

Hamilton

METAL FORMING LTD



PURLINS

TECHNICAL DATA

www.hamiltonmetalfforming.com

Introduction

This report was prepared on behalf of Hamilton Metal Forming Ltd.

The report should be used with great care by a qualified & competent Structural Engineer.

MCR Consulting could accept any liability for misinterpretation of the design work.



Design Standard:

The design check was carried in accordance with the relevant parts of BS EN 1993.

Material:

Steel grade to be S450GD + Z275 to BS EN 10346.

Elements' Specific Notes:

Purlins

The load tables provide the total ultimate load capacities for a double span purlins with varied restraints conditions. It also indicates the total service load to for the deflection limit of Span/180.

Restraints:

1. Anti-sag ties may be required to prevent distortion and misalignment of purlins during sheeting or to restrain against the effects of wind uplift.
2. The top flange of the purlin must have adequate restraint provided by robust steel sheeting (or similar) fixed directly to the top flange.
3. Anti-sag requirements assume that there are two slopes with a central ridge and Apex Tie.
4. When no anti-sag ties are used temporary propping may be required during sheeting.
5.
 - a. For roof with slope < 4° - Anti-sag requirements for flat roof (Contact Hamilton Metal Forming for details)
 - b. For roof slope 4° - 10°, For purlins span < 6m – No Anti-sag ties required.
For purlins span > 6.0m – 1 No. Anti-sag tie is required at mid span
 - c. For roof slope 10° - 15°, For purlins span < 8m – 1 No. Anti-sag tie is required at mid span.
For purlins span > 8.0m – 2 Nos. Anti-sag tie is required at third span

Eaves Beams:

The eaves beam system is engineered to support both the roof and wall cladding and hence applied loading on both the primary and secondary axis of the member. The load tables below give ultimate capacities for the vertical gravity and suction component on the primary axis together with the horizontal pressure and suction capacity of the secondary axis. Eaves Beam Combined Loading - the unity ratio of the total applied load in both directions should not exceed 1.00 and satisfy the below equation:

$$[(\text{Applied Vertical Load})/(\text{Vertical Load Capacity}) + (\text{Applied Horizontal Load})/(\text{Horizontal Load Capacity})] \leq 1.00$$

Deflection data is not provided for Eaves Beams

Restraints:

1. Eaves Beam span < 6.0m to be restraint at mid span.
2. Eaves Beam span > 6.0m to have 2 Nos. restraints at third span.

Side Rails-

Side Rails are Multi Beams sections installed horizontally to support a vertically installed wall cladding. The load tables provide the total ultimate load capacities for a double span rails with varied restraints conditions. It also indicates the total service load to for the deflection limit of Span/150.

Restraints:

1. The external flange of the rail must have adequate restraint provided by robust steel sheeting (or similar) fixed directly to the external flange.
2. For bay width < 6.0m, restraints to be provided at mid span.
3. For bay width > 6.0m, 2 Nos. restraints to be provided at third span.

