



Mabey & Johnson

COMPACT 200 SUPER PANEL BRIDGE

with

**EXTRA WIDE
SINGLE LANE ROADWAY**

and

EMERGENCY RAMPS

LOGISTIC SUPPORT BRIDGE MANUAL

PUBLICATION REFERENCE: 37C99 (Revision D)

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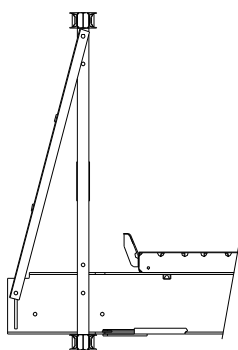
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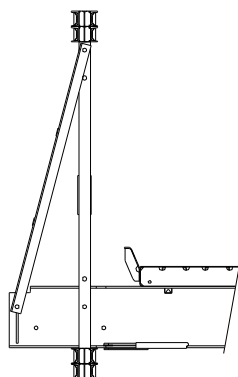
SECTION 1

DESIGN INFORMATION

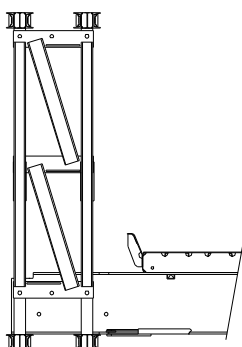
BRIDGE TRUSS CONSTRUCTIONS



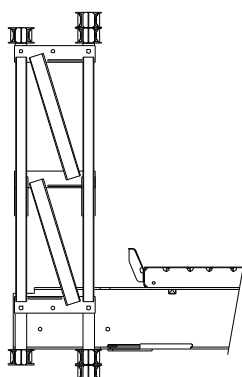
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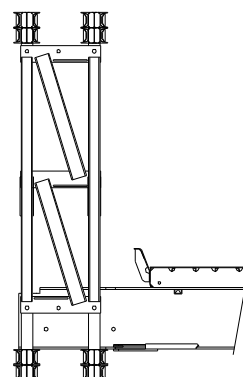
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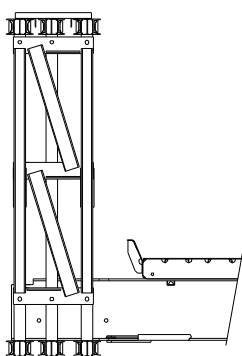
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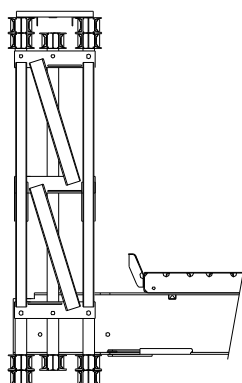
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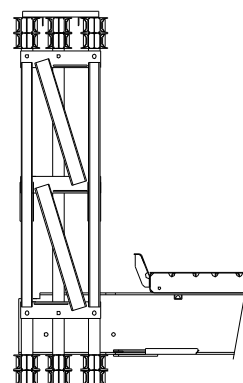
DSHr2H



TSH



TSHr2H



TSHr3H

BRIDGE TRUSS CONSTRUCTIONS

KEY TO ABBREVIATIONS

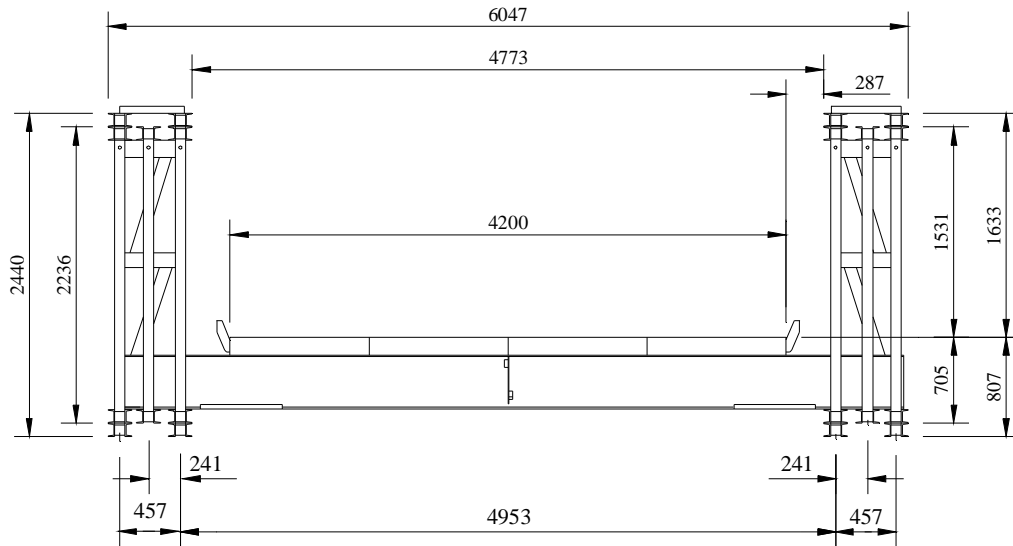
CODE	DESCRIPTION OF TRUSS CONSTRUCTION
SS	SINGLE SINGLE: each truss has a single panel line in a single storey format.
SSR	SINGLE SINGLE REINFORCED: each truss has a single panel line in a single storey format, with a chord reinforcement attached to both the top and the bottom of each panel. *
DS	DOUBLE SINGLE: each truss has two panel lines in a single storey format.
DSR1	DOUBLE SINGLE REINFORCED ONE: each truss has two panel lines in a single storey format, with a chord reinforcement attached to both the top and the bottom of the inner panel of each truss only. *
DSR2	DOUBLE SINGLE REINFORCED TWO: each truss has two panel lines in a single storey format, with a chord reinforcement attached to both the top and the bottom of both panels of each truss. *
TS	TRIPLE SINGLE: each truss has three panel lines in a single storey format.
TSR2	TRIPLE SINGLE REINFORCED TWO: each truss has three panel lines in a single storey format, with a chord reinforcement attached to both the top and the bottom of the inner and outer panels of each truss only. *
TSR3	TRIPLE SINGLE REINFORCED THREE: each truss has three panel lines in a single storey format, with a chord reinforcement attached to both the top and the bottom of all three panels of each truss. *
H	<p>The letter “H” is used after either the panel configuration or the chord reinforcement configuration to signify that Mabey Compact 200 Super Panels (MC411 & MC412) or Super Chord Reinforcements (MC304) are to be used to form the bridge trusses, instead of the original Compact 200 Standard Panels (MC200 & MC201) or Standard Chord Reinforcements (MC302), for example:</p> <p>“SSR” signifies that standard panels and standard chords are to be used in the bridge truss “SSRH” signifies that standard panels and super chords are to be used in the bridge truss “SSHR” signifies that super panels and standard chords are to be used in the bridge truss “SSHRH” signifies that super panels and super chords are to be used in the bridge truss</p> <p>A mix of standard and super panel stock is unusual, however, and it should be noted that the Logistic Support Bridging supplied to NATO is the current Compact 200 Super Panel Bridge consisting entirely of Super Panels and Super Chord Reinforcements.</p>
*	Note that the final bay at each end of each bridge span is always of unreinforced truss construction, even if the span is otherwise of reinforced truss construction.

BRIDGE DIMENSIONS

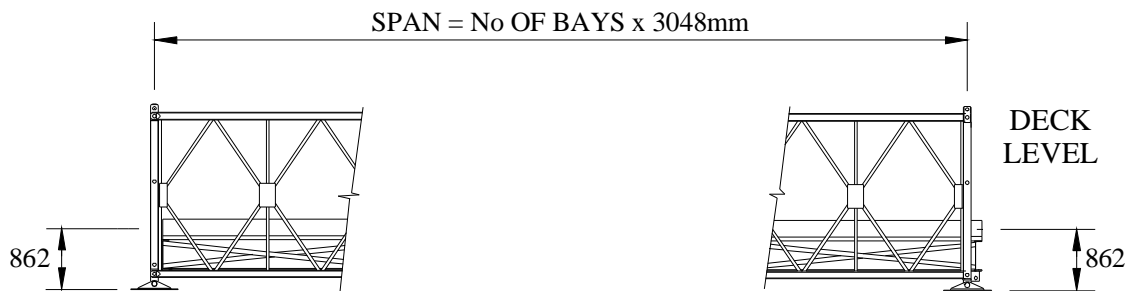
COMPACT 200 SUPER PANEL BRIDGES

EXTRA WIDE SINGLE LANE STEEL DECK ROADWAY

MLC110W LOGISTIC SUPPORT BRIDGE TRANSOMS



TRANSVERSE DIMENSIONS



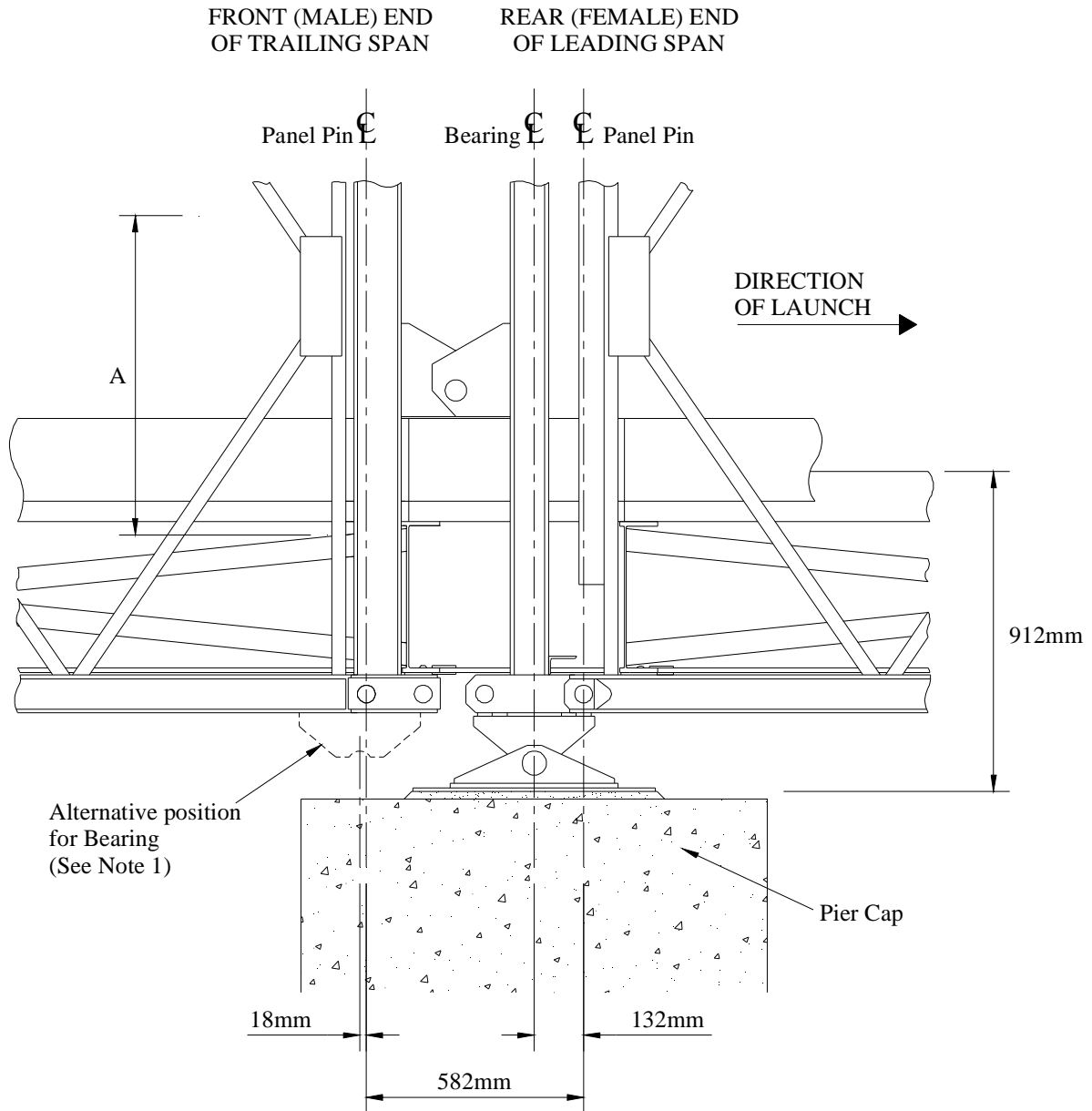
LONGITUDINAL DIMENSIONS

Notes:

1. All dimensions are in millimetres and are nominal, subject to manufacturing tolerances.
2. All of the dimensions given to the top of the bridge trusses are actually those to the top of the chords. They are, therefore, correct for single panel truss constructions and for double panel truss constructions, where the Bracing Frames are fitted to the underside of the top chords of the Panels. For all triple panel truss constructions, however, 35mm must be added to these dimensions as the Bracing Frames are fitted on top of the chords.
3. The dimensions given at the ends of the bridge in the lower diagram are from the bottom of the Bearing Baseplate to the roadway surface of the Steel Deck. The dimension of 862mm assumes the use of MLC110W Transoms (NLC18039), where HS25 Transoms (MC454) are used this dimension reduces to 806mm and other deck referenced dimensions in the upper diagram vary similarly by 56mm.

BRIDGE DIMENSIONS

SPAN JUNCTIONS



Notes:

- 1 Where adjacent bridge spans are of an identical truss construction and are the same length, the Span Junction Bearings may be placed in either of the two positions shown above. Where one bridge span is longer than the other, the Span Junction Bearings are usually placed under the Span Junction Posts attached to the longer span. Where adjacent bridge spans are of different truss constructions, the Span Junction Bearings must be placed under the Span Junction Posts attached to the bridge span with the greater truss construction.
- 2 Whilst the abutments can have a minimum width of 7 metres, as detailed on the previous page, piers must have a minimum width of 8 metres in order to accommodate span junction jacking operations.
- 3 The dimension of 912mm is from the underside of the span junction bearing baseplate to the roadway surface of the bridge deck and assumes the use of MLC110W Transoms (NLC18039), where HS25 Transoms (MC454) are used this dimension reduces to 856mm.

BRIDGE PROPERTIES

COMPACT 200 SUPER PANEL BRIDGES

BENDING MOMENT AND SHEAR CAPACITIES

TABLE 1: MILITARY APPLICATIONS @ 1.5 FACTOR OF SAFETY

TRUSS CONSTRUCTION	MOMENT CAPACITY (TONNE METRES)	SHEAR CAPACITY (TONNES)	
		STANDARD SHEAR	HIGH SHEAR
SS _H	365	52	80
SS _H R _H	736	52	80
DS _H	736	103	161
DS _H R _{1H}	1138	78	121
DS _H R _{2H}	1541	103	161
TS _H	1098	155	241
TS _H R _{2H}	1830	130	202
TS _H R _{3H}	2207	155	241

TABLE 2: CIVILIAN APPLICATIONS @ 1.7 FACTOR OF SAFETY

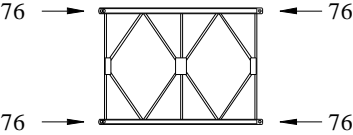
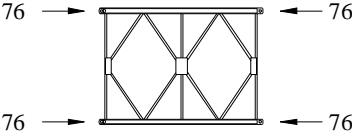
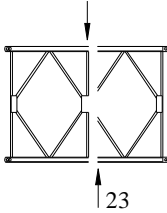
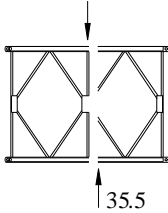
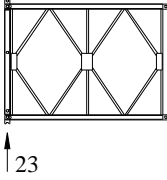
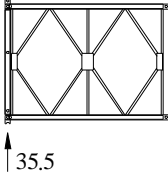
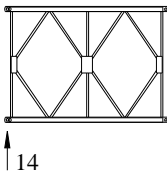
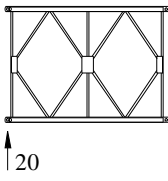
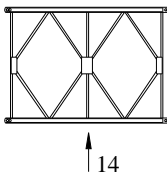
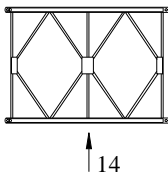
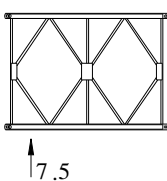
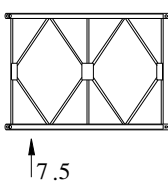
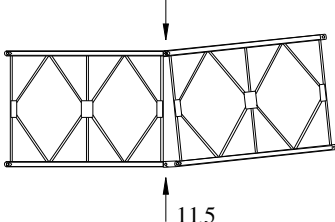
TRUSS CONSTRUCTION	MOMENT CAPACITY (TONNE METRES)	SHEAR CAPACITY (TONNES)	
		STANDARD SHEAR	HIGH SHEAR
SS _H	322	46	71
SS _H R _H	649	46	71
DS _H	649	91	142
DS _H R _{1H}	1004	69	107
DS _H R _{2H}	1360	91	142
TS _H	969	137	213
TS _H R _{2H}	1615	115	178
TS _H R _{3H}	1947	137	213

Notes:

1. The Moment and Shear properties tabulated above are the total bridge capacities (two trusses).
2. The values tabulated above for Shear take account of the maldistribution of loading within the unevenly reinforced trusses of DS_HR_{1H} and TS_HR_{2H} constructions.
3. The two columns of Shear capacities listed above refer to the two types of panels available for Compact 200 Super Panel Bridges. These are the Super Panel (MC411), with a shear capacity of 23 tonnes per panel at a 1.7 factor of safety, and the High Shear Super Panel (MC412), with an enhanced shear capacity of 35 tonnes per panel at a 1.7 factor of safety.

BRIDGE PROPERTIES

COMPACT 200 SUPER PANEL CAPACITIES

MC411 - SUPER PANEL	MC412 - HIGH SHEAR SUPER PANEL
	
	
	
	
	
	
	

Note: the capacities given above are in metric tonnes and incorporate a 1.7 factor of safety against failure, assuming that the Panels are laterally stabilized (as when in a bridge).

BRIDGE WEIGHTS

COMPACT 200 SUPER PANEL BRIDGES

EXTRA WIDE SINGLE LANE STEEL DECK ROADWAY

MLC110W LOGISTIC SUPPORT BRIDGE TRANSOMS

WEIGHTS PER BAY (TONNES)				
BRIDGE BAYS			LAUNCHING NOSE BAYS	
TRUSS CONSTRUCTION	FULLY DECKED	NO DECK FITTED	TRUSS CONSTRUCTION	NO DECK FITTED
SSH	2.719	1.314	SSH (bay 1)	1.195
SShRh	3.166	1.760	SShL (bay 1)	1.231
DSH	3.554	2.147	SSH	1.279
DSHR1H	3.997	2.591	SShL	1.315
DSHR2H	4.441	3.035	SShDH	1.511
TSH	4.242	2.835	SShNH	1.503
TShR2H	5.134	3.728	DSHN1H	2.338
TShR3H	5.583	4.177	DSHN2H	2.562
—	—	—	—	—
SShNH	2.943	1.537	SShNH (tail)	1.419
DSHN1H *	3.776	2.370	DSHN1H (tail)	2.095
DSHN2H *	3.998	2.592	DSHN2H (tail)	2.314
TShN2H *	4.688	3.282		
TShN3H *	4.913	3.507		
* Deduct 0.105 if Bracing Frames are not fitted				

TRUSS FORMAT	ADDITIONAL TOTAL WEIGHT PER BRIDGE OF END OF BRIDGE COMPONENTS	ADDITIONAL WEIGHT PER BAY OF HIGH SHEAR END PANELS
SINGLE	0.933	0.103
DOUBLE	1.148	0.205
TRIPLE	1.594	0.308

Notes:

1. The weights tabulated above are in tonnes per 3.048 metres (10 feet) long bay and are based upon the theoretical component weights with an allowance of 2.5% for galvanising.
2. The weights tabulated above assume the use of MLC110W Transoms (NLC18039), where HS25 Transoms (MC454) are used, the weights per bay are reduced by 0.083 tonnes.
3. The final bay at each end of each span is always of unreinforced truss construction, even if the bridge span is otherwise of reinforced truss construction.

