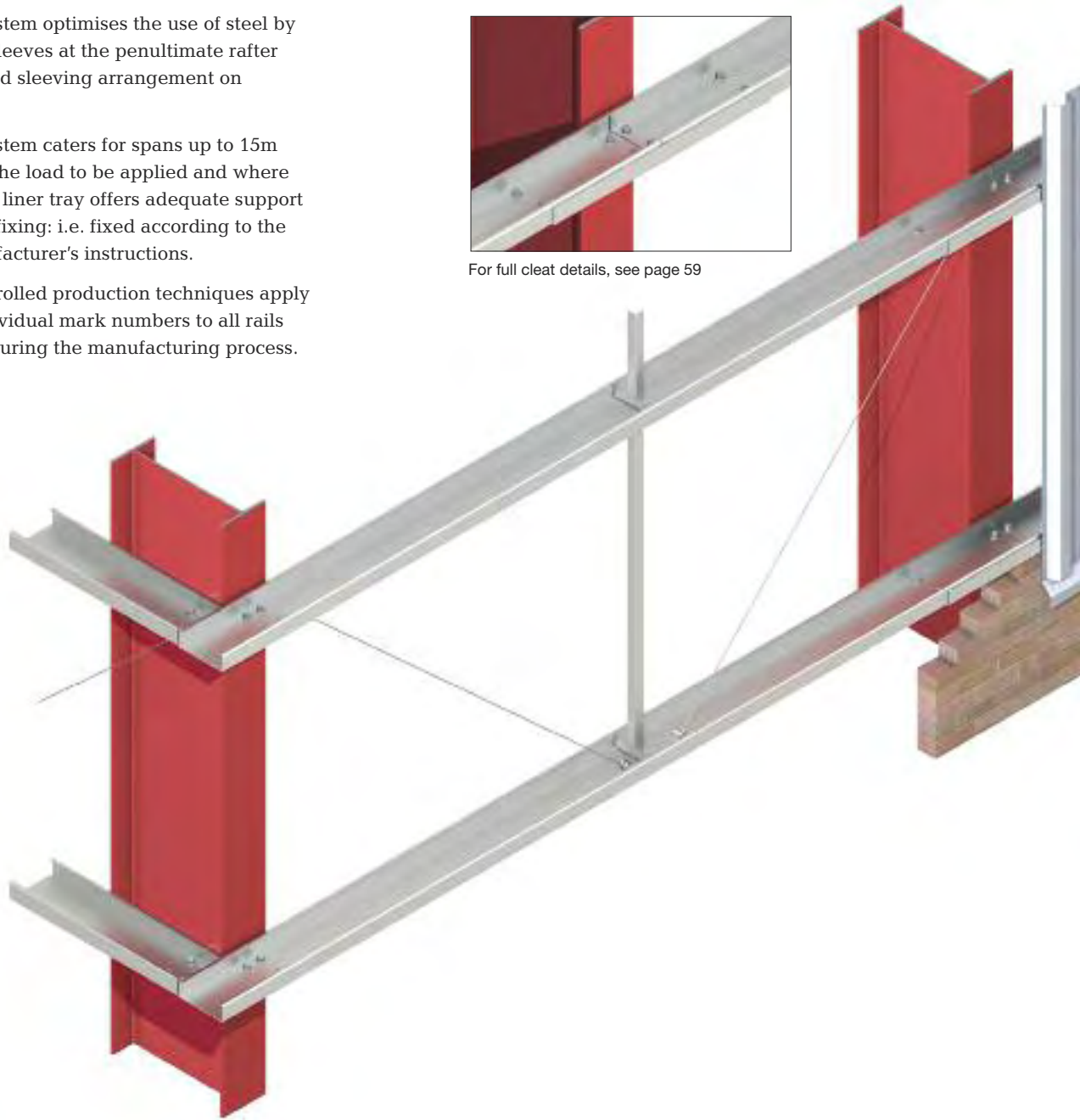
The sleeved system optimises the use of steel by incorporating sleeves at the penultimate rafter with a staggered sleeving arrangement on internal bays.

The sleeved system caters for spans up to 15m depending on the load to be applied and where the cladding or liner tray offers adequate support by virtue of its fixing: i.e. fixed according to the cladding manufacturer's instructions.

Computer controlled production techniques apply the client's individual mark numbers to all rails automatically during the manufacturing process.



For full cleat details, see page 59



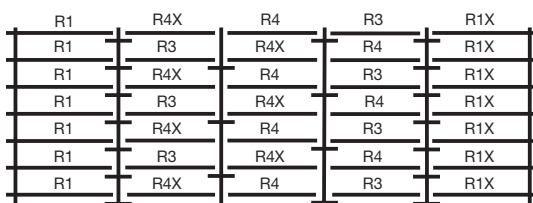
### Single span system

Single span lengths can be supplied to suit individual requirements. Penultimate rafter connections are sleeved with a staggered sleeving arrangement on internal bays.

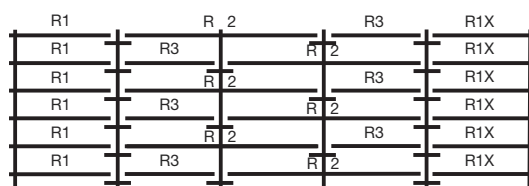
### Double span system

End bay rails are single span, with double span rails on internal bays. The maximum double span rail is 15m, therefore the maximum span between columns is 7.5m. A sleeve must occur at every joint position.

Typical single span arrangement indicating rail and sleeve positions.



Typical double span arrangement indicating rail and sleeve positions.

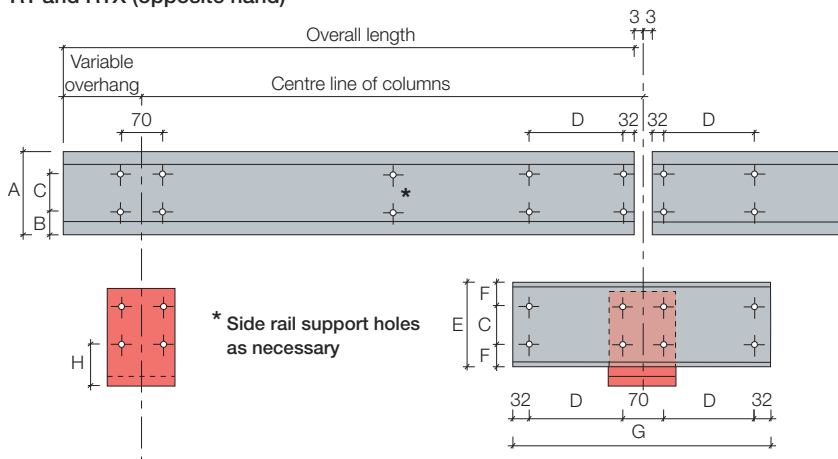


Note: consideration must be given to the handling of longer lengths



## Detailing

### R1 and R1X (opposite hand)

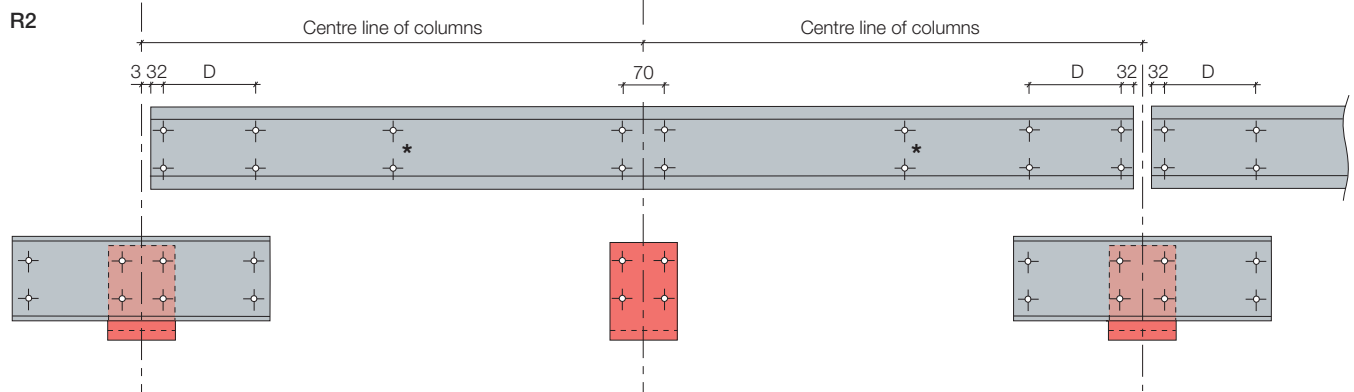


### C-section sleeves

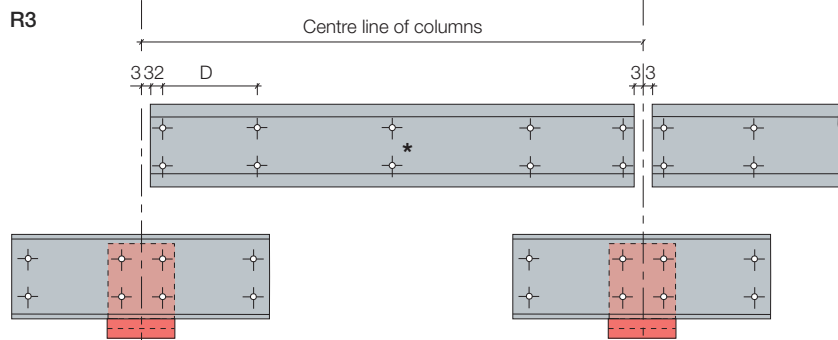
The C-section sleeve range includes one thickness per height of profile as shown on the table below.

Ref No.	Thickness mm	Weight kg
CS 142	2.0	2.64
CS 172	2.5	4.35
CS 202	2.7	6.00
CS 232	2.5	6.94
CS 262	2.9	9.55
CS 302	2.9	15.26
CS 342	3.0	20.81

### R2



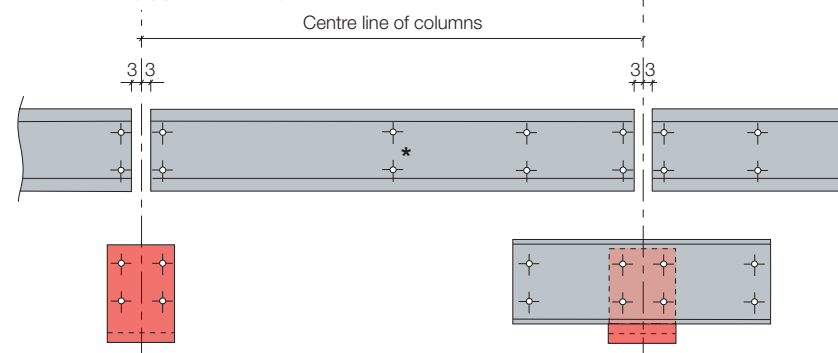
### R3



### C-section sleeved system (mm)

	A	B	C	D	E	F	G	H
142	43.0	56	240	147	45.5	614	50	
172	43.0	86	290	177	45.5	714	50	
202	43.0	116	350	207	45.5	834	50	
232	43.0	146	410	238	46.0	954	50	
262	43.0	176	460	268	46.0	1054	50	
302	53.5	195	610	308	56.5	1354	60	
342	53.5	235	760	349	57.0	1654	60	

### R4 and R4X (opposite hand)



Unless otherwise stated, all required holes are 18mm diameter for M16 bolts and are normally pierced in pairs on standard gauge lines.

For 'General detailing' notes, see page 86.

# Z-section sleeved side rail system

For buildings with 2 bays or more

The sleeved system optimises the use of steel by incorporating sleeves at the penultimate rafter with a staggered sleeving arrangement on internal bays.

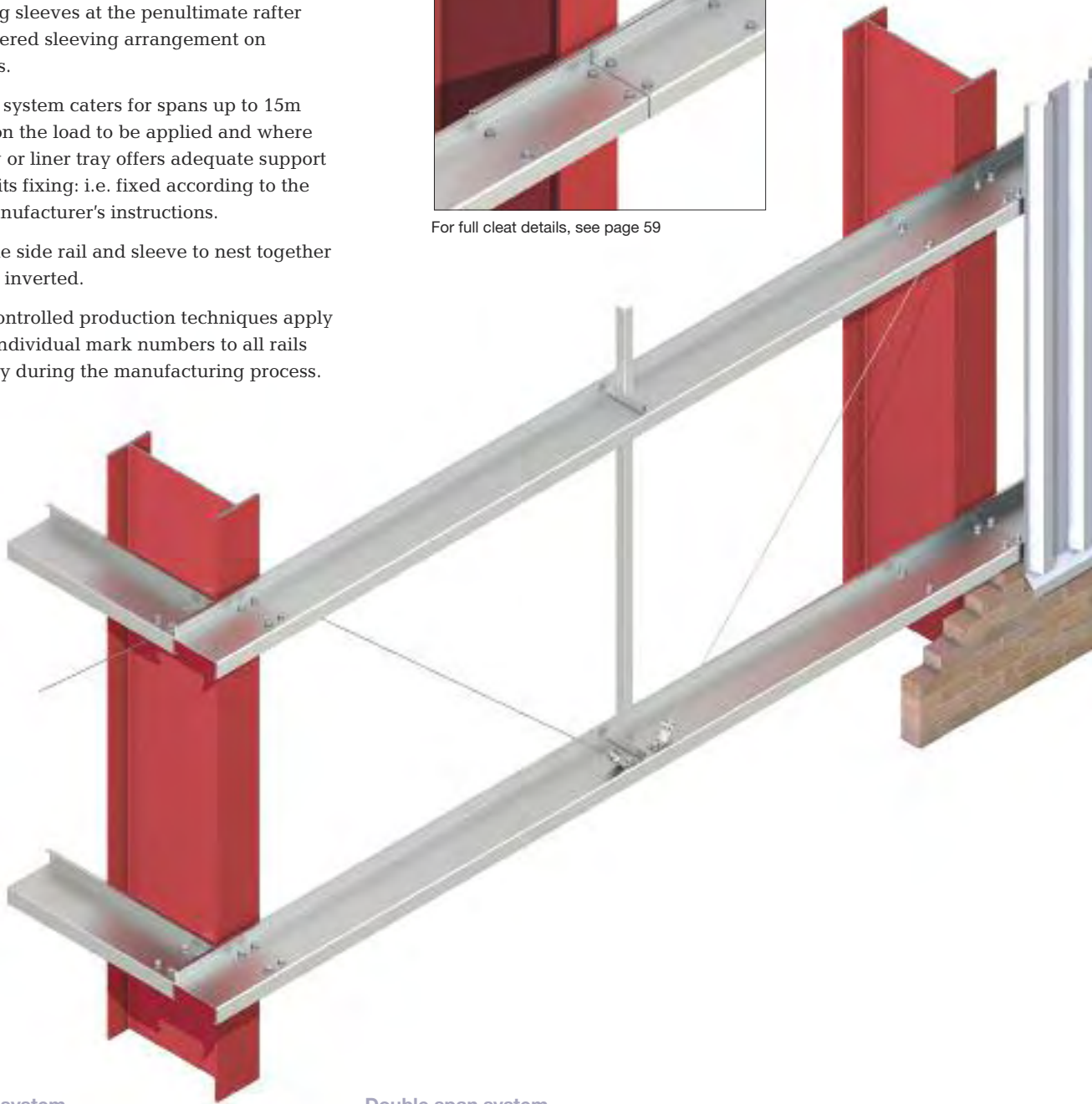
The sleeved system caters for spans up to 15m depending on the load to be applied and where the cladding or liner tray offers adequate support by virtue of its fixing: i.e. fixed according to the cladding manufacturer's instructions.

To enable the side rail and sleeve to nest together the sleeve is inverted.

Computer controlled production techniques apply the client's individual mark numbers to all rails automatically during the manufacturing process.



For full cleat details, see page 59



## Single span system

Single span lengths can be supplied to suit individual requirements. Penultimate rafter connections are sleeved with a staggered sleeving arrangement on internal bays.

Typical single span arrangement indicating rail and sleeve positions.

R1	R4	R4X	R3	R1X
R1	R3	R4	R4X	R1X
R1	R4	R4X	R3	R1X
R1	R3	R4	R4X	R1X
R1	R4	R4X	R3	R1X
R1	R3	R4	R4X	R1X
R1	R4	R4X	R3	R1X

## Double span system

End bay rails are single span, with double span rails on internal bays. The maximum double span rail is 15m, therefore the maximum span between columns is 7.5m. A sleeve must occur at every joint position.

Typical double span arrangement indicating rail and sleeve positions.

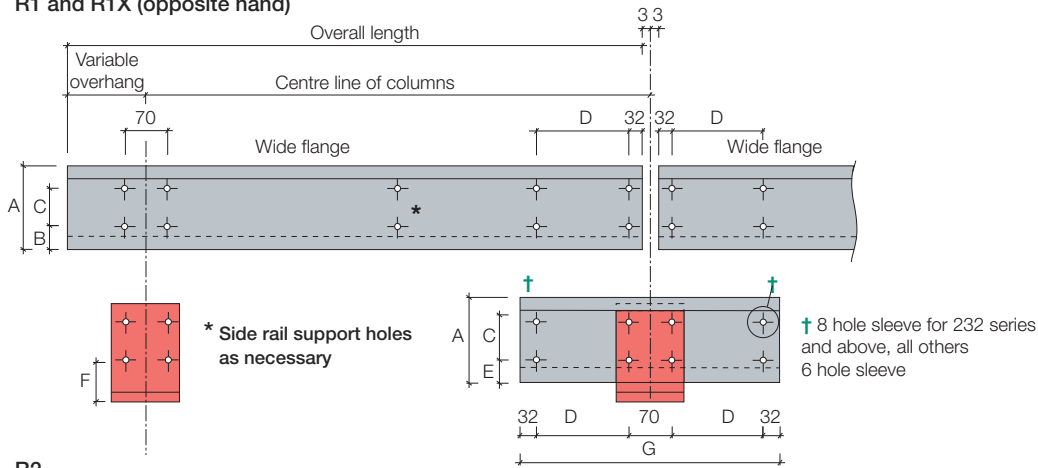
R1	R 2	R3	R1X
R1	R3	R 2	R1X
R1	R 2	R3	R1X
R1	R3	R 2	R1X
R1	R 2	R3	R1X
R1	R3	R 2	R1X

Note: consideration must be given to the handling of longer lengths

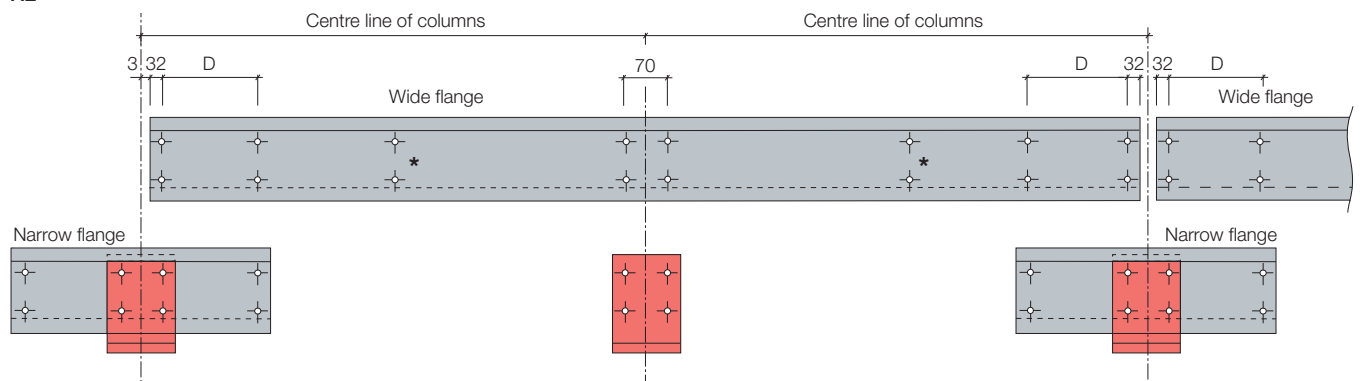


# Detailing

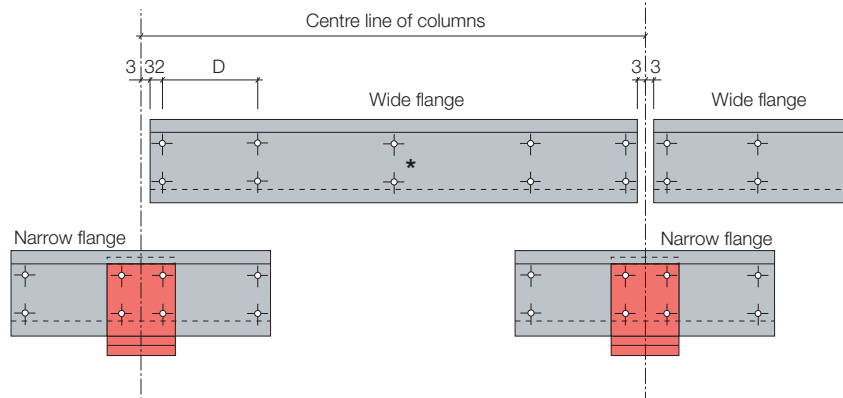
## R1 and R1X (opposite hand)



## R2



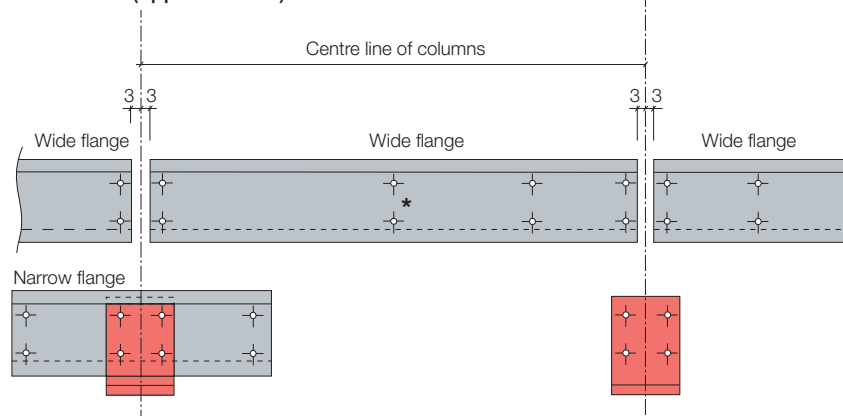
## R3



Sleeved system (mm)

A	B	C	D	E	F	G
142	42	56	240	44	50	614
172	42	86	290	44	50	714
202	42	116	350	44	50	834
232	42	146	410	44	50	954
262	42	176	460	44	50	1054
302	52	195	610	55	60	1354
342	52	235	760	55	60	1654

## R4 and R4X (opposite hand)



Unless otherwise stated, all required holes are 18mm diameter for M16 bolts and are normally pierced in pairs on standard gauge lines.

For 'General detailing' notes, see page 86.

# Brick and window restraint systems

## Introduction

These details are to be used for conditions where a double span gives an advantage over single span i.e. deflection governing.

### Typical application

Typical applications are wall and brickwork restraints, window cill or header rails where deflection due to horizontal wind is to be limited to a specific deflection ratio: eg brickwork restraint commonly limited to a ratio of span/300 as shown in the load tables on page 77. If a deflection limit greater than span/300 is required, then calculate the capacity for this by multiplying the capacity given in the table by 300/the required limit

e.g. required capacity for span/500  
 = 300/500 x table capacity for span

It is not permissible to use this method to calculate capacities for deflection limits less than span/300.

For brickwork restraints, it is assumed that the wall will support the C-section on the weak axis.

### Wall construction after rail erection

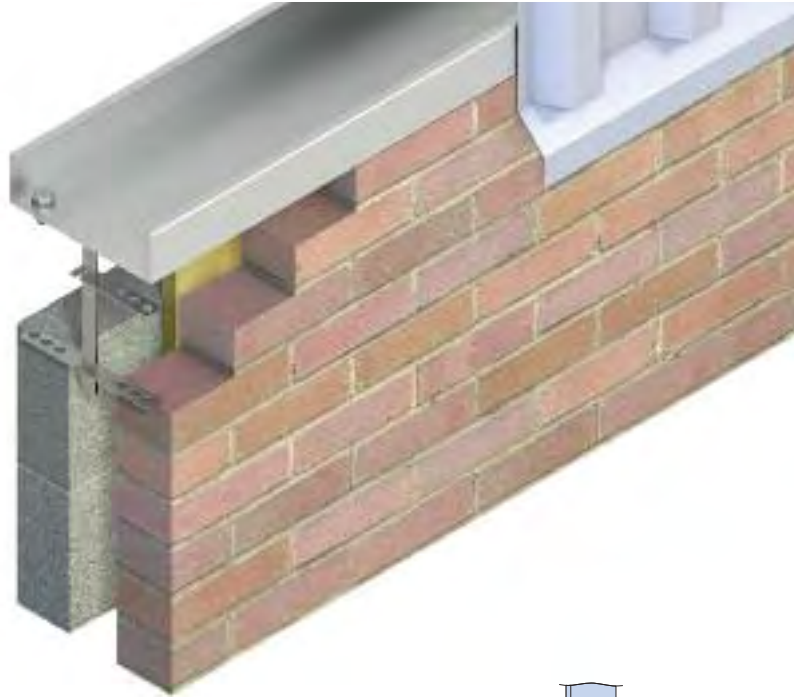
For cases where the wall will not be built until after the rail erection, or where the wall is not to be built up so that it supports both the inner and outer flanges of the C-section on the Y axis, Metsec side rail support and diagonal tie systems are required.

### Window cill support rails

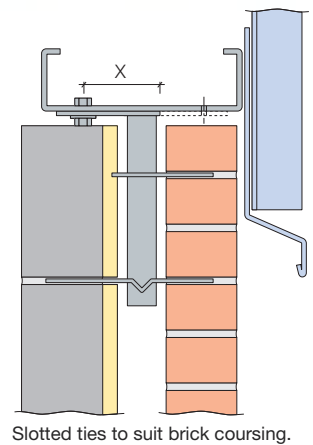
For window cill support rails where the weight of the window is to be supported by the rail, see the side rail support system for this condition, shown on page 51.

### Maximum span

The maximum double span section length is 15m, therefore the maximum column centres are 7.5m.



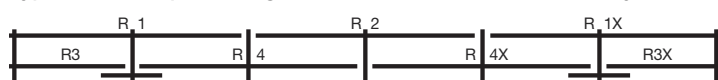
**Sliding anchor support to top of wall.**  
 Dimension 'X' in sliding anchor fixing plate to suit standard 18mm diameter holes in Metsec rail



### Double span layout

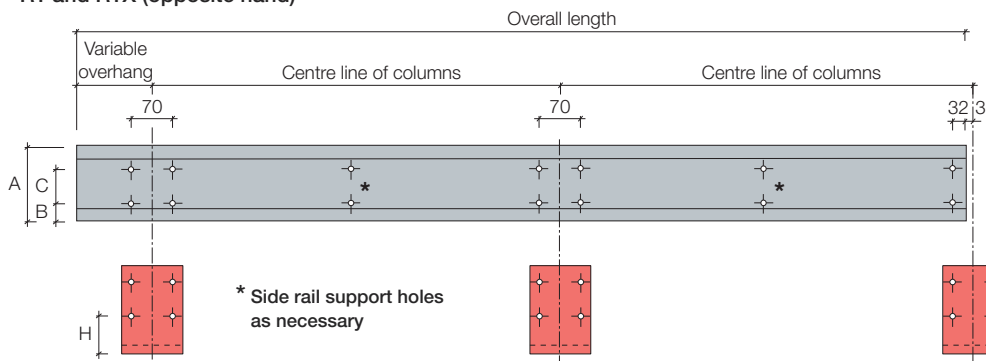
This arrangement can be used where stringent deflection limits are applied. i.e. glazing supports, brickwork restraints etc.

Typical double span arrangement for odd and even number bays

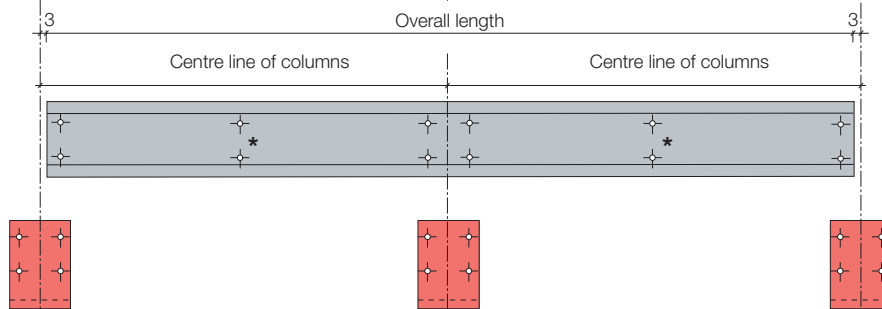


# Detailing

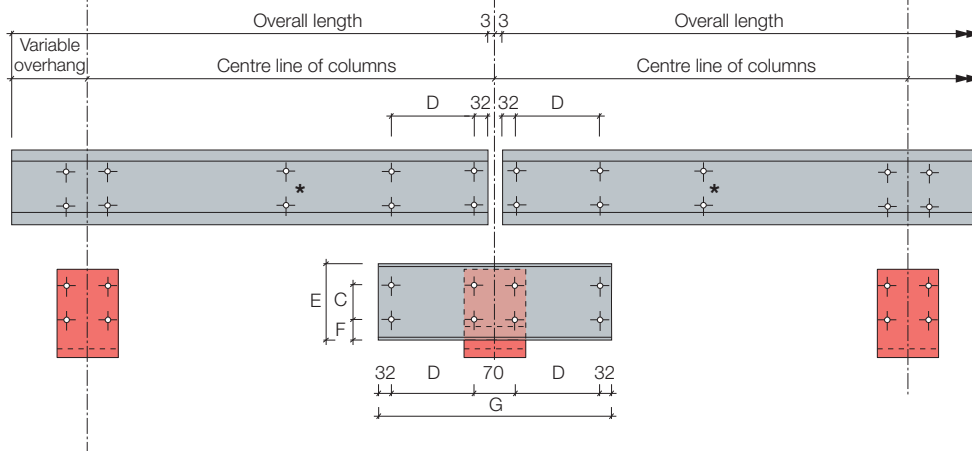
## R1 and R1X (opposite hand)



## R2



## R3 and R3X (opposite hand)



## R4 and R4X (opposite hand)

### C-section sleeves

The C-section sleeve range includes one thickness per height of profile, as shown on the table below.

### C-section sleeve details

Ref No.	Thickness mm	Weight kg
CS 142	2.0	2.64
CS 172	2.5	4.35
CS 202	2.7	6.00
CS 232	2.5	6.94
CS 262	2.9	9.55
CS 302	2.9	15.26
CS 342	3.0	20.81

This detail is only used when an odd number of bays is encountered

### C-section double span system (mm)

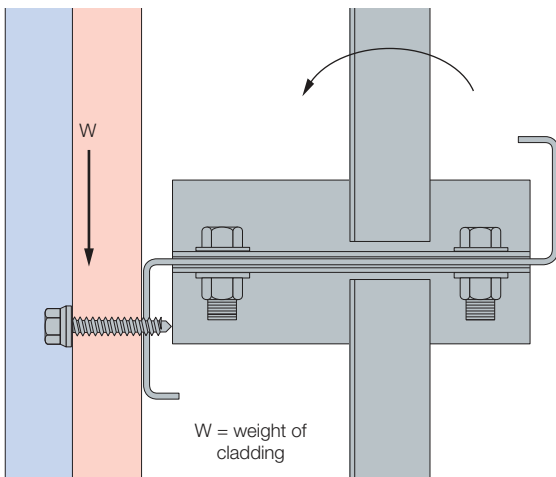
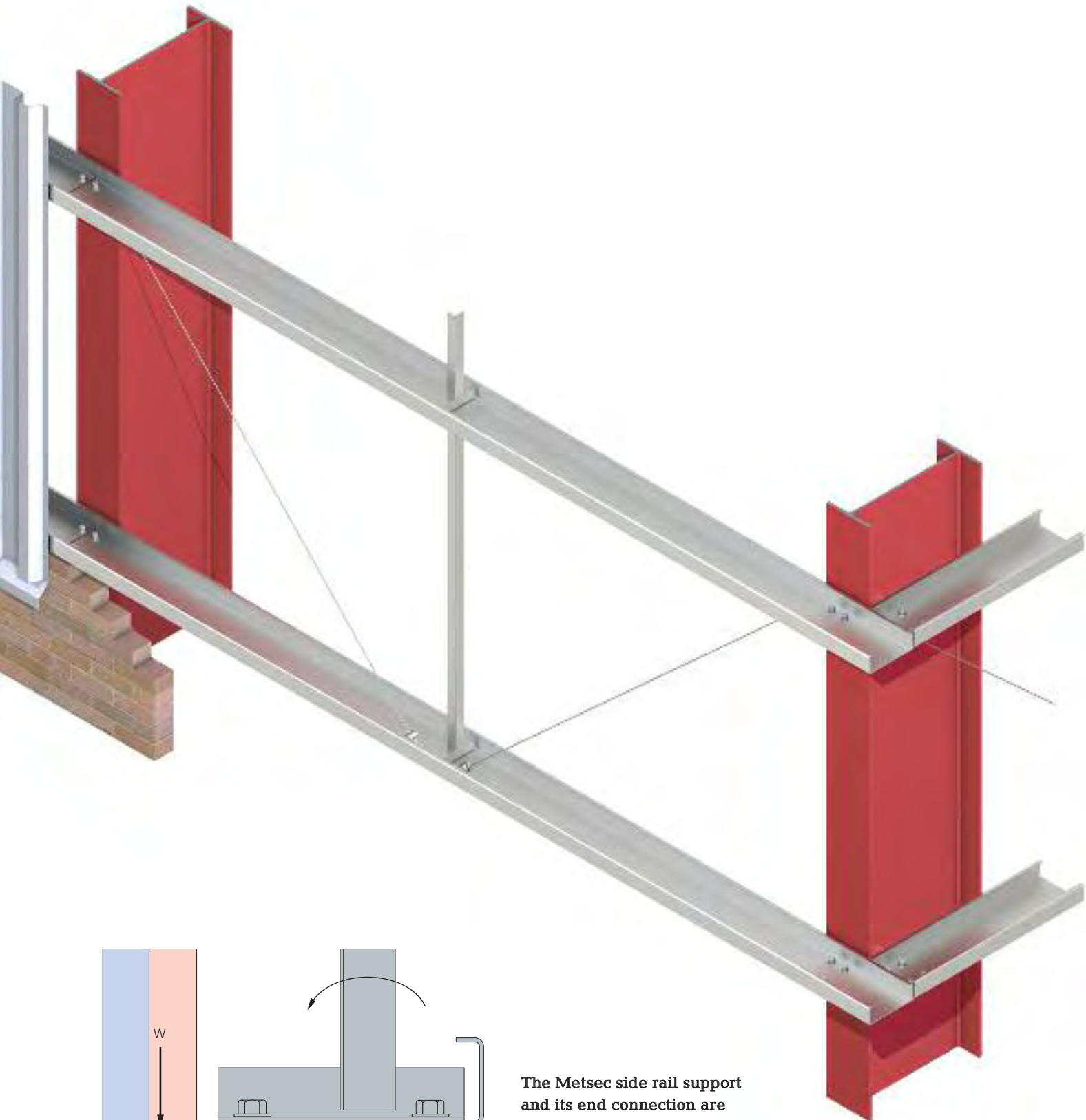
A	B	C	D	E	F	G	H
142	43.0	56	240	147	45.5	614	50
172	43.0	86	290	177	45.5	714	50
202	43.0	116	350	207	45.5	834	50
232	43.0	146	410	238	46.0	954	50
262	43.0	176	460	268	46.0	1054	50
302	53.5	195	610	308	56.5	1354	60
342	53.5	235	760	349	57.0	1654	60

Unless otherwise stated, all required holes are 18mm diameter for M16 bolts and are normally pierced in pairs on standard gauge lines.

For 'General detailing' notes, see page 86.

# Vertical cladding restraint requirements

Bolted connections for 142-342 series



The Metsec side rail support and its end connection are designed to prevent rotation of the side rail under eccentric cladding loads.

# Vertical cladding restraint requirements

**NEW! Rapid rail support system (RRS) for 142-262 series (CDR No. 001215818-0001)**

Our new rapid rail support system allows the steel erector to assemble the side rail supports without the need for tools, nuts, bolts or washers, therefore considerably reducing installation time. The system comprises a new 55mm deep channel with two new end fixings, a locater end and a lock end, which simply clip together through the standard holes in the rail. The system comes complete with a start/ finishing cleat leaving a tidy flush finish removing the need for countersunk bolts, countersunk holes & packing plates.

The new system is currently available for our 142, 172, 202, 232 and 262 section series and has been trialled on several major projects throughout the country proving to be a huge success with all parties involved.

The rapid rail system (RRS) is now available to all StruCAD V15 and Tekla V16.1 licence holders.

## Notes

- i. The rapid rail support system can be used for both vertical and horizontal cladding. For horizontal cladding refer to page 50, please note that vertical top hat sections fixed to the side rails by the sheeting contractor will be required.
- ii. A set of diagonal tie wires must be provided to the bottom set of rails.
- iii. The rapid rail support cannot be connected to an eaves beam.