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Purlin Geometry

Section Ref. (TBC)	h mm	b mm	C mm	t mm	Weight kg/m	A cm ²	I _y cm ⁴	We _y cm ³	Wp _y cm ³	I _z cm ⁴	We _z cm ³	Wp _z cm ³	I _t cm ⁴	I _w cm ⁶	e _o mm	i _y cm	i _z cm
MB 1456515	145.0	65.0	20.0	1.5	3.82	4.86	154.40	21.30	25.11	22.71	5.72	8.61	0.04	1,452.60	33.58	5.63	2.16
MB 1456516	145.0	65.0	20.0	1.6	4.07	5.19	164.69	22.67	26.75	24.11	6.08	9.15	0.05	1,540.00	33.40	5.64	2.16
MB 1456518	145.0	65.0	20.0	1.8	4.57	5.82	183.99	25.39	30.00	26.88	6.78	10.24	0.06	1,710.60	33.13	5.62	2.15
MB 1456520	145.0	65.0	20.0	2.0	4.99	6.35	202.70	28.07	33.21	29.62	7.47	11.32	0.09	1,875.60	32.95	5.65	2.16
MB 1756515	175.0	65.0	20.0	1.5	4.17	5.31	241.05	27.56	32.78	22.91	5.76	8.75	0.04	2,177.60	26.66	6.74	2.08
MB 1756516	175.0	65.0	20.0	1.6	4.45	5.67	257.12	29.33	34.91	24.33	6.12	9.31	0.05	2,308.60	26.56	6.74	2.07
MB 1756518	175.0	65.0	20.0	1.8	4.99	6.36	287.49	32.87	39.17	27.12	6.83	10.42	0.07	2,566.10	26.28	6.72	2.07
MB 1756520	175.0	65.0	20.0	2.0	5.46	6.95	316.29	36.38	43.40	29.87	7.52	11.52	0.10	2,816.80	26.03	6.74	2.07
MB 2056515	205.0	65.0	20.0	1.5	4.53	5.76	351.62	34.32	41.09	22.91	5.76	8.78	0.04	3,015.10	21.65	7.81	1.99
MB 2056516	205.0	65.0	20.0	1.6	4.83	6.15	375.06	36.54	43.77	24.33	6.12	9.34	0.05	3,197.20	21.55	7.81	1.99
MB 2056518	205.0	65.0	20.0	1.8	5.42	6.90	419.61	40.96	49.12	27.13	6.84	10.46	0.08	3,554.30	21.30	7.80	1.98
MB 2056520	205.0	65.0	20.0	2.0	5.93	7.55	461.18	45.35	54.44	29.88	7.54	11.57	0.10	3,902.50	21.07	7.81	1.99
MB 2356515	235.0	65.0	20.0	1.5	4.88	6.21	488.13	41.56	50.08	22.91	5.77	8.80	0.05	3,963.20	18.00	8.86	1.92
MB 2356516	235.0	65.0	20.0	1.6	5.20	6.63	520.67	44.26	53.35	24.34	6.13	9.37	0.06	4,203.00	17.91	8.86	1.92
MB 2356518	235.0	65.0	20.0	1.8	5.84	7.44	582.79	49.63	59.89	27.13	6.84	10.49	0.08	4,672.80	17.67	8.85	1.91
MB 2356520	235.0	65.0	20.0	2.0	6.40	8.15	640.06	54.97	66.39	29.88	7.55	11.61	0.11	5,131.20	17.45	8.86	1.91
MB 2656515	265.0	65.0	20.0	1.5	5.23	6.66	652.60	49.27	59.74	22.92	5.78	8.82	0.05	5,019.70	15.26	9.90	1.85
MB 2656516	265.0	65.0	20.0	1.6	5.58	7.11	696.11	52.48	63.66	24.34	6.14	9.39	0.06	5,323.10	15.15	9.90	1.85
MB 2656518	265.0	65.0	20.0	1.8	6.26	7.98	779.44	58.87	71.47	27.14	6.85	10.52	0.09	5,918.30	14.94	9.88	1.84
MB 2656520	265.0	65.0	20.0	2.0	6.87	8.75	855.01	65.21	79.23	29.89	7.55	11.64	0.12	6,499.90	14.74	9.89	1.85

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Double Span Purlins

Maximum Loads

Section Ref.	Span	Deflection	Gravity	Ult. Uplift Load		
(TBC)	L m	L/ 180 kN	Load UDLkN	No. of Anti-sag rods		
				0	1	2
MB 1456515	4.50	14.38	16.65	11.98	15.31	16.65
MB 1456516	4.50	15.24	17.76	12.79	16.34	17.76
MB 1456518	4.50	18.03	23.76	17.10	21.85	23.76
MB 1456520	4.50	20.36	28.41	20.46	26.14	28.41
MB 1756515	4.50	22.48	19.56	14.08	17.99	19.56
MB 1756516	4.50	23.83	20.87	15.02	19.20	20.87
MB 1756518	4.50	28.14	28.17	20.28	25.92	28.17
MB 1756520	4.50	31.75	33.81	24.35	31.11	33.81
MB 2056515	4.50	32.84	23.54	16.95	21.66	23.54
MB 2056516	4.50	34.81	25.12	18.09	23.11	25.12
MB 2056518	4.50	41.06	34.24	24.65	31.50	34.24
MB 2056520	4.50	46.28	41.27	29.72	37.97	41.27
MB 2356515	4.50	45.08	26.38	19.00	24.27	26.38
MB 2356516	4.50	47.79	28.15	20.27	25.90	28.15
MB 2356518	4.50	56.75	38.78	27.92	35.68	38.78
MB 2356520	4.50	64.22	46.93	33.79	43.17	46.93
MB 2656515	4.50	59.23	30.22	21.76	27.80	30.22
MB 2656516	4.50	62.78	32.24	23.21	29.66	32.24
MB 2656518	4.50	74.95	44.89	32.32	41.30	44.89
MB 2656520	4.50	85.31	54.55	39.28	50.19	54.55
MB 1456515	5.00	11.65	15.18	10.93	13.97	15.18
MB 1456516	5.00	12.35	16.20	11.66	14.90	16.20
MB 1456518	5.00	14.60	21.57	15.53	19.85	21.57
MB 1456520	5.00	16.49	25.77	18.56	23.71	25.77
MB 1756515	5.00	18.21	17.89	12.88	16.46	17.89
MB 1756516	5.00	19.30	19.09	13.74	17.56	19.09
MB 1756518	5.00	22.79	25.64	18.46	23.59	25.64
MB 1756520	5.00	25.72	30.73	22.13	28.27	30.73
MB 2056515	5.00	26.60	21.61	15.56	19.88	21.61
MB 2056516	5.00	28.20	23.06	16.60	21.21	23.06
MB 2056518	5.00	33.26	31.24	22.50	28.74	31.24
MB 2056520	5.00	37.49	37.57	27.05	34.56	37.57
MB 2356515	5.00	36.52	24.32	17.51	22.37	24.32
MB 2356516	5.00	38.71	25.95	18.68	23.87	25.95
MB 2356518	5.00	45.97	35.47	25.54	32.64	35.47
MB 2356520	5.00	52.02	42.80	30.81	39.37	42.80
MB 2656515	5.00	47.98	27.97	20.13	25.73	27.97
MB 2656516	5.00	50.86	29.84	21.48	27.45	29.84
MB 2656518	5.00	60.71	41.17	29.64	37.87	41.17
MB 2656520	5.00	69.10	49.86	35.90	45.87	49.86

