HADLEY GROUP

CI/SfB reference		
	(23)	Hh2
January 2015		

HADLEY UltraZED™2
HADLEY UltraBEAM™2

for Purlins & Cladding Rails

incorporating

UltraMEZZ® mezzanine floor joist system

Contents

Hadley Group

An international business

Customer Care

At Hadley we have shaped our business around adding value for our customers; understanding their diverse needs and, through local expertise, market insight and manufacturing capabilities, delivering beyond expectation.

Originality

Hadley Group Technology is the largest in-house cold roll forming technology academy in the UK. Hadley Group is protected from imitation via intellectual property rights to 145 of its products and processes assuring the integrity of our portfolio. Amongst these is UltraSTEEL® which has a global patent, with 1 billion metres produced annually both in-house and under licence.

Reach

Hadley Group is the UK's largest manufacturer of cold rolled metal profiles, with 50 dedicated rolling mills and a global reach spanning five continents.

Today, with 500 employees within seven manufacturing centres serving contracts and licence agreements in 36 countries - including operations in Germany, Dubai and Thailand - we are a truly international business in every way, with an unerring focus on practical ingenuity, delivering beyond expectation and adding value at every opportunity.

Experience

Our industrial heritage spans 50 years. Our loyal and skilled workforce understands how to create long term, positive relationships with customers who trust Hadley Group to advise, innovate, manufacture and deliver.

4 UK manufacturing bases

50 rolling mills

Authority

Quality

Hadley Building Products Division operates to design and quality procedures through a Quality Management System accredited to BS EN ISO 9001 that covers design and production.

Environment & Sustainability

Our commitment to the environment and a sustainable future is recognised by the award of BS EN ISO 14001 accreditation for our Environmental Management System and membership of the Steel Construction Sustainability Charter.

CE **HADLEY UltraZED™2 & UltraBEAM™2** products are CE Marked in accordance with the Construction Products Regulations with respect to structural metallic construction members conforming to BS EN 1090-1.

Design

HADLEY UltraZED™2 & UltraBEAM™2 products are supported by **HADLEY Design Suite PRO** Design Software which provides cost effective solutions to optimise the structural design. The software is user friendly, simple to use and saves designers both time and money.

HADLEY UltraZED™2 & UltraBEAM™2

All sections are considered in accordance with BS EN 1993-1-3. Sections have been tested and assessed by Hadley Group in association with the Steel Construction Institute and Wolverhampton University.

Evaluation and computer analysis of these test results has been utilised to determine the published sectional properties in accordance with BS EN 1993-1-3. Further testing and research into system design has been undertaken to provide reliable data for the compilation of **HADLEY Design Suite PRO**.

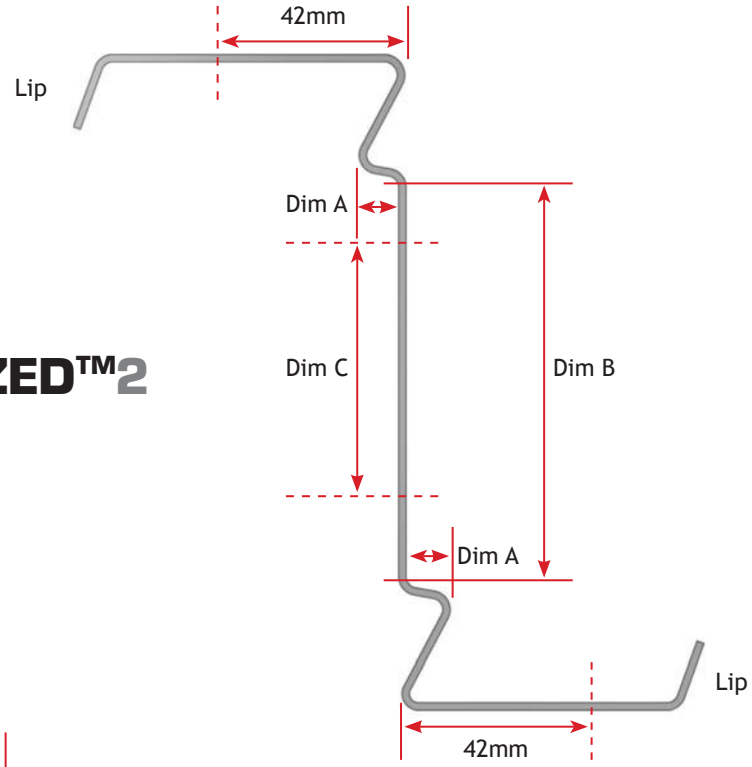
HADLEY UltraZED™2 & UltraBEAM™2 products have been awarded SCI Assessed Status by the Steel Construction Institute, an internationally recognised expert body in the design and structural application cold roll-formed sections.

ISO 9001 Cert: Q 027
ISO 14001 Cert: E 027

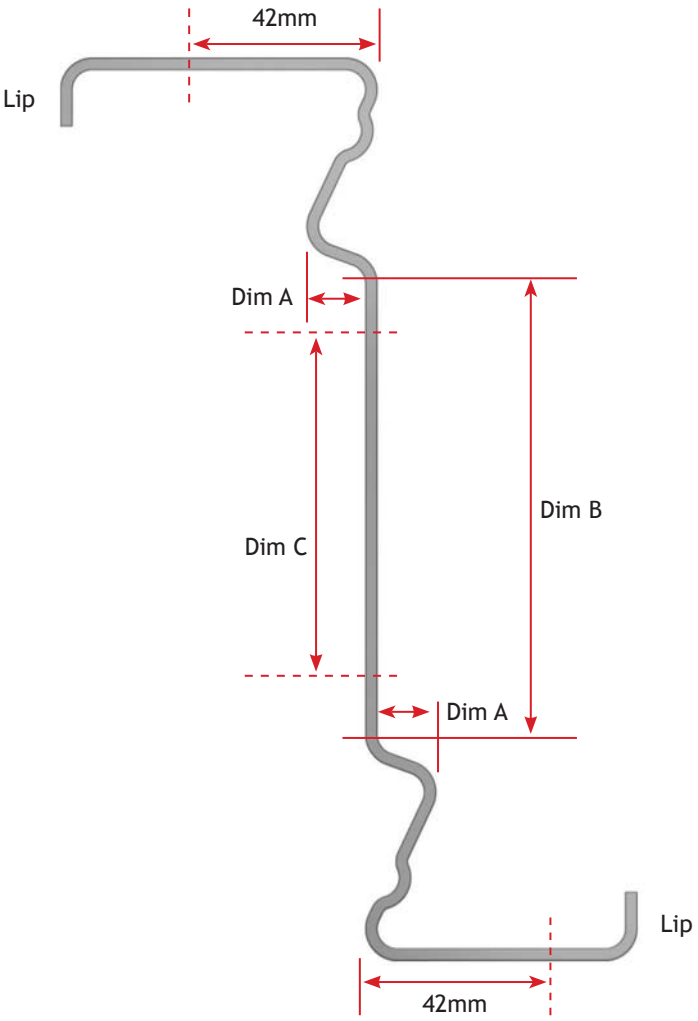
HADLEY UltraZED™2 Sectional properties and dimensions

ALL HOLES Ø14. FOR M12 BOLTS S450+Z275 NA-C to BS EN 10346 Tolerances on material size to BS EN 10143

HADLEY UltraZED™2				Wide flange		Narrow flange		Dim A stiffener depth	Dim B between stiffeners	Dim C hole centres	Second moment of area		Section modulus		Moment capacity	Radius of gyration	
Section Reference	Weight kg/m	Thickness mm	Depth mm	Width mm	Lip mm	Width mm	Lip mm	mm	mm	mm	Major axis cm^4	Minor axis cm^4	Major axis cm^3	Minor axis cm^3	Major axis Mc kNm	Major axis rxx cm	Minor axis ryy cm
145120	2.90	1.20	145	67	15	61	14	10	90	37	126.95	37.69	17.18	5.23	7.73	5.83	3.18
145130	3.14	1.30	145	67	15	61	14	10	90	37	137.16	40.65	18.59	5.64	8.37	5.83	3.17
145140	3.38	1.40	145	67	15	61	14	10	90	37	147.32	43.59	19.93	6.06	8.97	5.82	3.17
145150	3.63	1.50	145	67	15	61	14	10	90	37	157.43	46.50	21.29	6.47	9.58	5.82	3.16
145160	3.87	1.60	145	67	15	61	14	10	90	37	167.48	49.38	22.65	6.87	10.19	5.82	3.16
145180	4.32	1.80	145	67	15	61	14	10	90	37	187.42	55.06	25.34	7.67	11.40	5.82	3.16
145200	4.80	2.00	145	67	15	61	14	10	90	37	207.14	60.64	28.02	8.46	12.61	5.82	3.15
145230	5.49	2.30	145	67	15	61	14	10	90	37	236.32	68.81	31.96	9.62	14.38	5.81	3.14
170120	3.12	1.20	170	67	15	61	14	10	115	62	183.51	37.70	21.21	5.22	9.54	6.74	3.06
170130	3.38	1.30	170	67	15	61	14	10	115	62	198.33	40.66	22.92	5.64	10.31	6.74	3.05
170140	3.64	1.40	170	67	15	61	14	10	115	62	213.08	43.60	24.62	6.05	11.08	6.74	3.05
170150	3.90	1.50	170	67	15	61	14	10	115	62	227.76	46.50	26.31	6.46	11.84	6.74	3.04
170160	4.16	1.60	170	67	15	61	14	10	115	62	242.36	49.39	27.99	6.89	12.60	6.74	3.04
170180	4.63	1.80	170	67	15	61	14	10	115	62	271.35	55.07	31.34	7.66	14.10	6.74	3.03
170200	5.15	2.00	170	67	15	61	14	10	115	62	300.07	60.65	34.67	8.45	15.60	6.73	3.03
170230	5.88	2.30	170	67	15	61	14	10	115	62	342.60	68.82	39.58	9.61	17.81	6.73	3.02
200120	3.42	1.20	200	70	15	60	15	13	100	50	257.32	32.74	25.06	4.84	11.28	7.70	2.77
200130	3.65	1.30	200	70	15	60	15	13	100	50	279.79	36.23	27.25	5.36	12.26	7.70	2.77
200140	3.93	1.40	200	70	15	60	15	13	100	50	300.58	38.81	29.27	5.74	13.17	7.70	2.77
200150	4.21	1.50	200	70	15	60	15	13	100	50	321.27	41.35	31.29	6.12	14.08	7.69	2.76
200160	4.49	1.60	200	70	15	60	15	13	100	50	341.85	43.87	33.29	6.50	14.98	7.69	2.76
200180	5.00	1.80	200	70	15	60	15	13	100	50	382.70	48.81	37.26	7.24	16.77	7.69	2.75
200200	5.56	2.00	200	70	15	60	15	13	100	50	423.15	53.64	41.20	7.97	18.54	7.69	2.74
200230	6.35	2.30	200	70	15	60	15	13	100	50	483.05	60.67	47.02	9.04	21.16	7.68	2.72
200250	6.91	2.50	200	70	15	60	15	13	100	50	522.47	65.21	50.86	9.73	22.89	7.68	2.71
200300	8.24	3.00	200	70	15	60	15	13	100	50	619.27	76.10	60.26	11.40	27.12	7.68	2.69
225130	3.92	1.30	225	70	15	60	15	13	125	75	370.67	36.24	32.14	5.35	14.46	8.57	2.68
225140	4.22	1.40	225	70	15	60	15	13	125	75	398.28	38.82	34.53	5.73	15.54	8.57	2.67
225150	4.52	1.50	225	70	15	60	15	13	125	75	425.76	41.36	36.91	6.11	16.61	8.57	2.67
225160	4.82	1.60	225	70	15	60	15	13	125	75	453.11	43.88	39.28	6.49	17.68	8.56	2.67
225180	5.37	1.80	225	70	15	60	15	13	125	75	507.43	48.82	43.99	7.23	19.80	8.56	2.66
225200	5.96	2.00	225	70	15	60	15	13	125	75	561.25	53.66	48.65	7.96	21.89	8.56	2.65
225230	6.79	2.30	225	70	15	60	15	13	125	75	641.02	60.69	55.56	9.02	25.00	8.55	2.63
225250	7.38	2.50	225	70	15	60	15	13	125	75	693.57	65.24	60.11	9.71	27.05	8.55	2.62
225300	8.83	3.00	225	70	15	60	15	13	125	75	822.77	76.13	71.29	11.38	32.08	8.55	2.60
255130	4.21	1.30	255	70	15	60	15	13	155	105	500.84	36.25	38.38	5.34	16.28	9.60	2.58
255140	4.54	1.40	255	70	15	60	15	13	155	105	538.23	38.83	41.25	5.72	17.89	9.60	2.58
255150	4.85	1.50	255	70	15	60	15	13	155	105	575.46	41.38	44.10	6.10	19.53	9.59	2.57
255160	5.17	1.60	255	70	15	60	15	13	155	105	612.53	43.89	46.94	6.48	21.12	9.59	2.57
255180	5.82	1.80	255	70	15	60	15	13	155	105	689.19	48.84	52.58	7.22	23.66	9.59	2.56
255200	6.42	2.00	255	70	15	60	15	13	155	105	759.21	53.67	58.17	7.95	26.18	9.59	2.55
255230	7.35	2.30	255	70	15	60	15	13	155	105	867.55	60.71	66.46	9.01	29.91	9.59	2.53
255250	7.98	2.50	255	70	15	60	15	13	155	105	938.99	65.26	71.93	9.70	32.37	9.58	2.52
255300	9.53	3.00	255	70	15	60	15	13	155	105	1114.83	76.16	85.39	11.36	38.43	9.57	2.50
285140	4.81	1.40	285	70	15	60	15	13	185	135	704.73	38.84	48.39	5.72	19.49	10.61	2.49
285150	5.16	1.50	285	70	15	60	15	13	185	135	753.58	41.39	51.75	6.10	21.31	10.60	2.48
285160	5.50	1.60	285	70	15	60	15	13	185	135	802.23	43.91	55.06	6.47	23.16	10.60	2.48
285180	6.19	1.80	285	70	15	60	15	13	185	135	898.95	48.86	61.72	7.21	26.95	10.60	2.47
285200	6.84	2.00	285	70	15	60	15	13	185	135	994.89	53.69	68.31	7.94	30.74	10.60	2.46
285230	7.87	2.30	285	70	15	60	15	13	185	135	1137.34	60.73	98.08	9.05	35.14	10.59	2.45
285250	8.55	2.50	285	70	15	60	15	13	185	135	1231.33	65.28	84.53	9.68	38.04	10.59	2.44
285300	10.19	3.00	285	70	15	60	15	13	185	135	1462.94	76.18	100.41	11.34	45.18	10.59	2.41
305150	5.46	1.50	305	70	15	60	15	13	205	155	889.12	41.40	57.10	6.09	22.34	11.27	2.43
305160	5.83	1.60	305	70	15	60	15	13	205	155	946.60	43.91	60.79	6.47	24.32	11.27	2.43
305180	6.55	1.80	305	70	15	60	15	13	205	155	1060.90	48.86	68.13	7.20	28.35	11.27	2.42
305200	7.28	2.00	305	70	15	60	15	13	205	155	1174.31	53.70	75.41	7.93	32.51	11.26	2.41
305230	8.30	2.30	305	70	15	60	15	13	205	155	1342.76	60.74	86.22	8.99	38.80	11.25	2.39
305250	9.02	2.50	305	70	15	60	15	13	205	155	1453.97	65.29	93.35	9.68	42.01	11.25	2.38
305300	10.83	3.00	305	70	15	60	15	13	205	155	1728.15	76.19	110.94	11.33	49.92	11.25	2.36



HADLEY UltraZED™2
145 and 170 Series



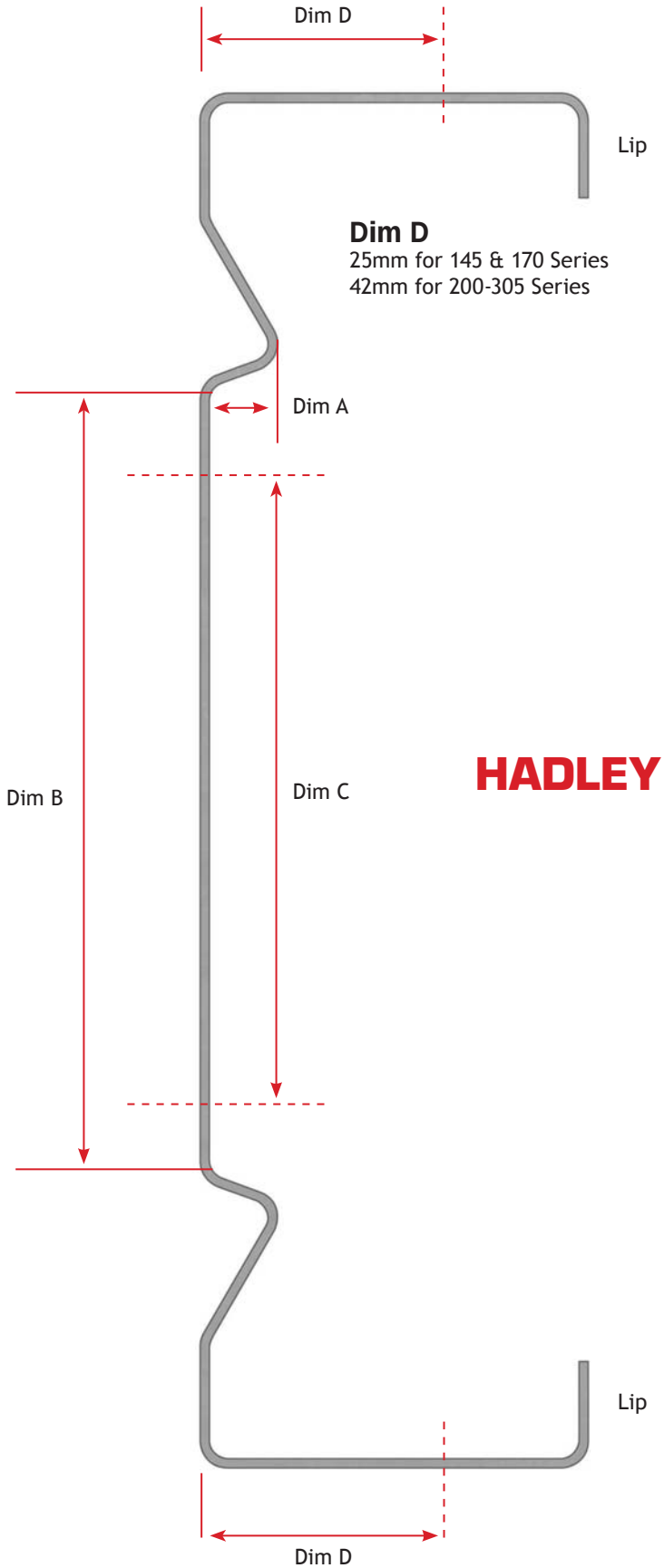
HADLEY UltraZED™2
200 to 305 Series

ALL HOLES Ø14. FOR GRADE 8.8 M12 BOLTS. Steel Grade S450+Z275 NA-C.
Tolerances on material size to BS EN 10143. All dimensions are nominal and for general guidance only

HADLEY UltraBEAM™2 Sectional properties and dimensions

ALL HOLES Ø14. FOR GRADE 8.8 M12 BOLTS. Steel Grade S450+Z275 NA-C Tolerances on material size to BS EN 10143

HADLEY UltraBEAM™2				Flange		Dim A Web stiffener depth	Dim B Between stiffeners	Dim C hole centres	Second moment of area		Section modulus		Moment capacity	Radius of gyration	
Section Reference	Weight mtr	Thickness mm	Depth mm	Width mm	Lip mm	mm	mm	mm	Major axis cm^4	Minor axis cm^4	Major axis cm^3	Minor axis cm^3	Major axis Mcx kNm	Major axis rxx cm	Minor axis ryy cm
1456312	2.70	1.20	145	63	16	9	75	37	121.54	18.89	16.76	4.34	5.15	5.78	2.28
1456313	2.93	1.30	145	63	16	9	75	37	131.35	20.37	18.12	4.68	5.71	5.78	2.27
1456314	3.15	1.40	145	63	16	9	75	37	141.10	21.84	19.46	5.02	6.30	5.78	2.27
1456315	3.38	1.50	145	63	16	9	75	37	150.81	23.28	20.80	5.36	6.91	5.78	2.27
1456316	3.61	1.60	145	63	16	9	75	37	160.47	24.72	22.13	5.69	7.53	5.78	2.27
1456318	4.06	1.80	145	63	16	9	75	37	179.65	27.55	24.78	6.34	8.86	5.78	2.26
1456320	4.51	2.00	145	63	16	9	75	37	198.64	30.32	27.40	6.99	10.25	5.77	2.26
1456323	5.14	2.30	145	63	16	9	75	37	226.75	34.37	31.28	7.93	12.32	5.77	2.25
1706312	2.92	1.20	170	63	16	9	100	62	176.09	19.88	20.72	4.42	6.21	6.69	2.25
1706313	3.18	1.30	170	63	16	9	100	62	190.34	21.44	22.39	4.77	6.88	6.68	2.24
1706314	3.42	1.40	170	63	16	9	100	62	204.53	22.98	24.06	5.12	7.58	6.68	2.24
1706315	3.67	1.50	170	63	16	9	100	62	218.66	24.50	25.72	5.46	8.31	6.69	2.24
1706316	3.92	1.60	170	63	16	9	100	62	232.72	26.02	27.38	5.80	9.06	6.69	2.24
1706318	4.41	1.80	170	63	16	9	100	62	260.66	28.99	30.67	6.46	10.65	6.69	2.23
1706320	4.89	2.00	170	63	16	9	100	62	288.34	31.91	33.92	7.12	12.34	6.68	2.22
1706323	5.59	2.30	170	63	16	9	100	62	329.39	36.18	38.75	8.08	14.96	6.68	2.21
2006312	3.42	1.20	200	63	18	12.5	100	50	258.23	21.29	25.82	4.66	7.63	7.70	2.21
2006313	3.65	1.30	200	63	18	12.5	100	50	279.19	22.96	27.92	5.03	8.65	7.69	2.21
2006314	3.93	1.40	200	63	18	12.5	100	50	300.08	24.61	30.01	5.39	9.66	7.69	2.20
2006315	4.21	1.50	200	63	18	12.5	100	50	320.87	26.24	32.09	5.75	10.69	7.69	2.20
2006316	4.49	1.60	200	63	18	12.5	100	50	341.59	27.86	34.16	6.11	11.61	7.69	2.20
2006318	5.00	1.80	200	63	18	12.5	100	50	382.76	31.06	38.28	6.81	13.53	7.69	2.19
2006320	5.56	2.00	200	63	18	12.5	100	50	423.61	34.18	42.36	7.50	15.55	7.69	2.18
2006323	6.35	2.30	200	63	18	12.5	100	50	484.25	38.76	48.43	8.52	18.77	7.69	2.17
2006325	6.91	2.50	200	63	18	12.5	100	50	524.27	41.74	52.43	9.18	21.03	7.68	2.17
2006330	8.24	3.00	200	63	18	12.5	100	50	622.87	48.92	62.29	10.77	26.70	7.68	2.15
2256313	3.92	1.30	225	63	18	12.5	125	75	369.73	23.81	32.87	5.10	9.83	8.56	2.17
2256314	4.22	1.40	225	63	18	12.5	125	75	397.44	25.52	35.33	5.46	10.96	8.56	2.17
2256315	4.52	1.50	225	63	18	12.5	125	75	425.05	27.22	37.78	5.83	12.15	8.56	2.17
2256316	4.82	1.60	225	63	18	12.5	125	75	452.55	28.90	40.23	6.19	13.34	8.56	2.16
2256318	5.37	1.80	225	63	18	12.5	125	75	507.25	32.21	45.09	6.90	15.54	8.56	2.16
2256320	5.96	2.00	225	63	18	12.5	125	75	561.54	35.45	49.91	7.60	17.85	8.56	2.15
2256323	6.79	2.30	225	63	18	12.5	125	75	642.20	40.20	57.08	8.63	21.55	8.56	2.14
2256325	7.38	2.50	225	63	18	12.5	125	75	695.47	43.29	61.82	9.30	24.15	8.55	2.13
2256330	8.83	3.00	225	63	18	12.5	125	75	826.86	50.74	73.50	10.92	30.91	8.55	2.13
2556313	4.21	1.30	255	63	18	12.5	155	105	499.40	24.69	39.17	5.16	11.19	9.59	2.13
2556314	4.54	1.40	255	63	18	12.5	155	105	536.90	26.47	42.11	5.54	12.48	9.59	2.13
2556315	4.85	1.50	255	63	18	12.5	155	105	574.28	28.23	45.04	5.91	13.82	9.58	2.12
2556316	5.17	1.60	255	63	18	12.5	155	105	611.52	29.97	47.96	6.27	15.22	9.58	2.12
2556318	5.82	1.80	255	63	18	12.5	155	105	685.62	33.41	53.77	6.99	17.92	9.59	2.12
2556320	6.42	2.00	255	63	18	12.5	155	105	759.21	36.78	59.55	7.70	20.59	9.58	2.11
2556323	7.35	2.30	255	63	18	12.5	155	105	868.63	41.70	68.13	8.74	24.85	9.58	2.10
2556325	7.98	2.50	255	63	18	12.5	155	105	940.93	44.90	73.80	9.42	27.85	9.58	2.09
2556330	9.53	3.00	255	63	18	12.5	155	105	1119.49	52.63	87.80	11.06	35.83	9.57	2.08
2856314	4.81	1.40	285	63	18	12.5	185	135	702.82	27.30	49.32	5.59	13.92	10.59	2.09
2856315	5.16	1.50	285	63	18	12.5	185	135	751.83	29.11	52.76	5.97	15.41	10.59	2.08
2856316	5.50	1.60	285	63	18	12.5	185	135	800.68	30.91	56.19	6.34	16.97	10.59	2.08
2856318	6.19	1.80	285	63	18	12.5	185	135	897.90	34.45	63.01	7.07	20.23	10.59	2.08
2856320	6.84	2.00	285	63	18	12.5	185	135	994.50	37.92	69.79	7.79	23.24	10.59	2.07
2856323	7.87	2.30	285	63	18	12.5	185	135	1138.23	43.00	79.88	8.84	29.41	10.59	2.06
2856325	8.55	2.50	285	63	18	12.5	185	135	1233.26	46.30	86.54	9.52	31.45	10.59	2.05
2856330	10.19	3.00	285	63	18	12.5	185	135	1468.13	54.27	103.03	11.18	40.52	10.58	2.03
3056314	5.10	1.40	305	63	18	12.5	205	155	829.03	27.79	54.36	5.63	14.82	11.26	2.06
3056315	5.46	1.50	305	63	18	12.5	205	155	886.93	29.63	58.16	6.00	16.41	11.25	2.06
3056316	5.83	1.60	305	63	18	12.5	205	155	944.62	31.46	61.94	6.38	18.07	11.25	2.05
3056318	6.55	1.80	305	63	18	12.5	205	155	1059.47	35.07	69.47	7.11	21.57	11.26	2.05
3056320	7.28	2.00	305	63	18	12.5	205	155	1173.60	38.60	76.96	7.83	24.93	11.25	2.04
3056323	8.30	2.30	305	63	18	12.5	205	155	1343.48	43.77	88.10	8.89	31.16	11.25	2.03
3056325	9.02	2.50	305	63	18	12.5	205	155	1455.84	47.14	95.47	9.58	33.75	11.25	2.02
3056330	10.83	3.00	305	63	18	12.5	205	155	1733.68	55.25	113.68	11.25	40.16	11.24	2.01



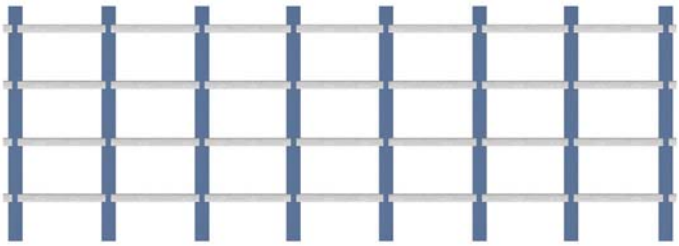
HADLEY UltraBEAM™2

ALL HOLES Ø14. FOR GRADE 8.8 M12 BOLTS. Steel Grade S450+Z275 NA-C.
Tolerances on material size to BS EN 10143. All dimensions are nominal and for general guidance only

HADLEY UltraZED™2 Roof Purlin Systems

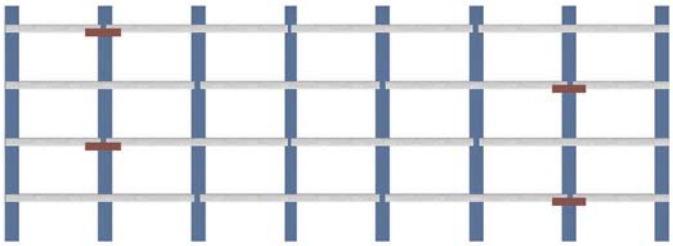
HADLEY UltraZED™2 purlins are available in four systems, the choice of system being dictated by span, load, sheeting line limitations, the number of bays and the end user's preferred site practice.

HADLEY Design Suite PRO Design Software incorporates an 'optimum system' feature which may be used to suggest the most cost effective system for any given design criteria.



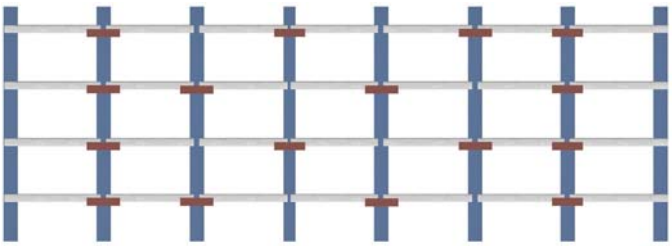
Non-continuous (butted) system

For short spans (typically cost effective for spans less than 5 metres) or for roofs that prevent any continuity of purlin lines this system is exceptionally suitable.
The system may be utilised between the rafters and allows a variety of section depths to be included.



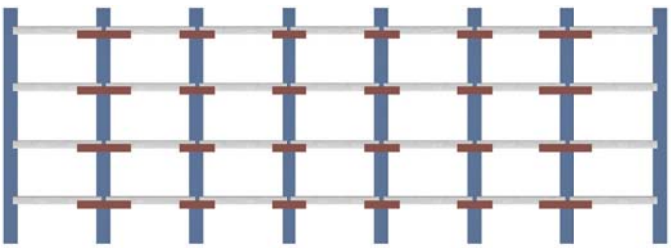
Double spanning butt-jointed system

Purlins comprise of double spanning lengths up to a maximum length of 16 metres (8 metre span). Sleeve connections at alternative joints on the penultimate rafter are necessary to stagger the joint positions thereafter.
The virtual elimination of sleeves, fewer bolts and component parts allied to improved deflection performance can offer considerable cost savings over other purlin systems.



Sleeved system

Purlins may be single spanning or double spanning (where double spanning is preferred our double spanning butt-jointed system virtually eliminates the use of sleeves). Sleeves are required at every joint on the penultimate rafter and staggered to give a sleeve connection at every other joint thereafter.



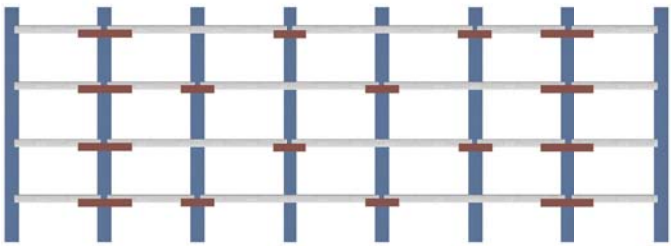
Heavy End Bay sleeved systems - single and double spanning

HEB - Single span system

By incorporating sleeves at every joint the roof purlins are made continuous, resulting in a substantial increase in both load bearing and deflection performance. Because the end bays lack the continuity of the inner bays they need to have longer connecting sleeves and be of heavier gauge material - it is from this that the system derives its name. A minimum of five bays is necessary to realise continuity.

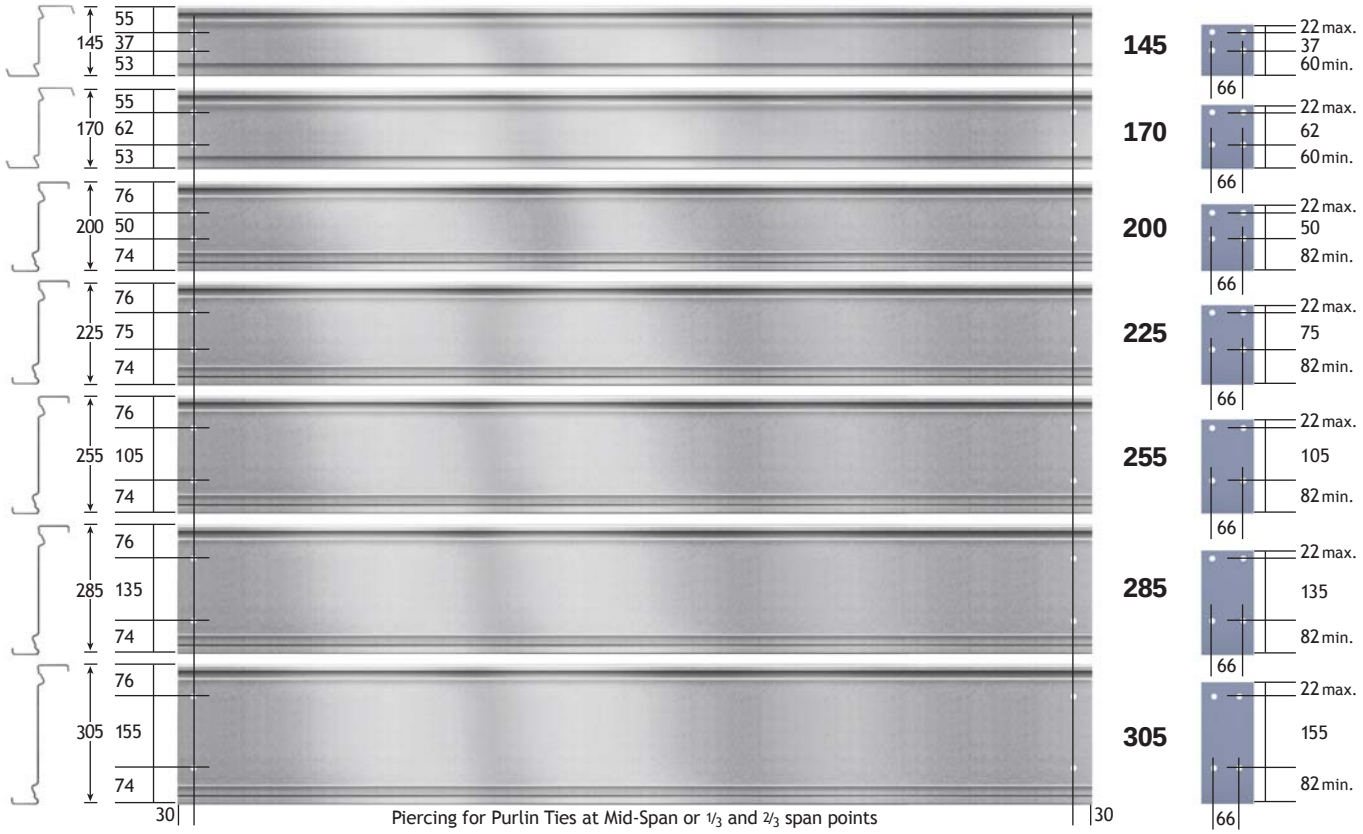
HEB - Double span system

To maximise carrying capacity whilst minimising component parts the double spanning heavy end bay system also incorporates sleeves at every joint. However the double span configuration effectively halves the number of sleeves required compared to the single span system.

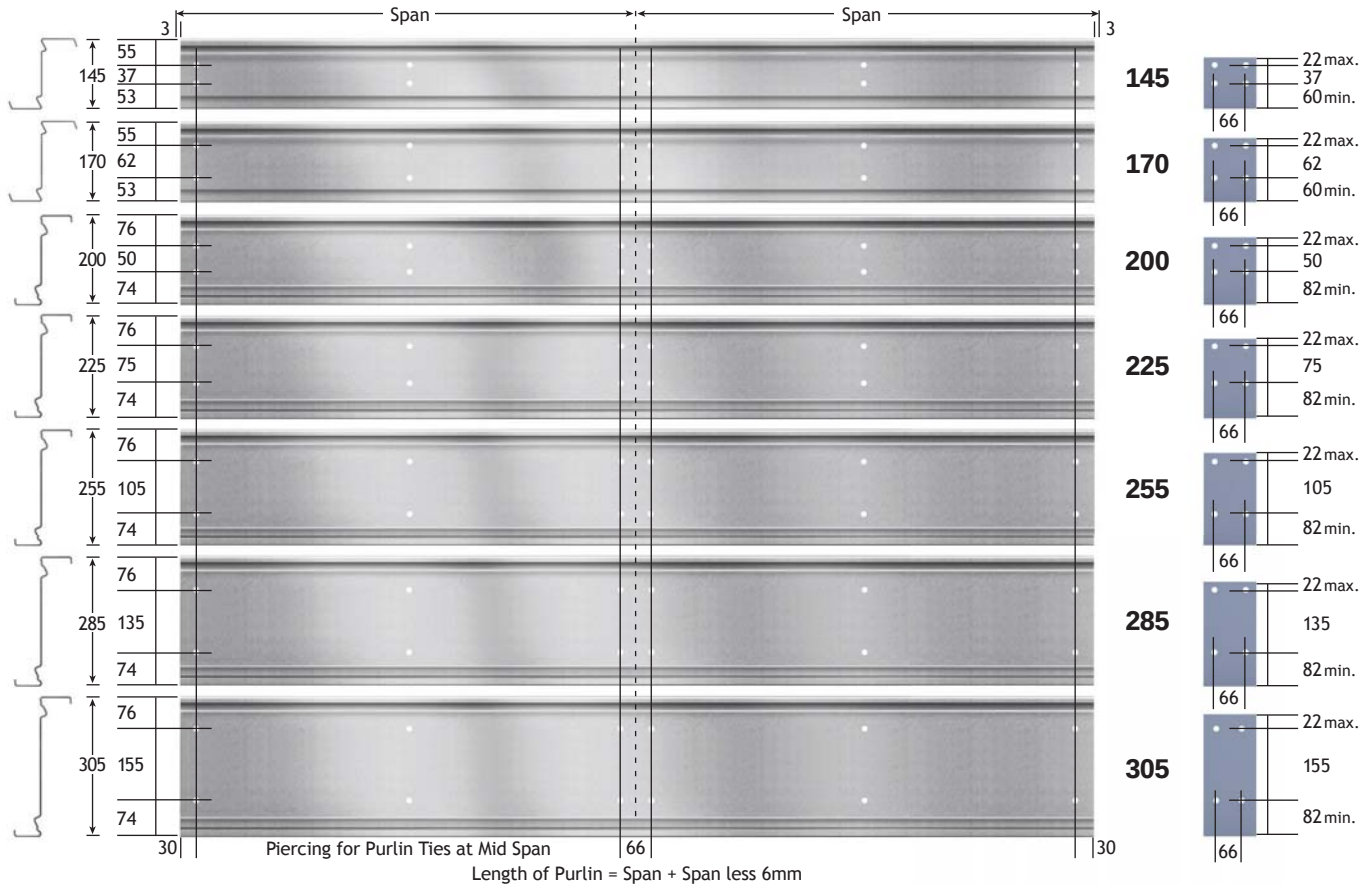


Indicates typical sleeve location

HADLEY UltraZED™2 non-continuous single span piercing configurations All holes punched Ø14 for M12 bolts.
Holes are punched in pairs on standard gauge lines as shown.



HADLEY UltraZED™2 double span butt-jointed piercing configurations. All holes punched Ø14 for M12 bolts.
Holes are punched in pairs on standard gauge lines as shown.