Male Cleat (RS1)



Female Cleat (RS2)

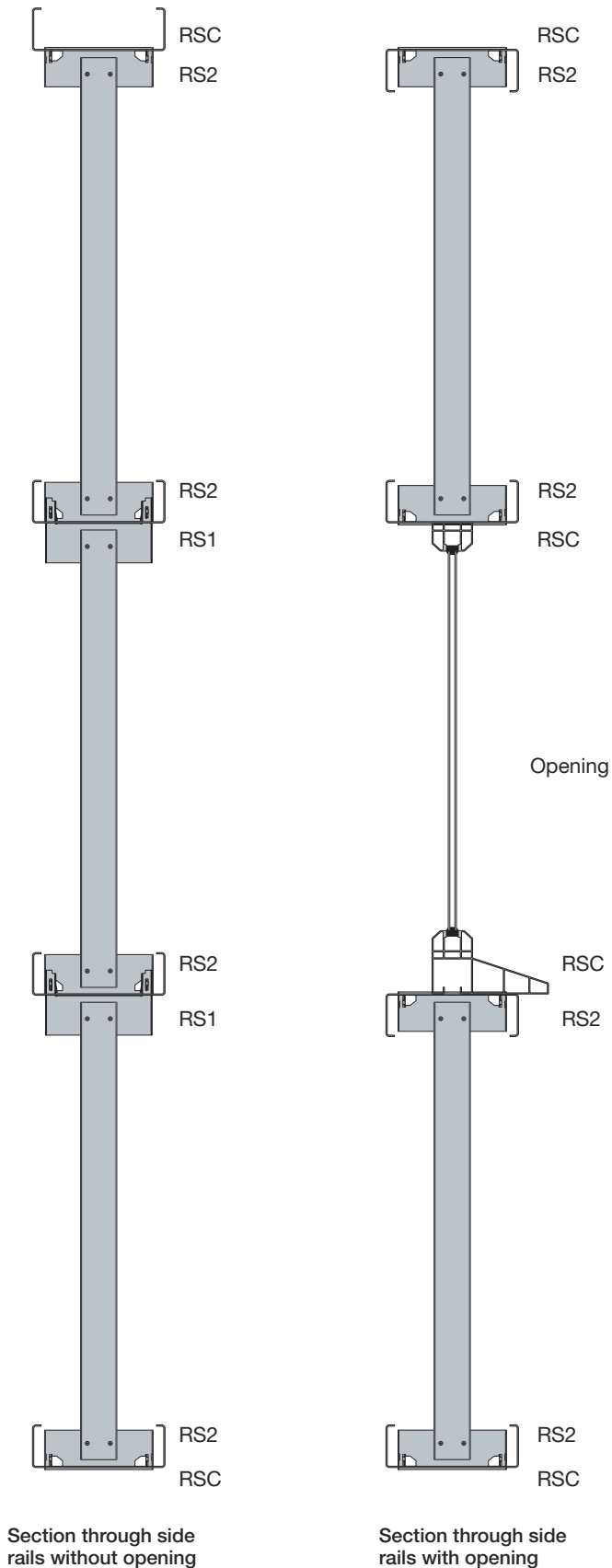


Start/Stop Cleat (RSC)

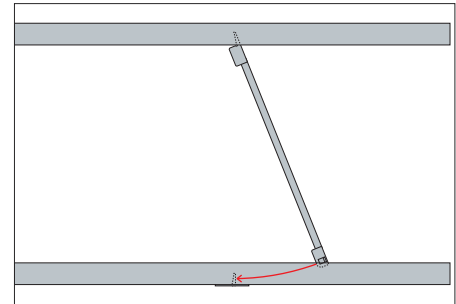


## Rapid rail support system (RRS)

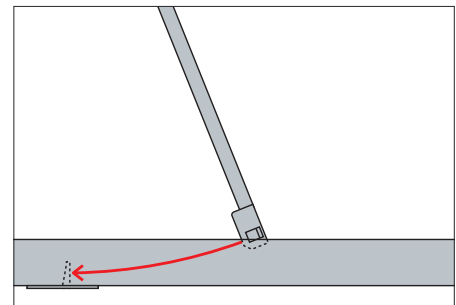
### Typical assembly arrangements



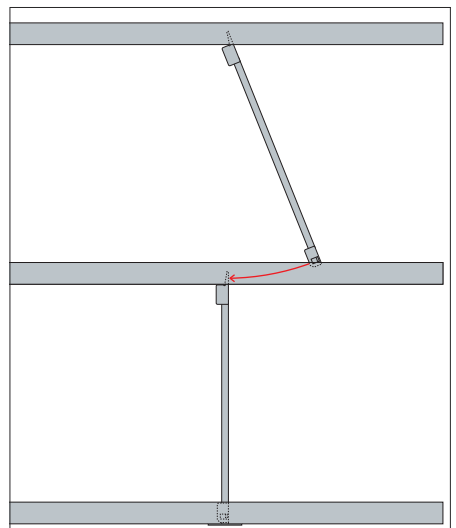
### Installation procedure



1. Provide temporary props to the bottom rail to ensure a level line is achieved.  
The Starter Cleat is then installed in the bottom rail and the male end of the rapid rail support is installed in the upper rail.



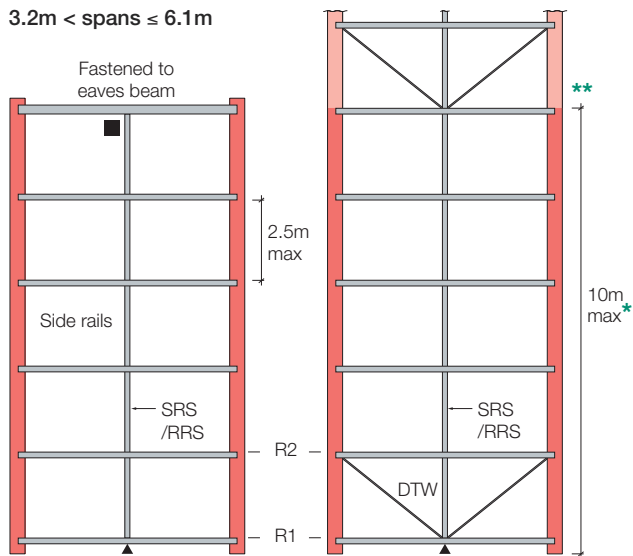
2. The rapid rail support is then rotated and clicked into the start/stop cleat.



3. Subsequent rapid rail supports are then installed with the male end inserted in the upper rail and the female end clicked into the lower rapid rail support. The top rail is finished with a start/stop cleat.

## Restraint requirements

### 3.2m < spans ≤ 6.1m



Side rail systems can be supported by the inclusion of diagonal tie wires (DTW) or suspended from a suitable eaves beam as shown.

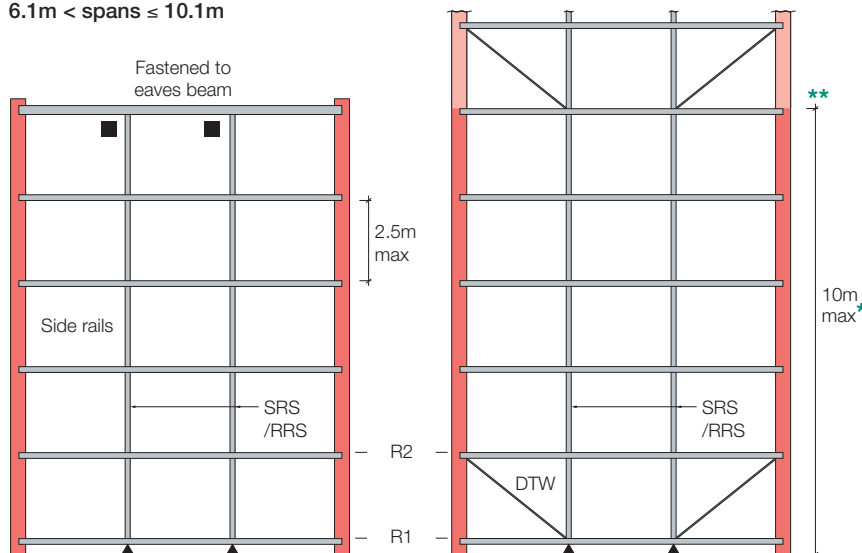
Recommended sequence of erection:-

1. Fix bottom rail (R1) and sleeves if required.
2. Provide temporary props (▲) to ensure a level line is achieved.
3. Fix second rail (R2) and sleeves if required.
4. Fix side rail supports and diagonal tie wires between R1 & R2 to ensure a level line is achieved to both rails.

Temporary props (▲) may now be removed unless support is solely taken from the eaves beam.

5. Fix the remaining rails and side rail supports progressively up the side of the building.

### 6.1m < spans ≤ 10.1m

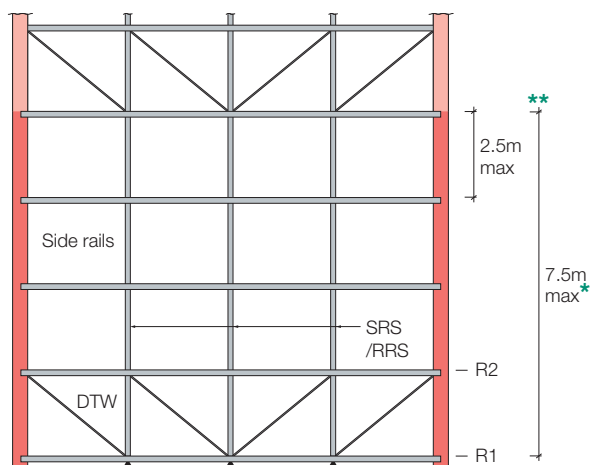


\*Maximum heights indicated are based on a total cladding weight of 15kg/m<sup>2</sup> on elevation. If the weight of the cladding exceeds this value, the maximum height can be defined pro-rata.

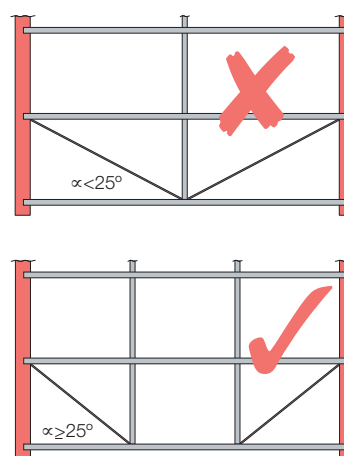
\*\*In all cases, if the height to eaves exceeds the maximum recommended height, additional tie wires must be included as shown.

■ Stiffener cleat positions (see page 25)

### 10.1m < spans ≤ 15m



### Additional side rail supports



Note: if the diagonal tie wire angle  $\alpha$  falls below 25°, additional side rail supports should be included.

## Vertical cladding restraint fixing details

### Diagonal tie wires

Metsec diagonal tie wires provide significant benefits in terms of both drawing office detailing and site erection time.

They are delivered fully assembled to avoid the possibility of lost items on site. The assembly is protected by galvanising and is provided with adjustable ends for easy erection. To enable the length of diagonal tie wires to be determined, the depth between rails (B) and the distance between rail holes (A) must be given.

Metsec will ensure the correct length is supplied.

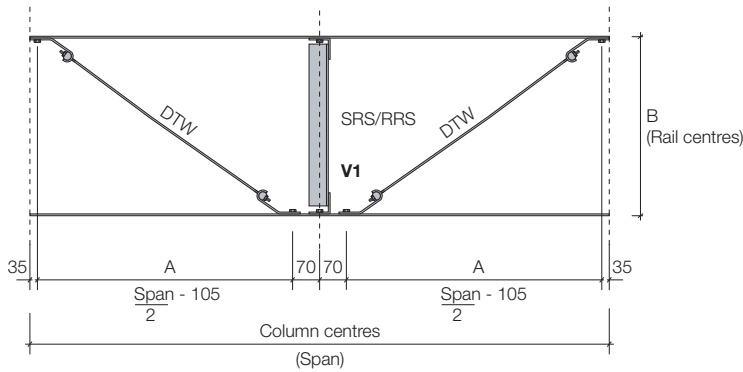


It is important that the end bracket is always bolted to the cleat hole nearest the stanchion.

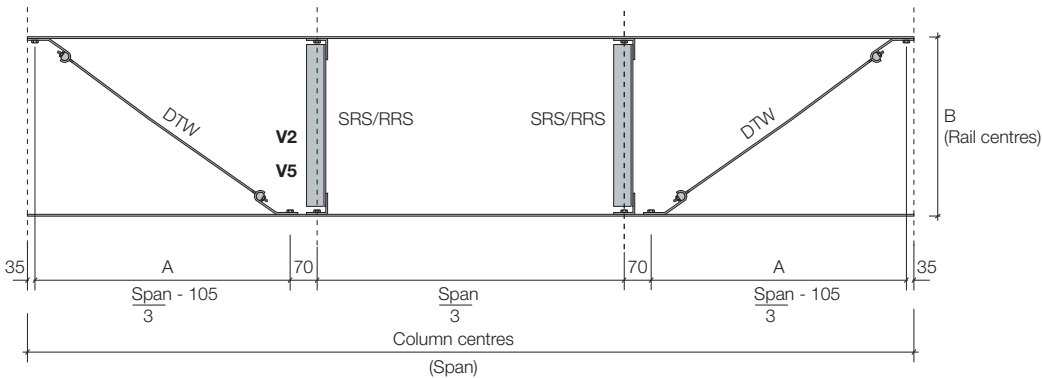


Radial slots in the end brackets accommodate angles between 25° and 65°.

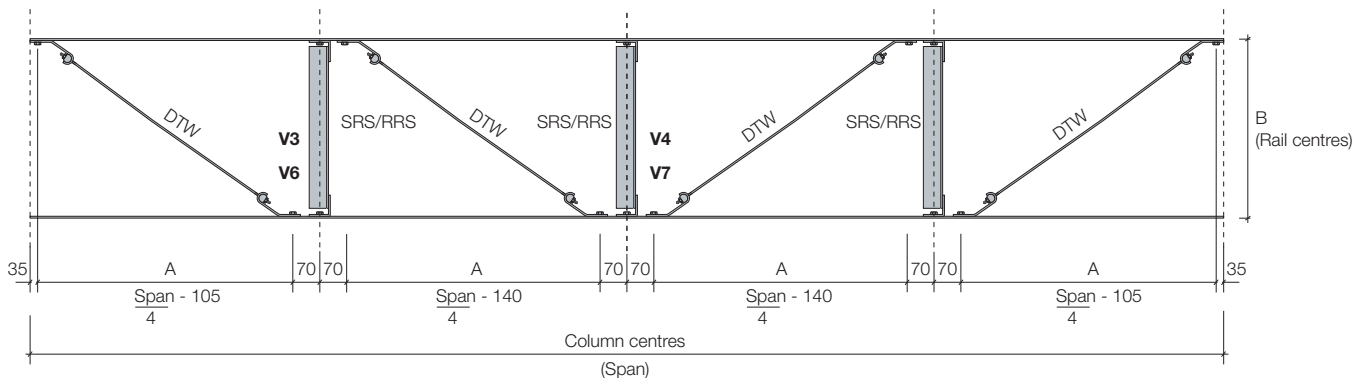
#### 3.2m < spans ≤ 6.1m



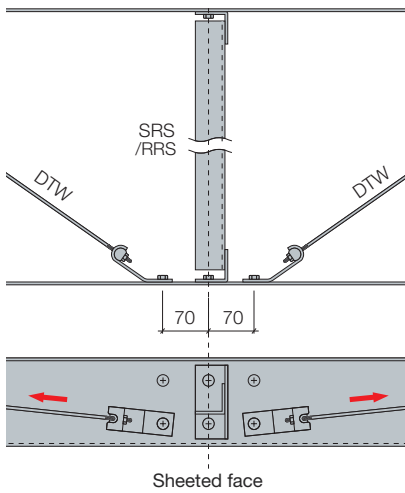
#### 6.1m < spans ≤ 10.1m



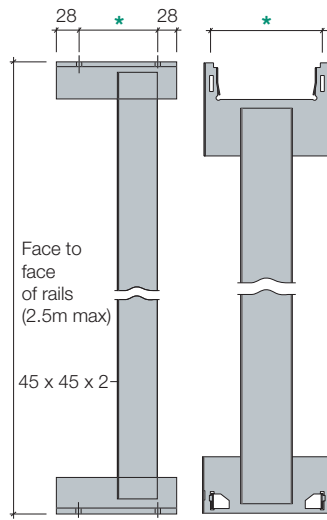
#### 10.1m < spans ≤ 15m



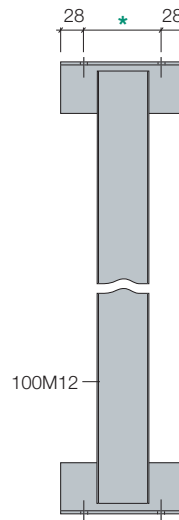
V1



142-262 series



302 and 342 series



**Side rail supports**

Side rail supports are bolted between the lines of side rails in accordance with the recommendations shown.

Side rail supports are fully assembled from pre-galvanised material.

SRS denotes side rail supports

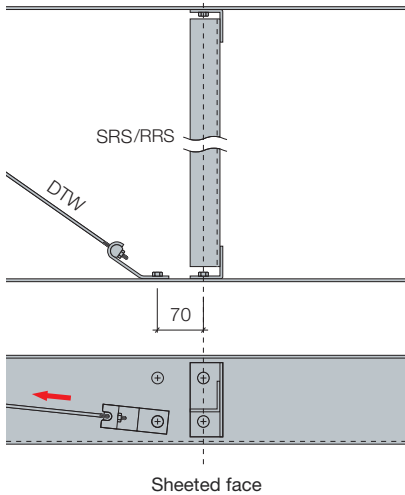
DTW denotes diagonal tie wires

Indicates to cleat bolts nearest to column face

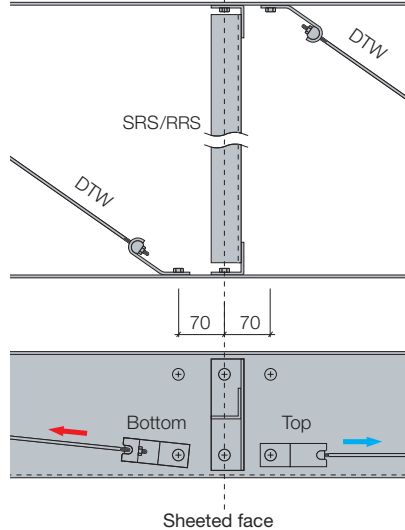
Indicates to cleat bolts nearest to sheeting face

\* Standard gauge lines

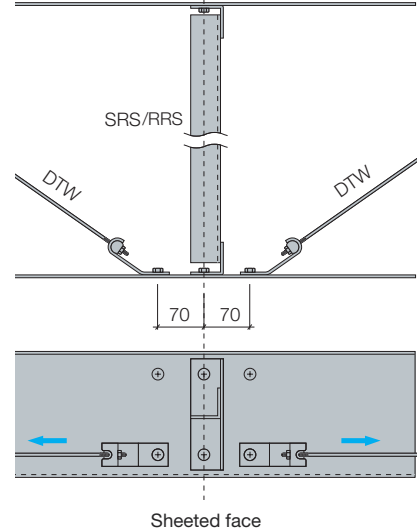
V2



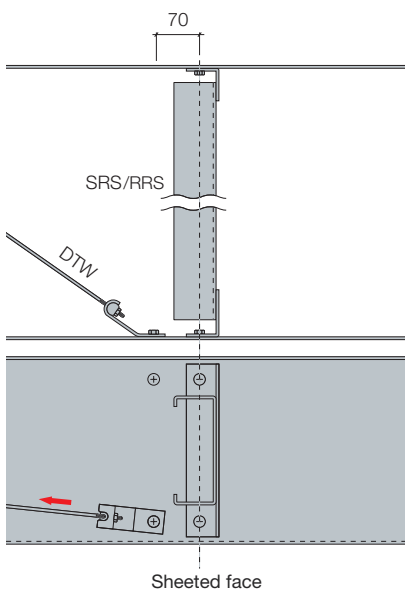
V3



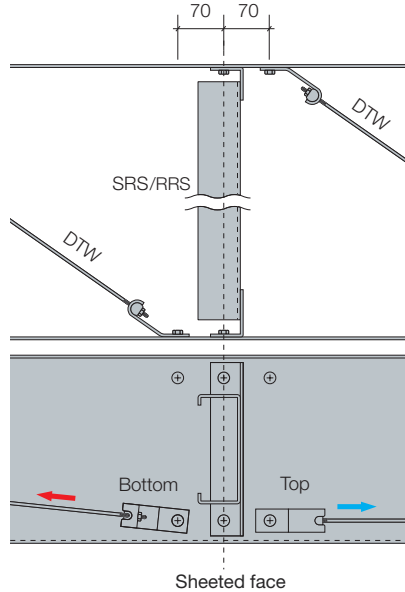
V4



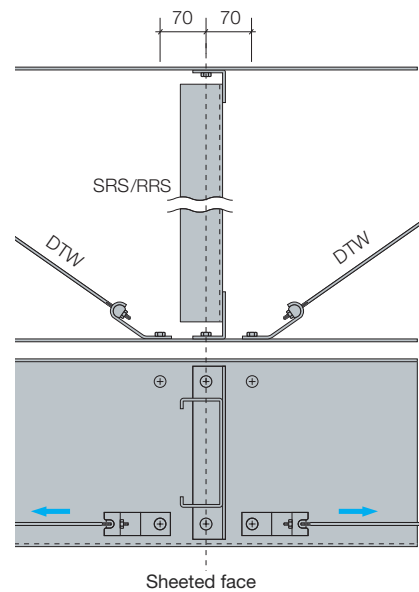
V5 302 and 342 series



V6 302 and 342 series



V7 302 and 342 series



# Horizontal cladding

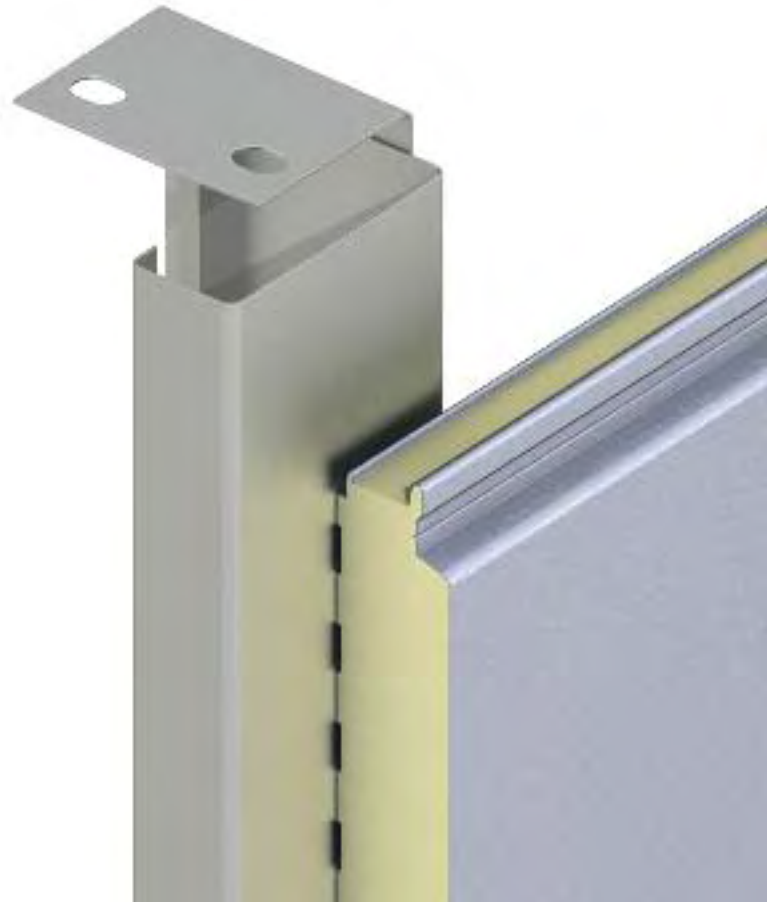
## Panel joint rail (PJR)

For economy, it is recommended that Metsec horizontal cladding supports with riveted end cleats are used as vertical supports to the horizontal cladding panels.

Joints in panels may require a wider flange for fixing purposes which can be provided by using a Metsec panel joint rail.

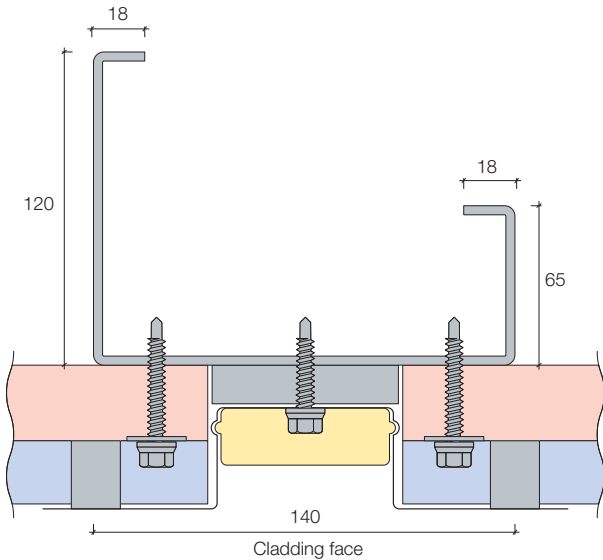
Alignment of the steel face can easily be achieved by adjustment of the horizontal rails on slotted cleats at the stanchion position.

Metsec have carried out comprehensive testing at The University of Strathclyde to verify the adequacy of this type of support without slip under the required load. See page 44 for test results.

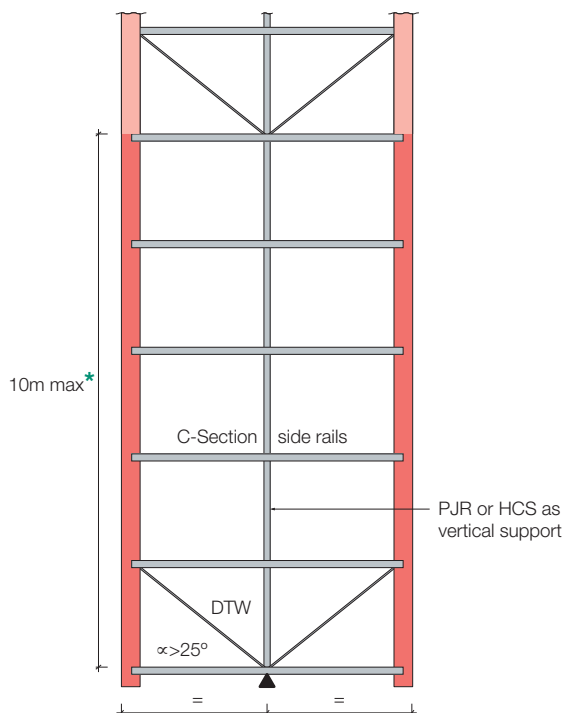


PJR with riveted end cleats

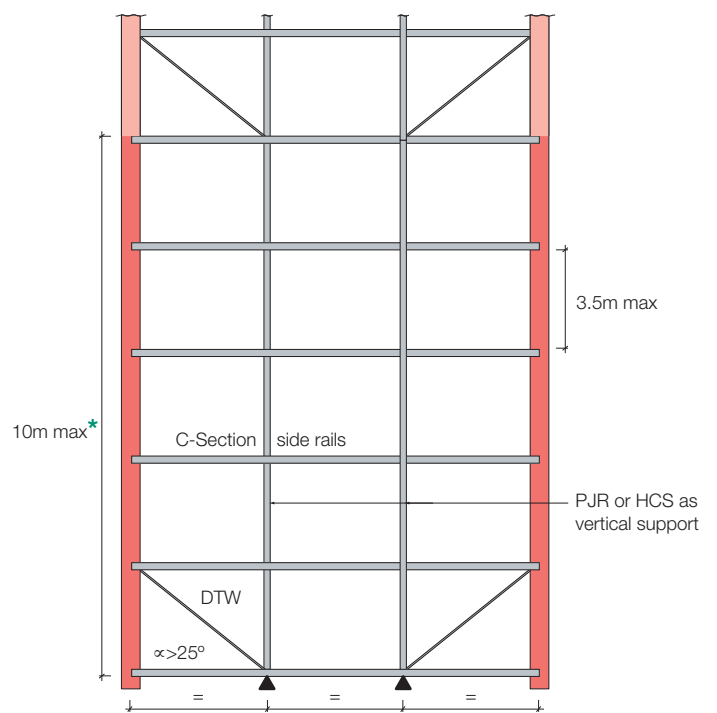
### PJR support at panel joint



3.2m < spans ≤ 6.1m



6.1m < spans ≤ 10.1m



\* Maximum heights indicated are based on a total cladding weight of 15kg/m<sup>2</sup> on elevation. For heavier claddings, the maximum height may be derived on a pro-rata basis.

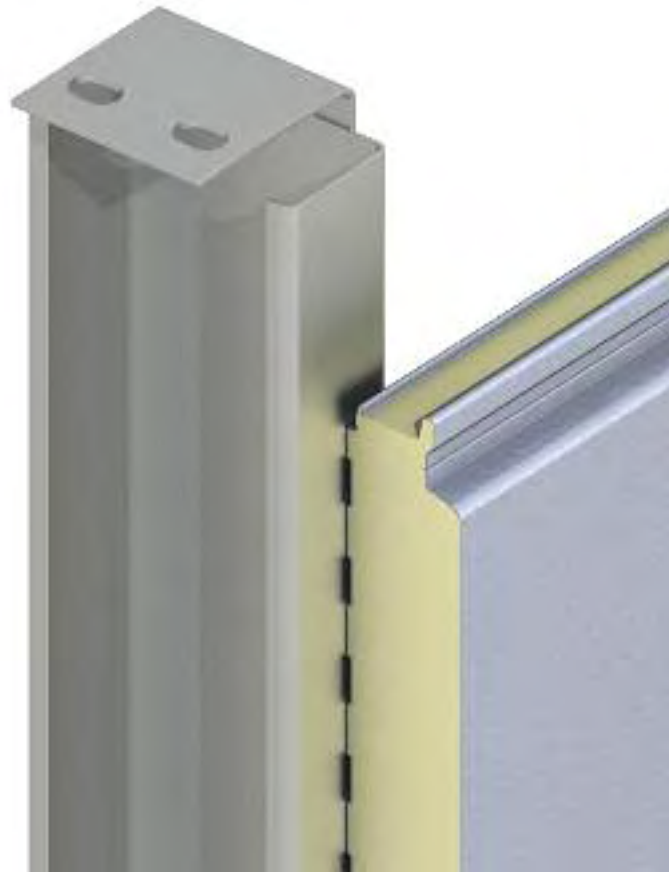
## Horizontal cladding support (HCS)

In order to achieve the alignment tolerances associated with some horizontal cladding systems, it is recommended that C-section side rails are used in conjunction with HCS or PJR as vertical supports. Additional local adjustment is provided by slotted holes in the HCS and PJR fixing cleats.

The maximum spacing of vertical supports to horizontal panels is shown and is necessary to provide adequate restraint to the rails. If this cannot be achieved, please refer to Metsec for advice.

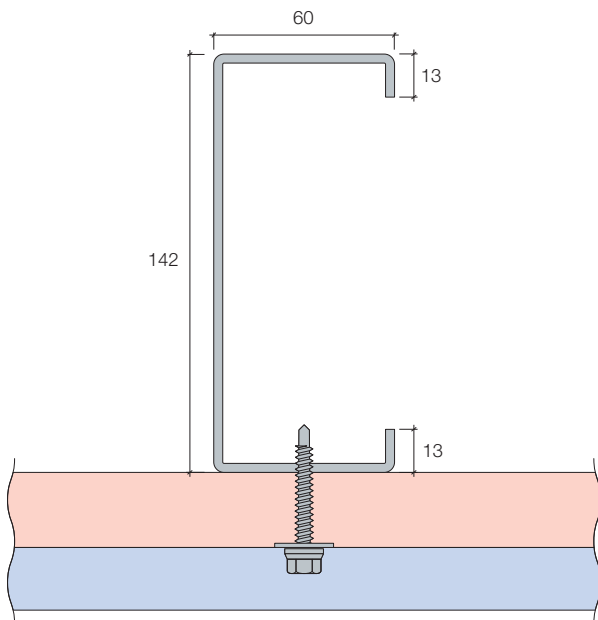
Sequence of erection of the side rails, side rail supports and diagonal tie wire restraints is similar to the recommendations shown on pages 39 to 41.

Note: rail alignment and cladding support to be provided by the steelwork contractor.

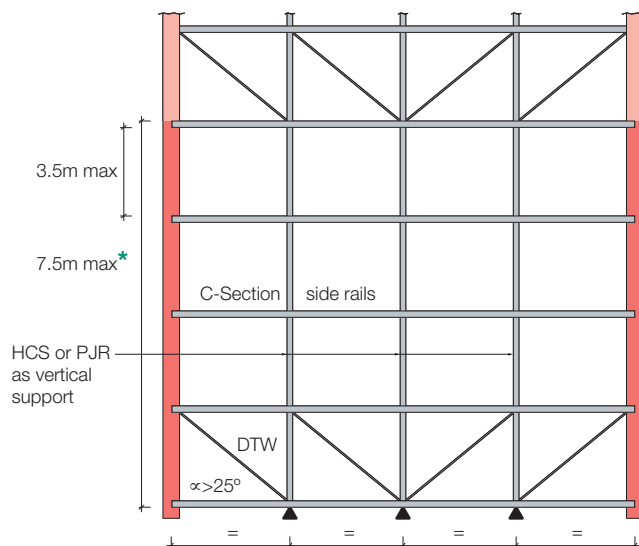


HCS with riveted end cleats

### HCS intermediate support to panel



### 10.1m < spans ≤ 15m



Span (rail crs.) m	Safe working loads (kN) on PJR and HCS		Deflection span/150
	Pressure	Suction	
1.6	19.67	13.15	33.36
1.8	17.48	11.68	26.36
2.0	15.74	10.52	21.35
2.2	14.30	9.56	17.64
2.4	13.11	8.76	14.82
2.6	18.07	9.93	15.51
2.8	16.78	9.22	13.37
3.0	15.66	8.61	11.65
3.2	14.68	8.07	10.24
3.4	13.82	7.59	9.07
3.6	13.05	7.17	8.09

PJR gauge up to 2.5m span = 1.6mm, otherwise 2.0mm.

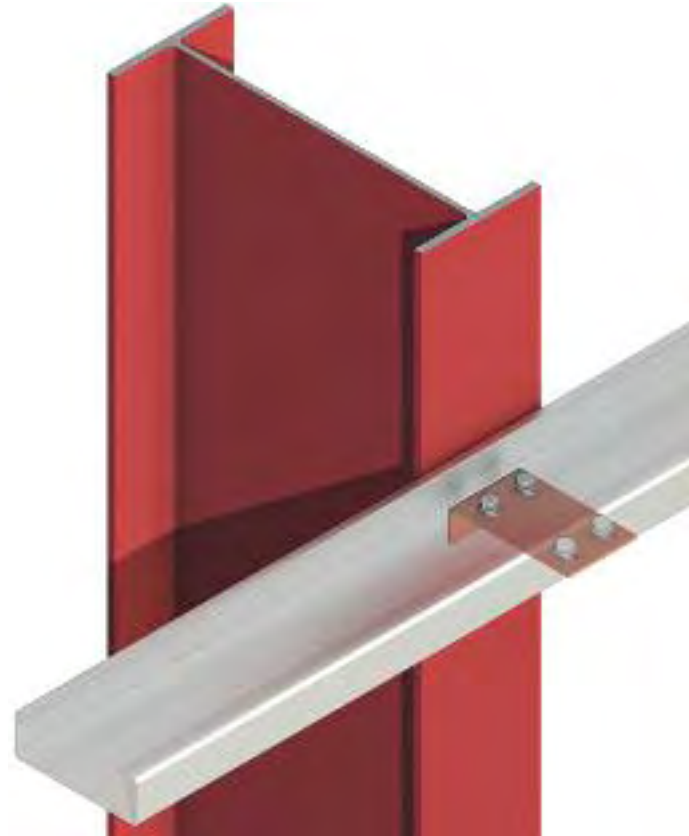
## Horizontal cladding

Tighter tolerances are associated with some of the horizontal cladding systems in today's market. These tolerances can be achieved by using Metsec C-section rails supported on cleats with slotted holes in combination with the slotted cleats in the PJR and HCS.

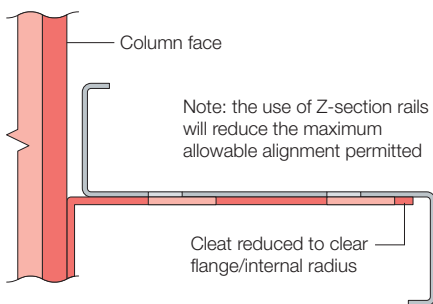
Metsec have carried out comprehensive testing at The University of Strathclyde to support the use of slotted cleats without slip under the required loads. The recommended torque on a grade 8.8 bolt is 244Nm. The results of these tests are shown in the table below and are applicable to Metsec components.