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Double Span Purlins

Maximum Loads

Section Ref.	Span	Deflection	Gravity	Ult. Uplift Load		
(TBC)	L m	L/ 180 kN	Load UDLkN	No. of Anti-sag rods		
				0	1	2
MB 1456515	5.50	9.63	13.95	10.04	12.83	13.95
MB 1456516	5.50	10.20	14.88	10.72	13.69	14.88
MB 1456518	5.50	12.07	19.76	14.23	18.18	19.76
MB 1456520	5.50	13.63	23.57	16.97	21.69	23.57
MB 1756515	5.50	15.05	16.48	11.87	15.16	16.48
MB 1756516	5.50	15.95	17.58	12.66	16.18	17.58
MB 1756518	5.50	18.83	23.52	16.94	21.64	23.52
MB 1756520	5.50	21.25	28.15	20.27	25.90	28.15
MB 2056515	5.50	21.98	19.96	14.37	18.37	19.96
MB 2056516	5.50	23.30	21.30	15.34	19.60	21.30
MB 2056518	5.50	27.49	28.71	20.67	26.42	28.71
MB 2056520	5.50	30.98	34.46	24.81	31.71	34.46
MB 2356515	5.50	30.18	22.53	16.22	20.73	22.53
MB 2356516	5.50	31.99	24.04	17.31	22.12	24.04
MB 2356518	5.50	37.99	32.66	23.52	30.05	32.66
MB 2356520	5.50	42.99	39.32	28.31	36.18	39.32
MB 2656515	5.50	39.65	26.00	18.72	23.92	26.00
MB 2656516	5.50	42.03	27.74	19.97	25.52	27.74
MB 2656518	5.50	50.17	37.99	27.36	34.96	37.99
MB 2656520	5.50	57.11	45.88	33.03	42.21	45.88
MB 1456515	6.00	8.09	12.89	9.28	11.86	12.89
MB 1456516	6.00	8.57	13.76	9.90	12.65	13.76
MB 1456518	6.00	10.14	18.23	13.12	16.77	18.23
MB 1456520	6.00	11.45	21.72	15.64	19.98	21.72
MB 1756515	6.00	12.64	15.27	10.99	14.05	15.27
MB 1756516	6.00	13.40	16.29	11.73	14.99	16.29
MB 1756518	6.00	15.83	21.73	15.64	19.99	21.73
MB 1756520	6.00	17.86	25.97	18.70	23.89	25.97
MB 2056515	6.00	18.47	18.54	13.35	17.05	18.54
MB 2056516	6.00	19.58	19.78	14.24	18.20	19.78
MB 2056518	6.00	23.10	26.56	19.12	24.43	26.56
MB 2056520	6.00	26.03	31.83	22.91	29.28	31.83
MB 2356515	6.00	25.36	20.97	15.10	19.29	20.97
MB 2356516	6.00	26.88	22.38	16.11	20.59	22.38
MB 2356518	6.00	31.92	30.26	21.79	27.84	30.26
MB 2356520	6.00	36.12	36.37	26.18	33.46	36.37
MB 2656515	6.00	33.32	24.26	17.47	22.32	24.26
MB 2656516	6.00	35.32	25.89	19.21	24.55	26.69
MB 2656518	6.00	42.16	35.25	25.38	32.43	35.25
MB 2656520	6.00	47.99	42.49	30.59	39.09	42.49