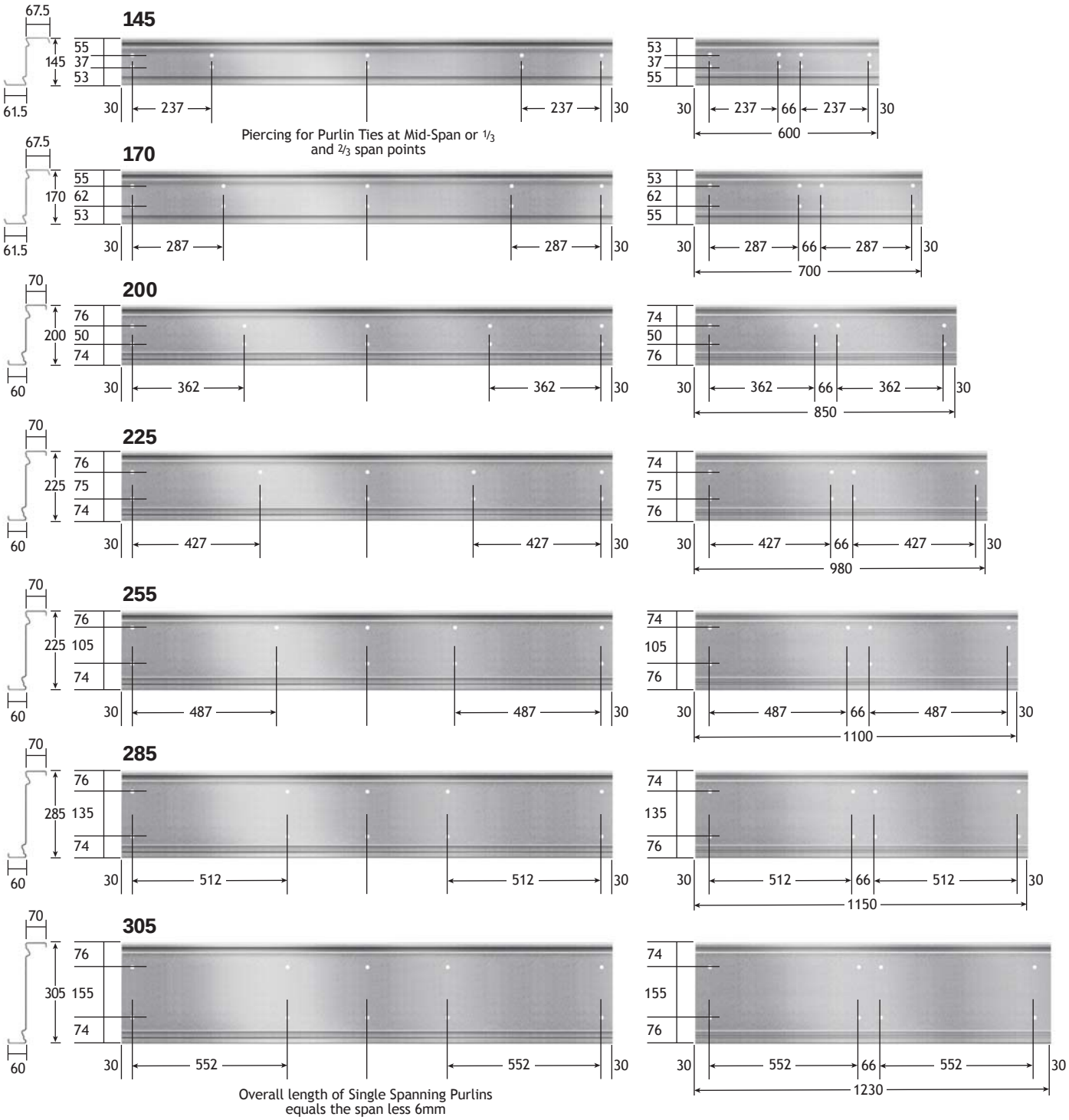


HADLEY UltraZED™2

Standard Sleeve Piercing Configurations

HADLEY UltraZED™2 sleeve and section is the same profile. The sleeve is an inverted short length of purlin section that connects the purlin and sleeve at the rafter/column cleat. Considerable experimentation has determined the sleeve rotational stiffness. Sleeves are not designed to be simple joining plates and they must not be used to join purlin section at any position other than the rafter/column cleat.

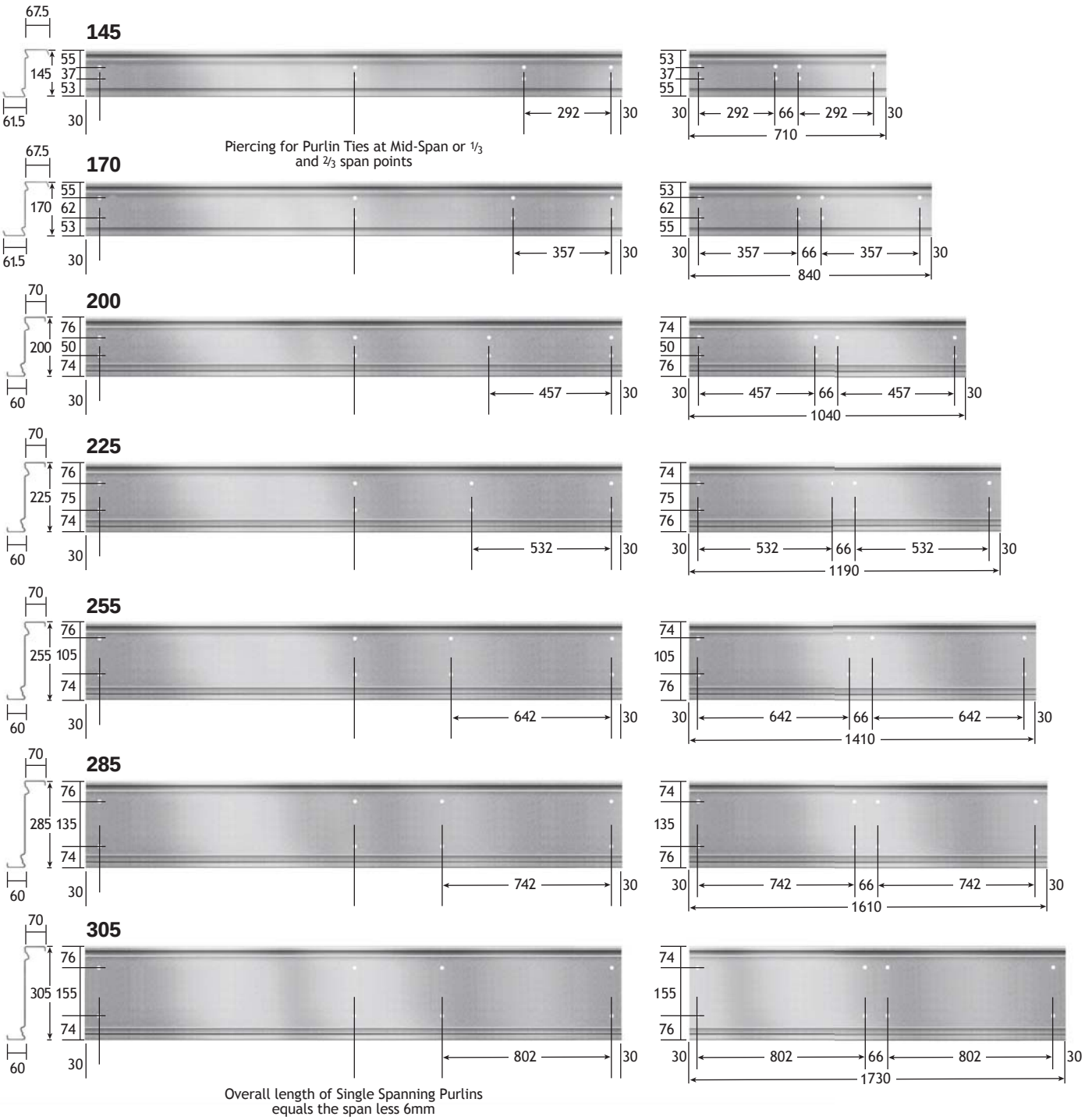
All holes punched Ø14 for M12 bolts. Holes are punched in pairs on standard gauge lines as shown.



Heavy End Bay Sleeve Piercing Configurations

HADLEY UltraZED™2 Heavy End Bay sleeve and purlin section is the same profile. The HEB sleeve is longer than the corresponding standard sleeve and is manufactured from the same thickness material as the end bay purlin. Standard sleeves are required at every joint throughout the remainder of the roof.

All holes punched Ø14 for M12 bolts. Holes are punched in pairs on standard gauge lines as shown.



Roof purlin construction guidelines

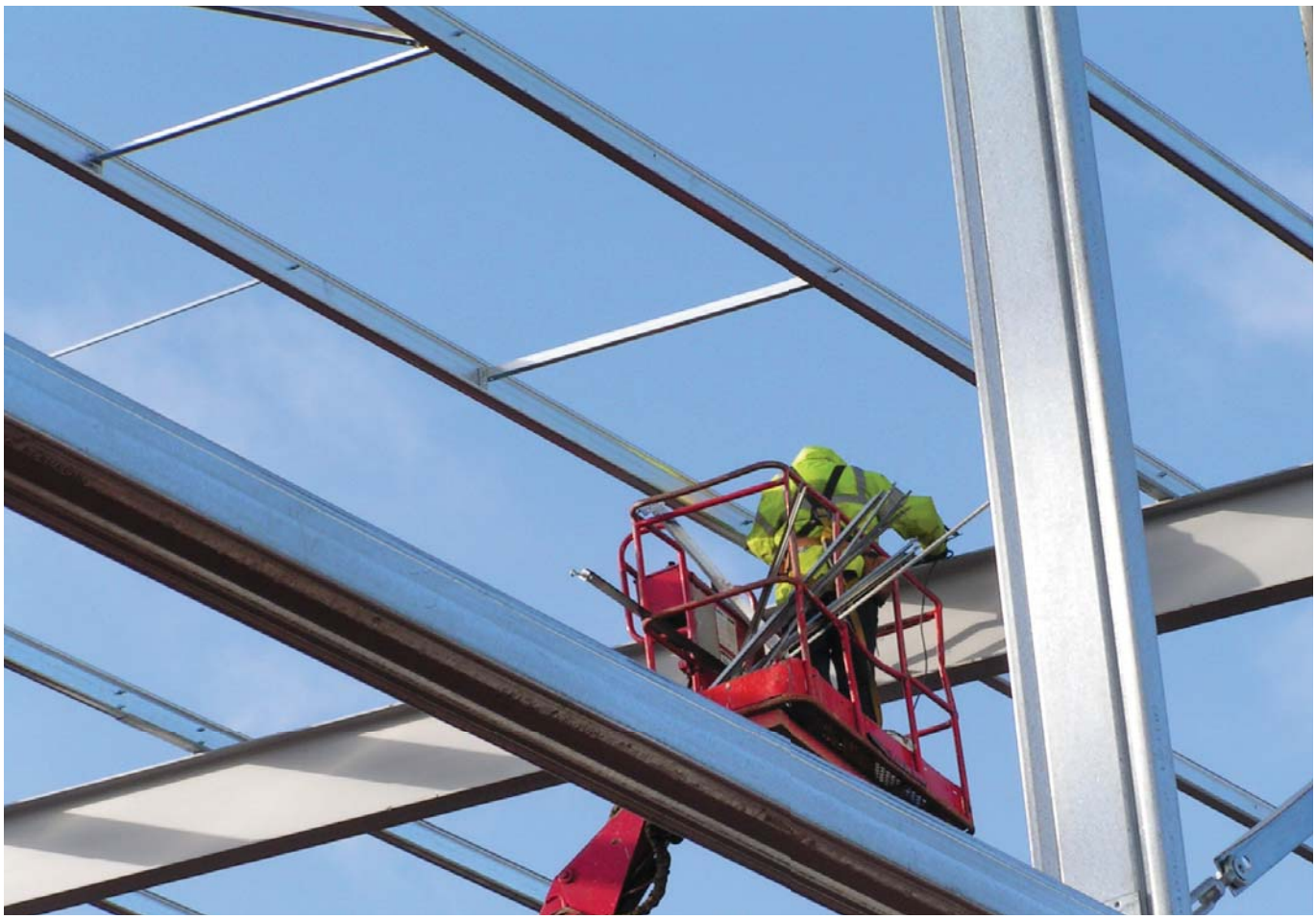
Roof purlin behaviour – especially during the construction phase is dependent upon several inter-relating factors. Purlin stiffness, section geometry, span and length of roof slope all contribute to differing strut and bracing requirements, as does the cladding type and fixing method employed.

The guidelines below are the result of best practice methodology resulting from many years' experience and apply to screw fixed metal/composite cladding systems only.

These guidelines may be applied to Fibre Cement roof sheets providing the recommendations for the inclusion of Purlin Ties shown on page 18 and 19 are followed.

Bracing requirements for roof purlins

		Eaves/valley condition				
Roof slope	Span mtrs	With eaves member	No eaves member	Purlin Ties	Length between bracing	Apex tie
0° - 3°	<= 4.5 >4.5 - <=6.1 >6.1 - <=7.6 >7.6 - <=9.0 >9.0	1 Eaves Brace 1 Eaves Brace 2 Eaves Braces 2 Eaves Braces 3 Eaves Braces	1 SRS+DPB 1 SRS+DPB 2 SRS+DPB 2 SRS+DPB 3 SRS+DPB	0 - 1 1 1 - 2 2 2 - 3 SRS	SRS/DPB at 20 mtrs SRS/DPB at 20 mtrs SRS/DPB at 20 mtrs SRS/DPB at 15 mtrs SRS/DPB at 15 mtrs	1 1 1 - 2 2 3
>3° - 20°	<= 6.1 >6.1 - <=7.6 >7.6 - <=9.0 >9.0	1 Eaves Brace 2 Eaves Braces 2 Eaves Braces 3 Eaves Braces	1 SRS+DPB 2 SRS+DPB 2 SRS+DPB 3 SRS+DPB	0 - 1 0 - 1 1 - 2 2 SRS	SRS/DPB at 20 mtrs SRS/DPB at 15 mtrs SRS/DPB at 15 mtrs SRS/DPB at 15 mtrs	1 1 1 - 2 2 Apex struts
>20° - 30°	<= 6.1 >6.1 - <=7.6 >7.6 - <=9.0 >9.0	1 Eaves Brace 2 Eaves Braces 2 Eaves Braces 3 Eaves Braces	1 SRS+DPB 2 SRS+DPB 2 SRS+DPB 3 SRS+DPB	1 1 2 2 SRS	SRS/DPB at 15 mtrs SRS/DPB at 15 mtrs SRS/DPB at 15 mtrs SRS/DPB at 15 mtrs	1 1 2 2 Apex struts



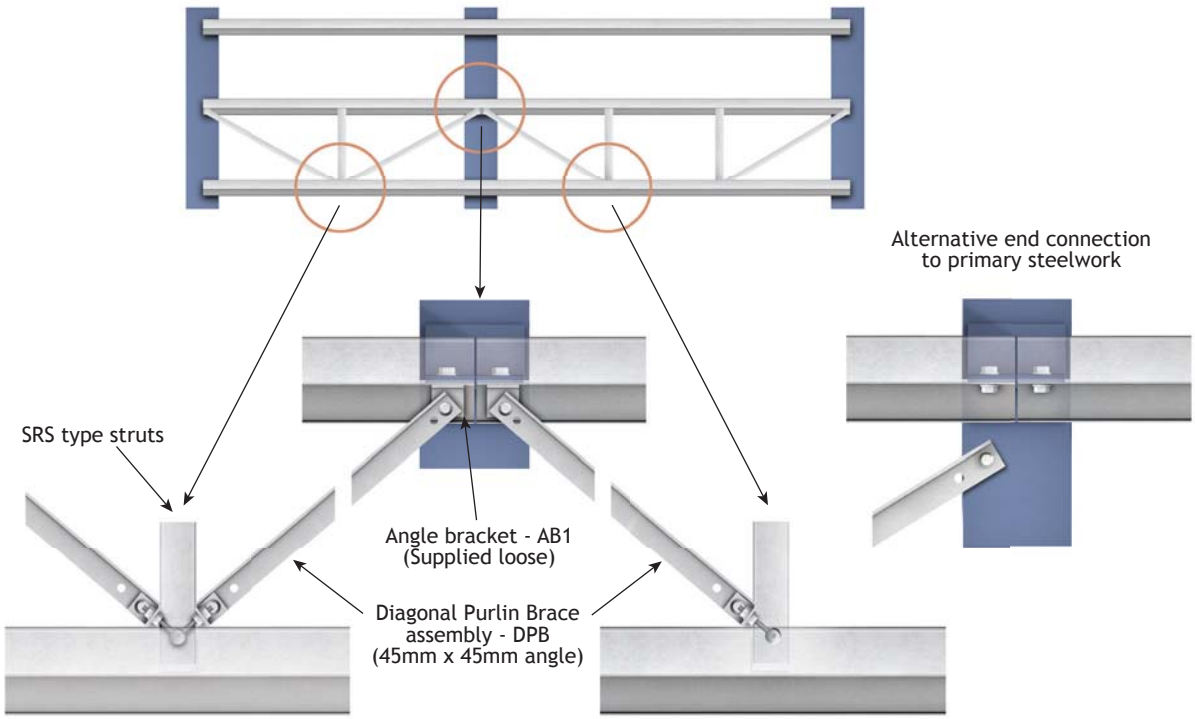
Diagonal Purlin Brace - DPB

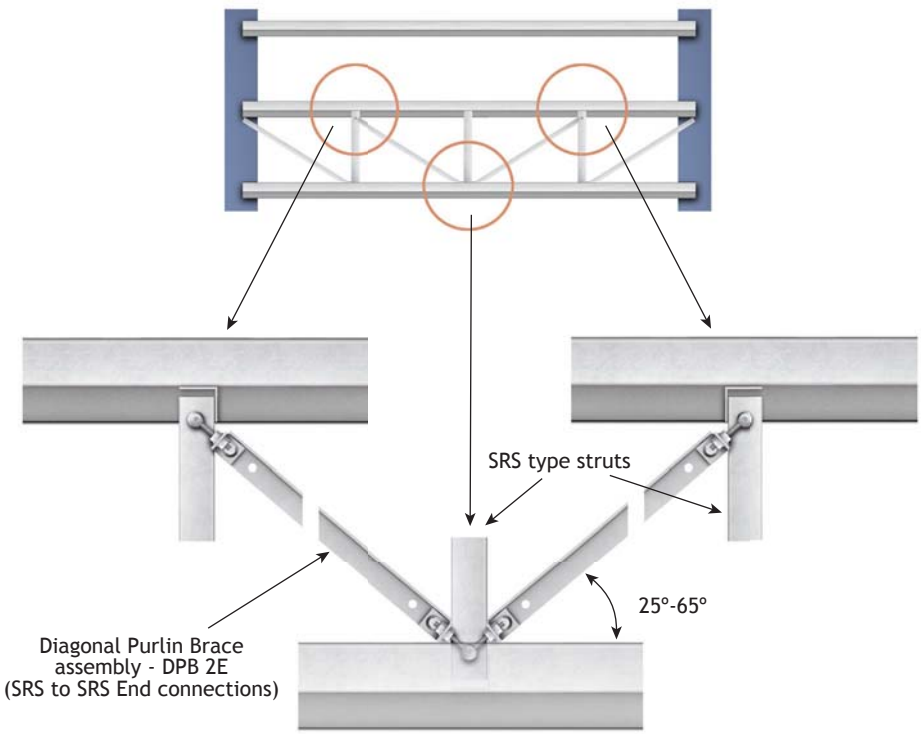
Diagonal Purlin Braces are utilised in conjunction with SRS struts to afford resistance to downslope roof purlin loads. Typically they are positioned at the bottom of slope where no suitable eaves member exists. On longer roof slopes they are incorporated at additional locations as indicated in the tabulated guidelines on page 14.

Wire type diagonal bracing should not be utilised on roof slopes below 15° as they do not provide sufficient restraint against the up-slope forces often experienced during the construction phase.

When a single DPB connects to only one side of a SRS strut the strut should be orientated so that the resulting forces do not pull the strut and its end cleat apart.

All SRS type struts have holes punched at both ends for diagonal tie assemblies.





Purlins supporting gutters

Where roof design defines that roof purlins support a gutter, either by use of a gutter strap or by the inherent design of the gutter profile, the purlin must be restrained against twist and distortion by incorporating Eaves Braces or SRS type struts depending upon the roof construction details.

Restraints should be provided so that the maximum unrestrained length of purlin does not exceed 2.5 metres.

Where gutters are designed to locate between two adjacent purlins (Fig 1) both purlins should be suitably restrained.

If in doubt, we recommend consultation with our Technical Department.

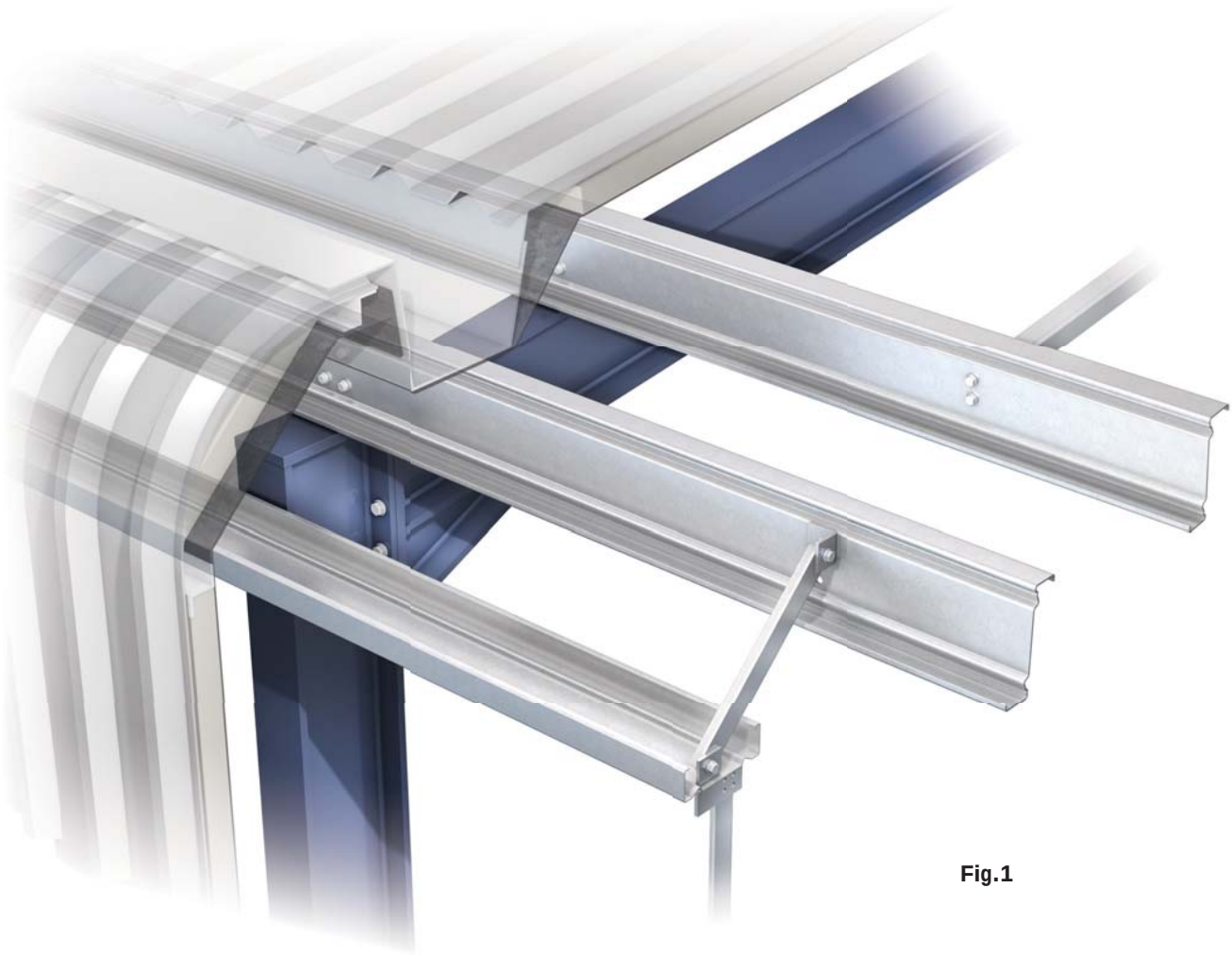


Fig.1

Eaves Beams supporting gutters

Where cold roll-formed Eaves Beams are required to act as supports for gutters careful consideration should be given to the section design and construction methodology utilised. Sections should be suitable to limit deflection under full design loading taking into account the performance requirements of the gutter and all other actions on the structure. Associated bracing should be considered and included to prevent excessive movement of Eaves Beams and purlins both during and upon completion of construction.

If construction details prevent the use of an Eaves Brace assembly between the Eaves Beam and adjacent purlin our Under Purlin Eaves Brace assembly (Fig .2) shown on page 31 should be considered. This may enable the Eaves Brace to pass under the gutter and connect to the adjacent purlin web via an extendable angle cleat.

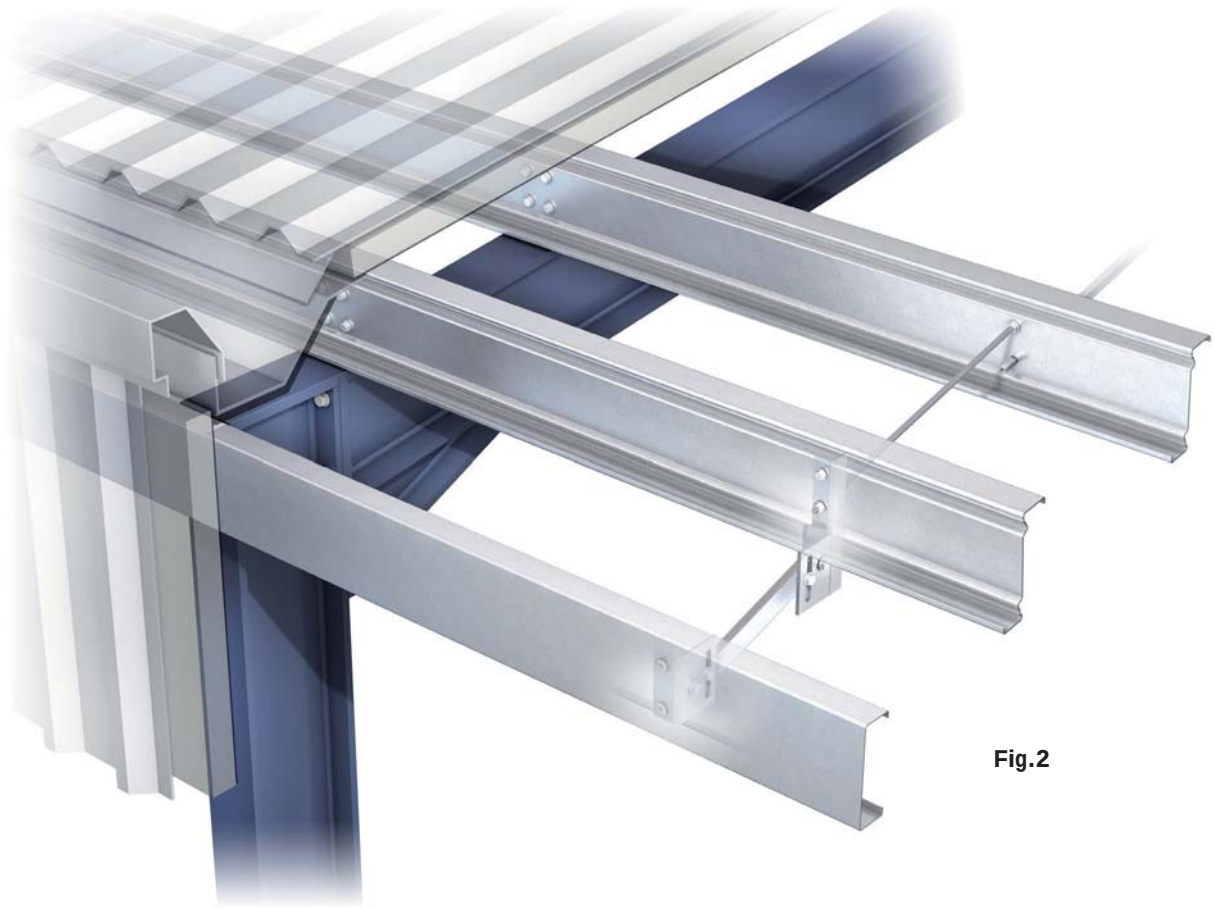


Fig.2

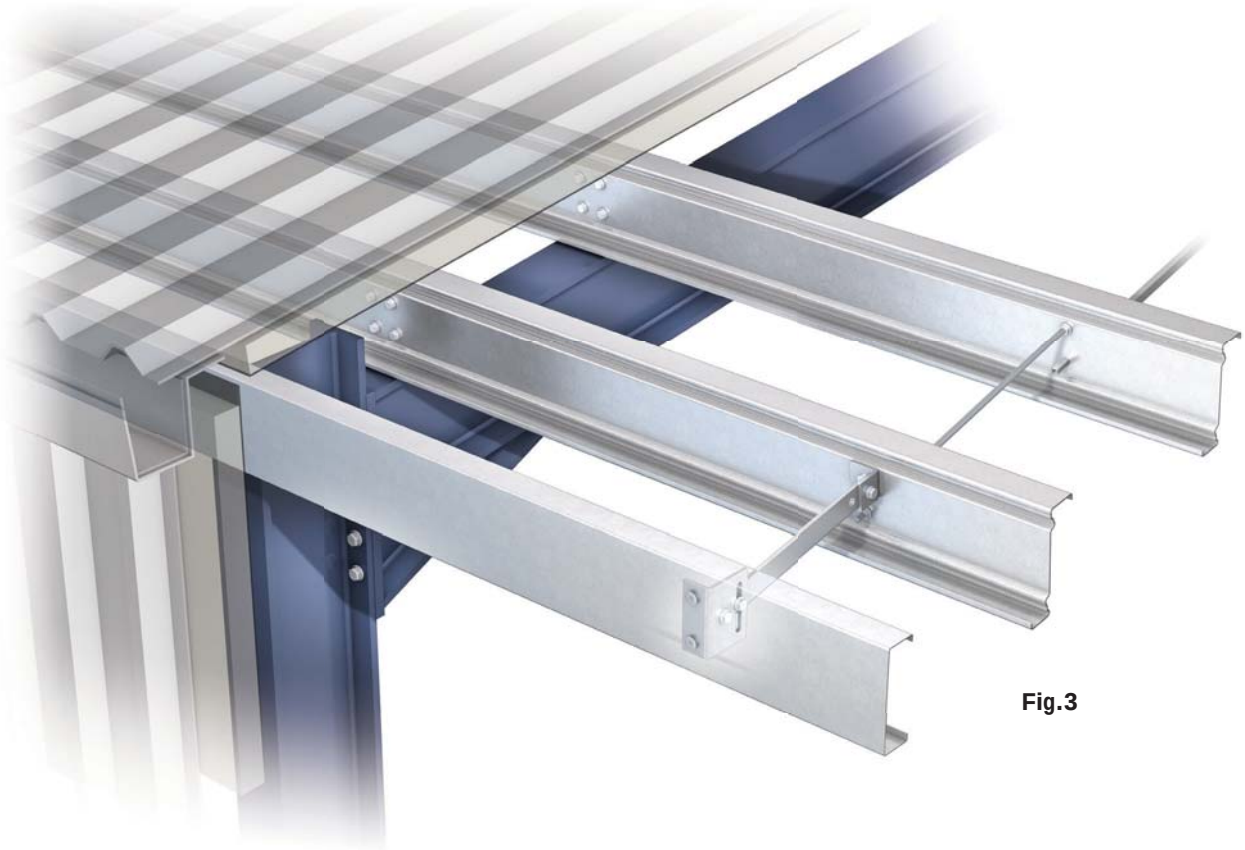


Fig.3

Purlin Ties (anti-sag bars)

Purlin Ties are designed to fulfil two purposes:

1) Provide lateral restraint to purlins under wind uplift actions.
2) To help provide a stable working platform and maintain dimensionally accurate purlin spacing.

Maintaining accurate purlin spacing, straightness and minimising purlin twist is important. Dimensional tolerances applicable to the installation of cold roll-formed purlins are covered in the SCI Publication P346 'Best Practice for the Specification and Installation of Metal Cladding and Secondary Steelwork'

Inclusion of Purlin Ties and associated bracing components will help ensure best practice is accomplished. Alternatively or in addition to the aforementioned, temporary bracing may be incorporated to ensure suitable dimensional tolerances are achieved.

The table opposite is intended as a general guide only and assumes that good sheeting practice is followed. This includes positioning and fixing sheets progressively (laying large areas of unfixed sheets with the associated dynamic actions is known to cause problems with purlins 'creeping and rolling' during the installation of fixings). In all cases, ensuring that purlins are kept upright and straight before installing fixings is of paramount importance.

In instances where Purlin Ties are not included we recommend that purlins are punched to accept their inclusion should the sheeting contractor later determine that they are required.

In all cases the following criteria apply:

1) Eaves Brace or SRS strut/DPB should always be included at the roof eaves or valley positions.
2) Apex Ties should always be included between purlins at the roof apex.




Full scale wind uplift tests at Oxford Brookes University in conjunciton with the Steel Construction Institute

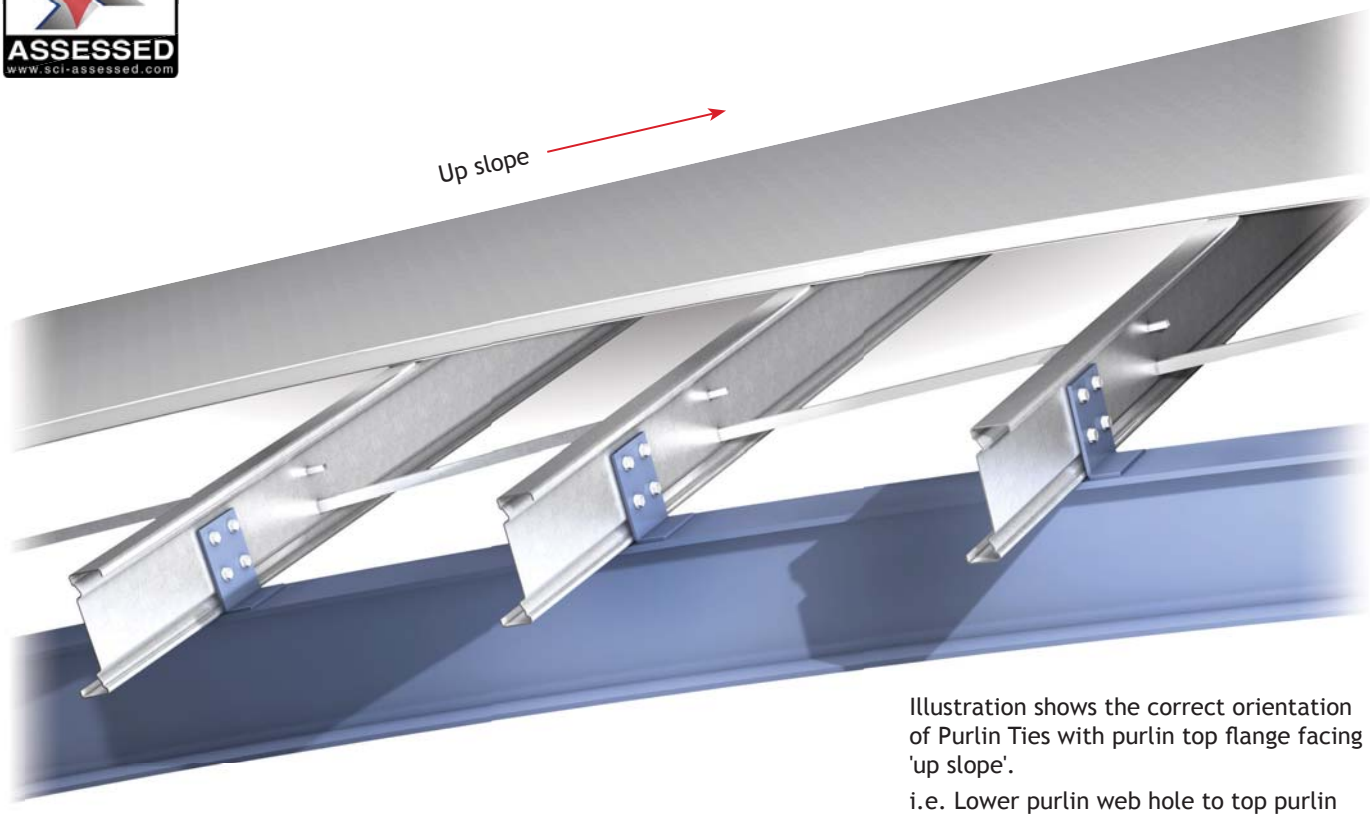


Illustration shows the correct orientation of Purlin Ties with purlin top flange facing 'up slope'.

i.e. Lower purlin web hole to top purlin web hole working up the slope.

Purlin Ties (anti-sag bars)

Guidance on the inclusion of Purlin Ties roof slopes >3° - <=20° Screw fixed single skin metal sheeting and built up spacer bar system with screw fixed steel liner			
UltraZED™2 section depth	Roof purlin systems All except HEB inner bays	Roof purlin systems HEB inner bays only	Close tolerance to assist in achieving recommended dimensional tolerances
	Max recommended span (mtrs) without Purlin Ties	Max recommended span (mtrs) without Purlin Ties	Max recommended span (mtrs) without Purlin Ties
145	6.1	6.5	5.5
170	6.2	6.5	5.8
200	6.8	7.1	6.0
225	7.1	7.1	6.1
255	7.1 (>10 use SRS struts)	7.1 (>10 use SRS struts)	6.1 (>10 use SRS struts)
285	7.1 (>10 use SRS struts)	7.1 (>10 use SRS struts)	6.1 (>10 use SRS struts)
305	7.1 (>10 use SRS struts)	7.1 (>10 use SRS struts)	6.1 (>10 use SRS struts)

Guidance on the inclusion of Purlin Ties roof slopes >3° - <=20° Screw fixed composite cladding panels			
UltraZED™2 section depth	Roof purlin systems All except HEB inner bays	Roof purlin systems HEB inner bays only	Close tolerance to assist in achieving recommended dimensional tolerances
	Max recommended span (mtrs) without Purlin Ties	Max recommended span (mtrs) without Purlin Ties	Max recommended span (mtrs) without Purlin Ties
145	6.1	6.3	5.5
170	6.1	6.3	5.8
200	6.1	6.3	6.0
225	6.1	6.3	6.1
255	6.1	6.3	6.1
285	6.1	6.3	6.1
305	6.1	6.3	6.1

Guidance on the inclusion of Purlin Ties roof slopes >5° - <=20° Fibre Cement (FC) cladding			
UltraZED™2 section depth	Roof purlin systems All except HEB inner bays	Roof purlin systems HEB inner bays only	Close tolerance to assist in achieving recommended dimensional tolerances
	Max recommended span (mtrs) without Purlin Ties	Max recommended span (mtrs) without Purlin Ties	Max recommended span (mtrs) without Purlin Ties
All sections	4.5	4.5	4.5

NOTE! Wind uplift loads may dictate that Purlin Ties are required at lesser spans than those shown above - Consult technical department and/or use **HADLEY Design Suite PRO** Design Software to check this.

Flat roof construction <3°

On shallow roof slopes 'Z' profiles become less stable as the vertical axis moves further away from the neutral axis; this causes the purlins to roll up-slope prior to cladding attachment. To counter this we recommend incorporating Purlin Ties or temporary struts on spans greater than 4.5 metres.

Inclusion of Eaves Braces or SRS/DPB assemblies is of paramount importance to ensure the eaves purlins are both straight and normal to the roof slope.

On roof slopes greater than 15 metres additional SRS/DPB assemblies should be incorporated within the roof design so that the maximum distance between bracing assemblies does not exceed 15 metres.

Consideration to purlin deflection should take into account the potential for ponding on shallow pitch roofs.