Rail series	Max wind load required kN	Test load kN	Torque Nm	Dimensions for detailing (mm)	
				D1	D2
142	34.3	45	100	150	56
172	45.3	52.5	125	180	86
202	49.3	52.5	125	210	116
232	52.3	60	150	240	146
262	68.3	75	200	270	176
302	74.4	82.5	225	310	195
342	90.3	90	250	350	235

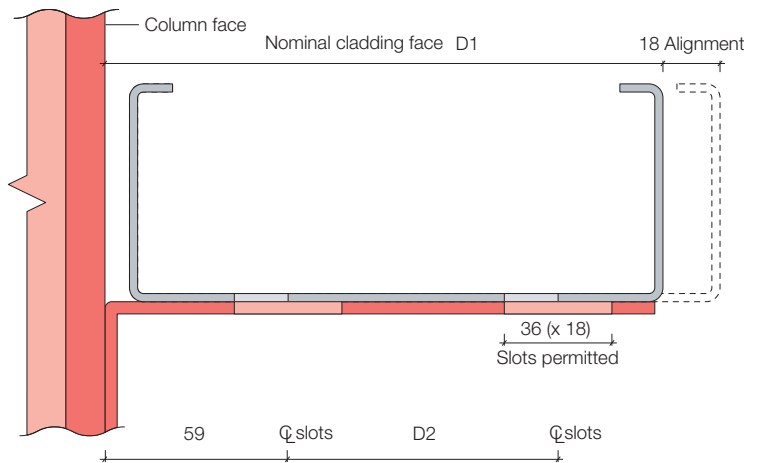
Slotted cleats by others or to special order



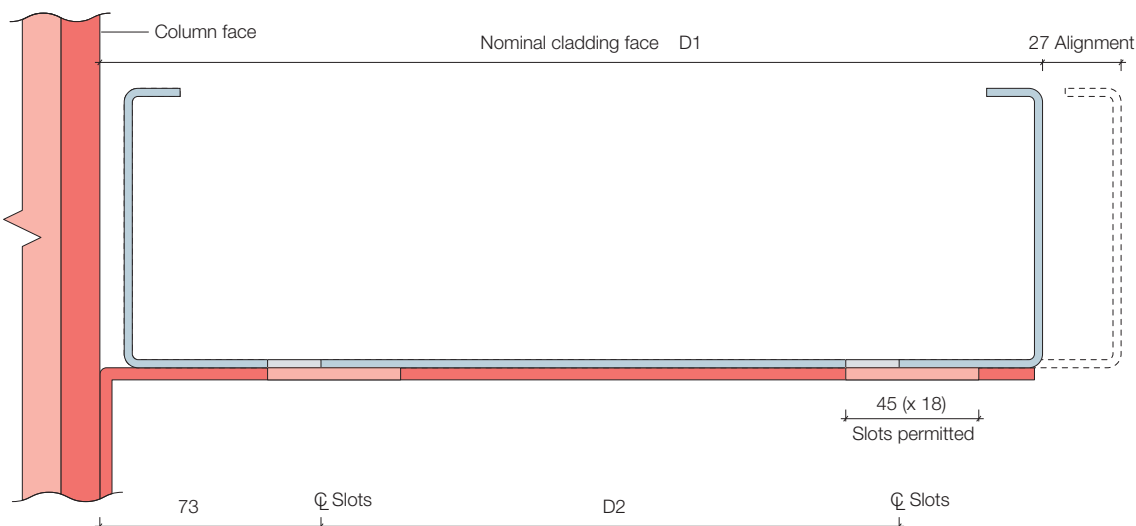
### Z-section alignment



### C-section alignment for 142 to 262 Series



### C-section alignment for 302 to 342 Series





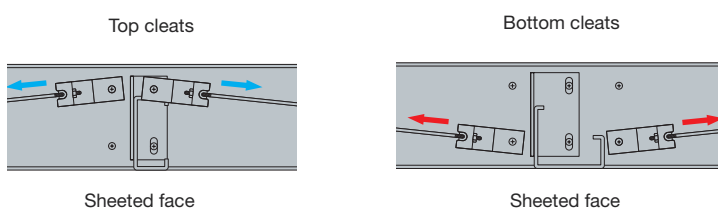
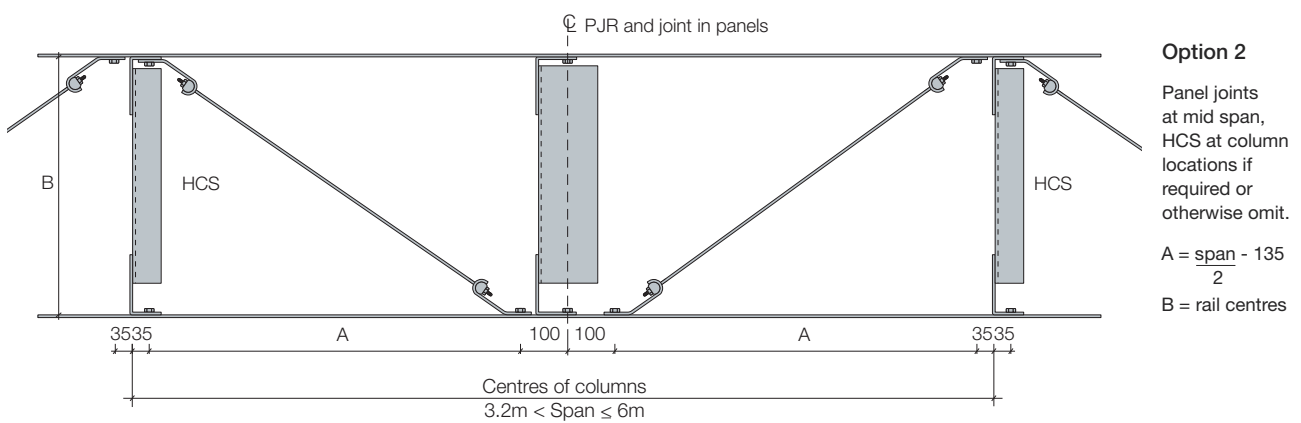
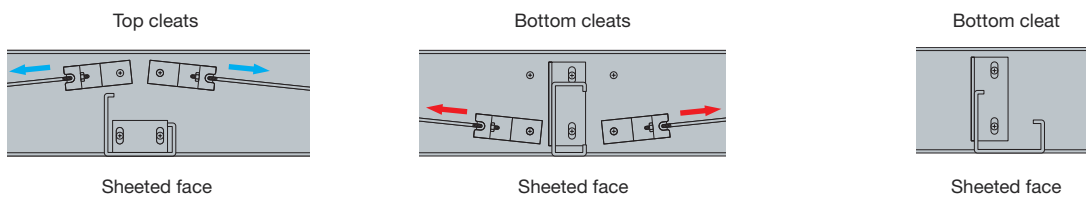
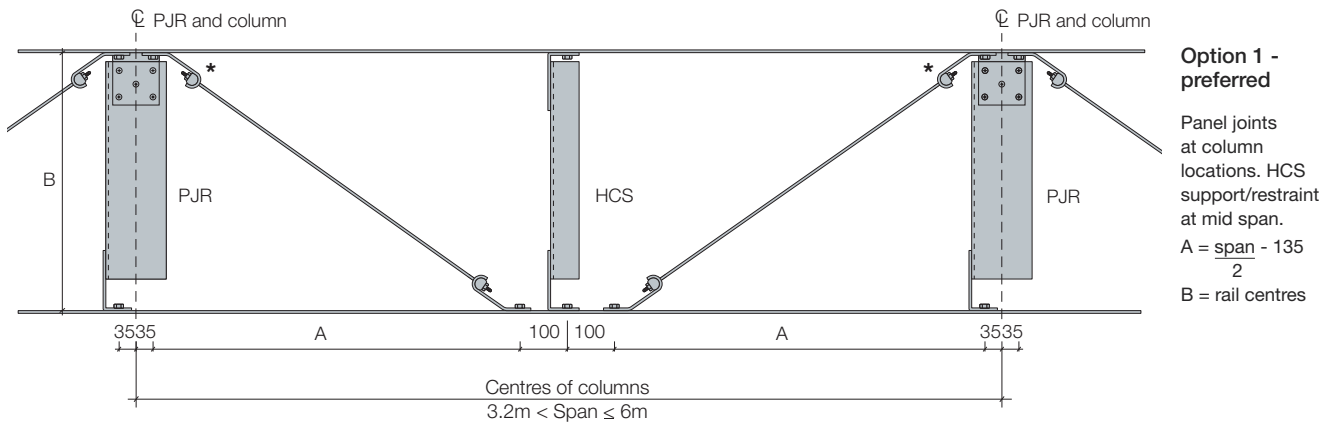
## Horizontal cladding

The panel joint rail options shown are based on a maximum panel length of 6m (longer panel lengths are available). The details provided are for guidance only and are intended to demonstrate the main principles which should be adopted.

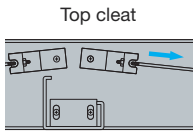
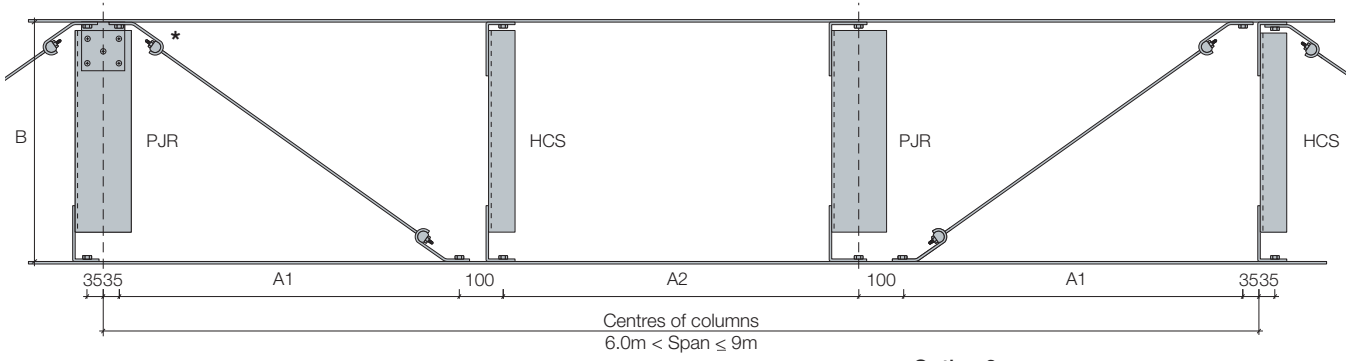
For simplicity, panels and column centres should be compatible as shown.

Attention must be given to the maximum permissible horizontal span of the composite panel to be used without additional vertical supports being required.

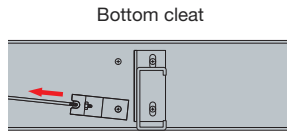
-  Indicates to cleat bolts nearest to column face
-  Indicates to cleat bolts nearest to sheeting face
- \* This detail cannot be used in conjunction with Metsec's standard WOC cleats



# Panel joint rail options



Top cleat  
Sheeted face



Bottom cleat  
Sheeted face

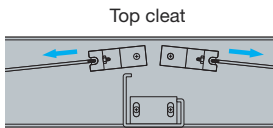
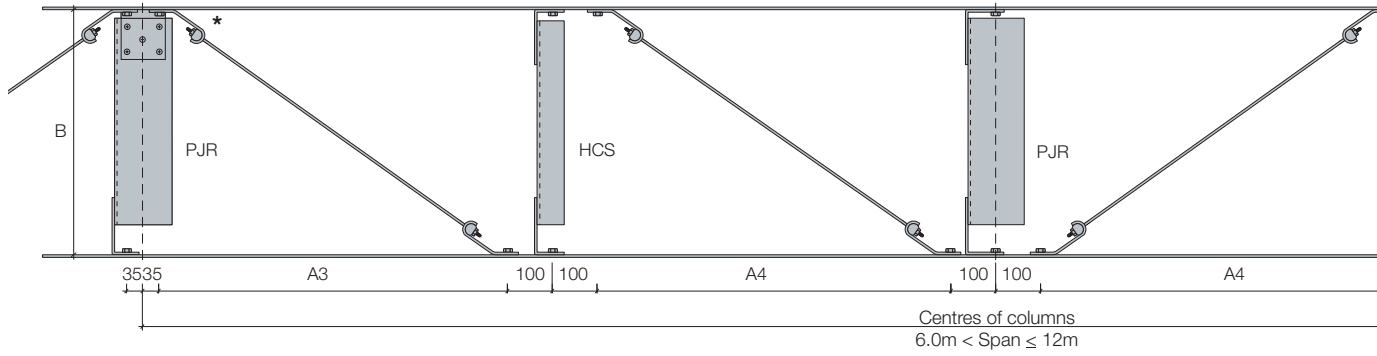
### Option 3

Panel joints at 1/3 span and alternate column locations. HCS at 1/3 span. HCS at column if required or otherwise omit.

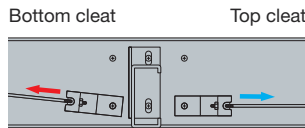
$$A1 = \frac{\text{span} - 135}{3}$$

$$A2 = \frac{\text{span}}{3}$$

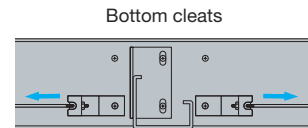
$$B = \text{rail centres}$$



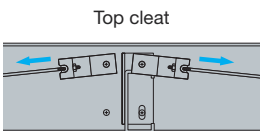
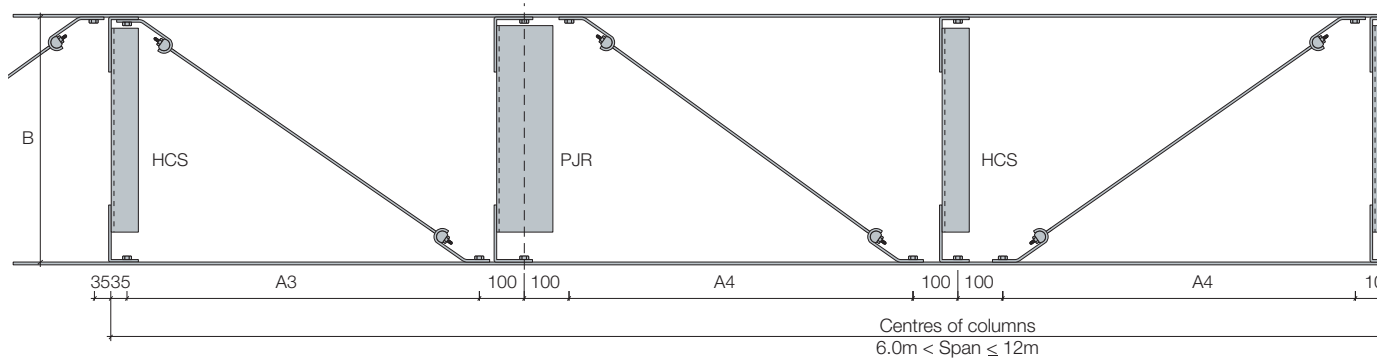
Top cleat  
Sheeted face



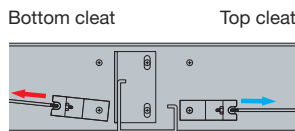
Bottom cleat  
Sheeted face



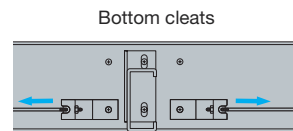
Bottom cleats  
Sheeted face



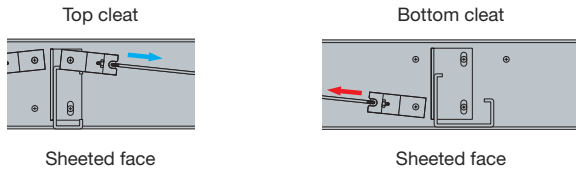
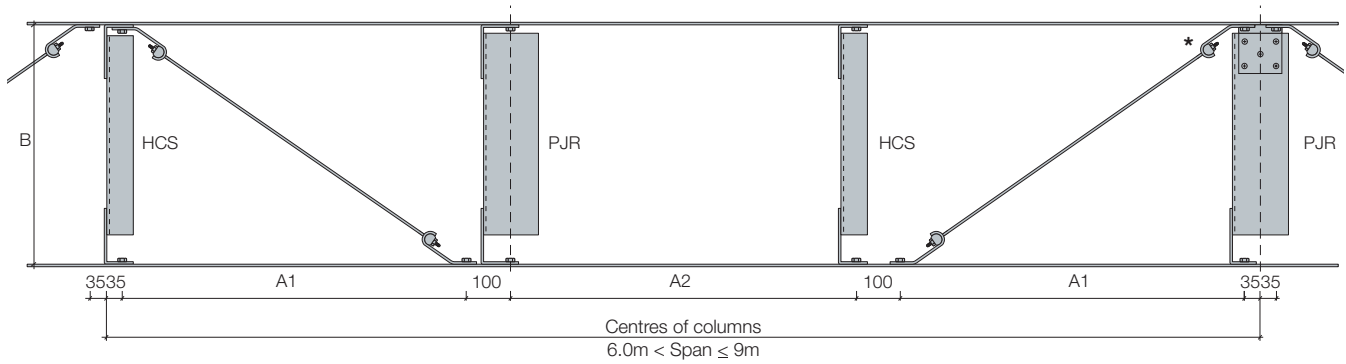
Top cleat  
Sheeted face



Bottom cleat  
Sheeted face



Bottom cleats  
Sheeted face



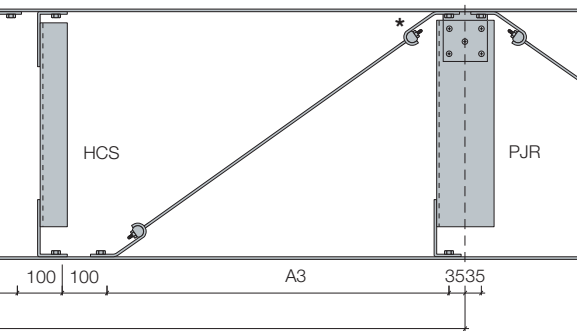
**Option 4**

Panel joints at 1/3 span and alternate column locations. HCS at 1/3 span. HCS at column if required or otherwise omit.

$$A1 = \frac{\text{span} - 135}{3}$$

$$A2 = \frac{\text{span} - 200}{4}$$

B = rail centres



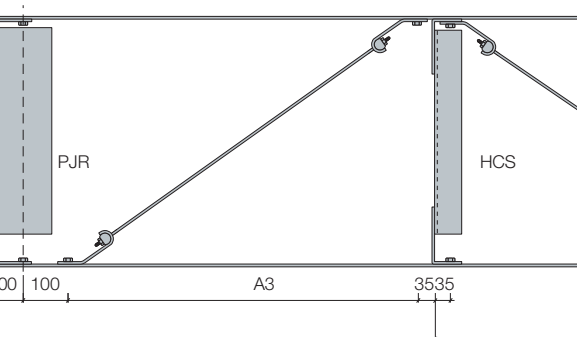
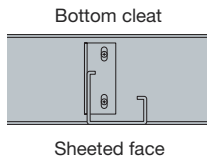
**Option 5 - preferred**

Panel joints at 1/4 span and alternate column locations. HCS 1/4 span.

$$A3 = \frac{\text{span} - 135}{4}$$

$$A4 = \frac{\text{span} - 200}{4}$$

B = rail centres



**Option 6**

Panel joints at 1/4 span. HCS at midspan. HCS at columns if required or otherwise omit.

$$A3 = \frac{\text{span} - 135}{4}$$

$$A4 = \frac{\text{span} - 200}{4}$$

B = rail centres

Indicates to cleat bolts nearest to column face

Indicates to cleat bolts nearest to sheeting face

\* This detail cannot be used in conjunction with Metsec's standard WOC cleats

Note: the panel joint rail options shown are based on a maximum panel length of 6m (longer panel lengths are available). The details provided are for guidance only and are intended to demonstrate the main principles which should be adopted. For simplicity, panels and column centres should be compatible as shown.

Attention must be given to the maximum permissible horizontal span of the composite panel to be used without additional vertical supports being required.

## Alternative cladding arrangements

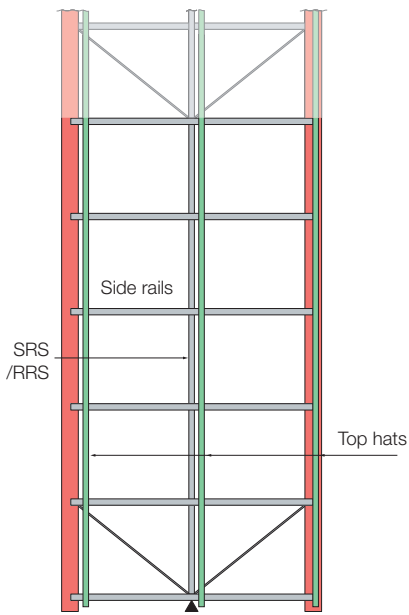
Vertical top hat sections supplied and fixed to the side rails by sheeting contractor.

Note: it is recommended that top hats are positioned close to the vertical side rail supports to avoid undue twisting of the rails with some of the heavier cladding systems.

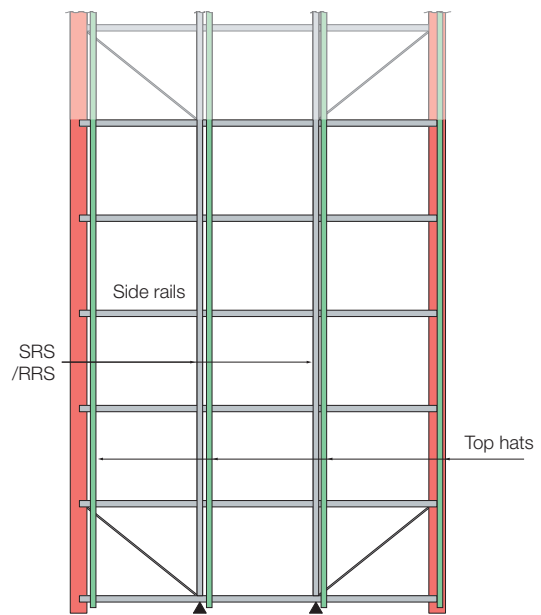
Fixing and erection of the side rails, side rail supports and diagonal tie wires should be in accordance with the recommendations shown on pages 39 to 43.

Rail alignment to be provided by the steelwork contractor. Cladding support to be provided by the sheeting contractor.

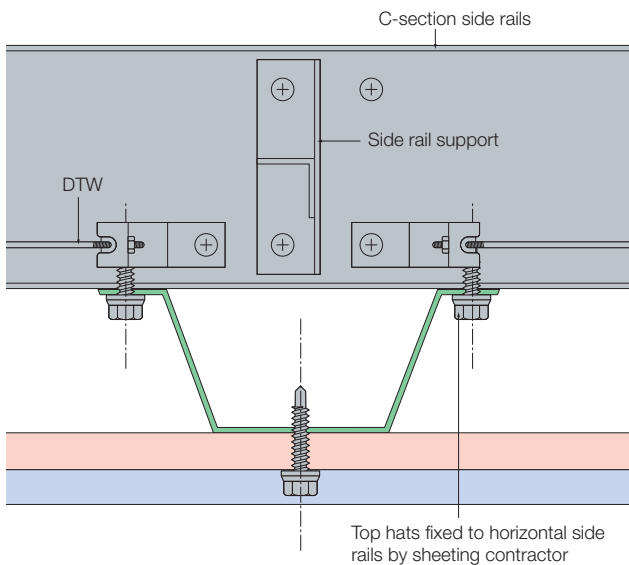
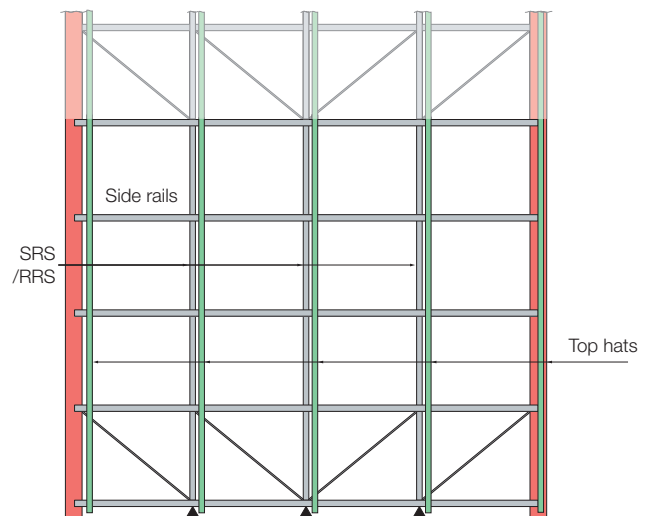
3.2m < spans ≤ 6.1m



6.1m < spans ≤ 10.1m



10.1m < spans ≤ 15m

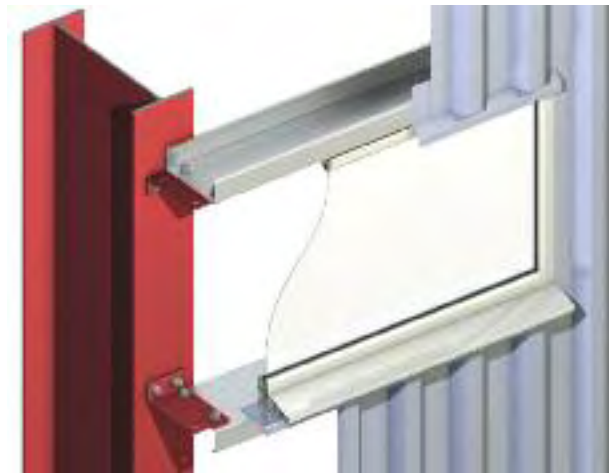


# Window trimmers

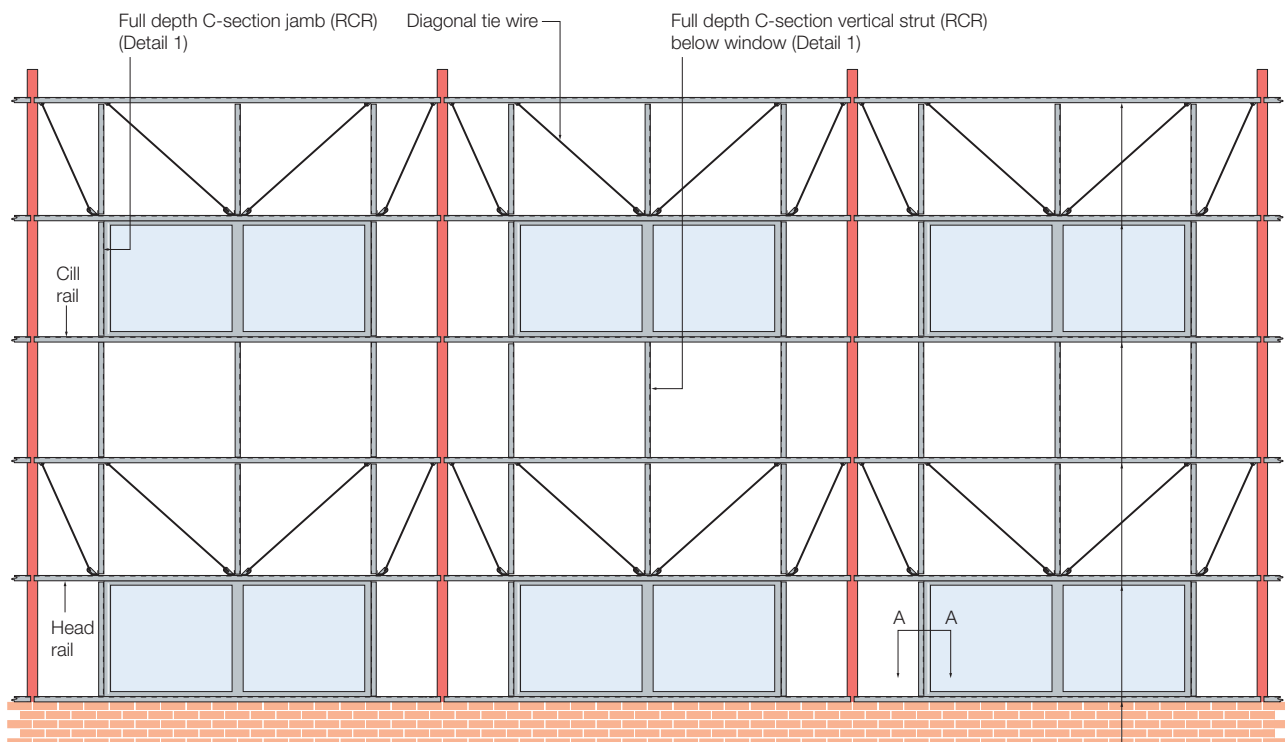
Used in conjunction with C-section side rails, C-section window trimmers provide the necessary surface fixings for windows, claddings and associated flashings. The window trimmer should ideally be of the same depth as the main supporting rail and be connected using riveted C-rail (RCR). Counterformed holes provide the necessary unobstructed fixing surface.

## Riveted C-rails

Riveted C-rails up to 2.5m long are delivered to site with pre-fixed end cleats to aid in the speed of erection and avoid the possibility of losing loose cleats.



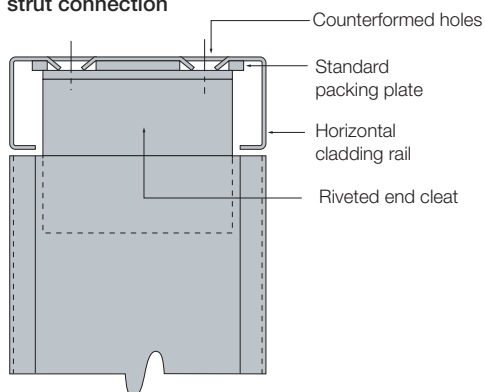
Complex arrangement of windows within a wall elevation illustrating how each bank of windows requires a system of diagonal tie wire bracings in combination with RCR's.



**NB:** All side rail systems are generally designed to a vertical deflection limit of  $\text{Span}/300$ . However, if a more stringent deflection limit is required by the cladding contractor, e.g. over window openings, then please contact our technical department for advice.

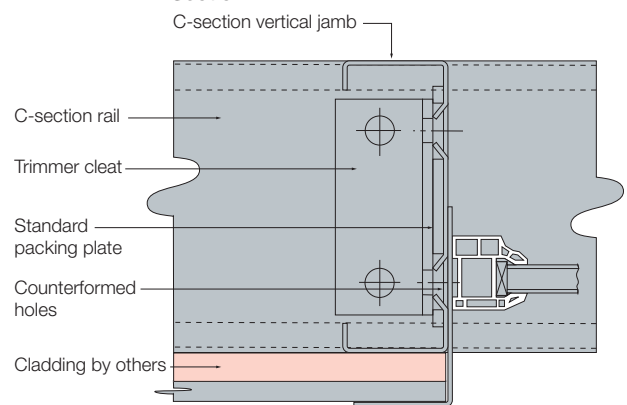
C-section rails

## Detail 1 - jamb and vertical strut connection



Pre-fixed cleats on lengths up to 2.5m

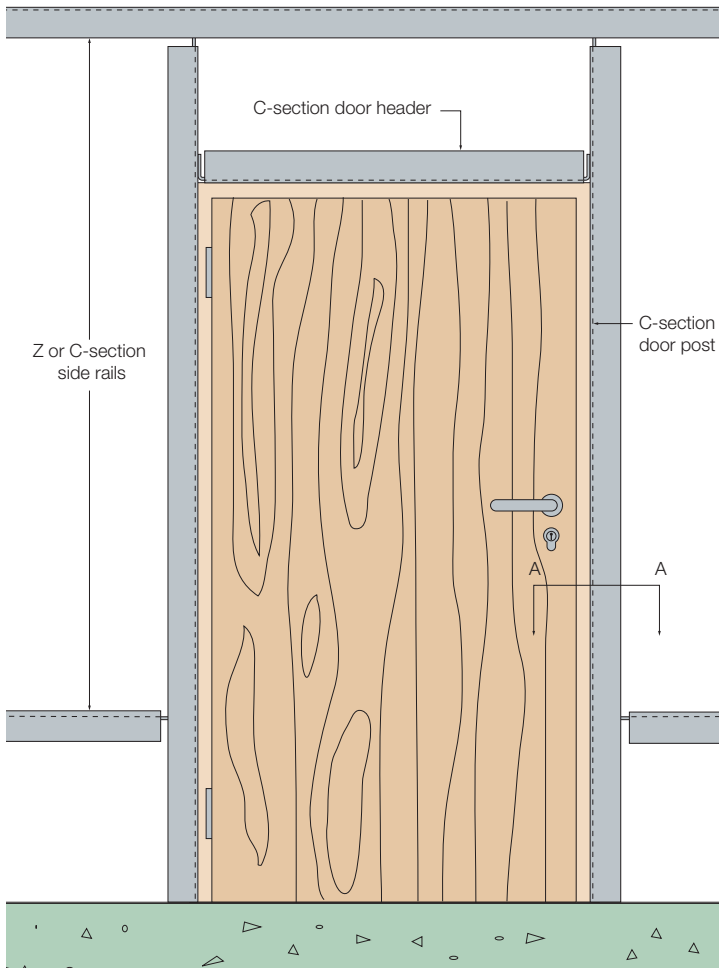
## Section A-A



For lengths over 2.5m bolted end cleats are required

# Door posts

Typical door aperture



Metsec C-sections can be used to provide trimming to personnel doors.

C-sections are connected to the framework of the cladding rail system using compatible depths of sections and standard trimmer cleats.

The use of counterformed holes provides an unobstructive surface for the fixing of door jamb or head rails.

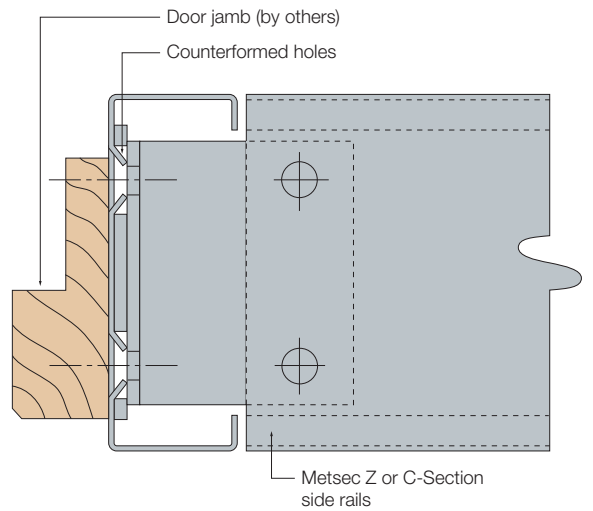
Standard trimming cleat



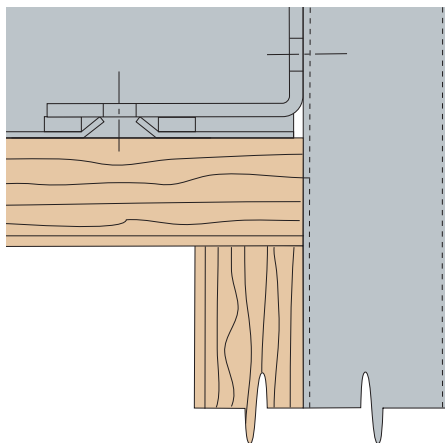
C-section cladding rails can be used toeing up or down



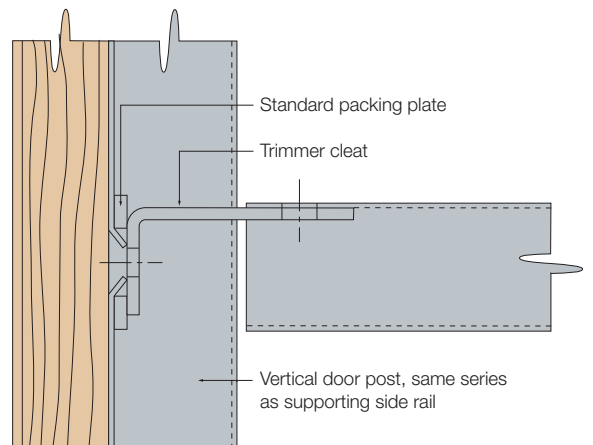
View on A-A



Head rail connection



Front elevation



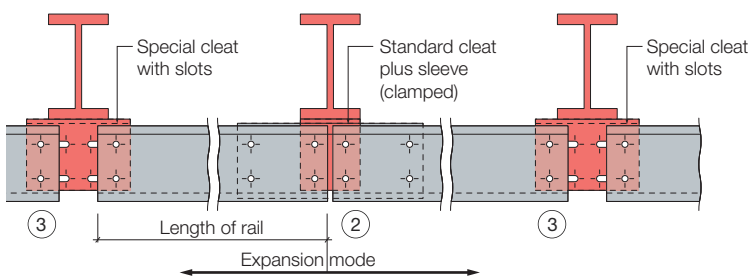
# Fire wall restraint systems

## Achieving up to 4 hours fire resistance

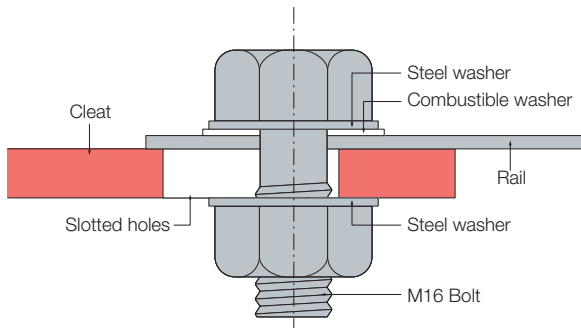
Metsec Z and C-section side rail systems, combined with the appropriate fire resistant wall cladding system, have performed satisfactorily in fire tests up to 4 hours duration. The period of fire resistance is dependent upon the construction and materials used in the fire wall cladding, therefore certification for the fire resistance period should be obtained from the cladding supplier. Accessories and column stays need no facility for expansion and are supplied as standard items.

In isolation, the eaves beam is part of the roof system and therefore need not be fire protected. However, if the rail system is suspended from this beam, it then forms part of the rail system and requires fire protection.

## Even bay sleeved arrangement



The side rail to be used should be selected from the sleeved rail load tables on pages 69-71



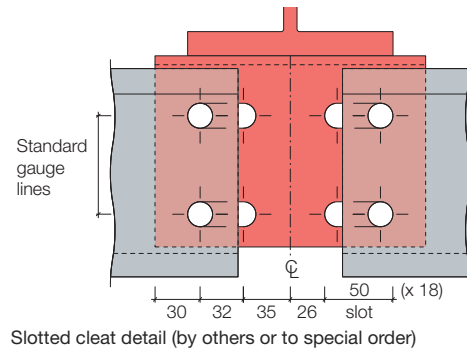
## Rail expansion

Under fire conditions, the rails expand. To achieve the necessary movement, the column fixing cleat should be slotted longitudinally. All fixing bolts should be fitted with combustible washers which collapse under heat, thus loosening the bolts and allowing expansion. This reduces distortion and buckling of the rail, ensuring integrity of the wall construction.

## Rail configurations

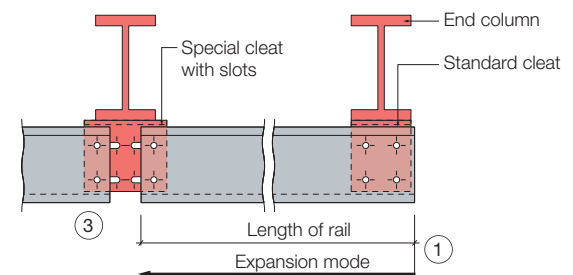
The illustrations above indicate an odd bay arrangement of rails for a fire wall. Grids (1) to (5), are designed as sleeved systems with the sleeves and standard cleats positioned on the same column lines, simplifying detailing and keeping one type of cleat on each column. The slotted cleats are positioned at alternate columns.

The end bay, grids (5) to (6), is designed as a butt system keeping the depth of section similar to the rest but increasing the gauge to maintain rail centres.