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Double Span Purlins

Maximum Loads

Section Ref.	Span	Deflection	Gravity	Ult. Uplift Load		
(TBC)	L m	L/ 180 kN	Load UDLkN	No. of Anti-sag rods		
				0	1	2
MB 1456515	6.50	6.89	11.99	8.63	11.03	11.99
MB 1456516	6.50	7.30	13.19	9.50	12.13	13.19
MB 1456518	6.50	8.64	16.91	12.17	15.55	16.91
MB 1456520	6.50	9.76	20.14	14.50	18.53	20.14
MB 1756515	6.50	10.77	14.22	10.24	13.08	14.22
MB 1756516	6.50	11.42	15.64	11.26	14.39	15.64
MB 1756518	6.50	13.49	20.19	14.53	18.57	20.19
MB 1756520	6.50	15.22	24.09	17.35	22.17	24.09
MB 2056515	6.50	15.74	17.30	12.45	15.91	17.30
MB 2056516	6.50	16.68	19.02	13.70	17.50	19.02
MB 2056518	6.50	19.68	24.71	17.79	22.73	24.71
MB 2056520	6.50	22.18	29.57	21.29	27.20	29.57
MB 2356515	6.50	21.61	19.61	14.12	18.04	19.61
MB 2356516	6.50	22.90	21.57	15.53	19.85	21.57
MB 2356518	6.50	27.20	28.18	20.29	25.92	28.18
MB 2356520	6.50	30.78	33.81	24.35	31.11	33.81
MB 2656515	6.50	28.39	22.73	16.36	20.91	22.73
MB 2656516	6.50	30.09	25.00	18.00	23.00	25.00
MB 2656518	6.50	35.92	32.87	23.67	30.24	32.87
MB 2656520	6.50	40.89	39.55	28.47	36.38	39.55
MB 1456515	7.00	5.94	11.20	8.07	10.31	11.20
MB 1456516	7.00	6.30	12.32	8.87	11.34	12.32
MB 1456518	7.00	7.45	15.77	11.36	14.51	15.77
MB 1456520	7.00	8.42	18.77	13.51	17.27	18.77
MB 1756515	7.00	9.29	13.31	9.58	12.24	13.31
MB 1756516	7.00	9.85	14.64	10.54	13.47	14.64
MB 1756518	7.00	11.63	18.85	13.57	17.34	18.85
MB 1756520	7.00	13.12	22.47	16.18	20.68	22.47
MB 2056515	7.00	13.57	16.21	11.67	14.91	16.21
MB 2056516	7.00	14.39	17.83	12.84	16.40	17.83
MB 2056518	7.00	16.97	23.09	16.62	21.24	23.09
MB 2056520	7.00	19.13	27.61	19.88	25.40	27.61
MB 2356515	7.00	18.63	18.41	13.26	16.94	18.41
MB 2356516	7.00	19.75	20.25	14.58	18.63	20.25
MB 2356518	7.00	23.45	26.36	18.98	24.26	26.36
MB 2356520	7.00	26.54	31.60	22.75	29.07	31.60
MB 2656515	7.00	24.48	21.37	15.39	19.66	21.37
MB 2656516	7.00	25.95	23.51	16.92	21.63	23.51
MB 2656518	7.00	30.97	30.79	22.17	28.32	30.79
MB 2656520	7.00	35.26	36.99	26.63	34.03	36.99

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Section Ref.	Span	Deflection	Gravity	Ult. Uplift Load		
(TBC)	L m	L/ 180 kN	Load UDLkN	No. of Anti-sag rods		
				0	1	2
MB 1456520	7.50	7.33	17.58	12.66	16.17	17.58
MB 1756515	7.50	8.09	12.50	9.00	11.50	12.50
MB 1756516	7.50	8.58	13.75	9.90	12.65	13.75
MB 1756518	7.50	10.13	17.66	12.72	16.25	17.66
MB 1756520	7.50	11.43	21.06	15.16	19.37	21.06
MB 2056515	7.50	11.82	15.25	10.98	14.03	15.25
MB 2056516	7.50	12.53	16.77	12.08	15.43	16.77
MB 2056518	7.50	14.78	21.67	15.60	19.94	21.67
MB 2056520	7.50	16.66	25.88	18.63	23.81	25.88
MB 2356515	7.50	16.23	17.33	12.48	15.95	17.33
MB 2356516	7.50	17.20	19.07	13.73	17.54	19.07
MB 2356518	7.50	20.43	24.76	17.83	22.78	24.76
MB 2356520	7.50	23.12	29.65	21.35	27.28	29.65
MB 2656515	7.50	21.32	20.16	14.51	18.54	20.16
MB 2656516	7.50	22.60	22.17	15.96	20.40	22.17
MB 2656518	7.50	26.98	28.95	20.85	26.64	28.95
MB 2656520	7.50	30.71	34.74	25.01	31.96	34.74
MB 1456520	8.00	6.44	16.52		15.20	16.52
MB 1756518	8.00	8.90	16.64		15.30	16.64
MB 1756520	8	10.05	19.81		18.22	19.81
MB 2056515	8.00	10.39	14.39		13.24	14.39
MB 2056516	8.00	11.01	15.83		14.57	15.83
MB 2056518	8.00	12.99	20.41		18.78	20.41
MB 2056520	8.00	14.64	24.37		22.42	24.37
MB 2356515	8.00	14.26	16.38		15.07	16.38
MB 2356516	8.00	15.12	18.02		16.58	18.02
MB 2356518	8.00	17.96	23.35		21.48	23.35
MB 2356520	8.00	20.32	27.93		25.69	27.93
MB 2656515	8.00	18.74	19.07		17.54	19.07
MB 2656516	8.00	19.87	20.98		19.30	20.98
MB 2656518	8.00	23.71	27.32		25.13	27.32
MB 2656520	8.00	26.99	32.74		30.12	32.74
MB 2056515	8.50	9.20	13.63		12.54	13.63
MB 2056516	8.50	9.76	14.99		13.79	14.99
MB 2056518	8.50	11.51	19.29		17.75	19.29
MB 2056520	8.50	12.97	23.01		21.17	23.01
MB 2356515	8.50	12.64	15.53		14.29	15.53
MB 2356516	8.50	13.39	17.08		15.72	17.08
MB 2356518	8.50	15.91	22.09		20.32	22.09
MB 2356520	8.50	18.00	26.39		24.28	26.39
MB 2656515	8.50	16.60	18.09		16.64	18.09
MB 2656516	8.50	17.60	19.90		18.31	19.90
MB 2656518	8.50	21.01	25.85		23.78	25.85
MB 2656520	8.50	23.91	30.95		28.48	30.95