Curved roof construction

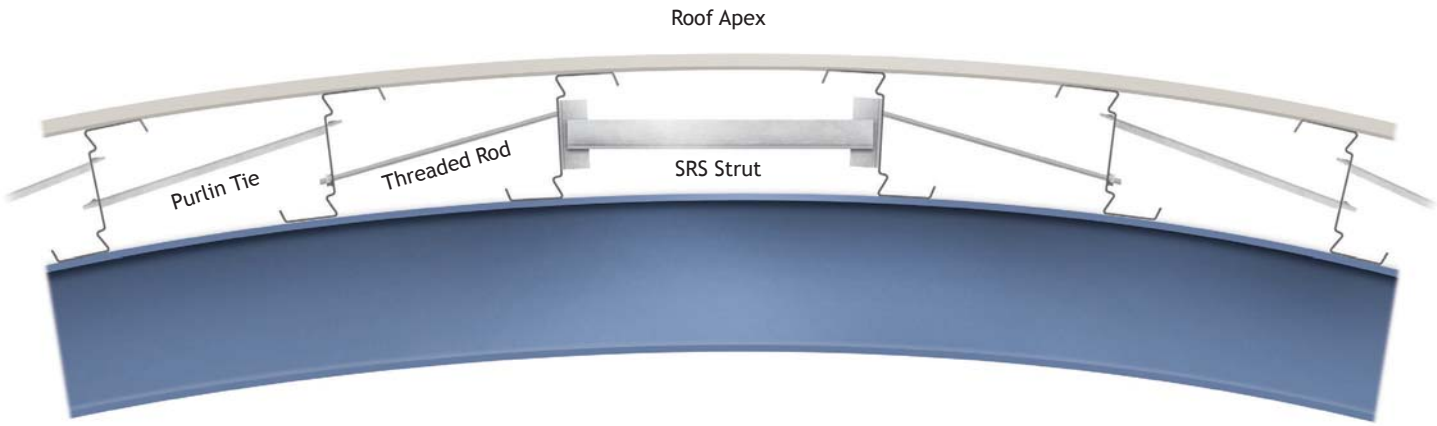
Purlins utilised in curved roof construction require special consideration with regard to strut and bracing requirements.

The general roof construction detail below should be incorporated.

If the roof curve is achieved by different length cleats on facetted rafters this may result in small variations in the length of Purlin Ties between adjacent rows of purlins. In this case consideration should be given to Purlin Tie marking and bundling, together with erection procedures.

Spans <=7.5 metres - minimum of 1 Purlin Tie required
Spans >7.6 metres – minimum of 2 Purlin Ties required

Roof tangent >30° use 'special' SRS type struts in lieu of Purlin Ties, please consult **HADLEY** BPD technical department for details.

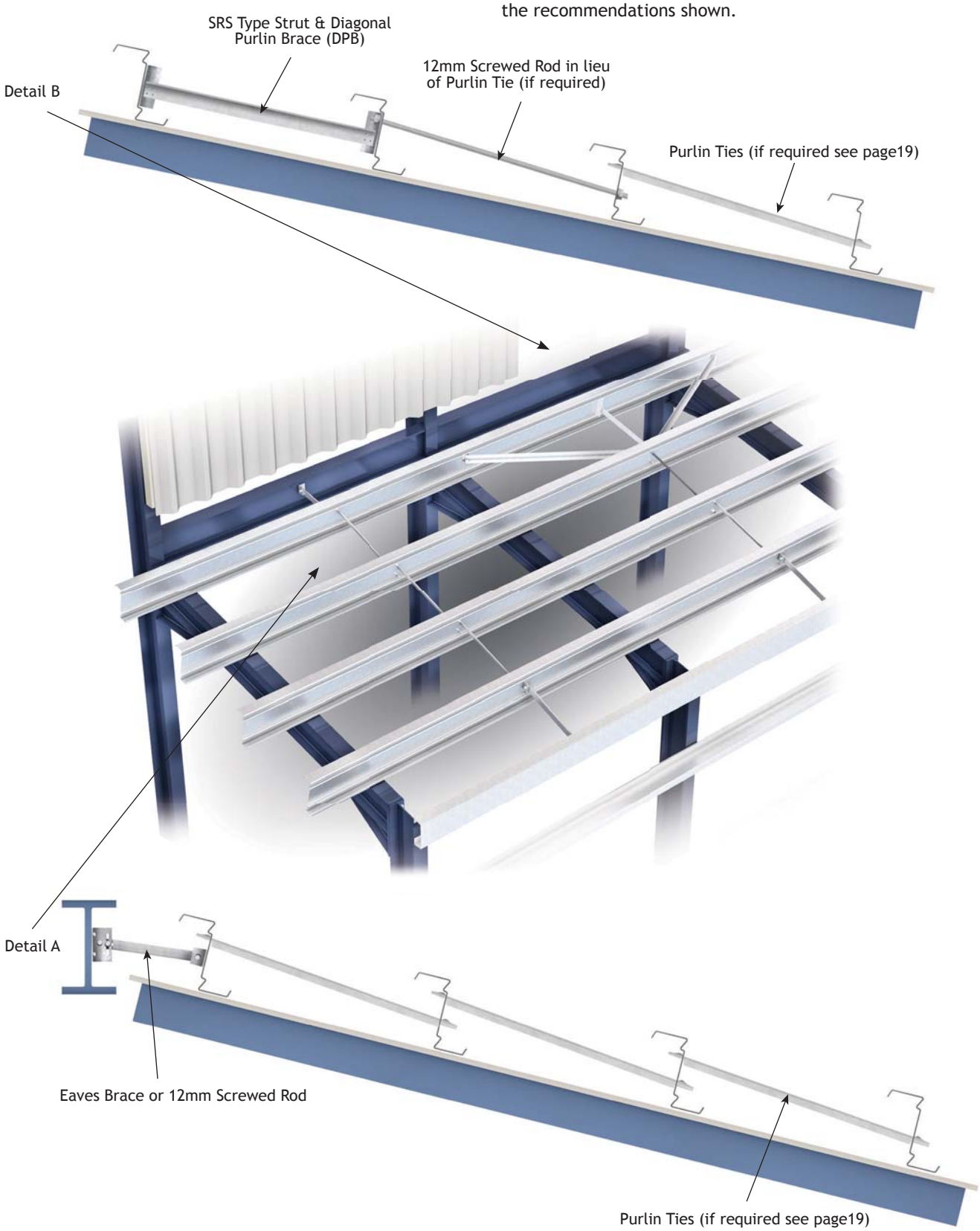


Mono-pitch roof construction

The bracing requirement for mono-pitch roofs are the same as for duo-pitch with the exception that the eaves bracing may be repositioned to the high eaves if this better suits the building design.

If a structural member is available at the high eaves position an Eaves Brace Assembly or threaded rod may be used to avoid the use of a Diagonal Purlin Brace.

If length of roof slope exceeds the parameters listed on page 14, additional bracing should be included in accordance with the recommendations shown.

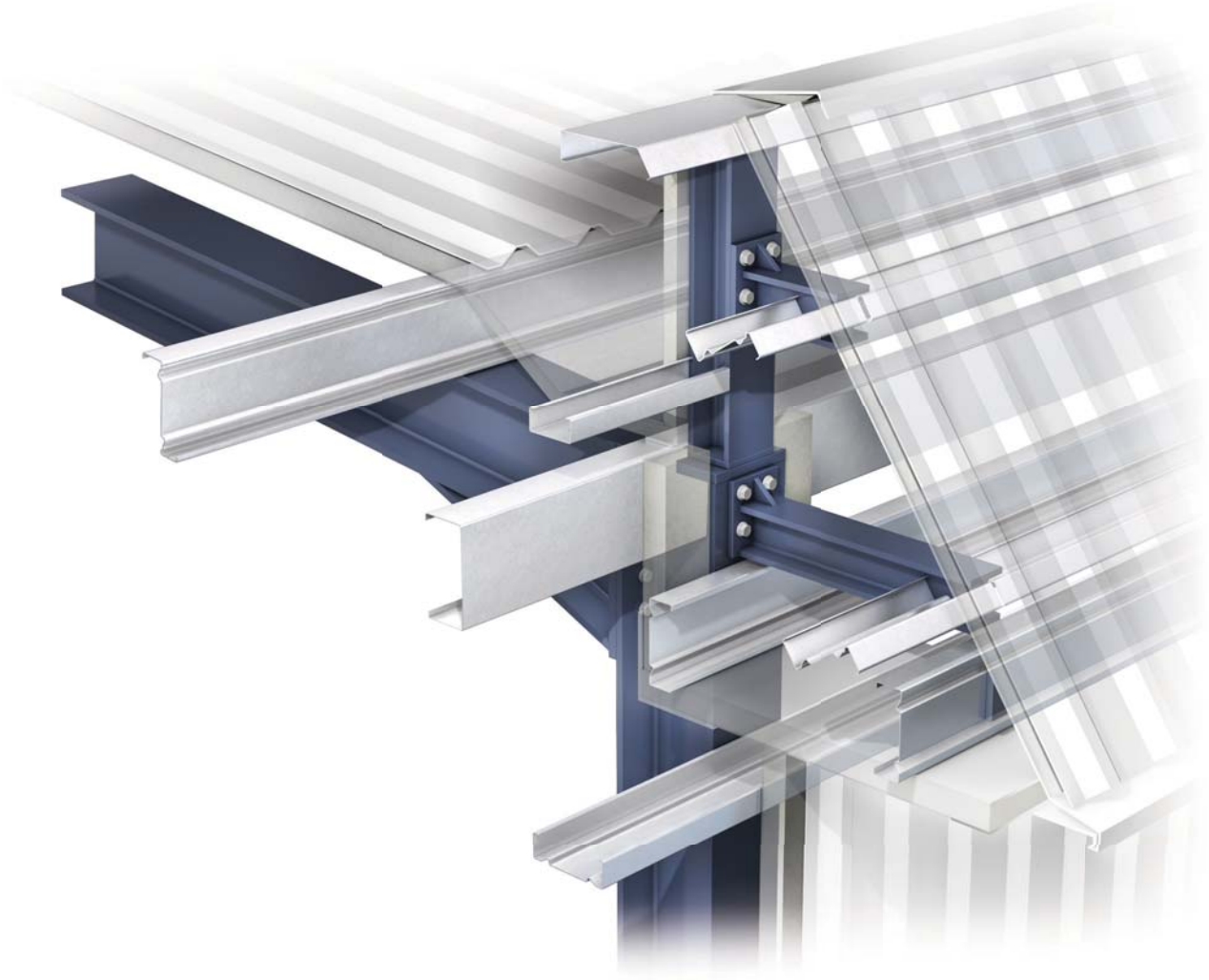


Steep roof construction >30°

Roof construction in excess of 30° induces down-slope forces on the purlins which need designing to resist these bi-axial actions. **HADLEY Design Suite PRO** Design Software will determine the purlin section and bracing requirements easily and quickly.

Where roof slopes exceed 65° the roof construction should be considered as a side rail system.

For tiled roof construction the parameters outlined on page 24 should be utilised.



Bracing requirements for roof purlins roof slopes >30° - <=65°					
Roof slope	**Cladding type**	**Span mtrs**	**Eaves condition**	**Strut**	**Length between bracing**
>30° - <=65°	Screw fixed cladding	<=6.1 >6.1 - <=9 >9	1 SRS+DPB 2 SRS+DPB 3 SRS+DPB	1 SRS 2 SRS 3 SRS	DPB at 10 mtrs DPB at 10 mtrs DPB at 10 mtrs
>30° - <=45°	Unrestrained cladding	<=6.1 >6.1 - <=9 >9	1 SRS+DPB 2 SRS+DPB 3 SRS+DPB	1 SRS 2 SRS 3 SRS	DPB at 10 mtrs DPB at 10 mtrs DPB at 10 mtrs
>45°- <=65°	Unrestrained cladding	<=6.1 >6.1 - <=9 >9	1 HDS+HD-DTB 2 HDS+HD-DTB 3 HDS+HD-DTB	1 HD-DTB 2 HD-DTB 3 HD-DTB	HD-DTB at 8 mtrs HD-DTB at 7 mtrs HD-DTB at 6 mtrs

Unrestrained cladding used on roof slopes >10° could result in down slope slippage of the cladding. In this instance the bottom of the cladding may require supporting against a suitable ledger angle as shown for vertical clip fixed cladding on page 56.

Tiled roof construction

Providing consideration is given to the high down-slope action created by the combination of steep roof slopes and heavy materials, **HADLEY UltraZED™2** is suitable for inclusion in most tiled roof construction including slate and concrete tiles.

This is particularly pertinent to roof construction utilising timber rafters fixed directly to **UltraZED™2** purlins. However, in all cases the strut and bracing must be capable of resisting the down-slope actions both during and after construction. Wherever possible the purlins should be tied across the apex, fixed to a laterally rigid structural component and have diagonal bracing included throughout the roof slope as detailed in the guidelines.

When selecting **UltraZED™2** purlins to support tiled roofs we recommend using our **HADLEY Design Suite PRO** Design Software which designs the section for bi-axial bending actions therefore ensuring a reliable solution is realised.

Bracing requirements for roof purlins - concrete tiles over metal deck UltraZED™2

		Eaves/valley condition				
Roof slope	Span mtrs	Structural beam	Cold rolled Eaves Beam	No eaves member	Purlin Tie type	Distance between diagonal bracing
<=25°	<= 6.1 >6.1 - <=9.0 >9	1 Eaves Brace 2 Eaves Braces 3 Eaves Braces	1 SRS+DPB 2 SRS+DPB 3 SRS+DPB	1 SRS+DPB 2 SRS+DPB 3 SRS+DPB	PT PT PT(SRS>10m)	SRS/DPB at 15 mtrs SRS/DPB at 15 mtrs SRS/DPB at 15 mtrs
>25° - 65°	<= 6.1 >6.1 - <=9.0 >9	1-2 Fabricated Eaves Braces by others 2-3 Fabricated Eaves Braces by others 3-4 Fabricated Eaves Braces by others	N/A N/A N/A	1-2 SRS+DPB 2-3 SRS+DPB 3-4 SRS+DPB	SRS SRS SRS	SRS/DPB at 15 mtrs SRS/DPB at 15 mtrs SRS/DPB at 15 mtrs

Bracing requirements for roof purlins - concrete tiles with timber rafters fixed to UltraZED™2

		Eaves/valley condition				
Roof slope	Span mtrs	Structural beam	Cold rolled Eaves Beam	No eaves member	Purlin Tie type	Distance between diagonal bracing
<=25°	<= 6.1 >6.1 - <=9.0 >9	1 Fabricated Eaves Brace by others 2 Fabricated Eaves Braces by others 3 Fabricated Eaves Braces by others	N/A N/A N/A	1 HDS +HD-DTB 2 HDS +HD-DTB 3 HDS +HD-DTB	SRS (2m max) SRS (2m max) SRS (2m max)	HDS+HD-DTB at 6 mtrs HDS+HD-DTB at 6 mtrs HDS+HD-DTB at 6 mtrs
>25° - 65°	<= 6.1 >6.1 - <=9.0	2 Fabricated Eaves Braces by others 3 Fabricated Eaves Braces by others	N/A N/A	2 HDS +HD-DTB 3 HDS +HD-DTB	HDS HDS	HDS+HD-DTB at 3.6 mtrs HDS+HD-DTB at 3.6 mtrs

NB: A cold rolled Eaves Beam is not suitable for use with roof slopes that exceed 25° or concrete tiles with timber rafters. A fabricated hot rolled structural member should be incorporated with a fabricated Eaves Brace connecting it to the first purlin.

Cantilevered purlins

HADLEY UltraZED™2 purlins may be extended over the gable rafter to form a cantilever arm supporting the roof cladding to create an overhanging canopy detail.

The following rules should be applied:

Execution
Sections must be installed as one continuous length incorporating the end bay and overhang.
Purlins must be laterally restrained by the roof sheeting.

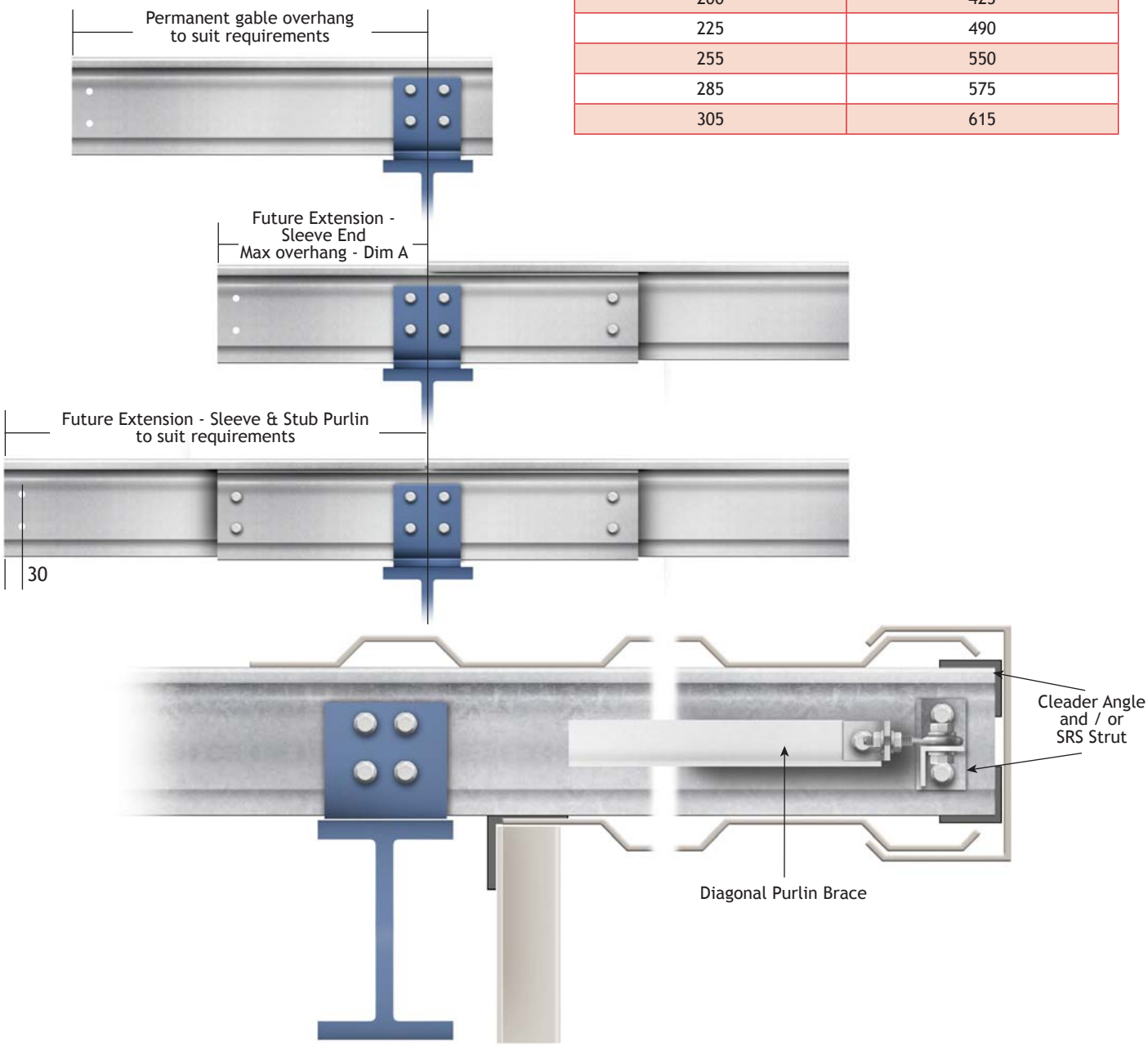
Design
For steel cladding, purlin deflection is typically limited to span/180 and the end deflection of the cantilever should reflect this limitation.

HADLEY Design Suite PRO Design Software may be used to check cantilever suitability of a purlin; however as a general guide we recommend that the cantilever does not exceed 25% of its backing span.

Construction
The purlins should be 'tied' together to provide a stable platform and prevent purlin rotation. This may be achieved in a number of ways including fixing cleader angle to purlin flanges or the inclusion of SRS type struts at the end of the cantilever. Cleader angle should be made continuous over the roof apex and positively fixed to prevent down-slope movement. Additionally, on mono pitched roofs and/or roofs exceeding 25° a Diagonal Purlin Brace should be included.

For other cases or heavy cladding please consult our technical department for advice.

Section ref.	Dimension A
145	300
170	350
200	425
225	490
255	550
285	575
305	615



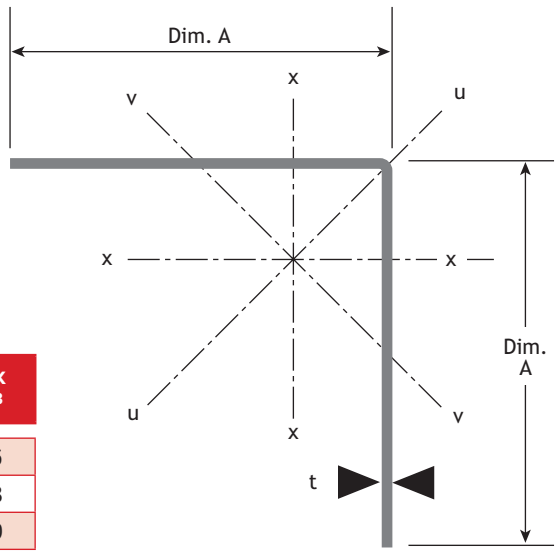
Cleader angle

Cleader angle is manufactured from cold roll-formed pre-galvanised steel section and is available in three sizes

45x45x2.0 = 1.35kg/m
70x70x1.6 = 1.73kg/m
70x70x2.5 = 2.70kg/m

Maximum length = 6.0m
Cleader angle can be cut and punched to customer's requirements and can be spanned over multiple purlins if required. Our recommendation is for 45x45x2.0 for spans up to 1.2m; 70x70x1.6 <=1.8m. Above 1.8m 70x70x2.5 should be utilised.

Cleader angle can be fitted to top or bottom purlin flanges with M12 bolts through pre-pierced holes or by self-drilling/ tapping screws.



Dim. A (mm)	t (mm)	Weight kg/m	Ixx cm^4	Ivv cm^4	Iuu cm^4	Wxx cm^3
45	2.0	1.35	3.43	1.44	5.52	2.65
70	1.6	1.73	11.01	4.34	17.68	5.38
70	2.5	2.70	16.86	6.63	27.09	8.40

Suspension of services from **HADLEY** UltraZED™2 purlins

Building services may be suspended from **HADLEY** UltraZED™2 purlins providing certain design considerations are fulfilled. Many different types of service support clips and attachment methods are available and it is up to the designer and installer to ensure that the chosen method is fit for purpose. We also recommend seeking advice from our technical department and the clip manufacturer prior to installation.

Lightweight service loads

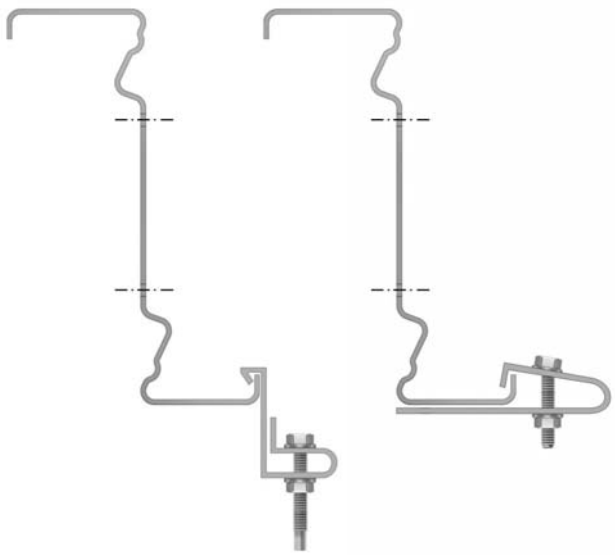
The recommendations shown apply to clips that attach to the lower purlin flange or lip and are for a roof pitch of 12° or less. They are limited by acceptable movement of the purlin flange and **in most instances will be considerably less than the maximum design load of the clip** – the guidelines shown below should **not** be exceeded.

Suspension of lightweight services from UltraZED™2 purlins Maximum applied loads to purlin lips/flange Maximum roof slope 12°

Purlin gauge mm	Maximum load per clip kg	Maximum load per/m run of purlin	Maximum load per purlin kg
1.2-1.5	10	15	25
1.6-1.8	15	25	35
2.0-2.3	25	35	45
2.5-3.0	30	40	50

Very light duty (e.g. strip light fittings)

Light duty (e.g. lightweight tiled ceilings)



WHENEVER POSSIBLE, SERVICE LOADS SHOULD BE APPLIED VIA THE SECTION WEB.

HADLEY Design Suite PRO Design Software may be used to design **HADLEY** UltraZED™2 purlins to carry service loads. To accurately determine purlin deflection **HADLEY Design Suite PRO** software has a facility to calculate point loads at any point along the purlin span.

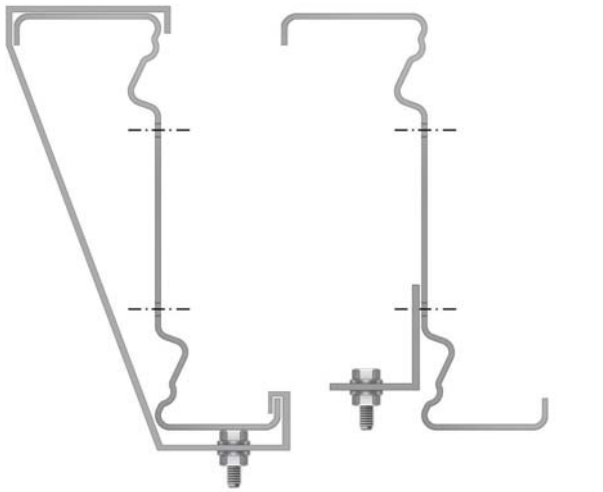
Detail for heavier service loads

When it is necessary to suspend heavier services or equipment from purlins; cleats bolted through standard gauge holes in the section web should be considered. Cleats fitted in this manner may also be used to attach channel support strut between purlins.

Where significant loads are suspended from purlins we recommend contacting our technical department.

Light/medium duty

Heavy duty (web fix)



CAUTION: In all circumstances, purlins should first be capable of supporting the service loading either with due design load allowance made by the design engineer or have proven sufficient surplus capacity.

Trimmer cleats

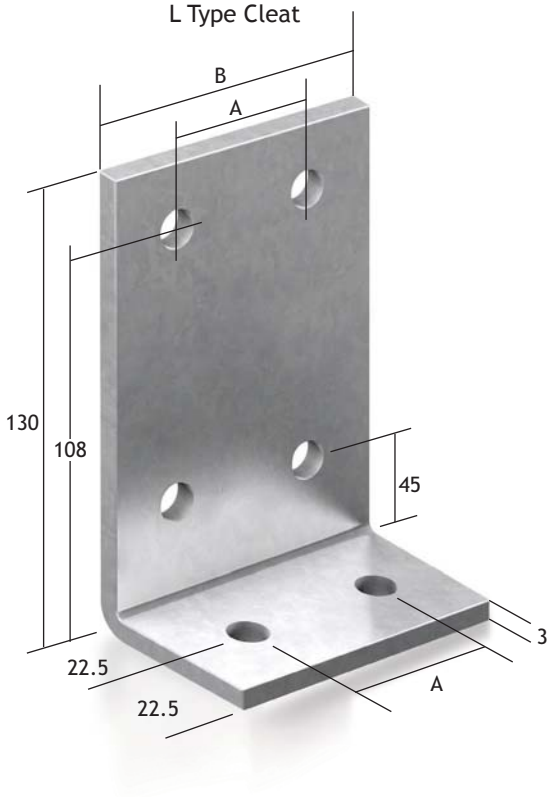
Supplied as short (S Type) or long (L Type) trimmer cleats and manufactured from 3mm pre-galvanised steel, building shell trimmer cleats are suitable for joining **HADLEY UltraZED™2** and **HADLEY UltraBEAM™2** sections of the same depth.

Cleats can be supplied as factory assembled components or loose for on-site installation.

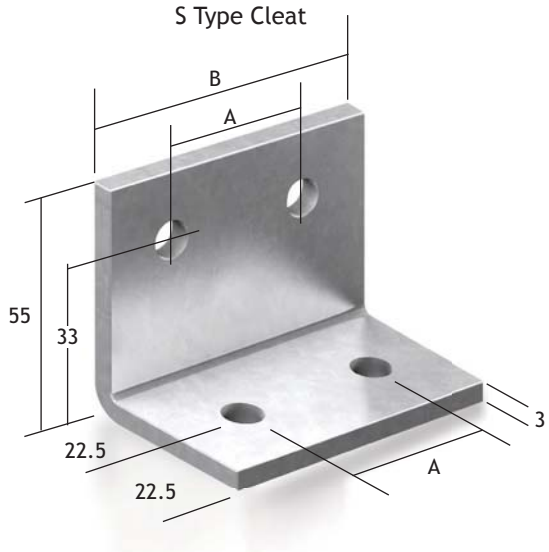
Bolted connections allow for construction tolerances.

Section ref.	Dimension A	Dimension B
145	37	73
170	62	98
200	50	86
225	75	111
255	105	141
285	135	171
305	155	191

L Type Cleat



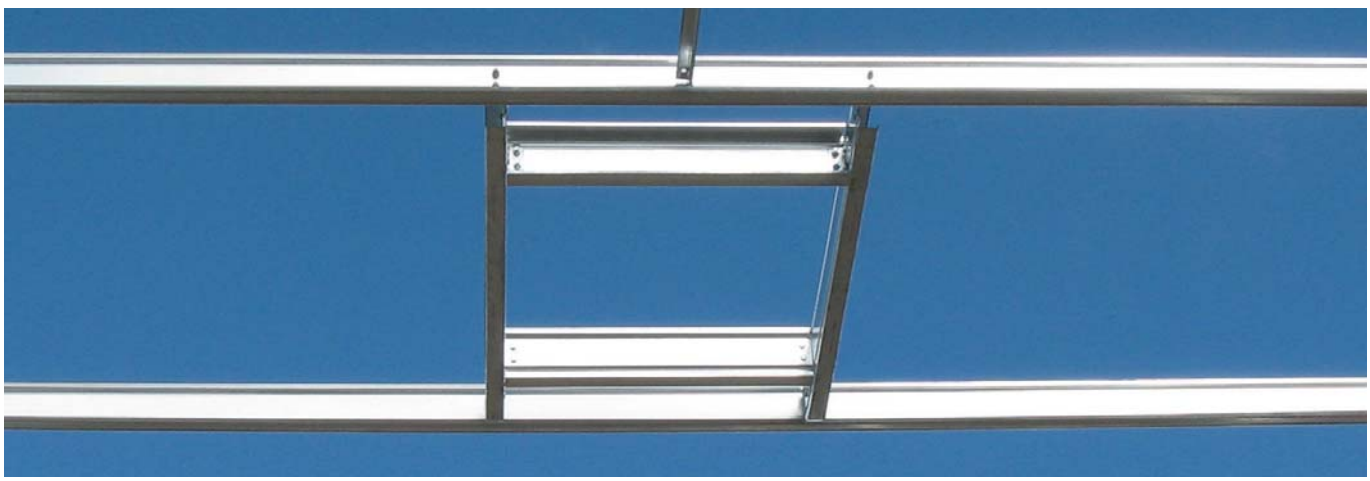
S Type Cleat



Roof apertures

A framework consisting of **HADLEY UltraBEAM™2** trimmer sections may be utilised to facilitate roof apertures such as sun (solar) pipes or roof lights incorporated into a roof. The frames may be supplied as single components for on-site assembly or as factory assembled components ready for installation. The frames can be supplied from same depth sections to fit flush with both flanges of the purlins or rails or designed to be flush with the sheeting face only.

These frames offer a light weight and cost effective solution to the installation of any 'through roof' or 'through wall' component.



CAUTION: In instances where trimmer members support multiple purlin ends, particular consideration should be made to the supporting primary purlins which will need to be increased in strength.

Eaves Beams

Our Eaves Beam sections are designed to act as an eaves purlin, top sheeting rail and gutter support.

Design

Eaves Beams are designed for combined vertical and horizontal actions as single span beams. Horizontal forces are deemed to be transmitted through the roof diaphragm via the Eaves Brace(s).
HADLEY Design Suite PRO Design Software should be utilised to determine the correct Eaves Beam for most applications.

Construction

General
HADLEY EavesBEAM2 sections are produced as C profiles for detailing simplicity and manufacture. Three depths are available - 200, 255 & 305 in various gauges as listed. Web holes are 14 dia. for M12 fasteners and may be counter formed to provide a flush cladding face if required.

When using countersunk M12 set screws an allowance of 5mm should be made for the depth of counter form. The counter formed holes bear directly onto cleats and accessories meaning packer plates are not required.

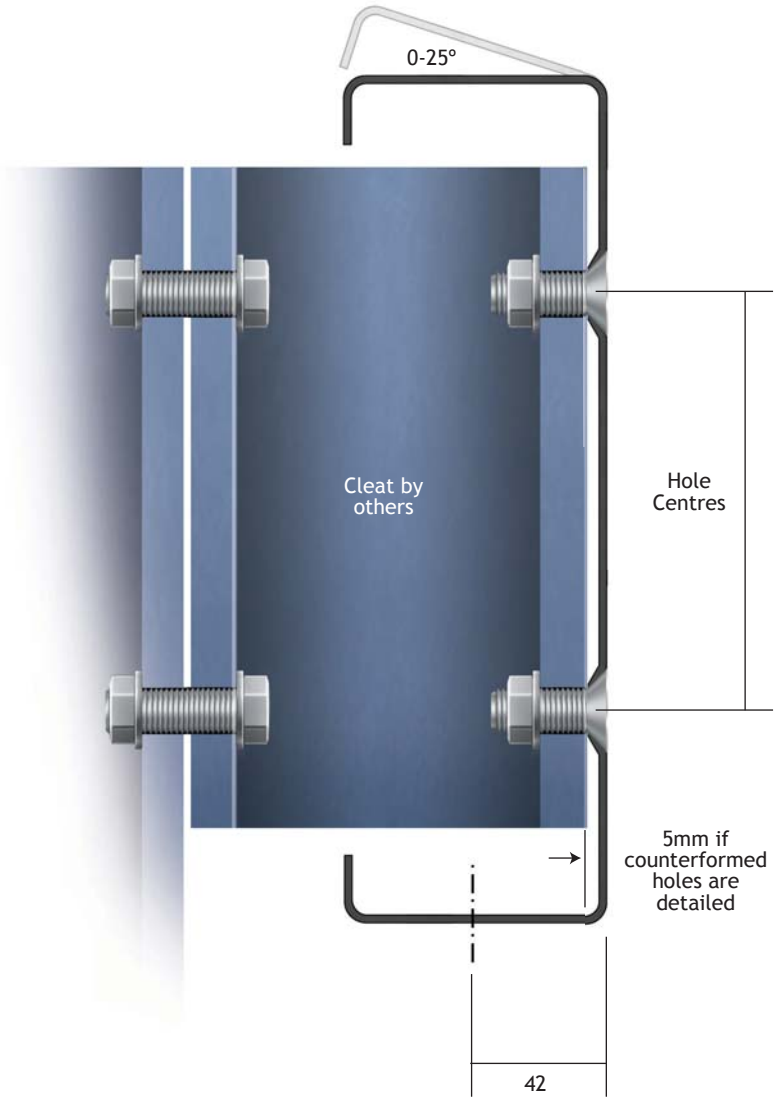
The top flange can be angled from 0° - 25° in 5° increments.

Eaves Brace Assemblies

Eaves Brace assemblies have a variable angle that enables the Eaves Brace to be easily adjusted on-site. A unique combination of holes and slots effectively prevents slippage due to rotation forces.
Eaves Brace(s) should be installed between the Eaves Beam and the first up-slope purlin:

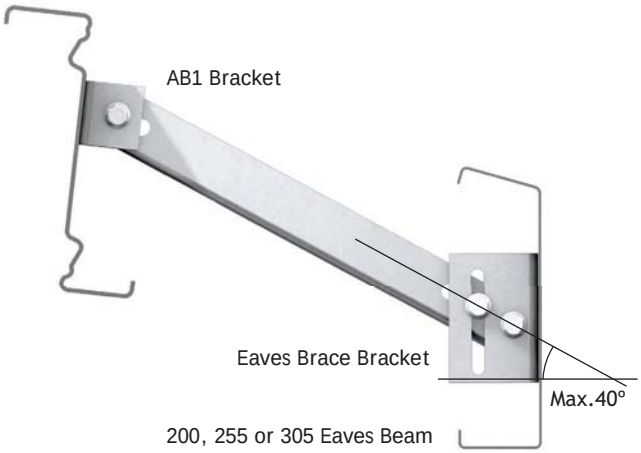
<=6.1 metres	1 Eaves Brace assembly
>6.1 - 9 metres	2 Eaves Brace assemblies
>9 metres	3 Eaves Brace assemblies

When an Eaves Beam is used to support an internal gutter an Under Purlin Eaves Brace assembly may be utilised in lieu of a standard Eaves Brace.

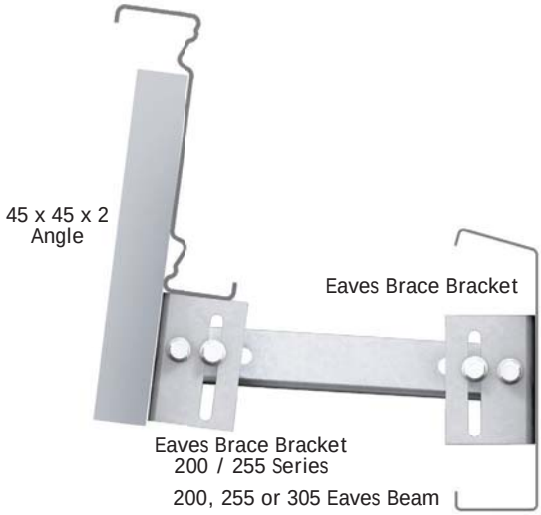


EavesBEAM2				Flange		Dim hole centres	Second moment of area		Section modulus		Moment capacity	Radius of gyration	
Section Reference	Weight kg/m	Thickness mm	Depth mm	Width mm	Lip mm	mm	Major axis cm^4	Minor axis cm^4	Major axis cm^3	Minor axis cm^3	Major axis Mc kNm	Major axis rxx cm	Minor axis ryy cm
EB2007518	5.30	1.80	200	75	19	50	420.37	50.33	42.04	9.43	13.64	7.90	2.73
EB2007520	5.87	2.00	200	75	19	50	463.93	55.27	46.39	10.35	15.75	7.89	2.72
EB2007525	7.26	2.50	200	75	19	50	570.11	67.07	57.01	12.55	21.05	7.87	2.70
EB2557518	6.08	1.80	255	75	19	105	742.64	54.08	58.25	9.65	17.61	9.81	2.65
EB2557520	6.73	2.00	255	75	19	105	820.21	59.39	64.33	10.60	20.65	9.80	2.64
EB2557525	8.34	2.50	255	75	19	105	1009.89	72.08	79.21	12.85	27.70	9.77	2.61
EB3057518	6.78	1.80	305	75	19	155	1137.08	56.75	74.56	9.80	20.97	11.49	2.57
EB3057520	7.51	2.00	305	75	19	155	1256.51	62.32	82.39	10.76	24.62	11.47	2.55
EB3057525	9.32	2.50	305	75	19	155	1549.10	75.62	101.58	13.05	33.46	11.44	2.53

Eaves Brace Assembly



Under Purlin Eaves Brace Assembly



HADLEY EavesBEAM2 may be utilised to support **HADLEY UltraZED™2** and **HADLEY UltraBEAM™2** side cladding rails via our Side Rail Support Hanger Assembly.

The Hanger Bracket and Tubular Strut which combine to make up the assembly are connected to the lower flange of the Eaves Beam by a M12 Bolt.