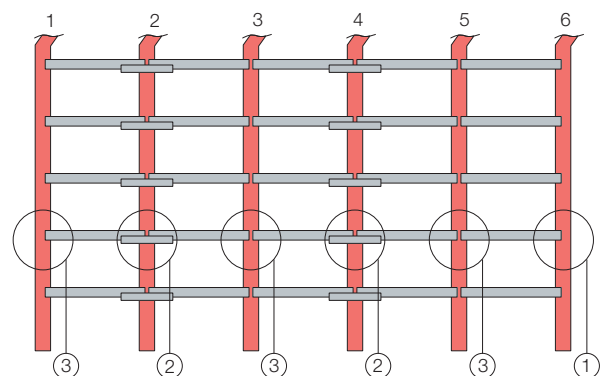
Slotted cleat detail (by others or to special order)

## Single bay butt arrangement



The side rail to be used should be selected from the butt rail load tables on pages 72-74

## Firewall connection arrangement



### Connection details

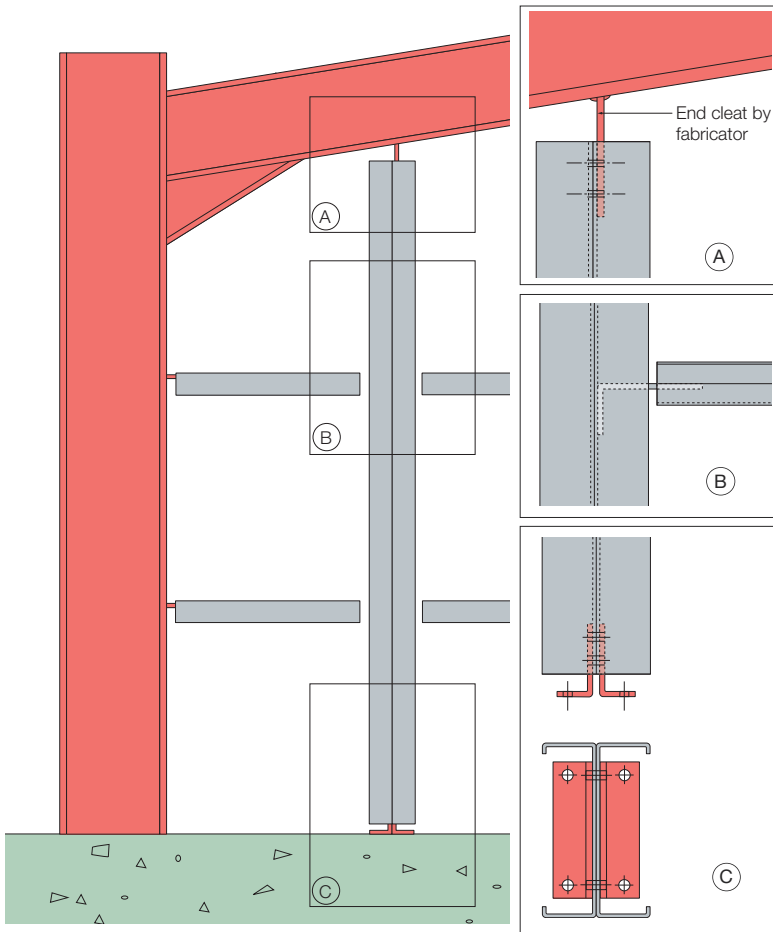
- 1 Standard butt connection
- 2 Standard sleeve connection (sleeve arrangement is not to be staggered)
- 3 Butt connection with slotted holes in cleats (see slotted cleat detail).

The philosophy of rail expansion under fire, is that, with the sleeved system, the rail is locked at the sleeved position and expansion occurs to the left and to the right of this connection into the slotted position. Whereas with the butt system one side is locked and the free end is allowed to expand into the slotted cleat.

Utilising the standard slotted cleat detail, the rail length for both systems equates to the distance of column to column less 35mm. When cleating, clearance between ends of rails should be increased to allow for expansion of the corresponding system, as shown.

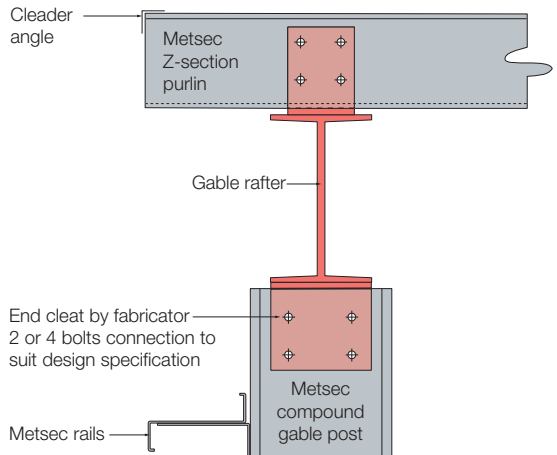
# Ancillary items

## Sheeting posts



The MetSPEC design software can be used to select these sections. Capacities have been derived by calculation in accordance with BS 5950:Part 5:1998.

Compound back-to-back C-sections are used for these members as shown.



To make a compound member, the sections are connected together in the web with pairs of bolts (washer under bolt head and nut) at spacings along the sections (as stated in the program) with all bolts on standard web gauge lines.

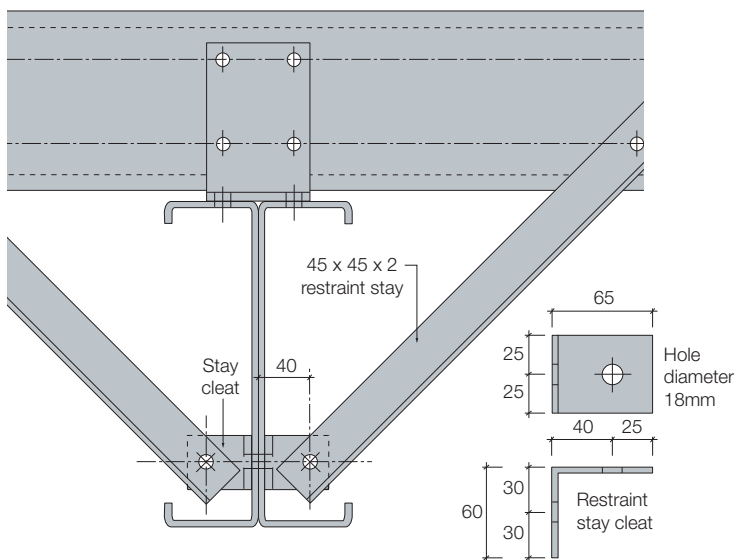
The post must be adequately fixed to the main structure at the top and bottom to provide an effective height factor of 0.85. Connection at the ends to be via 2 or 4 bolts in web on standard web gauge lines.

The fabricator should ensure that the end bracket supporting the sections is suitable for the load to be carried. Restraint stays may be required, the spacings of these is as determined by the MetSPEC design software.

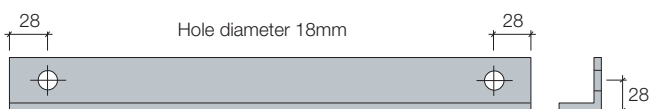
All fixing bolts are to be M16 Grade 8.8 plated bolts complete with washers.

Note: maximum capacity is achieved using a washer under both bolt head and nut for connection of the sections to the supports at ends. The MetSPEC design software allows for a choice of one or two washers per nut/bolt combination.

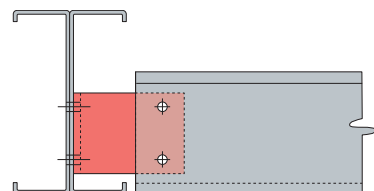
Detail showing side rail connection to the outer flange of the compound sheeting post



Restraint tie



Inset rail connection



# Wind bracing

Metsec C-sections can be used for applications where axial tension or compression loads are to be carried. The MetSPEC design software can be used to select these sections.

Capacities have been derived by calculation in accordance with BS 5950:Part 5:1998.

The capacities are for axial compression or tension loads only and do not take into account bending moments other than those due to self weight or end connection eccentricity, (i.e. gutters etc. to be supported on other members). Connection of sections to support brackets at the ends must be via the web.

### Connection of compound sections

Back to back compound C-sections are used for all compression loads. Compound sections are connected with pairs of bolts (washer under bolt head and nut) on standard web gauge lines equally spaced as determined by the MetSPEC design software.

Tension load capacities are for single or back to back members all connected at ends to support brackets via the web.

The fabricator should ensure that the gusset or end bracket supporting the sections is suitable for the load carried. All fixing bolts are to be M16 grade 8.8 plated bolts complete with washers.

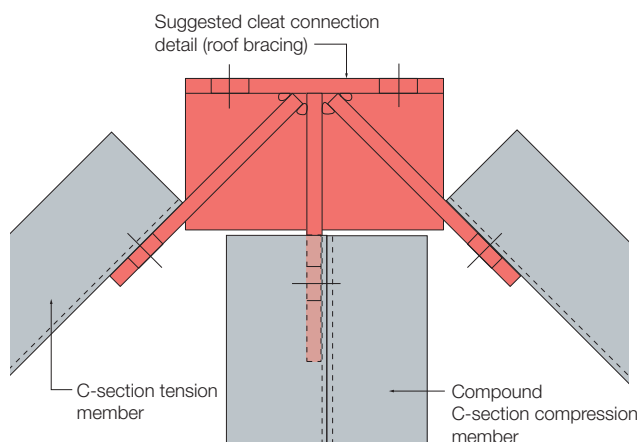
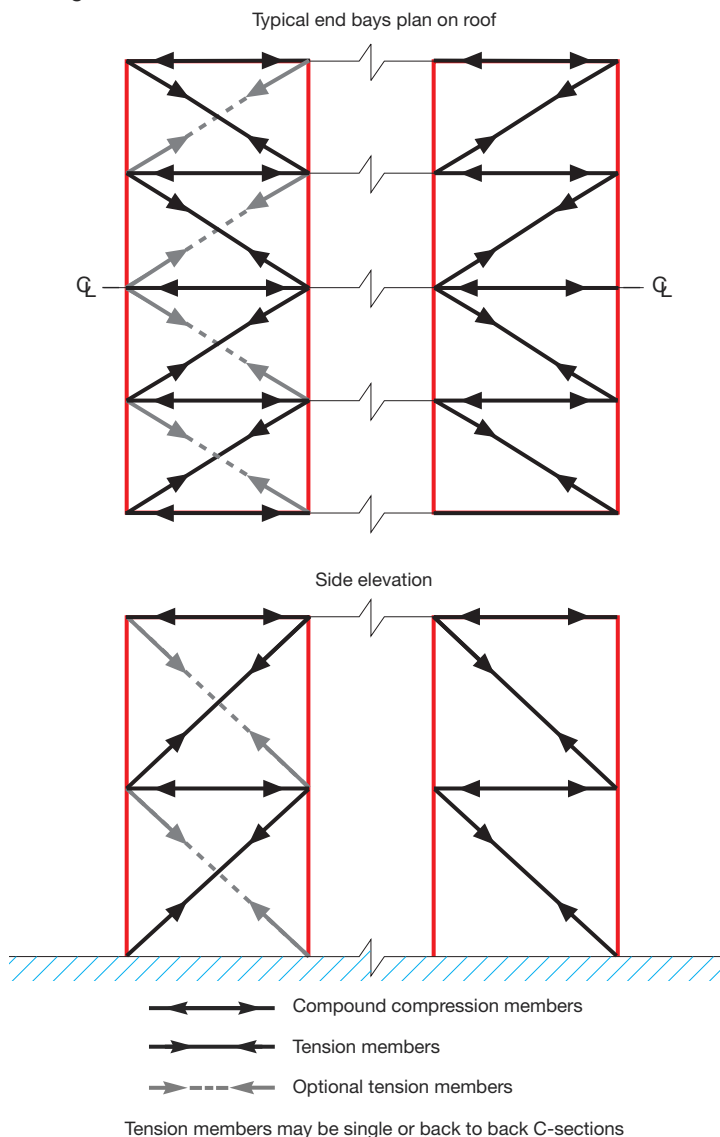


### Wind bracing

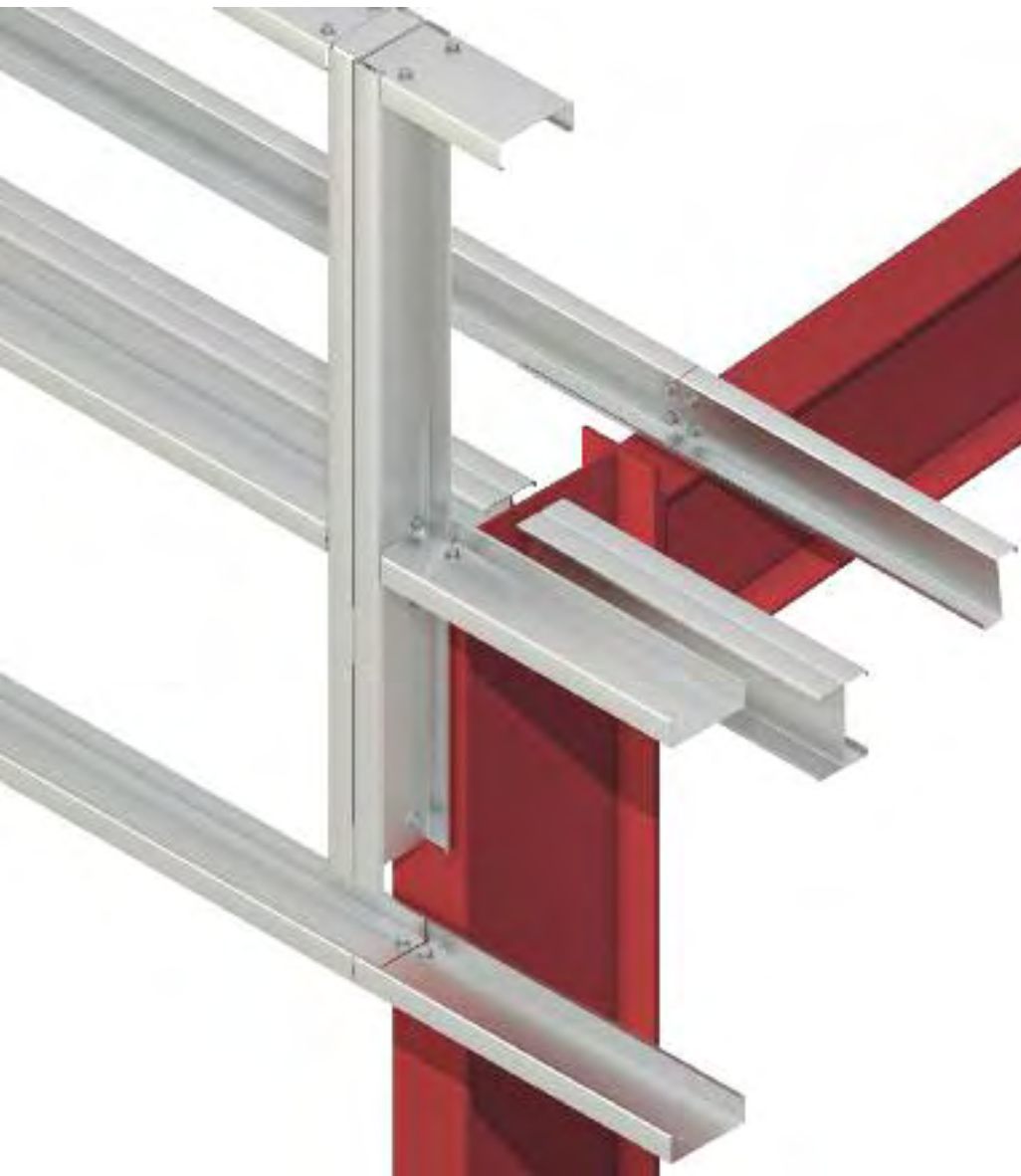
Note: maximum capacity is achieved with a washer under both nut and bolt head. A reduction in capacity is involved if only one washer is used. End connection bolts to support brackets are in pairs on standard web gauge lines. The MetSPEC design software gives a choice of two or four bolts.



Typical arrangement for C-section compression and tension wind bracing members



# Column ties and parapet posts

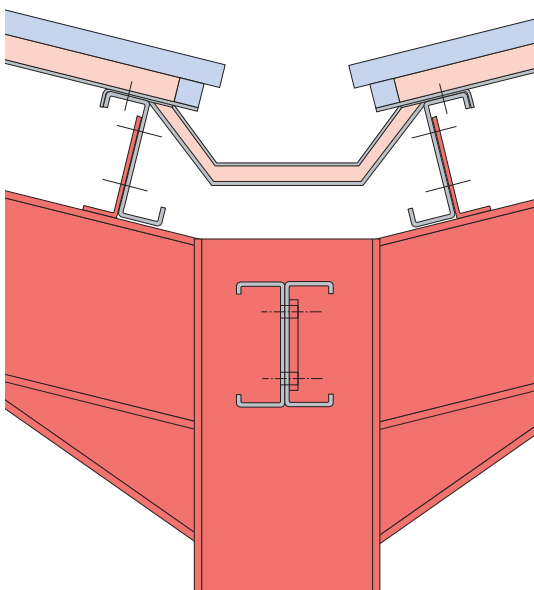


Metsec C-section compound column ties offer significant economic advantages from initial purchase through to on site installation.

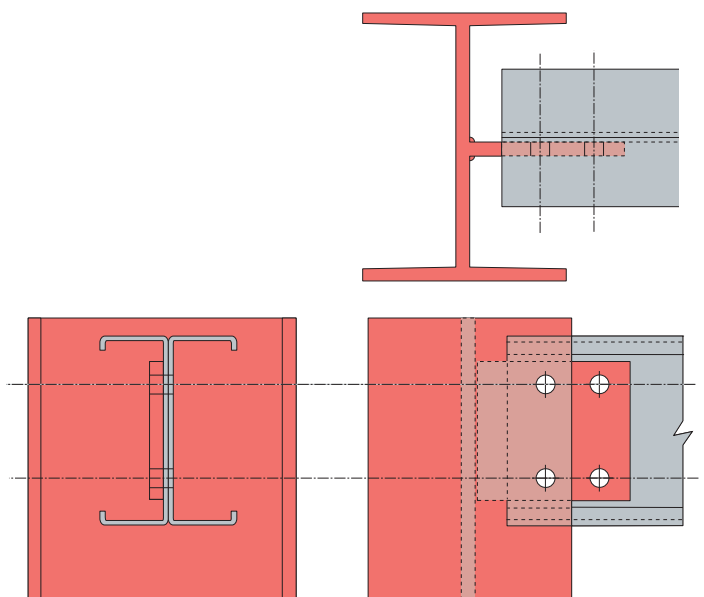
Supplied as single components, C-sections are installed on site to form a compound back-to-back member and produce excellent strength to weight characteristics.

The selection of C-sections and general design guidance is determined from the MetSPEC design software.

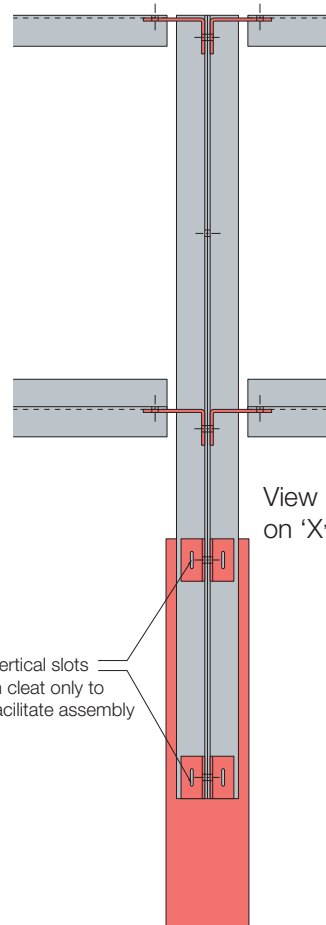
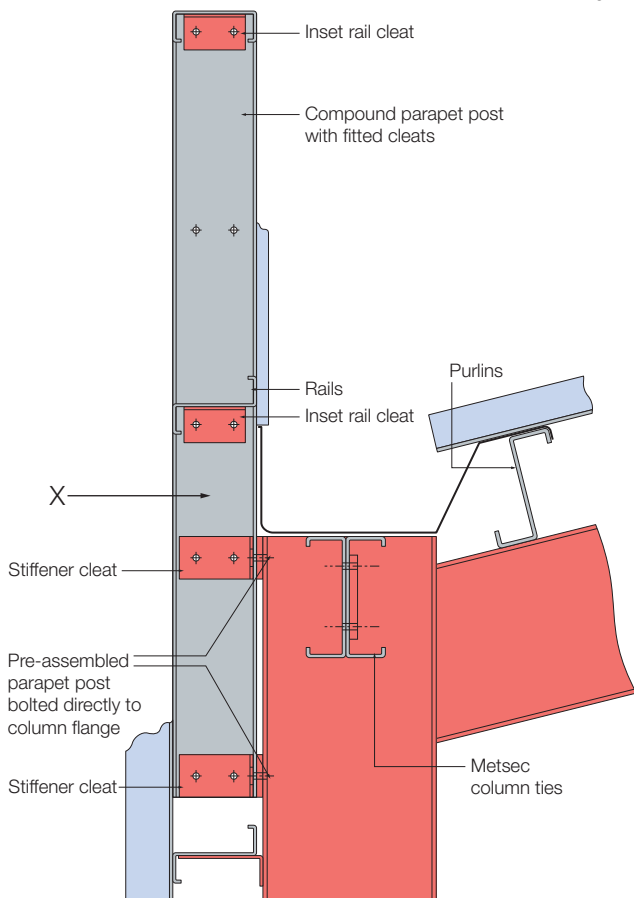
Column tie shown with central gutter



End connection details



**Pre-assembled by others**



Parapet posts can be constructed from back to back C-sections to form a compound member complete with all cleats.

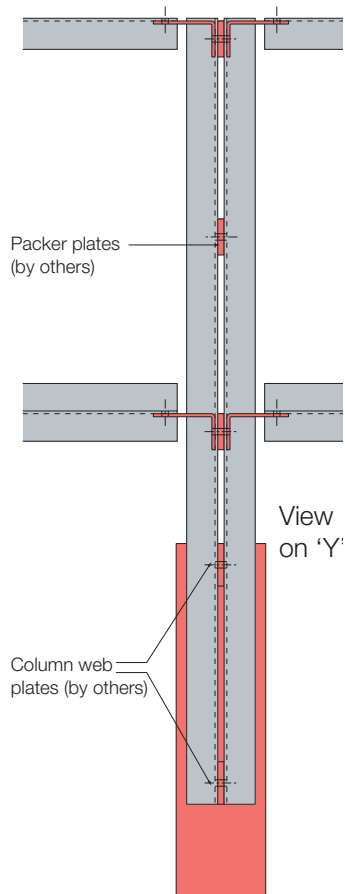
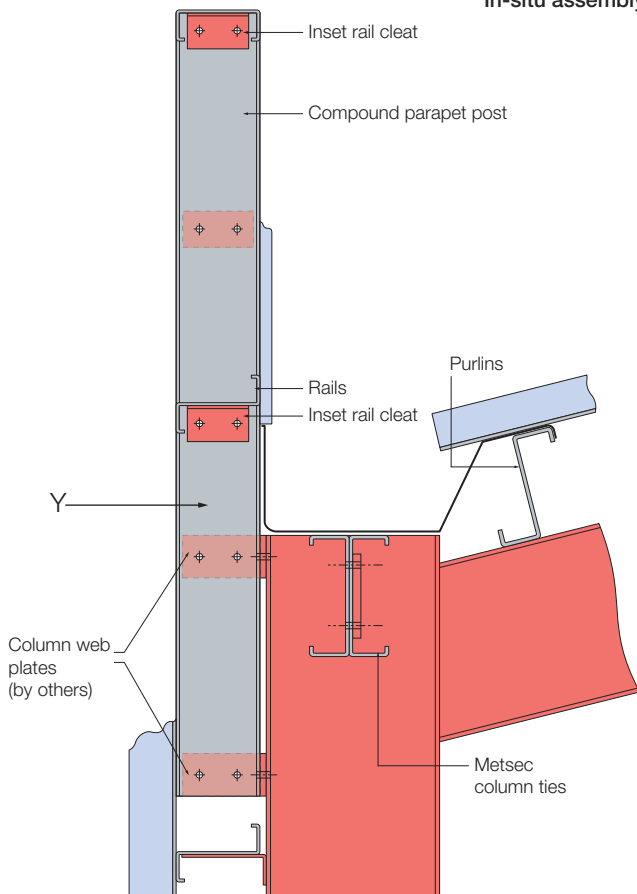
These can be supplied as single components for on-site assembly before lifting into position. C-section compound parapet posts offer significant cost savings against conventional hot rolled steelwork.

Parapet posts are fixed directly to the columns with 8mm stand off packs to maintain the sheeting line.

All necessary sheeting rails can be connected to the parapet post by using inset rail cleats (by others or to special order) fitted to the compound section prior to lifting into position.

For further guidance on the use and applications of C-section parapet posts, please consult our design department.

**In-situ assembly**



# Service supports

There are many different types of service support clips available in today's market. When fixing either to Z-sections or C-sections, the most common types and their application are shown.

The maximum recommended safe working loads given in the table opposite are intended for guidance only. They are for roof pitches less than 12° and will be conservative for some of the more innovative or heavy duty clips available. Please refer to the clip manufacturer for advice.

Note: beware of published clip load capacities as these may be for the clip only. Unacceptable movement of the purlin flange, particularly on steep slopes, may cause slip or failure of the fixings.

An equivalent service load used for the design of the purlins may be calculated as follows:

Point loads from services = 25kg at 1.2m spacing

Purlin centres = 1.8m

$$\text{Equivalent service load} = \frac{25 \times 9.81 \times 10^{-3}}{1.2 \times 1.8} = 0.114 \text{ kN/m}^2$$

By using a Metstrut channel fixed between purlin lines, loads can be evenly distributed as shown on Detail A below.

### C-section trimming detail

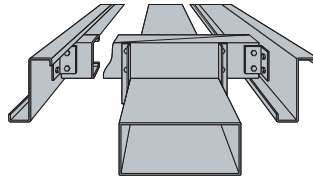
Using standard gauge line holes, a channel or angle trimmer can be fitted and used to carry heavier or large pieces of equipment as shown on Detail B below.

An allowance should be made when selecting sections from the design load tables if services are to be hung from the purlins, either as a uniformly distributed load for a small service load, or a point load if the load is of a large magnitude. Our engineers are available to advise on purlin selection for unusual cases.

Detail A

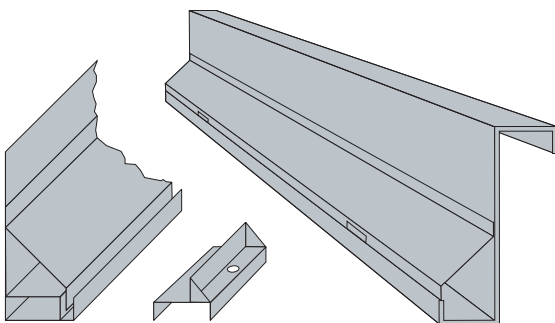


Detail B

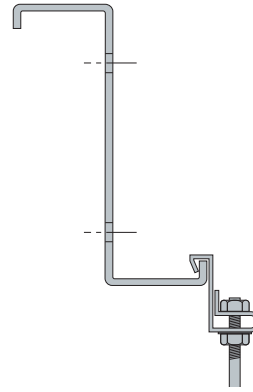


Proprietary duct systems and dust covers are available for simplicity and rapid installation of electrical services.

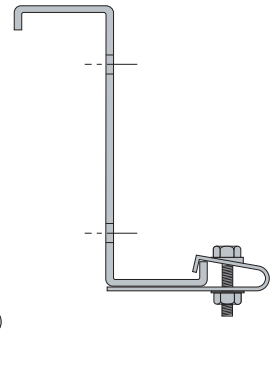
Dust covers are simply installed on site and have the ability to also contain cables.



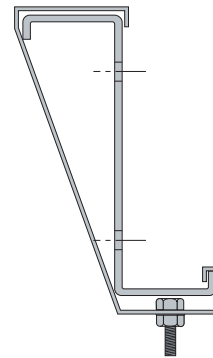
Light duty



Light/medium duty

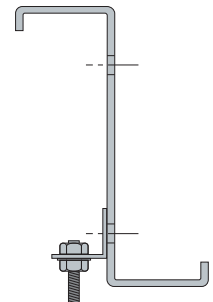


Light/medium duty

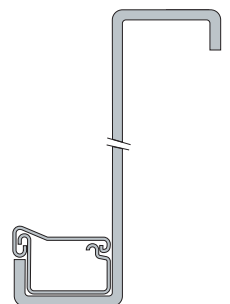
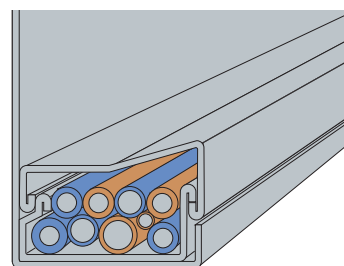


Profile gauge (mm)	Safe working load (kg)
1.3	10
1.4	12
1.5	15
1.6	15
1.8	20
2.0	25
2.3	30
2.5	35
2.9	50

Heavy duty (web fix)



Metsec purlin with shallow tray and lid to bottom flange



# Cleats

## Standard Z and C-section

Metsec standard purlin cleats are suitable for all normal applications on purlins and side rail systems.

For abnormal loadings in tiled roof/steep slopes, cleats should be stiffened.

Special cleats can be supplied by arrangement.

Cleat ref.	A	B*	C	D	E	F
142	130	50	56	35	65	6
172	160	50	86	35	65	6
202	190	50	116	35	65	6
232	220	50	146	35	65	8
262	250	50	176	35	65	8
302	280	60	195	40	75	8
342	320	60	235	40	75	8

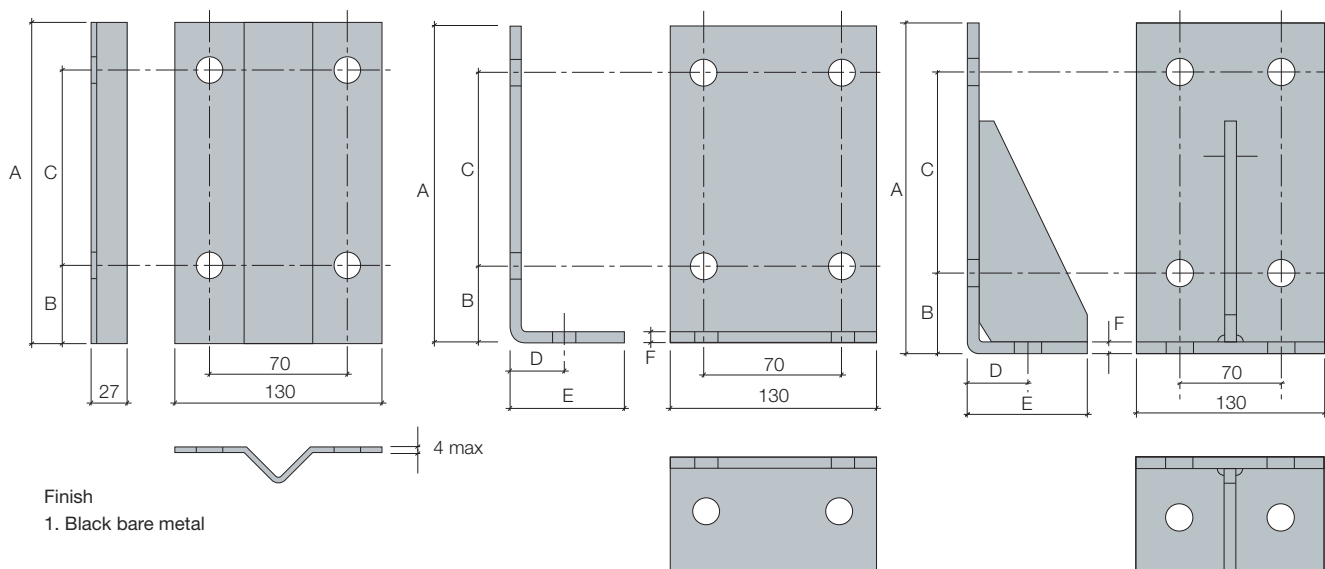
All holes 18mm diameter

\* Variable height cleats can be supplied if required.  
Dimension B = 142 maximum

### Series 142-262 weld-on cleats

### Series 142-262 bolt-on cleats

### Series 302 and 342 weld-on or bolt-on cleat



Finish  
1. Black bare metal

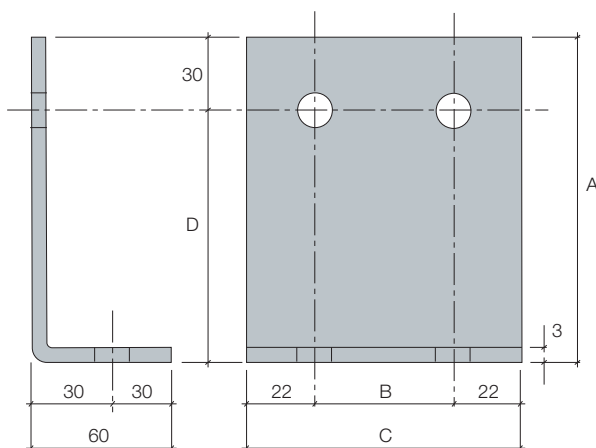
Finish  
1. 6mm pre-galvanised  
2. 8mm hot dipped galvanised

Finish  
1. Black bare metal for welding or bolting  
2. Hot dipped galvanised for bolting

### Building shell trimmer cleats

Cleat ref.	A	B	C	D
TC 142	126	56	100	96
TC 172	136	86	130	106
TC 202	136	116	160	106
TC 232	142	146	190	112
TC 262	146	176	220	116
TC 302	156	195	239	126
TC 342	166	235	279	136

### Trimmer cleats



All trimming cleats are 3mm galvanised steel, suitable for compatible depths of Z-section and C-section, i.e. 202. Z. to 202. C. etc.

# Roof systems

## Introduction

The load tables contained in this document are based on the criteria shown opposite and are the results of extensive design and testing using the facilities and skills of the Department of Mechanical Engineering at The University of Strathclyde.

### Performance

The performance of the systems shown in this document has been derived by calculation in accordance with BS 5950:5 1998, calibrated and proven by full scale tests. Purlin load tables are valid up to and including 25° roof slopes. For slopes greater than 25°, use our MetSPEC design software, see page 87.

### Wind assessment

Wind loads are determined using BS 6399:2 1997.

A fast, accurate and economical assessment of these loads is easily carried out using our MetSPEC design software.