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Eaves Beam Geometry

Section Ref. (TBC)	h mm	b _t mm	b _b mm	C mm	t mm	Weight kg/m	A mm ²	I _y mm ⁴	We _y mm ³	Wp _y mm ³	I _z mm ⁴	We _z mm ³	Wp _z mm ³	I _w mm ⁴	I _w mm ⁶	e _s mm	i _y mm	i _z mm
EB 185/18	185.0	85.0	95.0	20.0	1.8	5.84	744.06	4,031,800	42,237	50,614	624,030	10,590	16,652	821	5.90	45.3	73.7	29.0
EB 185/20	185.0	85.0	95.0	20.0	2.0	6.40	815.47	4,446,400	46,745	56,072	688,830	11,692	18,430	1,123	6.49E+09	45.1	73.81	29.1
EB 215/18	215.0	85.0	95.0	20.0	1.8	6.26	798.06	5,702,300	51,650	62,239	657,750	10,868	17,436	887	8.34E+09	42.1	84.5	28.7
EB 215/20	215.0	85.0	95.0	20.0	2.0	6.87	875.47	6,278,100	57,187	68,974	726,020	12,000	19,300	1,215	9.172E+09	41.9	84.7	28.8

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Eaves Beam Maximum Loads

Section Ref.	Span	Vertical		Horizontal	
EB 185/18	L m	Ult. Load (kN)		Ult. Load (kN)	
		Gravity	Uplift	Pressure	Suction
EB 185/18	4.50	23.98	23.14	13.75	20.63
	5.00	21.57	20.83	12.38	18.56
	5.50	19.62	18.93	11.26	16.87
	6.00	16.71	16.70	10.31	15.47
	6.50	16.60	16.02	17.86	26.78
	7.00	15.41	14.87	16.57	24.87
	7.50	14.38	13.89	15.47	23.21
	8.00	13.48	13.02	14.51	21.76
	8.50	12.52	12.25	13.65	20.48
Section Ref.	Span	Vertical		Horizontal	
EB 185/18	L m	Ult. Load (kN)		Ult. Load (kN)	
		Gravity	Uplift	Pressure	Suction
EB 185/20	4.50	26.38	25.46	15.12	22.69
	5.00	23.73	22.91	13.62	20.42
	5.50	21.58	20.82	12.38	18.56
	6.00	18.38	18.37	11.35	17.02
	6.50	18.26	17.63	19.64	29.46
	7.00	16.95	16.36	18.23	27.35

* Eaves Beam < 6.0m to be restraint at mid span.

* Eaves Beam > 6.0m to have 2Nos. restraints at third span.

* Eaves Beam Combined Loading - the unity ratio of the total applied load in both directions should not exceed 1.00 and satisfy the below equation:

$$\frac{\sum[(\text{Applied Vertical Load})/(\text{Vertical Load Capacity})+(\text{Applied Horizontal Load})/(\text{Horizontal Load Capacity})]}{\leq 1.00}$$

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Eaves Beam Maximum Loads

Section Ref.	Span	Vertical		Horizontal	
EB 185/18	L m	Ult. Load (kN)		Ult. Load (kN)	
		Gravity	Uplift	Pressure	Suction
EB 215/18	4.50	29.20	28.01	14.30	20.63
	5.00	26.28	25.21	12.87	18.56
	5.50	23.88	22.92	11.70	16.87
	6.00	21.43	21.02	10.73	15.47
	6.50	20.21	19.39	18.56	26.78
	7.00	18.77	18.01	17.24	24.87
	7.50	17.52	16.81	16.09	23.21
	8.00	16.43	15.76	15.08	21.76
	8.50	15.46	14.82	14.19	20.48
Section Ref.	Span	Vertical		Horizontal	
EB 185/18	L m	Ult. Load (kN)		Ult. Load (kN)	
		Gravity	Uplift	Pressure	Suction
EB 215/20	4.50	32.12	30.81	15.73	23.60
	5.00	28.91	27.73	14.15	21.23
	5.50	26.27	25.21	12.87	19.30
	6.00	23.57	23.12	11.80	17.70
	6.50	22.23	21.33	20.42	30.63
	7.00	20.65	19.81	18.96	28.44
	7.50	19.27	18.49	17.70	26.54
	8.00	18.07	17.34	16.59	24.89
	8.50	17.00	16.31	15.61	23.42

* Eaves Beam < 6.0m to be restraint at mid span.