BRIDGE CONSTRUCTIONS *for* MILITARY LOADS

COMPACT 200 SUPER PANEL BRIDGES

EXTRA WIDE SINGLE LANE STEEL DECK ROADWAY

SPAN		MLC40 CIVILIAN	MLC60 NORMAL	MLC80 T NORMAL	MLC110 W NORMAL
BAYS	METRES				
5	15.24	SS _H	SS _H +	DS _H	DS _H
6	18.29	SS _H +	SS _H R _H +	DS _H	DS _H
7	21.34	SS _H R _H +	SS _H R _H ++	DS _H	DS _H
8	24.38	SS _H R _H ++	SS _H R _H ++	DS _H R _{1H} ++	DS _H R _{1H} ++
9	27.43	SS _H R _H ++	DS _H	DS _H R _{1H} ++	DS _H R _{1H} ++
10	30.48	SS _H R _H +++	DS _H R _{1H} +	DS _H R _{1H} ++	DS _H R _{2H} ++
11	33.53	DS _H	DS _H R _{1H} ++	DS _H R _{1H} +++	DS _H R _{2H} ++
12	36.58	DS _H R _{1H} ++	DS _H R _{1H} ++	DS _H R _{2H} +	DS _H R _{2H} +++
13	39.62	DS _H R _{1H} ++	DS _H R _{1H} +++	DS _H R _{2H} ++	DS _H R _{2H} +++
14	42.67	DS _H R _{1H} ++	DS _H R _{2H} +	DS _H R _{2H} ++	TS _H R _{2H} ++
15	45.72	DS _H R _{2H} +	DS _H R _{2H} +	DS _H R _{2H} ++	TS _H R _{3H} +
16	48.77	DS _H R _{2H} +	DS _H R _{2H} ++	TS _H R _{2H} ++	TS _H R _{3H} ++
17	51.82	DS _H R _{2H} ++	TS _H R _{2H}	TS _H R _{2H} ++	(TS _H R _{3H} ++ @ C)
18	54.86	TS _H R _{2H} +	TS _H R _{2H} +	TS _H R _{3H} +	X
19	57.91	TS _H R _{3H}	TS _H R _{3H}	TS _H R _{3H} ++	X
20	60.96	TS _H R _{3H}	TS _H R _{3H} +	(TS _H R _{3H} ++ @ C)	X

Notes:

1. “+ / ++ / +++” indicates the number of bays of High Shear Panels required at each end of the span.
2. It is assumed that civilian vehicles of up to 40 tonnes gross weight may cross the bridges as well as the military vehicles specified, hence truss constructions tabulated for MLC40 loading are as required to provide a 1.7 minimum “civilian” factor of safety against failure. The constructions tabulated for MLC60, MLC80 T and MLC110 W loadings, however, are those as required to provide a 1.5 minimum “military” factor of safety against failure.
3. The constructions tabulated for MLC40, MLC60 and MLC80 T loadings are adequate to sustain a minimum of 100,000 cycles of the relevant design live loading, however, fatigue has not been considered a criterion when assessing the constructions required for MLC110 W loading.
4. All of the design loadings have been considered as normal crossings in convoy with 30 metre intervals between vehicles and with dynamic impact and eccentricity effects applied as defined in the NATO Design and Test Code for Military Bridges and Gap Crossing Equipment. Where a construction has been given in brackets and listed as “@ C”, however, it is only suitable for a “caution” crossing. In such cases, only one vehicle is allowed onto the span at any one time, at a reduced speed, so as to limit the dynamic impact effects to 5% on bending and 10% on shear, and at a limited eccentricity within the roadway of 10%.
5. In addition to the live loading as specified, a superimposed dead loading of 0.75 kN/m² has been applied over the entire roadway to account for potential mud deposits.
6. Bridges constructed using MLC110W Transoms (NLC18039) are able to sustain all loadings up to and including MLC80T / MLC110W, however, where HS25 Transoms (MC454) are used the maximum loadings that they can sustain with a 1.5 factor of safety are MLC80T / MLC70W.

END REACTIONS *due to* MILITARY LOADS

COMPACT 200 SUPER PANEL BRIDGES

EXTRA WIDE SINGLE LANE STEEL DECK ROADWAY

BRIDGE SPAN		MLC40 (CIVILIAN)					MLC60 (NORMAL)				
		END REACTIONS			GROUND PRESSURES		END REACTIONS			GROUND PRESSURES	
Bays	Metres	Dead tonnes	Live tonnes	Total tonnes	UG kN/m ²	GB kN/m ²	Dead tonnes	Live tonnes	Total tonnes	UG kN/m ²	GB kN/m ²
5	15.24	12.7	48.8	61.5	290	79	12.8	65.8	78.6	374	100
6	18.29	14.7	51.5	66.2	313	85	15.6	67.6	83.2	397	106
7	21.34	17.7	53.9	71.6	340	91	17.8	70.2	88.0	420	112
8	24.38	19.8	55.7	75.5	359	96	19.8	72.8	92.6	443	118
9	27.43	21.9	57.1	79.0	376	101	24.0	73.7	97.7	468	125
10	30.48	24.1	58.2	82.3	392	105	28.2	75.7	103.9	498	133
11	33.53	28.5	57.9	86.4	412	110	30.9	77.0	107.9	518	138
12	36.58	33.4	59.0	92.4	442	118	33.4	78.0	111.4	535	142
13	39.62	35.9	59.7	95.6	458	122	36.1	79.0	115.1	553	147
14	42.67	38.4	61.3	99.7	478	127	40.9	82.0	122.9	592	157
15	45.72	43.6	63.9	107.5	516	137	43.6	86.6	130.2	628	166
16	48.77	46.3	66.7	113.0	543	144	46.5	90.7	137.2	662	175
17	51.82	49.2	70.2	119.4	575	153	54.9	94.2	149.1	720	190
18	54.86	58.3	73.7	132.0	636	169	58.3	97.4	155.7	753	199
19	57.91	64.8	76.8	141.6	684	181	64.8	100.2	165.0	799	211
20	60.96	68.1	79.6	147.7	714	189	68.4	104.0	172.4	835	220

Notes:

- 1 The reactions and ground pressures tabulated above are the totals per abutment at each end of the bridge.
- 2 UG = the pressure under the Upper Grillage at each corner of the bridge when Ground Beams are not used. The effective bearing area of an Upper Grillage is 1.04 metres x 0.96 metres.
- 3 GB = the pressure under the Ground Beam assembly at each end of the bridge when used. The effective bearing area of a Ground Beam assembly is 6.4 metres x 1.2 metres.
- 4 For details of the required truss constructions and all notes pertaining to the application of the design loadings, refer to page 1:09 of this manual.

- 5 In addition to the self weight of the bridge and the live loading as specified, a superimposed dead loading of 0.75 kN/m^2 has been applied over the entire roadway to account for potential mud deposits.

END REACTIONS *due to* MILITARY LOADS

COMPACT 200 SUPER PANEL BRIDGES

EXTRA WIDE SINGLE LANE STEEL DECK ROADWAY

BRIDGE SPAN		MLC80 T (NORMAL)					MLC110 W (NORMAL)				
		END REACTIONS			GROUND PRESSURES		END REACTIONS			GROUND PRESSURES	
Bays	Metres	Dead tonnes	Live tonnes	Total tonnes	UG kN/m ²	GB kN/m ²	Dead tonnes	Live tonnes	Total tonnes	UG kN/m ²	GB kN/m ²
5	15.24	14.9	80.5	95.4	457	122	14.9	94.9	109.8	527	140
6	18.29	17.2	83.0	100.2	480	128	17.2	100.6	117.8	567	150
7	21.34	19.5	84.8	104.3	500	133	19.5	104.6	124.1	598	159
8	24.38	23.5	86.4	109.9	528	140	23.5	109.4	132.9	641	170
9	27.43	26.0	87.5	113.5	546	145	26.0	113.8	139.8	675	179
10	30.48	28.4	88.4	116.8	562	149	30.2	117.0	147.2	711	188
11	33.53	31.1	89.1	120.2	578	154	32.9	119.9	152.8	739	195
12	36.58	35.4	89.8	125.2	603	160	35.8	122.2	158.0	764	202
13	39.62	38.4	94.4	132.8	640	170	38.6	124.2	162.8	788	208
14	42.67	41.1	101.2	142.3	687	182	46.3	125.9	172.2	834	220
15	45.72	43.8	107.2	151.0	730	193	52.0	129.0	181.0	877	231
16	48.77	52.4	112.5	164.9	798	211	55.3	133.4	188.7	915	241
17	51.82	55.5	117.1	172.6	836	220	58.9	137.7	196.6	954	251
18	54.86	61.9	121.3	183.2	888	234	X	X	X	X	X
19	57.91	65.4	125.0	190.4	923	243	X	X	X	X	X
20	60.96	68.7	128.3	197.0	956	252	X	X	X	X	X

Notes:

- 1 The reactions and ground pressures tabulated above are the totals per abutment at each end of the bridge.
- 2 UG = the pressure under the Upper Grillage at each corner of the bridge when Ground Beams are not used. The effective bearing area of an Upper Grillage is 1.04 metres x 0.96 metres.
- 3 GB = the pressure under the Ground Beam assembly at each end of the bridge when used. The effective bearing area of a Ground Beam assembly is 6.4 metres x 1.2 metres.
- 4 For details of the required truss constructions and all notes pertaining to the application of the design loadings, refer to page 1:09 of this manual.

- 5 In addition to the self weight of the bridge and the live loading as specified, a superimposed dead loading of 0.75 kN/m^2 has been applied over the entire roadway to account for potential mud deposits.

PIER REACTIONS *due to* MILITARY LOADS

COMPACT 200 SUPER PANEL BRIDGES

EXTRA WIDE SINGLE LANE STEEL DECK ROADWAY

TOTAL (DEAD & LIVE LOAD) PIER REACTIONS DUE TO MLC 40 (TONNES)																
SPAN (bays)	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
5	89	91	94	96	98	100	105	110	112	119	128	135	141	153	162	168
6		93	96	98	100	102	107	112	114	121	130	137	143	155	164	170
7			99	101	103	105	110	115	117	124	133	140	146	158	167	173
8				103	105	107	112	117	119	126	135	142	148	160	169	175
9					107	109	114	119	121	128	137	144	150	162	171	177
10						111	116	121	124	130	139	146	152	164	174	179
11							120	124	127	133	143	149	155	167	177	172
12								130	132	139	148	155	161	173	182	188
13									137	143	151	157	163	175	185	190
14										149	158	164	170	183	192	197
15											167	173	179	191	200	206
16												179	185	198	207	212
17													191	204	213	218
18														216	225	231
19															234	240
20																245

TOTAL (DEAD & LIVE LOAD) PIER REACTIONS DUE TO MLC 60 (TONNES)																
SPAN (bays)	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
5	111	114	116	118	123	127	130	132	135	142	151	159	172	180	190	197
6		117	119	121	126	130	133	135	138	145	154	162	175	182	193	199
7			121	123	128	132	135	137	140	147	156	164	177	185	195	202
8				125	130	134	137	139	142	149	158	166	179	187	197	204
9					133	137	140	143	145	153	161	169	182	190	200	207
10						142	145	147	150	157	166	174	187	194	204	211
11							147	150	153	160	169	176	190	197	207	214
12								152	155	165	172	179	192	200	210	217
13									163	173	180	186	198	204	213	219
14										182	189	195	207	213	222	228
15											195	202	214	220	229	236
16												208	220	227	237	243
17													232	240	250	256
18														247	257	264
19															267	274
20																281

Notes:

- 1 The reactions tabulated above are the total reactions per pier at the junction of two simply supported bridge spans joined with span junction equipment.

- 2 The reaction at a pier supporting two spans of different lengths is given in the cell that intersects the column of the longer span and the row of the shorter span, for example, the reaction at a pier supporting a 16 bay span joined to a 19 bay span due to MLC60 loading = 237 tonnes.

PIER REACTIONS *due to* MILITARY LOADS

COMPACT 200 SUPER PANEL BRIDGES

EXTRA WIDE SINGLE LANE STEEL DECK ROADWAY

TOTAL (DEAD & LIVE LOAD) PIER REACTIONS DUE TO MLC80T (TONNES)																
SPAN (bays)	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
5	127	129	132	136	138	140	143	147	155	164	172	185	193	203	209	216
6		132	134	138	140	143	145	150	157	166	174	188	195	205	212	218
7			136	140	143	145	148	152	160	169	177	190	197	207	214	220
8				144	147	149	152	156	164	173	181	194	201	211	218	224
9					149	152	154	159	166	175	183	196	204	214	220	227
10						154	157	161	169	177	185	199	206	216	223	229
11							159	164	171	180	188	202	209	219	226	232
12								170	180	189	197	211	218	228	234	241
13									190	199	207	220	228	238	244	251
14										208	216	229	236	246	253	259
15											223	237	244	254	261	267
16												250	257	268	274	280
17													264	275	281	288
18														285	291	298
19															298	304
20																310

TOTAL (DEAD & LIVE LOAD) PIER REACTIONS DUE TO MLC110W (TONNES)																
SPAN (bays)	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
5	177	179	182	186	188	192	195	198	201	209	221	234	245			
6		182	184	188	190	195	197	200	203	211	224	236	248			
7			186	190	193	197	200	202	205	213	226	238	250			
8				194	197	201	204	206	209	217	230	242	254			
9					199	203	206	209	212	220	232	245	256			
10						208	210	213	216	224	237	249	261			
11							213	216	219	227	239	252	263			
12								219	222	230	242	255	266			
13									224	232	245	257	269			
14										240	253	265	277			
15											268	280	291			
16												292	304			
17													315			
18																
19																
20																

Notes:

- 1 The reactions tabulated above are the total reactions per pier at the junction of two simply supported bridge spans joined with span junction equipment.

- 2 The reaction at a pier supporting two spans of different lengths is given in the cell that intersects the column of the longer span and the row of the shorter span, for example, the reaction at a pier supporting a 14 bay span joined to a 16 bay span due to MLC110W loading = 265 tonnes.

PERMANENT BRIDGE FOUNDATIONS

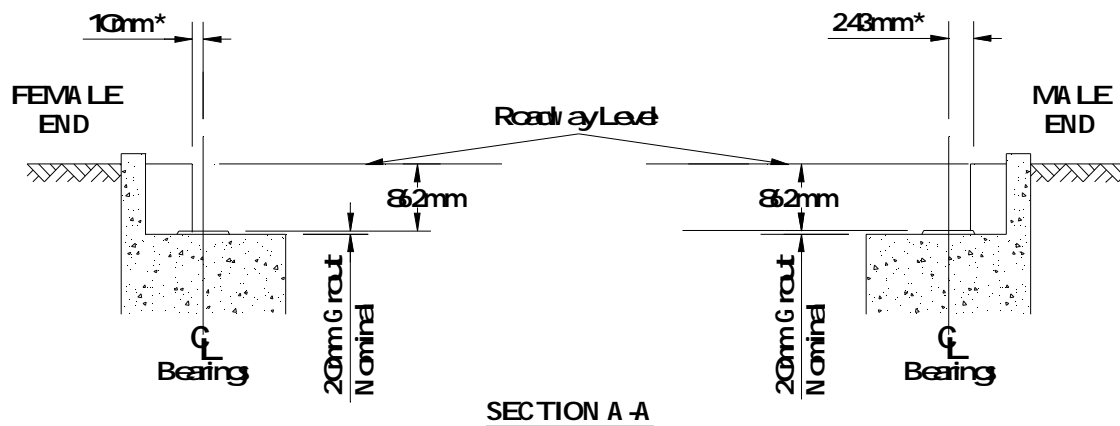
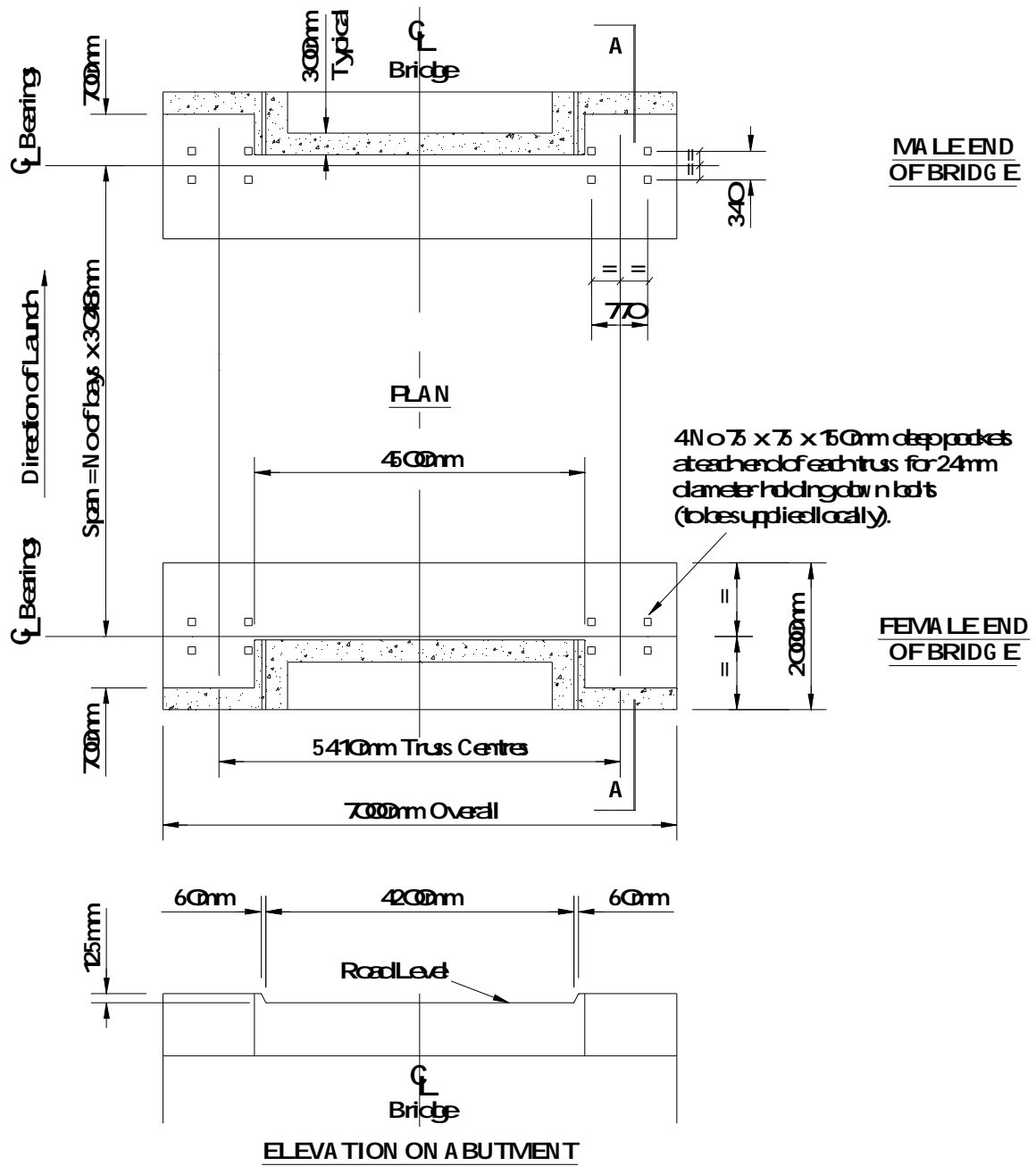
COMPACT 200 SUPER PANEL BRIDGES