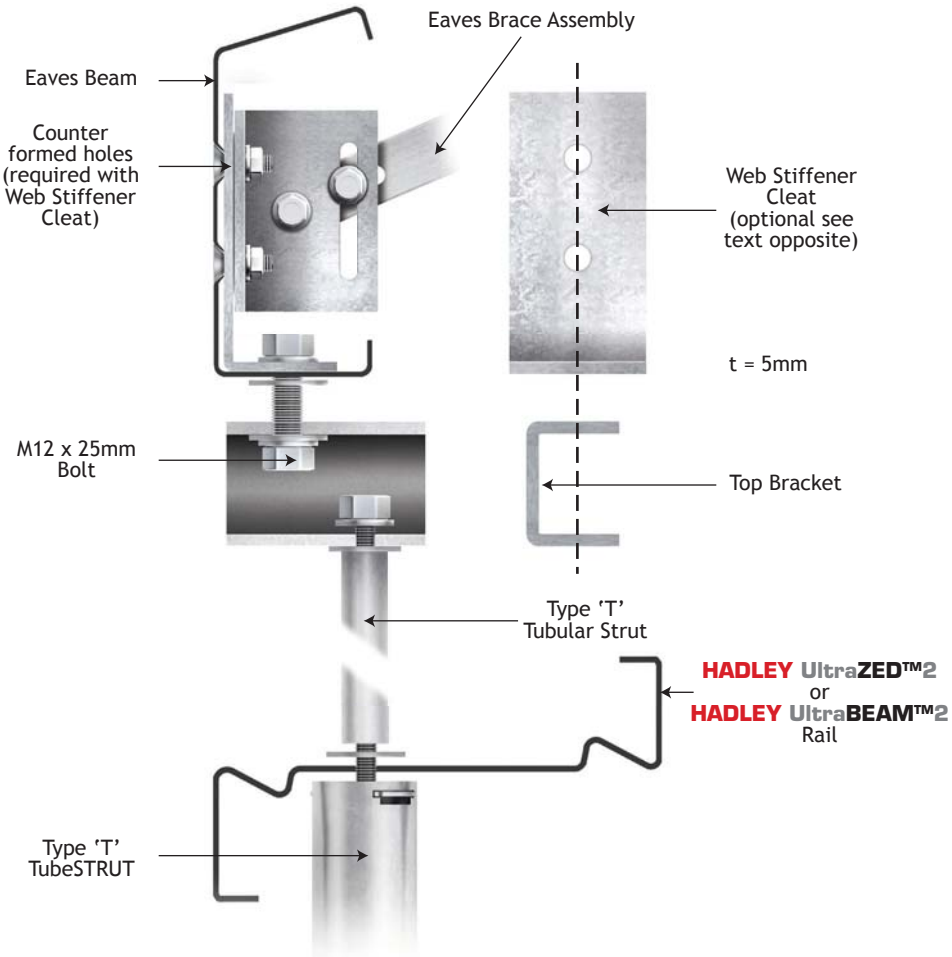
The Hanger Bracket has slotted holes which facilitate the different gauge line back marks for the 145/170 and 200-305 Series Side Rails.

Suitable for use with screw fixed metal cladding up to 0.13kN/m^2 the Support Hanger Assembly may be used without recourse to the use of an Eaves Beam Web Stiffener Cleat providing the height of the supported cladding does not exceed 6 metres.

Where cladding height exceeds 6 metres, up to a maximum height of 10 metres, a Web Stiffener Cleat is required bolted to the Eaves Beam Web via M12 Counter Sunk Headed Bolts.

The Eaves Brace length should be shortened by 5mm when counter formed holes are used or 10mm when used in conjunction with a Web Stiffener Cleat.

Side Rail Support Hanger Assembly



Rafter and column cleats

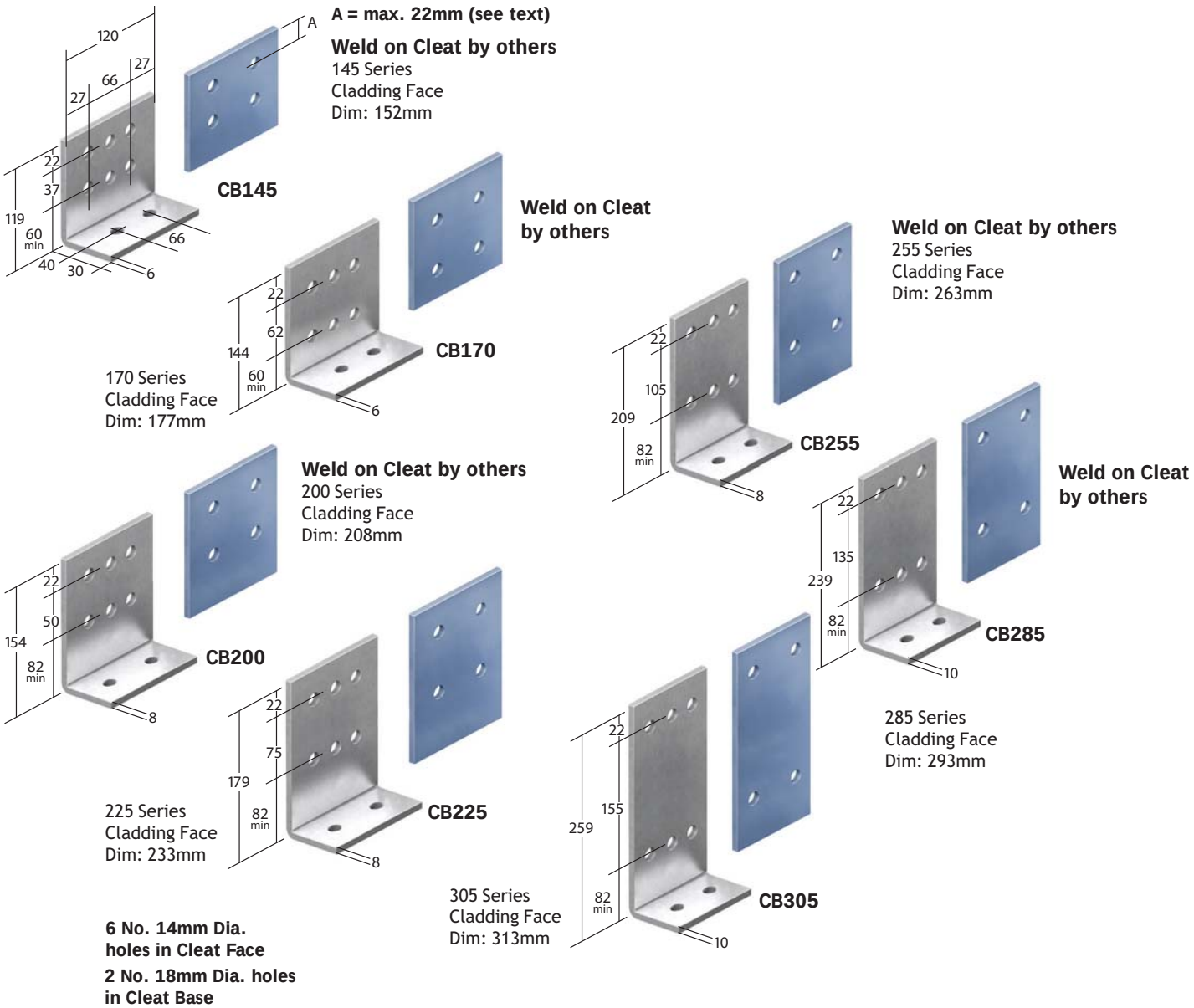
Primary connection cleats are available to order as post galvanised with 2x18mm holes in the base for bolting on (CB). Standard cleats are suitable for normal roof and side elevation applications.

Extended cleats or cleats designed for abnormal actions in steep roofs and sides should be checked for suitability of design.

Special cleats may be supplied to customer requirements by arrangement.

Customers fabricating their own cleats must ensure that the design satisfies the minimum thickness criteria illustrated for normal applications

The top hole to edge distance must not exceed 22mm.

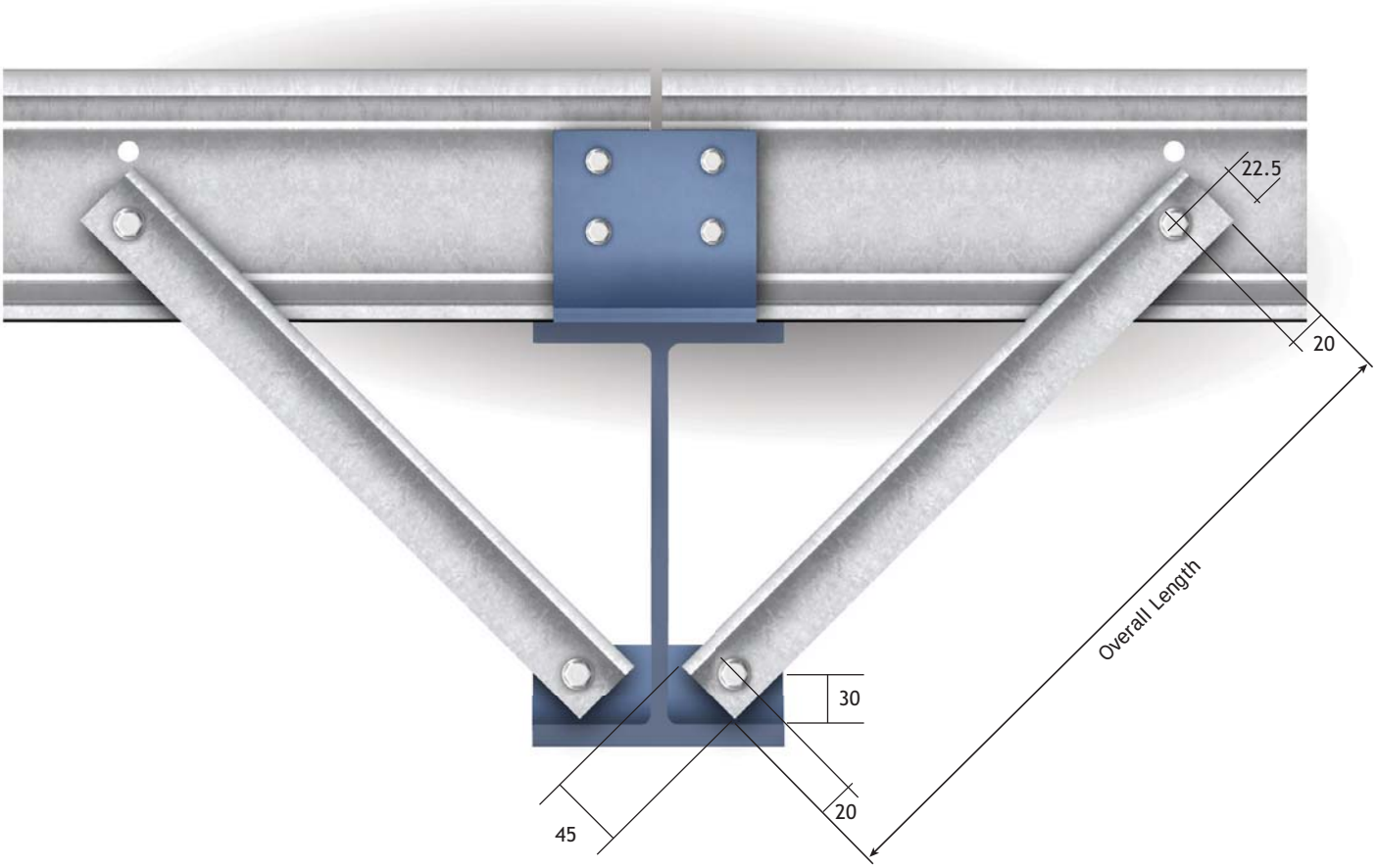


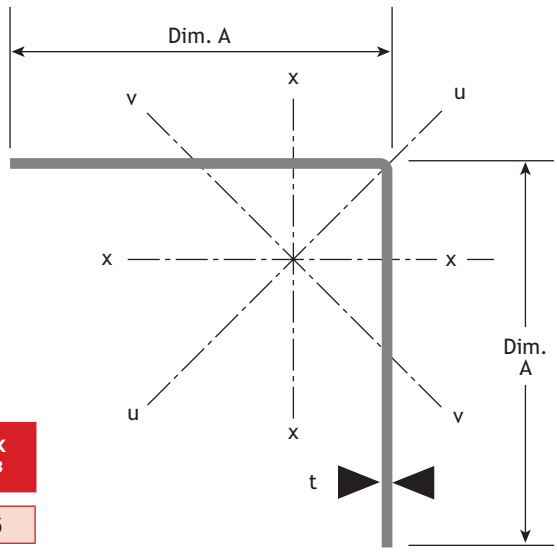
Rafter and column stays

Rafter and column restraint stays are manufactured from 45x45x2mm pre-galvanised angle cut to length and punched with 14mm diameter holes for M12 bolts.

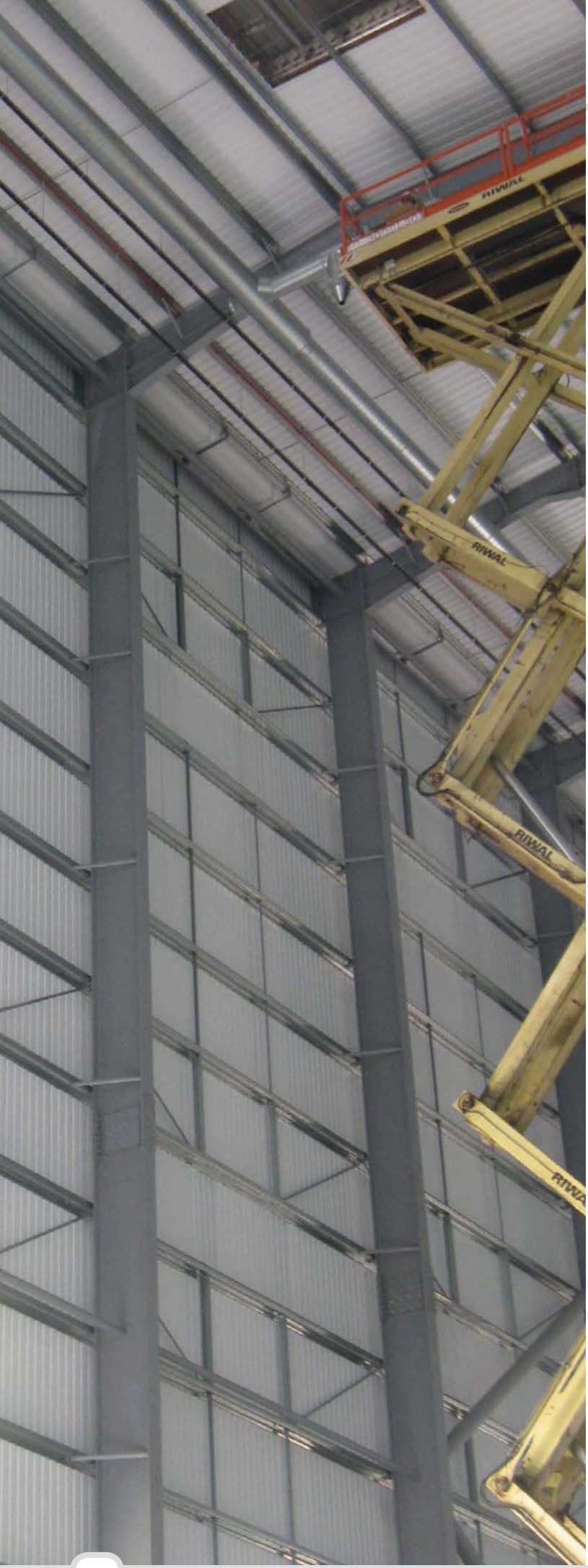
Ideally the rafter/column stay should be connected to the standard sleeve fixing holes at an angle close to 45°. However, if the supporting steelwork is constructed from deep universal section, lattice beams or trusses the stay fixing holes can be added to achieve a more appropriate angle.

On exceptionally deep rafter/column members it may be necessary to increase the size of the angle used.





Dim. A (mm)	t (mm)	Weight kg/m	Ixx cm^4	Ivv cm^4	Iuu cm^4	Wxx cm^3
45	2.0	1.35	3.43	1.44	5.52	2.65



Side cladding rail index

HADLEY UltraZED™2 and **HADLEY UltraBEAM™2** side cladding rails are offered in a number of different arrangements to accommodate most architectural and structural requirements.

Firewall

In some boundary wall conditions it is necessary to design the cladding rails to facilitate a firewall cladding system. Manufacturers of such systems will usually require the horizontal rail/ cleat connection to be slotted and include combustible washers that allow for thermal expansion of the rails.

Vertical screw fixed cladding

The conventional side cladding rail system is utilised for vertically fixed composite or built up cladding finishes where the final cladding solution provides a diaphragm action to restrain and support the cladding rails.

This means that a bracing system may be utilised that provides support during the installation of the cladding components - typically this will utilise **TubeSTRUT** or **SRS** type side rails support struts and diagonal tie wires.

Window trimmers and heavy cladding supports

Side cladding rails supporting windows and heavy cladding panels should be designed to resist the imposed forces. Typically this will necessitate the use of heavy duty strut and bracing components.

Horizontal laid cladding

Cladding that is laid horizontally attaches to rails that run vertically up the side elevation of the building. This may be achieved by short vertical rails fixed between horizontal rails or by attaching top hat (or similar) sections to conventional horizontal rails.

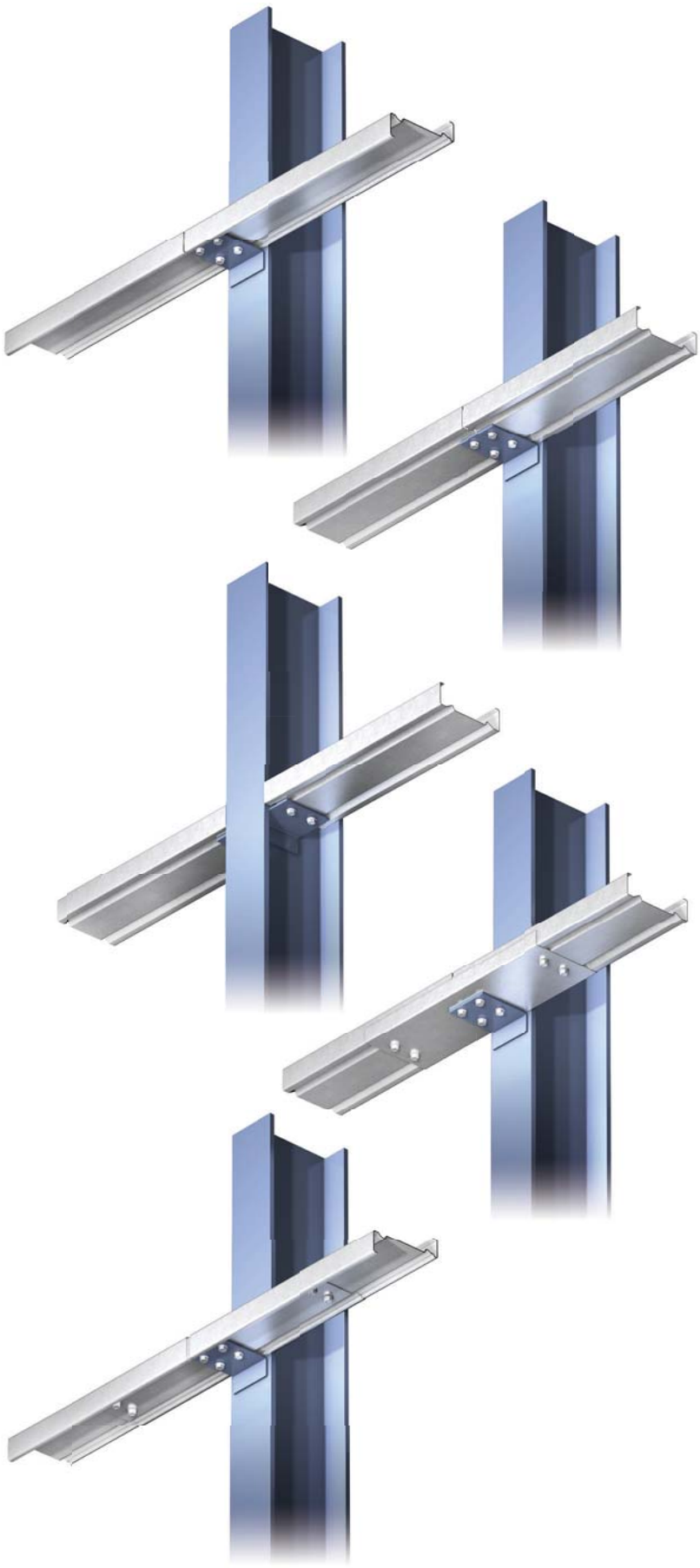
Experience indicates that the latter method is more cost effective and offers greater flexibility to accommodate architectural design features.

In many cases the horizontally laid cladding may not form a diaphragm that supports the cladding rail system after installation, for this reason we recommend inclusion of heavy duty diagonal ties (HD-DTB) in lieu of tie wires which may elongate under sustained loading over time.

Vertical 'clip fixed' cladding

Where vertical cladding is attached via sliding clips the full weight of the panels is supported by the bottom cladding rail. In this instance the rail and associated support system must be designed accordingly.

HADLEY UltraZED™2 and HADLEY UltraBEAM™2 cladding rail systems



HADLEY UltraZED™2 and **HADLEY UltraBEAM™2** cladding rails are available in four systems, the choice of system being influenced by span, load, sheeting line limitations, elevation complexity, the number of bays and the end user's preferred site practice.

Non-continuous (butted) system

Providing a versatile approach to cladding rail design, single spanning rails may be installed inset between columns. Single span rails are frequently the principal design option available in elevations that contain numerous door and window openings. Deflection of rails adjacent to such apertures is frequently limited and may become the determining factor for the sheeting line dimension.

For these reasons it may be judicious to consider the selection of these rails before more continuous systems.

Non-continuous rails may also be included as 'drop in' sections between rails in areas of high wind loading.

Sleeved system

Increasing the structural performance of a non-continuous cladding rail section by approximately 45% for load bearing capacity and 90% for bending resistance, a sleeved system combines easily handled single spanning lengths with weight saving design.

HADLEY UltraZED™2 Heavy End Bay sleeved system

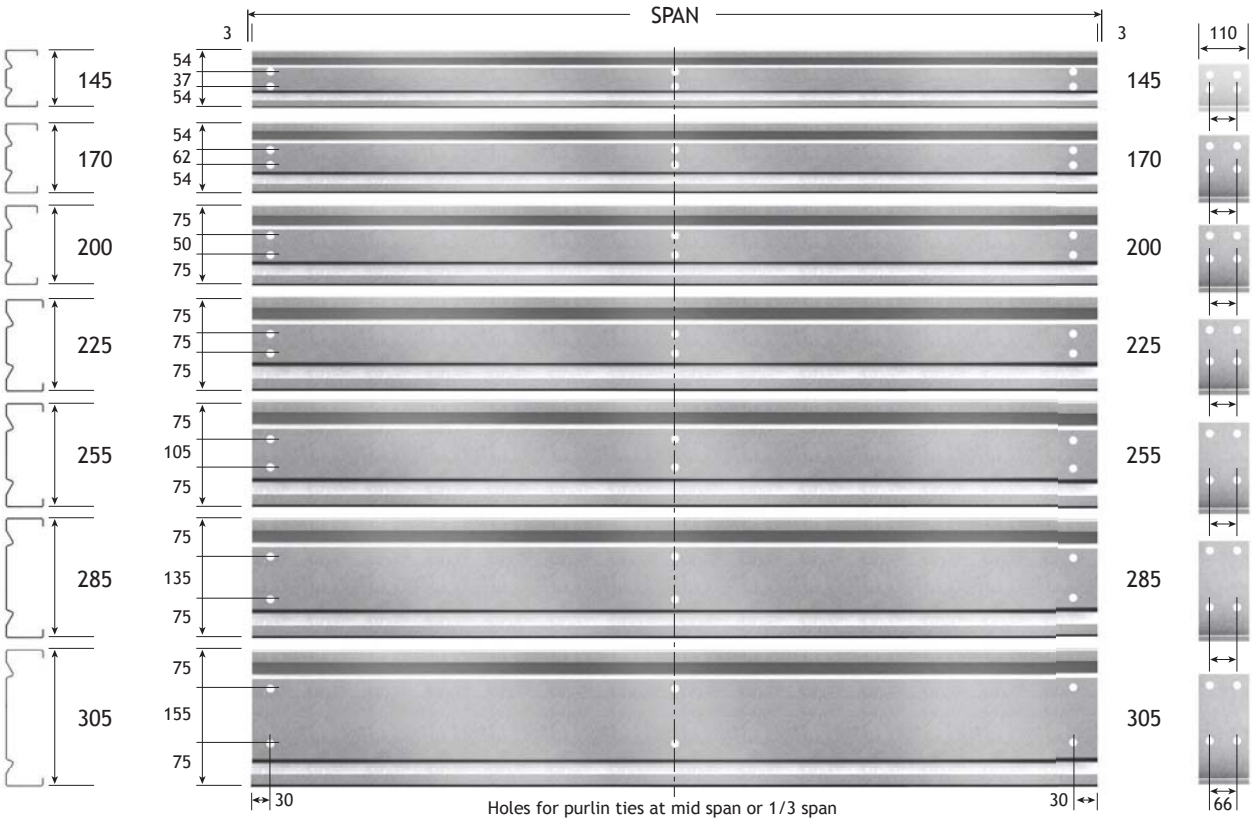
HEB - Single span system

By incorporating sleeves at every joint the cladding rails are made continuous, resulting in a substantial increase in both load bearing and deflection performance. Because the end bays lack the continuity of the inner bays they need to have longer connecting sleeves and be of heavier gauge material - it is from this that the system derives its name. A minimum of five bays is necessary to realise continuity.

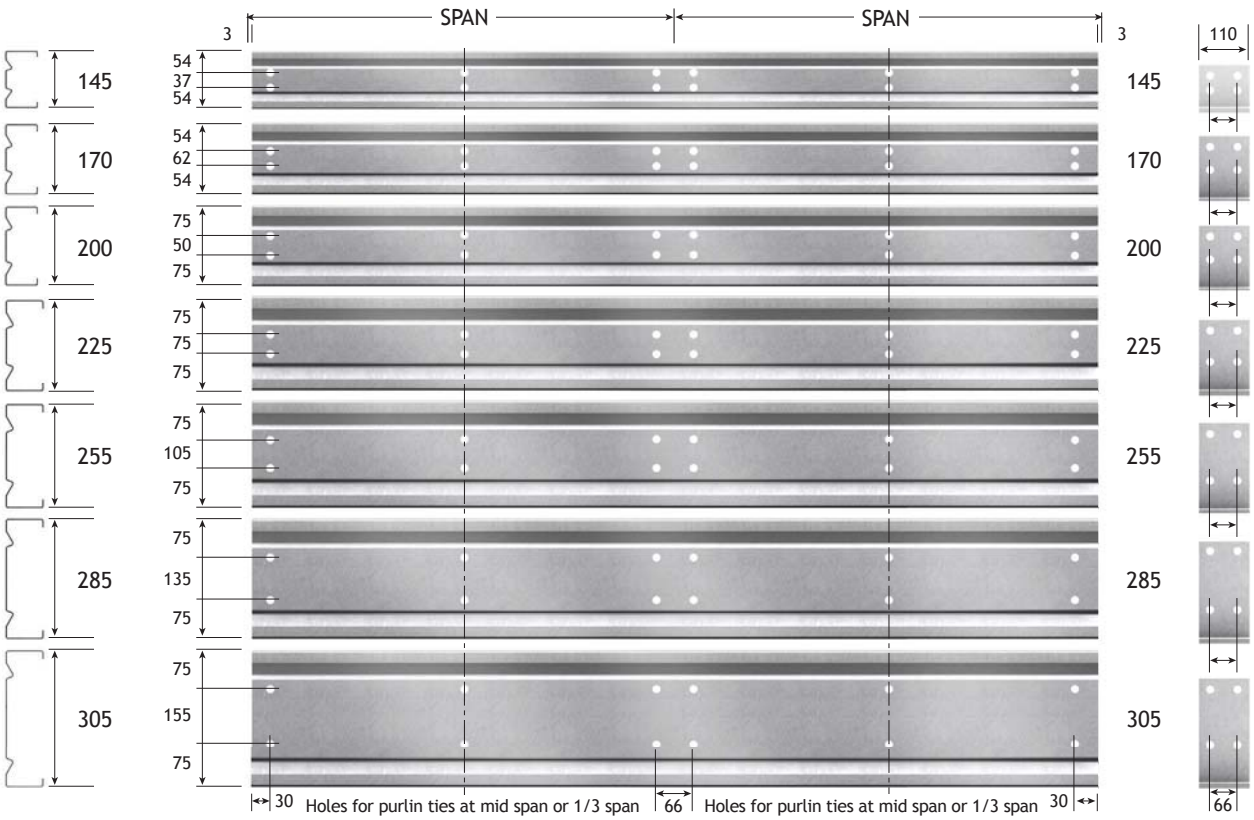
Double spanning butt-jointed system

Affording nearly 2½ times the resistance against bending that a single span non-continuous rail offers, double spanning rails are often the optimum choice for trimming window openings and for use as brickwork restraints.

HADLEY UltraBEAM™2 non-continuous single span piercing configurations – for **HADLEY UltraZED™2** sections see page 11. All holes punched Ø14 for M12 bolts. Holes are punched in pairs on standard gauge lines as shown.



HADLEY UltraBEAM™2 double span piercing configurations – for **HADLEY UltraZED™2** see page 11.
All holes punched Ø14 for M12 bolts. Holes are punched in pairs on standard gauge lines as shown.

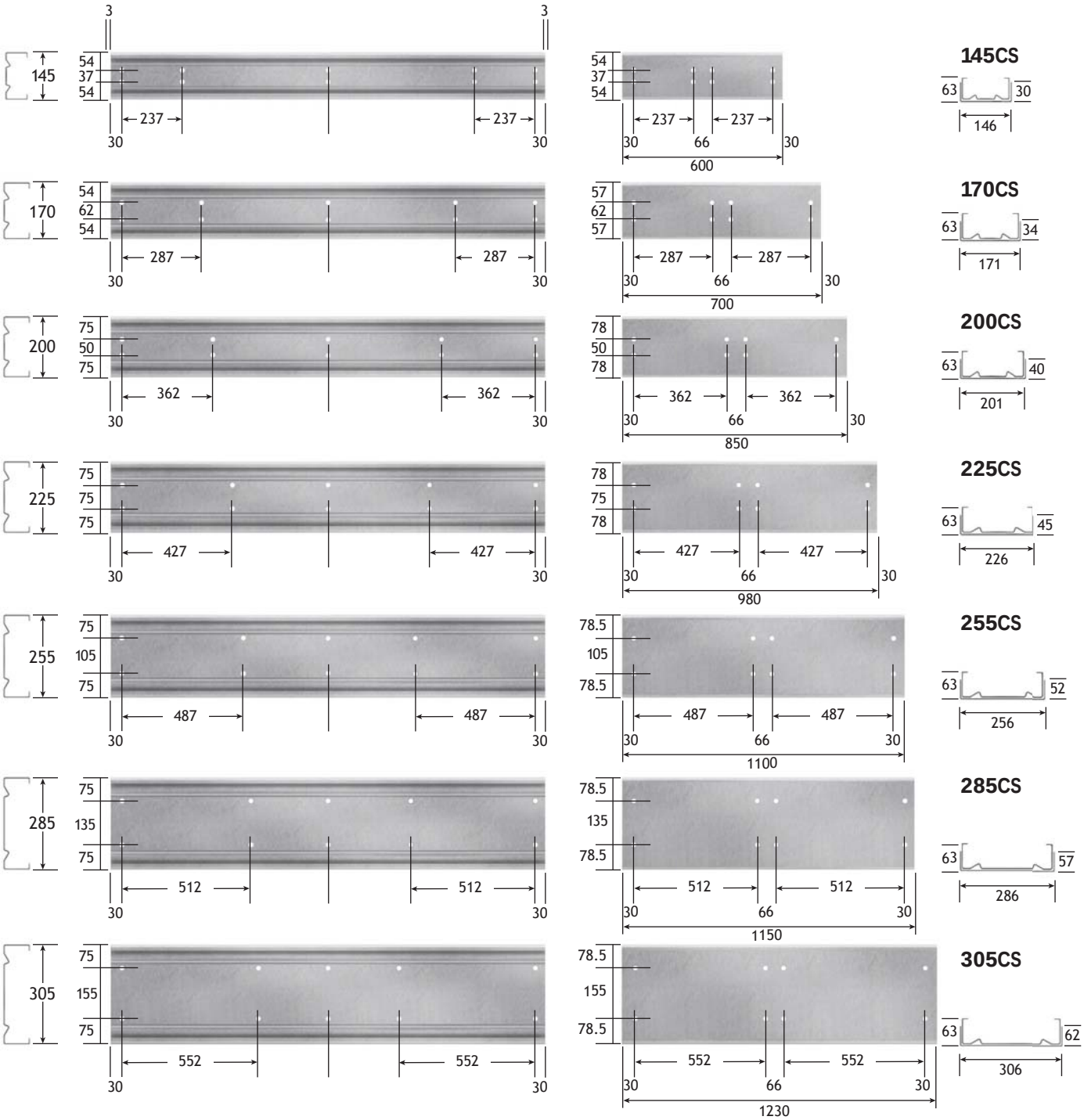


HADLEY UltraBEAM™2 standard sleeve piercing configurations

HADLEY UltraBEAM™2 sleeve section is a length of plain channel profile that fits over the outside of the **UltraBEAM™2** side rail. The sleeve section connects the purlin and sleeve at the column cleat. Extensive testing and analysis has determined the sleeve rotational stiffness. Sleeves are not designed to be simple joining plates and they must not be used to join section at any position other than the column cleat.

All holes punched Ø14 for M12 bolts. Holes are punched in pairs on standard gauge lines as shown.

For **HADLEY UltraZED™2** sleeved sections see page 12.
For **HADLEY UltraZED™2** HEB sections see page 13.



Fire wall side rail system

HADLEY UltraZED™2 and **HADLEY UltraBEAM™2** side rail systems are suitable for inclusion within a fire resistant cladding system providing that certain criteria are met. Fire resistance up to 4 hours has been achieved depending upon the construction method and materials utilised. The certificate for fire resistance of the wall system should be obtained from the cladding supplier based upon the supplier's construction details.

Methodology and typical details

During a fire the outer cladding sheets act as a diaphragm tied back to the primary steel columns via a cold roll-formed eaves beam or top sheeting rail (typically <= 2 hours resistance) or hot rolled eaves member (typically > 2 hours resistance) and bottom sheeting rail (incorporating slotted hole connections).

If the side rail system is suspended from an eaves beam the eaves beam must be protected from fire.

Accessories and column restraints need no provision for expansion.

Excessive bowing due to thermal expansion is minimised by the following:

i) All rails are separated by a 40mm expansion gap.

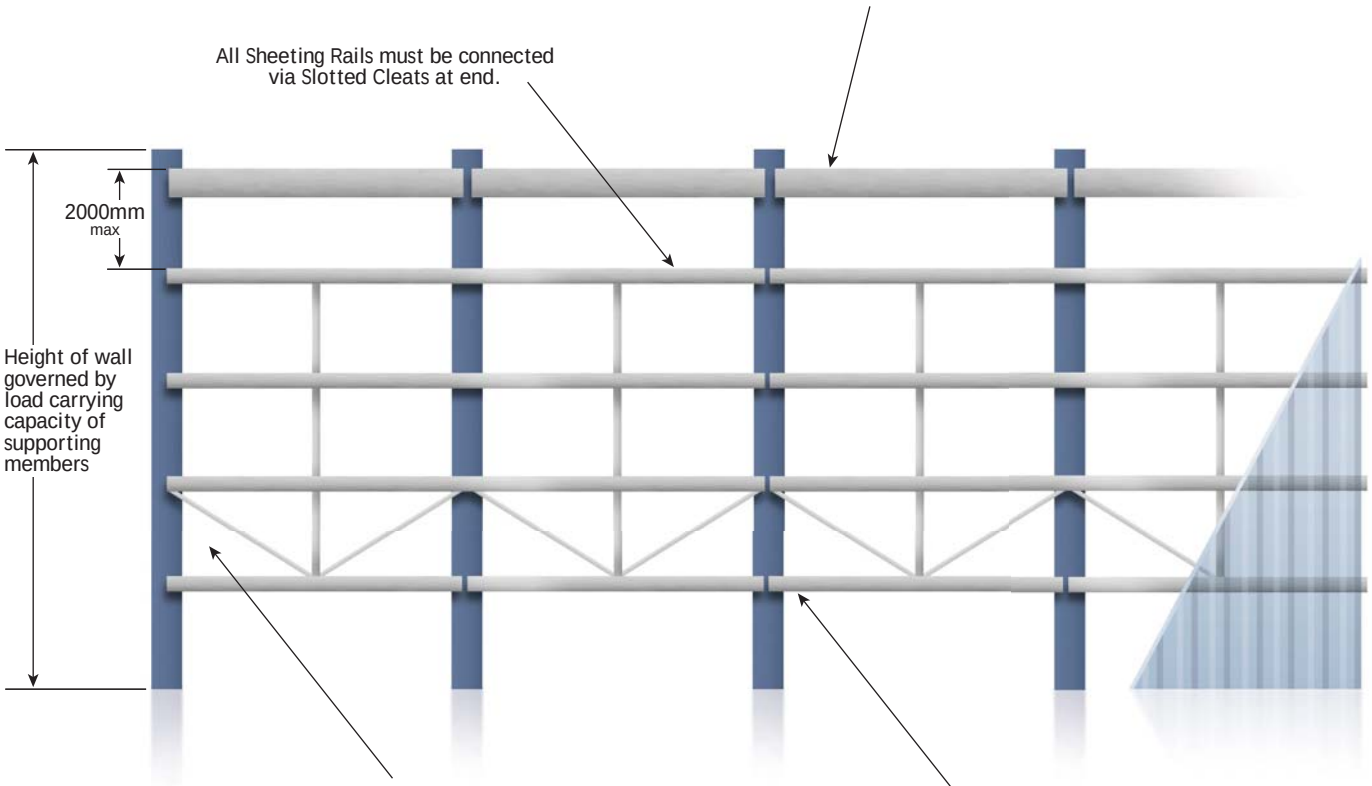
ii) Special column 'Firewall' (FW series) cleats incorporating slotted holes are used.

iii) All fixing bolts should be fitted with combustible washers which will soften under fire condition and allow the rail to freely expand.

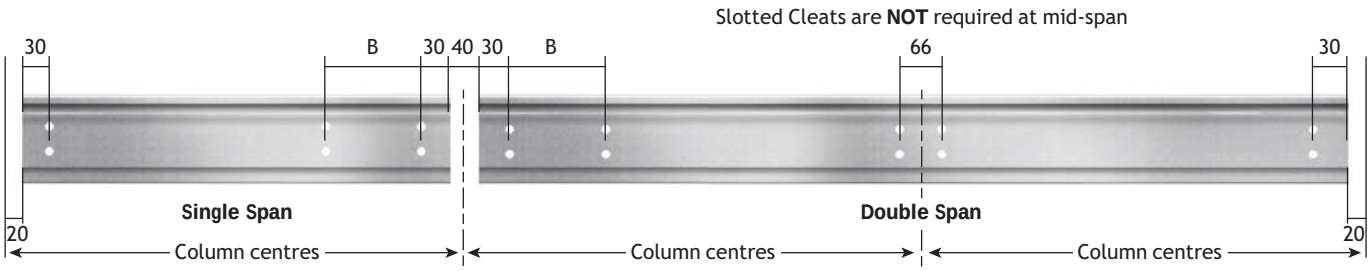
iv) Bottom sheeting rails should be single spanning. For purposes of design however, these rails may be sleeved using special 'Firewall sleeves' incorporating slotted holes. Double spanning rails (with expansion gap and slotted cleats) may be utilised elsewhere.

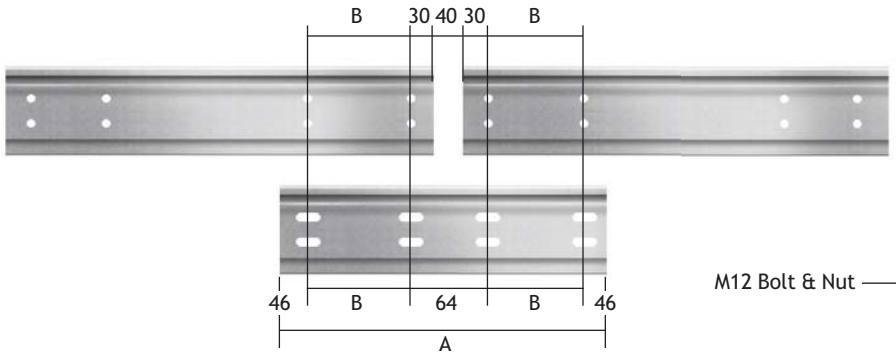
Design of a gable end condition should be considered in the same way as a side elevation with reference to the general design parameters listed above.

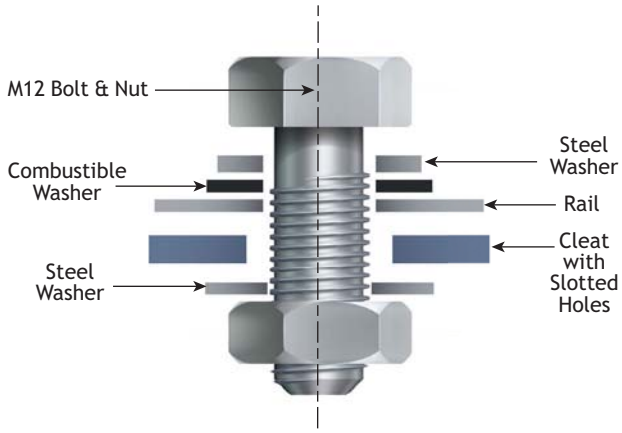
In the event of fire the Eaves Beam supports the Cladding and MUST BE FIRE PROTECTED.
NB: Intumescent paint is not deemed suitable for fire protecting cold roll-formed sections.
< = 2 hours fire protection - Cold Rolled Eaves Beam may be used.
> 2 hours fire protection - Hot Rolled Eaves Member only.