* Eaves Beam > 6.0m to have 2Nos. restraints at third span.

* Eaves Beam Combined Loading - the unity ratio of the total applied load in both directions should not exceed 1.00 and satisfy the below equation:

$$\frac{\sum[(\text{Applied Vertical Load})/(\text{Vertical Load Capacity})+(\text{Applied Horizontal Load})/(\text{Horizontal Load Capacity})]}{\leq 1.00}$$

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Side Rail Geometry

Section Ref. (TBC)	h mm	b mm	C mm	t mm	Weight kg/m	A cm ²	I _y cm ⁴	We _y cm ³	Wp _y cm ³	I _z cm ⁴	We _z cm ³	Wp _z cm ³	I _{xt} cm ⁴	I _{xy} cm ⁵	e _x mm	i _y cm	i _z cm
MB 1456515	145.0	65.0	20.0	1.5	3.82	4.86	154.40	21.30	25.11	22.71	5.72	8.61	0.04	1,452.60	33.58	5.63	2.16
MB 1456516	145.0	65.0	20.0	1.6	4.07	5.19	164.69	22.67	26.75	24.11	6.08	9.15	0.05	1,540.00	33.40	5.64	2.16
MB 1456518	145.0	65.0	20.0	1.8	4.57	5.82	183.99	25.39	30.00	26.88	6.78	10.24	0.06	1,710.60	33.13	5.62	2.15
MB 1456520	145.0	65.0	20.0	2.0	4.99	6.35	202.70	28.07	33.21	29.62	7.47	11.32	0.09	1,875.60	32.95	5.65	2.16
MB 1756515	175.0	65.0	20.0	1.5	4.17	5.31	241.05	27.56	32.78	22.91	5.76	8.75	0.04	2,177.60	26.66	6.74	2.08
MB 1756516	175.0	65.0	20.0	1.6	4.45	5.67	257.12	29.33	34.91	24.33	6.12	9.31	0.05	2,308.60	26.56	6.74	2.07
MB 1756518	175.0	65.0	20.0	1.8	4.99	6.36	287.49	32.87	39.17	27.12	6.83	10.42	0.07	2,566.10	26.28	6.72	2.07
MB 1756520	175.0	65.0	20.0	2.0	5.46	6.95	316.29	36.38	43.40	29.87	7.52	11.52	0.10	2,816.80	26.03	6.74	2.07
MB 2056515	205.0	65.0	20.0	1.5	4.53	5.76	351.62	34.32	41.09	22.91	5.76	8.78	0.04	3,015.10	21.65	7.81	1.99
MB 2056516	205.0	65.0	20.0	1.6	4.83	6.15	375.06	36.54	43.77	24.33	6.12	9.34	0.05	3,197.20	21.55	7.81	1.99
MB 2056518	205.0	65.0	20.0	1.8	5.42	6.90	419.61	40.96	49.12	27.13	6.84	10.46	0.08	3,554.30	21.30	7.80	1.98
MB 2056520	205.0	65.0	20.0	2.0	5.93	7.55	461.18	45.35	54.44	29.88	7.54	11.57	0.10	3,902.50	21.07	7.81	1.99
MB 2356515	235.0	65.0	20.0	1.5	4.88	6.21	488.13	41.56	50.08	22.91	5.77	8.80	0.05	3,963.20	18.00	8.86	1.92
MB 2356516	235.0	65.0	20.0	1.6	5.20	6.63	520.67	44.26	53.35	24.34	6.13	9.37	0.06	4,203.00	17.91	8.86	1.92
MB 2356518	235.0	65.0	20.0	1.8	5.84	7.44	582.79	49.63	59.89	27.13	6.84	10.49	0.08	4,672.80	17.67	8.85	1.91
MB 2356520	235.0	65.0	20.0	2.0	6.40	8.15	640.06	54.97	66.39	29.88	7.55	11.61	0.11	5,131.20	17.45	8.86	1.91
MB 2656515	265.0	65.0	20.0	1.5	5.23	6.66	652.60	49.27	59.74	22.92	5.78	8.82	0.05	5,019.70	15.26	9.90	1.85
MB 2656516	265.0	65.0	20.0	1.6	5.58	7.11	696.11	52.48	63.66	24.34	6.14	9.39	0.06	5,323.10	15.15	9.90	1.85
MB 2656518	265.0	65.0	20.0	1.8	6.26	7.98	779.44	58.87	71.47	27.14	6.85	10.52	0.09	5,918.30	14.94	9.88	1.84
MB 2656520	265.0	65.0	20.0	2.0	6.87	8.75	855.01	65.21	79.23	29.89	7.55	11.64	0.12	6,499.90	14.74	9.89	1.85