### Load factors

Loading	Factor
Dead load	1.40
Dead load restraining uplift or overturning	1.00
Dead load acting with wind and imposed loads combined	1.20
Imposed load	1.60
Imposed load acting with wind load	1.20
Wind load	1.40
Wind load acting with imposed load	1.20
Forces due to temperature effects	1.20
Drifting snow	1.05

## Z-section sleeved purlin system

Section reference	Weight kg/m	Total kN	Working loads								Ultimate U.D.L. in kN/span				
			Allowable loading in kN/m <sup>2</sup> purlin centres in mm						Deflection		Down load	Uplift - Metal cladding Number of anti sag rods			
			1000	1200	1500	1800	2000	2400	Span 180	Span 360		0	1	2	
SPAN 4.0m															
142 Z 13	2.84	10.84	2.71	2.26	1.81	1.51	1.36	1.13	11.75	5.82	17.51	11.33	17.51	17.51	
142 Z 14	3.05	12.24	3.06	2.55	2.04	1.70	1.53	1.27	12.62	6.25	19.75	12.36	19.75	19.75	
142 Z 15	3.26	13.47	3.37	2.81	2.24	1.87	1.68	1.40	13.47	6.67	22.01	13.36	22.01	22.01	
SPAN 4.5m															
142 Z 13	2.84	9.48	2.11	1.76	1.40	1.17	1.05	0.88	9.48	4.68	15.56	9.53	15.56	15.56	
142 Z 14	3.05	10.18	2.26	1.89	1.51	1.26	1.13	0.94	10.18	5.02	17.55	10.42	17.55	17.55	
142 Z 15	3.26	10.87	2.42	2.01	1.61	1.34	1.21	1.01	10.87	5.36	19.57	11.27	19.57	19.57	
142 Z 16	3.47	11.56	2.57	2.14	1.71	1.43	1.28	1.07	11.56	5.71	21.58	12.09	21.58	21.58	
172 Z 13	3.25	12.01	2.67	2.22	1.78	1.48	1.33	1.11	14.99	7.42	19.42	11.19	19.42	19.42	
172 Z 14	3.49	13.62	3.03	2.52	2.02	1.68	1.51	1.26	16.10	7.97	22.01	12.22	22.01	22.01	
SPAN 5.0m															
142 Z 13	2.84	7.81	1.56	1.30	1.04	0.87	0.78	0.65	7.81	3.84	14.00	8.25	14.00	14.00	
142 Z 14	3.05	8.39	1.68	1.40	1.12	0.93	0.84	0.70	8.39	4.12	15.80	9.02	15.80	15.80	
142 Z 15	3.26	8.96	1.79	1.49	1.19	1.00	0.90	0.75	8.96	4.40	17.61	9.77	17.61	17.61	
142 Z 16	3.47	9.53	1.91	1.59	1.27	1.06	0.95	0.79	9.53	4.68	19.42	10.48	19.42	19.42	
172 Z 13	3.25	10.78	2.16	1.80	1.44	1.20	1.08	0.90	12.38	6.11	17.48	9.49	17.48	17.48	
172 Z 14	3.49	12.23	2.45	2.04	1.63	1.36	1.22	1.02	13.30	6.56	19.81	10.39	19.81	19.81	
172 Z 15	3.73	13.71	2.74	2.28	1.83	1.52	1.37	1.14	14.21	7.01	22.19	11.26	22.19	22.19	
172 Z 16	3.98	15.11	3.02	2.52	2.02	1.68	1.51	1.26	15.11	7.46	24.59	12.10	24.59	24.59	
202 Z 14	3.82	14.44	2.89	2.41	1.93	1.60	1.44	1.20	18.7	9.27	23.36	10.51	23.36	23.36	
202 Z 15	4.09	16.30	3.26	2.72	2.17	1.81	1.63	1.36	20.03	9.91	26.37	11.39	26.33	26.35	
SPAN 5.5m															
142 Z 14	3.05	7.03	1.28	1.06	0.85	0.71	0.64	0.53	7.03	3.43	14.36	7.96	14.36	14.36	
142 Z 15	3.26	7.50	1.36	1.14	0.91	0.76	0.68	0.57	7.50	3.66	16.01	8.62	16.01	16.01	
142 Z 16	3.47	7.98	1.45	1.21	0.97	0.81	0.73	0.60	7.98	3.90	17.66	9.25	17.66	17.66	
172 Z 13	3.25	9.78	1.78	1.48	1.19	0.99	0.89	0.74	10.39	5.11	15.89	8.27	15.89	15.89	
172 Z 14	3.49	11.09	2.02	1.68	1.34	1.12	1.01	0.84	11.17	5.49	18.01	9.06	18.01	18.01	
172 Z 15	3.73	11.93	2.17	1.81	1.45	1.21	1.08	0.90	11.93	5.87	20.17	9.83	20.17	20.17	
172 Z 16	3.98	12.69	2.31	1.92	1.54	1.28	1.15	0.96	12.69	6.24	22.35	10.58	22.35	22.35	
202 Z 14	3.82	13.16	2.39	1.99	1.60	1.33	1.20	1.00	15.76	7.78	21.35	9.06	21.35	21.35	
202 Z 15	4.09	14.79	2.69	2.24	1.79	1.49	1.34	1.12	16.84	8.31	23.97	9.84	23.97	23.97	
202 Z 16	4.35	16.43	2.99	2.49	1.99	1.66	1.49	1.24	17.93	8.85	26.62	10.59	26.62	26.62	

# Roof systems

## Z-section sleeved purlin system

Section reference	Weight kg/m	Total kN	Working loads								Ultimate U.D.L. in kN/span				
			Allowable loading in kN/m <sup>2</sup>						Deflection		Down load	Uplift - Metal cladding			
			purlin centres in mm						Span	Span		Number of anti sag rods			
			1000	1200	1500	1800	2000	2400	180	360		0	1	2	
SPAN 6.0m															
172 Z 13	3.25	8.85	1.47	1.23	0.98	0.82	0.74	0.61	8.85	4.33	14.57	7.33	14.57	14.57	
172 Z 14	3.49	9.51	1.58	1.32	1.06	0.88	0.79	0.66	9.51	4.65	16.51	8.04	16.51	16.51	
172 Z 15	3.73	10.16	1.69	1.41	1.13	0.94	0.85	0.71	10.16	4.97	18.49	8.73	18.49	18.49	
172 Z 16	3.98	10.81	1.80	1.50	1.20	1.00	0.90	0.75	10.81	5.29	20.49	9.40	20.49	20.49	
202 Z 14	3.82	12.03	2.01	1.67	1.34	1.11	1.00	0.84	13.44	6.61	19.57	7.98	19.57	19.57	
202 Z 15	4.09	13.52	2.25	1.88	1.50	1.25	1.13	0.94	14.37	7.06	21.97	8.68	21.97	21.97	
202 Z 16	4.35	15.03	2.50	2.09	1.67	1.39	1.25	1.04	15.29	7.52	24.40	9.35	24.40	24.40	
202 Z 18	4.88	17.12	2.85	2.38	1.90	1.59	1.43	1.19	17.12	8.42	29.24	10.61	28.44	29.24	
202 Z 20	5.40	18.93	3.15	2.63	2.10	1.75	1.58	1.31	18.93	9.30	33.97	11.77	31.61	33.97	
232 Z 15	4.44	15.41	2.57	2.14	1.71	1.43	1.28	1.07	19.40	9.57	25.02	9.43	24.85	25.02	
232 Z 16	4.73	17.36	2.89	2.41	1.93	1.61	1.45	1.21	20.65	10.19	28.17	10.28	27.22	28.17	
SPAN 6.5m															
202 Z 14	3.82	11.08	1.70	1.42	1.14	0.95	0.85	0.71	11.60	5.68	18.06	7.14	18.06	18.06	
202 Z 15	4.09	12.40	1.91	1.59	1.27	1.06	0.95	0.79	12.40	6.07	20.28	7.77	20.28	20.28	
202 Z 16	4.35	13.19	2.03	1.69	1.35	1.13	1.01	0.85	13.19	6.46	22.52	8.37	22.52	22.52	
202 Z 18	4.88	14.77	2.27	1.89	1.51	1.26	1.14	0.95	14.77	7.23	26.99	9.51	26.34	26.99	
202 Z 20	5.40	16.33	2.51	2.09	1.67	1.40	1.26	1.05	16.33	7.99	31.36	10.55	29.27	31.36	
232 Z 15	4.44	14.35	2.21	1.84	1.47	1.23	1.10	0.92	16.76	8.24	23.35	8.43	22.98	23.35	
232 Z 16	4.73	15.99	2.46	2.05	1.64	1.37	1.23	1.02	17.84	8.77	26.00	9.20	25.19	26.00	
232 Z 18	5.30	19.26	2.96	2.47	1.98	1.65	1.48	1.23	19.98	9.82	31.29	10.70	29.50	31.29	
SPAN 7.0m															
202 Z 15	4.09	10.80	1.54	1.29	1.03	0.86	0.77	0.64	10.80	5.26	18.83	7.03	18.83	18.83	
202 Z 16	4.35	11.49	1.64	1.37	1.09	0.91	0.82	0.68	11.49	5.60	20.91	7.57	20.91	20.91	
202 Z 18	4.88	12.87	1.84	1.53	1.23	1.02	0.92	0.77	12.87	6.27	25.06	8.61	24.57	25.06	
232 Z 15	4.44	13.29	1.90	1.58	1.27	1.05	0.95	0.79	14.63	7.16	21.69	7.62	21.41	21.69	
232 Z 16	4.73	14.81	2.12	1.76	1.41	1.18	1.06	0.88	15.57	7.62	24.15	8.32	23.49	24.15	
232 Z 18	5.30	17.43	2.49	2.08	1.66	1.38	1.25	1.04	17.43	8.53	29.06	9.69	27.54	29.06	
232 Z 20	5.87	19.28	2.75	2.30	1.84	1.53	1.38	1.15	19.28	9.44	33.88	10.99	31.38	33.88	
262 Z 16	5.11	16.50	2.36	1.96	1.57	1.31	1.18	0.98	20.35	10.00	26.89	26.89	26.89	26.89	
262 Z 18	5.73	20.23	2.89	2.41	1.93	1.61	1.44	1.20	22.79	11.20	32.91	32.91	32.91	32.91	
SPAN 7.5m															
202 Z 18	4.88	11.30	1.51	1.26	1.00	0.84	0.75	0.63	11.30	5.47	23.39	-	23.04	23.39	
202 Z 20	5.40	12.49	1.67	1.39	1.11	0.93	0.83	0.69	12.49	6.05	27.18	-	25.59	27.18	
232 Z 15	4.44	12.36	1.65	1.37	1.10	0.92	0.82	0.69	12.87	6.27	20.24	-	20.07	20.24	
232 Z 16	4.73	13.70	1.83	1.52	1.22	1.01	0.91	0.76	13.70	6.67	22.54	-	22.03	22.54	
232 Z 18	5.30	15.34	2.05	1.70	1.36	1.14	1.02	0.85	15.34	7.47	27.12	-	25.85	27.12	
232 Z 20	5.87	16.96	2.26	1.88	1.51	1.26	1.13	0.94	16.96	8.27	31.62	-	29.46	31.62	
232 Z 23	6.71	19.38	2.58	2.15	1.72	1.44	1.29	1.08	19.38	9.44	38.12	-	34.41	38.12	
262 Z 16	5.11	15.54	2.07	1.73	1.38	1.15	1.04	0.86	17.92	8.77	25.39	25.39	25.39	25.39	
262 Z 18	5.73	18.83	2.51	2.09	1.67	1.39	1.26	1.05	20.08	9.83	30.72	30.72	30.72	30.72	
262 Z 20	6.34	22.07	2.94	2.45	1.96	1.63	1.47	1.23	22.21	10.87	35.96	35.23	35.96	35.96	
SPAN 8.0m															
232 Z 15	4.44	11.40	1.43	1.19	0.95	0.79	0.71	0.59	11.40	5.53	18.97	-	18.89	18.97	
232 Z 16	4.73	12.14	1.52	1.26	1.01	0.84	0.76	0.63	12.14	5.88	21.13	-	20.74	21.13	
232 Z 18	5.30	13.59	1.70	1.42	1.13	0.94	0.85	0.71	13.59	6.59	25.43	-	24.35	25.43	
232 Z 20	5.87	15.03	1.88	1.57	1.25	1.04	0.94	0.78	15.03	7.29	29.64	-	27.76	29.64	
232 Z 23	6.71	17.17	2.15	1.79	1.43	1.19	1.07	0.89	17.17	8.32	35.74	-	32.43	35.74	
262 Z 16	5.11	14.52	1.82	1.51	1.21	1.01	0.91	0.76	15.90	7.75	23.80	-	23.80	23.80	
262 Z 18	5.73	17.61	2.20	1.83	1.47	1.22	1.10	0.92	17.81	8.68	28.80	-	28.80	28.80	
262 Z 20	6.34	19.71	2.46	2.05	1.64	1.37	1.23	1.03	19.71	9.61	33.71	-	33.71	33.71	

# Roof systems

## Z-section sleeved purlin system

Section reference	Weight kg/m	Working loads									Ultimate U.D.L. in kN/span			
		Total kN	Allowable loading in kN/m <sup>2</sup> purlin centres in mm						Deflection		Down load	Uplift - Metal cladding Number of anti sag rods		
			1000	1200	1500	1800	2000	2400	Span 180	Span 360		0	1	2
SPAN 8.50m														
232 Z 16	4.73	10.82	1.27	1.06	0.85	0.71	0.64	0.53	10.82	5.21	19.89	-	19.59	19.89
232 Z 18	5.30	12.12	1.43	1.19	0.95	0.79	0.71	0.59	12.12	5.84	23.93	-	23.00	23.93
232 Z 20	5.87	13.40	1.58	1.31	1.05	0.88	0.79	0.66	13.40	6.46	27.90	-	26.23	27.90
232 Z 23	6.71	15.31	1.80	1.50	1.20	1.00	0.90	0.75	15.31	7.37	33.64	-	30.64	33.64
262 Z 16	5.11	13.63	1.60	1.34	1.07	0.89	0.80	0.67	14.20	6.89	22.40	-	22.40	22.40
262 Z 18	5.73	15.91	1.87	1.56	1.25	1.04	0.94	0.78	15.91	7.71	27.10	-	27.10	27.10
262 Z 20	6.34	17.60	2.07	1.73	1.38	1.15	1.04	0.86	17.60	8.54	31.73	-	31.73	31.73
262 Z 23	7.26	20.11	2.37	1.97	1.58	1.31	1.18	0.99	20.11	9.75	38.47	-	38.47	38.47
SPAN 9.00m														
232 Z 20	5.87	12.01	1.33	1.11	0.89	0.74	0.67	0.56	12.01	5.75	26.35	-	-	26.35
232 Z 23	6.71	13.72	1.52	1.27	1.02	0.85	0.76	0.64	13.72	6.56	31.77	-	-	31.77
262 Z 16	5.11	12.75	1.42	1.18	0.94	0.79	0.71	0.59	12.75	6.15	21.15	-	-	21.15
262 Z 18	5.73	14.28	1.59	1.32	1.06	0.88	0.79	0.66	14.28	6.89	25.60	-	-	25.60
262 Z 20	6.34	15.80	1.76	1.46	1.17	0.98	0.88	0.73	15.80	7.62	29.97	-	-	29.97
262 Z 23	7.26	18.06	2.01	1.67	1.34	1.11	1.00	0.84	18.06	8.71	36.33	-	-	36.33
262 Z 25	7.86	19.54	2.17	1.81	1.45	1.21	1.09	0.90	19.54	9.42	40.46	-	-	40.46
302 Z 20	7.86	23.97	2.66	2.22	1.78	1.48	1.33	1.11	26.69	13.00	39.33	-	39.33	39.33
302 Z 23	9.01	30.23	3.36	2.80	2.24	1.87	1.68	1.40	30.53	14.87	49.48	-	49.48	49.48
302 Z 25	9.76	33.08	3.68	3.06	2.45	2.04	1.84	1.53	33.08	16.11	56.23	-	56.23	56.23
SPAN 9.50m														
262 Z 18	5.73	12.88	1.36	1.13	0.90	0.75	0.68	0.56	12.88	6.17	24.25	-	-	24.25
262 Z 20	6.34	14.25	1.50	1.25	1.00	0.83	0.75	0.63	14.25	6.83	28.39	-	-	28.39
262 Z 23	7.26	16.29	1.71	1.43	1.14	0.95	0.86	0.71	16.29	7.81	34.42	-	-	34.42
262 Z 25	7.86	17.63	1.86	1.55	1.24	1.03	0.93	0.77	17.63	8.45	38.33	-	-	38.33
302 Z 20	7.86	22.64	2.38	1.99	1.59	1.32	1.19	0.99	24.12	11.70	37.26	-	37.26	37.26
302 Z 23	9.01	27.60	2.91	2.42	1.94	1.61	1.45	1.21	27.60	13.38	46.88	-	46.88	46.88
302 Z 25	9.76	29.90	3.15	2.62	2.10	1.75	1.57	1.31	29.90	14.49	53.27	-	53.27	53.27
SPAN 10.00m														
262 Z 18	5.73	11.67	1.17	0.97	0.78	0.65	0.58	0.49	11.67	5.55	23.04	-	-	23.04
262 Z 20	6.34	12.91	1.29	1.08	0.86	0.72	0.65	0.54	12.91	6.14	26.97	-	-	26.97
262 Z 23	7.26	14.75	1.48	1.23	0.98	0.82	0.74	0.61	14.75	7.02	32.70	-	-	32.70
262 Z 25	7.86	15.97	1.60	1.33	1.06	0.89	0.80	0.67	15.97	7.60	36.41	-	-	36.41
302 Z 20	7.86	21.45	2.14	1.79	1.43	1.19	1.07	0.89	21.90	10.56	35.39	-	35.39	35.39
302 Z 23	9.01	25.06	2.51	2.09	1.67	1.39	1.25	1.04	25.06	12.09	44.54	-	44.54	44.54
302 Z 25	9.76	27.14	2.71	2.26	1.81	1.51	1.36	1.13	27.14	13.09	50.61	-	50.61	50.61
SPAN 10.50m														
302 Z 20	7.86	19.96	1.90	1.58	1.27	1.06	0.95	0.79	19.96	9.57	33.71	-	33.71	33.71
302 Z 23	9.01	22.83	2.17	1.81	1.45	1.21	1.09	0.91	22.83	10.95	42.41	-	42.41	42.41
302 Z 25	9.76	24.74	2.36	1.96	1.57	1.31	1.18	0.98	24.74	11.86	48.20	-	48.20	48.20
342 Z 23	9.73	29.22	2.78	2.32	1.86	1.55	1.39	1.16	30.13	14.56	48.16	-	48.16	48.16
342 Z 25	10.55	32.64	3.11	2.59	2.07	1.73	1.55	1.30	32.64	15.78	54.90	-	54.90	54.90
342 Z 27	11.37	35.14	3.35	2.79	2.23	1.86	1.67	1.39	35.14	16.99	61.56	-	61.56	61.56
SPAN 11.00m														
302 Z 20	7.86	18.25	1.66	1.38	1.11	0.92	0.83	0.69	18.25	8.70	32.18	-	32.18	32.18
302 Z 23	9.01	20.88	1.90	1.58	1.27	1.05	0.95	0.79	20.88	9.96	40.49	-	40.49	40.49
302 Z 25	9.76	22.62	2.06	1.71	1.37	1.14	1.03	0.86	22.62	10.78	46.01	-	46.01	46.01
342 Z 23	9.73	27.59	2.51	2.09	1.67	1.39	1.25	1.05	27.59	13.27	45.97	----	45.97	45.97
342 Z 25	10.55	29.89	2.72	2.26	1.81	1.51	1.36	1.13	29.89	14.38	52.41	-	52.41	52.41
342 Z 27	11.37	32.18	2.93	2.44	1.95	1.63	1.46	1.22	32.18	15.48	58.76	-	58.76	58.76

# Roof systems

## Z-section sleeved purlin system

Section reference	Weight kg/m	Total kN	Working loads							Deflection		Ultimate U.D.L. in kN/span		
			Allowable loading in kN/m <sup>2</sup> purlin centres in mm							Span	Span	Down load	Uplift - Metal cladding Number of anti sag rods	
			1000	1200	1500	1800	2000	2400	180	360	0		1	2
SPAN 11.50m														
302 Z 20	7.86	16.74	1.46	1.21	0.97	0.81	0.73	0.61	16.74	7.93	30.78	-	30.78	30.78
302 Z 23	9.01	19.16	1.67	1.39	1.11	0.93	0.83	0.69	19.16	9.07	38.73	-	38.73	38.73
302 Z 25	9.76	20.75	1.80	1.50	1.20	1.00	0.90	0.75	20.75	9.82	44.01	-	44.01	44.01
342 Z 23	9.73	25.35	2.20	1.84	1.47	1.22	1.10	0.92	25.35	12.13	43.97	-	43.97	43.97
342 Z 25	10.55	27.46	2.39	1.99	1.59	1.33	1.19	1.00	27.46	13.14	50.13	-	50.13	50.13
342 Z 27	11.37	29.56	2.57	2.14	1.71	1.43	1.29	1.07	29.56	14.14	56.20	-	56.20	56.20
SPAN 12.00m														
302 Z 20	7.86	15.40	1.28	1.07	0.86	0.71	0.64	0.53	15.40	7.24	29.49	-	29.49	29.49
302 Z 23	9.01	17.62	1.47	1.22	0.98	0.82	0.73	0.61	17.62	8.28	37.11	-	37.11	37.11
302 Z 25	9.76	19.09	1.59	1.33	1.06	0.88	0.80	0.66	19.09	8.97	42.18	-	42.18	42.18
342 Z 23	9.73	23.35	1.95	1.62	1.30	1.08	0.97	0.81	23.35	11.10	42.14	-	42.14	42.14
342 Z 25	10.55	25.30	2.11	1.76	1.41	1.17	1.05	0.88	25.30	12.03	48.04	-	48.04	48.04
342 Z 27	11.37	27.24	2.27	1.89	1.51	1.26	1.13	0.95	27.24	12.95	53.86	-	53.86	53.86
342 Z 30	12.58	30.12	2.51	2.09	1.67	1.39	1.25	1.05	30.12	14.32	62.39	-	62.39	62.39
SPAN 12.50m														
302 Z 20	7.86	14.20	1.14	0.95	0.76	0.63	0.57	0.47	14.20	6.62	28.31	-	28.31	28.31
302 Z 23	9.01	16.25	1.30	1.08	0.87	0.72	0.65	0.54	16.25	7.57	35.63	-	35.63	35.63
302 Z 25	9.76	17.60	1.41	1.17	0.94	0.78	0.70	0.59	17.60	8.20	40.49	-	40.49	40.49
342 Z 23	9.73	21.57	1.73	1.44	1.15	0.96	0.86	0.72	21.57	10.19	40.45	-	40.45	40.45
342 Z 25	10.55	23.37	1.87	1.56	1.25	1.04	0.93	0.78	23.37	11.04	46.12	-	46.12	46.12
342 Z 27	11.37	25.16	2.01	1.68	1.34	1.12	1.01	0.84	25.16	11.88	51.71	-	51.71	51.71
342 Z 30	12.58	27.82	2.23	1.85	1.48	1.24	1.11	0.93	27.82	13.14	59.90	-	59.90	59.9
SPAN 13.00m														
302 Z 20	7.86	13.12	1.01	0.84	0.67	0.56	0.50	0.42	13.12	6.06	27.23	-	27.23	27.23
302 Z 23	9.01	15.01	1.15	0.96	0.77	0.64	0.58	0.48	15.01	6.93	34.26	-	34.26	34.26
302 Z 25	9.76	16.26	1.25	1.04	0.83	0.69	0.63	0.52	16.26	7.51	38.93	-	38.93	38.93
342 Z 23	9.73	19.97	1.54	1.28	1.02	0.85	0.77	0.64	19.97	9.36	38.90	-	38.90	38.90
342 Z 25	10.55	21.63	1.66	1.39	1.11	0.92	0.83	0.69	21.63	10.14	44.35	-	44.35	44.35
342 Z 27	11.37	23.29	1.79	1.49	1.19	1.00	0.90	0.75	23.29	10.92	49.72	-	49.72	49.72
342 Z 30	12.58	25.75	1.98	1.65	1.32	1.10	0.99	0.83	25.75	12.07	57.59	-	57.59	57.59
SPAN 13.50m														
342 Z 23	9.73	18.52	1.37	1.14	0.91	0.76	0.69	0.57	18.52	8.62	37.46	-	-	37.46
342 Z 25	10.55	20.07	1.49	1.24	0.99	0.83	0.74	0.62	20.07	9.34	42.70	-	-	42.70
342 Z 27	11.37	21.60	1.60	1.33	1.07	0.89	0.80	0.67	21.60	10.05	47.88	-	-	47.88
342 Z 30	12.58	23.89	1.77	1.47	1.18	0.98	0.88	0.74	23.89	11.11	55.46	-	-	55.46
SPAN 14.00m														
342 Z 23	9.73	17.21	1.23	1.02	0.82	0.68	0.61	0.51	17.21	7.94	36.12	-	-	36.12
342 Z 25	10.55	18.65	1.33	1.11	0.89	0.74	0.67	0.56	18.65	8.60	41.18	-	-	41.18
342 Z 27	11.37	20.08	1.43	1.20	0.96	0.80	0.72	0.60	20.08	9.26	46.17	-	-	46.17
342 Z 30	12.58	22.20	1.59	1.32	1.06	0.88	0.79	0.66	22.20	10.24	53.48	-	-	53.48
SPAN 14.50m														
342 Z 23	9.73	16.02	1.11	0.92	0.74	0.61	0.55	0.46	16.02	7.32	34.87	-	-	34.87
342 Z 25	10.55	17.36	1.20	1.00	0.80	0.67	0.60	0.50	17.36	7.93	39.76	-	-	39.76
342 Z 27	11.37	18.69	1.29	1.07	0.86	0.72	0.64	0.54	18.69	8.54	44.58	-	-	44.58
342 Z 30	12.58	20.66	1.43	1.19	0.95	0.79	0.71	0.59	20.66	9.44	51.63	-	-	51.63
SPAN 15.00m														
342 Z 23	9.73	14.94	1.00	0.83	0.66	0.55	0.50	0.41	14.94	6.75	33.71	-	-	33.71
342 Z 25	10.55	16.19	1.08	0.90	0.72	0.60	0.54	0.45	16.19	7.32	38.43	-	-	38.43
342 Z 27	11.37	17.42	1.16	0.97	0.77	0.65	0.58	0.48	17.42	7.88	43.09	-	-	43.09
342 Z 30	12.58	19.26	1.28	1.07	0.86	0.71	0.64	0.54	19.26	8.71	49.91	-	-	49.91

# Roof systems

## Z-section heavy end bay sleeved purlin system

Section reference	Weight kg/m	Working loads in kN/span						Ultimate U.D.L. in kN span					
		Down U.D.L.		Deflection Span 180		Down U.D.L.		Uplift – Metal cladding. Number of anti sag rods					
		End bay	Inner bay	End bay	Inner bay	End bay	Inner bay	0		1		2	
								End bay	Inner bay	End bay	Inner bay	End bay	Inner bay
SPAN 4.50m													
142 Z 13	2.84	-	13.24	-	16.24	-	21.36	-	13.09	-	21.36	-	21.36
142 Z 14	3.05	9.86	14.94	9.86	17.45	17.55	24.09	10.42	14.30	17.55	24.09	17.55	24.09
142 Z 15	3.26	10.52	16.66	10.52	18.62	19.57	26.86	11.27	15.47	19.57	26.86	19.57	26.86
142 Z 16	3.47	11.19	18.38	11.19	19.81	21.58	29.62	12.09	16.59	21.58	29.62	21.58	29.62
142 Z 18	3.89	12.52	-	12.52	-	25.52	-	13.64	-	25.52	-	25.52	-
142 Z 20	4.30	13.82	-	13.82	-	29.28	-	15.00	-	29.28	-	29.28	-
SPAN 5.00m													
142 Z 13	2.84	-	11.89	-	14.02	-	19.22	-	11.32	-	19.22	-	19.22
142 Z 14	3.05	8.12	13.42	8.12	15.06	15.80	21.68	9.02	12.38	15.80	21.68	15.80	21.68
142 Z 15	3.26	8.67	14.97	8.67	16.08	17.61	24.17	9.77	13.41	17.61	24.17	17.61	24.17
142 Z 16	3.47	9.22	16.51	9.22	17.10	19.42	26.66	10.48	14.39	19.42	26.66	19.42	26.66
142 Z 18	3.89	10.31	-	10.31	-	22.96	-	11.83	-	22.96	-	22.96	-
142 Z 20	4.30	11.39	-	11.39	-	26.35	-	13.00	-	26.35	-	26.35	-
172 Z 13	3.25	-	14.85	-	21.73	-	23.99	-	13.02	-	23.99	-	23.99
172 Z 14	3.49	12.23	16.85	13.14	23.34	19.81	27.19	10.39	14.26	19.81	27.19	19.81	27.19
172 Z 15	3.73	13.71	18.87	14.04	24.94	22.19	30.45	11.26	15.45	22.19	30.45	22.19	30.45
172 Z 16	3.98	14.93	20.92	14.93	26.53	24.59	33.75	12.10	16.61	24.59	33.75	24.59	33.75
172 Z 18	4.45	16.70	25.02	16.70	29.68	29.38	40.33	13.69	18.79	29.38	40.33	29.38	40.33
172 Z 20	4.93	18.46	-	18.46	-	34.05	-	15.14	-	34.05	-	34.05	-
SPAN 5.50m													
142 Z 13	2.84	-	10.79	-	12.21	-	17.47	-	9.98	-	17.47	-	17.47
142 Z 14	3.05	6.79	12.18	6.79	13.11	14.36	19.71	7.96	10.92	14.36	19.71	14.36	19.71
142 Z 15	3.26	7.25	13.58	7.25	14.00	16.01	21.98	8.62	11.83	16.01	21.98	16.01	21.98
142 Z 16	3.47	7.71	-	7.71	-	17.66	-	9.25	-	17.66	-	17.66	-
142 Z 18	3.89	8.62	-	8.62	-	20.88	-	10.43	-	20.88	-	20.88	-
142 Z 20	4.30	9.52	-	9.52	-	23.95	-	11.47	-	23.95	-	23.95	-
172 Z 13	3.25	-	13.48	-	19.02	-	21.81	-	11.35	-	21.81	-	21.81
172 Z 14	3.49	11.03	15.29	11.03	20.43	18.01	24.72	9.06	12.44	18.01	24.72	18.01	24.72
172 Z 15	3.73	11.78	17.13	11.78	21.83	20.17	27.69	9.83	13.49	20.17	27.69	20.17	27.69
172 Z 16	3.98	12.53	18.99	12.53	23.23	22.35	30.68	10.58	14.52	22.35	30.68	22.35	30.68
172 Z 18	4.45	14.02	22.70	14.02	25.98	26.71	36.66	11.97	16.43	26.71	36.66	26.71	36.66
172 Z 20	4.93	15.50	-	15.50	-	30.96	-	13.24	-	30.96	-	30.96	-
SPAN 6.00m													
172 Z 13	3.25	-	12.33	-	16.77	-	19.99	-	10.06	-	19.99	-	19.99
172 Z 14	3.49	9.37	13.98	9.37	18.01	16.51	22.66	8.04	11.04	16.51	22.66	16.51	22.66
172 Z 15	3.73	10.01	15.67	10.01	19.25	18.49	25.38	8.73	11.98	18.49	25.38	18.49	25.38
172 Z 16	3.98	10.65	17.37	10.65	20.48	20.49	28.13	9.40	12.90	20.49	28.13	20.49	28.13
172 Z 18	4.45	11.91	20.78	11.91	22.90	24.49	33.61	10.64	14.60	24.49	33.61	24.49	33.61
172 Z 20	4.93	13.17	24.09	13.17	25.31	28.38	38.95	11.76	16.15	28.38	38.95	28.38	38.95
172 Z 23	5.63	15.02	-	15.02	-	33.92	-	13.28	-	33.92	-	33.92	-
172 Z 25	6.09	16.23	-	16.23	-	37.44	-	14.18	-	37.44	-	37.44	-
202 Z 14	3.82	-	16.59	-	25.08	-	26.86	-	10.96	-	26.86	-	26.86
202 Z 15	4.09	13.52	18.64	14.43	26.81	21.97	30.16	8.68	11.91	21.97	30.16	21.97	30.16
202 Z 16	4.35	15.03	20.71	15.36	28.53	24.40	33.49	9.35	12.83	24.40	33.49	24.40	33.49
202 Z 18	4.88	17.19	24.83	17.19	31.94	29.24	40.14	10.61	14.57	28.44	39.03	29.24	40.14
202 Z 20	5.40	19.01	-	19.01	-	33.97	-	11.77	-	31.61	-	33.97	-
202 Z 23	6.17	21.70	-	21.70	-	40.77	-	13.33	-	35.82	-	40.77	-
202 Z 27	7.19	25.22	-	25.22	-	49.35	-	15.15	-	40.66	-	49.12	-

# Roof systems

## Z-section heavy end bay sleeved purlin system

Section reference	Weight kg/m	Working loads in kN/span						Ultimate U.D.L. in kN span					
		Down U.D.L.		Deflection Span		Down U.D.L.		Uplift – Metal cladding. Number of anti sag rods					
				180				0		1		2	
		End bay	Inner bay	End bay	Inner bay	End bay	Inner bay	End bay	Inner bay	End bay	Inner bay	End bay	Inner bay
SPAN 6.50m													
172 Z 13	3.25	-	11.35	-	14.87	-	18.45	-	9.04	-	18.45	-	18.45
172 Z 14	3.49	8.04	12.88	8.04	15.97	15.24	20.92	7.23	9.92	15.24	20.92	15.24	20.92
172 Z 15	3.73	8.59	14.43	8.59	17.07	17.07	23.43	7.85	10.77	17.07	23.43	17.07	23.43
172 Z 16	3.98	9.14	16.00	9.14	18.16	18.91	25.96	8.45	11.60	18.91	25.96	18.91	25.96
172 Z 18	4.45	10.23	19.14	10.23	20.31	22.60	31.02	9.57	13.13	22.60	31.02	22.60	31.02
172 Z 20	4.93	11.30	-	11.30	-	26.19	-	10.58	-	26.19	-	26.19	-
172 Z 23	5.63	12.89	-	12.89	-	31.31	-	11.93	-	31.31	-	31.31	-
172 Z 25	6.09	13.93	-	13.93	-	34.56	-	12.74	-	34.56	-	34.56	-
202 Z 14	3.82	-	15.28	-	22.33	-	24.79	-	9.80	-	24.79	-	24.79
202 Z 15	4.09	12.42	17.17	12.42	23.87	20.28	27.84	7.77	10.66	20.28	27.84	20.28	27.84
202 Z 16	4.35	13.22	19.08	13.22	25.41	22.52	30.91	8.37	11.49	22.52	30.91	22.52	30.91
202 Z 18	4.88	14.80	22.88	14.80	28.44	26.99	37.05	9.51	13.05	26.34	36.15	26.99	37.05
202 Z 20	5.40	16.36	-	16.36	-	31.36	-	10.55	-	29.27	-	31.36	-
202 Z 23	6.17	18.68	-	18.68	-	37.63	-	11.94	-	33.15	-	37.63	-
202 Z 27	7.19	21.71	-	21.71	-	45.56	-	13.56	-	37.57	-	45.56	-
SPAN 7.00m													
172 Z 13	3.25	-	10.51	-	13.25	-	17.14	-	8.19	-	17.14	-	17.14
172 Z 14	3.49	6.96	11.93	6.96	14.24	14.15	19.42	-	9.00	14.15	19.42	14.15	19.42
172 Z 15	3.73	7.44	13.37	7.44	15.22	15.85	21.75	-	9.77	15.85	21.75	15.85	21.75
172 Z 16	3.98	7.92	14.83	7.92	16.19	17.56	24.11	-	10.52	17.56	24.11	17.56	24.11
172 Z 18	4.45	8.85	17.74	8.85	18.11	20.99	28.81	-	11.91	20.99	28.81	20.99	28.81
172 Z 20	4.93	9.78	-	9.78	-	24.32	-	-	-	24.32	-	24.32	-
172 Z 23	5.63	11.16	-	11.16	-	29.08	-	-	-	29.08	-	29.08	-
172 Z 25	6.09	12.07	-	12.07	-	32.09	-	-	-	32.09	-	32.09	-
202 Z 14	3.82	-	14.16	-	19.99	-	23.02	-	8.87	-	23.02	-	23.02
202 Z 15	4.09	10.79	15.91	10.79	21.36	18.83	25.85	7.03	9.65	18.83	25.85	18.83	25.85
202 Z 16	4.35	11.48	17.68	11.48	22.74	20.91	28.71	7.57	10.40	20.91	28.71	20.91	28.71
202 Z 18	4.88	12.85	21.21	12.85	25.45	25.06	34.40	8.61	11.81	24.57	33.72	25.06	34.40
202 Z 20	5.40	14.21	-	14.21	-	29.12	-	9.55	-	27.30	-	29.12	-
202 Z 23	6.17	16.22	-	16.22	-	34.94	-	10.81	-	30.90	-	34.94	-
202 Z 27	7.19	18.85	-	18.85	-	42.30	-	12.26	-	34.99	-	42.30	-
232 Z 15	4.44	-	18.34	-	28.63	-	29.76	-	10.46	-	29.39	-	29.76
232 Z 16	4.73	14.81	20.43	15.83	30.47	24.15	33.14	8.32	11.42	23.49	32.25	24.15	33.14
232 Z 18	5.30	17.73	24.61	17.73	34.12	29.06	39.89	9.69	13.30	27.54	37.80	29.06	39.89
232 Z 20	5.87	19.61	28.71	19.61	37.74	33.88	46.50	10.99	15.08	31.38	43.07	33.88	46.50
232 Z 23	6.71	22.40	-	22.40	-	40.84	-	12.78	-	36.65	-	40.84	-
SPAN 7.50m													
202 Z 14	3.82	-	13.18	-	17.97	-	21.49	-	8.08	-	21.49	-	21.49
202 Z 15	4.09	9.44	14.82	9.44	19.20	17.58	24.13	-	8.80	17.58	24.13	17.58	24.13
202 Z 16	4.35	10.05	16.47	10.05	20.44	19.52	26.79	-	9.48	19.52	26.79	19.52	26.79
202 Z 18	4.88	11.25	19.75	11.25	22.88	23.39	32.11	-	10.78	23.04	31.62	23.39	32.11
202 Z 20	5.40	12.43	-	12.43	-	27.18	-	-	-	25.59	-	27.18	-
202 Z 23	6.17	14.19	-	14.19	-	32.61	-	-	-	28.96	-	32.61	-
202 Z 27	7.19	16.50	-	16.50	-	39.48	-	-	-	32.76	-	39.48	-
232 Z 15	4.44	-	17.08	-	25.82	-	27.78	-	9.53	-	27.55	-	27.78
232 Z 16	4.73	13.78	19.03	13.88	27.48	22.54	30.93	-	10.42	22.03	30.24	22.54	30.93
232 Z 18	5.30	15.55	22.93	15.55	30.77	27.12	37.23	-	12.14	25.85	35.47	27.12	37.23
232 Z 20	5.87	17.19	26.74	17.19	34.03	31.62	43.40	-	13.77	29.46	40.43	31.62	43.40
232 Z 23	6.71	19.64	-	19.64	-	38.12	-	-	-	34.41	-	38.12	-
232 Z 25	7.27	21.25	-	21.25	-	42.31	-	-	-	37.39	-	42.31	-