End hole details in **HADLEY** UltraZED™2 and **HADLEY** UltraBEAM™2 rail

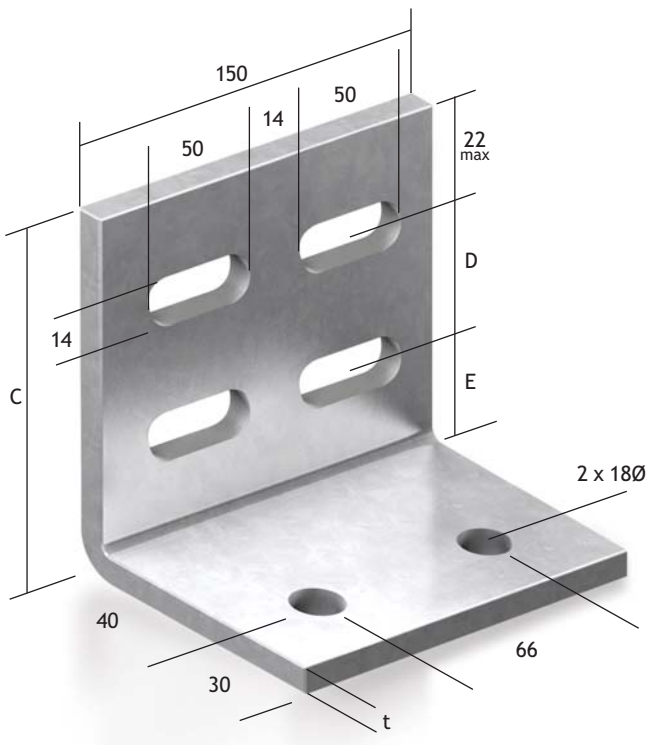






Firewall Sleeve Dimensions		
Section	Dimension A	Dimension B
145	630	237
170	730	287
200	880	362
225	1010	427
255	1130	487
285	1180	512
305	1260	552

Firewall Cleat Dimensions				
Ref	Dim C	Dim D	Dim E	Dim t
FW145	119	37	60	6
FW170	144	62	60	6
FW200	154	50	82	8
FW225	179	75	82	8
FW255	209	105	82	8
FW285	239	135	82	10
FW305	259	155	82	10



Side rail assemblies

Construction details

Prior to fixing cladding rails should be supported and levelled by one of the following methods:

i) Accurate spacing of rails should be achieved by the addition of side rail support struts at intermediate, one third or lesser points of spans. The type of strut required is determined by rail depth, spacing and cladding type/weight. Struts should be able to resist the compression, tension and torsional actions imposed during and after construction.

ii) Rails may be suspended from a suitable cold roll-formed or hot rolled eaves member.

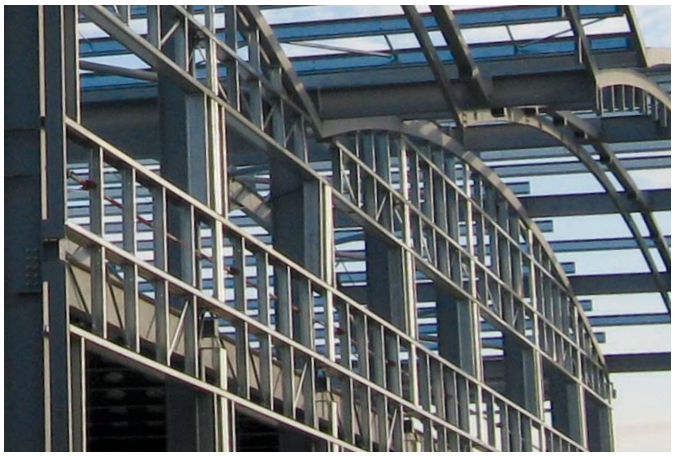
iii) Rails may be propped from a suitable safe structure.

iv) Rails may be supported by diagonal tie assemblies. Diagonal tie assemblies resist the vertical actions imposed by the self-weight of the rails and cladding prior to the attached sheeting forming a rigid diaphragm.

The sheeting rails encompassing the adjustable diagonal tie assemblies must be levelled prior to supporting additional rails.

UNDER NO CIRCUMSTANCES SHOULD DIAGONAL TIE ASSEMBLIES BE USED TO LEVEL MULTIPLE ROWS OF RAILS.

The included angle between diagonal tie assemblies and horizontal rails should not be less than 25°. If this occurs additional struts should be included. Alternatively, diagonal ties may be re-positioned to fall between rails spaced further apart.



Span mtrs	Section ref.	Strut type	Max strut length mm	Diagonal Tie assembly	Max height between assemblies*
Cladding weight <= 15kg/m^2 (screw fixed metal and composite cladding)					
<=6.1	145-255	TubeSTRUT	2500	DTW-TS	15mtrs
<=6.1	285-305	SRS	2000	DTW-SRS	15mtrs
>6.1-<=7.5	145-255	TubeSTRUT	2500	DTW-TS	15mtrs
>6.1-<=7.5	285-305	SRS	2000	DTW-SRS	10mtrs
>7.5	145-255	TubeSTRUT	2500	DTW-TS	15mtrs
>7.5	285-305	HDS + HD-DTB with	2500	HD-DTB	10mtrs
		SRS max 2000mm elsewhere	2000	N/A	N/A
Cladding weight > 15kg/m^2 - <=17kg/m^2 (screw fixed metal and composite cladding)					
<=6.1	145-255	TubeSTRUT	2500	DTW-TS	10mtrs
<=6.1	285-305	HDS + HD-DTB with	2500	HD-DTB	12mtrs
		SRS max 2000mm elsewhere	2000	N/A	N/A
>6.1-<=7.5	145-255	TubeSTRUT	2500	DTW-TS	10mtrs
>6.1-<=7.5	285-305	HDS + HD-DTB with	2500	HD-DTB	10mtrs
		SRS max 2000mm elsewhere	2000	N/A	N/A
>7.5	145-305	HDS + HD-DTB with	2500	HD-DTB	7.5mtrs
		SRS max 2000mm elsewhere	2000	N/A	N/A
Cladding weight > 17kg/m^2 (screw fixed metal and composite cladding)					
All spans	145-305	HDS Throughout	2500	HD-DTB	Contact Tech Dept.

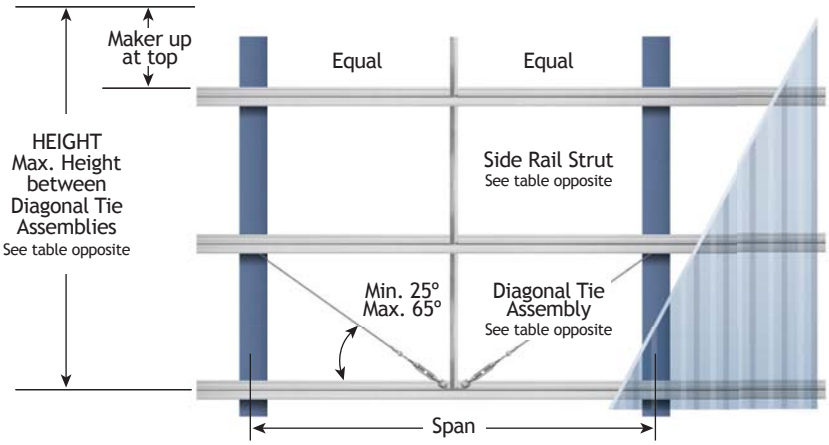
* Applies to struts in compression. If struts are used in tension (supported below diagonal tie assemblies) the maximum height should be restricted to 6mtrs.

WARNING: The recommendations above assume a diaphragm action from screw fixing metal cladding as typically provided by built up cladding systems and composite cladding less than 150mm deep and less than 17kg/m^2.

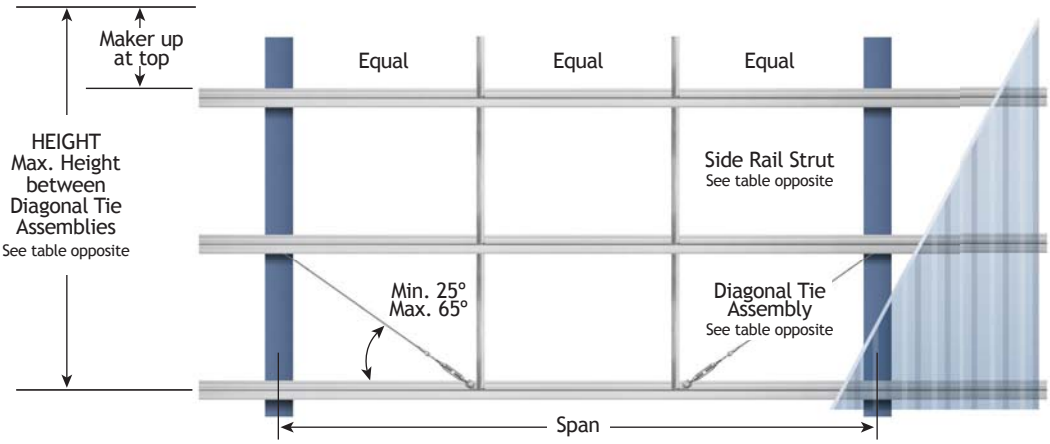
Increased insulation values and cladding construction thicknesses may fall outside such typical limits and additional information on construction details and installation requirements must be sought from the cladding manufacturer.

Some composite cladding panels, in particular those which exceed 17kg/m^2 and cement fibre sheets may require a structural support to facilitate installation and construction details.

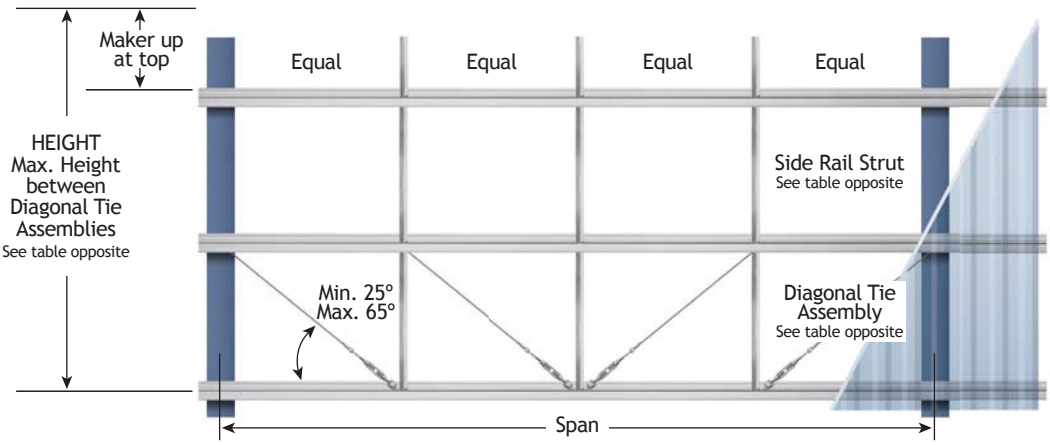
1 Span <=6.1m Screw Fixed Cladding. (<=5m Cement Fibre Cladding)



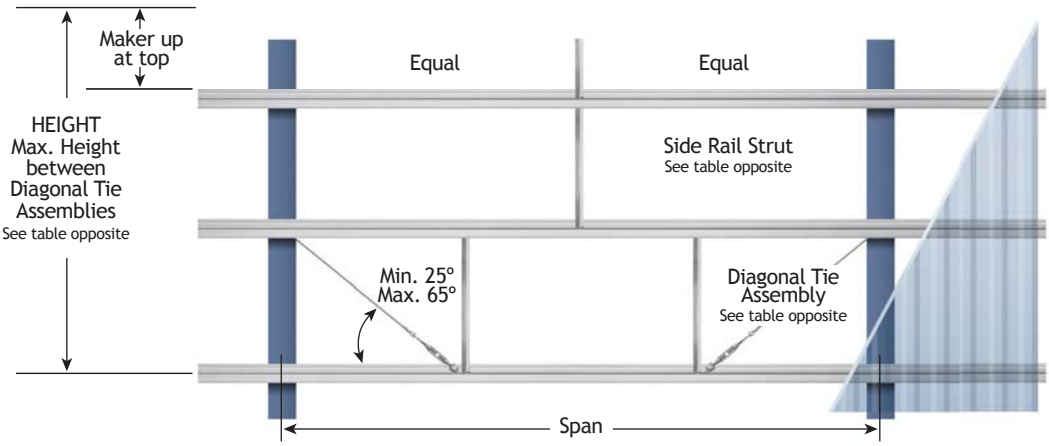
2 Span >6.1m-<=10m Screw Fixed Cladding. (>5m-<7.6m Cement Fibre Cladding)



3 Span >10m Screw Fixed Cladding. (>7.6m Cement Fibre Cladding)



4 Strut and Tie Assembly for close Rail spacing condition



TubeSTRUT strut and lateral restraint system

TubeSTRUT components offer noteworthy benefits over traditional angle struts or other products. **TubeSTRUT** is all steel in construction and utilises a robust, large diameter pre-galvanised steel tube with threaded male or female connections at each end.

TubeSTRUT is significantly quicker to install than bolted assemblies, robust enough to withstand typical site conditions and adequate for use in compression or tension with standard or countersunk holes.

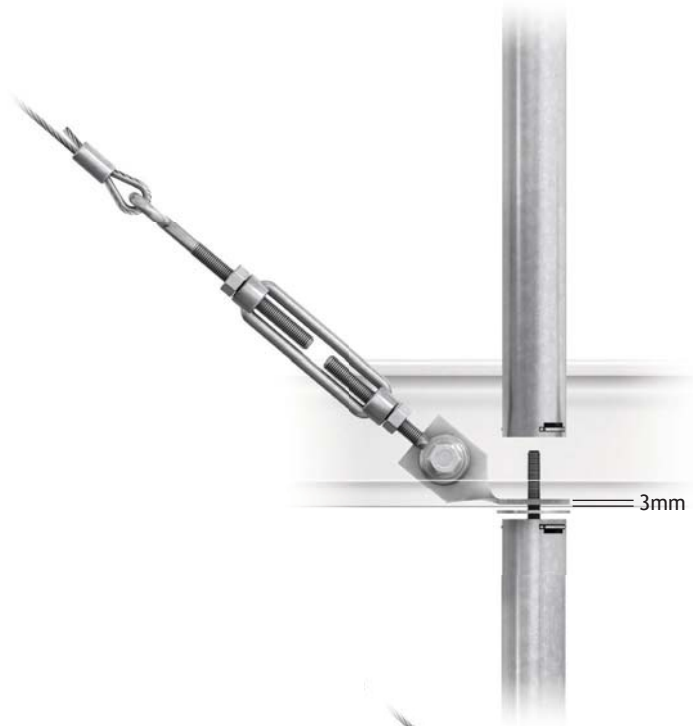
TubeSTRUT components are suitable for 145 – 255 series **HADLEY UltraZED™2** and **HADLEY UltraBEAM™2** side rails with screw fixed cladding weighing up to 17kg/m² (see guide on page 40).

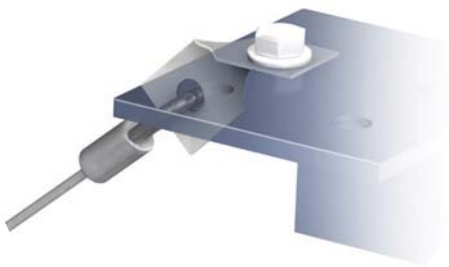
It is recommended (but not essential) that struts are installed male end uppermost with a M12 bolt fitted through the lowermost rail.

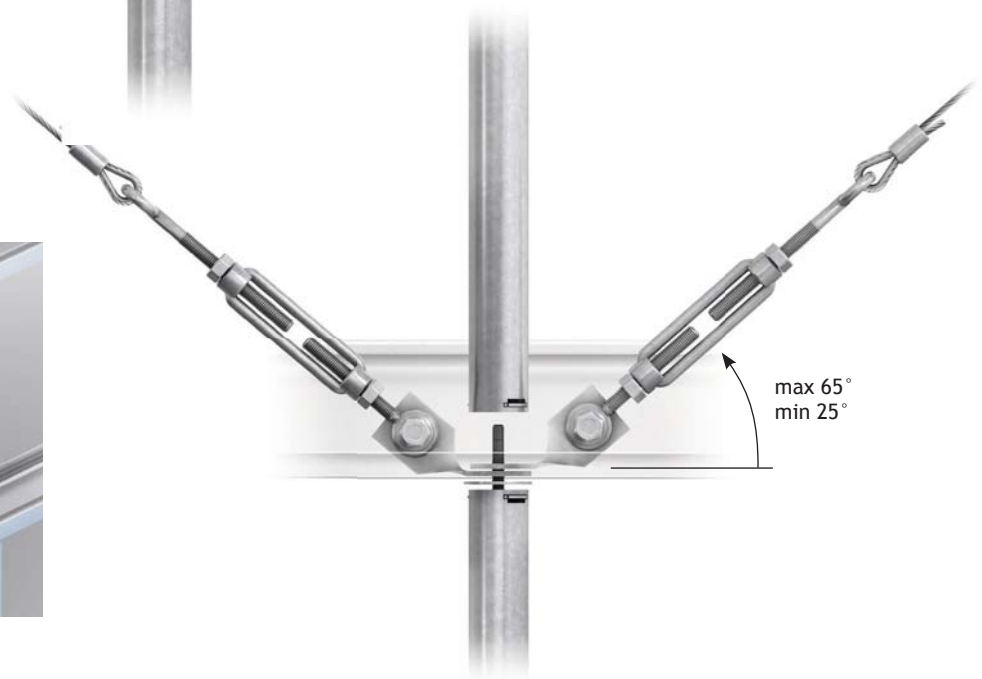
If using **TubeSTRUT** components with countersunk holes no length adjustment is necessary.

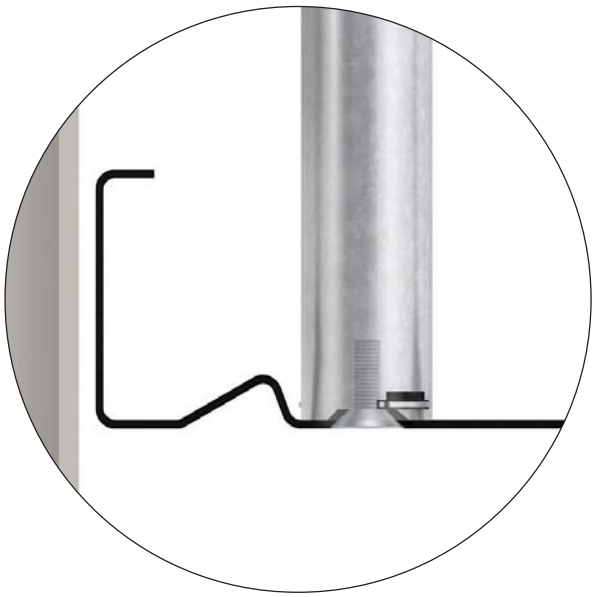
If the countersunk hole connection includes a diagonal tie assembly a SRS type strut should be fitted in lieu of the **TubeSTRUT**. Alternatively if construction details allow, the diagonal tie assembly may be redeployed to vertically adjacent rails so that it does not conflict with a countersunk hole.

Diagonal tie assemblies for use with **TubeSTRUT** components are designated DTW-TS and may be installed with the adjustable turnbuckle at either the **TubeSTRUT** or column cleat interfaces. To simplify and hasten adjustment we recommend that the turnbuckle is located adjacent to the strut.

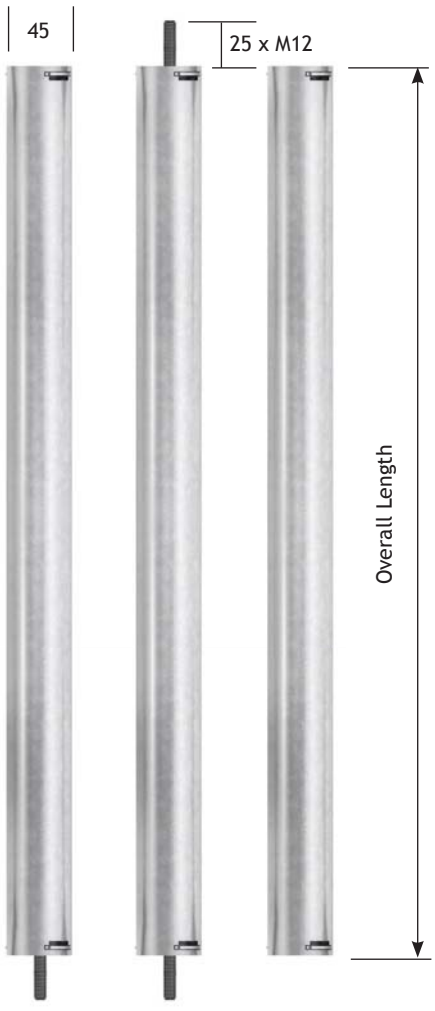









Cladding
Face


45
25 x M12
Overall Length
Type T
Type M
Type F

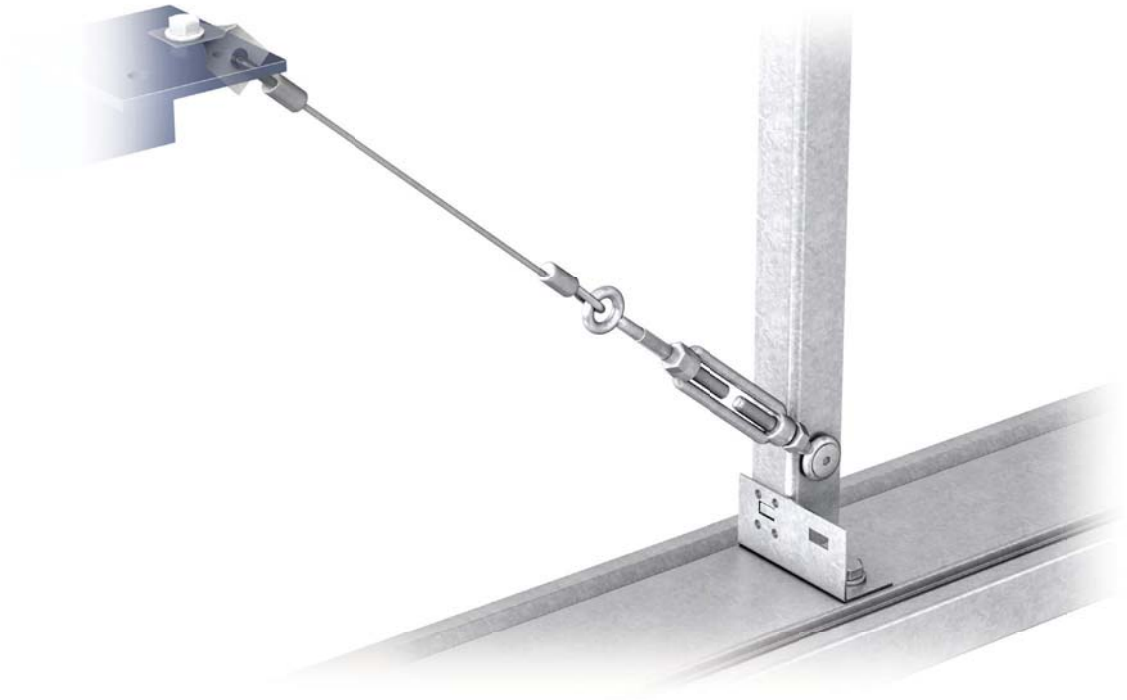
SRS angle strut and lateral restraint system

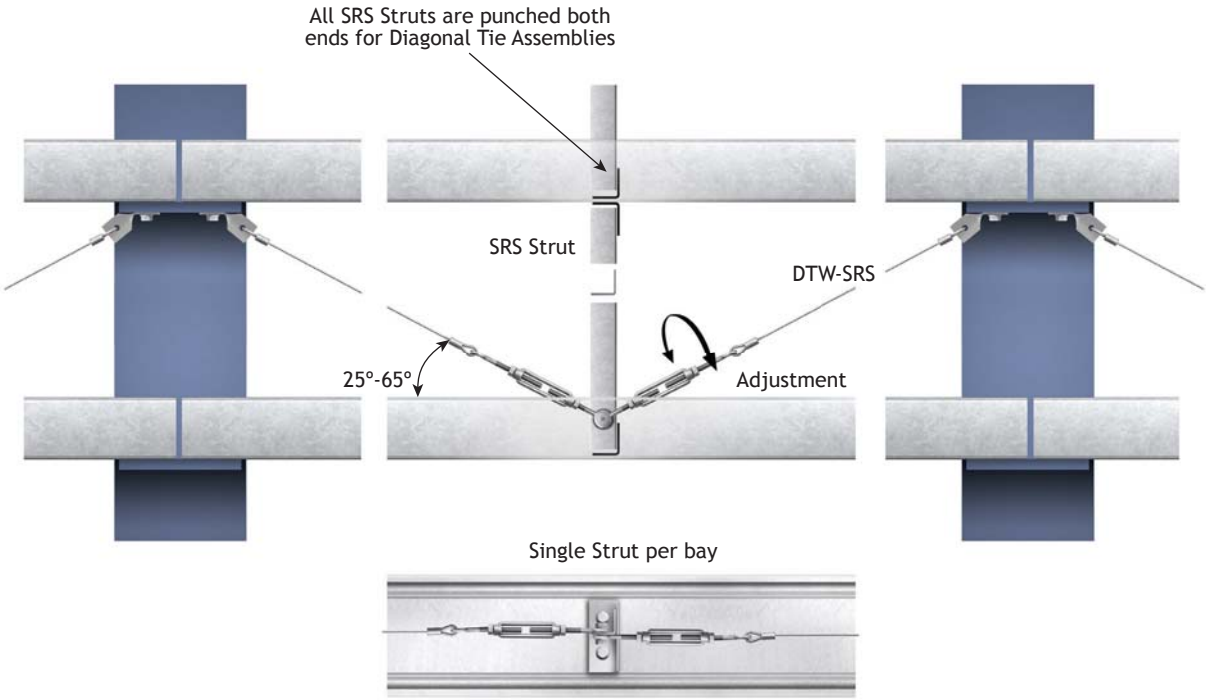
SRS angle struts and lateral restraints are used as outlined in the guide on page 40 and where a strut/diagonal tie assembly conflicts with a countersunk hole.

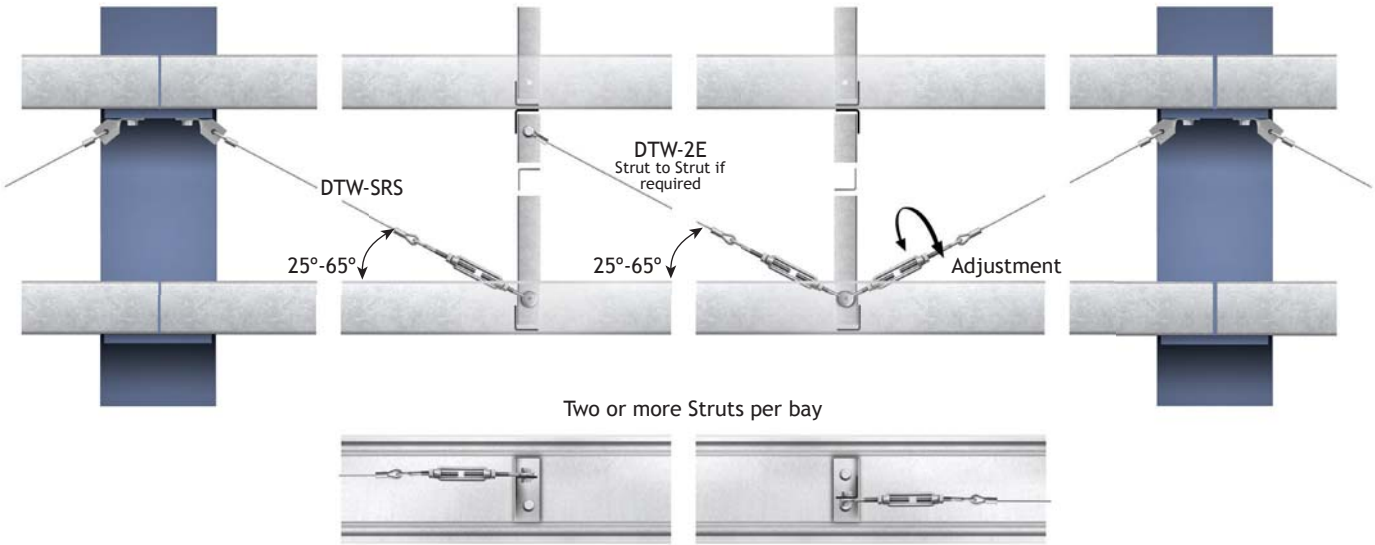
Where a single diagonal tie assembly is attached to a SRS it is vital that the SRS strut is orientated so that the force applied to the strut from the diagonal tie does not impose excessive shear load on the cleat joint - see illustration.

Diagonal tie assemblies for use with SRS components are designated DTW-SRS or DTW-2E – see illustration.

If installing SRS components in conjunction with countersunk holes the strut length should be reduced by 5mm per countersunk hole.




All SRS Struts are punched both ends for Diagonal Tie Assemblies
SRS Strut
DTW-SRS
25°-65°
Adjustment
Single Strut per bay


DTW-2E
Strut to Strut if required
DTW-SRS
25°-65°
25°-65°
Adjustment
Two or more Struts per bay

Heavy Duty Diagonal Tie Assemblies for use with Heavy Duty strut & Vertical Rail systems

For use with Heavy Duty strut & Vertical Rail systems.

Vertical Rails, Heavy Duty Struts and Heavy Duty Diagonal Tie assemblies are used as outlined in the guides on pages 40 and 57. They are designed to withstand larger imposed actions than other restraint systems.

Construction notes

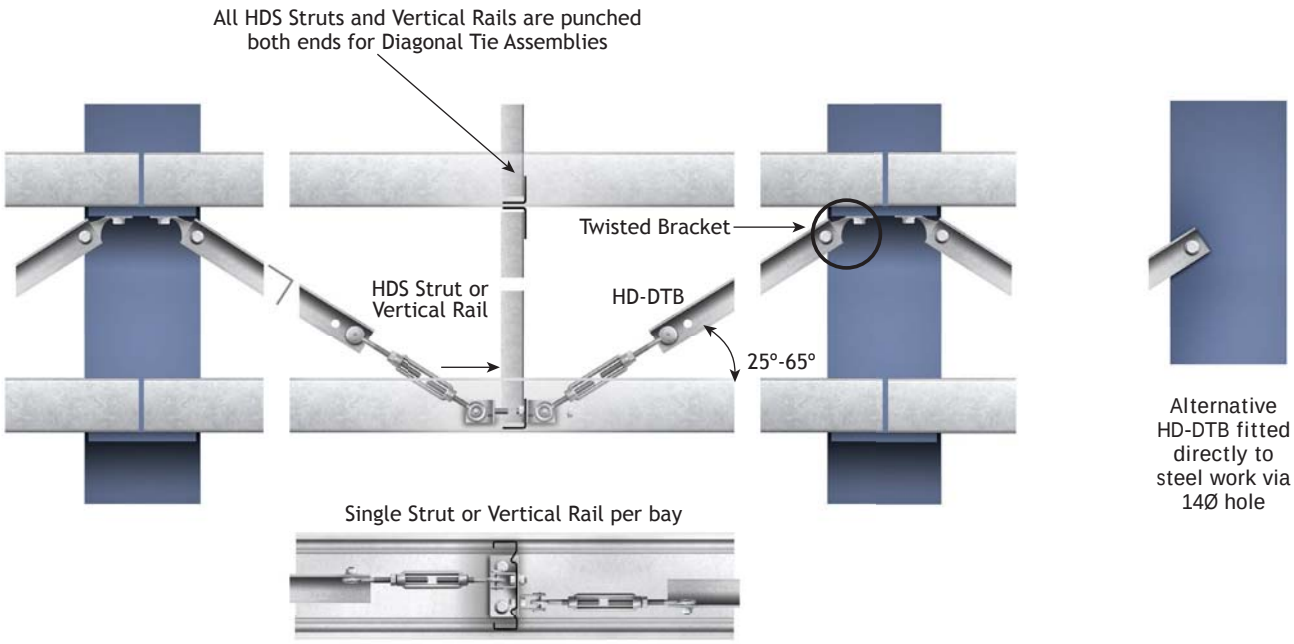
If a strut component is required to fit between horizontal rails that vary in depth but retain common sheeting faces a Vertical Rail assembly should be utilised.

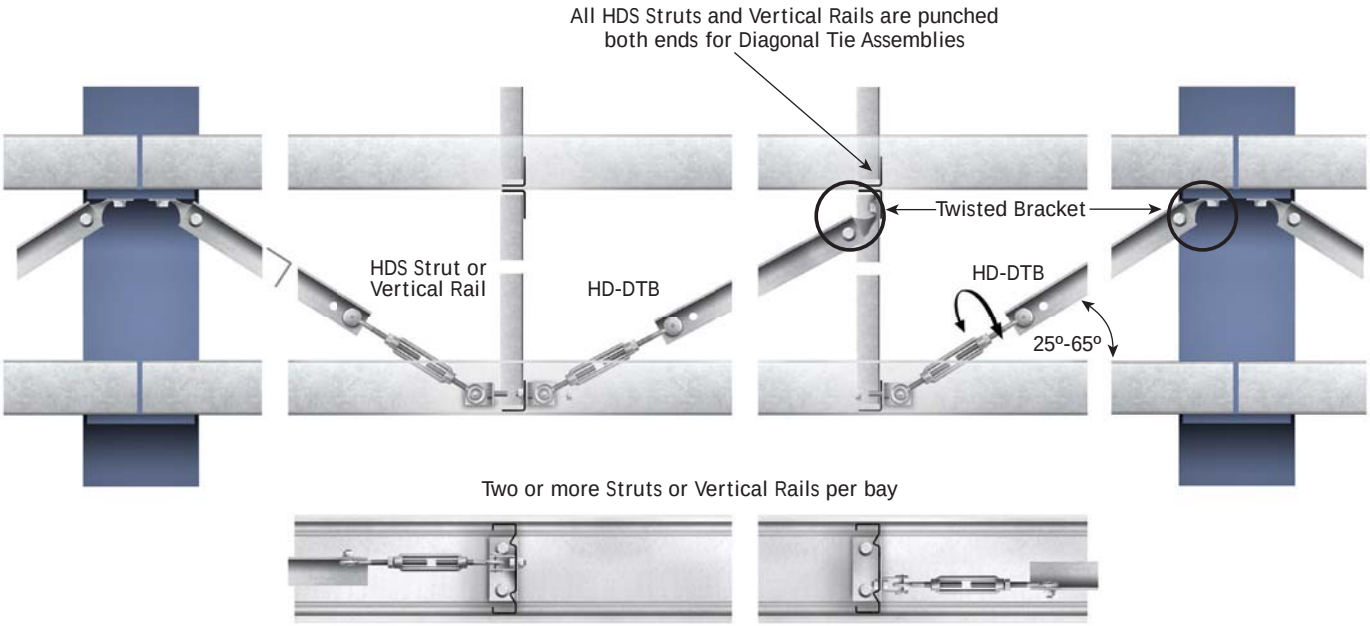
To ensure correct fit of diagonal tie assemblies all VR and HDS assemblies are detailed to be installed with the open face of the vertical section orientated to the left when viewed from outside of the building.

Diagonal tie assemblies for use with Vertical Rails and Heavy Duty Strut components are designated HD-DTB and may be connected via a bracket or directly to pre-drilled steelwork if preferred.

If installing VR or HD components in conjunction with countersunk holes the vertical length should be reduced by 5mm per countersunk hole.

Vertical Rails are manufactured from 145 series **HADLEY UltraBEAM™2** section with an appropriate cleat connection at each end. End cleats are supplied factory assembled as standard but may be site bolted if required. See page 50 for full details.

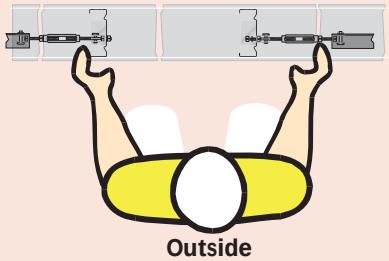




Heavy Duty Strut References		
Horizontal Rail Series	**Strut Section**	**Strut Reference**
145	70 x 70 angle	HDS145
170	145 UltraBEAM™2	HDS170
200	145 UltraBEAM™2	HDS200
225	145 UltraBEAM™2	HDS225
255	170 UltraBEAM™2	HDS255
285	170 UltraBEAM™2	HDS285
305	170 UltraBEAM™2	HDS305

Note: Construction/Details

To ensure correct selection of Diagonal Tie Assemblies during construction of Side Rail System all HDS Struts and VR Rails should be orientated as detailed.



ie:- Open side of vertical section to left when viewed from outside of building.

Horizontal composite cladding panel support

Horizontally laid composite cladding requires special consideration which will vary according to manufacturer, system details and construction features. **Users are strongly recommended to check the requirements of the proposed cladding system with the cladding manufacturer.**

There are two principal construction methods available, both of which have certain benefits and limitations.

Conventional side rail with 'follow-on trade' fitted top hat section

One option is to utilise a standard side rail system with vertical top hat sections (supplied by others) screw fixed to the side rail outer flanges. This has the benefit of fewer components and lower cost, allied to a flexible method of installation that is unhindered by predetermined design limitations. However, the overall depth of wall is increased.

Construction and design considerations for this method are shown on page 55.

Inset Vertical Rail system

The second option necessitates that all cladding joint positions are finalised prior to final steelwork details. This facilitates the use of an inset vertical rail system. Our solution is comprehensive, simple and flexible and does not compromise the layout of the primary steelwork.

The inset system of vertical rails comprises of three main components that may be utilised in various combinations to provide a wide variety of options for attaching horizontal cladding dependent upon the cladding requirements and the location of that requirement in relation to the steelwork. The three components are:

i) **Vertical Rail (VR)** Page 50. A length of **HADLEY UltraBEAM™2** section that fits in-between the horizontal **HADLEY UltraZED™2** or **UltraBEAM™2** side rails to which the horizontal cladding panels are attached. VR sections can be incorporated at any position between the primary columns and includes points for diagonal tie system attachment. Vertical 145 rail sections may also be attached to column faces by 'wing cleats' - see page 51.

ii) **Panel Connecting Rail (PCR)** Page 53. A length of **UltraBEAM™2** section presented so that its widest element forms a sheeting face where two cladding panels join together. Dependent upon the cladding type the dimension of this sheeting face may need to be at least 150mm. Panel Connecting Rails may be installed at any position located between or at the column faces. Panel Connecting Rails are relatively shallow compared to the horizontal rails and this allows for the diagonal tie assemblies to pass behind them.

Panel Connecting Rails cannot function as a strut to support vertical loads.

iii) **Panel Connecting Strut (PCS-VR)** Page 52. A composite 'T' section formed from a Vertical Rail with a channel section attached to its outer flange and presented so that its widest element forms a sheeting face where two panels join together. Unlike a PCR it is designed to function as a strut to support vertical loads. For added simplicity, vertical lengths (max 6 metres long) of PCS-VR section can also be affixed by 'wing' cleats connected to a column face - see page 51.

Vertical Rails, Panel Connecting Rails and Panel Connecting Struts are all supplied with cleats attached. Cleats may be supplied loose for on-site assembly or omitted to suit customer requirements.

Design

Use **HADLEY Design Suite PRO** Design Software to quickly determine the correct section and system requirements for **UltraBEAM™2** and **UltraBEAM™2** products to support horizontally laid cladding.

Maximum horizontal rail span without Vertical Rail or Panel Connecting Strut = 3.05mtrs

Wind action design capacity of horizontal rails are as published.