EXTRA WIDE SINGLE LANE STEEL DECK ROADWAY

NOTES PERTAINING TO THE TYPICAL BRIDGE ABUTMENT DETAIL DIAGRAM

- 1 For permanent, or semi-permanent, bridge deployments, the typical concrete abutment details that are geometrically required to facilitate the installation of a Compact 200 bridge with an Extra Wide single lane roadway are shown on the diagram opposite. The dimensions given are the minimum recommended to give sufficient space for launching and jacking operations to be undertaken. If wing walls are required at the sides of the abutments for earth retention purposes, the overall widths should be increased appropriately.
- 2 The abutment foundations must be designed and detailed locally, by others, to sustain the loads to which they will be subjected, both when in service and during the bridge launching and installation, without any significant settlement taking place.
- 3 Depending upon the ground conditions particular to the site, the bases of the abutments may need to be extended forwards in order to sustain the loads from the launching rollers, which are normally placed 750mm in front of the bridge bearing positions.
- 4 For ease of installation, the back walls of the abutments must not be constructed until after the bridge has been launched, jacked down and installed upon its bearings. The starter bars for the reinforcement of the back walls should be bent down, such that they are clear of the underside of the bridge during launching, and should be omitted completely from the area directly behind the bearing positions, where jacks are to be used.
- 5 The dimensions given on the lower diagram for the height of the back walls of the abutments are as measured from the underside of the bearing baseplate to the roadway surface of the bridge deck. The dimension of 862mm assumes the use of MLC110W Transoms (NLC18039), where HS25 Transoms (MC454) are used this dimension reduces to 806mm.
- 6 The dimensions marked thus * on the diagram allow for 25 millimetres of clearance between the back walls of the abutments and the ends of the bridge deck at an ambient temperature of 15°C. This is adequate for single span bridges of up to 60 metres in length where the local temperature range is from -20°C to $+50^{\circ}\text{C}$. For longer, multiple span bridges or for more extreme environments, the dimension at the abutment where it is intended to install the sliding bearings will need to be adjusted to cater for the thermal expansion appropriate to the local temperature range and to the span of the bridge.
- 7 It is essential that all of the bearings on an abutment are set at the same level in order to avoid maldistribution of stresses in the bridge trusses.
- 8 The dimensions given on the diagram assume that the bridge is to be installed level. Whilst it is possible to install a Compact 200 bridge on a longitudinal gradient of up to 1 in 20, when this is required Mabey & Johnson Engineers should be consulted for revised dimensions and for advice as to the practicality of the proposed scheme.
- 9 In addition to the details shown on the diagram, it is recommended that bollards are installed at each end of the bridge so as to protect the bridge trusses from damage due to vehicular collision.
- 10 All dimensions given are in millimetres, however, please note that the diagrams are not to scale and details should not, therefore, be measured from them.

TYPICAL ABUTMENT DETAILS



SECTION 2

EQUIPMENT SETS

EQUIPMENT SETS CAPABILITIES

In order to provide a balanced stock of logistic support bridging that can cater for a wide range of uses with maximum efficiency, the bridging is supplied in a series of equipment sets that have the following capabilities:

1 STANDARD BRIDGE SET:

All of the components that are required to construct any bridge span up to 40 metres (nominal) that is able to sustain any design loading up to MLC80 Tracked or MLC110 Wheeled.

Furthermore, two such Standard Bridge Sets when added together provide all of the components that are required to construct any bridge span up to 50 metres (nominal) that is able to sustain any design loading up to MLC80 Tracked or MLC110 Wheeled.

2 LONG SPAN SET:

All of the components that are required such that when they are added to the components of two Standard Bridge Sets there are sufficient components to construct any bridge span up to 60 metres (nominal) that is able to sustain any design loading up to MLC80 Tracked or MLC70 Wheeled.

3 EMERGENCY RAMP SET:

All of the components that are required to construct two 10 metre emergency ramps, one for each end of a bridge, but exclusive of any ground beams or grillage supports that may be required.

4 LAUNCHING & ERECTION EQUIPMENT SET:

All of the components that are required to assemble and install by cantilever launch any bridge with a span of up to 40 metres (nominal) that is able to sustain any design loading up to MLC80 Tracked or MLC110 Wheeled.

Furthermore, two such Launching and Erection Equipment Sets, when added together, provide all of the components that are required to assemble and install by cantilever launch any of the following:

- i. A bridge with a span of up to 50 metres (nominal) that is able to sustain any design loading up to MLC80 Tracked or MLC110 Wheeled.
- ii. A bridge with a span of up to 60 metres (nominal) that is able to sustain any design loading up to MLC80 Tracked or MLC70 Wheeled.

Each Launching and Erection Equipment Set is sub-divided into equipment kits, as follows, such that any one can be deployed to a site separately as and when necessary:

- a Launching Nose Equipment**
- b Launching Roller Equipment**
- c Jacking Equipment**
- d Hand Tools**

EQUIPMENT SETS CAPABILITIES

5 SPAN JUNCTION SET:

All of the components that are required to connect two standard bridge spans together at an intermediate pier, where each span can be up to 40 metres (nominal) that is able to sustain any design loading up to MLC80 Tracked or MLC110 Wheeled.

Furthermore, two such Span Junction Sets, when added together, provide all of the components that are required to connect two long bridge spans together at an intermediate pier as follows:

- i. Two spans each of up to 50 metres (nominal) that is able to sustain any design loading up to MLC80 Tracked or MLC110 Wheeled.
- ii. Two spans each of up to 60 metres (nominal) that is able to sustain any design loading up to MLC80 Tracked or MLC70 Wheeled.

Each Span Junction Set is sub-divided into equipment kits, as follows, such that any one can be deployed to site separately as and when necessary:

- a **Span Junction Bridging Equipment**
- b **Span Junction Launching Equipment**

6 FIXED PIER SET:

All of the components that are required to construct a pier of up to 10 metres height (nominal) that, when placed upon suitable foundations, is capable of supporting two adjacent bridge spans connected with Span Junction Equipment as follows:

- i. When used in conjunction with two Standard Bridge Sets and one Span Junction Set, each span can be up to 40 metres (nominal) and sustain any design loading up to MLC80 Tracked or MLC110 Wheeled.
- ii. When used in conjunction with four Standard Bridge Sets, two Long Span Sets (when appropriate) and two Span Junction Sets, each span can either be up to 50 metres (nominal) and able to sustain any design loading up to MLC80 Tracked or MLC110 Wheeled, or up to 60 metres (nominal) and able to sustain any design loading up to MLC80 Tracked or MLC70 Wheeled.

LOGISTIC SUPPORT BRIDGE STOCK MODULES

To ensure that the required logistic support bridging capability is achieved, it must be stored in stock modules, each of which contains the following mix of the above defined equipment sets:

- i. **2 x Standard Bridge Sets**
- ii. **1 x Long Span Set**
- iii. **2 x Emergency Ramp Sets**
- iv. **2 x Launching & Erection Equipment Sets**
- v. **1 x Span Junction Set**
- vi. **1 x Fixed Pier Set**

STOCK MODULE CAPABILITIES

CAPABILITIES OF ONE LOGISTIC SUPPORT BRIDGE STOCK MODULE

One stock module, as defined on the previous page, will be able to provide for any one of the following logistic bridge deployments:

- i. Two separate bridges where each bridge can have a span of up to approximately 40 metres maximum that is capable of sustaining loads of up to MLC80 Tracked or MLC110 Wheeled. Each bridge can be erected and launched simultaneously and each one can be provided with emergency ramps if required.
- ii. One bridge with a span of up to approximately 50 metres maximum that is capable of sustaining loads of up to MLC80 Tracked or MLC110 Wheeled. The bridge can be erected and launched and provided with emergency ramps if required.
- iii. One bridge with a span in excess of 50 metres and up to approximately 60 metres maximum that is capable of sustaining loads of up to MLC80 Tracked or MLC70 Wheeled. The bridge can be erected and launched and provided with emergency ramps if required.
- iv. One bridge with an overall span of up to approximately 80 metres comprising two spans joined together with span junction equipment, where each span can be up to a maximum of approximately 40 metres and be capable of sustaining loads of up to MLC80 Tracked or MLC110 Wheeled. The bridge can be erected and launched, can be provided with a fixed pier at the span junction of up to approximately 10 metres in height and can be provided with emergency ramps if required.

CAPABILITIES OF TWO LOGISTIC SUPPORT BRIDGE STOCK MODULES

By combining the logistic bridge equipment sets of two stock modules, as defined on the previous page, it will be able to provide for any one of the following logistic bridge deployments:

- v. Four separate bridges where each bridge can have a span of up to approximately 40 metres maximum that is capable of sustaining loads of up to MLC80 Tracked or MLC110 Wheeled. Each bridge can be erected and launched simultaneously and each one can be provided with emergency ramps if required.
- vi. Two separate bridges where each bridge can have a span of up to approximately 50 metres maximum that is capable of sustaining loads of up to MLC80 Tracked or MLC110 Wheeled. Each bridge can be erected and launched simultaneously and each one can be provided with emergency ramps if required.
- vii. Two separate bridges where each bridge can have a span in excess of 50 metres and up to approximately 60 metres maximum that is capable of sustaining loads of up to MLC80 Tracked or MLC70 Wheeled. Each bridge can be erected and launched simultaneously and each one can be provided with emergency ramps if required.
- viii. Two separate bridges where each bridge can have an overall span up to a maximum of approximately 80 metres comprising two spans joined together with span junction equipment, where each span can be up to a maximum of approximately 40 metres and be capable of sustaining loads of up to MLC80 Tracked or MLC110 Wheeled. Each bridge can be erected and launched simultaneously, can be provided with a fixed pier at the span junction of up to approximately 10 metres in height and can be provided with emergency ramps if required.

STOCK MODULE CAPABILITIES

CAPABILITIES OF TWO LOGISTIC SUPPORT BRIDGE STOCK MODULES - continued

Furthermore, by combining the logistic bridge equipment sets of two stock modules not only is it possible to double the deployment capabilities of one stock module, as detailed in “ v ” to “ viii ” on the previous page, but it will also be able to provide for any one of the following logistic bridge deployments:

- ix. One bridge with an overall span of up to approximately 120 metres comprising three spans each joined together with span junction equipment. Each span can be up to a maximum of approximately 40 metres and be capable of sustaining loads of up to MLC80 Tracked or MLC110 Wheeled. The bridge can be erected and launched, can be provided with a fixed pier at each span junction of up to approximately 10 metres in height and can be provided with emergency ramps if required.
- x. One bridge with an overall span of up to approximately 100 metres comprising two spans joined together with span junction equipment. Each span can be up to a maximum of approximately 50 metres and be capable of sustaining loads of up to MLC80 Tracked or MLC110 Wheeled. The bridge can be erected and launched, can be provided with a fixed pier at the span junction of up to approximately 10 metres in height and can be provided with emergency ramps if required.
- xi. One bridge with an overall span of up to approximately 120 metres comprising two spans joined together with span junction equipment. Each span can be in excess of 50 metres up to a maximum of approximately 60 metres and be capable of sustaining loads of up to MLC80 Tracked or MLC70 Wheeled. The bridge can be erected and launched, can be provided with a fixed pier at the span junction of up to approximately 10 metres in height and can be provided with emergency ramps if required.

EQUIPMENT SETS COMPONENTS

STANDARD BRIDGE SET

MARK	DESCRIPTION	REQUIRED	SPARE	TOTAL
MC411	PANEL : SUPER	28		28
MC412	PANEL : SUPER : HIGH SHEAR	24		24
MC304	CHORD REINFORCEMENT : SUPER	88		88
MC458	RAKER	18		18
MC312	FRAME : VERTICAL	24		24
MC358	FRAME : BRACING	22		22
NLC18039	TRANSOM : 4.20m R/WAY : MLC110W	14		14
MC134	SWAYBRACE : 4.20m R/WAY	26		26
MC222	BRACE : VERTICAL	26		26
MC360	DECK : STEEL	52		52
MC300	KERB : STEEL DECK	26		26
MC364	INFILL : DECK : EoB : 4.20m R/WAY	2		2
MC317	POST : END : MALE	4		4
MC318	POST : END : FEMALE	4		4
MC329	BEAM : TIE	4		4
NLC19541	BASEPLATE : TRIPLE BEARING	4		4
NLC19030	BEARING : FIXED	4		4
NLC19031	BEARING : SLIDING	4		4
MC307	PIN : PANEL	228	22	250
MC307A	CIRCLIP : PANEL PIN	456	94	550
MC378	SCREW : DECK CLAMP	224	26	250
MC379	NUT : DECK CLAMP	224	26	250
NLU15328	PLUG : BRIDGE DECK	224	26	250
MC430	BOLT : BRACING	326	34	360
MC431	BOLT : TRANSOM	156	14	170
MC433	BOLT : CHORD	432	38	470
MC436	NUT : M24	914	86	1000
NLC19035	SIGN : MLC40	2		2
NLC19036	SIGN : MLC60	2		2
NLC19037	SIGN : MLC70W/80T	2		2
NLC19038	SIGN : MLC110W/80T	2		2
NLC19039	PLATE : SIGN MOUNTING	2		2
NLC19040	BOLT : SIGN MOUNTING	8	2	10

Note that the “REQUIRED” quantities are those components necessary to construct a maximum standard bridge span of 13 bays $DS_{HR}2_H+++$. The “SPARE” quantities listed provide sufficient spare parts to cater for the immediate losses expected in a single deployment of the equipment and also include the additional components required to enable two standard bridge sets, when combined with those components of a long span set, to construct a long span bridge of 20 bays $TS_{HR}3_H++$.

EQUIPMENT SETS COMPONENTS

LONG SPAN SET

MARK	DESCRIPTION	REQUIRED	SPARE	TOTAL
MC411	PANEL : SUPER	16		16
MC304	CHORD REINFORCEMENT : SUPER	40		40

EMERGENCY RAMP SET

MARK	DESCRIPTION	REQUIRED	SPARE	TOTAL
NLC12195	PLATE : PACK : EoB : 4.20m RAMP	2		2
NLC12068	BEAM : SUPPORT : RAMP : 4.20m	4		4
NLC19545	PLATE : BEARING : RAMP TOE	2		2
NLC22055	PLATE : EXPANSION : 4.20m RAMP	4		4
MC360	DECK : STEEL	24		24
MC300	KERB : STEEL DECK	12		12
NLC12197	PLATE : CLAMP : RAMP DECK	12		12
NLC19546	TOE : RAMP	8		8
MC378	SCREW : DECK CLAMP	80	20	100
MC379	NUT : DECK CLAMP	80	20	100
NLU15328	PLUG : RAMP DECK	80	20	100
MC430	BOLT : BRACING	102	18	120
MC436	NUT : M24	102	18	120

Notes:

- 1 The “SPARE” quantities listed in the above Equipment Sets are those additional spare parts as required to cater for the immediate losses expected in a single deployment of the equipment.
- 2 Additional spare parts of all components should be held separately in a central store to cater for projected deployments as appropriate.

EQUIPMENT SETS COMPONENTS

LAUNCHING & ERECTION EQUIPMENT SET

(a) LAUNCHING NOSE EQUIPMENT

MARK	DESCRIPTION	REQUIRED	SPARE	TOTAL
MC411	PANEL : SUPER	20		20
MC304	CHORD REINFORCEMENT : SUPER	18		18
MC458	RAKER	16		16
MC312	FRAME : VERTICAL	6		6
MC358	FRAME : BRACING	6		6
NLC18039	TRANSOM : 4.20m R/WAY : MLC110W	8		8
MC134	SWAYBRACE : 4.20m R/WAY	16		16
MC307	PIN : PANEL	59	6	65
MC307A	CIRCLIP : PANEL PIN	118	32	150
MC430	BOLT : BRACING	55	10	65
MC431	BOLT : TRANSOM	90	10	100
MC433	BOLT : CHORD	72	13	85
MC436	NUT : M24	217	33	250
MC66	LAUNCHING LINK	4	1	5
MC349	SWAY EXTENSION : 4.20m R/WAY	4	1	5
MC268	BOLT ASSEMBLY : DROP NOSE	4	1	5
NLC19585	MARKER : CENTRE of GRAVITY	2		2

(b) LAUNCHING ROLLER EQUIPMENT

MARK	DESCRIPTION	REQUIRED	SPARE	TOTAL
NLC19030	BEARING : FIXED	12		12
NLC12112	BEAM : BALANCE	4		4
NLC12113	DIAPHRAGM : BALANCE BEAM	4		4
BB11	BOLT ASS'Y : BRACING : BAILEY	24	6	30
MBB58	ROLLER : SINGLE	2		2
MBB59	ROLLER : ROCKING	12		12
NLC20048	STOOL : ROLLER : DSR1	2		2
NLC20024	SPIKE	4	1	5

(c) JACKING EQUIPMENT

MARK	DESCRIPTION	REQUIRED	SPARE	TOTAL
MC263	FRAME : JACKING	4		4
MC221	FRAME : VERTICAL (JACKING)	2		2
NLC21143	JACK : PLAIN RAM : 35t / 300mm	4	1	5
NLC9018	SEAL KIT : 35t JACK	4	1	5
NLC9169	PLATE : JACK HEAD	4		4

EQUIPMENT SETS COMPONENTS

LAUNCHING & ERECTION EQUIPMENT SET

(d) TOOLS

MARK	DESCRIPTION	REQUIRED	SPARE	TOTAL
MC352	TOOL : CIRCLIP INSTALLATION	4		4
MC353	TOOL : CIRCLIP REMOVAL	4		4
MC357	PIN : DRIFT : 24mm	10		10
NLC11140	PIN : DRIFT : 48mm	2		2
NLC9003	SPANNER : PODGER : OPEN : 36mm A/F	5		5
NLC9004	SPANNER : PODGER : RING : 36mm A/F	5		5
NLC8003	WRENCH : RATCHET : ¾" DRIVE	4		4
NLC8004	WRENCH : " T " BAR : ¾" DRIVE	4		4
NLC8005	SOCKET : ¾" DRIVE : 36mm A/F	8	2	10
MM534	HOOK : DECK LIFTING : 500kg SWL	4	1	5
NLC12185	WRENCH : " T " BAR : 16mm A/F	4		4
NLC21005	GIMLET : DECK PLUG	4		4
NLC8006	HAMMER : SLEDGE : 3.25kg	2		2
NLC9007	HAMMER : CLUB : 1kg	2		2
NLC9009	CROW BAR : 1.5m	2		2
NLC9010	NAIL BAR : 0.6m	1		1
NLC9011	TIN SNIPS	1		1
NLC9015	SPANNER : ADJUSTABLE : 28mm Max	2		2
NLC9016	HOIST : CHAIN PULL : 1.5t	1		1
NLU10103	JACK : 6.5t / 75mm	1		1
NLT17375	SERVICE KIT : 6.5t JACK	1		1
MM569	BAR : PANEL CARRYING	6		6
NLC19560	BAR : TRANSOM CARRYING	12		12
NLC20070	BAR : DECK CARRYING	16		16

Notes:

- 1 The "SPARE" quantities listed in all four sections of the Launching & Erection Equipment Set are those additional spare parts as required to cater for the immediate losses expected in a single deployment of the equipment.
- 2 Additional spare parts of all components should be held separately in a central store to cater for projected deployments as appropriate.
- 3 Where HS25 Transoms (MC454) are used instead of MLC110W Transoms, the Mark Number of the required Transom Carrying Bars is MM528 (instead of NLC19560).