# Roof systems

## Z-section heavy end bay sleeved purlin system

Section reference	Weight kg/m	Working loads in kN/span						Ultimate U.D.L. in kN span					
		Down U.D.L.		Deflection Span		Down U.D.L.		Uplift – Metal cladding. Number of anti sag rods					
				180				0		1		2	
		End bay	Inner bay	End bay	Inner bay	End bay	Inner bay	End bay	Inner bay	End bay	Inner bay	End bay	Inner bay
SPAN 8.00m													
202 Z 14	3.82	-	12.33	-	16.22	-	20.14	-	-	-	20.14	-	20.14
202 Z 15	4.09	8.31	13.86	8.31	17.33	16.48	22.62	-	-	16.48	22.62	16.48	22.62
202 Z 16	4.35	8.85	15.40	8.85	18.45	18.30	25.12	-	-	18.30	25.12	18.30	25.12
202 Z 18	4.88	9.91	18.48	9.91	20.65	21.93	30.10	-	-	21.69	29.77	21.93	30.10
202 Z 20	5.40	10.95	-	10.95	-	25.48	-	-	-	24.09	-	25.48	-
202 Z 23	6.17	12.50	-	12.50	-	30.58	-	-	-	27.25	-	30.58	-
202 Z 27	7.19	14.53	-	14.53	-	37.02	-	-	-	30.81	-	37.02	-
232 Z 15	4.44	-	15.97	-	23.37	-	26.04	-	-	-	25.93	-	26.04
232 Z 16	4.73	12.26	17.80	12.26	24.88	21.13	29.00	-	-	20.74	28.47	21.13	29.00
232 Z 18	5.30	13.72	21.45	13.72	27.86	25.43	34.90	-	-	24.35	33.42	25.43	34.90
232 Z 20	5.87	15.18	25.02	15.18	30.81	29.64	40.68	-	-	27.76	38.10	29.64	40.68
232 Z 23	6.71	17.34	-	17.34	-	35.74	-	-	-	32.43	-	35.74	-
232 Z 25	7.27	18.76	-	18.76	-	39.66	-	-	-	35.23	-	39.66	-
262 Z 16	5.11	-	20.07	-	32.35	-	32.67	-	32.67	-	32.67	-	32.67
262 Z 18	5.73	17.61	24.31	17.61	36.24	28.80	39.53	-	38.95	28.80	39.53	28.80	39.53
262 Z 20	6.34	20.23	28.49	20.23	40.09	33.71	46.28	-	44.32	33.71	46.28	33.71	46.28
SPAN 8.50m													
232 Z 15	4.44	-	15.00	-	21.23	-	24.51	-	-	-	24.49	-	24.51
232 Z 16	4.73	10.88	16.71	10.88	22.60	19.89	27.29	-	-	19.59	26.89	19.89	27.29
232 Z 18	5.30	12.19	20.14	12.19	25.31	23.93	32.85	-	-	23.00	31.57	23.93	32.85
232 Z 20	5.87	13.48	23.50	13.48	27.99	27.90	38.29	-	-	26.23	36.00	27.90	38.29
232 Z 23	6.71	15.40	-	15.40	-	33.64	-	-	-	30.64	-	33.64	-
232 Z 25	7.27	16.65	-	16.65	-	37.33	-	-	-	33.29	-	37.33	-
262 Z 16	5.11	-	18.84	-	29.46	-	30.74	-	-	-	30.74	-	30.74
262 Z 18	5.73	16.27	22.83	16.27	33.00	27.10	37.20	-	-	27.10	37.20	27.10	37.20
262 Z 20	6.34	18.00	26.76	18.00	36.52	31.73	43.55	-	-	31.73	43.55	31.73	43.55
262 Z 23	7.26	20.57	-	20.57	-	38.47	-	-	-	38.47	-	38.47	-
262 Z 25	7.86	22.26	-	22.26	-	42.84	-	-	-	42.84	-	42.84	-
SPAN 9.00m													
232 Z 15	4.44	-	14.13	-	19.35	-	23.15	-	-	-	-	-	23.15
232 Z 16	4.73	9.71	15.75	9.71	20.60	18.78	25.78	-	-	-	-	18.78	25.78
232 Z 18	5.30	10.87	18.98	10.87	23.07	22.60	31.02	-	-	-	-	22.60	31.02
232 Z 20	5.87	12.03	22.15	12.03	25.51	26.35	36.16	-	-	-	-	26.35	36.16
232 Z 23	6.71	13.74	-	13.74	-	31.77	-	-	-	-	-	31.77	-
232 Z 25	7.27	14.86	-	14.86	-	35.26	-	-	-	-	-	35.26	-
262 Z 16	5.11	-	17.75	-	26.92	-	29.04	-	-	-	-	-	29.04
262 Z 18	5.73	14.55	21.52	14.55	30.15	25.60	35.13	-	-	-	-	25.60	35.13
262 Z 20	6.34	16.10	25.22	16.10	33.36	29.97	41.13	-	-	-	-	29.97	41.13
262 Z 23	7.26	18.39	-	18.39	-	36.33	-	-	-	-	-	36.33	-
262 Z 25	7.86	19.91	-	19.91	-	40.46	-	-	-	-	-	40.46	-
SPAN 9.50m													
262 Z 16	5.11	-	16.78	-	24.67	-	27.51	-	-	-	-	-	27.51
262 Z 18	5.73	13.07	20.34	13.07	27.63	24.25	33.29	-	-	-	-	24.25	33.29
262 Z 20	6.34	14.46	23.84	14.46	30.57	28.39	38.97	-	-	-	-	28.39	38.97
262 Z 23	7.26	16.52	-	16.52	-	34.42	-	-	-	-	-	34.42	-
262 Z 25	7.86	17.88	-	17.88	-	38.33	-	-	-	-	-	38.33	-
262 Z 29	9.06	20.56	-	20.56	-	45.95	-	-	-	-	-	45.95	-
302 Z 20	7.86	-	31.32	-	51.35	-	51.14	-	-	-	51.14	-	51.14
302 Z 23	9.01	28.57	39.48	28.57	58.75	46.88	64.35	-	-	46.88	64.35	46.88	64.35

# Roof systems

## Z-section heavy end bay sleeved purlin system

Section reference	Weight kg/m	Working loads in kN/span				Ultimate U.D.L. in kN span							
		Down U.D.L.		Deflection Span		Down U.D.L.		Uplift – Metal cladding. Number of anti sag rods					
				180				0		1		2	
		End bay	Inner bay	End bay	Inner bay	End bay	Inner bay	End bay	Inner bay	End bay	Inner bay	End bay	Inner bay
SPAN 10.00m													
262 Z 16	5.11	-	15.90	-	22.66	-	26.13	-	-	-	-	-	26.13
262 Z 18	5.73	11.78	19.27	11.78	25.38	23.04	31.62	-	-	-	-	23.04	31.62
262 Z 20	6.34	13.04	22.59	13.04	28.09	26.97	37.02	-	-	-	-	26.97	37.02
262 Z 23	7.26	14.90	-	14.90	-	32.70	-	-	-	-	-	32.70	-
262 Z 25	7.86	16.12	-	16.12	-	36.41	-	-	-	-	-	36.41	-
262 Z 29	9.06	18.54	-	18.54	-	43.65	-	-	-	-	-	43.65	-
302 Z 20	7.86	-	29.69	-	47.31	-	48.58	-	-	-	48.58	-	48.58
302 Z 23	9.01	25.84	37.43	25.84	54.12	44.54	61.13	-	-	44.54	61.13	44.54	61.13
302 Z 25	9.76	27.99	-	27.99	-	50.61	-	-	-	50.61	-	50.61	-
302 Z 29	11.27	32.24	-	32.24	-	62.44	-	-	-	62.44	-	62.44	-
SPAN 10.50m													
262 Z 16	5.11	-	15.10	-	20.87	-	24.89	-	-	-	-	-	24.89
262 Z 18	5.73	10.67	18.31	10.67	23.38	21.94	30.12	-	-	-	-	21.94	30.12
262 Z 20	6.34	11.80	-	11.80	-	25.69	-	-	-	-	-	25.69	-
262 Z 23	7.26	13.48	-	13.48	-	31.14	-	-	-	-	-	31.14	-
262 Z 25	7.86	14.59	-	14.59	-	34.68	-	-	-	-	-	34.68	-
262 Z 29	9.06	16.78	-	16.78	-	41.57	-	-	-	-	-	41.57	-
302 Z 20	7.86	-	28.21	-	43.68	-	46.27	-	-	-	46.27	-	46.27
302 Z 23	9.01	23.45	35.57	23.45	49.98	42.41	58.22	-	-	42.41	58.22	42.41	58.22
302 Z 25	9.76	25.40	-	25.40	-	48.20	-	-	-	48.20	-	48.20	-
302 Z 29	11.27	29.26	-	29.26	-	59.46	-	-	-	59.46	-	59.46	-
342 Z 23	9.73	-	40.44	-	65.67	-	66.10	-	-	-	66.10	-	66.10
342 Z 25	10.55	33.36	46.15	34.15	71.15	54.90	75.36	-	-	54.90	75.36	54.90	75.36
342 Z 27	11.37	36.76	-	36.76	-	61.56	-	-	-	61.56	-	61.56	-
342 Z 30	12.58	40.65	-	40.65	-	71.30	-	-	-	71.30	-	71.30	-
SPAN 11.00m													
262 Z 16	5.11	-	14.37	-	19.26	-	23.76	-	-	-	-	-	23.76
262 Z 18	5.73	9.68	17.43	9.68	21.58	20.94	28.75	-	-	-	-	20.94	28.75
262 Z 20	6.34	10.71	-	10.71	-	24.52	-	-	-	-	-	24.52	-
262 Z 23	7.26	12.24	-	12.24	-	29.73	-	-	-	-	-	29.73	-
262 Z 25	7.86	13.25	-	13.25	-	33.10	-	-	-	-	-	33.10	-
262 Z 29	9.06	15.24	-	15.24	-	39.68	-	-	-	-	-	39.68	-
302 Z 20	7.86	-	26.86	-	40.43	-	44.16	-	-	-	44.16	-	44.16
302 Z 23	9.01	21.35	33.88	21.35	46.25	40.49	55.57	-	-	40.49	55.57	40.49	55.57
302 Z 25	9.76	23.13	-	23.13	-	46.01	-	-	-	46.01	-	46.01	-
302 Z 29	11.27	26.64	-	26.64	-	56.76	-	-	-	56.76	-	56.76	-
342 Z 23	9.73	-	38.52	-	60.90	-	63.10	-	-	-	63.10	-	63.10
342 Z 25	10.55	31.15	43.96	31.15	65.98	52.41	71.93	-	-	52.41	71.93	52.41	71.93
342 Z 27	11.37	33.53	-	33.53	-	58.76	-	-	-	58.76	-	58.76	-
342 Z 30	12.58	37.08	-	37.08	-	68.06	-	-	-	68.06	-	68.06	-
SPAN 11.50m													
302 Z 20	7.86	-	25.63	-	37.49	-	42.24	-	-	-	42.24	-	42.24
302 Z 23	9.01	19.50	32.33	19.50	42.90	38.73	53.15	-	-	38.73	53.15	38.73	53.15
302 Z 25	9.76	21.12	-	21.12	-	44.01	-	-	-	44.01	-	44.01	-
302 Z 29	11.27	24.33	-	24.33	-	54.29	-	-	-	54.29	-	54.29	-
342 Z 23	9.73	-	36.76	-	56.59	-	60.35	-	-	-	60.35	-	60.35
342 Z 25	10.55	28.50	41.96	28.50	61.31	50.13	68.81	-	-	50.13	68.81	50.13	68.81
342 Z 27	11.37	30.68	-	30.68	-	56.20	-	-	-	56.20	-	56.20	-
342 Z 30	12.58	33.92	-	33.92	-	65.10	-	-	-	65.10	-	65.10	-
SPAN 12.00m													
302 Z 20	7.86	-	24.49	-	34.84	-	40.48	-	-	-	40.48	-	40.48
302 Z 23	9.01	17.86	30.91	17.86	39.86	37.11	50.94	-	-	37.11	50.94	37.11	50.94
302 Z 25	9.76	19.34	-	19.34	-	42.18	-	-	-	42.18	-	42.18	-
302 Z 29	11.27	22.28	-	22.28	-	52.03	-	-	-	52.03	-	52.03	-
342 Z 23	9.73	-	35.15	-	52.68	-	57.84	-	-	-	57.84	-	57.84

# Roof systems

## Z-section heavy end bay sleeved purlin system

Section reference	Weight kg/m	Working loads in kN/span				Ultimate U.D.L. in kN span							
		Down U.D.L.		Deflection Span 180		Down U.D.L.		Uplift – Metal cladding. Number of anti sag rods					
		End bay	Inner bay	End bay	Inner bay	End bay	Inner bay	0		1		2	
								End bay	Inner bay	End bay	Inner bay	End bay	Inner bay
SPAN 12.50m													
302 Z 20	7.86	-	23.45	-	32.43	-	38.86	-	-	-	38.86	-	38.86
302 Z 23	9.01	16.39	29.60	16.39	37.11	35.63	48.90	-	-	35.63	48.90	35.63	48.90
302 Z 25	9.76	17.76	-	17.76	-	40.49	-	-	-	40.49	-	40.49	-
302 Z 29	11.27	20.45	-	20.45	-	49.95	-	-	-	49.95	-	49.95	-
342 Z 23	9.73	-	33.66	-	49.13	-	55.53	-	-	-	55.53	-	55.53
342 Z 25	10.55	24.04	38.43	24.04	53.23	46.12	63.30	-	-	46.12	63.30	46.12	63.30
342 Z 27	11.37	25.88	-	25.88	-	51.71	-	-	-	51.71	-	51.71	-
342 Z 30	12.58	28.62	-	28.62	-	59.9	-	-	-	59.9	-	59.9	-
SPAN 13.00m													
302 Z 20	7.86	-	22.48	-	30.24	-	37.37	-	-	-	37.37	-	37.37
302 Z 23	9.01	15.08	28.38	15.08	34.60	34.26	47.02	-	-	34.26	47.02	34.26	47.02
302 Z 25	9.76	16.33	-	16.33	-	38.93	-	-	-	38.93	-	38.93	-
302 Z 29	11.26	18.82	-	18.82	-	48.03	-	-	-	48.03	-	48.03	-
342 Z 23	9.73	-	32.28	-	45.90	-	53.39	-	-	-	53.39	-	53.39
342 Z 25	10.55	22.16	36.87	22.16	49.73	44.35	60.87	-	-	44.35	60.87	44.35	60.87
342 Z 27	11.37	23.86	-	23.86	-	49.72	-	-	-	49.72	-	49.72	-
342 Z 30	12.58	26.38	-	26.38	-	57.59	-	-	-	57.59	-	57.59	-
SPAN 13.50m													
342 Z 23	9.73	-	31.01	-	42.94	-	51.41	-	-	-	-	-	51.41
342 Z 25	10.55	20.47	35.41	20.47	46.53	42.7	58.61	-	-	-	-	42.7	58.61
342 Z 27	11.37	22.04	-	22.04	-	47.88	-	-	-	-	-	47.88	-
342 Z 30	12.58	24.37	-	24.37	-	55.46	-	-	-	-	-	55.46	-
SPAN 14.00m													
342 Z 23	9.73	-	29.82	-	40.24	-	49.58	-	-	-	-	-	49.58
342 Z 25	10.55	18.95	34.06	18.95	43.6	41.18	56.52	-	-	-	-	41.18	56.52
342 Z 27	11.37	20.4	-	20.4	-	46.17	-	-	-	-	-	46.17	-
342 Z 30	12.58	22.55	-	22.55	-	53.48	-	-	-	-	-	53.48	-
SPAN 14.50m													
342 Z 23	9.73	-	28.71	-	37.76	-	47.87	-	-	-	-	-	47.87
342 Z 25	10.55	17.56	32.79	17.56	40.91	39.76	54.57	-	-	-	-	39.76	54.57
342 Z 27	11.37	18.91	-	18.91	-	44.58	-	-	-	-	-	44.58	-
342 Z 30	12.58	20.9	-	20.9	-	51.63	-	-	-	-	-	51.63	-
SPAN 15.00m													
342 Z 23	9.73	-	27.67	-	35.48	-	46.27	-	-	-	-	-	46.27
342 Z 25	10.55	16.3	31.61	16.3	38.44	38.43	52.75	-	-	-	-	38.43	52.75
342 Z 27	11.37	17.55	-	17.55	-	43.09	-	-	-	-	-	43.09	-
342 Z 30	12.58	19.41	-	19.41	-	49.91	-	-	-	-	-	49.91	-

# Roof systems

## Z-section butt purlin system

Section reference	Weight kg/m	Total kN	Working loads							Deflection		Ultimate U.D.L. in kN/span		
			Allowable loading in kN/m <sup>2</sup>							Span 180	Span 360	Down load	Uplift - Metal cladding	
			purlin centres in mm										Number of anti sag rods	
			1000	1200	1500	1800	2000	2400			0	1	2	
SPAN 3.50m														
142 Z 13	2.84	8.73	2.49	2.08	1.66	1.39	1.25	1.04	8.73	4.31	15.10	8.03	15.10	15.10
142 Z 14	3.05	9.37	2.68	2.23	1.79	1.49	1.34	1.12	9.37	4.63	17.04	9.08	17.04	17.04
SPAN 4.00m														
142 Z 13	2.84	6.64	1.66	1.38	1.11	0.92	0.83	0.69	6.64	3.27	13.22	6.98	13.22	13.22
142 Z 14	3.05	7.14	1.78	1.49	1.19	0.99	0.89	0.74	7.14	3.51	14.91	7.91	14.91	14.91
142 Z 15	3.26	7.62	1.90	1.59	1.27	1.06	0.95	0.79	7.62	3.74	16.62	8.82	16.62	16.62
142 Z 16	3.47	8.10	2.03	1.69	1.35	1.13	1.01	0.84	8.10	3.98	18.33	9.71	18.33	18.33
SPAN 4.50m														
172 Z 13	3.25	8.61	1.91	1.60	1.28	1.06	0.96	0.80	8.61	4.24	14.66	6.93	14.66	14.66
172 Z 14	3.49	9.25	2.06	1.71	1.37	1.14	1.03	0.86	9.25	4.55	16.62	7.91	16.62	16.62
172 Z 15	3.73	9.89	2.20	1.83	1.46	1.22	1.10	0.92	9.89	4.86	18.61	8.89	18.61	18.61
172 Z 16	3.98	10.52	2.34	1.95	1.56	1.30	1.17	0.97	10.52	5.17	20.63	9.85	20.63	20.63
SPAN 5.00m														
172 Z 13	3.25	6.93	1.39	1.16	0.92	0.77	0.69	0.58	6.93	3.39	13.19	6.15	13.19	13.19
172 Z 14	3.49	7.45	1.49	1.24	0.99	0.83	0.74	0.62	7.45	3.64	14.96	7.03	14.96	14.96
172 Z 15	3.73	7.96	1.59	1.33	1.06	0.88	0.80	0.66	7.96	3.89	16.75	7.90	16.75	16.75
202 Z 14	3.82	10.90	2.18	1.82	1.45	1.21	1.09	0.91	10.90	5.36	17.73	7.34	17.73	17.73
202 Z 15	4.09	11.65	2.33	1.94	1.55	1.29	1.16	0.97	11.65	5.72	19.91	8.29	19.91	19.91
202 Z 16	4.35	12.40	2.48	2.07	1.65	1.38	1.24	1.03	12.40	6.09	22.10	9.23	22.10	22.10
SPAN 5.50m														
172 Z 13	3.25	5.69	1.03	0.86	0.69	0.57	0.52	0.43	5.69	2.76	12.00	5.51	12.00	12.00
172 Z 14	3.49	6.11	1.11	0.93	0.74	0.62	0.56	0.46	6.11	2.96	13.60	6.29	13.60	13.60
172 Z 15	3.73	6.53	1.19	0.99	0.79	0.66	0.59	0.49	6.53	3.16	15.23	7.07	15.23	15.23
202 Z 14	3.82	8.96	1.63	1.36	1.09	0.90	0.81	0.68	8.96	4.37	16.12	6.57	16.12	16.12
202 Z 15	4.09	9.57	1.74	1.45	1.16	0.97	0.87	0.73	9.57	4.68	18.10	7.42	18.10	18.10
202 Z 16	4.35	10.19	1.85	1.54	1.23	1.03	0.93	0.77	10.19	4.98	20.09	8.27	20.09	20.09
SPAN 6.00m														
202 Z 14	3.82	7.47	1.25	1.04	0.83	0.69	0.62	0.52	7.47	3.62	14.77	5.92	14.77	14.77
202 Z 15	4.09	7.99	1.33	1.11	0.89	0.74	0.67	0.55	7.99	3.87	16.59	6.69	16.59	16.59
202 Z 16	4.35	8.50	1.42	1.18	0.94	0.79	0.71	0.59	8.50	4.12	18.42	7.45	18.42	18.42
232 Z 15	4.44	11.15	1.86	1.55	1.24	1.03	0.93	0.77	11.15	5.44	19.10	6.84	19.10	19.10
232 Z 16	4.73	11.86	1.98	1.65	1.32	1.10	0.99	0.82	11.86	5.79	21.27	7.65	21.27	21.27
232 Z 18	5.30	13.29	2.21	1.85	1.48	1.23	1.11	0.92	13.29	6.49	25.59	9.22	25.59	25.59
SPAN 6.50m														
202 Z 18	4.87	8.04	1.24	1.03	0.82	0.69	0.62	0.52	8.04	3.87	20.38	8.09	20.38	20.38
202 Z 20	5.40	8.89	1.37	1.14	0.91	0.76	0.68	0.57	8.89	4.27	23.67	9.33	23.67	23.67
232 Z 15	4.44	9.44	1.45	1.21	0.97	0.81	0.73	0.61	9.44	4.58	17.63	6.20	17.63	17.63
232 Z 16	4.73	10.05	1.55	1.29	1.03	0.86	0.77	0.64	10.05	4.87	19.63	6.94	19.63	19.63
262 Z 16	5.11	13.50	2.08	1.73	1.39	1.15	1.04	0.87	13.50	6.59	22.11	6.99	22.11	22.11
262 Z 18	5.73	15.13	2.33	1.94	1.55	1.29	1.16	0.97	15.13	7.38	26.76	8.50	26.76	26.76
SPAN 7.00m														
232 Z 15	4.44	8.08	1.15	0.96	0.77	0.64	0.58	0.48	8.08	3.89	16.37	5.65	16.37	16.37
232 Z 16	4.73	8.60	1.23	1.02	0.82	0.68	0.61	0.51	8.60	4.14	18.23	6.33	18.23	18.23
262 Z 16	5.11	11.57	1.65	1.38	1.10	0.92	0.83	0.69	11.57	5.61	20.53	6.37	20.53	20.53
262 Z 18	5.73	12.96	1.85	1.54	1.23	1.03	0.93	0.77	12.96	6.29	24.84	7.75	24.84	24.84
262 Z 20	6.34	14.34	2.05	1.71	1.37	1.14	1.02	0.85	14.34	6.95	29.09	9.04	29.09	29.09
SPAN 7.50m														
262 Z 16	5.11	10.01	1.33	1.11	0.89	0.74	0.67	0.56	10.01	4.82	19.16	5.84	19.16	19.16
262 Z 18	5.73	11.22	1.50	1.25	1.00	0.83	0.75	0.62	11.22	5.40	23.19	7.10	23.19	23.19
262 Z 20	6.34	12.41	1.65	1.38	1.10	0.92	0.83	0.69	12.41	5.97	27.15	8.29	27.15	27.15
262 Z 23	7.26	14.18	1.89	1.58	1.26	1.05	0.95	0.79	14.18	6.82	32.91	9.89	32.91	32.91
262 Z 25	7.86	15.35	2.05	1.71	1.36	1.14	1.02	0.85	15.35	7.38	36.65	10.85	36.65	36.65

# Roof systems

## Z-section butt purlin system

Section reference	Weight kg/m	Total kN	Working loads								Ultimate U.D.L. in kN/span				
			Allowable loading in kN/m <sup>2</sup> purlin centres in mm						Deflection		Down load	Uplift - Metal cladding Number of anti sag rods			
			1000	1200	1500	1800	2000	2400	Span 180	Span 360		0	1	2	
SPAN 8.00m															
262 Z 18	5.73	9.78	1.22	1.02	0.81	0.68	0.61	0.51	9.78	4.66	21.74	-	8.57	13.11	
262 Z 20	6.34	10.82	1.35	1.13	0.90	0.75	0.68	0.56	10.82	5.16	25.45	-	9.40	14.35	
262 Z 23	7.26	12.36	1.55	1.29	1.03	0.86	0.77	0.64	12.36	5.90	30.86	-	10.79	16.37	
262 Z 25	7.86	13.38	1.67	1.39	1.11	0.93	0.84	0.70	13.38	6.38	34.36	-	11.69	17.66	
302 Z 20	7.86	18.89	2.36	1.97	1.57	1.31	1.18	0.98	18.89	9.14	33.40	11.11	27.43	33.40	
SPAN 8.50m															
262 Z 20	6.34	9.50	1.12	0.93	0.74	0.62	0.56	0.47	9.50	4.48	23.95	-	7.90	12.09	
262 Z 23	7.26	10.85	1.28	1.06	0.85	0.71	0.64	0.53	10.85	5.12	29.04	-	9.07	13.80	
262 Z 25	7.86	11.74	1.38	1.15	0.92	0.77	0.69	0.58	11.74	5.54	32.34	-	9.83	14.89	
302 Z 20	7.86	16.62	1.96	1.63	1.30	1.09	0.98	0.81	16.62	7.98	31.43	-	23.10	31.43	
302 Z 23	9.01	19.02	2.24	1.86	1.49	1.24	1.12	0.93	19.02	9.13	39.55	-	26.43	37.47	
SPAN 9.00m															
262 Z 25	7.86	10.37	1.15	0.96	0.77	0.64	0.58	0.48	10.37	4.84	30.54	-	-	12.66	
302 Z 20	7.86	14.72	1.64	1.36	1.09	0.91	0.82	0.68	14.72	7.01	29.69	-	19.61	28.66	
302 Z 23	9.01	16.84	1.87	1.56	1.25	1.04	0.94	0.78	16.84	8.02	37.36	-	22.45	32.74	
302 Z 25	9.76	18.24	2.03	1.69	1.35	1.13	1.01	0.84	18.24	8.69	42.45	-	24.17	35.24	
SPAN 9.50m															
302 Z 20	7.87	13.10	1.38	1.15	0.92	0.77	0.69	0.57	13.10	6.18	28.12	-	16.78	24.99	
302 Z 23	9.01	14.99	1.58	1.31	1.05	0.88	0.79	0.66	14.99	7.07	35.39	-	19.23	28.55	
302 Z 25	9.76	16.23	1.71	1.42	1.14	0.95	0.85	0.71	16.23	7.66	40.22	-	20.71	30.72	
342 Z 23	9.73	20.36	2.14	1.79	1.43	1.19	1.07	0.89	20.36	9.73	40.18	-	21.65	32.42	
SPAN 10.00m															
302 Z 23	9.01	13.40	1.34	1.12	0.89	0.74	0.67	0.56	13.40	6.26	33.62	-	16.59	24.93	
302 Z 25	9.76	14.51	1.45	1.21	0.97	0.81	0.73	0.60	14.51	6.78	38.21	-	17.87	26.82	
342 Z 23	9.73	18.24	1.82	1.52	1.22	1.01	0.91	0.76	18.24	8.64	38.17	-	18.67	28.25	
342 Z 25	10.55	19.76	1.98	1.65	1.32	1.10	0.99	0.82	19.76	9.37	43.52	-	20.21	30.52	
342 Z 27	11.37	21.28	2.13	1.77	1.42	1.18	1.06	0.89	21.28	10.08	48.79	-	21.74	32.77	
SPAN 10.50m															
302 Z 25	9.76	13.03	1.24	1.03	0.83	0.69	0.62	0.52	13.03	6.01	36.39	-	15.53	23.48	
342 Z 23	9.73	16.41	1.56	1.30	1.04	0.87	0.78	0.65	16.41	7.70	36.36	-	16.22	24.70	
342 Z 25	10.55	17.78	1.69	1.41	1.13	0.94	0.85	0.71	17.78	8.35	41.45	-	17.56	26.69	
342 Z 27	11.37	19.14	1.82	1.52	1.22	1.01	0.91	0.76	19.14	8.98	46.47	-	18.90	28.66	
SPAN 11.00m															
342 Z 23	9.73	14.82	1.35	1.12	0.90	0.75	0.67	0.56	14.82	6.88	34.70	-	14.18	21.69	
342 Z 25	10.55	16.05	1.46	1.22	0.97	0.81	0.73	0.61	16.05	7.46	39.56	-	15.36	23.44	
342 Z 27	11.37	17.28	1.57	1.31	1.05	0.87	0.79	0.65	17.28	8.03	44.36	-	16.53	25.18	
SPAN 11.50m															
342 Z 25	10.55	14.54	1.26	1.05	0.84	0.70	0.63	0.53	14.54	6.67	37.84	-	13.51	20.68	
342 Z 27	11.37	15.65	1.36	1.13	0.91	0.76	0.68	0.57	15.65	7.18	42.43	-	14.55	22.21	
342 Z 30	12.58	17.30	1.50	1.25	1.00	0.84	0.75	0.63	17.30	7.94	49.15	-	16.06	24.42	
SPAN 12.00m															
342 Z 27	11.37	14.21	1.18	0.99	0.79	0.66	0.59	0.49	14.21	6.44	40.66	-	12.87	19.69	
342 Z 30	12.58	15.71	1.31	1.09	0.87	0.73	0.65	0.55	15.71	7.12	47.10	-	14.22	21.64	

# Cladding systems

## Z and C-section sleeved side rail system

Uniform pressure values indicated in BLACK.  
Uniform suction values indicated in RED.

Section reference Z and C Profile	Weight kg/m	Working loads					
		Total U.D.L. kN	Allowable loading in kN/m <sup>2</sup> rail centres in mm				
			1000	1500	1800	2000	
SPAN 5.00m							
142 Z 13	142 C 13	2.84	9.54	1.91	1.27	1.06	0.95
			9.54	1.91	1.27	1.06	0.95
142 Z 14	142 C 14	3.05	10.25	2.05	1.37	1.14	1.03
			10.25	2.05	1.37	1.14	1.03
142 Z 15	142 C 15	3.26	10.59	2.12	1.41	1.18	1.06
			10.59	2.12	1.41	1.18	1.06
172 Z 13	172 C 13	3.25	12.13	2.43	1.62	1.35	1.21
			12.13	2.43	1.62	1.35	1.21
172 Z 14	172 C 14	3.49	13.78	2.76	1.84	1.53	1.38
			13.78	2.76	1.84	1.53	1.38
172 Z 15	172 C 15	3.73	15.45	3.09	2.06	1.72	1.55
			15.45	3.09	2.06	1.72	1.55
172 Z 16	172 C 16	3.98	17.15	3.43	2.29	1.91	1.72
			17.15	3.43	2.29	1.91	1.72
SPAN 5.50m							
142 Z 13	142 C 13	2.84	8.04	1.46	0.97	0.81	0.73
			8.04	1.46	0.97	0.81	0.73
142 Z 14	142 C 14	3.05	8.63	1.57	1.05	0.87	0.78
			8.63	1.57	1.05	0.87	0.78
142 Z 15	142 C 15	3.26	9.21	1.68	1.12	0.93	0.84
			9.21	1.68	1.12	0.93	0.84
172 Z 13	172 C 13	3.25	10.96	1.99	1.33	1.11	1.00
			10.96	1.99	1.33	1.11	1.00
172 Z 14	172 C 14	3.49	12.45	2.26	1.51	1.26	1.13
			12.45	2.26	1.51	1.26	1.13
172 Z 15	172 C 15	3.73	13.97	2.54	1.69	1.41	1.27
			13.97	2.54	1.69	1.41	1.27
172 Z 16	172 C 16	3.98	15.49	2.82	1.88	1.56	1.41
			15.49	2.82	1.88	1.56	1.41
SPAN 6.00m							
142 Z 13	142 C 13	2.84	6.86	1.14	0.76	0.64	0.57
			6.86	1.14	0.76	0.64	0.57
142 Z 14	142 C 14	3.05	7.37	1.23	0.82	0.68	0.61
			7.37	1.23	0.82	0.68	0.61
142 Z 15	142 C 15	3.26	7.87	1.31	0.87	0.73	0.66
			7.87	1.31	0.87	0.73	0.66
172 Z 13	172 C 13	3.25	9.98	1.66	1.11	0.92	0.83
			9.98	1.66	1.11	0.92	0.83
172 Z 14	172 C 14	3.49	11.34	1.89	1.26	1.05	0.95
			11.34	1.89	1.26	1.05	0.95
172 Z 15	172 C 15	3.73	12.46	2.08	1.38	1.15	1.04
			12.46	2.08	1.38	1.15	1.04
202 Z 14	202 C 14	3.82	13.44	2.24	1.49	1.24	1.12
			13.44	2.24	1.49	1.24	1.12
202 Z 15	202 C 15	4.09	15.13	2.52	1.68	1.40	1.26
			15.13	2.52	1.68	1.40	1.26
202 Z 16	202 C 16	4.35	16.84	2.81	1.87	1.56	1.40
			16.84	2.81	1.87	1.56	1.40

Tables are based on a deflection limit of Span/150 and  
adopt a cladding weight of 12.5kg/m<sup>2</sup> on elevation.

Section reference Z and C Profile	Weight kg/m	Working loads					
		Total U.D.L. kN	Allowable loading in kN/m <sup>2</sup> rail centres in mm				
			1000	1500	1800	2000	
SPAN 6.50m							
142 Z 13	142 C 13	2.84	5.93	0.91	0.61	0.51	0.46
			5.93	0.91	0.61	0.51	0.46
142 Z 14	142 C 14	3.05	6.38	0.98	0.65	0.55	0.49
			6.38	0.98	0.65	0.55	0.49
142 Z 15	142 C 15	3.26	6.81	1.05	0.70	0.58	0.52
			6.81	1.05	0.70	0.58	0.52
172 Z 13	172 C 13	3.25	9.39	1.45	0.96	0.80	0.72
			9.39	1.45	0.96	0.80	0.72
172 Z 14	172 C 14	3.49	10.09	1.55	1.03	0.86	0.78
			10.09	1.55	1.03	0.86	0.78
172 Z 15	172 C 15	3.73	10.78	1.66	1.11	0.92	0.83
			10.78	1.66	1.11	0.92	0.83
202 Z 14	202 C 14	3.82	12.79	1.97	1.31	1.09	0.98
			12.79	1.97	1.31	1.09	0.98
202 Z 15	202 C 15	4.09	14.27	2.20	1.46	1.22	1.10
			14.27	2.20	1.46	1.22	1.10
202 Z 16	202 C 16	4.35	15.86	2.44	1.63	1.36	1.22
			15.86	2.44	1.63	1.36	1.22
202 Z 18	202 C 18	4.88	18.10	2.78	1.86	1.55	1.39
			18.10	2.78	1.86	1.55	1.39
SPAN 7.00m							
142 Z 14	142 C 14	3.05	5.95	0.85	0.57	0.47	0.43
			5.95	0.85	0.57	0.47	0.43
142 Z 15	142 C 15	3.26	6.33	0.90	0.60	0.50	0.45
			6.33	0.90	0.60	0.50	0.45
172 Z 13	172 C 13	3.25	8.22	1.17	0.78	0.65	0.59
			8.22	1.17	0.78	0.65	0.59
172 Z 14	172 C 14	3.49	8.83	1.26	0.84	0.70	0.63
			8.83	1.26	0.84	0.70	0.63
172 Z 15	172 C 15	3.73	9.43	1.35	0.90	0.75	0.67
			9.43	1.35	0.90	0.75	0.67
202 Z 14	202 C 14	3.82	11.76	1.68	1.12	0.93	0.84
			11.76	1.68	1.12	0.93	0.84
202 Z 15	202 C 15	4.09	13.22	1.89	1.26	1.05	0.94
			13.22	1.89	1.26	1.05	0.94
202 Z 16	202 C 16	4.35	14.15	2.02	1.35	1.12	1.01
			14.15	2.02	1.35	1.12	1.01
202 Z 18	202 C 18	4.88	15.84	2.26	1.51	1.26	1.13
			15.84	2.26	1.51	1.26	1.13
232 Z 15	232 C 15	4.44	15.22	2.17	1.45	1.21	1.09
			15.22	2.17	1.45	1.21	1.09
232 Z 16	232 C 16	4.73	16.97	2.42	1.62	1.35	1.21
			16.97	2.42	1.62	1.35	1.21

# Cladding systems

## Z and C-section sleeved side rail system

Uniform pressure values indicated in BLACK.  
Uniform suction values indicated in RED.

Tables are based on a deflection limit of Span/150 and adopt a cladding weight of 12.5kg/m<sup>2</sup> on elevation.