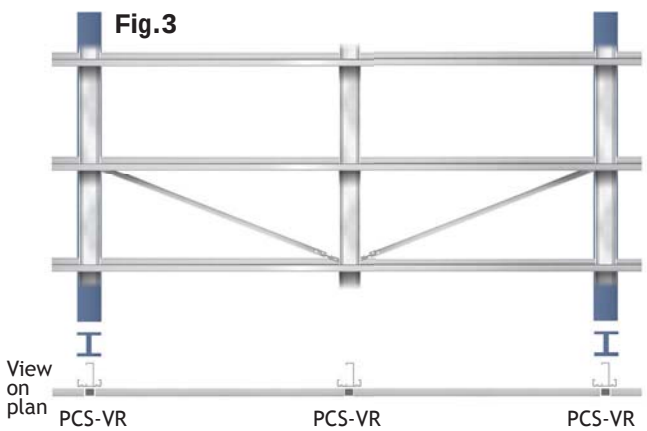
Maximum cladding height between additional HD-DTB diagonal tie assemblies

Horizontal rail span up to 6.1 metres max height = 12 metres
Horizontal rail span up to 7.5 metres max height = 10 metres
Horizontal rail span up to 10 metres max height = 7.5 metres

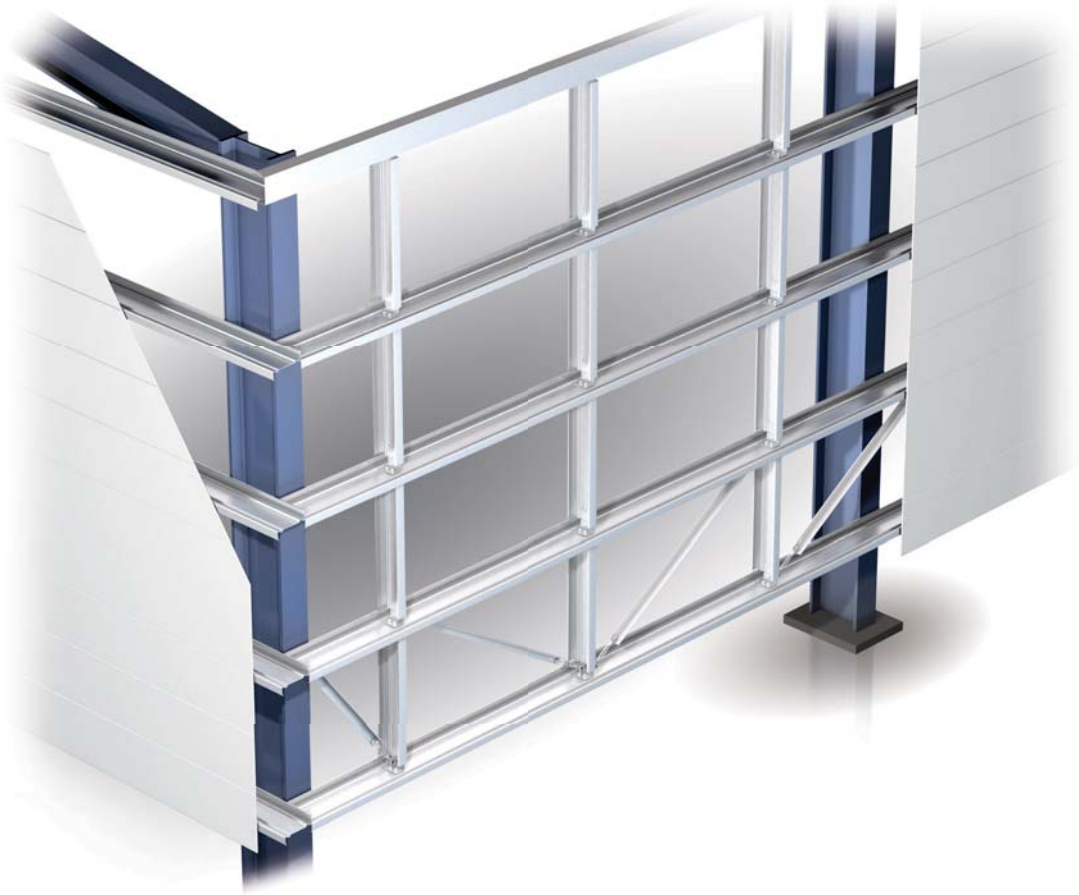
WARNING: Some composite cladding panels - in particular those which exceed 17kg/m² may require a structural support to facilitate installation and construction details.

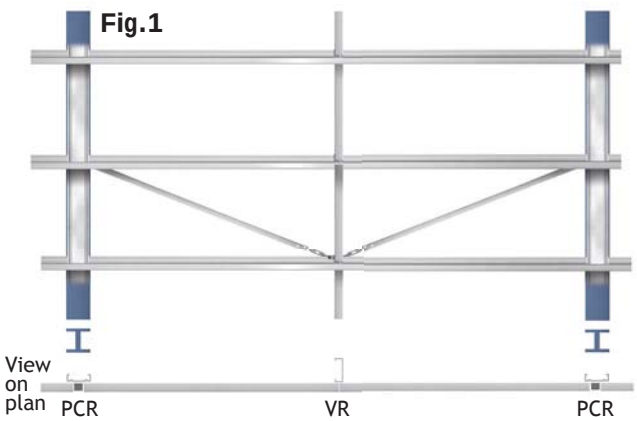
Typical Arrangements

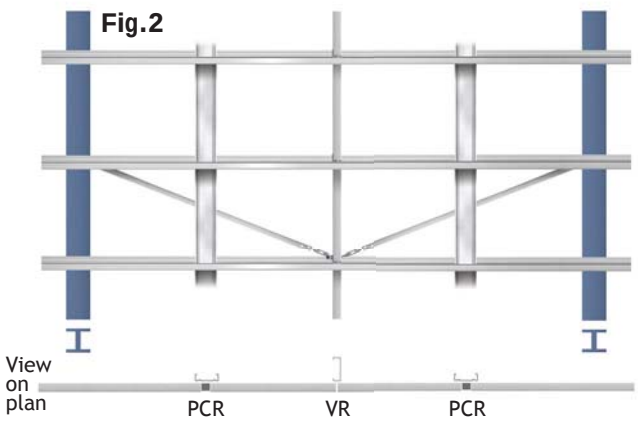
Fig.3

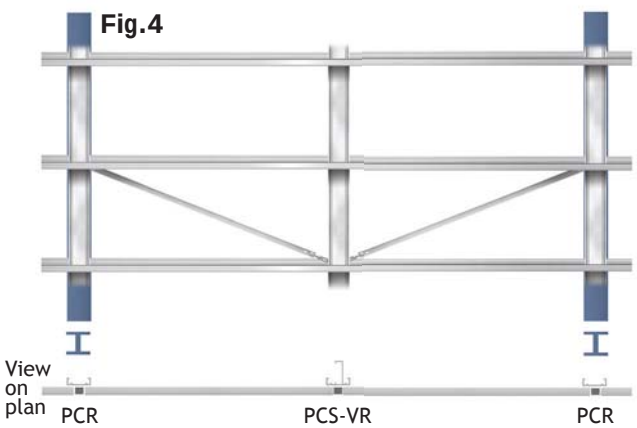


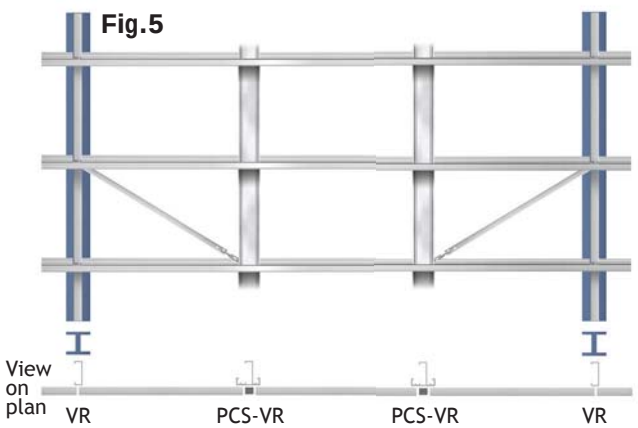
Typical Arrangements







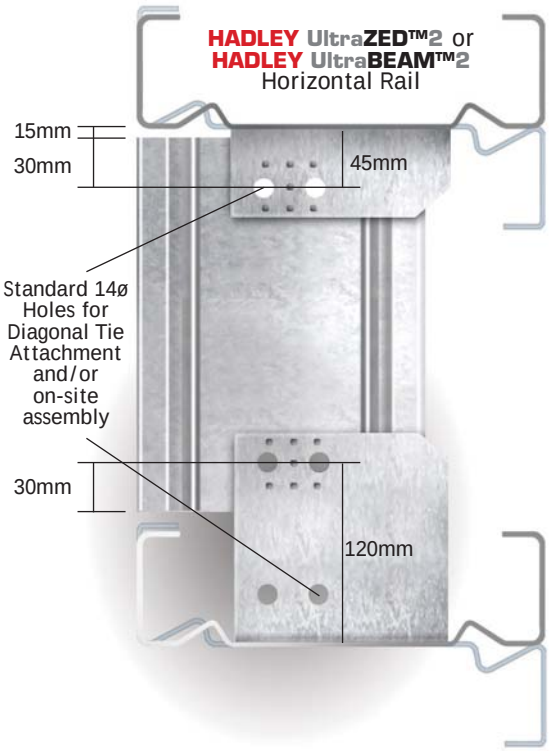


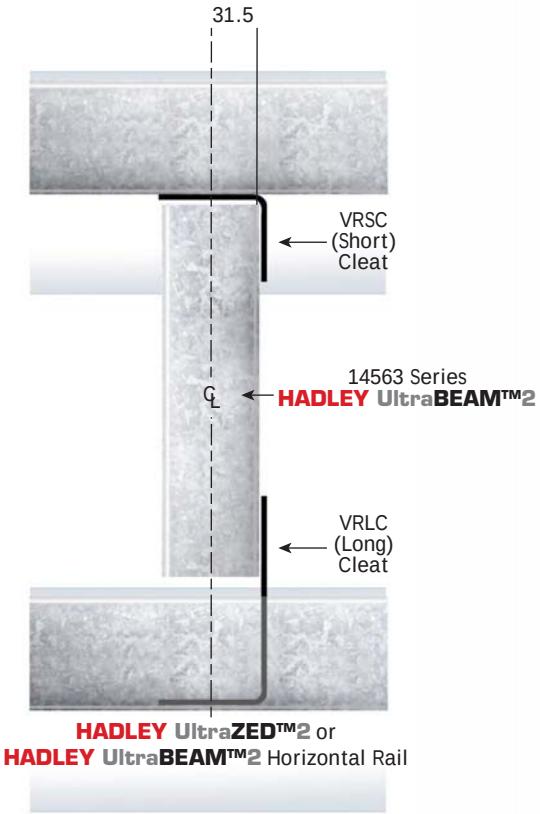


Vertical Rails - inset between horizontal rails

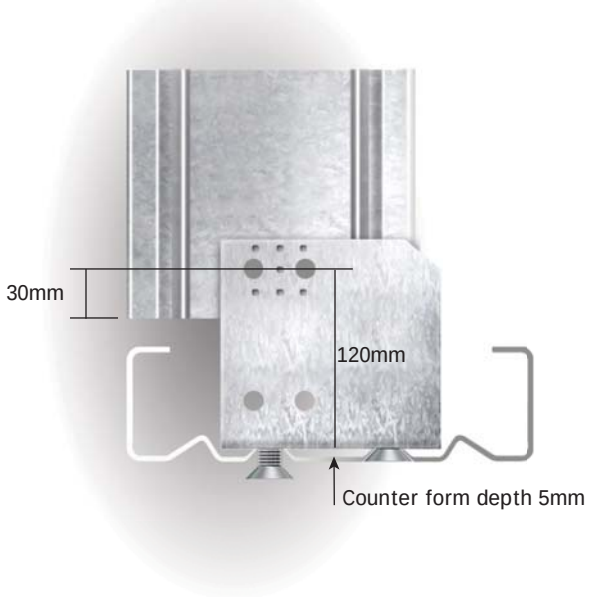
Vertical Rail (VR) A length of **HADLEY UltraBEAM™2** section that fits in-between the horizontal **UltraBEAM™2** or **UltraBEAM™2** side rails to which the horizontal cladding panels are attached.

VR sections can be incorporated at any position between the primary columns and includes points for diagonal tie system attachment.





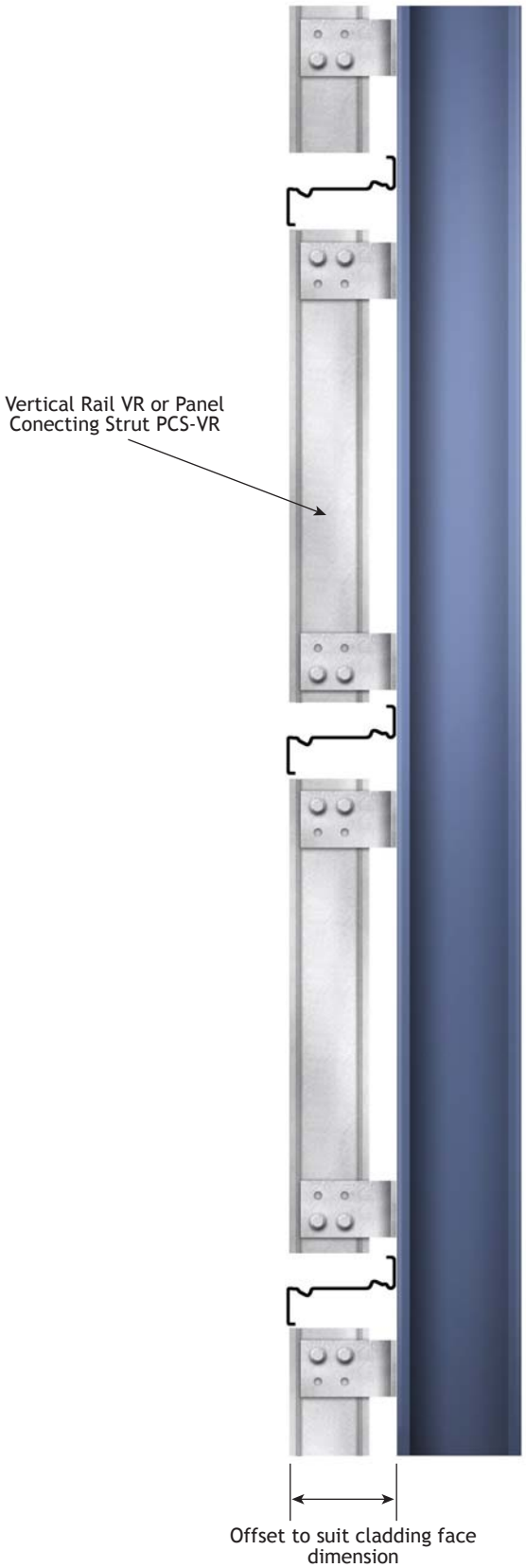
Counter formed hole detail
HADLEY UltraBEAM™2 ONLY



145 UltraBEAM™2 Series VR Assembly			
Horizontal UltraZED™2 or UltraBEAM™2 Rail	Vertical Rail	Short Cleat	Long Cleat
145	VR145/145	VRSC145 UltraBEAM Horizontal Rail Only*	VRLC145
170	VR145/170	VRSC170	VRLC170
200	VR145/200	VRSC200	VRLC200
225	VR145/225	VRSC225	VRLC225
255	VR145/255	VRSC255	VRLC255
285	VR145/285	VRSC285	VRLC285
305	VR145/305	VRSC305	VRLC305

* VRSC145 not available with **UltraZED™2** Horizontal Rail.
Use VRLC145 both ends with **UltraZED™2** Horizontal Rail.

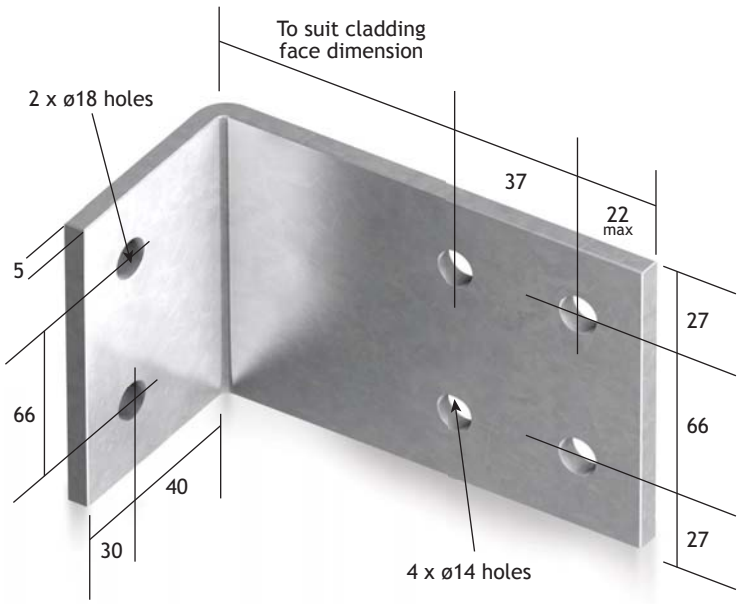
Vertical Rails VR and Panel Connecting Strut PCS-VR
Column face connection



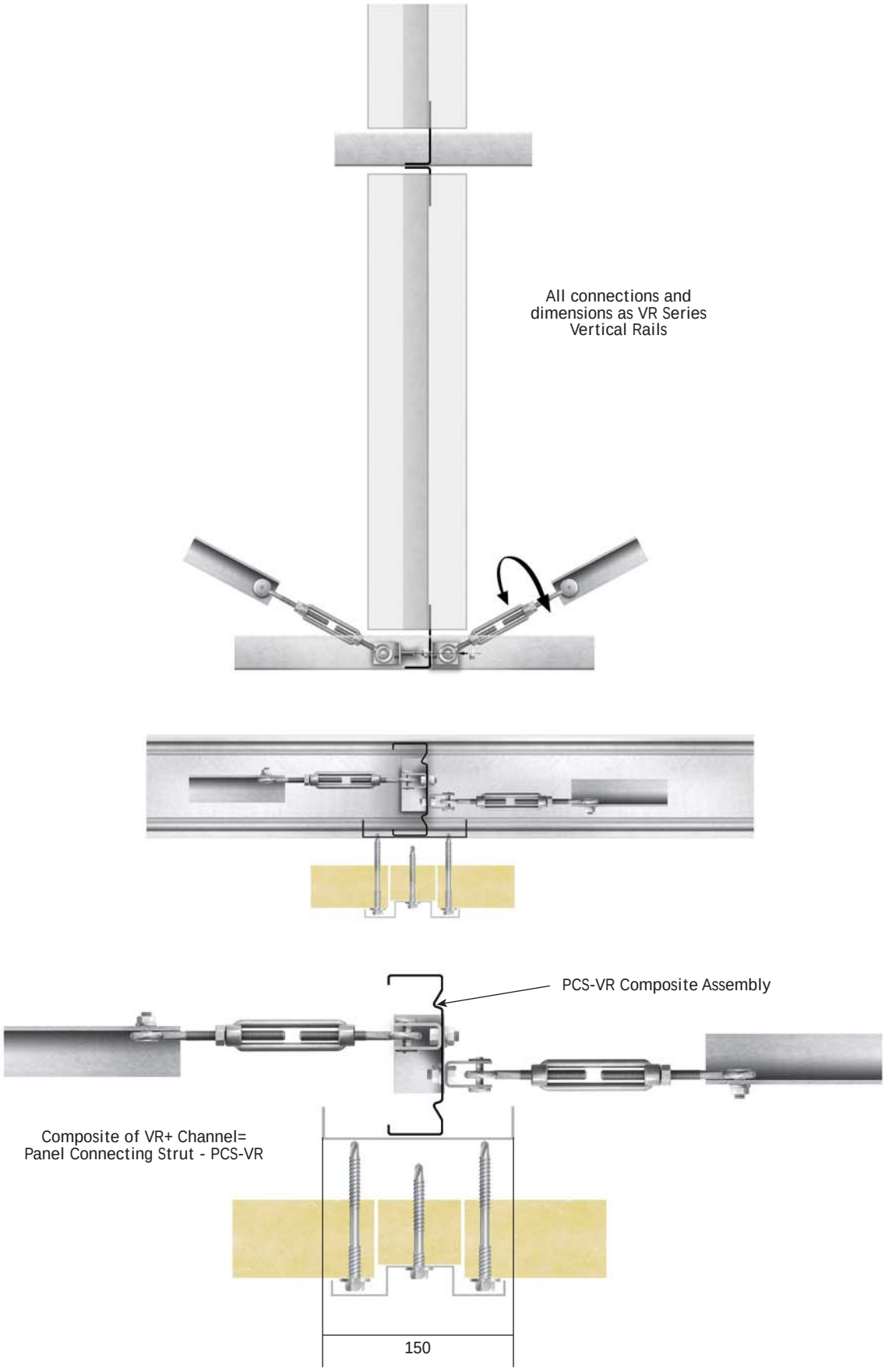
To minimise component parts and simplify installation Vertical Rails and Panel Connecting Struts may be installed between horizontal rails via bolt on or weld on 'wing cleats' attached to the column face.

Vertical rail sections are connected by 2 x M12 bolts at each end. The 'wing cleat' is usually detailed with 4 x Ø14 holes as shown below with only the outer pair of holes utilised at the end connections. VRCB cleats are galvanised and supplied to special order to suit customer requirements.

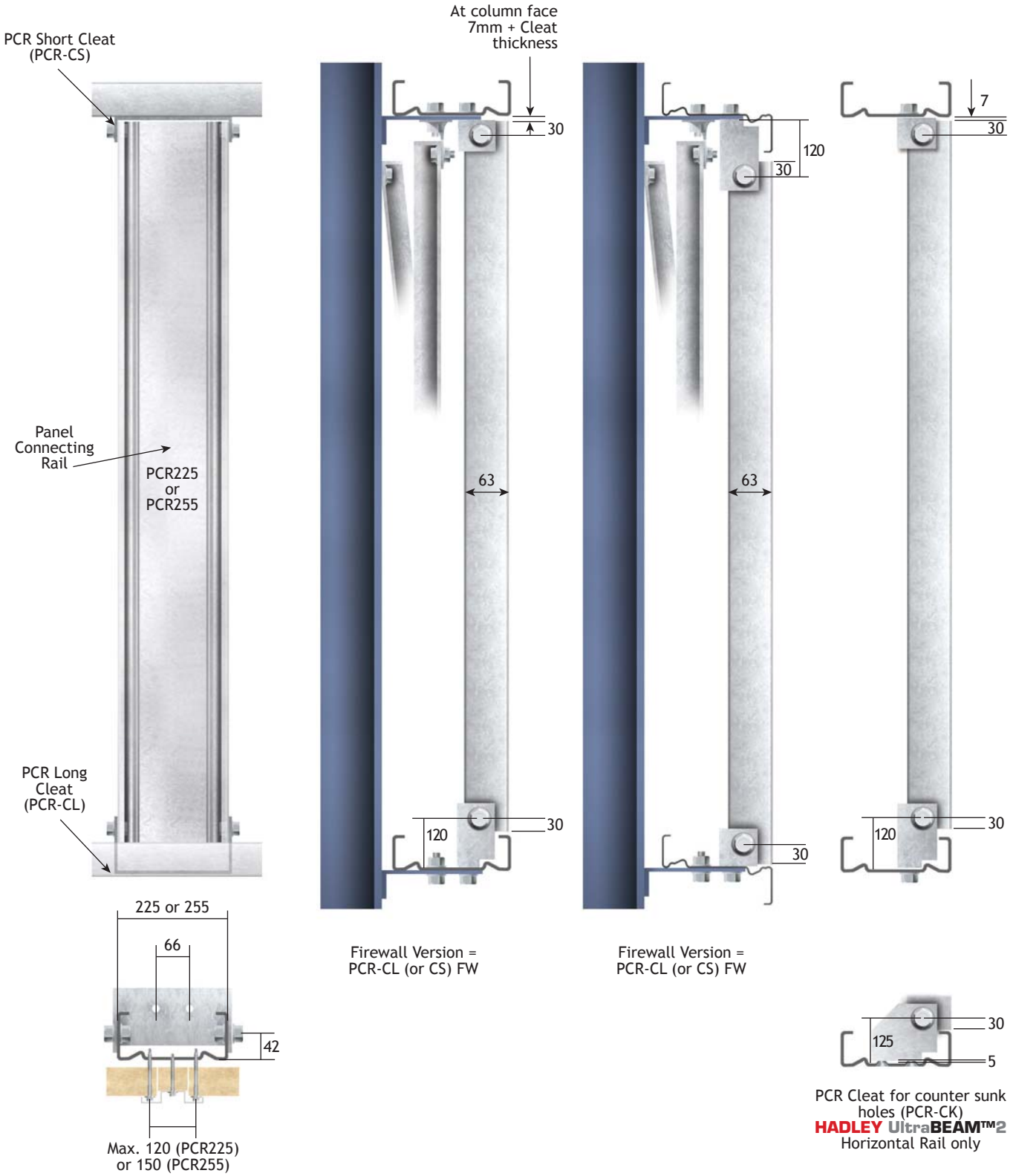
VRCB (Special order cleat)



Panel Connecting Strut - PCS-VR
Inset Rail Connection



Panel Connecting Rail - PCR



NB: The standard 30mm end piercing dimensions shown above may vary when detailing PCR products in 3D parametric modelling software that applies a pre-defined or user-defined gap between the PCR and the horizontal rail.

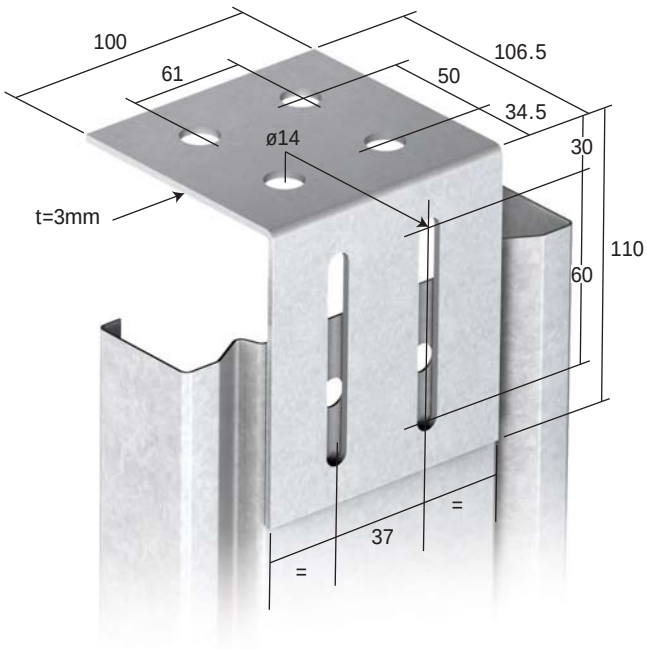
Horizontal composite cladding panel support system connection to Eaves Beam

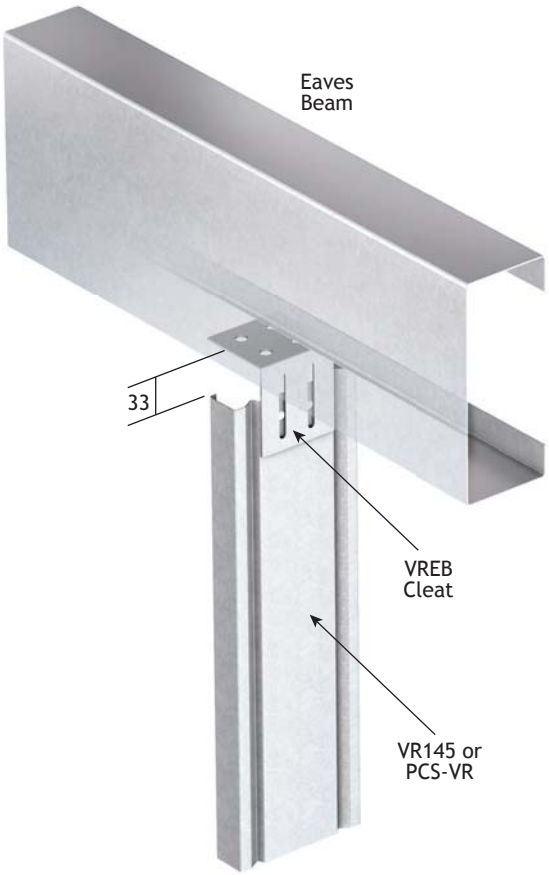
The VREB and PCR-EB connection cleats are designed to facilitate the connection between a cold roll-formed eaves beam and the horizontal cladding support system. They bolt to the lower flange of the eaves beam via standard flange holes.

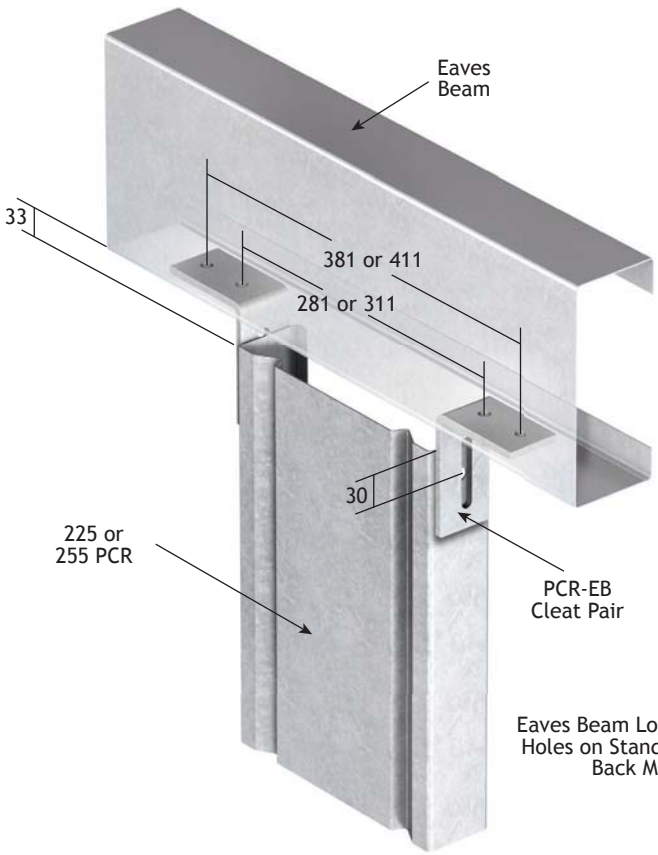
VREB and PCR-EB connection cleats are designed to resist lateral wind action, they are not designed to support the rail system from an eaves beam and must be utilised in conjunction with a Heavy Duty Diagonal Tie system.

Slotted holes in the vertical connection cater for vertical adjustment and levelling of the horizontal rails. Bolts should be tightened after final horizontal rail levelling adjustments have been made.

VREB and PCR-EB cleats are supplied as factory assembled components.







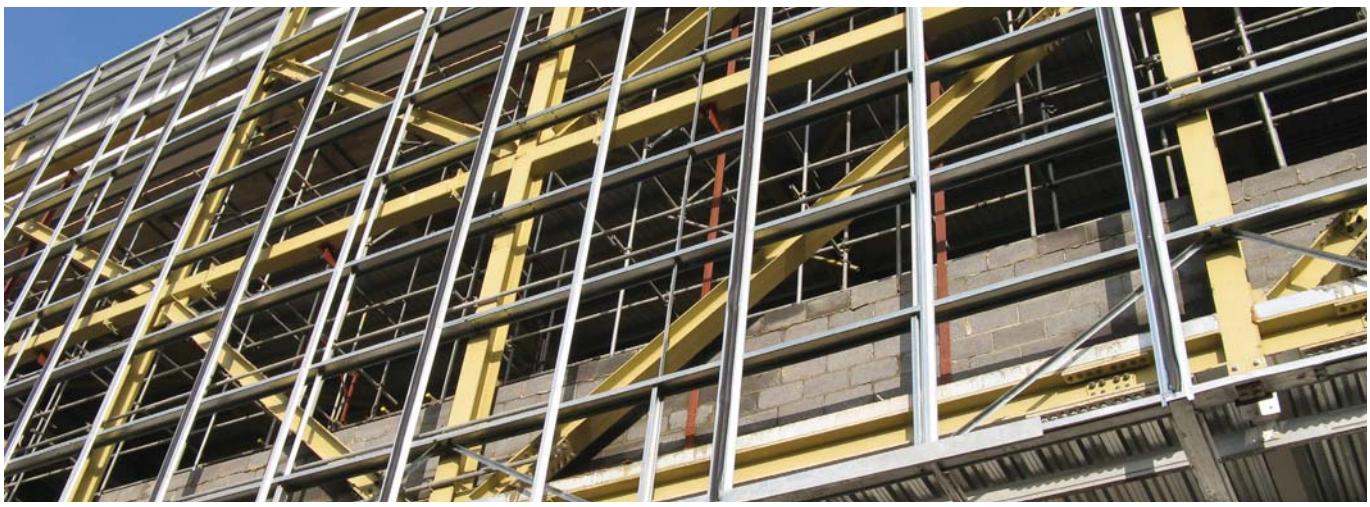
Eaves Beam Lower Flange Holes on Standard 42mm Back Mark

Top hat profile oversail system

Using self-drilling fasteners to fix top hat profiles (supplied by others) to a conventional **HADLEY UltraZED™2** or **HADLEY UltraBEAM™2** side rail system is an alternative that may be considered to an inset vertical rail system.

This solution eliminates the necessity to predetermine layout of the cladding panels prior to detailing the steelwork and is viable where the responsibility for the vertical rail system falls upon a third party such as the sheeting contractor.

A Heavy Duty Diagonal Tie system should be utilised in conjunction with Heavy Duty Struts with **TubeSTRUT**, SRS or HDS struts utilised throughout the remainder of the elevation as tabulated on page 40.



Vertical clip fixed (standing seam) cladding

Vertical cladding attached to horizontal rails by a clip system means that the vertical weight of the cladding is supported at its lowest point. This may result in the bottom sheeting rail being subjected to lateral loading transmitted via a ledger angle used to support the cladding. This requires the bottom sheeting rail to be stiff enough to withstand torsional and bending actions.

Design

The bottom rails should be a minimum 1.8mm thick and the wind action design capacity of the bottom rail reduced by 50%.

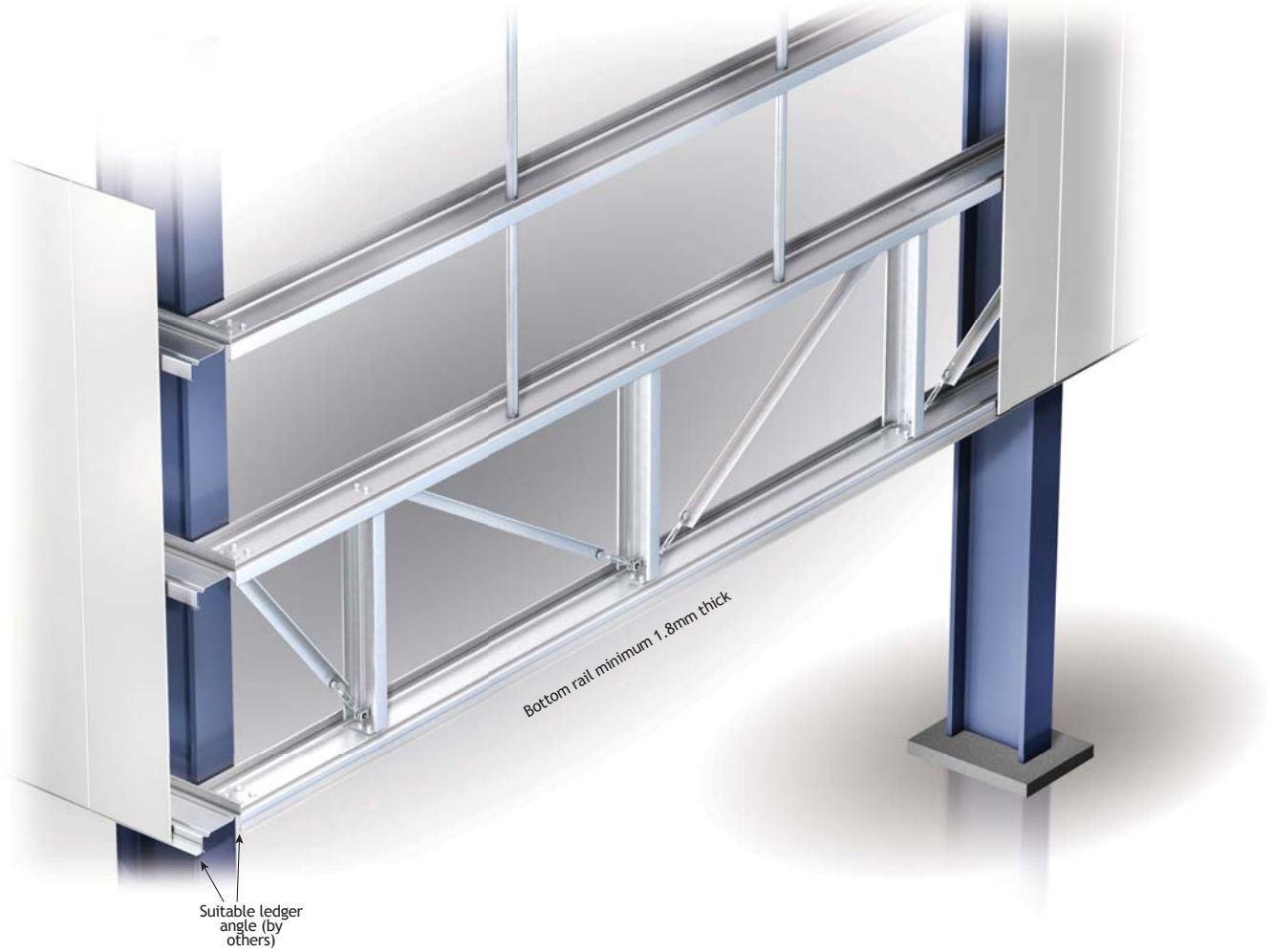
Wind action design capacity of horizontal rails is as published.

A Heavy Duty Diagonal Tie system should be utilised in conjunction with Heavy Duty Struts with TubeSTRUT, SRS or HDS struts utilised throughout the remainder of the elevation as tabulated on page 40.

Maximum cladding height between additional HD-DTB assemblies:

Horizontal rail span up to 5 metres max height = 8 metres
Horizontal rail span up to 7.5 metres max height = 7 metres
Horizontal rail span up to 10 metres max height = 6 metres

The above recommendations assume a maximum cladding weight of 17kg/m². Where wall height exceeds the maximum height shown the ledger supporting detail and inclusion of HD-DTB's must be repeated. If construction details prohibit this, a structural supporting beam must be utilised to support the full height cladding weight.



Window and opening trimmers

HADLEY **UltraBEAM™2** side rails utilised with **UltraBEAM™2** window and opening trimmers offer an unrestricted flat surface necessary for fixing windows, louvres, doors, claddings and associated flashings. The trimmer section is usually the same depth section as the adjoining rail.

Trimmers are supplied fully assembled with cleats factory bolted in place using countersunk headed bolts for a flush internal face. Cleats can be supplied loose for site assembly if required. Bolted connections in **UltraBEAM™2** rails that could intrude into an opening may also be counter sunk to provide a flush fixing surface.

Window openings

Design of side rails to support glazed windows needs careful consideration and is dependent upon several factors in combination. The window weight and its construction, rail span and cladding type should all be considered.

The rail supporting the window requires bracing against the moment induced by the weight of the window. This is invariably offset from the centre axis of the sill rail with the vertical weight supported by lateral restraints in conjunction with diagonal tie assemblies or a suitable structure.

Single unit windows

A single window unit requires vertical trimmer rails installing adjacent to the window jambs, the presence of these trimmers help restrain the rail against rotational twisting forces and can help reduce reliance on the support struts alone.

Ribbon windows

Ribbon windows are designed as continuous units – often spanning between columns without vertical trimmers being required. This necessitates additional strut and bracing to the sill support rail. The rails above the window cannot be supported off the window and these will therefore require independent bracing supports.

Design

Glazing is intolerant of excessive movement and the deflection of the flanking side rails should be designed accordingly. It is normal to limit the deflection of window sill and head rails under wind action to span/360 or better.

The tabulated design guide outlines the strut and bracing requirements for both window types with consideration to rail span, window weight and cladding type and weight. **HADLEY** **Design Suite PRO** Design Software should be used to select and specify the correct rail and bracing solution.

Typical glazing weights are tabulated within the design guidelines based upon 4mm glass which has an approximate weight of 12kg/m². It is usual to assume that double glazed units with twin 4mm layers of glass weigh 24kg/m² (0.23kN/m²). For thicker glass or units made up of more than two layers these weights should be increased accordingly.