EQUIPMENT SETS COMPONENTS

SPAN JUNCTION SET

(a) BRIDGING EQUIPMENT

MARK	DESCRIPTION	REQUIRED	SPARE	TOTAL
MC312	FRAME : VERTICAL	2		2
MC358	FRAME : BRACING	4		4
MC430	BOLT : BRACING	30	10	40
MC431	BOLT : TRANSOM	6	4	10
MC436	NUT : M24	36	14	50
MC315	POST : SPAN JUNCTION : MALE	4		4
MC336	POST : SPAN JUNCTION : FEMALE	4		4
MC70	BLOCK : BEARING : SPAN JUNCTION	4		4
MC234	PIN : SPAN JUNCTION	4	1	5
MC4A	CLIP : SAFETY : SPAN JUNCTION PIN	4	1	5
MC136	SWAY : SPAN JUNCTION : 4.20m R/WAY	1		1
MC361	DECK : SPAN JUNCTION	4		4
MC377	KERB : SPAN JUNCTION	2		2

(b) LAUNCHING EQUIPMENT

MARK	DESCRIPTION	REQUIRED	SPARE	TOTAL
MC65	LAUNCHING LINK : SPAN JUNCTION	8	2	10
MC161	CHORD REINFORCEMENT : SPAN JUNC	8		8
MC304	CHORD REINFORCEMENT : SUPER	8		8
MC307	PIN : PANEL	40	10	50
MC307A	CIRCLIP : PANEL PIN	80	20	100
MC433	BOLT : CHORD	32	18	50
MC436	NUT : M24	32	18	50
NLC19030	BEARING : FIXED	4		4
NLC12112	BEAM : BALANCE	4		4
NLC12113	DIAPHRAGM : BALANCE BEAM	4		4
BB11	BOLT ASSEMBLY : BRACING : BAILEY	24	6	30
MBB59	ROLLER : ROCKING	8		8
NLC20048	STOOL : ROLLER : DSR1	2		2
NLC13139	BEAM : JACKING : SPAN JUNCTION	2		2

Notes:

- 1 The “SPARE” quantities listed in the above Equipment Sets are those additional spare parts as required to cater for the immediate losses expected in a single deployment of the equipment.
- 2 Additional spare parts of all components should be held separately in a central store to cater for projected deployments as appropriate.

EQUIPMENT SETS COMPONENTS

FIXED PIER SET (10m)

MARK	DESCRIPTION	REQUIRED	SPARE	TOTAL
MC411	PANEL : SUPER	24		24
NLC4089	ANGLE BRACKET : C200 BOX PIER	48	2	50
NLT15072	BRACE : HORIZONTAL : C200 BOX PIER	8		8
NLC21066	SOLEPLATE : FEMALE EYE : DOUBLE	8		8
NLC19019	STRUT : PIER BRACE : 4.20m R/WAY	8		8
NLC19020	TIE : PIER BRACE : 4.20m R/WAY	8		8
NLC19021	TIE : HALF : PIER BRACE : 4.20m R/WAY	4		4
NLC17035	BEAM : PIER CAP : EXTERNAL	8		8
NLC17036	BEAM : PIER CAP : INTERNAL	4		4
NLC17037	PLATE : CONNECTOR : PIER CAP BEAM	32		32
NLC17039	BRACE : VERTICAL : PIER CAP BEAM	24		24
NLC19026	BEAM : BEARING : PIER CAP	14		14
NLC19027	CLAMP : BEARING BEAM	8	2	10
NLC19028	CLAMP : BEARING BASEPLATE	12	3	15
MC307	PIN : PANEL	64	6	70
MC307A	CIRCLIP : PANEL PIN	128	22	150
MC430	BOLT : BRACING	54	6	60
MC431	BOLT : TRANSOM	256	24	280
MX2320	BOLT : PIER BRACE	72	8	80
MC433	BOLT : CHORD	80	10	90
MC436	NUT : M24	462	48	510
NLC17057	PLATE : WASHER : 15mm (Anchor Bolt)	56	4	60
MC267	PLATE : WASHER : 8mm (Shim)	48	12	60
NLE1022	LIFTING BOLT ASSEMBLY : 3 t	4	1	5

Notes:

- 1 The “ SPARE ” quantities listed in the above Equipment Set are those additional spare parts as required to cater for the immediate losses expected in a single deployment of the equipment.
- 2 Additional spare parts of all components should be held separately in a central store to cater for projected deployments as appropriate.
- 3 Eight of the fourteen Pier Cap Bearing Beams listed above are required in order to support the Jacks during the bridge installation procedure.
- 4 Similarly, eight of the twelve Bearing Baseplate Clamps listed above are actually required to clamp pairs of Pier Cap Bearing Beams to the top of the pier in order to support the Jacks during the bridge installation procedure.

SECTION 3

BRIDGE PARTS LISTS

BRIDGE PARTS LISTS

SINGLE SPAN BRIDGES

PROCEDURE FOR CALCULATING THE QUANTITIES OF PARTS REQUIRED FOR SINGLE SPAN BRIDGES BY USE OF THE TABLES ON THE FOLLOWING PAGES

- 1 Determine the following information:
 - a The length of the bridge span in “ Bays ” (where 1 Bay = 3.048 metres).
 - b The required bridge truss construction.
- 2 If the bridge is required to be of Chord Reinforced truss construction and / or requires bays of High Shear Panels, disregard these facts for the moment.

For each component, consider the quantities listed beneath the appropriate truss construction in the table on page 3:04. Multiply the quantities listed under the heading “ INTERNAL BAY ” by the number of internal bays in the bridge span and add those quantities listed under the headings “ MALE END BAY ” and “ FEMALE END BAY ”.

Note that for bridge spans that do not require either Chord Reinforced truss constructions or bays of High Shear Panels, this gives the total quantity of parts required.

- 3 If the bridge is required to be of Chord Reinforced truss construction, adjust the quantities of parts calculated above in accordance with the appropriate tables on page 3:05 as follows:
 - a Multiply the quantities listed beneath the appropriate truss construction in table **1** by the number of intermediate bays in the bridge and **add** these to those quantities calculated previously at “ 2 ” above.
 - b Multiply the quantities listed beneath the appropriate truss construction in table **2** by the number of intermediate bays in the bridge and **deduct** these from those quantities calculated previously at “ 2 ” above.
 - c **Deduct** the quantities listed beneath the appropriate truss construction in table **3** from the total bridge quantities established above. Note that for bridge spans of Chord Reinforced truss constructions that do not require bays of High Shear Panels, this gives the total quantity of parts required.
- 4 If the bridge requires bays of High Shear Panels, adjust the quantities of parts calculated above in accordance with the appropriate table at the bottom of page 3:05 as follows:

Multiply the quantities listed beneath the appropriate truss construction by the number of bays of High Shear Panels required in the total bridge and add or subtract these to the quantities established above.
- 5 Note that the quantities calculated do not include any spare parts. It is recommended that a small quantity of spare Bolts, Nuts, Pins, Clips etc. are added to the required quantities to cater for potential losses or damage on site.

BRIDGE PARTS LISTS

SINGLE SPAN BRIDGES

EXAMPLES OF CALCULATING THE QUANTITIES OF PARTS REQUIRED FOR SINGLE SPAN BRIDGES BY USE OF THE TABLES ON THE FOLLOWING PAGES

- 1 Given the following bridge information:

- a The length of the bridge span required is 13 Bays.
- b The required truss construction (for MLC110W) is DS_HR2_H +++.

Calculate the quantities required of:

MC411 - Panel : Super
 MC412 - Panel : Super : High Shear
 MC304 - Chord Reinforcement : Super
 MC307 - Panel Pin
 MC430 - Bolt : Bracing

- 2 Disregard, for the moment, the fact that the bridge is required to be of Chord Reinforced truss construction and also requires bays of High Shear Panels and refer to the table on Page 3:04 and extract the appropriate quantities from the DS columns.

Note that the number of internal bays is $13 - 2 = 11$ and hence:

Required quantity of MC411 - Panel : Super	=	4 x 11 + 4 + 4	=	52
Required quantity of MC307 - Panel Pin	=	8 x 11 + 16 + 8	=	112
Required quantity of MC430 - Bolt : Bracing	=	30 x 11 + 18 + 18	=	366

- 3 Refer to the tables at the top of Page 3:05 that relate to the adjustments to the parts required for bridge spans with Chord Reinforced truss constructions and calculate the adjustments relevant to DS_HR2_H truss construction:

Table 1 gives adjustment of MC304 - Chord Reinforcement : Super	= + 8 x 11 = + 88
Table 1 gives adjustment of MC307 - Panel Pin	= + 8 x 11 = + 88
Table 2 gives adjustment of MC430 - Bolt : Bracing	= - 16 x 11 = - 176
Table 3 gives adjustment of MC307 - Panel Pin	= - 8

- 4 Refer to the table at the bottom of Page 3:05 that relates to the adjustments to the parts required for bridge spans requiring bays of High Shear Panels and calculate the adjustments relevant to DS_HR2_H +++ truss construction. The “+++” indicates 3 bays of High Shear Panels are required at each end of the bridge span, giving 6 bays of High Shear Panels required in total, hence:

Table gives adjustment of MC411 - Panel : Super	= - 4 x 6 = - 24
Table gives adjustment of MC412 - Panel : Super : High Shear	= + 4 x 6 = + 24

- 5 The total quantities required therefore, excluding any spare parts, are as follows:

MC411 - Panel : Super	= 52 + 0 + 0 + 0 - 24 = 28
MC412 - Panel : Super : High Shear	= 0 + 0 + 0 + 0 + 24 = 24
MC304 - Chord Reinforcement : Super	= 0 + 88 + 0 + 0 + 0 = 88
MC307 - Panel Pin	= 112 + 88 + 0 - 8 + 0 = 192
MC430 - Bolt : Bracing	= 366 + 0 - 176 + 0 + 0 = 190

PARTS PER BAY

COMPACT 200 SUPER PANEL BRIDGES

EXTRA WIDE SINGLE LANE STEEL DECK ROADWAY

MARK NUMBER	COMPONENT DESCRIPTION	MALE END BAY			INTERNAL BAY			FEMALE END BAY		
		SS	DS	TS	SS	DS	TS	SS	DS	TS
MC411	PANEL : SUPER	2	4	6	2	4	6	2	4	6
MC307	PANEL PIN	8	16	24	4	8	12	4	8	12
MC307A	SAFETY CIRCLIP	16	32	48	8	16	24	8	16	24
MC458	RAKER	2	-	-	2	-	-	-	-	-
MC312	VERTICAL FRAME	-	2	2	-	2	2	-	-	-
MC358	BRACING FRAME	-	-	-	-	2	2	-	-	-
NLC18039	TRANSOM : EW : MLC110W	2	2	2	1	1	1	1	1	1
MC134	SWAYBRACE : EW	2	2	2	2	2	2	2	2	2
MC222	VERTICAL BRACE	2	2	2	2	2	2	2	2	2
MC360	STEEL DECK	4	4	4	4	4	4	4	4	4
MC300	KERB : STEEL DECK	2	2	2	2	2	2	2	2	2
MC364	DECK INFILL : 4.20m R/WAY	1	1	1	-	-	-	1	1	1
MC317	END POST : MALE	-	-	-	-	-	-	2	4	6
MC318	END POST : FEMALE	2	4	6	-	-	-	-	-	-
MC329	TIE BEAM	-	2	2	-	-	-	-	2	2
NLC19541	BASEPLATE : TRIPLE	2	2	2	-	-	-	2	2	2
NLC19030	BEARING : FIXED	-	-	-	-	-	-	2	4	6
NLC19031	BEARING : SLIDING	2	4	6	-	-	-	-	-	-
MC430	BOLT : BRACING	14	18	20	14	30	34	14	18	20
MC431	BOLT : TRANSOM	12	16	18	10	12	14	6	8	8
MC436	NUT : M24	26	34	38	24	42	48	20	26	28
MC378	SCREW : STEEL DECK	24	24	24	16	16	16	24	24	24
MC379	NUT : STEEL DECK	24	24	24	16	16	16	24	24	24
NLU15328	PLUG : BRIDGE DECK	24	24	24	16	16	16	24	24	24

Notes:

- 1 The component quantities calculated using the above table are correct for bridge spans that do not require Chord Reinforced truss constructions, nor require bays of High Shear Panels.
- 2 For bridge spans that require Chord Reinforced truss constructions or bridge spans that require bays of High Shear Panels at either end, refer to the adjustment tables on the following page.
- 3 No spare parts are included in the above quantities. It is recommended, however, that a small quantity of spare Bolts, Nuts, Pins, Clips etc. are added to the required quantities as calculated using the above table, to cater for potential losses or damage on site.

PARTS PER BAY

COMPACT 200 SUPER PANEL BRIDGES

EXTRA WIDE SINGLE LANE STEEL DECK ROADWAY

ADJUSTMENTS TO PARTS REQUIRED FOR BRIDGE SPANS WITH CHORD REINFORCED TRUSS CONSTRUCTIONS

1 FOR **EACH** INTERMEDIATE BAY **ADD** THE FOLLOWING:

MARK NUMBER	COMPONENT DESCRIPTION	SS _H R _H DS _H R _{1H}	DS _H R _{2H} TS _H R _{2H}	TS _H R _{3H}
MC304	CHORD REINFORCEMENT : SUPER	4	8	12
MC433	BOLT : CHORD	16	32	48
MC436	NUT : M24	16	32	48
MC307	PANEL PIN	4	8	12
MC307A	SAFETY CIRCLIP	8	16	24

2 FOR **EACH** INTERMEDIATE BAY **DEDUCT** THE FOLLOWING:

MARK NUMBER	COMPONENT DESCRIPTION	SS _H R _H	DS _H R _{1H}	DS _H R _{2H}	TS _H R _{2H}	TS _H R _{3H}
MC430	BOLT : BRACING	-	8	16	4	-
MC436	NUT : M24	-	8	16	4	-

3 FROM THE **TOTAL** BRIDGE SPAN QUANTITIES **DEDUCT** THE FOLLOWING:

MARK NUMBER	COMPONENT DESCRIPTION	SS _H R _H	DS _H R _{1H}	DS _H R _{2H}	TS _H R _{2H}	TS _H R _{3H}
MC307	PANEL PIN	4	4	8	8	12
MC307A	SAFETY CIRCLIP	8	8	16	16	24

ADJUSTMENTS TO PARTS REQUIRED FOR BRIDGE SPANS WITH BAYS OF HIGH SHEAR PANELS

FOR EACH BAY OF HIGH SHEAR PANELS REQUIRED **ADJUST** AS FOLLOWS:

MARK NUMBER	COMPONENT DESCRIPTION	SS _H SS _H R _H	DS _H DS _H R _{1H} DS _H R _{2H}	TS _H TS _H R _{2H} TS _H R _{3H}
MC411	PANEL : SUPER	- 2	- 4	- 6
MC412	PANEL : SUPER : HIGH SHEAR	+ 2	+ 4	+ 6

BRIDGE PARTS LISTS

MULTIPLE SPAN BRIDGES *with* SPAN JUNCTION EQUIPMENT

PROCEDURE FOR CALCULATING THE QUANTITIES OF PARTS REQUIRED FOR MULTIPLE SPAN BRIDGES BY USE OF THE TABLES ON THE FOLLOWING PAGES

- 1 Determine the following information:
 - a The length of each bridge span in “ Bays ” (where 1 Bay = 3·048 metres).
 - b The bridge truss construction required for each span.
- 2 Calculate the parts required for each individual bridge span as if each one was a separate bridge, by following the procedure given previously on page 3:02 of this manual.
- 3 Summate the quantities of the parts calculated for each individual bridge span.
- 4 For each Span Junction in turn, refer to the table on either page 3:08, 3:09 or 3:10 as appropriate to the truss construction of the leading span. Note that Compact 200 bridges are erected and launched with the Male end of the Panels leading.

For each component, consider the quantities listed beneath the truss construction appropriate to the trailing span at the junction. Adjust the total quantities previously calculated as directed, by subtracting those quantities listed in table 1 and adding those quantities listed in table 2.

- 5 Note that the quantities calculated do not include any spare parts. It is recommended that a small quantity of spare Bolts, Nuts, Pins, Clips etc. are added to the required quantities to cater for potential losses or damage on site.
- 6 In formatting the tables, it has been assumed that the fixed bearings will be on the home bank at the rear of the final trailing span. If it is required to position the fixed bearings at another location, the quantities of fixed and sliding bearings required may need to be adjusted further to cater for this.

EXAMPLES OF CALCULATING THE QUANTITIES OF PARTS REQUIRED FOR MULTIPLE SPAN BRIDGES BY USE OF THE TABLES ON THE FOLLOWING PAGES

- 1 Given the following bridge information:
 - a The lengths of the required spans of a multiple span bridge are 10 Bays, 15 Bays and 6 Bays.
 - b The required truss constructions (for MLC110W) are D_{SH}R_{2H} ++, T_{SH}R_{3H} + and D_{SH}.

Calculate the quantities required of the following parts:

MC312	-	Vertical Frame
MC364	-	Deck Infill : 4.20m R/way
NLC19030	-	Bearing : Fixed
NLC19031	-	Bearing : Sliding

BRIDGE PARTS LISTS

MULTIPLE SPAN BRIDGES *with* SPAN JUNCTION EQUIPMENT

EXAMPLES OF CALCULATING THE QUANTITIES OF PARTS REQUIRED FOR MULTIPLE SPAN BRIDGES BY USE OF THE TABLES ON THE FOLLOWING PAGES

2 Extract the quantities of parts as appropriate for the individual spans from the table on page 3:04

Mark No.	10 Bay DS _H R _{2H} ++	15 Bay TS _H R _{3H} +	6 Bay DS _H
MC312	$2 \times 8 + 2 + 0 = 18$	$2 \times 13 + 2 + 0 = 28$	$2 \times 4 + 2 + 0 = 10$
MC364	$0 \times 8 + 1 + 1 = 2$	$0 \times 13 + 1 + 1 = 2$	$0 \times 4 + 1 + 1 = 2$
NLC19030	$0 \times 8 + 0 + 4 = 4$	$0 \times 13 + 0 + 6 = 6$	$0 \times 4 + 0 + 4 = 4$
NLC19031	$0 \times 8 + 4 + 0 = 4$	$0 \times 13 + 6 + 0 = 6$	$0 \times 4 + 4 + 0 = 4$

Note that although some of the bridge spans require Chord Reinforced truss constructions and bays of High Shear Panels, this does not affect the quantities of the parts required for this particular example and hence no further adjustments are necessary.