Section reference Z and C Profile	Weight kg/m	Working loads					
		Total U.D.L kN	Allowable loading in kN/m <sup>2</sup> rail centres in mm				
			1000	1500	1800	2000	
SPAN 7.50m							
172 Z 13	172 C 13	3.25	7.25	0.97	0.64	0.54	0.48
			7.25	0.97	0.64	0.54	0.48
172 Z 14	172 C 14	3.49	7.79	1.04	0.69	0.58	0.52
			7.79	1.04	0.69	0.58	0.52
172 Z 15	172 C 15	3.73	8.33	1.11	0.74	0.62	0.56
			8.33	1.11	0.74	0.62	0.56
202 Z 14	202 C 14	3.82	10.94	1.46	0.97	0.81	0.73
			10.94	1.46	0.97	0.81	0.73
202 Z 15	202 C 15	4.09	11.75	1.57	1.04	0.87	0.78
			11.75	1.57	1.04	0.87	0.78
202 Z 16	202 C 16	4.35	12.50	1.67	1.11	0.93	0.83
			12.50	1.67	1.11	0.93	0.83
232 Z 15	232 C 15	4.44	14.17	1.89	1.26	1.05	0.94
			14.17	1.89	1.26	1.05	0.94
232 Z 16	232 C 16	4.73	15.79	2.11	1.40	1.17	1.05
			15.79	2.11	1.40	1.17	1.05
232 Z 18	232 C 18	5.30	18.87	2.52	1.68	1.40	1.26
			18.87	2.52	1.68	1.40	1.26
SPAN 8.00m							
202 Z 14	202 C 14	3.82	9.78	1.22	0.81	0.68	0.61
			9.78	1.22	0.81	0.68	0.61
202 Z 15	202 C 15	4.09	10.45	1.31	0.87	0.73	0.65
			10.45	1.31	0.87	0.73	0.65
202 Z 16	202 C 16	4.35	11.13	1.39	0.93	0.77	0.70
			11.13	1.39	0.93	0.77	0.70
202 Z 18	202 C 18	4.88	12.46	1.56	1.04	0.87	0.78
			12.46	1.56	1.04	0.87	0.78
232 Z 15	232 C 15	4.44	13.25	1.66	1.10	0.92	0.83
			13.25	1.66	1.10	0.92	0.83
232 Z 16	232 C 16	4.73	14.77	1.85	1.23	1.03	0.92
			14.77	1.85	1.23	1.03	0.92
232 Z 18	232 C 18	5.30	16.81	2.10	1.40	1.17	1.05
			16.81	2.10	1.40	1.17	1.05
262 Z 16	262 C 16	5.11	16.63	2.08	1.39	1.16	1.04
			16.63	2.08	1.39	1.16	1.04
262 Z 18	262 C 18	5.73	20.17	2.52	1.68	1.40	1.26
			20.17	2.52	1.68	1.40	1.26
SPAN 8.50m							
202 Z 14	202 C 14	3.82	8.76	1.03	0.69	0.57	0.52
			8.76	1.03	0.69	0.57	0.52
202 Z 15	202 C 15	4.09	9.37	1.10	0.73	0.61	0.55
			9.37	1.10	0.73	0.61	0.55
202 Z 16	202 C 16	4.35	9.97	1.17	0.78	0.65	0.59
			9.97	1.17	0.78	0.65	0.59
202 Z 18	202 C 18	4.88	11.16	1.31	0.88	0.73	0.66
			11.16	1.31	0.88	0.73	0.66
232 Z 15	232 C 15	4.44	12.43	1.46	0.97	0.81	0.73
			12.43	1.46	0.97	0.81	0.73

Section reference Z and C Profile	Weight kg/m	Working loads					
		Total U.D.L kN	Allowable loading in kN/m <sup>2</sup> rail centres in mm				
			1000	1500	1800	2000	
SPAN 8.50m (continued)							
232 Z 16	232 C 16	4.73	13.46	1.58	1.06	0.88	0.79
			13.46	1.58	1.06	0.88	0.79
232 Z 18	232 C 18	5.30	15.07	1.77	1.18	0.99	0.89
			15.07	1.77	1.18	0.99	0.89
262 Z 16	262 C 16	5.11	15.61	1.84	1.22	1.02	0.92
			15.61	1.84	1.22	1.02	0.92
262 Z 18	262 C 18	5.73	18.94	2.23	1.49	1.24	1.11
			18.94	2.23	1.49	1.24	1.11
262 Z 20	262 C 20	6.34	21.75	2.56	1.71	1.42	1.28
			21.75	2.56	1.71	1.42	1.28
SPAN 9.00m							
202 Z 14	202 C 14	3.82	7.90	0.88	0.59	0.49	0.44
			7.90	0.88	0.59	0.49	0.44
202 Z 15	202 C 15	4.09	8.44	0.94	0.63	0.52	0.47
			8.44	0.94	0.63	0.52	0.47
202 Z 16	202 C 16	4.35	8.99	1.00	0.67	0.56	0.50
			8.99	1.00	0.67	0.56	0.50
202 Z 18	202 C 18	4.88	10.06	1.12	0.75	0.62	0.56
			10.06	1.12	0.75	0.62	0.56
232 Z 15	232 C 15	4.44	11.40	1.27	0.84	0.70	0.63
			11.40	1.27	0.84	0.70	0.63
232 Z 16	232 C 16	4.73	12.14	1.35	0.90	0.75	0.67
			12.14	1.35	0.90	0.75	0.67
232 Z 18	232 C 18	5.30	13.59	1.51	1.01	0.84	0.76
			13.59	1.51	1.01	0.84	0.76
262 Z 16	262 C 16	5.11	14.70	1.63	1.09	0.91	0.82
			14.70	1.63	1.09	0.91	0.82
262 Z 18	262 C 18	5.73	17.74	1.97	1.31	1.10	0.99
			17.74	1.97	1.31	1.10	0.99
262 Z 20	262 C 20	6.34	19.63	2.18	1.45	1.21	1.09
			19.63	2.18	1.45	1.21	1.09
262 Z 23	262 C 23	7.26	22.44	2.49	1.66	1.39	1.25
			22.44	2.49	1.66	1.39	1.25
SPAN 9.50m							
232 Z 15	232 C 15	4.44	10.35	1.09	0.73	0.61	0.54
			10.35	1.09	0.73	0.61	0.54
232 Z 16	232 C 16	4.73	11.01	1.16	0.77	0.64	0.58
			11.01	1.16	0.77	0.64	0.58
232 Z 18	232 C 18	5.30	12.33	1.30	0.87	0.72	0.65
			12.33	1.30	0.87	0.72	0.65
262 Z 16	262 C 16	5.11	13.88	1.46	0.97	0.81	0.73
			13.88	1.46	0.97	0.81	0.73
262 Z 18	262 C 18	5.73	16.09	1.69	1.13	0.94	0.85
			16.09	1.69	1.13	0.94	0.85
262 Z 20	262 C 20	6.34	17.81	1.88	1.25	1.04	0.94
			17.81	1.88	1.25	1.04	0.94
262 Z 23	262 C 23	7.26	20.36	2.14	1.43	1.19	1.07
			20.36	2.14	1.43	1.19	1.07

# Cladding systems

## Z and C-section sleeved side rail system

Uniform pressure values indicated in BLACK.  
Uniform suction values indicated in RED.

Tables are based on a deflection limit of Span/150 and adopt a cladding weight of 12.5kg/m<sup>2</sup> on elevation.

Section reference Z and C Profile	Weight kg/m	Working loads					
		Total U.D.L kN	Allowable loading in kN/m <sup>2</sup> rail centres in mm				
			1000	1500	1800	2000	
SPAN 10.00m							
232 Z 15 232 C 15	4.44	9.43	0.94	0.63	0.52	0.47	
		9.43	0.94	0.63	0.52	0.47	
232 Z 16 232 C 16	4.73	10.03	1.00	0.67	0.56	0.50	
		10.03	1.00	0.67	0.56	0.50	
232 Z 18 232 C 18	5.30	11.23	1.12	0.75	0.62	0.56	
		11.23	1.12	0.75	0.62	0.56	
262 Z 16 262 C 16	5.11	13.10	1.31	0.87	0.73	0.66	
		13.10	1.31	0.87	0.73	0.66	
262 Z 18 262 C 18	5.73	14.68	1.47	0.98	0.82	0.73	
		14.68	1.47	0.98	0.82	0.73	
262 Z 20 262 C 20	6.34	16.24	1.62	1.08	0.90	0.81	
		16.24	1.62	1.08	0.90	0.81	
302 Z 20 302 C 20	7.86	24.92	2.49	1.66	1.38	1.25	
		24.92	2.49	1.66	1.38	1.25	
SPAN 10.50m							
232 Z 15 232 C 15	4.44	8.63	0.82	0.55	0.46	0.41	
		8.63	0.82	0.55	0.46	0.41	
232 Z 16 232 C 16	4.73	9.19	0.88	0.58	0.49	0.44	
		9.19	0.88	0.58	0.49	0.44	
232 Z 18 232 C 18	5.30	10.28	0.98	0.65	0.54	0.49	
		10.28	0.98	0.65	0.54	0.49	
262 Z 16 262 C 16	5.11	11.99	1.14	0.76	0.63	0.57	
		11.99	1.14	0.76	0.63	0.57	
262 Z 18 262 C 18	5.73	13.44	1.28	0.85	0.71	0.64	
		13.44	1.28	0.85	0.71	0.64	
262 Z 20 262 C 20	6.34	14.87	1.42	0.94	0.79	0.71	
		14.87	1.42	0.94	0.79	0.71	
302 Z 20 302 C 20	7.86	23.87	2.27	1.52	1.26	1.14	
		23.87	2.27	1.52	1.26	1.14	
302 Z 23 302 C 23	9.01	28.52	2.72	1.81	1.51	1.36	
		28.52	2.72	1.81	1.51	1.36	
SPAN 11.00m							
262 Z 16 262 C 16	5.11	11.02	1.00	0.67	0.56	0.50	
		11.02	1.00	0.67	0.56	0.50	
262 Z 18 262 C 18	5.73	12.35	1.12	0.75	0.62	0.56	
		12.35	1.12	0.75	0.62	0.56	
262 Z 20 262 C 20	6.34	13.67	1.24	0.83	0.69	0.62	
		13.67	1.24	0.83	0.69	0.62	
302 Z 20 302 C 20	7.86	22.76	2.07	1.38	1.15	1.03	
		22.76	2.07	1.38	1.15	1.03	
302 Z 23 302 C 23	9.01	26.22	2.38	1.59	1.32	1.19	
		26.22	2.38	1.59	1.32	1.19	
302 Z 25 302 C 25	9.76	28.41	2.58	1.72	1.44	1.29	
		28.41	2.58	1.72	1.44	1.29	

Section reference Z and C Profile	Weight kg/m	Working loads					
		Total U.D.L kN	Allowable loading in kN/m <sup>2</sup> rail centres in mm				
			1000	1500	1800	2000	
SPAN 11.50m							
262 Z 16 262 C 16	5.11	9.83	0.86	0.57	0.48	0.43	
		9.83	0.86	0.57	0.48	0.43	
262 Z 18 262 C 18	5.73	11.40	0.99	0.66	0.55	0.50	
		11.40	0.99	0.66	0.55	0.50	
262 Z 20 262 C 20	6.34	12.62	1.10	0.73	0.61	0.55	
		12.62	1.10	0.73	0.61	0.55	
302 Z 20 302 C 20	7.86	21.16	1.84	1.23	1.02	0.92	
		21.16	1.84	1.23	1.02	0.92	
302 Z 23 302 C 23	9.01	24.21	2.11	1.40	1.17	1.05	
		24.21	2.11	1.40	1.17	1.05	
302 Z 25 302 C 25	9.76	26.22	2.28	1.52	1.27	1.14	
		26.22	2.28	1.52	1.27	1.14	
342 Z 23 342 C 23	9.73	31.12	2.71	1.80	1.50	1.35	
		31.12	2.71	1.80	1.50	1.35	
SPAN 12.00m							
262 Z 16 262 C 16	5.11	9.42	0.79	0.52	0.44	0.39	
		9.42	0.79	0.52	0.44	0.39	
262 Z 18 262 C 18	5.73	10.55	0.88	0.59	0.49	0.44	
		10.55	0.88	0.59	0.49	0.44	
262 Z 20 262 C 20	6.34	11.68	0.97	0.65	0.54	0.49	
		11.68	0.97	0.65	0.54	0.49	
302 Z 20 302 C 20	7.86	19.60	1.63	1.09	0.91	0.82	
		19.60	1.63	1.09	0.91	0.82	
302 Z 23 302 C 23	9.01	22.42	1.87	1.25	1.04	0.93	
		22.42	1.87	1.25	1.04	0.93	
302 Z 25 302 C 25	9.76	24.28	2.02	1.35	1.12	1.01	
		24.28	2.02	1.35	1.12	1.01	
342 Z 23 342 C 23	9.73	29.40	2.45	1.63	1.36	1.23	
		29.40	2.45	1.63	1.36	1.23	
342 Z 25 342 C 25	10.55	31.85	2.65	1.77	1.47	1.33	
		31.85	2.65	1.77	1.47	1.33	



Amazon distribution centre, Dunfirmline

# Cladding systems

## Z and C-section butt side rail system

Uniform pressure values indicated in BLACK.  
Uniform suction values indicated in RED.

Tables are based on a deflection limit of Span/150 and adopt a cladding weight of 12.5kg/m<sup>2</sup> on elevation.

Section reference Z and C Profile	Weight kg/m	Working loads					
		Total U.D.L kN	Allowable loading in kN/m <sup>2</sup> rail centres in mm				
			1000	1500	1800	2000	
SPAN 3.50m							
142 Z 13 142 C 13	2.84	10.59	3.03	2.02	1.68	1.51	
		10.59	3.03	2.02	1.68	1.51	
142 Z 14 142 C 14	3.05	11.37	3.25	2.17	1.81	1.62	
		11.37	3.25	2.17	1.81	1.62	
SPAN 4.00m							
142 Z 13 142 C 13	2.84	8.11	2.03	1.35	1.13	1.01	
		8.11	2.03	1.35	1.13	1.01	
142 Z 14 142 C 14	3.05	8.71	2.18	1.45	1.21	1.09	
		8.71	2.18	1.45	1.21	1.09	
142 Z 15 142 C 15	3.26	9.30	2.32	1.55	1.29	1.16	
		9.30	2.32	1.55	1.29	1.16	
142 Z 16 142 C 16	3.47	9.89	2.47	1.65	1.37	1.24	
		9.89	2.47	1.65	1.37	1.24	
SPAN 4.50m							
142 Z 13 142 C 13	2.84	6.40	1.42	0.95	0.79	0.71	
		6.40	1.42	0.95	0.79	0.71	
142 Z 14 142 C 14	3.05	6.88	1.53	1.02	0.85	0.76	
		6.88	1.53	1.02	0.85	0.76	
142 Z 15 142 C 15	3.26	7.34	1.63	1.09	0.91	0.82	
		7.34	1.63	1.09	0.91	0.82	
172 Z 13 172 C 13	3.25	10.23	2.27	1.52	1.26	1.14	
		10.23	2.27	1.52	1.26	1.14	
172 Z 14 172 C 14	3.49	11.29	2.51	1.67	1.39	1.25	
		11.29	2.51	1.67	1.39	1.25	
172 Z 15 172 C 15	3.73	12.06	2.68	1.79	1.49	1.34	
		12.06	2.68	1.79	1.49	1.34	
172 Z 16 172 C 16	3.98	12.83	2.85	1.90	1.58	1.43	
		12.83	2.85	1.90	1.58	1.43	
SPAN 5.00m							
142 Z 13 142 C 13	2.84	5.19	1.04	0.69	0.58	0.52	
		5.19	1.04	0.69	0.58	0.52	
142 Z 14 142 C 14	3.05	5.58	1.12	0.74	0.62	0.56	
		5.58	1.12	0.74	0.62	0.56	
172 Z 13 172 C 13	3.25	8.51	1.70	1.13	0.95	0.85	
		8.51	1.70	1.13	0.95	0.85	
172 Z 14 172 C 14	3.49	9.15	1.83	1.22	1.02	0.91	
		9.15	1.83	1.22	1.02	0.91	
172 Z 15 172 C 15	3.73	9.77	1.95	1.30	1.09	0.98	
		9.77	1.95	1.30	1.09	0.98	
202 Z 14 202 C 14	3.82	12.33	2.47	1.64	1.37	1.23	
		12.33	2.47	1.64	1.37	1.23	
202 Z 15 202 C 15	4.09	13.86	2.77	1.85	1.54	1.39	
		13.86	2.77	1.85	1.54	1.39	

Section reference Z and C Profile	Weight kg/m	Working loads					
		Total U.D.L kN	Allowable loading in kN/m <sup>2</sup> rail centres in mm				
			1000	1500	1800	2000	
SPAN 5.50m							
142 Z 13 142 C 13	2.84	4.29	0.78	0.52	0.43	0.39	
		4.29	0.78	0.52	0.43	0.39	
142 Z 14 142 C 14	3.05	4.60	0.84	0.56	0.47	0.42	
		4.60	0.84	0.56	0.47	0.42	
142 Z 15 142 C 15	3.26	4.92	0.89	0.60	0.50	0.45	
		4.92	0.89	0.60	0.50	0.45	
172 Z 13 172 C 13	3.25	7.03	1.28	0.85	0.71	0.64	
		7.03	1.28	0.85	0.71	0.64	
172 Z 14 172 C 14	3.49	7.56	1.37	0.92	0.76	0.69	
		7.56	1.37	0.92	0.76	0.69	
172 Z 15 172 C 15	3.73	8.07	1.47	0.98	0.82	0.73	
		8.07	1.47	0.98	0.82	0.73	
202 Z 14 202 C 14	3.82	10.99	2.00	1.33	1.11	1.00	
		10.99	2.00	1.33	1.11	1.00	
202 Z 15 202 C 15	4.09	11.75	2.14	1.42	1.19	1.07	
		11.75	2.14	1.42	1.19	1.07	
202 Z 16 202 C 16	4.35	12.51	2.27	1.52	1.26	1.14	
		12.51	2.27	1.52	1.26	1.14	
SPAN 6.00m							
172 Z 13 172 C 13	3.25	5.91	0.99	0.66	0.55	0.49	
		5.91	0.99	0.66	0.55	0.49	
172 Z 14 172 C 14	3.49	6.35	1.06	0.71	0.59	0.53	
		6.35	1.06	0.71	0.59	0.53	
172 Z 15 172 C 15	3.73	6.79	1.13	0.75	0.63	0.57	
		6.79	1.13	0.75	0.63	0.57	
202 Z 14 202 C 14	3.82	9.24	1.54	1.03	0.86	0.77	
		9.24	1.54	1.03	0.86	0.77	
202 Z 15 202 C 15	4.09	9.87	1.65	1.10	0.91	0.82	
		9.87	1.65	1.10	0.91	0.82	
202 Z 16 202 C 16	4.35	10.51	1.75	1.17	0.97	0.88	
		10.51	1.75	1.17	0.97	0.88	
232 Z 15 232 C 15	4.44	13.15	2.19	1.46	1.22	1.10	
		13.15	2.19	1.46	1.22	1.10	
232 Z 16 232 C 16	4.73	14.57	2.43	1.62	1.35	1.21	
		14.57	2.43	1.62	1.35	1.21	

# Cladding systems

## Z and C-section butt side rail system

Uniform pressure values indicated in BLACK.  
Uniform suction values indicated in RED.

Tables are based on a deflection limit of Span/150 and adopt a cladding weight of 12.5kg/m<sup>2</sup> on elevation.

Section reference Z and C Profile	Weight kg/m	Working loads				
		Total U.D.L kN	Allowable loading in kN/m <sup>2</sup> rail centres in mm			
			1000	1500	1800	2000
SPAN 6.50m						
172 Z 13 172 C 13	3.25	5.04	0.78	0.52	0.43	0.39
		5.04	0.78	0.52	0.43	0.39
172 Z 14 172 C 14	3.49	5.41	0.83	0.55	0.46	0.42
		5.41	0.83	0.55	0.46	0.42
172 Z 15 172 C 15	3.73	5.79	0.89	0.59	0.49	0.45
		5.79	0.89	0.59	0.49	0.45
202 Z 14 202 C 14	3.82	7.87	1.21	0.81	0.67	0.61
		7.87	1.21	0.81	0.67	0.61
202 Z 15 202 C 15	4.09	8.41	1.29	0.86	0.72	0.65
		8.41	1.29	0.86	0.72	0.65
202 Z 16 202 C 16	4.35	8.96	1.38	0.92	0.77	0.69
		8.96	1.38	0.92	0.77	0.69
232 Z 15 232 C 15	4.44	11.67	1.80	1.20	1.00	0.90
		11.67	1.80	1.20	1.00	0.90
232 Z 16 232 C 16	4.73	12.42	1.91	1.27	1.06	0.96
		12.42	1.91	1.27	1.06	0.96
232 Z 18 232 C 18	5.30	13.90	2.14	1.43	1.19	1.07
		13.90	2.14	1.43	1.19	1.07
SPAN 7.00m						
172 Z 13 172 C 13	3.25	4.34	0.62	0.41	0.34	0.31
		4.34	0.62	0.41	0.34	0.31
172 Z 14 172 C 14	3.49	4.66	0.67	0.44	0.37	0.33
		4.66	0.67	0.44	0.37	0.33
172 Z 15 172 C 15	3.73	4.98	0.71	0.47	0.40	0.36
		4.98	0.71	0.47	0.40	0.36
202 Z 14 202 C 14	3.82	6.79	0.97	0.65	0.54	0.49
		6.79	0.97	0.65	0.54	0.49
202 Z 15 202 C 15	4.09	7.25	1.04	0.69	0.58	0.52
		7.25	1.04	0.69	0.58	0.52
202 Z 16 202 C 16	4.35	7.74	1.11	0.74	0.61	0.55
		7.74	1.11	0.74	0.61	0.55
232 Z 15 232 C 15	4.44	10.06	1.44	0.96	0.80	0.72
		10.06	1.44	0.96	0.80	0.72
232 Z 16 232 C 16	4.73	10.70	1.53	1.02	0.85	0.76
		10.70	1.53	1.02	0.85	0.76
232 Z 18 232 C 18	5.30	11.99	1.71	1.14	0.95	0.86
		11.99	1.71	1.14	0.95	0.86

Section reference Z and C Profile	Weight kg/m	Working loads				
		Total U.D.L kN	Allowable loading in kN/m <sup>2</sup> rail centres in mm			
			1000	1500	1800	2000
SPAN 7.50m						
202 Z 14 202 C 14	3.82	5.91	0.79	0.53	0.44	0.39
		5.91	0.79	0.53	0.44	0.39
202 Z 15 202 C 15	4.09	6.32	0.84	0.56	0.47	0.42
		6.32	0.84	0.56	0.47	0.42
202 Z 16 202 C 16	4.35	6.73	0.90	0.60	0.50	0.45
		6.73	0.90	0.60	0.50	0.45
232 Z 15 232 C 15	4.44	8.76	1.17	0.78	0.65	0.58
		8.76	1.17	0.78	0.65	0.58
232 Z 16 232 C 16	4.73	9.32	1.24	0.83	0.69	0.62
		9.32	1.24	0.83	0.69	0.62
232 Z 18 232 C 18	5.30	10.44	1.39	0.93	0.77	0.70
		10.44	1.39	0.93	0.77	0.70
262 Z 16 262 C 16	5.11	12.47	1.66	1.11	0.92	0.83
		12.47	1.66	1.11	0.92	0.83
262 Z 18 262 C 18	5.73	13.97	1.86	1.24	1.03	0.93
		13.97	1.86	1.24	1.03	0.93
SPAN 8.00m						
232 Z 15 232 C 15	4.44	7.70	0.96	0.64	0.54	0.48
		7.70	0.96	0.64	0.54	0.48
232 Z 16 232 C 16	4.73	8.20	1.03	0.68	0.57	0.51
		8.20	1.03	0.68	0.57	0.51
232 Z 18 232 C 18	5.30	9.18	1.15	0.76	0.64	0.57
		9.18	1.15	0.76	0.64	0.57
232 Z 20 232 C 20	5.87	10.15	1.27	0.85	0.71	0.63
		10.15	1.27	0.85	0.71	0.63
262 Z 16 262 C 16	5.11	10.95	1.37	0.91	0.76	0.68
		10.95	1.37	0.91	0.76	0.68
262 Z 18 262 C 18	5.73	12.27	1.53	1.02	0.85	0.77
		12.27	1.53	1.02	0.85	0.77
262 Z 20 262 C 20	6.34	13.58	1.70	1.13	0.94	0.85
		13.58	1.70	1.13	0.94	0.85
SPAN 8.50m						
232 Z 15 232 C 15	4.44	6.83	0.80	0.54	0.45	0.40
		6.83	0.80	0.54	0.45	0.40
232 Z 16 232 C 16	4.73	7.26	0.85	0.57	0.47	0.43
		7.26	0.85	0.57	0.47	0.43
232 Z 18 232 C 18	5.30	8.13	0.96	0.64	0.53	0.48
		8.13	0.96	0.64	0.53	0.48
232 Z 20 232 C 20	5.87	8.99	1.06	0.71	0.59	0.53
		8.99	1.06	0.71	0.59	0.53
262 Z 16 262 C 16	5.11	9.71	1.14	0.76	0.63	0.57
		9.71	1.14	0.76	0.63	0.57
262 Z 18 262 C 18	5.73	10.87	1.28	0.85	0.71	0.64
		10.87	1.28	0.85	0.71	0.64
262 Z 20 262 C 20	6.34	12.03	1.42	0.94	0.79	0.71
		12.03	1.42	0.94	0.79	0.71
262 Z 23 262 C 23	7.26	13.74	1.62	1.08	0.90	0.81
		13.74	1.62	1.08	0.90	0.81
262 Z 25 262 C 25	7.86	14.88	1.75	1.17	0.97	0.88
		14.88	1.75	1.17	0.97	0.88

# Cladding systems

## Z and C-section butt side rail system

Uniform pressure values indicated in BLACK.  
Uniform suction values indicated in RED.

Tables are based on a deflection limit of Span/150 and adopt a cladding weight of 12.5kg/m<sup>2</sup> on elevation.

Section reference Z and C Profile	Weight kg/m	Working loads					
		Total U.D.L kN	Allowable loading in kN/m <sup>2</sup> rail centres in mm				
			1000	1500	1800	2000	
SPAN 9.00m							
232 Z 15	232 C 15	4.44	6.08	0.68	0.45	0.38	0.34
			6.08	0.68	0.45	0.38	0.34
232 Z 16	232 C 16	4.73	6.48	0.72	0.48	0.40	0.36
			6.48	0.72	0.48	0.40	0.36
232 Z 18	232 C 18	5.30	7.25	0.81	0.54	0.45	0.40
			7.25	0.81	0.54	0.45	0.40
232 Z 20	232 C 20	5.87	8.02	0.89	0.59	0.50	0.45
			8.02	0.89	0.59	0.50	0.45
262 Z 16	262 C 16	5.11	8.66	0.96	0.64	0.53	0.48
			8.66	0.96	0.64	0.53	0.48
262 Z 18	262 C 18	5.73	9.69	1.08	0.72	0.60	0.54
			9.69	1.08	0.72	0.60	0.54
262 Z 20	262 C 20	6.34	10.73	1.19	0.79	0.66	0.60
			10.73	1.19	0.79	0.66	0.60
262 Z 23	262 C 23	7.26	12.26	1.36	0.91	0.76	0.68
			12.26	1.36	0.91	0.76	0.68
302 Z 20	302 C 20	7.86	18.50	2.06	1.37	1.14	1.03
			18.50	2.06	1.37	1.14	1.03
302 Z 23	302 C 23	9.01	21.16	2.35	1.57	1.31	1.18
			21.16	2.35	1.57	1.31	1.18
SPAN 9.50m							
262 Z 16	262 C 16	5.11	7.77	0.82	0.55	0.45	0.41
			7.77	0.82	0.55	0.45	0.41
262 Z 18	262 C 18	5.73	8.70	0.92	0.61	0.51	0.46
			8.70	0.92	0.61	0.51	0.46
262 Z 20	262 C 20	6.34	9.63	1.01	0.68	0.56	0.51
			9.63	1.01	0.68	0.56	0.51
262 Z 23	262 C 23	7.26	11.00	1.16	0.77	0.64	0.58
			11.00	1.16	0.77	0.64	0.58
302 Z 20	302 C 20	7.86	16.60	1.75	1.16	0.97	0.87
			16.60	1.75	1.16	0.97	0.87
302 Z 23	302 C 23	9.01	18.99	2.00	1.33	1.11	1.00
			18.99	2.00	1.33	1.11	1.00
302 Z 25	302 C 25	9.76	20.58	2.17	1.44	1.20	1.08
			20.58	2.17	1.44	1.20	1.08
SPAN 10.00m							
262 Z 16	262 C 16	5.11	7.01	0.70	0.47	0.39	0.35
			6.93	0.69	0.46	0.38	0.35
262 Z 18	262 C 18	5.73	7.85	0.79	0.52	0.44	0.39
			7.76	0.78	0.52	0.43	0.39
262 Z 20	262 C 20	6.34	8.69	0.87	0.58	0.48	0.43
			8.53	0.85	0.57	0.47	0.43
302 Z 20	302 C 20	7.86	14.98	1.50	1.00	0.83	0.75
			14.98	1.50	1.00	0.83	0.75
302 Z 23	302 C 23	9.01	17.14	1.71	1.14	0.95	0.86
			17.14	1.71	1.14	0.95	0.86
302 Z 25	302 C 25	9.76	18.57	1.86	1.24	1.03	0.93
			18.57	1.86	1.24	1.03	0.93
342 Z 23	342 C 23	9.73	23.04	2.30	1.54	1.28	1.15
			23.04	2.30	1.54	1.28	1.15
342 Z 25	342 C 25	10.55	24.96	2.50	1.66	1.39	1.25
			24.96	2.50	1.66	1.39	1.25

Section reference Z and C Profile	Weight kg/m	Working loads					
		Total U.D.L kN	Allowable loading in kN/m <sup>2</sup> rail centres in mm				
			1000	1500	1800	2000	
SPAN 10.50m							
262 Z 25	262 C 25	7.86	9.75	0.93	0.62	0.52	0.46
			9.75	0.93	0.62	0.52	0.46
302 Z 20	302 C 20	7.86	13.59	1.29	0.86	0.72	0.65
			13.59	1.29	0.86	0.72	0.65
302 Z 23	302 C 23	9.01	15.55	1.48	0.99	0.82	0.74
			15.55	1.48	0.99	0.82	0.74
302 Z 25	302 C 25	9.76	16.84	1.60	1.07	0.89	0.80
			16.84	1.60	1.07	0.89	0.80
342 Z 23	342 C 23	9.73	20.90	1.99	1.33	1.11	1.00
			20.90	1.99	1.33	1.11	1.00
342 Z 25	342 C 25	10.55	22.64	2.16	1.44	1.20	1.08
			22.64	2.16	1.44	1.20	1.08
SPAN 11.00m							
302 Z 20	302 C 20	7.86	12.39	1.13	0.75	0.63	0.56
			12.39	1.13	0.75	0.63	0.56
302 Z 23	302 C 23	9.01	14.17	1.29	0.86	0.72	0.64
			14.17	1.29	0.86	0.72	0.64
302 Z 25	302 C 25	9.76	15.35	1.40	0.93	0.78	0.70
			15.35	1.40	0.93	0.78	0.70
342 Z 23	342 C 23	9.73	19.04	1.73	1.15	0.96	0.87
			19.04	1.73	1.15	0.96	0.87
342 Z 25	342 C 25	10.55	20.63	1.88	1.25	1.04	0.94
			20.63	1.88	1.25	1.04	0.94
342 Z 27	342 C 27	11.37	22.21	2.02	1.35	1.12	1.01
			22.21	2.02	1.35	1.12	1.01
342 Z 30	342 C 30	12.58	24.55	2.23	1.49	1.24	1.12
			24.55	2.23	1.49	1.24	1.12
SPAN 11.50m							
302 Z 23	302 C 23	9.01	12.96	1.13	0.75	0.63	0.56
			12.96	1.13	0.75	0.63	0.56
302 Z 25	302 C 25	9.76	14.04	1.22	0.81	0.68	0.61
			14.04	1.22	0.81	0.68	0.61
342 Z 23	342 C 23	9.73	17.42	1.52	1.01	0.84	0.76
			17.42	1.52	1.01	0.84	0.76
342 Z 25	342 C 25	10.55	18.87	1.64	1.09	0.91	0.82
			18.87	1.64	1.09	0.91	0.82
342 Z 27	342 C 27	11.37	20.32	1.77	1.19	0.98	0.88
			20.32	1.77	1.19	0.98	0.88
342 Z 30	342 C 30	12.58	22.47	1.95	1.30	1.09	0.98
			22.47	1.95	1.30	1.09	0.98
SPAN 12.00m							
302 Z 25	302 C 25	9.76	12.89	1.07	0.72	0.60	0.54
			12.89	1.07	0.72	0.60	0.54
342 Z 23	342 C 23	9.73	16.00	1.33	0.89	0.74	0.67
			16.00	1.33	0.89	0.74	0.67
342 Z 25	342 C 25	10.55	17.33	1.44	0.96	0.80	0.72
			17.33	1.44	0.96	0.80	0.72
342 Z 27	342 C 27	11.37	18.66	1.56	1.04	0.86	0.78
			18.66	1.56	1.04	0.86	0.78

# Wall restraints

## Single span C-section wall restraint

Section reference	Weight kg/m	Working U.D.L (kN) for a deflection not exceeding Span/300
SPAN 3.5m		
142 C 13	2.84	5.30
142 C 15	3.26	6.07
142 C 18	3.89	7.22
172 C 13	3.25	8.69
172 C 14	3.49	9.33
172 C 15	3.73	9.97
SPAN 4.0m		
142 C 15	3.26	4.65
142 C 18	3.89	5.53
172 C 13	3.25	6.65
172 C 14	3.49	7.14
172 C 15	3.73	7.63
172 C 18	4.45	9.09
202 C 14	3.82	10.39
202 C 15	4.09	11.11
202 C 16	4.35	11.82
SPAN 4.5m		
172 C 13	3.25	5.26
172 C 15	3.73	6.03
172 C 18	4.45	7.18
202 C 14	3.82	8.21
202 C 15	4.09	8.78
202 C 16	4.35	9.34
202 C 20	5.40	11.56
232 C 15	4.44	12.17
232 C 16	4.73	12.95

Section reference	Weight kg/m	Working U.D.L (kN) for a deflection not exceeding Span/300
SPAN 5.0m		
172 C 18	4.45	5.82
172 C 20	4.93	6.43
202 C 14	3.82	6.65
202 C 16	4.35	7.57
202 C 20	5.40	9.36
232 C 15	4.44	9.86
232 C 18	5.30	11.75
232 C 20	5.87	13.00
232 C 23	6.71	14.84
SPAN 5.5m		
202 C 16	4.35	6.25
202 C 20	5.40	7.74
232 C 15	4.44	8.15
232 C 18	5.30	9.71
232 C 23	6.71	12.27
262 C 16	5.11	11.59
262 C 18	5.73	12.98
262 C 20	6.34	14.37
SPAN 6.0m		
232 C 15	4.44	6.85
232 C 18	5.30	8.16
232 C 20	5.87	9.03
262 C 16	5.11	9.74
262 C 18	5.73	10.91
262 C 20	6.34	12.07
262 C 25	7.86	14.93

Section reference	Weight kg/m	Working U.D.L (kN) for a deflection not exceeding Span/300
SPAN 6.5m		
232 C 18	5.30	6.95
232 C 20	5.87	10.29
262 C 16	5.11	8.30
262 C 18	5.73	9.30
262 C 20	6.34	10.29
262 C 25	7.86	12.72
302 C 20	7.86	17.73
302 C 23	9.01	20.28
SPAN 7.0m		
262 C 16	5.11	7.16
262 C 18	5.73	8.02
262 C 20	6.34	8.87
262 C 25	7.86	10.97
302 C 20	7.86	15.29
302 C 23	9.01	17.49
302 C 25	9.76	18.95
302 C 29	11.27	21.83
SPAN 7.5m		
262 C 20	6.34	7.73
262 C 23	7.26	8.83
262 C 25	7.86	9.55
302 C 20	7.86	13.32
302 C 25	9.76	16.50
302 C 29	11.27	19.00
342 C 23	9.73	20.48
342 C 25	10.55	22.19

## Double span C-section wall restraint

Section reference	Weight kg/m	Working U.D.L (kN) for a deflection not exceeding Span/300
SPAN 3.5m		
142 C 14	3.05	11.71
SPAN 4.0m		
142 C 13	2.84	8.35
142 C 15	3.26	9.57
172 C 13	3.25	10.94
172 C 14	3.49	12.91
SPAN 4.5m		
142 C 13	2.84	6.60
142 C 15	3.26	7.57
142 C 18	3.89	8.99
172 C 13	3.25	10.07
172 C 15	3.73	12.42
SPAN 5.0m		
142 C 13	2.84	5.34
142 C 15	3.26	6.13
142 C 18	3.89	7.29
172 C 13	3.25	8.77
172 C 15	3.73	10.06
172 C 18	4.45	11.98
202 C 14	3.82	11.57

Section reference	Weight kg/m	Working U.D.L (kN) for a deflection not exceeding Span/300
SPAN 5.5m		
172 C 13	3.25	7.25
172 C 15	3.73	8.31
172 C 18	4.45	9.90
202 C 14	3.82	10.83
202 C 16	4.35	12.88
202 C 20	5.40	15.94
232 C 15	4.44	13.06
232 C 18	5.30	19.40
SPAN 6.0m		
172 C 14	3.49	6.54
172 C 16	3.98	7.43
172 C 20	4.93	9.19
202 C 14	3.82	9.51
202 C 16	4.35	10.82
202 C 20	5.40	13.39
232 C 15	4.44	12.34
232 C 18	5.30	16.81
262 C 16	5.11	14.54
262 C 18	5.73	18.93

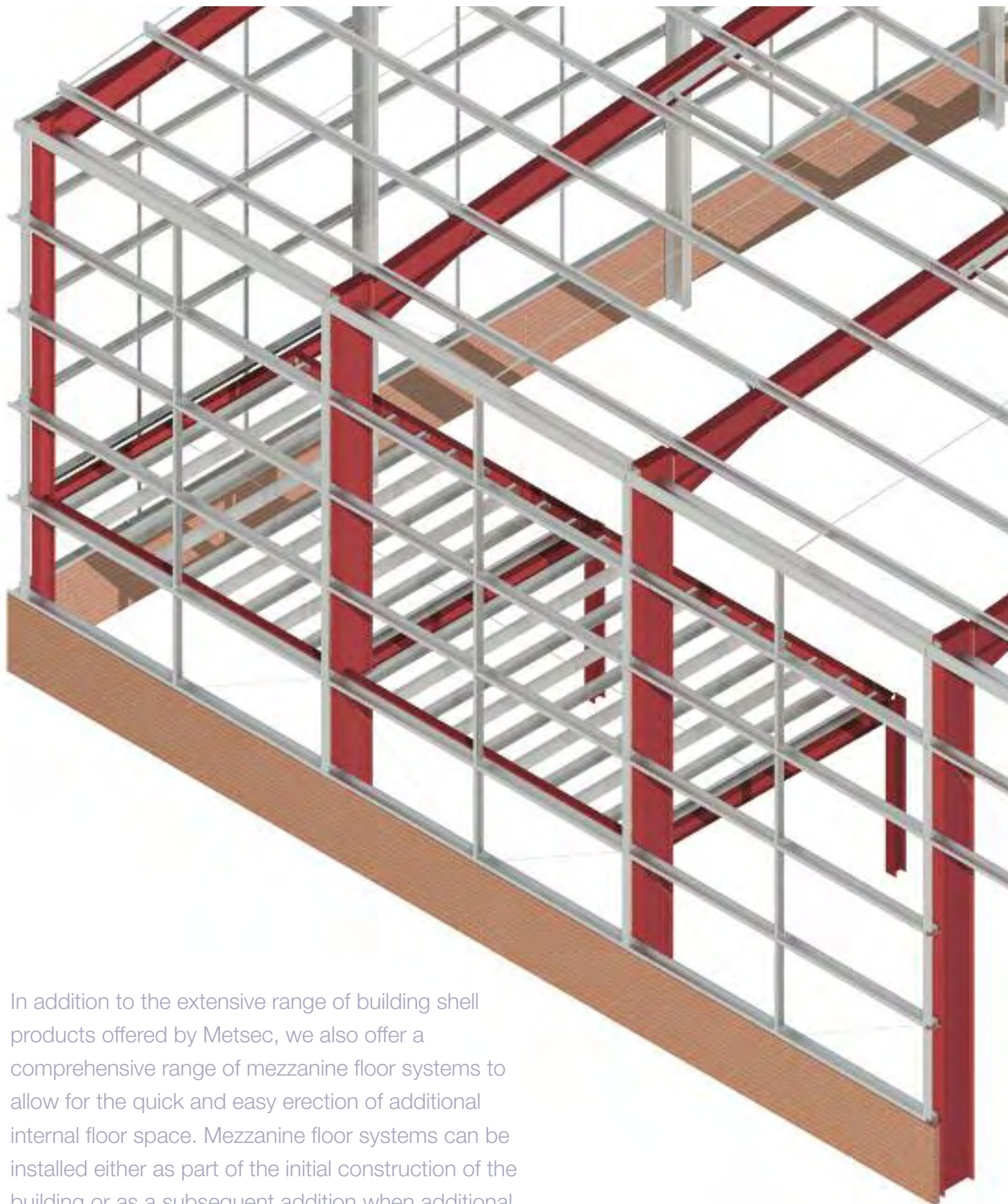
Section reference	Weight kg/m	Working U.D.L (kN) for a deflection not exceeding Span/300
SPAN 6.5m		
202 C 14	3.82	8.11
202 C 16	4.35	9.22
232 C 15	4.44	11.68
232 C 18	5.30	14.32
262 C 20	6.34	21.18
SPAN 7.0m		
202 C 15	4.09	7.47
202 C 18	4.88	8.90
232 C 15	4.44	10.36
232 C 18	5.30	12.35
262 C 16	5.11	13.20
262 C 20	6.34	18.26
SPAN 7.5m		
232 C 15	4.44	9.02
232 C 18	5.30	10.76
262 C 16	5.11	12.59
262 C 20	6.34	15.91
302 C 20	7.86	22.78
302 C 23	9.01	30.84
302 C 25	9.76	33.99

# Eaves beams

Section reference	Weight kg/m	All loads are working loads/span	
		Vertical U.D.L. kN	Deflection U.D.L. in kN (Span/200)
<b>Number of lateral supports 1</b>			
SPAN 4.0m			
170 E 20	5.89	17.88	17.88
SPAN 4.5m			
170 E 20	5.89	14.05	14.05
SPAN 5.0m			
170 E 20	5.89	11.30	11.30
SPAN 5.5m			
170 E 20	5.89	9.26	9.26
SPAN 6.0m			
170 E 20	5.89	7.70	7.70
230 E 20	6.83	15.66	15.66
<b>Number of lateral supports 2</b>			
SPAN 6.5m			
170 E 20	5.89	6.48	6.48
230 E 20	6.83	13.25	13.25
SPAN 7.0m			
230 E 20	6.83	11.33	11.33
230 E 25	8.47	14.03	14.03
SPAN 7.5m			
230 E 20	6.83	9.78	9.78
230 E 25	8.47	12.10	12.10
SPAN 8.0m			
230 E 25	8.47	10.52	10.52
270 E 25	9.76	16.81	16.81
SPAN 8.5m			
230 E 25	8.47	9.20	9.20
270 E 25	9.76	14.76	14.76
SPAN 9.0m			
230 E 25	8.47	8.09	8.09
270 E 25	9.76	13.03	13.03
270 E 29	11.27	15.01	15.01
SPAN 9.5m			
270 E 25	9.76	11.56	11.56
270 E 29	11.27	13.31	13.31
SPAN 10.0m			
270 E 25	9.76	10.29	10.29
270 E 29	11.27	11.86	11.86
330 E 30	12.58	18.91	18.91
SPAN 10.5m			
270 E 29	11.27	10.60	10.60
330 E 30	12.58	16.98	16.98
SPAN 11.0m			
270 E 29	11.27	9.50	9.50
330 E 30	12.58	15.29	15.29
<b>Number of lateral supports 3</b>			
SPAN 11.5m			
270 E 29	11.27	8.53	8.53
330 E 30	12.58	13.81	13.81
SPAN 12.0m			
270 E 29	11.27	7.68	7.68
330 E 30	12.58	12.51	12.51

Note: The above loads are based on a horizontal working wind load of 1kN/m run.