Window weight is assumed to be carried within the depth of the side rails and supported by struts. For eccentric loads please contact our technical department.

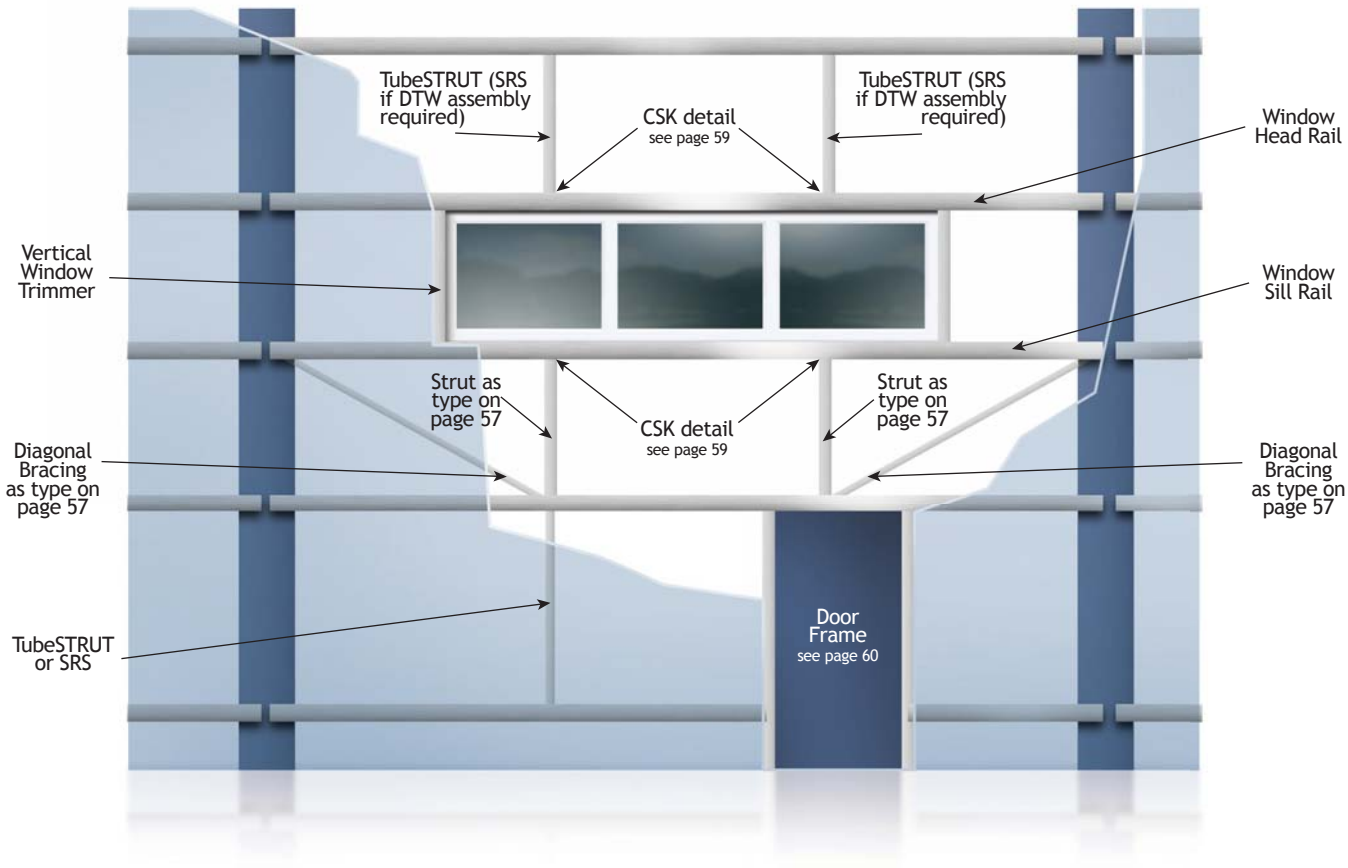
Window weight <= 0.12kN/m run			Window weight >0.12- 0.5kN/m run		
Single unit windows - screw fixed cladding			**Single unit windows - screw fixed cladding**		
Span mtrs	**Strut number type**	**Diagonal tie assembly**	**Span mtrs**	**Strut number type**	**Diagonal tie assembly**
<=6.1	1 **TubeSTRUT** or SRS	DTW	<=6.1	1 HDS	HD-DTB
>6.1 - <=9	2 **TubeSTRUT** or SRS	DTW	>6.1 - <=9	2 HDS	HD-DTB
>9	3 **TubeSTRUT** or SRS	DTW	>9	3 HDS	HD-DTB
Ribbon windows - screw fixed cladding ALL windows -unrestrained cladding			**Ribbon windows - screw fixed cladding ALL windows -unrestrained cladding**		
Span mtrs	**Strut number type**	**Diagonal tie assembly**	**Span mtrs**	**Strut number type**	**Diagonal tie assembly**
<=6.1	1 HDS	HD-DTB	<=5	1 HDS	HD-DTB
>6.1 - <=9	2 HDS	HD-DTB	>5 - <=7.5	2 HDS	HD-DTB
>9	3 HDS	HD-DTB	>7.5 - <-9	3 HDS	HD-DTB
			>9	4 HDS	HD-DTB

Window wt <= 0.25kN/m run minimum rail thickness = 1.2mm

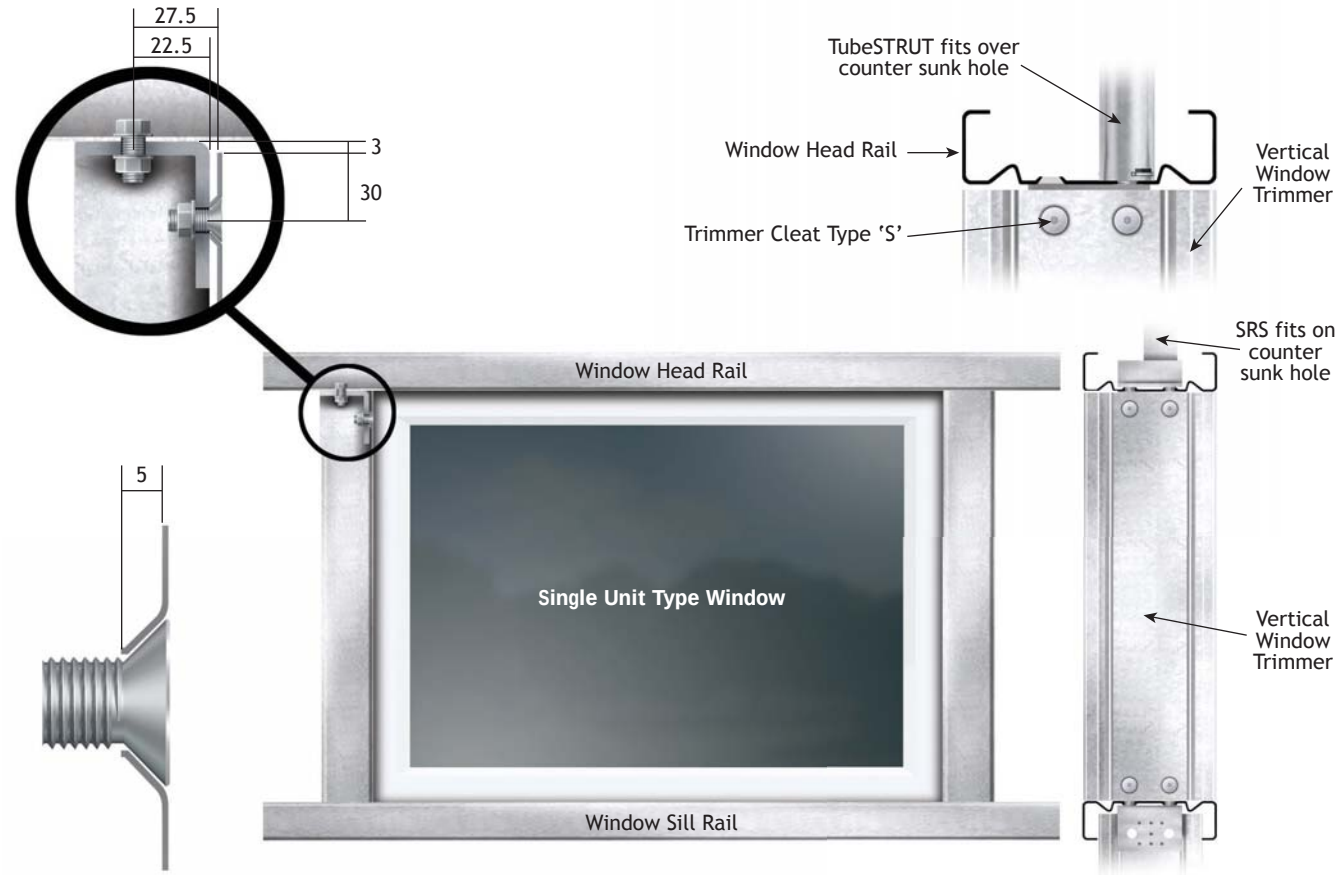
Window wt >0.25 - 0.4kN/m run minimum rail thickness = 1.4mm

Window wt >0.4 - <=0.5kN/m run minimum rail thickness = 1.6mm

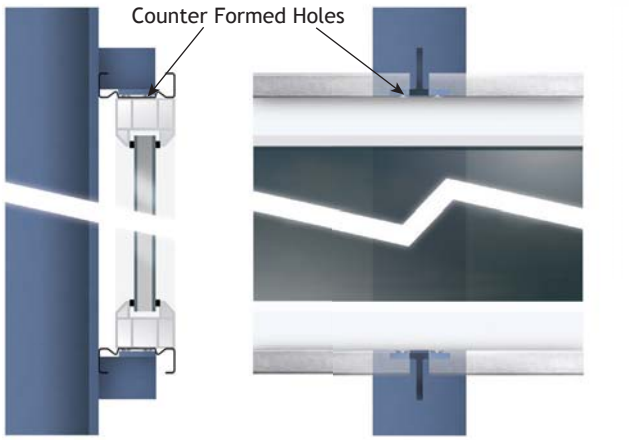
Window and opening trimmers

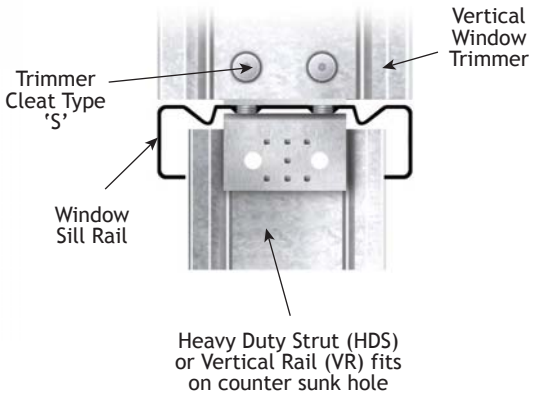


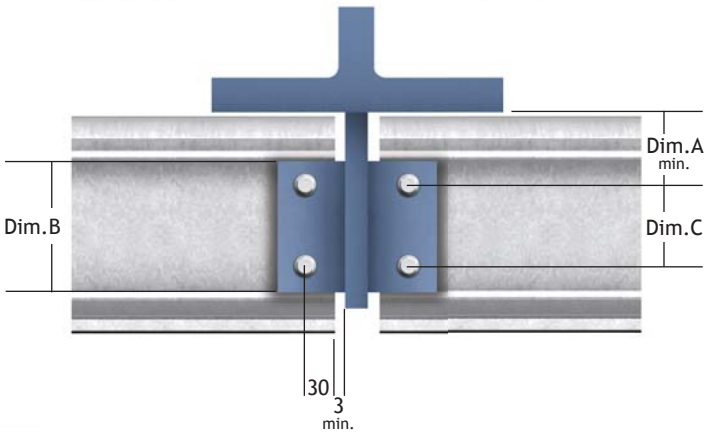
Window and opening trimmers



Ribbon window cleat connections







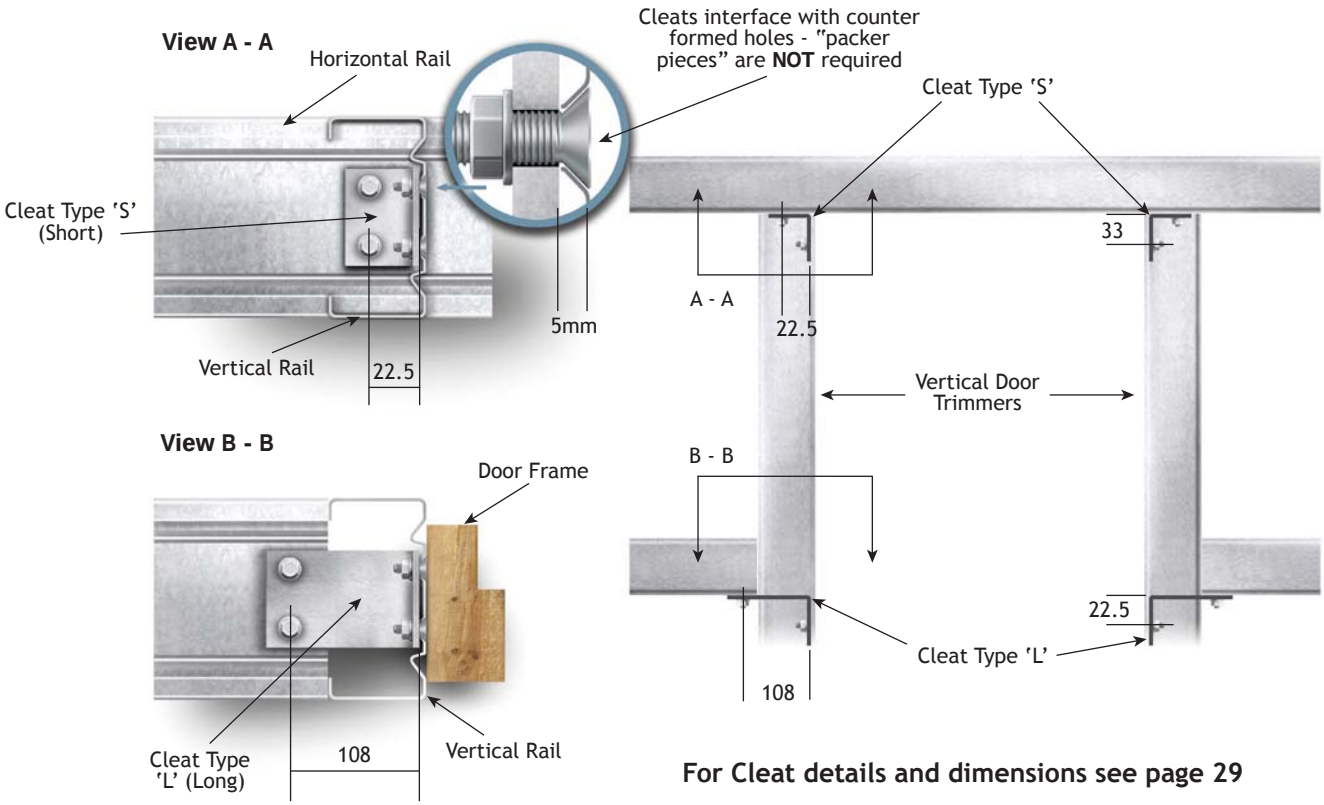
Ribbon Window Cleat Connections			
Ref	**Dim. A**	**Dim. B**	**Dim. C**
145	60	75	37
170	60	100	62
200	82	100	50
225	82	125	75
255	82	155	105
285	82	185	135
305	82	205	155

Door trimmers

HADLEY **UltraBEAM™2** sections may be utilised to trim around door openings. Bolted connections in **UltraBEAM™2** rails and trimmers that could intrude into an opening may be counter sunk to provide a flush fixing surface.

Vertical door trimmers should be the same section depth as the horizontal rails and material thicknesses selected with consideration to the type, weight and use of the door.

If it is intended to connect vertical trimmer rails to a finished floor a method of building tolerance adjustment such as a slotted fixing cleat should be considered.



For Cleat details and dimensions see page 29

Brickwork restraints

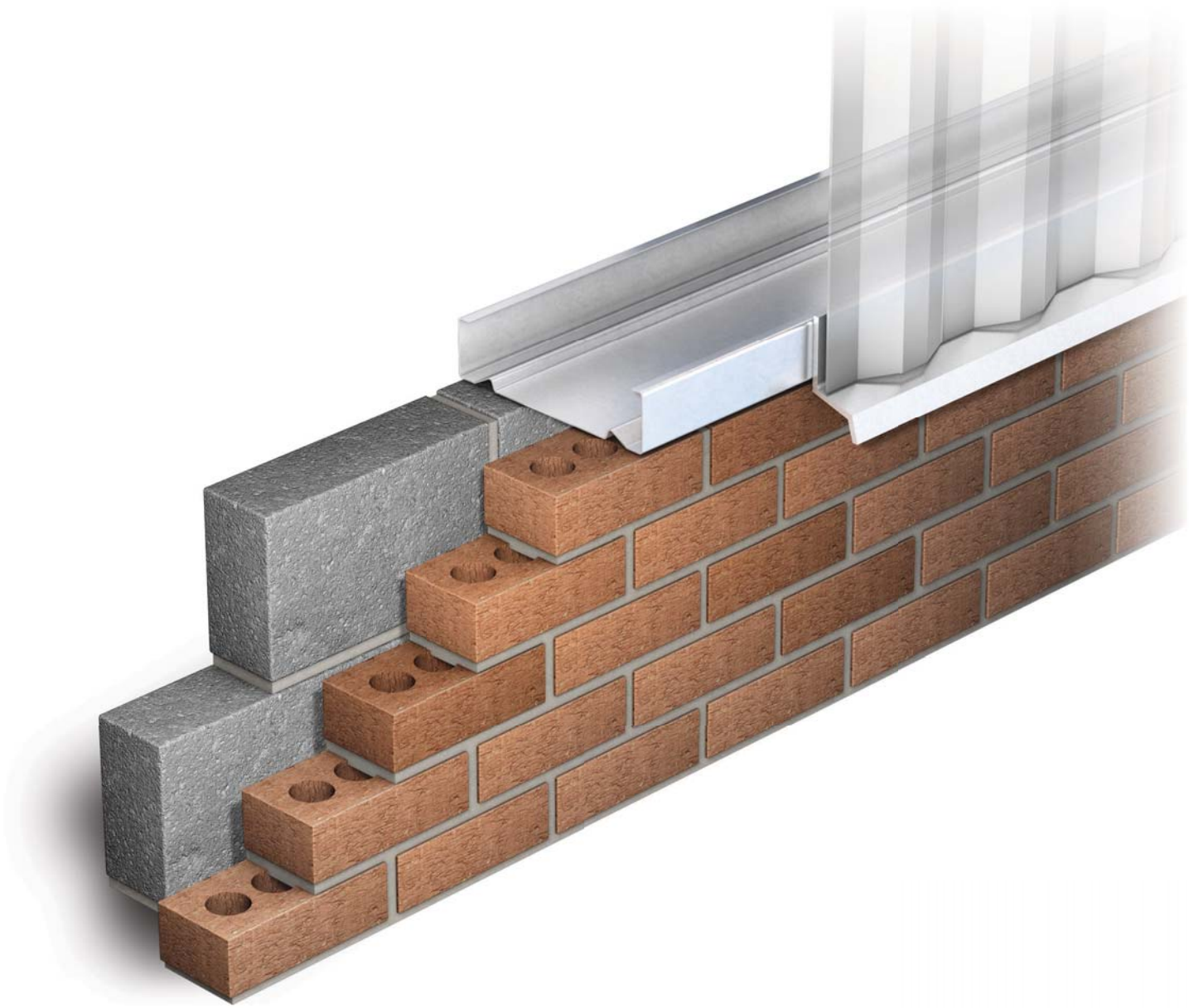
HADLEY **UltraBEAM™2** or cold roll-formed Eaves Beam sections offer a cost effective solution to restraining masonry walls. Lighter in weight than comparable hot rolled steel profiles these sections may be used as single span or double span members to satisfy design criteria.

The deflection limit for wall and brickwork restraint rails is normally considered to be span/300 or better. To achieve this it may be necessary to increase the section thickness and/or rail depth, adopt a double spanning system in lieu of single spanning or consider introducing another sheeting rail adjacent to the brickwork restraint rail.

It is usual to assume that the restraint rail is supported on its weak axis by the constructed wall, however if the wall is not to be constructed until after rails are installed or the finished wall does not support both flanges of the section, lateral bracing struts and diagonal tie assemblies are required.

The brickwork restraints may be tied to the brickwork via threaded rods built into the wall, bent fixing straps or sliding anchor supports. Fixing centres for restraint ties are determined by the requirements of the wall construction.

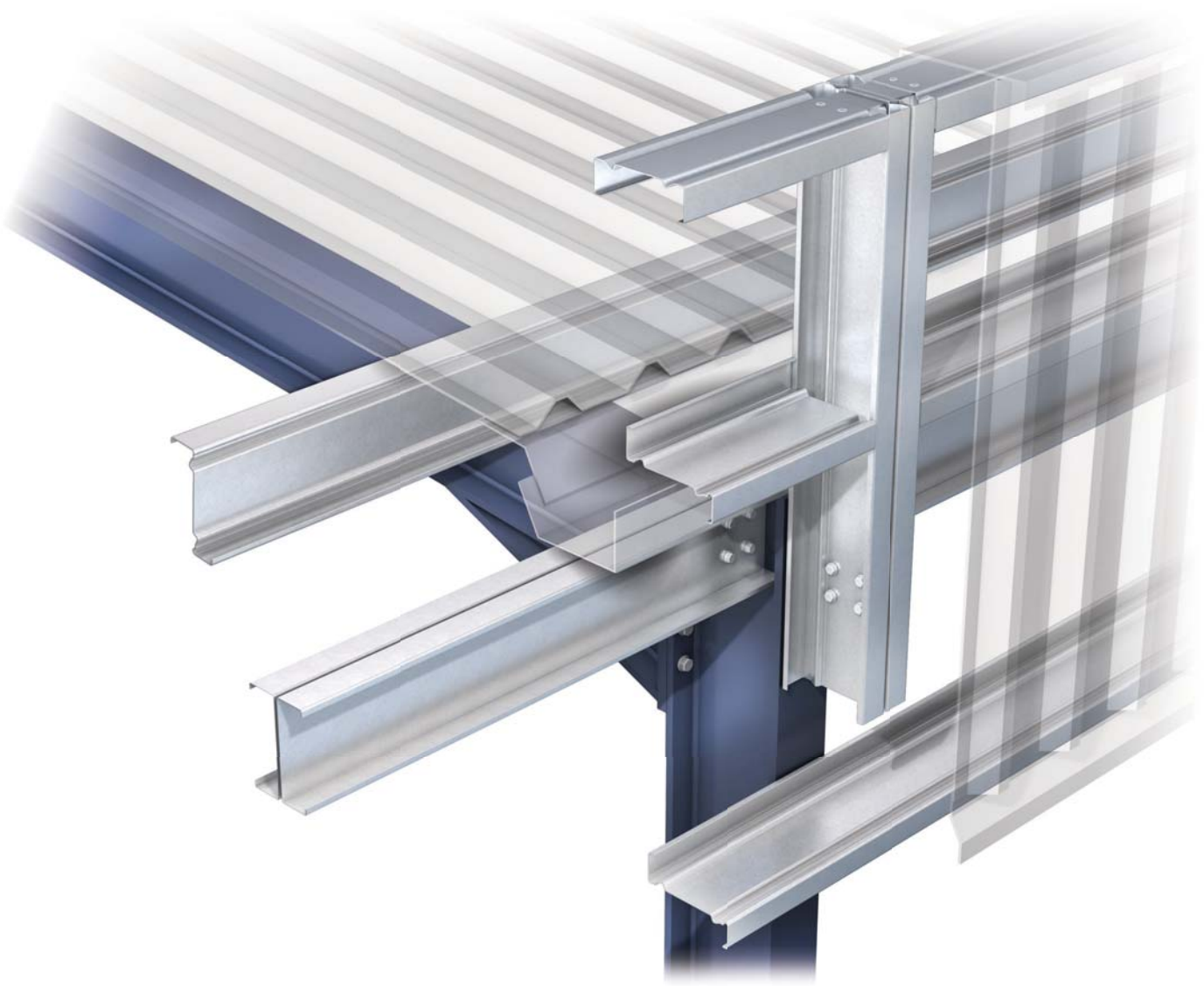
HADLEY **Design Suite PRO** Design Software offers a quick and accurate method of selecting **UltraBEAM™2** or cold roll-formed **HADLEY** **EavesBEAM2** sections for use as masonry restraints.



Parapet posts

HADLEY **UltraBEAM™2** parapet posts provide a light weight and cost effective option to conventional construction methods. Compound pairs of **UltraBEAM™2** sections can be supplied as single components for site assembly or factory assembled ready for installation.

Parapet posts can be fixed to the column face via purpose made 'wing' cleats with horizontal rails connecting into the post by inset trimmer cleats. Wing cleats, trimmer cleats and packing spacers can be incorporated into the posts at the time of factory assembly.

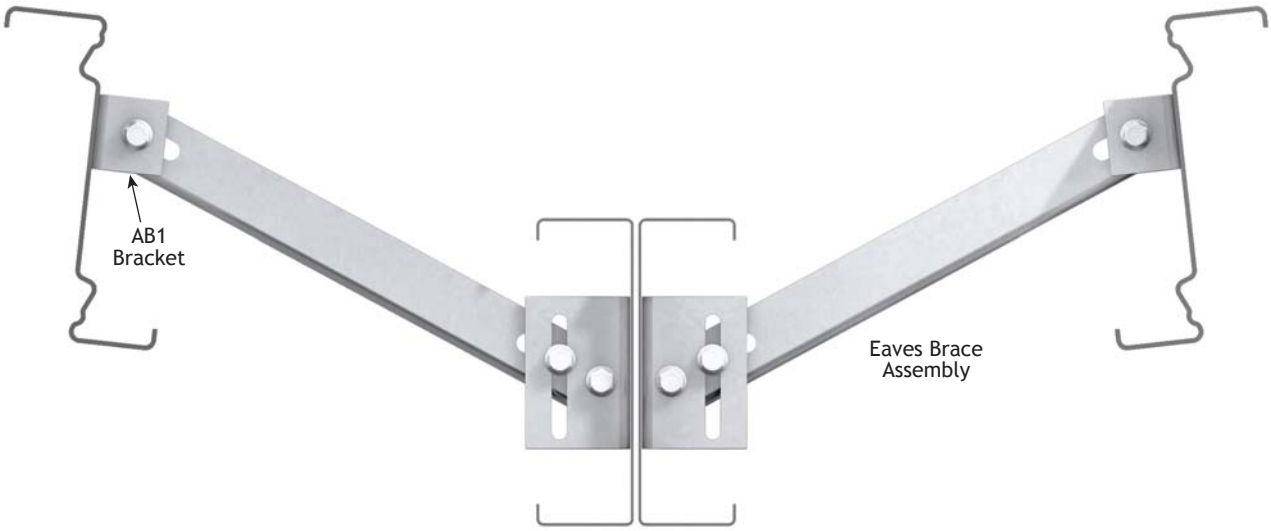


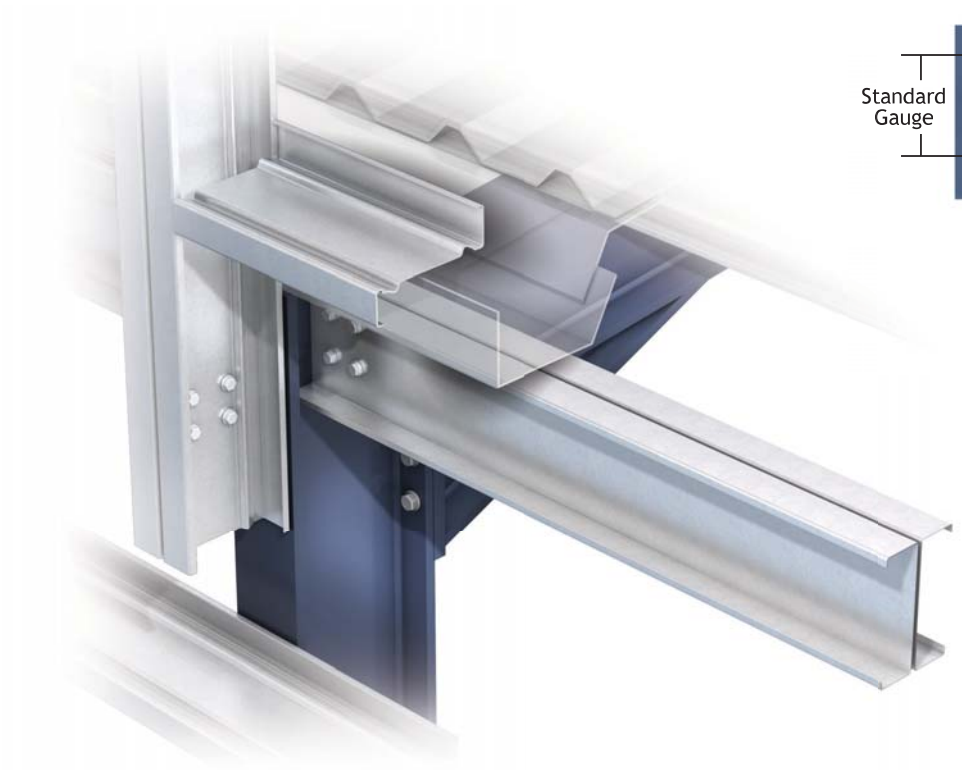
Column ties

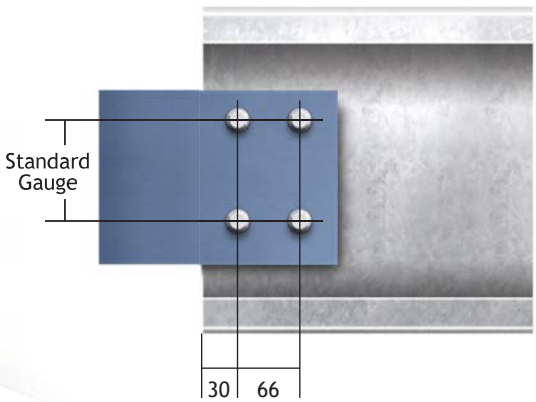
Column ties manufactured from back to back pairs of **HADLEY EavesBEAM2** sections offer a light weight and cost effective alternative to conventional construction methods. Compound pairs of sections can be supplied as single components for site assembly or factory assembled ready for installation.

Column ties should be connected to the column via a suitable cleat incorporating four M12 bolts at each end. If lateral bracing within the span is necessary this may be achieved by using an eaves brace assembly (or similar) connected to a suitable structural member or **HADLEY UltraZED™2** roof purlin.

To form a compound member beams should be bolted together through pairs of standard web holes. For further information please contact our technical department.





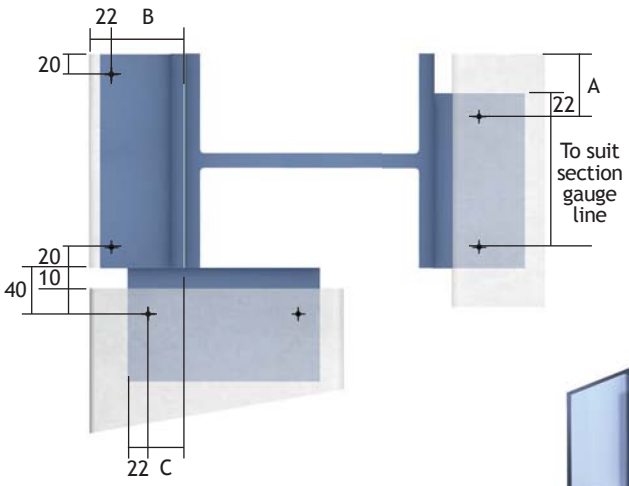


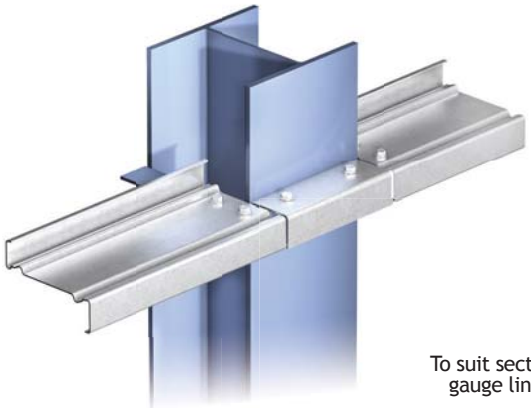
Column Tie End connection detail - all holes 14mm dia. for grade 8.8 M12 fasteners

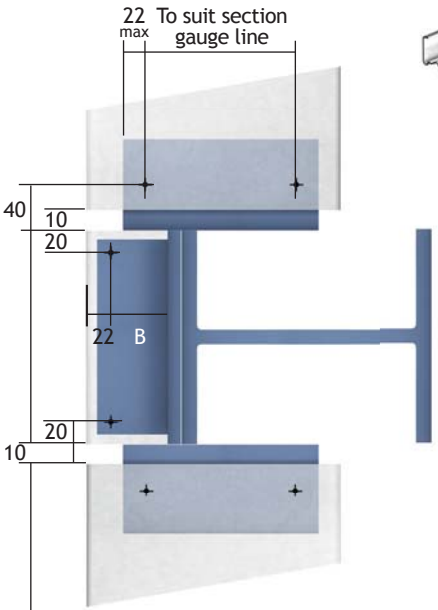
Corner and column trimmer details

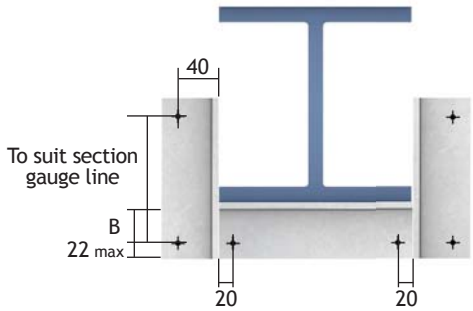
A = 55mm (*Wide flange to sheeting) 145 and 170 Series
or
A = 76mm (*Wide flange to sheeting) 200 - 305 Series
B = Cladding Face Dimensions Less 24mm min. dimension Using CF70 Filler Piece
C = Cladding Face Dimensions Less 55mm (*Wide flange to sheeting) 145 and 170 Series
or
C = Less 76mm (*Wide flange to sheeting) 200 - 305 Series

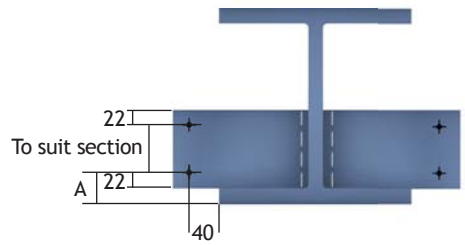
* Applicable to **HADLEY UltraZED™2** only.

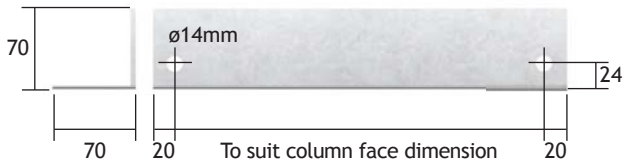




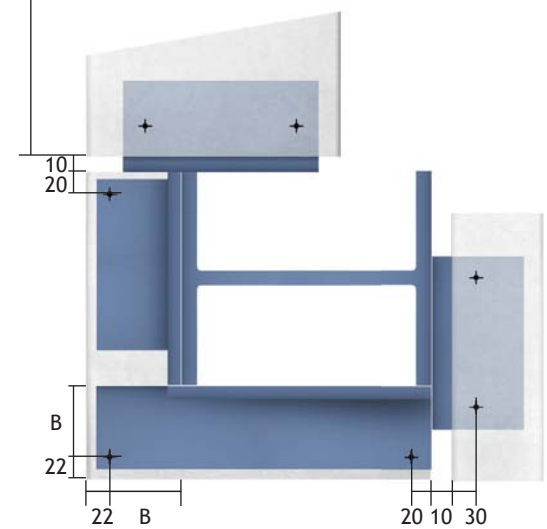


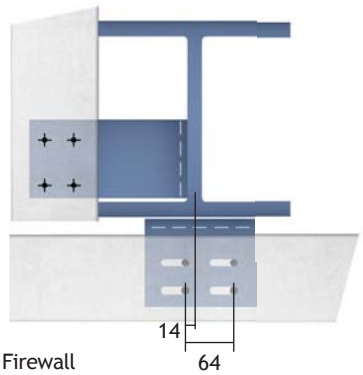






* Overall length of Rail = column centre distance **LESS** half column width each end **LESS** 20mm





Side Rail Firewall

Ceiling support beams

Where a support system is required for a suspended ceiling **HADLEY UltraBEAM™2** sections provide a reliable, lightweight and cost effective solution.

Section can be cut to length and pierced to provide a pre-engineered solution or supplied in plain lengths for site working.

Support beams may be installed in two different ways:

i) **Cleated and bolted end connection** where the ends of the beams are fixed via a cleat to a suitable support structure. Beams should be installed as opposing pairs with lateral restraint afforded by SRS angle struts fixed between pairs or by screw fixing 45x45x2mm cleader angle to the top flanges of all adjacent beams using two self-drilling/tapping screws per connection.

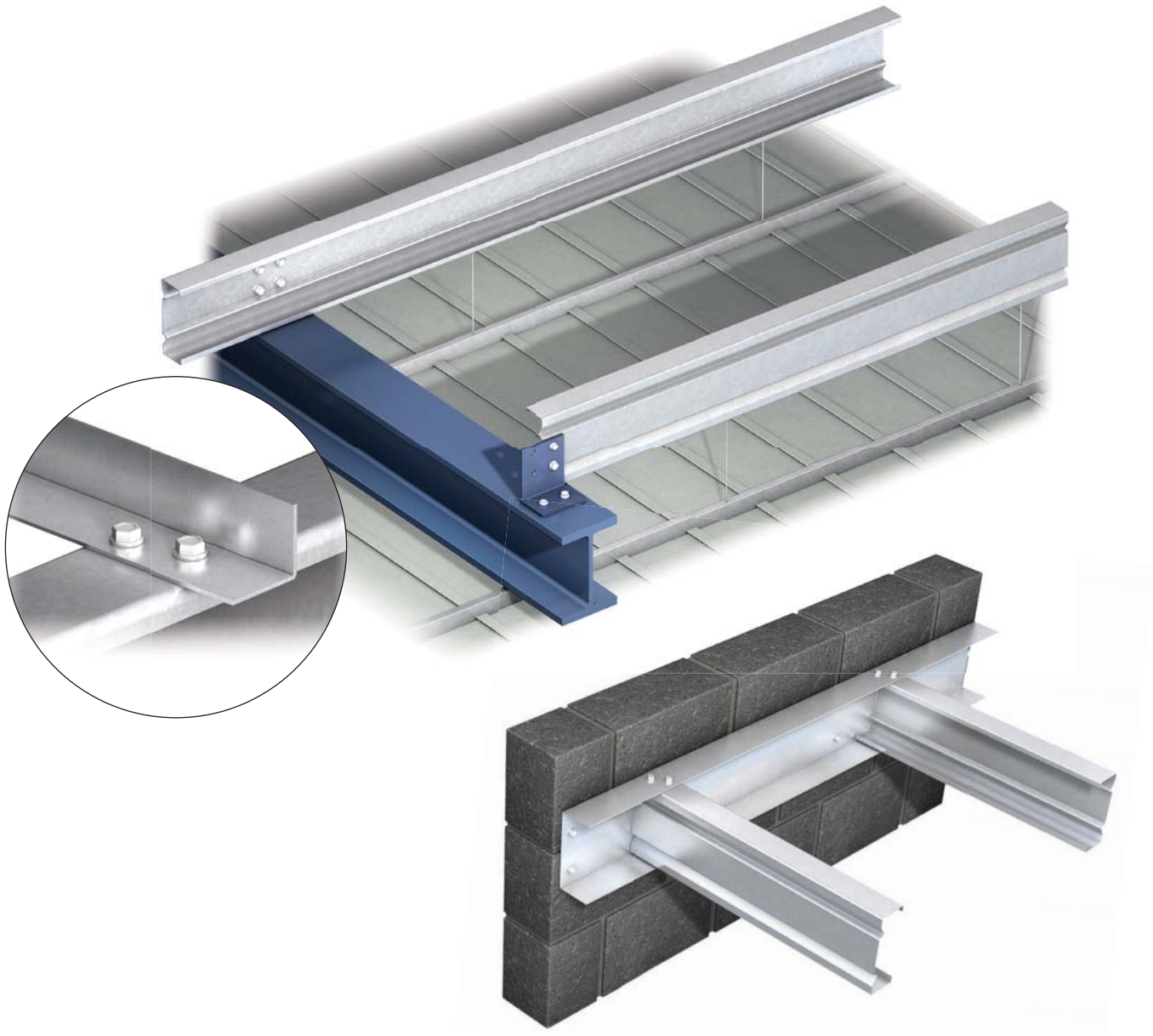
In both cases lateral restraint should be provided at intervals not exceeding 3000mm centres.

ii) **Suspended support end connection** where the ends of the beams are bolted to a laterally unrestrained cleat that is suspended from a suitable structure. Beams should be installed as opposing pairs with lateral restraint afforded by SRS angle struts fixed between pairs or by screw fixing 45x45x2mm cleader angle to the top flanges of all adjacent beams using two self-drilling/tapping screws per connection.