3 Summate the quantities of each of the parts calculated for each individual bridge span.

MC312	-	Vertical Frame	=	18	+	28	+	10	=	56
MC364	-	Deck Infill : 4.20m R/way	=	2	+	2	+	2	=	6
NLC19030	-	Bearing : Fixed	=	4	+	6	+	4	=	14
NLC19031	-	Bearing : Sliding	=	4	+	6	+	4	=	14

4 For each Span Junction in turn, extract the adjustments to the parts required from the appropriate tables on pages 3:08, 3:09 and 3:10.

a At the first Span Junction, the leading span truss construction is DS_HR_{2H} ++ and the trailing span truss construction is TS_HR_{3H} +. Therefore, the appropriate table is that on page 3:09 and the appropriate column of adjustments is the third one, which gives the following:

MC312 - Vertical Frame	=	+ 2	NLC19030 - Bearing : Fixed	=	- 4
MC364 - Deck Infill : 4.20m	=	- 2	NLC19031 - Bearing : Sliding	=	+ 0

b At the second Span Junction, the leading span truss construction is TS_HR_{3H} + and the trailing span truss construction is DS_H. Therefore, the appropriate table is that on page 3:10 and the appropriate column of adjustments is the second one, which gives the following:

MC312 - Vertical Frame	=	+ 2	NLC19030 - Bearing : Fixed	=	- 6
MC364 - Deck Infill : 4.20m	=	- 2	NLC19031 - Bearing : Sliding	=	+ 2

5 The total quantities required therefore, excluding any spare parts, are as follows:

MC312	-	Vertical Frame	=	56	+	2	+	2	=	60
MC364	-	Deck Infill : 4.20m R/way	=	6	-	2	-	2	=	2
NLC19030	-	Bearing : Fixed	=	14	-	4	-	6	=	

4
NLC19031 - Bearing : Sliding = 14 + 0 + 2 =
16

PARTS PER SPAN JUNCTION

COMPACT 200 SUPER PANEL BRIDGES

EXTRA WIDE SINGLE LANE STEEL DECK ROADWAY

ADJUSTMENTS TO PARTS REQUIRED FOR MULTIPLE SPAN BRIDGES WITH SPANS CONNECTED USING SPAN JUNCTION EQUIPMENT

LEADING SPAN TRUSS CONSTRUCTION = SS (R)

1 FOR EACH SPAN JUNCTION **DEDUCT** THE FOLLOWING:

MARK NUMBER	COMPONENT DESCRIPTION	TRAILING SPAN TRUSS TYPE		
		SS (R)	DS (R)	TS (R)
MC317	END POST : MALE	2	2	2
MC318	END POST : FEMALE	2	4	6
MC329	TIE BEAM	-	2	2
NLC19541	BASEPLATE : TRIPLE	2	2	2
NLC19030	BEARING : FIXED	2	2	2
MC364	DECK INFILL : 4.20m ROADWAY	2	2	2

2 FOR EACH SPAN JUNCTION **ADD** THE FOLLOWING:

MARK NUMBER	COMPONENT DESCRIPTION	TRAILING SPAN TRUSS TYPE		
		SS (R)	DS (R)	TS (R)
MC315	SPAN JUNCTION POST : MALE	2	2	2
MC336	SPAN JUNCTION POST : FEMALE	2	4	6
MC234	SPAN JUNCTION PIN	2	2	2
MC4A	SAFETY CLIP : S J PIN	2	2	2
MC70	BEARING BLOCK : SPAN JUNCTION	2	4	6
NLC19031	BEARING : SLIDING	-	-	-
MC312	VERTICAL FRAME	-	-	-
MC358	BRACING FRAME	-	2	2
MC136	SWAYFRAME : S J : 4.20m R/WAY	1	1	1
MC361	STEEL DECK : SPAN JUNCTION	4	4	4
MC377	KERB : S J STEEL DECK	2	2	2
MC430	BOLT : BRACING	6	18	20
MC431	BOLT : TRANSOM	2	2	2
MC436	NUT : M24	8	20	22

PARTS PER SPAN JUNCTION

COMPACT 200 SUPER PANEL BRIDGES

EXTRA WIDE SINGLE LANE STEEL DECK ROADWAY

ADJUSTMENTS TO PARTS REQUIRED FOR MULTIPLE SPAN BRIDGES
WITH SPANS CONNECTED USING SPAN JUNCTION EQUIPMENT

LEADING SPAN TRUSS CONSTRUCTION = DS (R)

1 FOR EACH SPAN JUNCTION **DEDUCT** THE FOLLOWING:

MARK NUMBER	COMPONENT DESCRIPTION	TRAILING SPAN TRUSS TYPE		
		SS (R)	DS (R)	TS (R)
MC317	END POST : MALE	4	4	4
MC318	END POST : FEMALE	2	4	6
MC329	TIE BEAM	2	4	4
NLC19541	BASEPLATE : TRIPLE	2	2	2
NLC19030	BEARING : FIXED	4	4	4
MC364	DECK INFILL : 4.20m ROADWAY	2	2	2

2 FOR EACH SPAN JUNCTION **ADD** THE FOLLOWING:

MARK NUMBER	COMPONENT DESCRIPTION	TRAILING SPAN TRUSS TYPE		
		SS (R)	DS (R)	TS (R)
MC315	SPAN JUNCTION POST : MALE	4	4	4
MC336	SPAN JUNCTION POST : FEMALE	2	4	6
MC234	SPAN JUNCTION PIN	2	4	4
MC4A	SAFETY CLIP : S J PIN	2	4	4
MC70	BEARING BLOCK : SPAN JUNCTION	4	4	6
NLC19031	BEARING : SLIDING	2	-	-
MC312	VERTICAL FRAME	2	2	2
MC358	BRACING FRAME	2	4	4
MC136	SWAYFRAME : S J : 4.20m R/WAY	1	1	1
MC361	STEEL DECK : SPAN JUNCTION	4	4	4
MC377	KERB : S J STEEL DECK	2	2	2
MC430	BOLT : BRACING	18	30	32
MC431	BOLT : TRANSOM	6	6	6
MC436	NUT : M24	24	36	38

PARTS PER SPAN JUNCTION

COMPACT 200 SUPER PANEL BRIDGES

EXTRA WIDE SINGLE LANE STEEL DECK ROADWAY

ADJUSTMENTS TO PARTS REQUIRED FOR MULTIPLE SPAN BRIDGES
WITH SPANS CONNECTED USING SPAN JUNCTION EQUIPMENT

LEADING SPAN TRUSS CONSTRUCTION = TS (R)

1 FOR EACH SPAN JUNCTION **DEDUCT** THE FOLLOWING:

MARK NUMBER	COMPONENT DESCRIPTION	TRAILING SPAN TRUSS TYPE		
		SS (R)	DS (R)	TS (R)
MC317	END POST : MALE	6	6	6
MC318	END POST : FEMALE	2	4	6
MC329	TIE BEAM	2	4	4
NLC19541	BASEPLATE : TRIPLE	2	2	2
NLC19030	BEARING : FIXED	6	6	6
MC364	DECK INFILL : 4.20m ROADWAY	2	2	2

2 FOR EACH SPAN JUNCTION **ADD** THE FOLLOWING:

MARK NUMBER	COMPONENT DESCRIPTION	TRAILING SPAN TRUSS TYPE		
		SS (R)	DS (R)	TS (R)
MC315	SPAN JUNCTION POST : MALE	6	6	6
MC336	SPAN JUNCTION POST : FEMALE	2	4	6
MC234	SPAN JUNCTION PIN	2	4	6
MC4A	SAFETY CLIP : S J PIN	2	4	6
MC70	BEARING BLOCK : SPAN JUNCTION	6	6	6
NLC19031	BEARING : SLIDING	4	2	-
MC312	VERTICAL FRAME	2	2	2
MC358	BRACING FRAME	2	4	4
MC136	SWAYFRAME : S J : 4.20m R/WAY	1	1	1
MC361	STEEL DECK : SPAN JUNCTION	4	4	4
MC377	KERB : S J STEEL DECK	2	2	2
MC430	BOLT : BRACING	20	32	34
MC431	BOLT : TRANSOM	8	8	8
MC436	NUT : M24	28	40	42

SECTION 4

LAUNCHING DATA

BRIDGE INSTALLATION

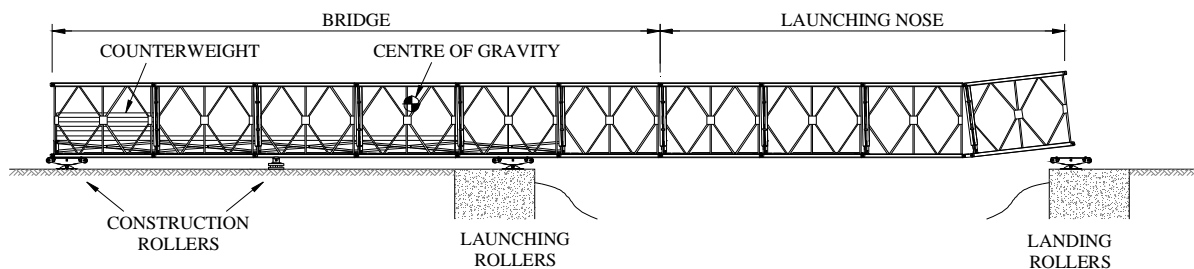
BASIC PRINCIPLES OF BRIDGE ERECTION & LAUNCHING

A basic principle of the Mabey Compact 200 Logistic Bridge is that it can be constructed on rollers on one bank, known as the “home bank”, and then launched across the gap to be bridged, to the “far bank”, without requiring any temporary intermediate supports.

This is achieved by erecting a temporary skeleton structure at the front of the bridge, known as the “Launching Nose”, which is constructed using Mabey Compact 200 components similar to those used in the bridge, but with the addition of a few special components.

The “Launching Nose” is built of such a length that when the completed structure is rolled forwards across the gap, the tip of the nose touches down on the “far bank landing rollers” before the centre of gravity passes the “home bank launching rollers”.

The length of the “Construction Plane” normally required for erection is approximately equal to the span of the bridge. Effective use of counterweight, however, usually in the form of bridge decks placed on the rear bays of the structure, can reduce the required length of the “Construction Plane” and / or the required length of the “Launching Nose”.



It is a design feature of the bridge that, when necessary, it can be erected and installed by hand. It is an advantage to have the use of a crane on site, however, in order to both ease and speed up the erection process. Furthermore, whilst it is possible to push small spans across the gap to be bridged by hand, larger spans will require some form of mechanical plant, preferably a winch, for launching.

Once the bridge is in position across the gap, the launching nose is dismantled. The bridge is then jacked up, one end at a time, to enable the launching and landing rollers to be removed and the bridge bearings to be installed before lowering the bridge onto them. Finally, the bridge decking is completed and the approaches prepared for traffic access.

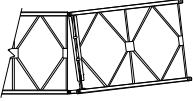
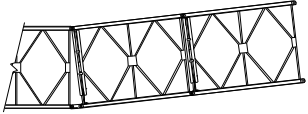
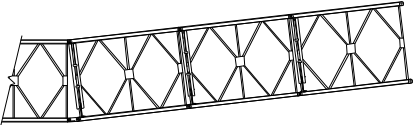
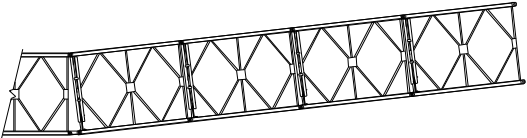
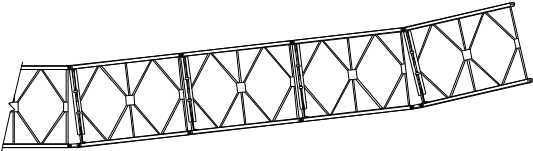
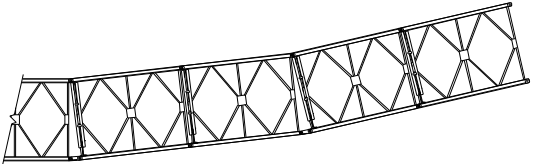
LAUNCHING DATA

On the following pages, it is intended to give details of the required launching nose configuration, details of the required launching roller layout and a list of all components required for the erection and launching of all single span bridges.

Currently this information is only available in another restricted publication, however, details for specific bridges can be supplied upon request, please refer to Mabey & Johnson Ltd.

BRIDGE INSTALLATION

UPLIFT PROVIDED BY LAUNCHING LINKS

LAUNCH LINKS @ 1 BAY FROM TIP OF NOSE 	UPLIFT = 363mm
LAUNCH LINKS @ 2 BAYS FROM TIP OF NOSE 	UPLIFT = 710mm
LAUNCH LINKS @ 3 BAYS FROM TIP OF NOSE 	UPLIFT = 1056mm
LAUNCH LINKS @ 4 BAYS FROM TIP OF NOSE 	UPLIFT = 1403mm
LAUNCH LINKS @ 1 & 4 BAYS FROM TIP OF NOSE 	UPLIFT = 1790mm
LAUNCH LINKS @ 2 & 4 BAYS FROM TIP OF NOSE 	UPLIFT = 2132mm

SPAN = 39.624 m : LOAD = MLC110W : 13 BAYS DSHR2H+++



LAUNCHING SCHEME INSTRUCTIONS

SPAN = 39.624 m : LOAD = MLC110W : 13 BAYS DShR2H+++

Note that these instructions on the erection and launching of the bridge are to be read in conjunction with the launching scheme drawing on the opposite page. Refer also to Section 5 of this manual, for connection details, and to Section 6 for further information on the construction procedures.

STAGE 1:

Construct bay 1 (nose bay) in SSh construction. Construct bay 2 (nose bay) in SShL construction. Construct bays 3, 4, 5 and 6 (nose bays) in SSh construction. Construct bay 7 (nose bay) in SShDh construction and bay 8 (nose bay) in SShNh construction. Construct bay 9 (**undecked** bridge bay) in DShN2H+ construction, using High Shear Panels. Construct bays 10 and 11 (**undecked** bridge bays) in DShR2H+ construction, using High Shear Panels. Construct bays 12 and 13 (**undecked** bridge bays) in DShR2H construction.

Note that whichever method is employed for the installation of the Launching Links (refer to Section 6), the links must be inserted into the bottom chords between bays 2 and 3 before commencing stage 2.

STAGE 2:

Move the structure forwards by 5 bay lengths. Construct bay 14 (**undecked** bridge bay) in DShR2H construction. Construct bays 15, 16, 17 and 18 (decked bridge bays) in DShR2H construction.

STAGE 3:

Move the structure forwards by 2 bay lengths. Construct bays 19 and 20 (decked bridge bays) in DShR2H+ construction, using High Shear Panels.

STAGE 4:

Move the structure forwards by 2 bay lengths. Construct bay 21 (decked bridge bay) in DShN2H+ construction, using High Shear Panels. Place 20 additional Deck Units onto the decking of bay 21 to act as counterweight. Construct bay 22 (**undecked** tail bay) in DShN2H construction.

STAGE 5:

Move the bridge slowly forwards over the remainder of the gap until it is positioned over its final bearing position. (Note that the launching nose bays 1 to 7 may be dismantled as they become one bay clear of the landing rollers if required).

STAGE 6:

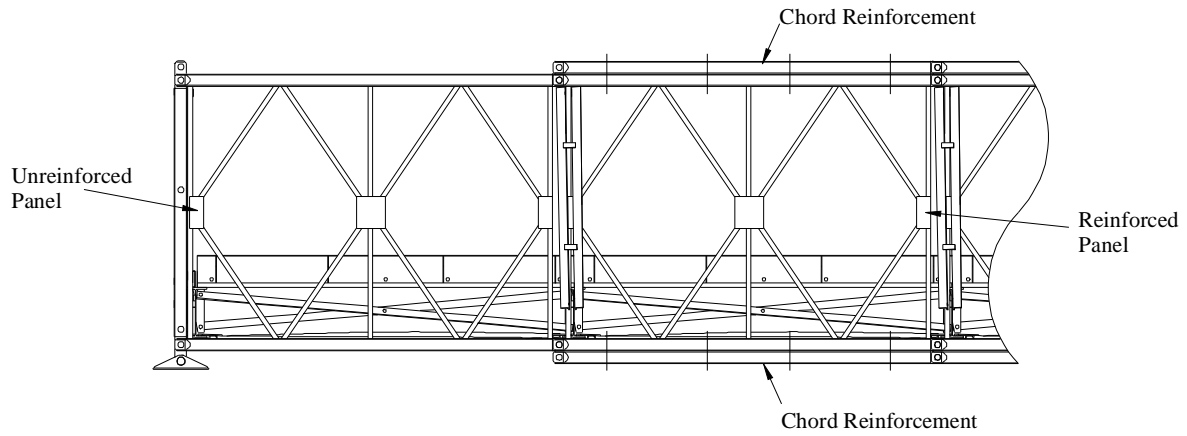
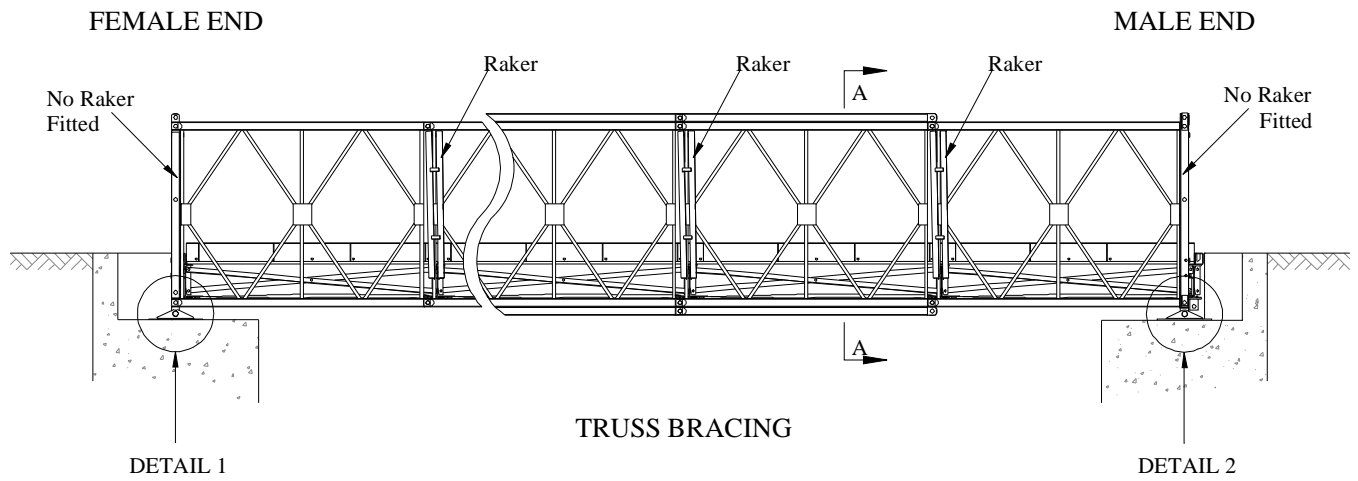
Remove the counterweight and lower the bridge onto its bearings. Finally, fit all remaining bridge deck and any other components as necessary.