# Mezzanine floor systems



In addition to the extensive range of building shell products offered by Metsec, we also offer a comprehensive range of mezzanine floor systems to allow for the quick and easy erection of additional internal floor space. Mezzanine floor systems can be installed either as part of the initial construction of the building or as a subsequent addition when additional space is required in an existing structure.

## Design notes

Load capacities have been derived in accordance with the following documents:

BS 5950:Part 5:1998 "Code of Practice for design of cold formed thin gauge sections".

Steel Construction Institute publication 'Building Design Using Cold Formed Steel Sections- Worked Examples'.

Load capacities are valid only when fixed in accordance with details shown in this document.

The performance of the systems have been validated by a comprehensive test programme carried out by the Department of Mechanical Engineering at The University of Strathclyde.

Adequate torsional restraint is provided by 38mm minimum thickness flooring grade particle board.

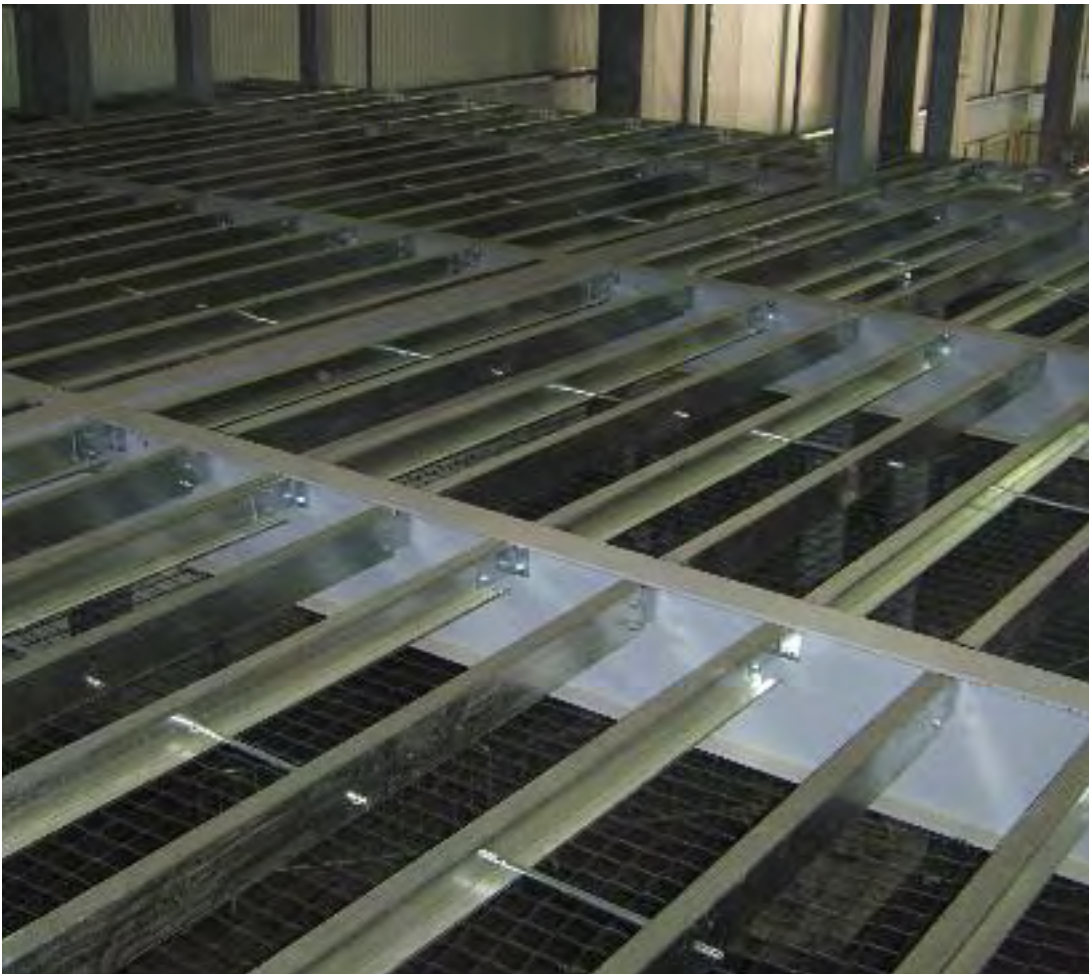
This must be fixed to the top flange of the C-sections using appropriate self-drilling, self-tapping screws at a spacing not greater than 1150mm along the span.

Tie bars must be provided at mid span position as illustrated on page 85.

All fixing bolts must be M16 diameter, grade 8.8 complete with washer under head and nut.

Double span load capacities are based on the consideration of a uniformly distributed load on both spans or on one span only.

Note: the additional consideration of one span loaded is appropriate to this type of floor.



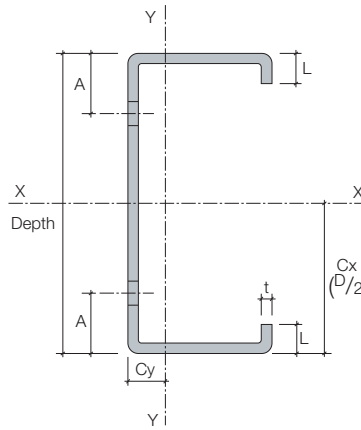
Ocado, Tamworth showing new rapid fix mezzanine floor beam tie

# Dimensions, piercings and physical properties

## Section reference

The section reference of a M-section 232mm deep and 1.8mm thick = 232 M 18. The first 3 digits of the section reference indicate the depth of the section in millimetres (ie 232 equals 232mm deep).

The fourth digit is a letter that signifies the profile type (ie M for M-section). The last two digits indicate the material thickness (ie 18 equals 1.8mm).



Section depth mm	A mm	L mm
142	41	13
150	45	13
165	47.5	14
172, 202	51	13
220	60	13
232, 262	51	13
302,342	51	18

## Nominal dimensions

Section reference	Weight kg/m	Area cm <sup>2</sup>	Depth mm	Flange mm	t mm
142 M 13	2.84	3.62	142	60	1.3
142 M 14	3.05	3.89	142	60	1.4
142 M 15	3.26	4.16	142	60	1.5
142 M 16	3.47	4.42	142	60	1.6
142 M 18	3.89	4.95	142	60	1.8
142 M 20	4.30	5.48	142	60	2.0
150 M 15	3.26	4.16	150	56	1.5
150 M 20	4.30	5.48	150	56	2.0
165 M 15	3.73	4.76	165	67	1.5
165 M 20	4.93	6.28	165	67	2.0
172 M 13	3.25	4.14	172	65	1.3
172 M 14	3.49	4.45	172	65	1.4
172 M 15	3.73	4.76	172	65	1.5
172 M 16	3.98	5.06	172	65	1.6
172 M 18	4.45	5.67	172	65	1.8
172 M 20	4.93	6.28	172	65	2.0
172 M 23	5.63	7.17	172	65	2.3
172 M 25	6.09	7.76	172	65	2.5
202 M 14	3.82	4.87	202	65	1.4
202 M 15	4.09	5.21	202	65	1.5
202 M 16	4.35	5.54	202	65	1.6
202 M 18	4.88	6.21	202	65	1.8
202 M 20	5.40	6.88	202	65	2.0
202 M 23	6.17	7.86	202	65	2.3
202 M 27	7.19	9.16	202	65	2.7
220 M 15	4.09	5.21	220	56	1.5
220 M 20	5.40	6.88	220	56	2.0
232 M 15	4.44	5.66	232	65	1.5
232 M 16	4.73	6.02	232	65	1.6
232 M 18	5.30	6.75	232	65	1.8
232 M 20	5.87	7.48	232	65	2.0
232 M 23	6.71	8.55	232	65	2.3
232 M 25	7.27	9.26	232	65	2.5
262 M 16	5.11	6.50	262	65	1.6
262 M 18	5.73	7.29	262	65	1.8
262 M 20	6.34	8.08	262	65	2.0
262 M 23	7.26	9.24	262	65	2.3
262 M 25	7.86	10.01	262	65	2.5
262 M 29	9.06	11.54	262	65	2.9
302 M 20	7.86	10.02	302	88	2.0
302 M 23	9.01	11.47	302	88	2.3
302 M 25	9.76	12.44	302	88	2.5
302 M 29	11.27	14.35	302	88	2.9
342 M 23	9.73	12.39	342	88	2.3
342 M 25	10.55	13.44	342	88	2.5
342 M 27	11.37	14.48	342	88	2.7
342 M 30	12.58	16.03	342	88	3.0

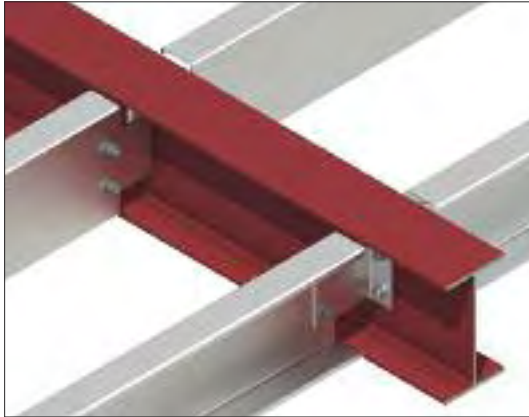
## Section properties

Ixx cm <sup>4</sup>	Iyy cm <sup>4</sup>	Zxx cm <sup>3</sup>	Zyy cm <sup>3</sup>	rx cm	ry cm	Cy cm	Q	Mcx kNm	Mcy kNm
119.0	17.6	16.76	4.18	5.69	2.19	1.80	0.551	6.022	1.882
127.7	18.8	17.99	4.48	5.68	2.18	1.80	0.586	6.790	2.016
136.4	20.1	19.22	4.77	5.68	2.18	1.80	0.620	7.566	2.148
145.1	21.3	20.44	5.06	5.67	2.17	1.80	0.652	8.341	2.279
162.2	23.7	22.85	5.63	5.67	2.16	1.80	0.706	9.862	2.535
179.1	26.0	25.23	6.19	5.66	2.16	1.80	0.750	11.315	2.787
148.2	17.2	19.76	4.31	5.92	2.02	1.60	0.617	7.897	1.941
194.6	22.3	25.94	5.59	5.89	2.00	1.60	0.732	11.626	2.515
208.5	28.2	25.27	5.94	6.58	2.42	1.95	0.555	9.213	2.672
274.2	36.7	33.24	7.73	6.56	2.40	1.95	0.690	14.218	3.477
194.7	22.7	22.64	4.83	6.81	2.32	1.81	0.486	7.507	2.174
209.1	24.3	24.32	5.18	6.81	2.32	1.81	0.518	8.505	2.330
223.5	25.9	25.98	5.52	6.80	2.31	1.81	0.549	9.523	2.484
237.7	27.5	27.64	5.86	6.80	2.31	1.81	0.578	10.552	2.636
266.0	30.6	30.93	6.52	6.79	2.30	1.81	0.632	12.607	2.935
294.0	33.6	34.18	7.17	6.78	2.29	1.81	0.676	14.610	3.228
335.3	38.1	38.99	8.13	6.76	2.28	1.81	0.730	17.466	3.656
362.5	41.0	42.16	8.74	6.75	2.27	1.82	0.759	19.278	3.934
303.9	25.4	30.09	5.26	7.85	2.27	1.66	0.477	10.076	2.367
324.8	27.1	32.16	5.61	7.84	2.27	1.66	0.505	11.312	2.523
345.6	28.8	34.22	5.95	7.84	2.26	1.66	0.532	12.560	2.678
386.9	32.0	38.31	6.63	7.83	2.25	1.66	0.581	15.052	2.982
427.8	35.2	42.36	7.29	7.82	2.24	1.67	0.621	17.487	3.280
488.4	39.9	48.35	8.26	7.80	2.23	1.67	0.669	20.986	3.716
567.7	45.9	56.20	9.50	7.78	2.21	1.67	0.720	25.405	4.274
364.7	19.2	33.15	4.47	8.31	1.91	1.30	0.502	11.861	2.010
480.3	24.9	43.66	5.79	8.28	1.88	1.30	0.591	17.909	2.605
449.9	28.2	38.79	5.68	8.86	2.22	1.54	0.469	13.022	2.555
478.8	29.9	41.28	6.03	8.86	2.21	1.54	0.493	14.499	2.711
536.3	33.3	46.23	6.71	8.85	2.20	1.54	0.538	17.448	3.020
593.1	36.6	51.13	7.38	8.83	2.19	1.54	0.575	20.340	3.322
677.5	41.4	58.40	8.36	8.82	2.18	1.55	0.619	24.524	3.763
733.0	44.6	63.19	9.00	8.81	2.17	1.55	0.643	27.220	4.049
639.5	30.8	48.82	6.09	9.85	2.16	1.43	0.460	16.330	2.739
716.4	34.3	54.69	6.78	9.84	2.15	1.43	0.501	19.760	3.050
792.7	37.8	60.51	7.46	9.83	2.15	1.44	0.535	23.134	3.356
905.8	42.7	69.15	8.45	9.82	2.13	1.44	0.576	28.047	3.801
980.4	46.0	74.84	9.09	9.80	2.12	1.44	0.598	31.231	4.091
1127.6	52.2	86.08	10.33	9.78	2.10	1.45	0.637	37.436	4.650
1360.3	93.0	90.09	13.97	11.59	3.03	2.14	0.474	30.351	6.285
1556.4	105.8	103.07	15.89	11.58	3.02	2.14	0.528	38.110	7.149
1686.0	114.1	111.65	17.14	11.57	3.01	2.14	0.560	43.246	7.713
1942.4	130.3	128.63	19.59	11.55	2.99	2.15	0.611	53.219	8.816
2090.8	109.3	122.27	16.05	12.92	2.95	1.99	0.492	43.256	7.224
2265.4	117.9	132.48	17.32	12.91	2.94	2.00	0.522	49.248	7.795
2438.8	126.3	142.62	18.57	12.90	2.93	2.00	0.547	55.149	8.357
2696.9	138.8	157.71	20.41	12.88	2.92	2.00	0.579	63.794	9.183

# Inset and oversail design

## Inset design

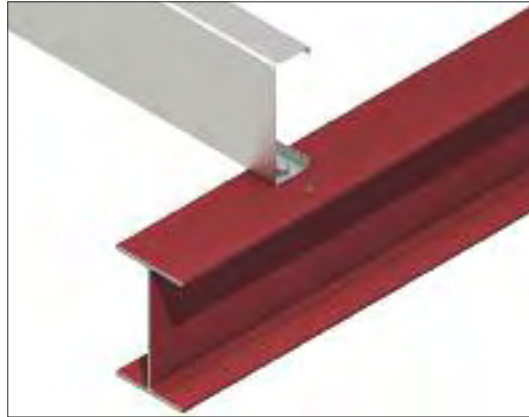
Mezzanine floors that require the maximum use of available headroom should be designed using the Metsec inset floor beam system. In this system, C-sections are connected within the framework of primary members thus keeping the overall depth to a minimum.



Web cleat connection between C-section secondary beams and hot rolled primary beam

## Oversail design without cleats

The Metsec oversail floor beam system, designed for use without cleats offers maximum economy. The direct connection of C-sections to primary members may reduce component and installation cost. The performance of C-sections used in this system is related to the length of C-section directly sitting on the main support beam known as the bearing length and should be a minimum of 65mm.



Oversail without cleat connection between C-section secondary beams and hot rolled primary beam.

## Oversail design with top cleats

The Metsec oversail floor beam system should be considered where there are no restrictions as to the finished height or depth of the mezzanine floor construction.



Oversail/top cleat connection between C-section secondary beams and hot rolled primary beam

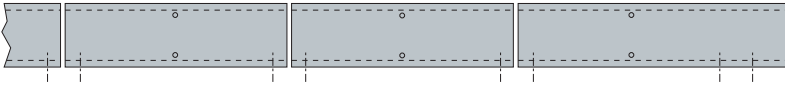
## Typical overhang

For single and double span arrangements, the maximum allowable overhang should be limited to  $\text{span}/8$  with cleats.

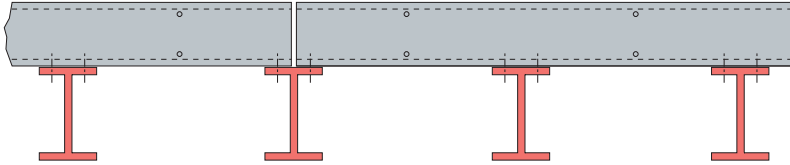


**Connection details without cleats**

Single span arrangement

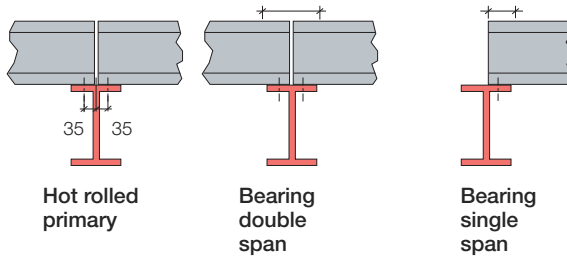


Double span arrangement



Maximum allowable overhang should be limited to  $\text{Span}/12$  without cleats.

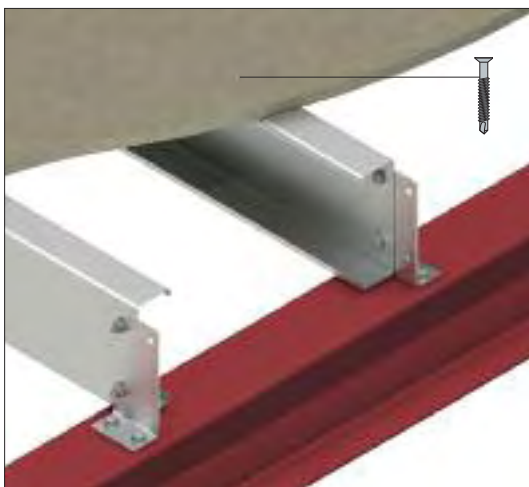
- All holes are 18mm diameter for M16 grade 8.8 bolts.
- All dimensions are in millimetres.
- End fixings and restraint holes are pierced in pairs and positioned longitudinally to suit requirements.
- Upper and lower flange holes are pierced in the centre of the respective flange width.
- Minimum edge distance for all holes is 25mm.
- Maximum length of section is 15m.
- Minimum length of section is 1.3m.
- Consideration should be given to the transportation and handling on site of long lengths.
- Standard drawing/order sheets are available on request.



**Deck fixing**

The use of self-tapping and drilling screw fixings permits one easy fixing operation. Fastener manufacturers offer a series of screw types to suit the thickness of the Metsec C-sections being used.

Material weights are provided as guidance for decking or additional ceiling loads and confirmation of such weights must be sought from the flooring material manufacturers.



Board type	Thickness mm	Approx. density kg/m <sup>3</sup>	Weight kg/m <sup>2</sup>	kN/m <sup>2</sup>
Hardwood particle	38	760	28.87	0.283
Hardwood particle	25	760	19.00	0.186
Softwood particle	38	700	26.60	0.260
Heavy duty chipboard	38	700	26.60	0.260
Heavy duty chipboard	30	660	19.80	0.194
Heavy duty chipboard	25	700	17.50	0.171
Flooring grade chipboard	22	700	15.40	0.151
Flooring grade chipboard	18	700	12.60	0.123
Mineral board fire panel	18	-	9.70	0.095
Mineral board fire panel	15	-	8.00	0.078

# Accessories - cleats

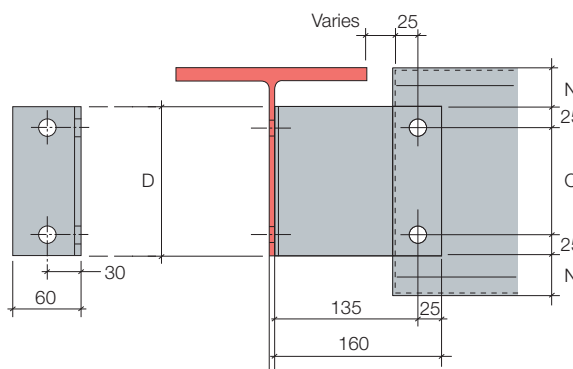
## Cleat specification

Standard and non-standard cleats can be supplied for inset (web) floor constructions.

Standard inset cleats are manufactured from 4mm and 5mm pre-hot dipped galvanised steel, G275 coating, guaranteed yield strength 350 N/mm<sup>2</sup>. Non-standard cleats by others or to special order.

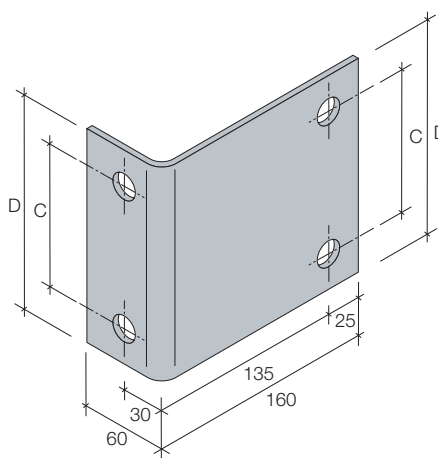
All holes are 18mm diameter for M16 bolts grade 8.8.

Non-standard cleats can be supplied for oversail (top) floor construction to special order.



## Mezzanine inset (web) cleats

Section series	C (mm)	D (mm)	N (mm)	Max Weight (kg)
MIC 142 4/5	60	110	16.0	0.91
MIC 150 4/5	60	110	20.0	0.91
MIC 165 4/5	70	120	22.5	0.99
MIC 172 4/5	70	120	26.0	0.99
MIC 202 4/5	100	150	26.0	1.24
MIC 220 4/5	100	150	35.0	1.24
MIC 232 4/5	130	180	26.0	1.48
MIC 262 4/5	160	210	26.0	1.73
MIC 302 4/5	200	250	26.0	2.06
MIC 342 4/5	240	290	26.0	2.39



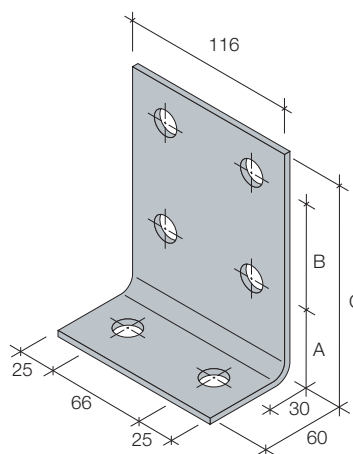
The Mezzanine inset cleat reference is the same as the section that it is being used in conjunction with, i.e.:

MIC 1724 - 4mm thick inset cleat for a 172 section

MIC 2325 - 5mm thick inset cleat for a 232 section

## Mezzanine oversail (top) cleats

Section series	A (mm)	B (mm)	C (mm)	Weight (kg)
MOC 142	49	60	134	0.71
MOC 150	53	60	138	0.72
MOC 165	55	70	150	0.76
MOC 172	59	70	154	0.78
MOC 202	59	100	184	0.89
MOC 220	68	100	193	0.92
MOC 232	59	130	214	1.00
MOC 262	59	160	244	1.11
MOC 302	59	200	284	1.25
MOC 342	59	240	324	1.40



# Accessories-tie bars

**NEW! Rapid fix tie bar (patent application No. 1008677.5)**

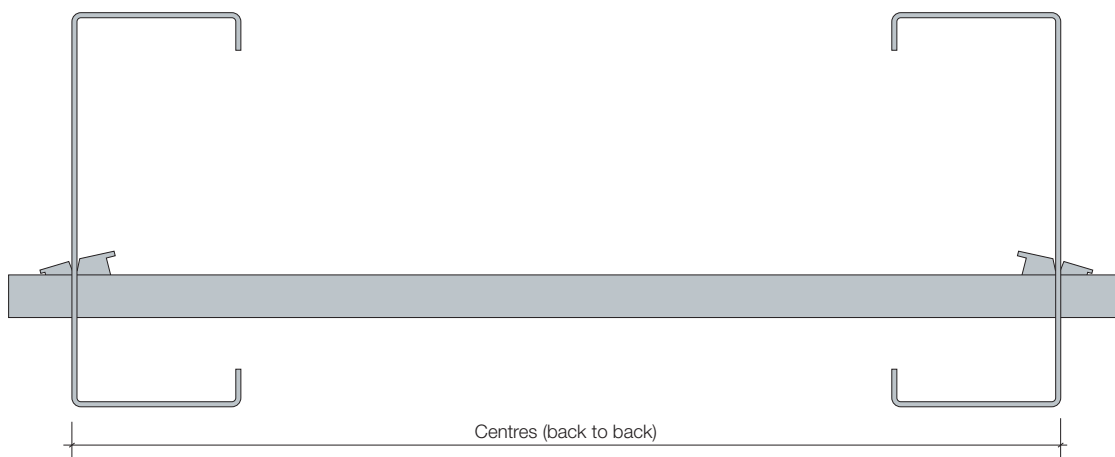
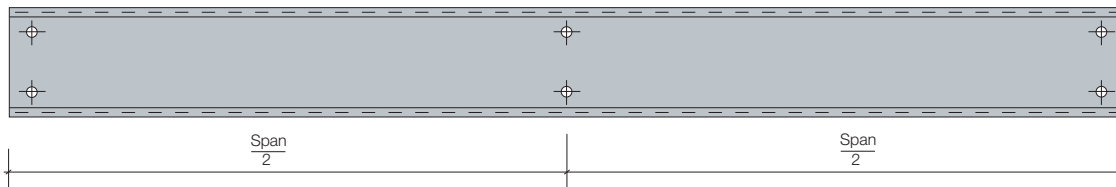
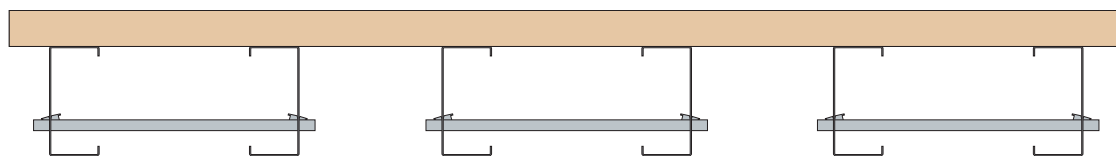
Our new rapid fix tie bar replaces threaded rod, nuts and washers, thereby greatly reducing installation time.

Tie bars must be used in all flooring applications to prevent the floor beam from twisting.

Tie bars are fitted at mid span location to the lower web holes of facing sections. Floor beams must have tie bars installed prior to the laying of decking materials.



Correct section orientation and tie bar arrangement



Unless otherwise stated, all required holes are 18mm diameter for M16 bolts and are normally pierced in pairs on standard gauge lines.

For 'General detailing' notes, see page 86

# Services and general notes

## General detailing information

- Unless otherwise stated, all required holes are 18mm diameter for M16 bolts and are normally pierced in pairs on standard gauge lines.
- All dimensions for illustrations shown in millimetres unless otherwise stated.
- Clearance between purlins at all joints is 6mm.
- End fixing holes are supplied as shown.
- For full cleat details see page 57 and 84.

## Customer service

Metsec are committed to providing the highest levels of customer satisfaction and ensure that our staff are trained to the highest possible levels in order to assist our customers at all stages of the design and installation process.

Our sales teams in particular have a thorough knowledge of our products and should be able to resolve most of your questions quickly and professionally.

## Metsec – Leaders in EDI

Metsec's vast experience in Electronic Data Interchange has established us as leaders in the field. Data from Metsec's own detailing software MetCAM or from specialist 3D draughting systems can simply be e-mailed to the Metsec Drawing Office for direct issue to production.

Metsec EDI means the benefits include reduced time in producing and transferring details. Also, by eliminating a potential source of errors, improved efficiency and greater customer satisfaction is achieved.

## Terms and conditions

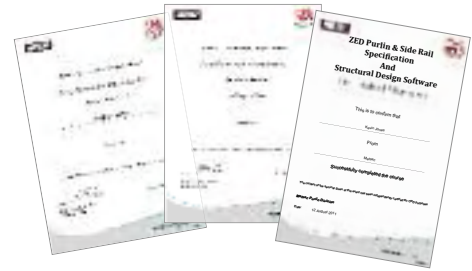
A copy of the standard Metsec Terms and Conditions are available for inspection on our website: [www.metsec.com](http://www.metsec.com)

## Research and development

Metsec operate a policy of continuous research and development reserving the rights to change the specification for products in this literature without prior notice.

## Company Registration

Metsec plc.  
Registered Office: Broadwell Road, Oldbury,  
West Midlands B69 4HF.  
Company Number: 1551970 (England)



## Training

CPD accredited by the Construction CPD Certification Service in the use and application of Metsec products and MetSPEC design software can be arranged by contacting Metsec.

## The Purlin “WEBINAR” available online at the Metsec Website.

CPD approved seminar entitled 'Structural Design Software for the Specification of Zed Purlins and Side Rails'

Assessed and independently certified by the Construction CPD Certification Service as a valuable contribution to Continuing Professional Development requirements, this seminar is offered totally free of charge.

This half an hour seminar has been specifically designed for consultant engineers to give an appreciation of the interaction between hot and cold rolled structural elements.

Also available upon request is a full one hour CPD seminar conducted at your offices.

## Software

Metsec are pioneers when it comes to the provision of design software packages. Our first design package for purlin design was produced in 1989, since when we have been continually updating and improving the packages that we offer.

Today, Metsec produce a number of stand-alone design software packages including MetSPEC for purlins, side rails and mezzanine floors.

This package enables the quick and easy design of purlins, side rails and mezzanine floor joists in accordance with BS5950-5:1998. It includes design capability to account for snow drifting, tiled roof and steep slope analysis along with automatic wind load calculation in 12 directions to give fast and accurate solutions to BS 6399-2:1997. A tutorial to guide users through the complete design process is also included.

For a free copy of the latest MetSPEC software please contact Metsec on 0121 601 6000 or visit our website: [www.metsec.com](http://www.metsec.com)



# Component weights

Section reference Z and C Profile	Weight kg/m	Z sleeve kg/each	H.E.B. sleeve kg/each	C sleeve kg/each
142 Z 13 142 C 13	2.84	1.74	n/a	2.64
142 Z 14 142 C 14	3.05	1.87	2.29	2.64
142 Z 15 142 C 15	3.26	2.00	2.45	2.64
142 Z 16 142 C 16	3.47	2.13	2.60	2.64
142 Z 18 142 C 18	3.89	2.39	2.92	2.64
142 Z 20 142 C 20	4.30	2.64	3.23	2.64
172 Z 13 172 C 13	3.25	2.32	n/a	4.35
172 Z 14 172 C 14	3.49	2.49	3.19	4.35
172 Z 15 172 C 15	3.73	2.66	3.41	4.35
172 Z 16 172 C 16	3.98	2.84	3.64	4.35
172 Z 18 172 C 18	4.45	3.18	4.07	4.35
172 Z 20 172 C 20	4.93	3.52	4.51	4.35
172 Z 23 172 C 23	5.63	4.02	5.15	4.35
172 Z 25 172 C 25	6.09	4.35	5.57	4.35
202 Z 14 202 C 14	3.82	3.19	n/a	6.00
202 Z 15 202 C 15	4.09	3.41	4.39	6.00
202 Z 16 202 C 16	4.35	3.63	4.67	6.00
202 Z 18 202 C 18	4.88	4.07	5.24	6.00
202 Z 20 202 C 20	5.40	4.50	5.80	6.00
202 Z 23 202 C 23	6.17	5.15	6.63	6.00
202 Z 27 202 C 27	7.19	6.00	7.72	6.00
232 Z 15 232 C 15	4.44	4.24	n/a	6.94
232 Z 16 232 C 16	4.73	4.51	6.15	6.94
232 Z 18 232 C 18	5.30	5.06	6.89	6.94
232 Z 20 232 C 20	5.87	5.60	7.63	6.94
232 Z 23 232 C 23	6.71	6.40	8.72	6.94
232 Z 25 232 C 25	7.27	6.94	9.45	6.94
262 Z 16 262 C 16	5.11	5.39	n/a	9.55
262 Z 18 262 C 18	5.73	6.04	8.60	9.55
262 Z 20 262 C 20	6.34	6.68	9.51	9.55
262 Z 23 262 C 23	7.26	7.65	10.89	9.55
262 Z 25 262 C 25	7.86	8.28	11.79	9.55
262 Z 29 262 C 29	9.06	9.55	13.59	9.55
302 Z 20 302 C 20	7.86	10.64	n/a	15.26
302 Z 23 302 C 23	9.01	12.20	15.32	15.26
302 Z 25 302 C 25	9.76	13.22	16.59	15.26
302 Z 29 302 C 29	11.27	15.26	19.16	15.26
342 Z 23 342 C 23	9.73	16.09	n/a	20.81
342 Z 25 342 C 25	10.55	17.45	21.1	20.81
342 Z 27 342 C 27	11.37	18.81	22.74	20.81
342 Z 30 342 C 30	12.58	20.81	25.16	20.81

Accessories	Weight kg/m
Panel joint rail (PJR)	5.32
Horizontal cladding support (HCS)	2.84
Side rail supports (142-262 series)	1.37
Side rail supports (302 and 342 series)	2.17
Eaves braces	1.37
Anti-sag rods (142-262 series)	0.50
Anti-sag rods (302 and 342 series)	1.37
Diagonal tie wires	0.50
Cleader angle 100 x 100 x 2	3.20
Cleader angle 45 x 45 x 2	1.37
Rafter stays	1.37

Section reference	Weight kg/m
<b>Eaves beams</b>	
170 E 20	5.89
170 E 23	6.73
230 E 20	6.83
230 E 25	8.47
270 E 25	9.76
270 E 29	11.27
330 E 30	12.58
<b>Stiffener cleats</b>	
EBS 170	1.52
EBS 230	1.88
EBS 270	2.08
EBS 330	2.45
<b>Packing plates</b>	
PP 142	0.38
PP 172	0.48
PP 202	0.58
PP 232	0.68
PP 262	0.78
PP 302	0.84
PP 342	0.97
<b>Z-section and C-section cleats</b>	
142	0.61
172	0.75
202	0.90
232	1.04
262	1.18
302	3.70
342	4.10
<b>Trimmer cleats</b>	
TC 142	0.44
TC 172	0.60
TC 202	0.74
TC 232	0.90
TC 262	1.07
TC 302	1.20
TC 342	1.48

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