For a suspended end connection system lateral restraint should be provided at intervals not exceeding 2000mm centres.

For both end connection systems the lateral restraint system must be secured to a structural member, perimeter wall or braced with opposing pairs of diagonal tie wires to prevent movement of the ceiling grid.

HADLEY Design Suite PRO Design Software provides a quick and reliable method of determining the correct choice of **UltraBEAM™2** for use as ceiling support members.



HADLEY UltraMEZZ® Mezzanine Floor Joist System

HADLEY UltraBEAM™2 cold roll-formed steel sections provide class leading performance for use in mezzanine platforms and other floor applications. **UltraBEAM™2** sections are manufactured from pre-galvanised structural grade steel, pre-punched, cut to length and individually marked to customer's requirements.

Value engineered to be cost effective; **UltraBEAM™2** sections are the result of many years of development and testing to ensure they are reliable and safe to use as intended.

Four systems suit different applications.

Delivery throughout UK mainland is arranged to suit customer's specific requirements; other destinations including export packaging and containerisation can be accommodated if required.

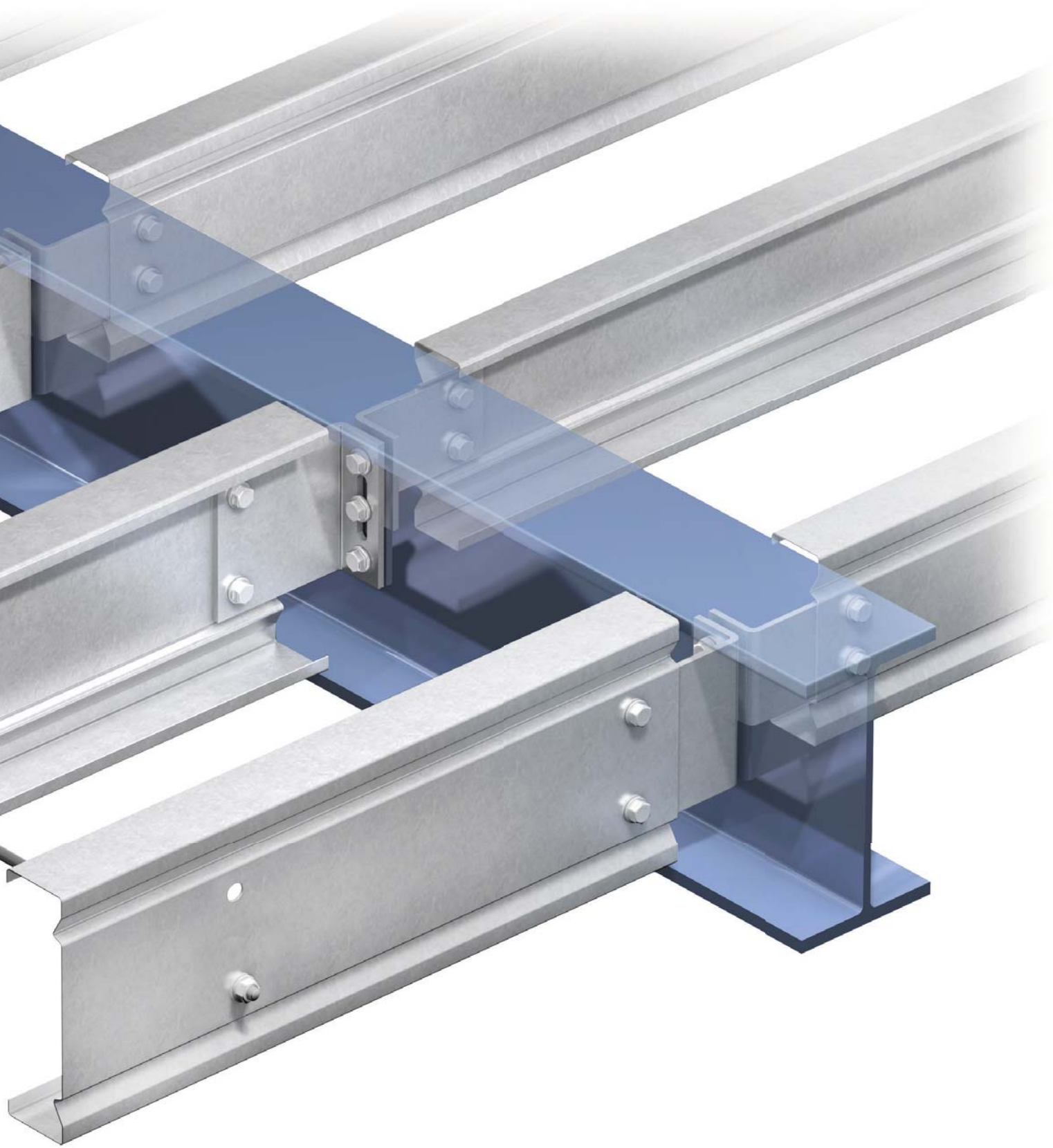
On large or complex projects our flexible approach enables customers to phase, batch and colour code deliveries to minimise disruption and simplify installation.

HADLEY UltraMEZZ® System MFS and MFL inset cleats offer an engineered solution to differential spanning beams and allows designers to use dissimilar depths of beams on opposite sides of the primary beam (see table on page 68 for allowable joist combinations).

Optimum selection of floor beam sections is simplified by our class leading **HADLEY Design Suite PRO**. Available free upon request. This new market leading software offers customers and specifiers numerous useful features to speed beam selection; create, save and store projects.

The HADLEY UltraMEZZ® System

- Pre-galvanised high grade steel
- Tested and reliable
- Pre-punched
- Cut to length
- Individually marked
- Fast Tie restraint system - cut to length, secure, time saving beam ties
- Delivered when and where you want
- Phasing, batch collated and colour coding
- Different joist depth combinations via standard cleats
- Free issue **HADLEY Design Suite PRO** with EC3 standards
- Internal & external design support team
- Fully integrated into 3D modelling software

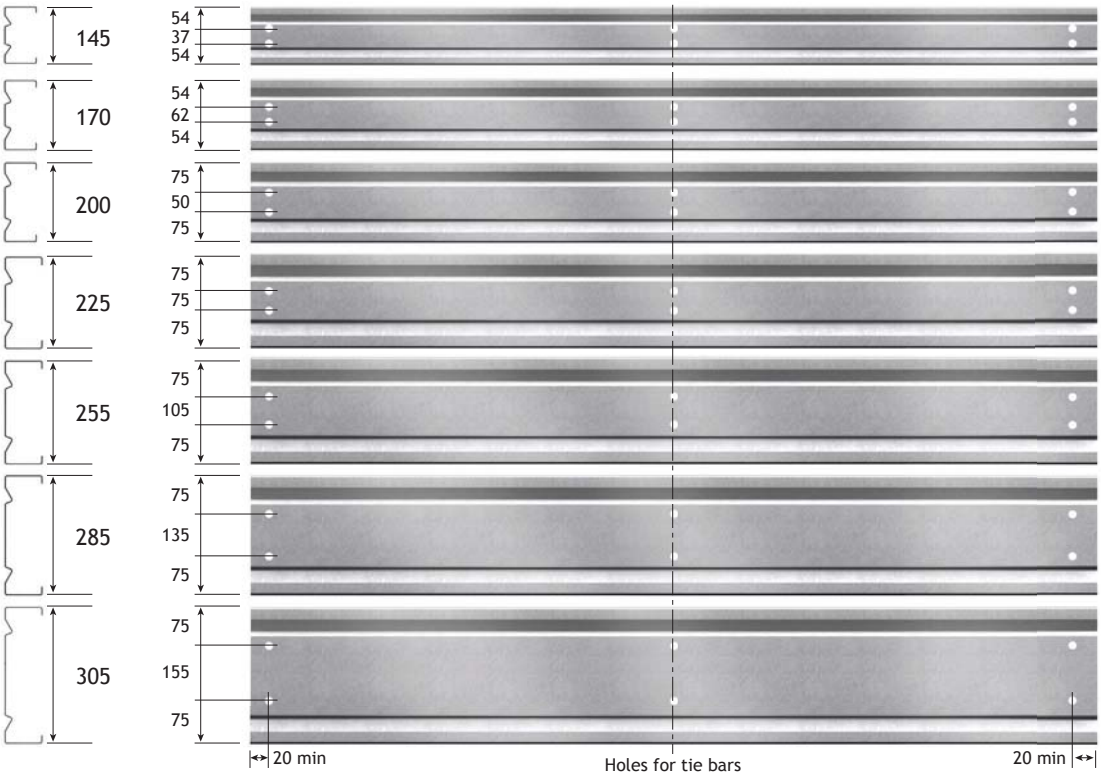


HADLEY UltraMEZZ® Inset System

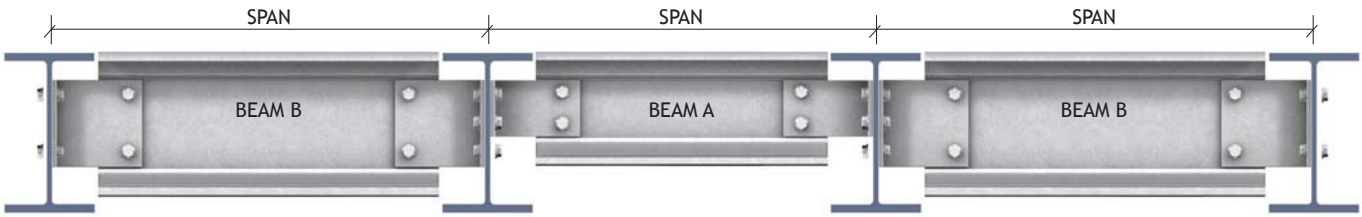
The **HADLEY UltraMEZZ®** inset floor joist system is utilised for mezzanine floors where maximising headroom may be paramount. **HADLEY UltraBEAM™2** joists are connected between primary beam members using our standard range of MFS (short) or MFL (long) galvanised cleats. The two types of cleat are fixed with M12 grade 8.8 bolts and satisfy all common primary beam flange widths.

To optimise floor joist selection the designer may specify different **UltraBEAM™2** joist depths to suit varying and/or load criteria within adjacent floor areas. This is made possible by virtue of all 255 - 305 cleats having slotted centralised holes through which the smaller beam's lower fixing bolt is allowed to pass. The table below lists all the available joist combinations.

Inset System



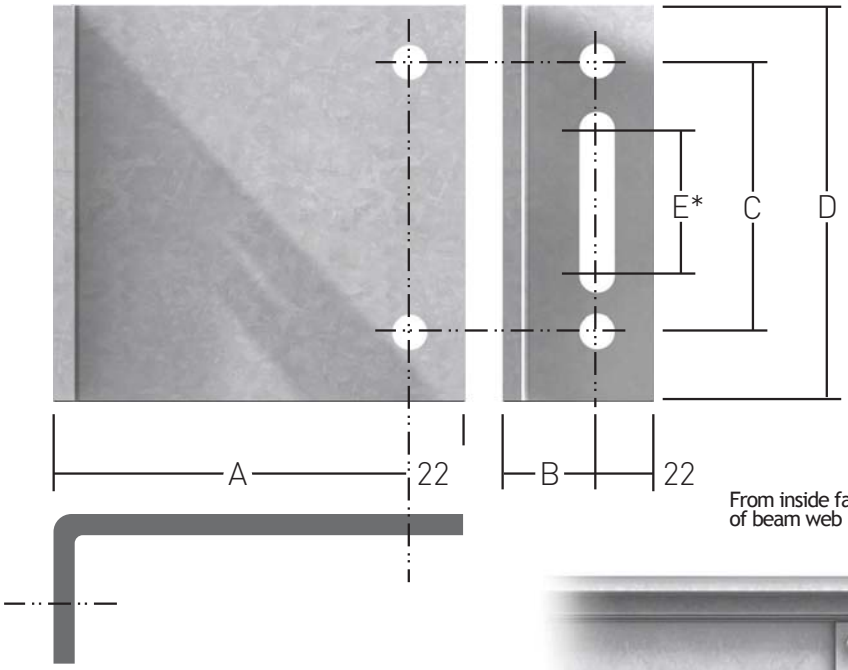
Permissible UltraBEAM™2 Joist Combinations							
Beam A	**Permissible combination Beam B**						
	145	170	200	225	255	285	305
145	✓						
170		✓					
200			✓		✓	✓	✓
225				✓		✓	✓
255			✓		✓		✓
285			✓	✓		✓	
305			✓	✓	✓		✓



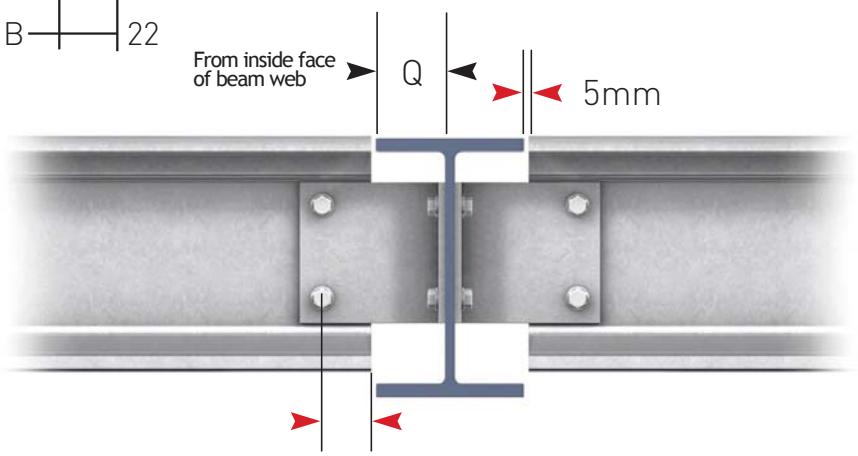
NB: Span = primary beam centres, i.e. cleat dimensions allowed for.

MFS Series For Primary Beams Where Dim. Q = 85mm Max							
Section	Thickness	Dim.A	Dim.B	Dim.C	Dim.D	Dim.E*	Reference
145	5	110	30	37	75	N/A	MFS-145
170	5	110	30	62	100	N/A	MFS-170
200	5	110	30	50	100	N/A	MFS-200
225	5	110	30	75	120	N/A	MFS-225
255	5	110	30	105	150	45	MFS-255
285	5	110	30	135	180	75	MFS-285
305	5	110	30	155	200	75	MFS-305

Inset Cleats



GALVANISED FINISH - ALL HOLES 14mm for Grade 8.8 M12 BOLTS

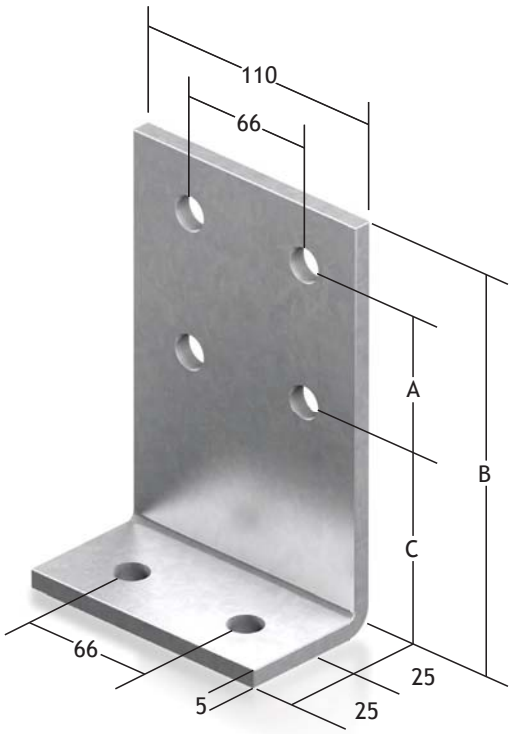


Minimum 20mm. (Varies to suit primary beam/cleat dimensions).

MFL Series For Primary Beams Where Dim. Q = 86-105mm							
Section	Thickness	Dim.A	Dim.B	Dim.C	Dim.D	Dim.E*	Reference
145	6	130	30	37	75	N/A	MFL-145
170	6	130	30	62	100	N/A	MFL-170
200	6	130	30	50	100	N/A	MFL-200
225	6	130	30	75	120	N/A	MFL-225
255	6	130	30	105	150	45	MFL-255
285	6	130	30	135	180	75	MFL-285
305	6	130	30	155	200	75	MFL-305

*Slot facilitates various joist combinations as listed in table opposite

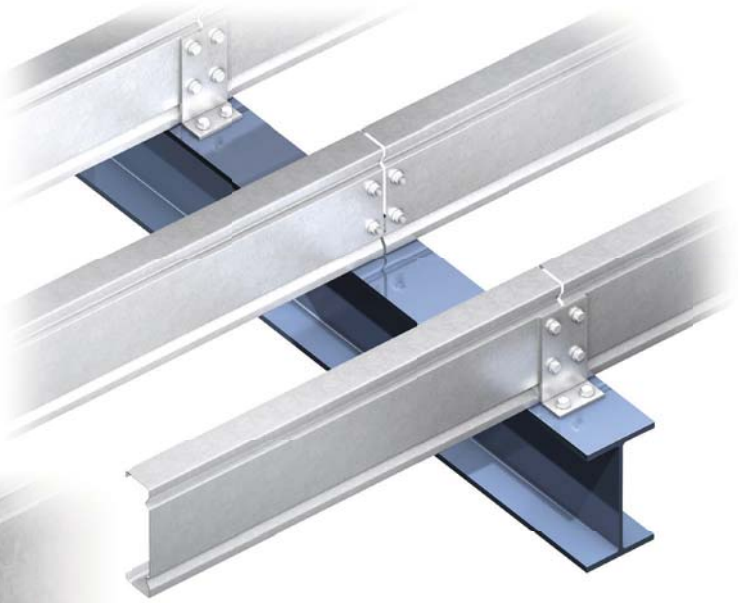
HADLEY UltraMEZZ® Top Cleat System

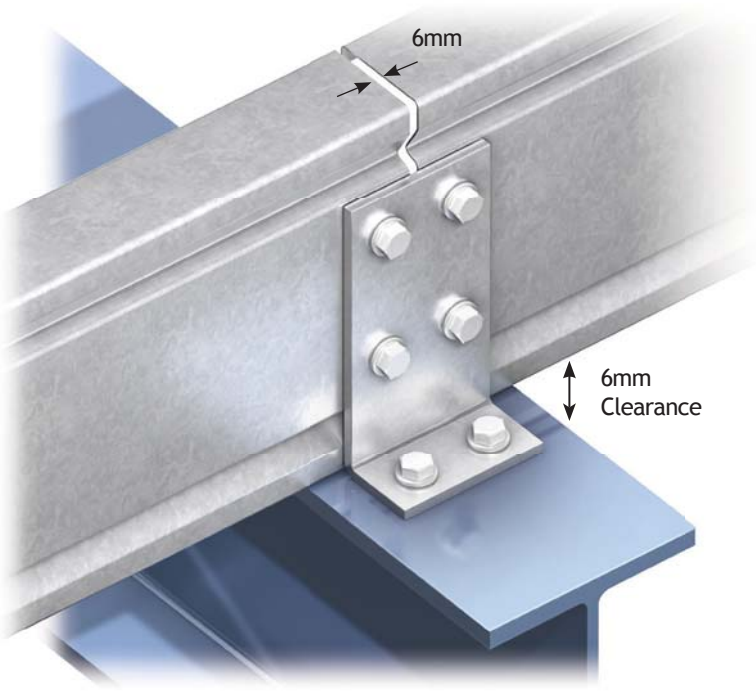


GALVANISED FINISH
ALL HOLES 14mm for Grade 8.8 M12 BOLTS

Top Cleat For Single Spanning Or Double Spanning Systems				
Section	**Dim.A**	**Dim.B**	**Dim.C**	**Reference**
145	37	119	60	MTC-145
170	62	144	60	MTC-170
200	50	153	81	MTC-200
225	75	178	81	MTC-225
255	105	208	81	MTC-255
285	135	238	81	MTC-285
305	155	258	81	MTC-305

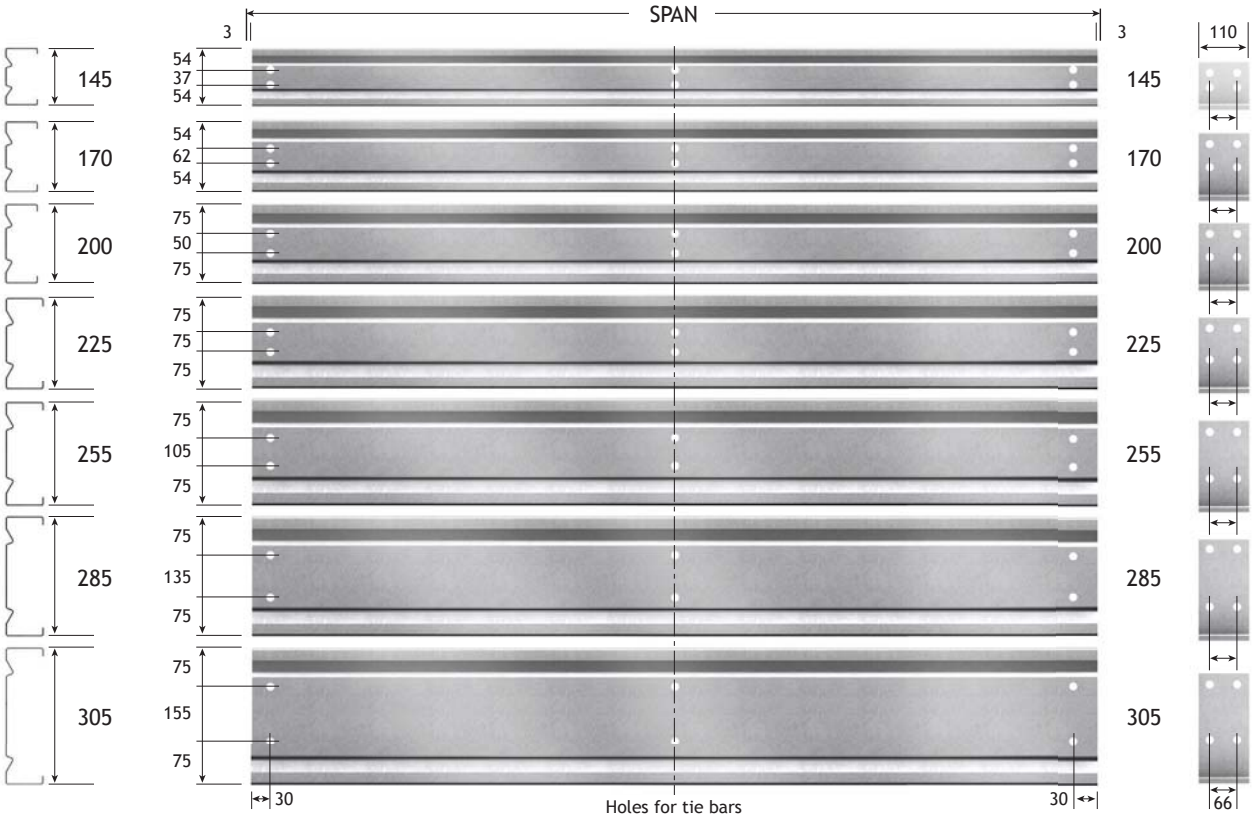
For Double Spanning load capacity of **HADLEY UltraBEAM™2** sections use **HADLEY Design Suite PRO** Design Software





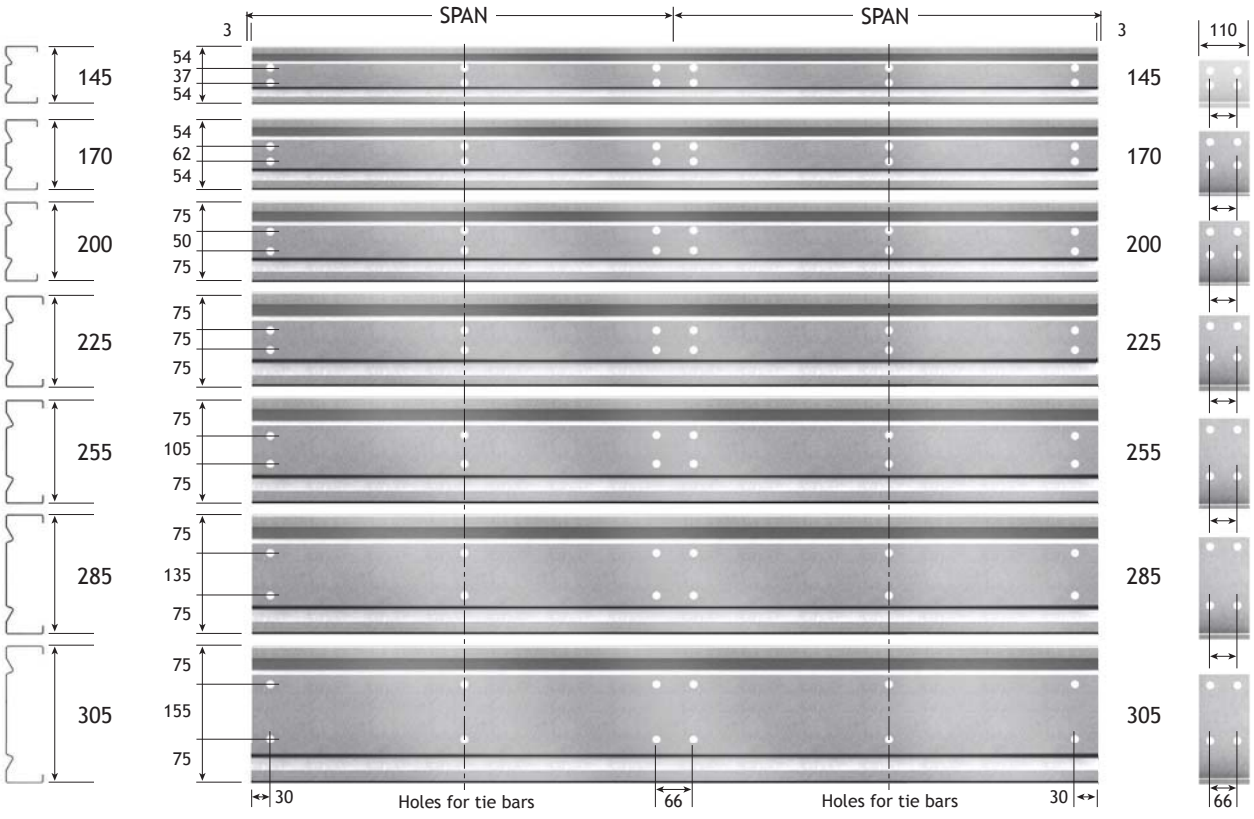
Top Cleat Fixed Single Span

Cleats



Top Cleat Fixed Double Span

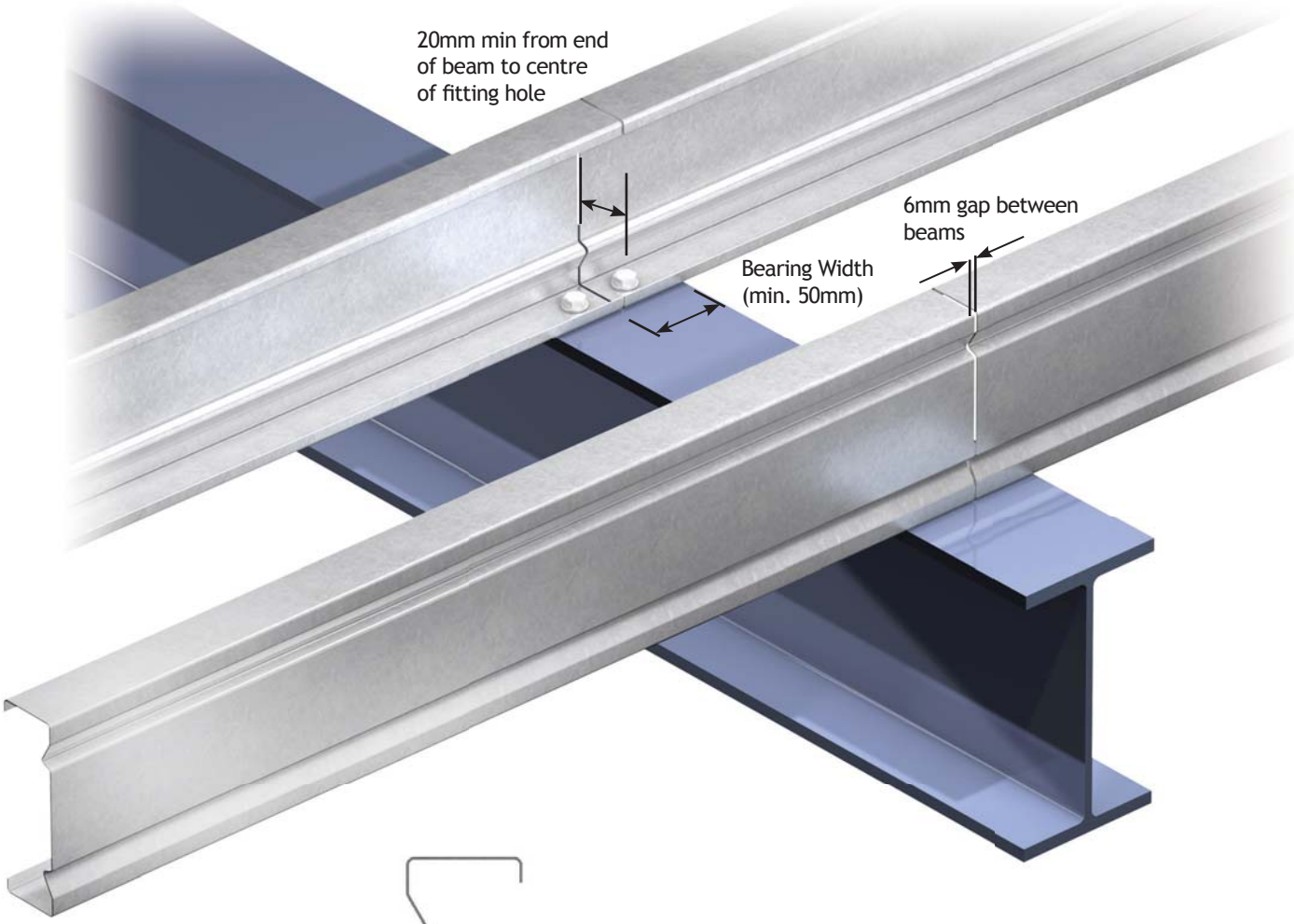
Cleats

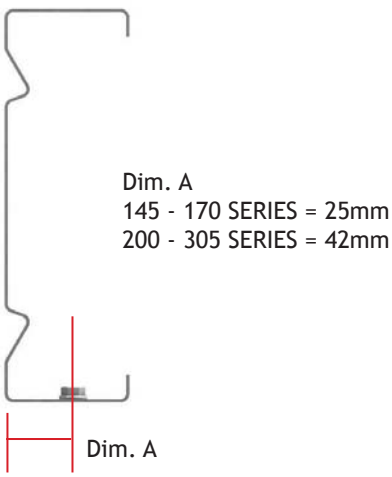


STANDARD HOLE DETAILS. **ALL HOLES ARE 14mm DIAMETER FOR Grade 8.8 M12 BOLTS**
We recommend that all bolts and washers are plated or galvanised against corrosion.

HADLEY UltraMEZZ® Flange Fixed System

HADLEY UltraBEAM™2 Floor joists sections may be fixed directly to support structures by bolting through the bottom flange. Carrying capacity is reduced due to limitations imposed by web crushing, however this system does offer some advantages due to fewer component parts and simplified end connections - especially for refurbishment projects where on site adjustments may be necessary. Use **HADLEY Design Suite PRO** Design Software to select Flange Fixed Floor beams. For double spanning joists where spans vary >10% consult Hadley Building Products Division technical department.





HADLEY UltraMEZZ® Restraint Ties

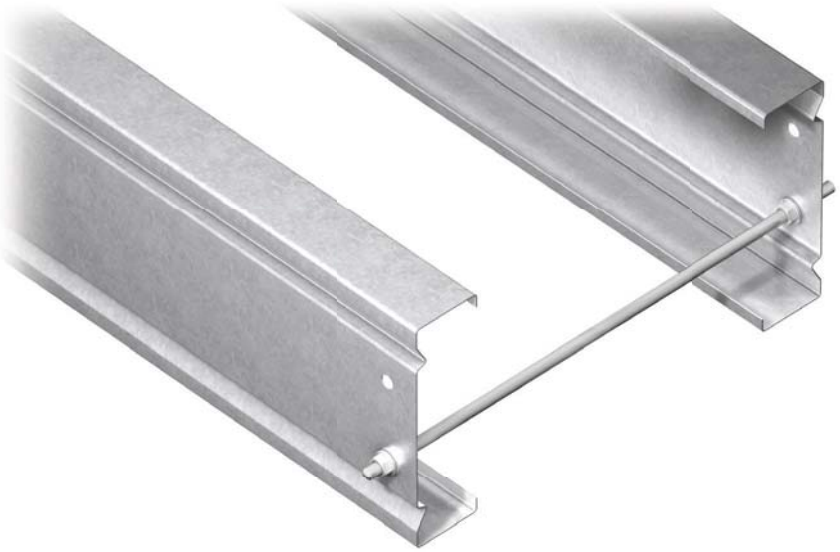
HADLEY UltraBEAM™2 Floor joists must be designed as opposing pairs with a restraint tie fixed as shown.

Restraint tie at mid-span <6m beam span
2 Restraint ties at 1/3 span >=6m beam span
Restraint ties MUST be fitted prior to the laying of floor decking.

Female tubular ties accept M12x25 set screws at each end. Pre-cut to exact joist spacing, simply install M12 bolt at each end - no site measuring or threading nuts and washers onto screwed rods, no error due to misalignment and beams are tightly held between tube and bolt head.

Threaded Bar Restraint Tie System

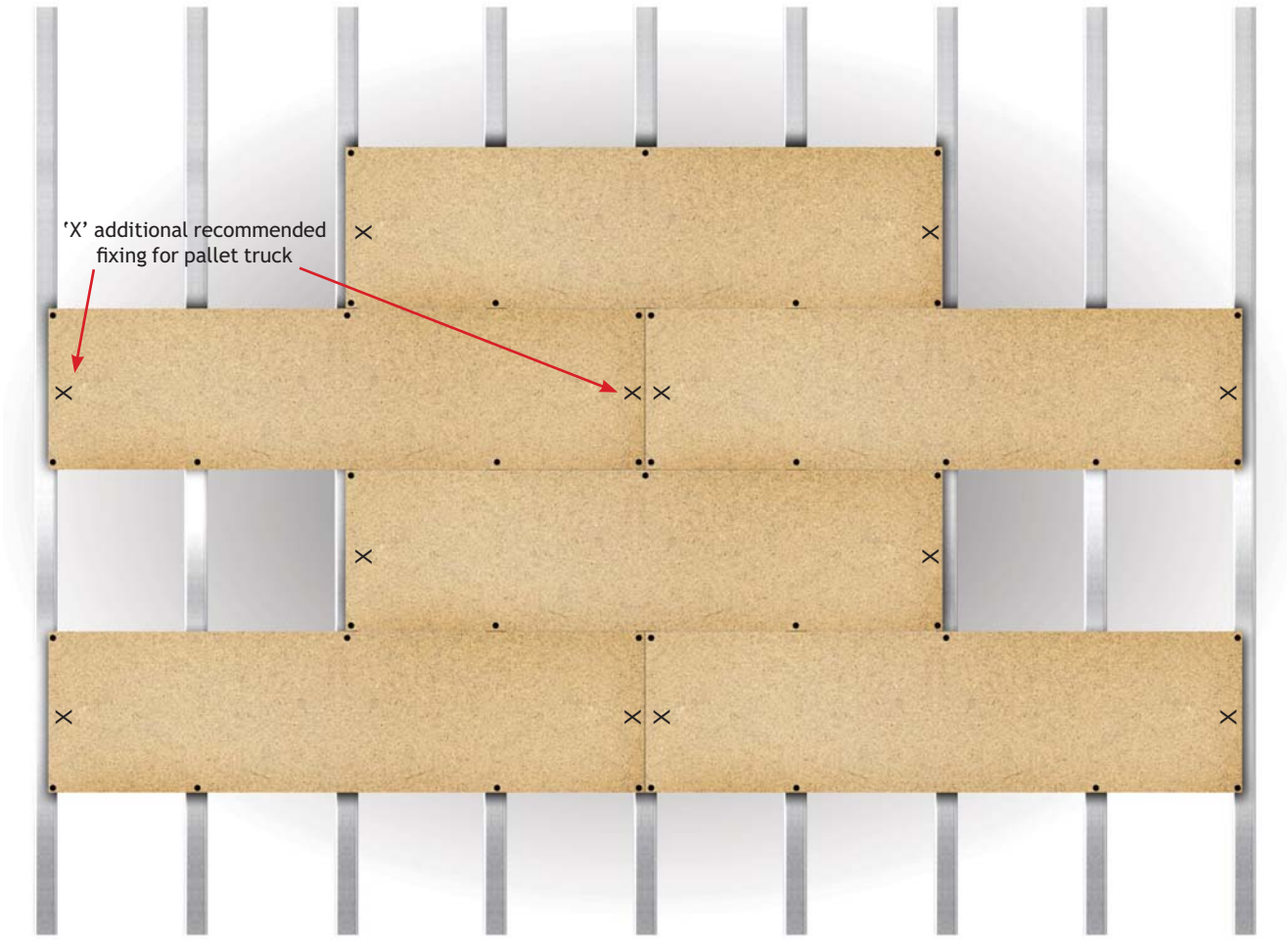
M10 or M12 threaded bar with four nuts and four washers provide restraint to opposing pairs of **HADLEY UltraBEAM™2** joists as shown below.



Fixing Decking

The elementary fixing pattern for floor decking is shown below. Floor decking must be securely fixed with self tapping or similar screws in accordance with decking manufacturers recommendations so that lateral restraint is afforded to the **HADLEY** UltraBEAM™2 top flange at no more than 1150mm maximum fastener spacing. For high floor loads or where high point loads are likely to be encountered such as those imposed by the actions of a pallet truck we recommend extra mid-point fixings marked 'X' should also be included.

Decking/Board Type (Contact manufacturer for specific details of board weight)	Thickness mm	Approximate Density kg/m³	Approximate Weight	
			kg/m²	kN/m²
Particleboard (chipboard) P5/P6	38	600 - 680	22.80 - 25.84	0.223 - 0.253
Particleboard P5/P6	30	600 - 680	18.00 - 20.40	0.176 - 0.200
Particleboard P5	25	600 - 680	15.00 - 17.00	0.147 - 0.167
Particleboard P5	22	600 - 680	13.20 - 14.96	0.129 - 0.147
Particleboard P5	18	600 - 680	10.80 - 12.24	0.106 - 0.120
Fire Panel Board	30	800	24.00	0.235
Fire Panel Board	25	800	20.00	0.196
Fire Panel Board	20	800	16.00	0.157
Fire Panel Board	15	800	12.00	0.118



* Please consult board supplier for fixing recommendations and suitability of the intended board thickness for the loading application. Above table is for guidance only.


Warning
Mind your head
Warning
Mind your head

Hadley Industries Holdings Limited (UK Headquarters)

Downing Street,

Smethwick,

West Midlands B66 2PA

Tel: +44 (0) 121 555 1300

Email: ask.bpd@hadleygroup.com

www.hadleygroup.com

Hadley Industries Holdings Limited

Building Products Division

123 West Bromwich Street

Oldbury, West Midlands, B69 3AZ

Tel: +44 (0) 121 555 1340

Email: ask.bpd@hadleygroup.com

www.hadleygroup.com

HADLEY GROUP