SECTION 5

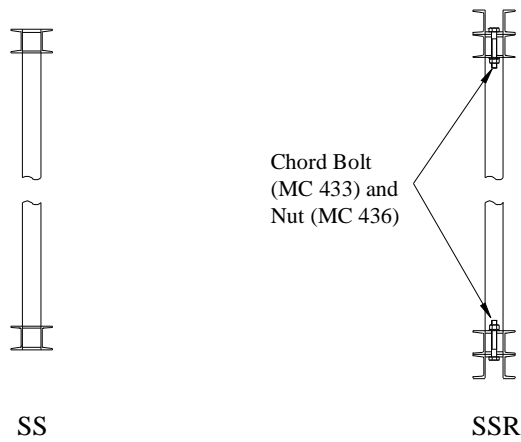
ASSEMBLY DETAILS

SINGLE PANEL TRUSSES

TRUSS ASSEMBLY DETAILS



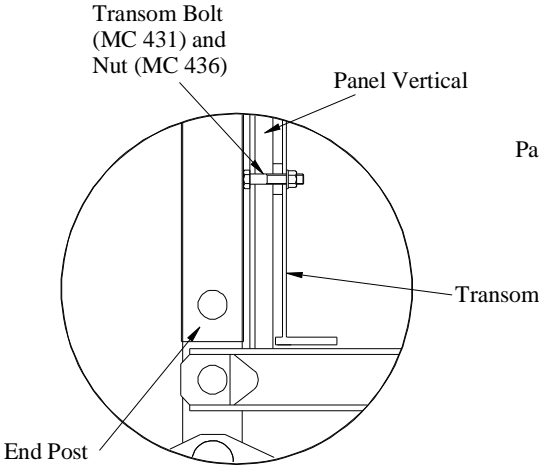
CHORD REINFORCEMENT



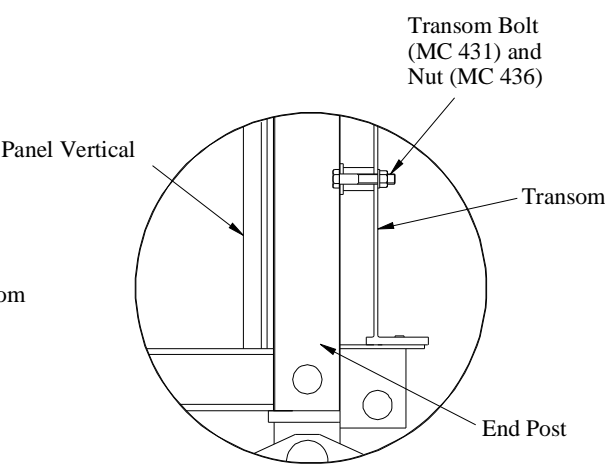
TRUSS SECTIONS

SINGLE PANEL TRUSSES

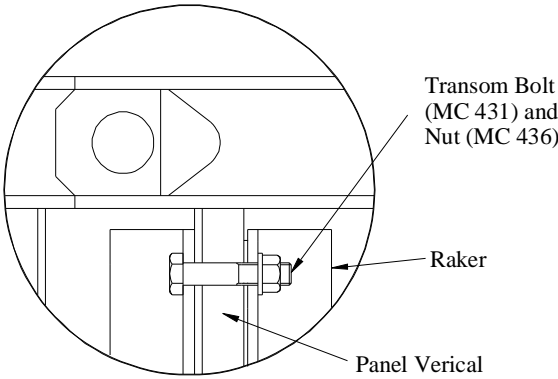
TRUSS BRACING CONNECTIONS



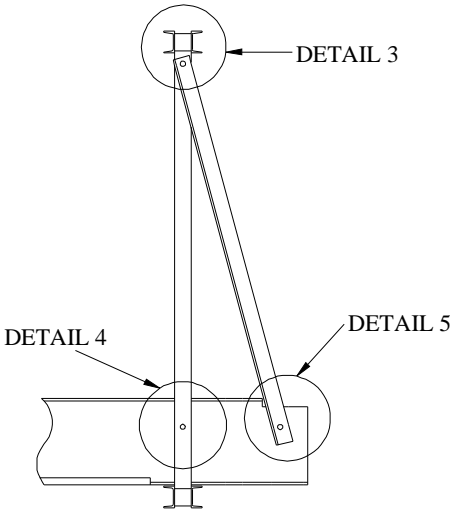
DETAIL 1



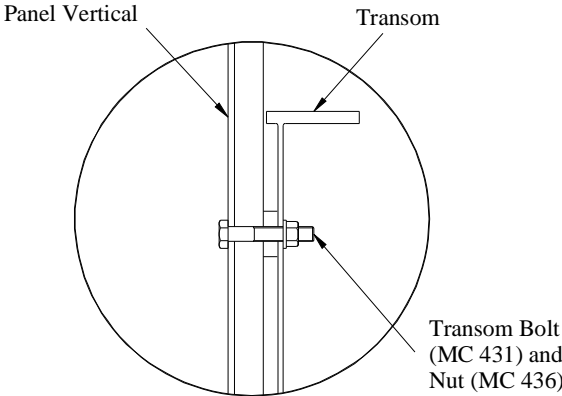
DETAIL 2



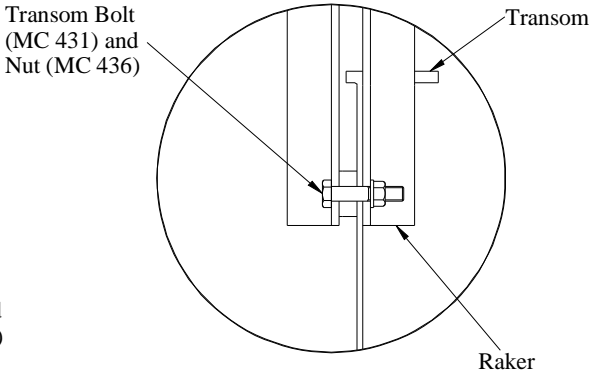
DETAIL 3



TYPICAL SECTION A-A



DETAIL 4

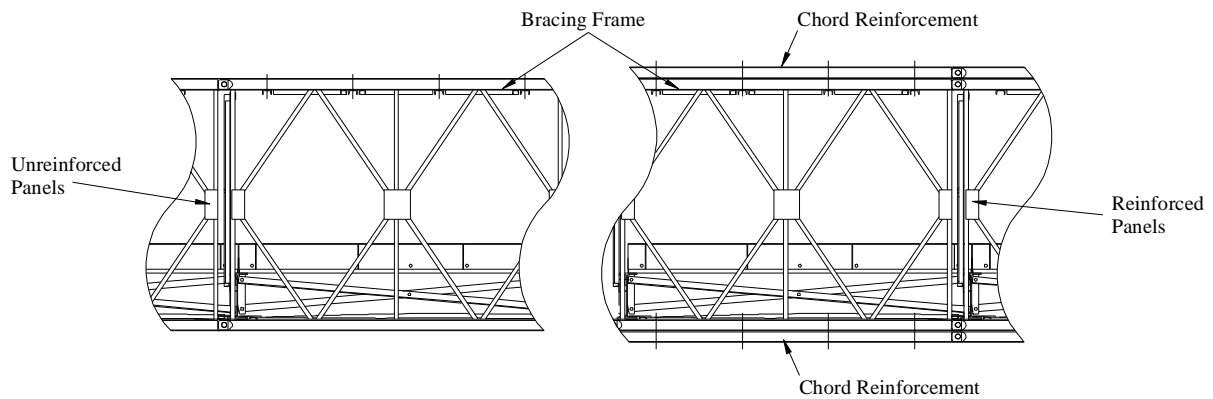
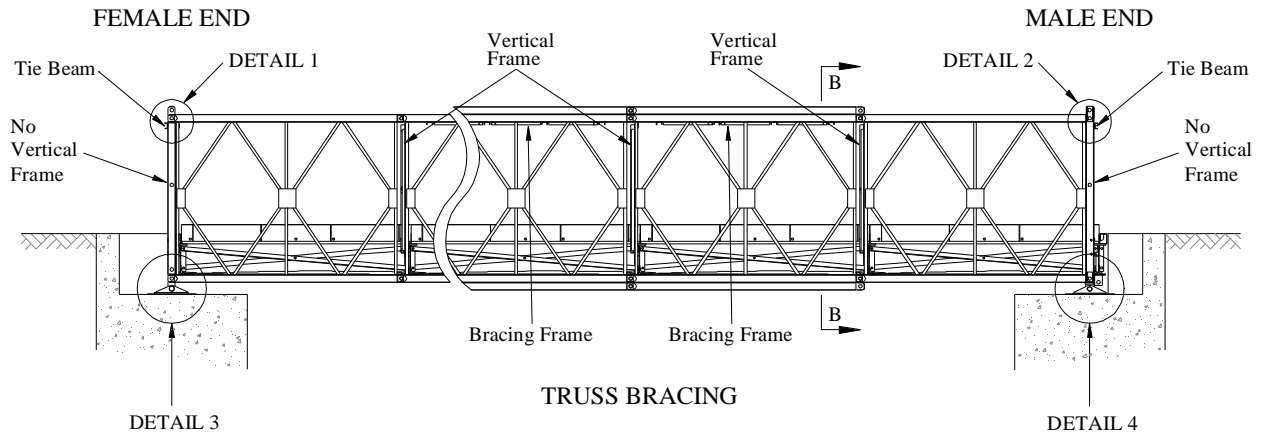


DETAIL 5

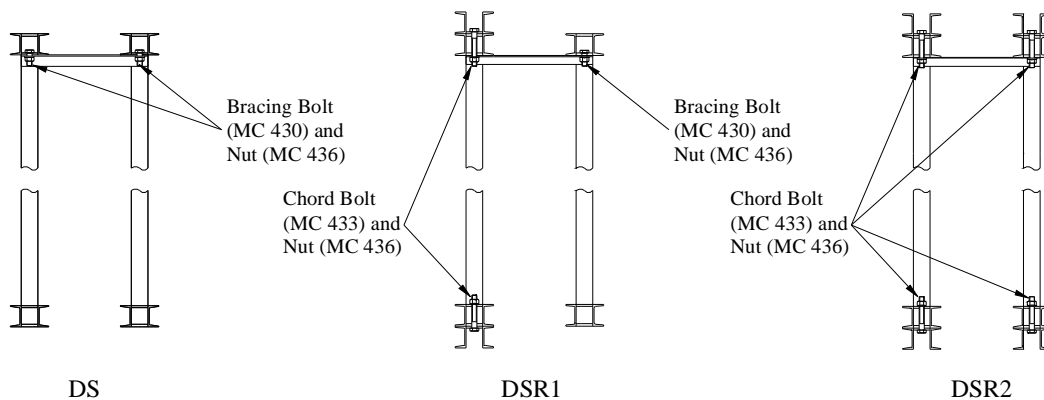
NOTE: CORRECT TRANSOM BOLT ORIENTATION IS ESSENTIAL

DOUBLE PANEL TRUSSES

TRUSS ASSEMBLY DETAILS



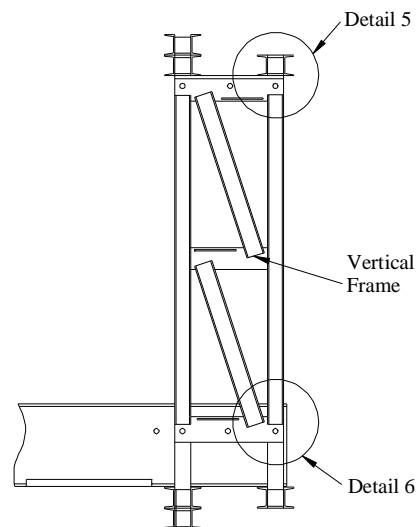
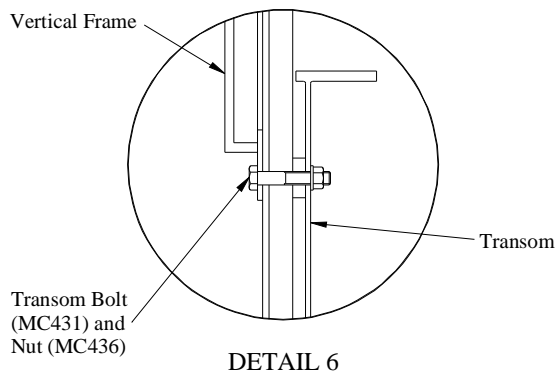
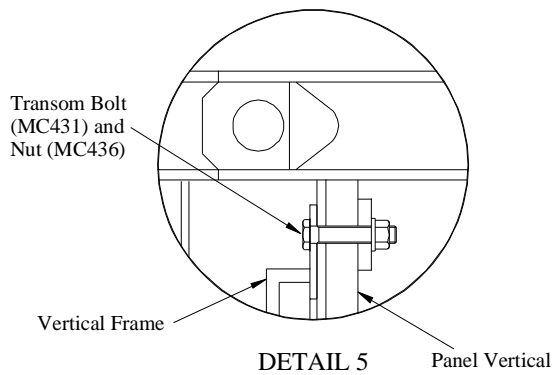
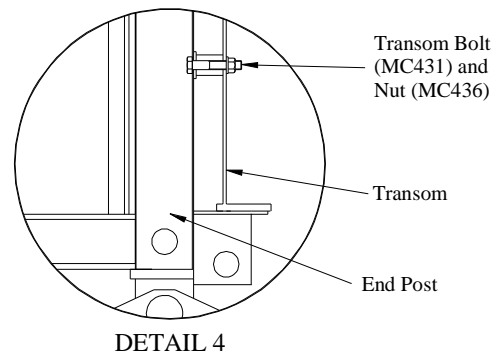
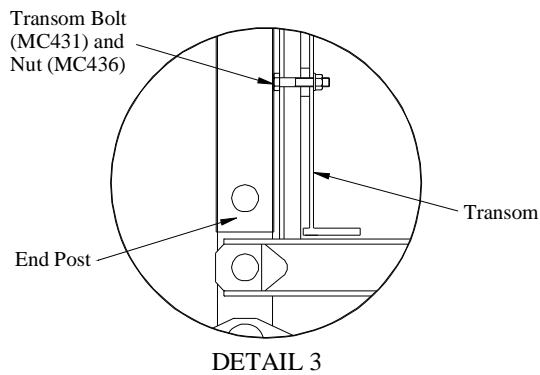
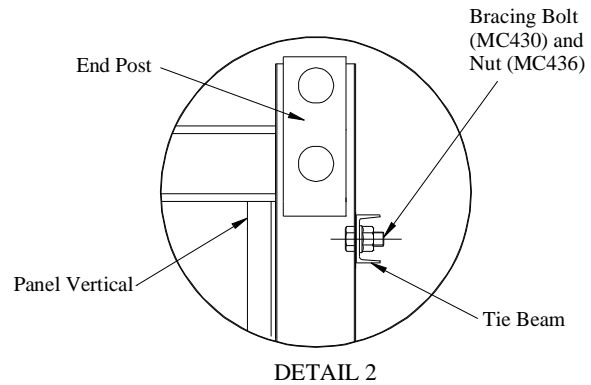
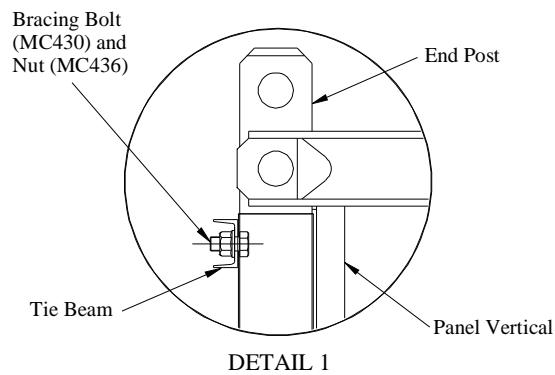
CHORD REINFORCEMENT



TRUSS SECTIONS

DOUBLE PANEL TRUSSES

TRUSS BRACING CONNECTIONS

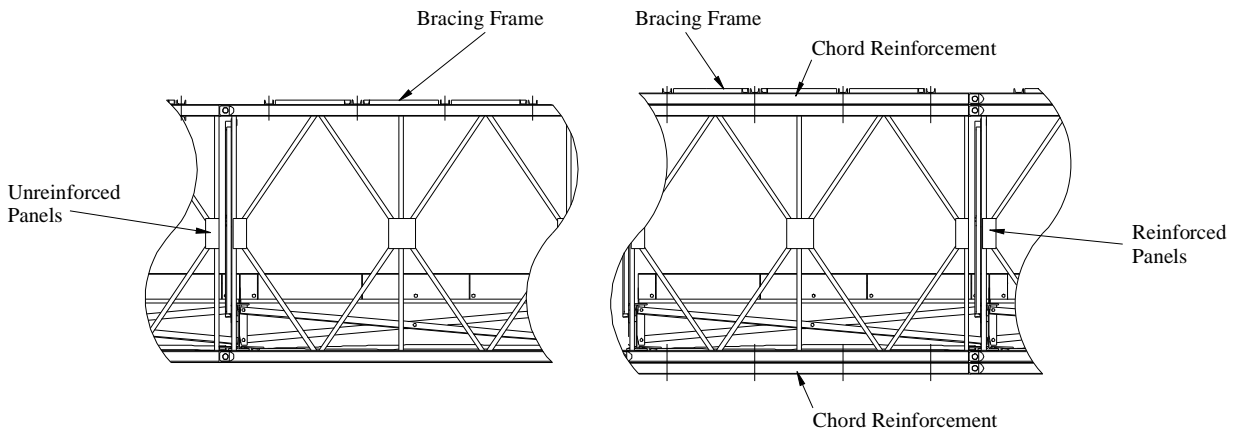
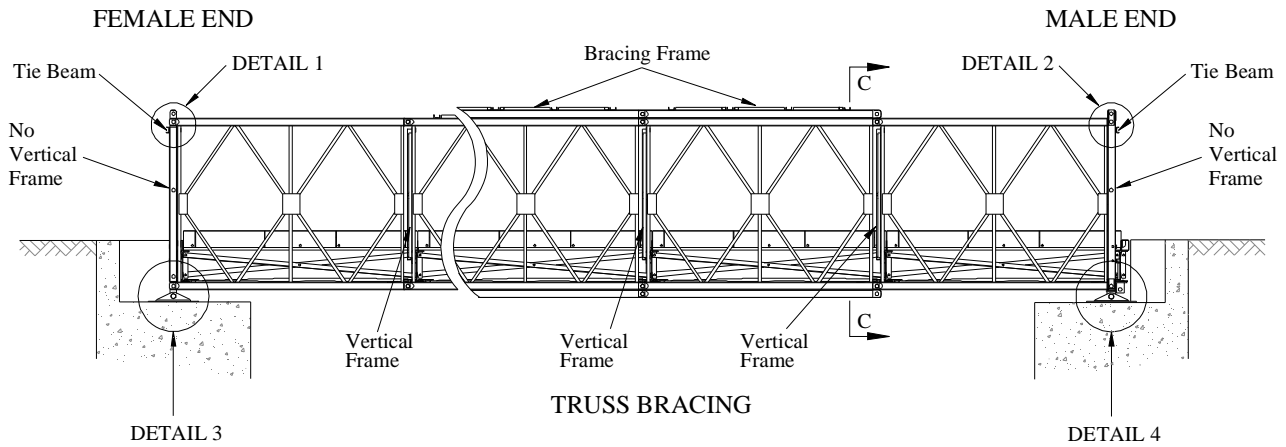