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Double Span Side Rails

Vertical Cladding

Section Ref.	Span	Deflection	Ult. Total UDL (kN)	
(TBC)	L m	L/ 150 kN	Pressure	Suction
MB 1456515	4.50	17.25	16.65	15.31
MB 1456516	4.50	18.29	17.76	16.34
MB 1456518	4.50	21.64	23.76	21.85
MB 1456520	4.50	24.44	28.41	26.14
MB 1756515	4.50	26.97	19.56	17.99
MB 1756516	4.50	28.59	20.87	19.20
MB 1756518	4.50	33.76	28.17	25.92
MB 1756520	4.50	38.10	33.81	31.11
MB 2056515	4.50	39.41	23.54	21.66
MB 2056516	4.50	41.77	25.12	23.11
MB 2056518	4.50	49.27	34.24	31.50
MB 2056520	4.50	55.54	41.27	37.97
MB 2356515	4.50	54.10	26.38	24.27
MB 2356516	4.50	57.34	28.15	25.90
MB 2356518	4.50	68.10	38.78	35.68
MB 2356520	4.50	77.06	46.93	43.17
MB 1456515	5.00	13.98	15.18	13.97
MB 1456516	5.00	14.81	16.20	14.90
MB 1456518	5.00	17.52	21.57	19.85
MB 1456520	5.00	19.79	25.77	23.71
MB 1756515	5.00	21.85	17.89	16.46
MB 1756516	5.00	23.16	19.09	17.56
MB 1756518	5.00	27.35	25.64	23.59
MB 1756520	5.00	30.86	30.73	28.27
MB 2056515	5.00	31.92	21.61	19.88
MB 2056516	5.00	33.84	23.06	21.21
MB 2056518	5.00	39.91	31.24	28.74
MB 2056520	5.00	44.98	37.57	34.56
MB 2356515	5.00	43.82	24.32	22.37
MB 2356516	5.00	46.45	25.95	23.87
MB 2356518	5.00	55.16	35.47	32.64
MB 2356520	5.00	62.42	42.80	39.37

* For bay width < 6.0m, restraints to be provided at mid span.

* For bay width > 6.0m, 2Nos. restraints to be provided at third span.

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Section Ref.	Span	Deflection	Ult. Total UDL (kN)	
(TBC)	L m	L/ 150 kN	Pressure	Suction
MB 1456515	5.50	11.55	13.95	12.83
MB 1456516	5.50	12.24	14.88	13.69
MB 1456518	5.50	14.48	19.76	18.18
MB 1456520	5.50	16.36	23.57	21.69
MB 1756515	5.50	18.06	16.48	15.16
MB 1756516	5.50	19.14	17.58	16.18
MB 1756518	5.50	22.60	23.52	21.64
MB 1756520	5.50	25.50	28.15	25.90
MB 2056515	5.50	26.38	19.96	18.37
MB 2056516	5.50	27.96	21.30	19.60
MB 2056518	5.50	32.98	28.71	26.42
MB 2056520	5.50	37.18	34.46	31.71
MB 2356515	5.50	36.21	22.53	20.73
MB 2356516	5.50	38.39	24.04	22.12
MB 2356518	5.50	45.59	32.66	30.05
MB 2356520	5.50	51.59	39.32	36.18
MB 2656515	5.50	47.58	26.00	23.92
MB 2656516	5.50	50.44	27.74	25.52
MB 2656518	5.50	60.21	37.99	34.96
MB 2656520	5.50	68.53	45.88	42.21
MB 1456515	6.00	9.71	12.38	9.13
MB 1456516	6.00	10.29	13.14	9.68
MB 1456518	6.00	12.17	17.31	12.74
MB 1456520	6.00	13.74	20.42	14.99
MB 1756515	6.00	15.17	14.66	10.82
MB 1756516	6.00	16.08	15.56	11.47
MB 1756518	6.00	18.99	20.64	15.19
MB 1756520	6.00	21.43	24.41	17.92
MB 2056515	6.00	22.17	17.24	12.62
MB 2056516	6.00	23.50	18.20	13.28
MB 2056518	6.00	27.71	24.17	17.59
MB 2056520	6.00	31.24	28.64	20.79
MB 2356515	6.00	30.43	19.50	14.28
MB 2356516	6.00	32.26	20.59	15.03
MB 2356518	6.00	38.31	27.54	20.05
MB 2356520	6.00	43.35	32.73	23.75
MB 2656515	6.00	39.98	22.56	16.52
MB 2656516	6.00	42.38	23.81	17.92
MB 2656518	6.00	50.59	32.08	23.35
MB 2656520	6.00	57.59	38.24	27.75

* For bay width < 6.0m, restraints to be provided at mid span.

* For bay width > 6.0m, 2Nos. restraints to be provided at third span.