TYPICAL SECTION B-B

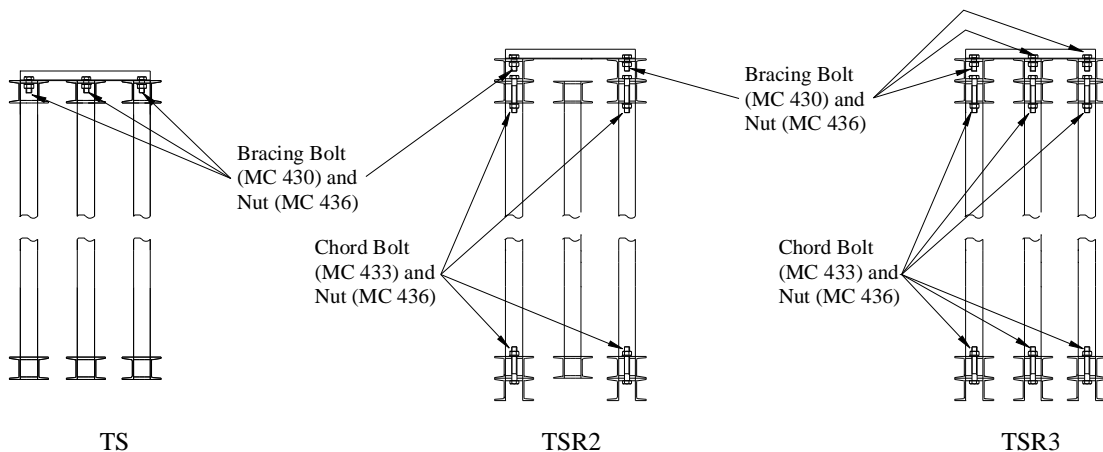
NOTE: CORRECT TRANSOM BOLT ORIENTATION IS ESSENTIAL

TRIPLE PANEL TRUSSES

TRUSS ASSEMBLY DETAILS



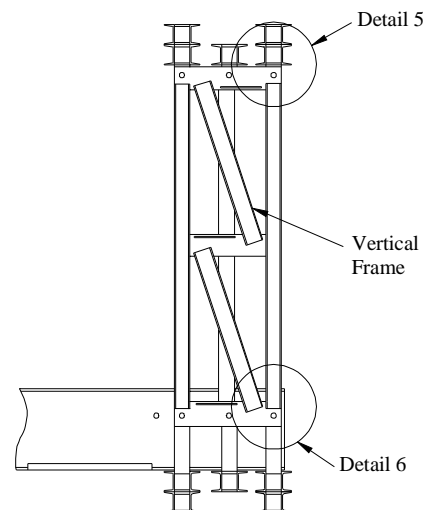
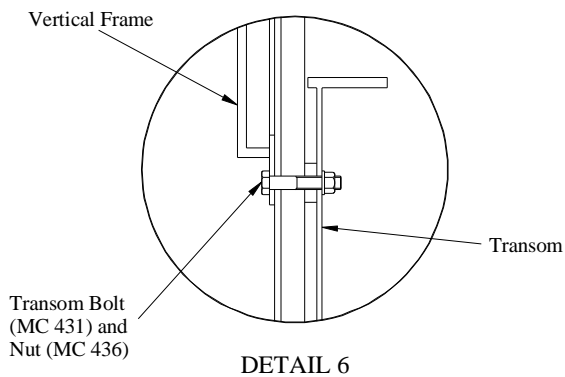
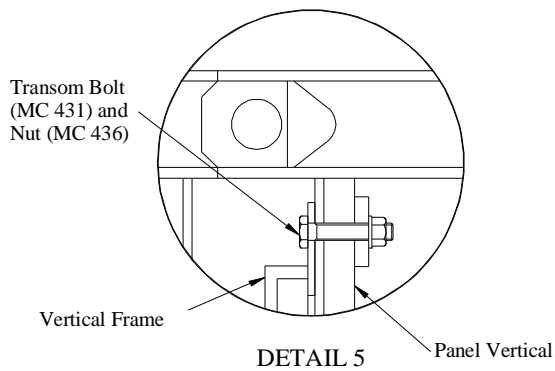
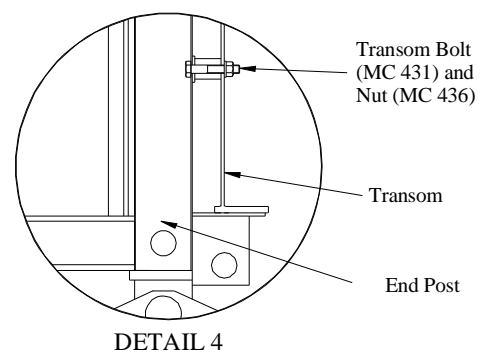
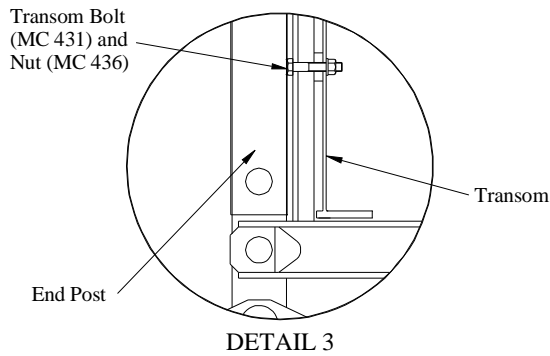
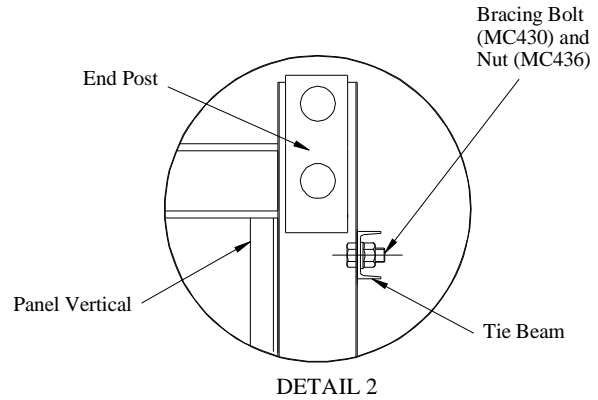
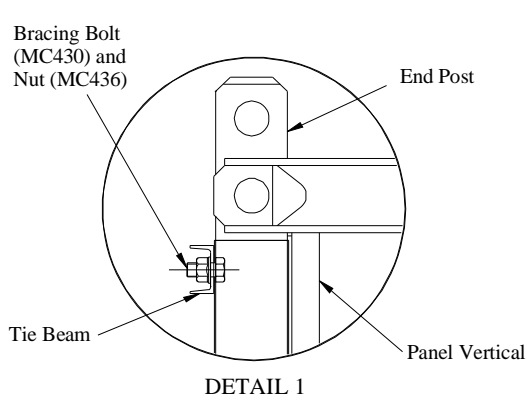
CHORD REINFORCEMENT



TRUSS SECTIONS

TRIPLE PANEL TRUSSES

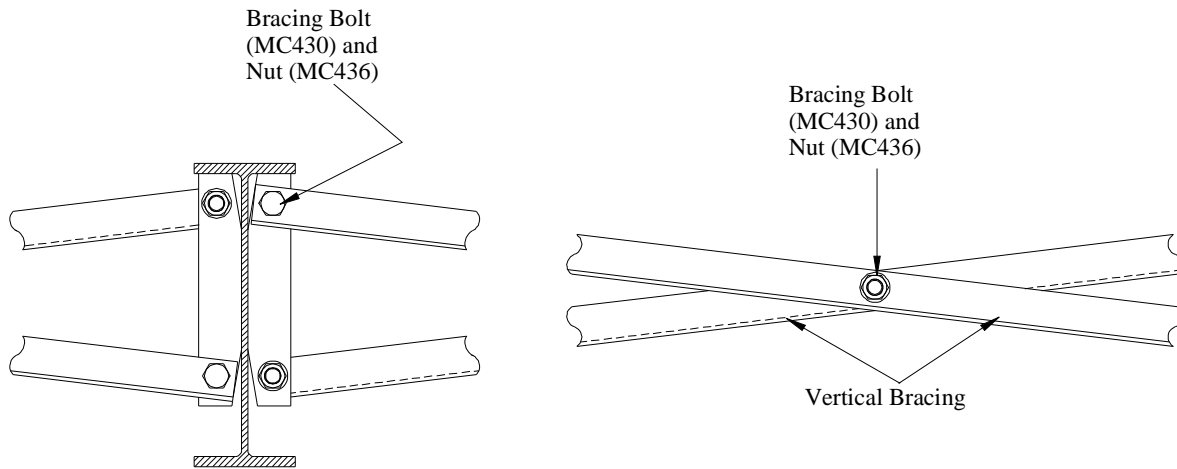
TRUSS BRACING CONNECTIONS



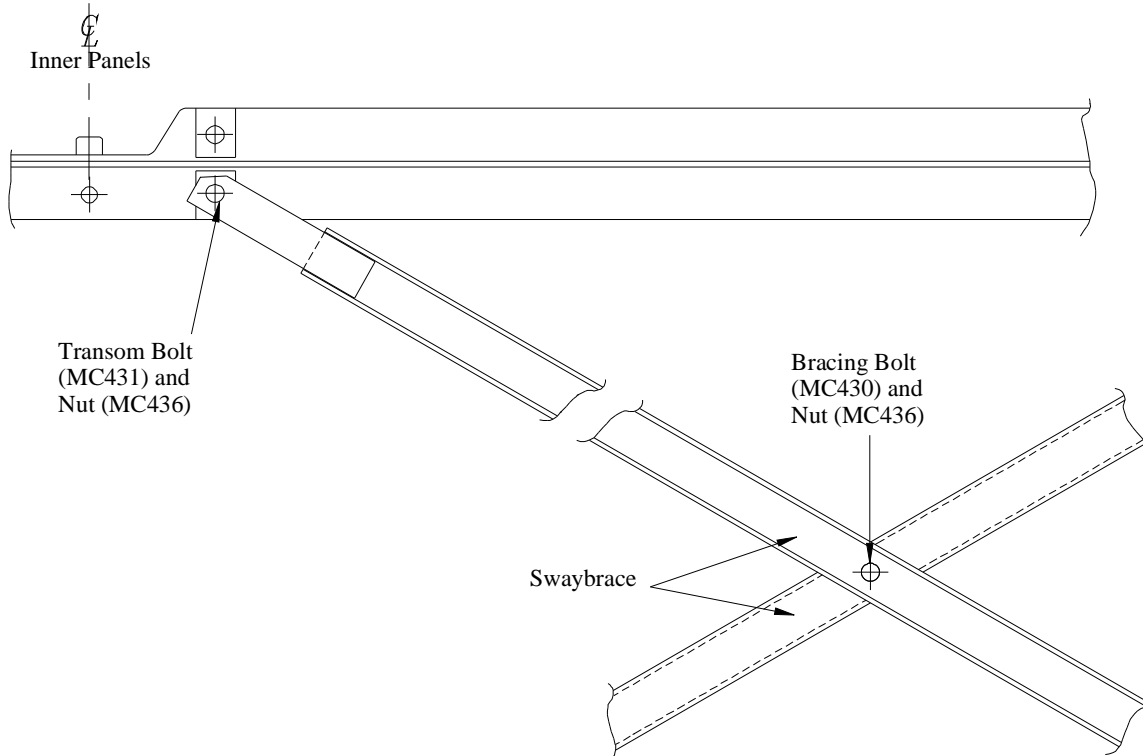
NOTE: CORRECT TRANSOM BOLT ORIENTATION IS ESSENTIAL

BRIDGE DECKING

TRANSOM BRACING CONNECTIONS



PART ELEVATION OF VERTICAL BRACING

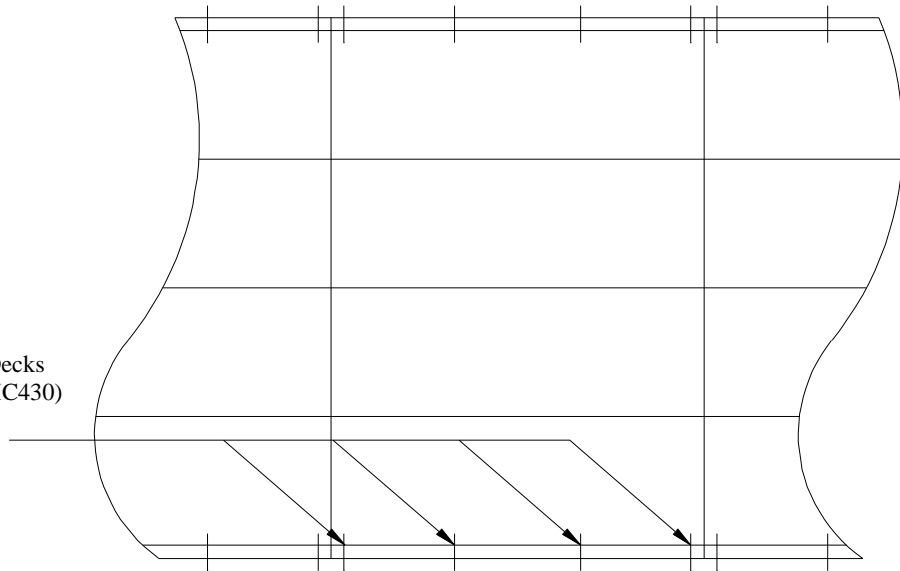


PART PLAN ON HORIZONTAL SWAYBRACING

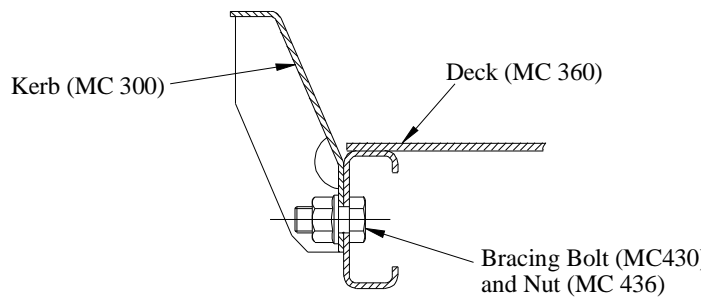
BRIDGE DECKING

STEEL DECK CONNECTIONS

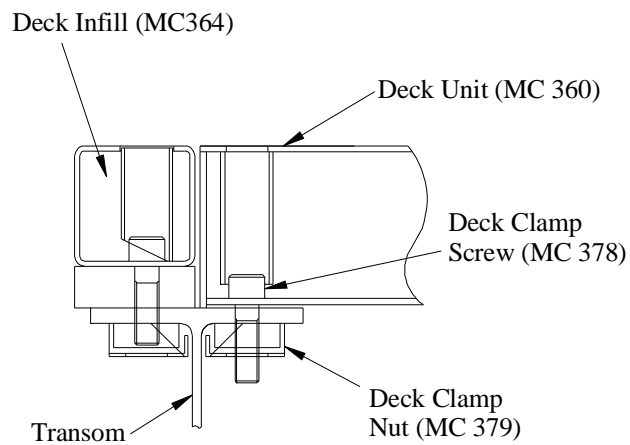
Kerbs are connected to Decks using 4 Bracing Bolts (MC430) and nuts (MC436) at the outer hole positions



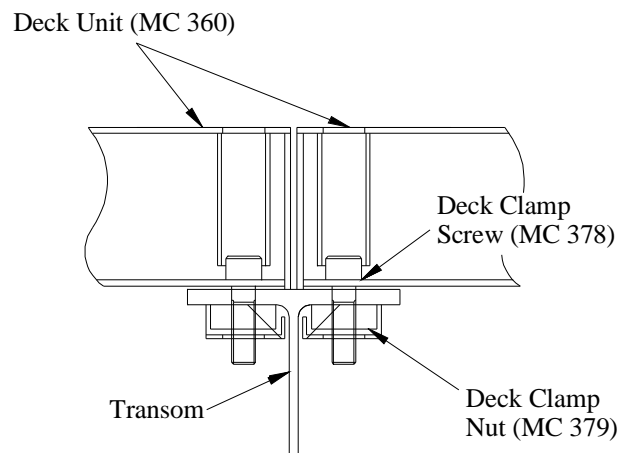
PLAN ON DECKING



SECTION ON KERB CONNECTION



END OF BRIDGE TRANSOM

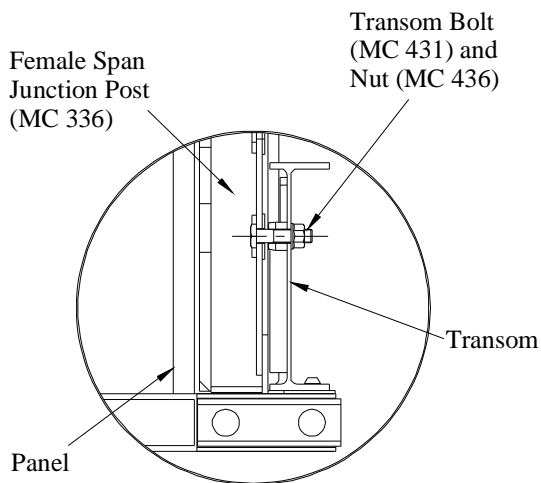
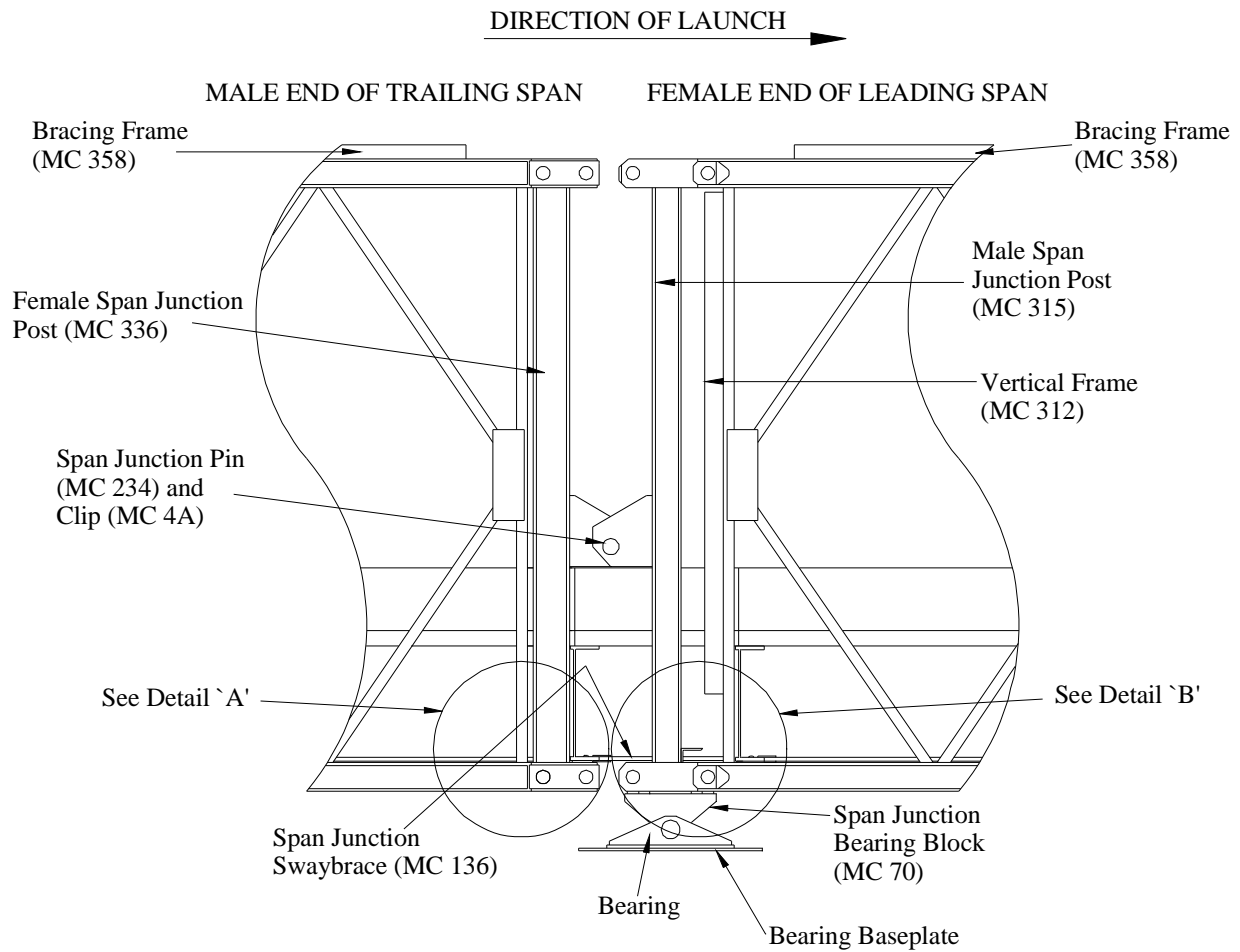