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Section Ref.	Span	Deflection	Ult. Total UDL (kN)	
(TBC)	L m	L/ 150 kN	Pressure	Suction
MB 1456515	6.50	8.27	11.51	8.49
MB 1456516	6.50	8.77	12.59	9.28
MB 1456518	6.50	10.37	16.06	11.82
MB 1456520	6.50	11.71	18.93	13.89
MB 1756515	6.50	12.93	13.65	10.07
MB 1756516	6.50	13.70	14.94	11.01
MB 1756518	6.50	16.18	19.18	14.11
MB 1756520	6.50	18.26	22.65	16.63
MB 2056515	6.50	18.89	16.08	11.77
MB 2056516	6.50	20.02	17.50	12.78
MB 2056518	6.50	23.61	22.48	16.37
MB 2056520	6.50	26.62	26.61	19.31
MB 2356515	6.50	25.93	18.24	13.35
MB 2356516	6.50	27.48	19.85	14.49
MB 2356518	6.50	32.64	25.64	18.67
MB 2356520	6.50	36.94	30.43	22.09
MB 2656515	6.50	34.07	21.14	15.47
MB 2656516	6.50	36.11	23.00	16.79
MB 2656518	6.50	43.11	29.91	21.78
MB 2656520	6.50	49.07	35.59	25.83
MB 1456515	7.00	7.13	10.76	7.94
MB 1456516	7.00	7.56	11.77	8.67
MB 1456518	7.00	8.94	14.98	11.03
MB 1456520	7.00	10.10	17.64	12.95
MB 1756515	7.00	11.15	12.78	9.43
MB 1756516	7.00	11.82	13.98	10.30
MB 1756518	7.00	13.95	17.90	13.18
MB 1756520	7.00	15.75	21.13	15.51
MB 2056515	7.00	16.29	15.07	11.03
MB 2056516	7.00	17.26	16.40	11.97
MB 2056518	7.00	20.36	21.01	15.29
MB 2056520	7.00	22.95	24.85	18.03
MB 2356515	7.00	22.36	17.12	12.53
MB 2356516	7.00	23.70	18.63	13.60
MB 2356518	7.00	28.14	23.99	17.46
MB 2356520	7.00	31.85	28.44	20.64
MB 2656515	7.00	29.37	19.87	14.55
MB 2656516	7.00	31.14	21.63	15.79
MB 2656518	7.00	37.17	28.02	20.39
MB 2656520	7.00	42.31	33.29	24.16

* For bay width < 6.0m, restraints to be provided at mid span.

* For bay width > 6.0m, 2Nos. restraints to be provided at third span.

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Section Ref.	Span	Deflection	Ult. Total UDL (kN)	
(TBC)	L m	L/ 150 kN		
			Pressure	Suction
MB 1456520	7.50	8.80	16.52	12.13
MB 1756515	7.50	9.71	12.00	8.86
MB 1756516	7.50	10.29	13.13	9.68
MB 1756518	7.50	12.15	16.78	12.35
MB 1756520	7.50	13.72	19.80	14.53
MB 2056515	7.50	14.19	14.18	10.38
MB 2056516	7.50	15.04	15.43	11.26
MB 2056518	7.50	17.74	19.72	14.35
MB 2056520	7.50	19.99	23.29	16.90
MB 2356515	7.50	19.48	16.12	11.80
MB 2356516	7.50	20.64	17.54	12.81
MB 2356518	7.50	24.52	22.54	16.40
MB 2356520	7.50	27.74	26.69	19.37
MB 2656515	7.50	25.59	18.75	13.72
MB 2656516	7.50	27.12	20.40	14.89
MB 2656518	7.50	32.38	26.35	19.18
MB 2656520	7.50	36.86	31.26	22.69
MB 1456520	8.00	7.73	14.87	12.31
MB 1756518	8.00	10.68	15.14	12.55
MB 1756520	8.00	12.05	17.83	14.76
MB 2056515	8.00	12.47	13.39	10.99
MB 2056516	8.00	13.22	14.57	12.02
MB 2056518	8.00	15.59	18.57	15.40
MB 2056520	8.00	17.57	21.93	18.16
MB 2356515	8.00	17.12	15.24	12.51
MB 2356516	8.00	18.14	16.58	13.68
MB 2356518	8.00	21.55	21.25	17.61
MB 2356520	8.00	24.38	25.13	20.81
MB 2656515	8.00	22.49	17.74	14.56
MB 2656516	8.00	23.84	19.30	15.92
MB 2656518	8.00	28.46	24.86	20.61
MB 2656520	8.00	32.39	29.46	24.40
MB 2056515	8.50	11.05	12.67	10.41
MB 2056516	8.50	11.71	13.79	11.38
MB 2056518	8.50	13.81	17.56	14.55
MB 2056520	8.50	15.57	20.71	17.15
MB 2356515	8.50	15.16	14.44	11.86
MB 2356516	8.50	16.07	15.72	12.97
MB 2356518	8.50	19.09	20.10	16.66
MB 2356520	8.50	21.60	23.75	19.67
MB 2656515	8.50	19.92	16.82	13.81
MB 2656516	8.50	21.12	18.31	15.10
MB 2656518	8.50	25.21	23.52	19.50
MB 2656520	8.50	28.69	27.86	23.07

* For bay width < 6.0m, restraints to be provided at mid span.

* For bay width > 6.0m, 2Nos. restraints to be provided at third span.

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