INTERMEDIATE TRANSOM

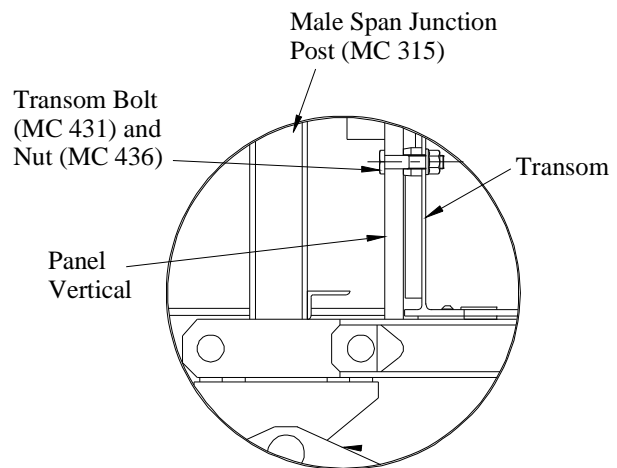
SECTIONS ON DECK CONNECTIONS

SPAN JUNCTIONS

TRUSS ASSEMBLY DETAILS



DETAIL 'A'

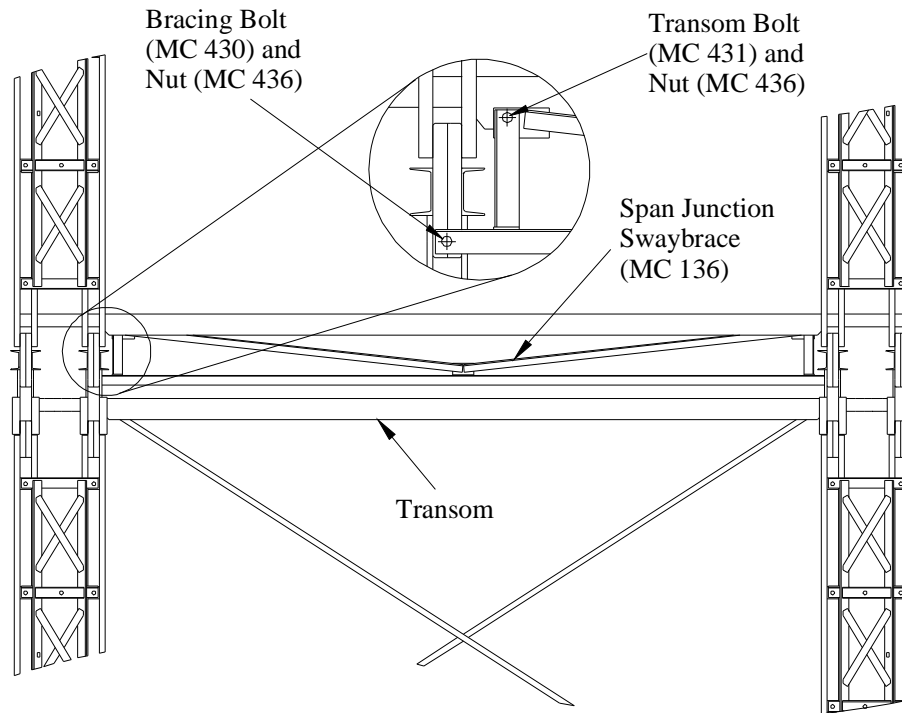


DETAIL 'B'

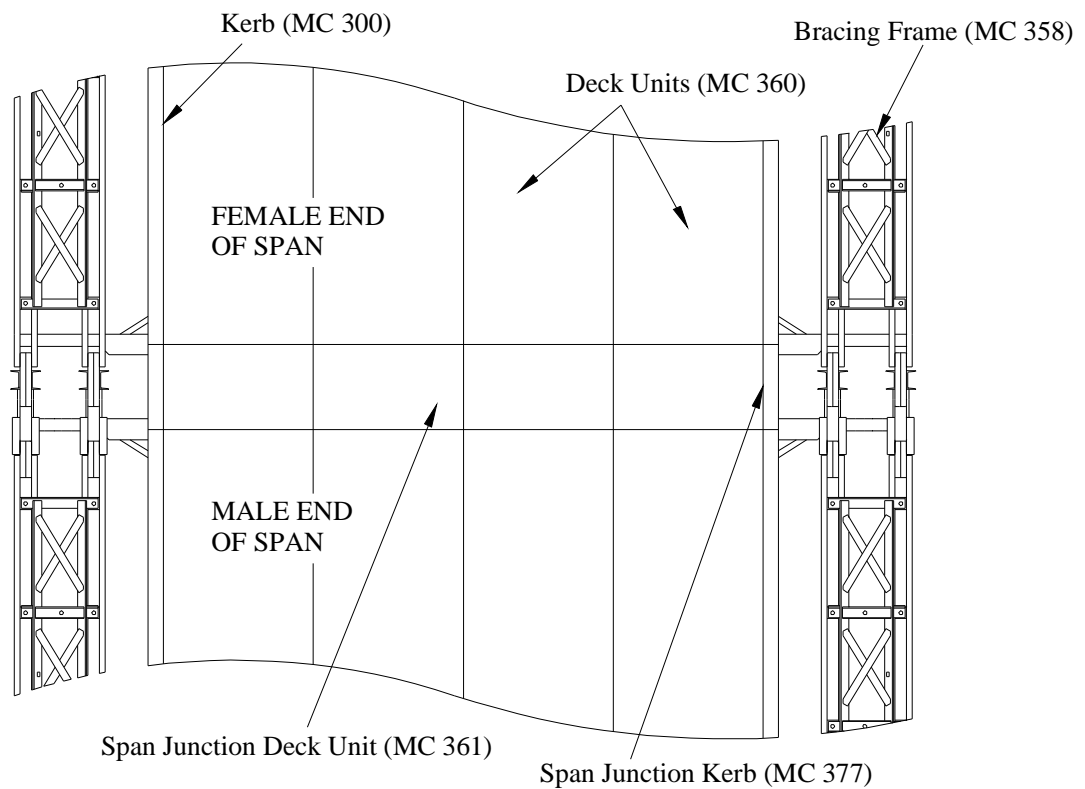
NOTE: CORRECT TRANSOM BOLT ORIENTATION IS ESSENTIAL

SPAN JUNCTIONS

DECK ASSEMBLY DETAILS



PLAN ON SWAYBRACE AT SPAN JUNCTION



PLAN ON DECKING AT SPAN JUNCTION

SECTION 6

ERECTION & INSTALLATION

BRIDGE INSTALLATION PROCEDURES

GENERAL PROCEDURE

- 1 It is most important that bridge erection and installation is supervised by a competent Engineer, whose responsibilities include the following:
 - a Safety.
 - b Checking that the proposed bridge span is correct for the site.
 - c Confirming that the proposed launching method is suited to the site.
 - d Checking the setting out dimensions and the levels of the installation rollers.
 - e Ensuring that the structure is erected correctly.
 - f Ensuring that launching is executed correctly.
 - g Ensuring that jacking is carried out properly.
 - h Inspecting the bridge when installed, to ensure that all components have been fitted correctly and that all bolts have been tightened, before permitting traffic to cross.

If at any time the erection supervisor is in doubt about any detail or procedure, he must refer to his superiors, or to the Project Engineering Department at Mabey & Johnson Ltd.

- 2 Before the commencement of any work on site, study the erection and launching information that has been provided, whether in drawings or in tables, along with the following information from start to finish. Ensure that all of the points are fully understood.
- 3 Set out the installation rollers to line and level. Ensure that the dimensions between successive rollers are correct, especially between the launching and landing bank rollers, and that all of the rollers are of the correct type and quantity at each position.
- 4 Mark the centreline of the bridge on both abutments and along the construction area. Check to this frequently during the erection, especially whilst constructing the first few bays and after every movement of the structure.
- 5 Determine the position of the Launching Links and by which method they will be fitted.
- 6 If the bridge is of chord reinforced construction, determine the position of the Nose Drop Bolt.
- 7 Build the launching nose, bridge and tail bay if required, bay by bay, referring to the following pages that give erection procedures for each truss construction type.
- 8 Pay particular attention to the fact that some bays of the bridge may initially be constructed for launching in a different configuration to that as finally required when the bridge is in service. For example, additional or fewer Chord Reinforcements may be temporarily fitted to a bay.
- 9 Determine how many bays of the bridge should have decking fitted when launching, and how many should not.
- 10 Determine how much counterweight should be placed on the bridge when launching, and on which bays of the bridge.

BRIDGE INSTALLATION PROCEDURES

GENERAL PROCEDURE

- 11 The launching nose, bridge and tail bay, if required, may be erected in their entirety on the home bank before being launched forwards across the gap.

The procedure usually adopted, however, is to erect several bays, move them forwards a little, then build a few more bays, then move the structure forward a little more, etc. This progressive erect and move method of bridge installation has the following three advantages:

- a The required construction plain is shorter.
- b Fewer construction rollers are required.
- c The erection can be carried out nearer to the stockpiles of the components.

When using this method of bridge installation, however, it is essential not to allow the partially erected structure to fall into the gap. When moving the structure forwards at any stage of the erection, never allow the Centre of Gravity of the erected portion approach closer than one panel length to the launching rollers on the home bank.

- 12 When erecting a structure on rollers, it is most important that it does not move accidentally. A suitable method of preventing movement, on a level launching plain, is to pass spikes through the bottom chords of panels and into the roller cages.
- 13 Before moving the structure, station a man at each roller position. Each one is to watch for any sign of a roller jamming, a pack under a roller becoming unstable, or anything else undesirable occurring when the structure is moved. In the event of any problem arising, the observer should immediately, by a pre-arranged signal, notify the erection supervisor to stop the movement of the structure.
- 14 Immediately prior to moving the structure, remove all spikes from the rollers and check that there are no other obstructions. Then, move the structure slowly forwards to its new position
- 15 Bridges may be pulled or pushed across a gap. Long bridge spans may tend to go off-line, however, and should therefore preferably be pulled. The force required to move the structure on a level launching plane will be approximately one tenth of the weight of the structure. The force must be applied on, or symmetrically about, the centreline of the structure, otherwise it will be likely to go off-line. Care must also be taken not to cause damage by pushing or pulling on a part which is not strong enough to take the force.
- 16 Always provide a suitable method of restraint to prevent the structure from over-running its new position. For example, a cable can be connected to the structure and passed around a strong tree, or connected to a bulldozer.
- 17 When the erection of the structure is complete, before launching it across the gap, check that all of the decking and counterweight has been correctly placed in accordance with the relevant erection and launching scheme.
- 18 Position a man at each roller as before, remove all spikes, then pull (or push) the structure slowly and steadily across the gap towards the landing rollers.

BRIDGE INSTALLATION PROCEDURES

GENERAL PROCEDURE

- 19 As the tip of the launching nose approaches the landing rollers, check their alignment. Note that it may be necessary to temporarily stop the launch in order to adjust the position, or the level, of these rollers.
- 20 If the structure is off line, the tip of the launching nose can be moved sideways a little, by pushing or pulling on one truss. Greater movement can be achieved as the structure approaches the point of balance on the launching rollers, but this should be undertaken with great care.
- 21 If the tip of the launching nose is too low, such that it will not pass over the landing rollers, or if the tip of the launching nose is too high, such that as the point of balance is reached it will descend onto them too forcefully, then the height of the landing rollers must be adjusted.
- 22 Having adjusted the landing rollers, as necessary, continue to launch the structure until the bridge section is correctly aligned over its bearing positions.

Do not dismantle any bays of the launching nose until the bridge is correctly aligned over its final position unless the erection and launching scheme specifically permits it. Consult the Project Engineering Department of Mabey & Johnson Ltd. where the removal of some bays of the launching nose is necessary due to site topography, but not already specifically permitted.

- 23 Remove any counterweight that has been placed on the structure. Fit End Posts then jack up the rear of the bridge, remove the launching rollers and lower the bridge onto its bearings.

Note that during this process it will be necessary to remove the tail bay, where one has been used, and it may be necessary to relocate components that have been fitted in different positions for launching to those required when the bridge is in service.

- 24 Remove the launching nose from the bridge and fit End Posts. Jack up the front of the bridge, remove the landing rollers and lower the bridge onto its bearings.

Note that during this process it may be necessary to relocate components that have been fitted in different positions for launching to those required when the bridge is in service.

- 25 During jacking operations, ensure that the longitudinal slope of the bridge does not exceed a gradient of 1 in 100. If the bridge is to be lowered a long way, it will be necessary to carry out the jacking in stages, jacking first at the back, then at the front and back alternately, until the operation is completed.
- 26 Never support both ends of the bridge on jacks at the same time.
- 27 Once all jacking operations are complete, place the remainder of the decks and relocate any remaining components which have been fitted in different positions for launching to those required when the bridge is in service.
- 28 Carry out a final inspection.

BRIDGE INSTALLATION PROCEDURES

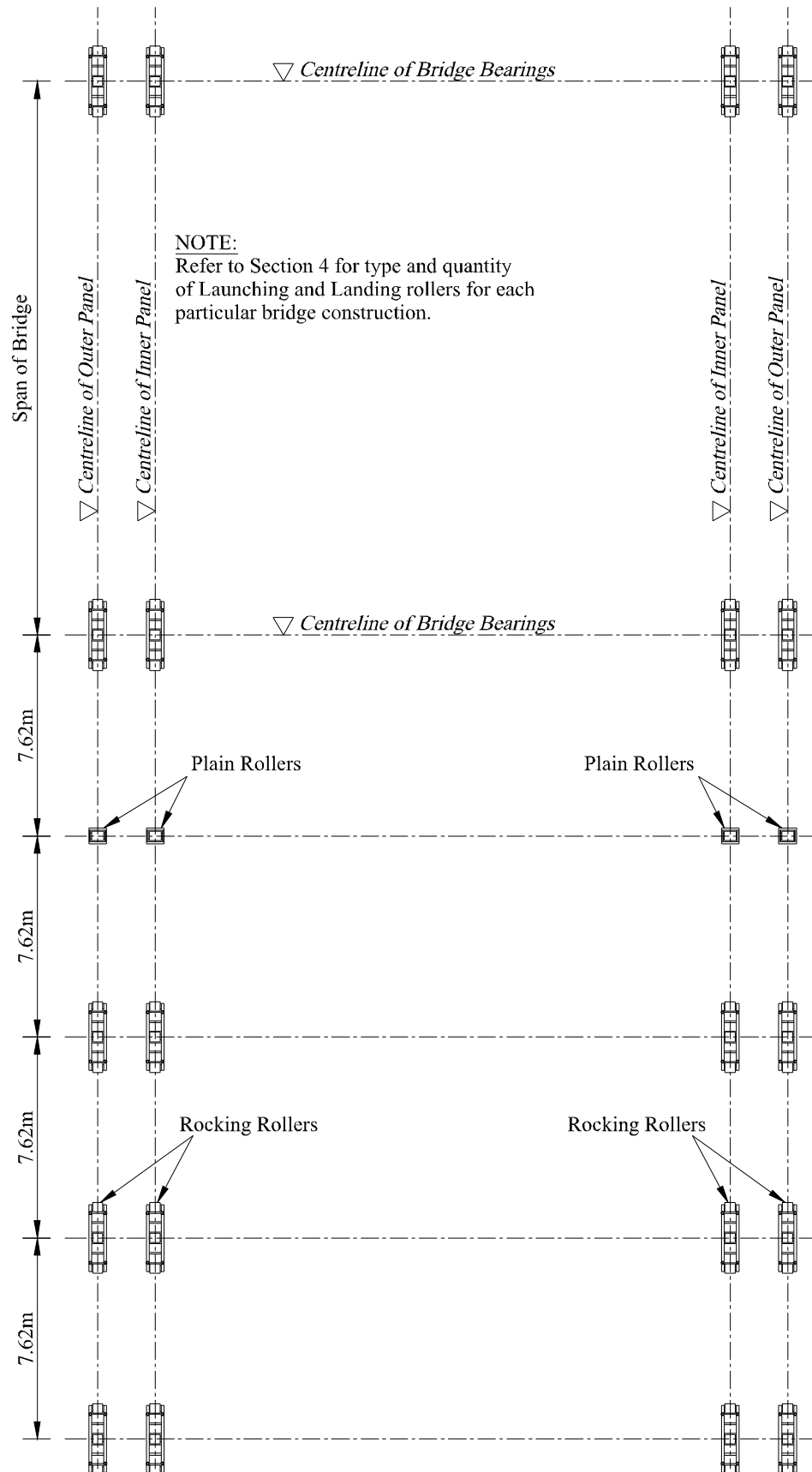
GENERAL PROCEDURE

SUPPLEMENTARY NOTES FOR GUIDANCE

- A Always try to achieve a level launching plain. A bridge can be erected and launched on a gradient, but greater care must be taken with regards to pulling or pushing methods, restraints against over-running desired positions and general safety.
- B Remain aware of the stability of the partially built structure at all times, use packs as necessary to prevent tipping. This is of particular importance in the early stages of erection, before three roller positions are covered, and when inserting Launching Links. Remember that the structure can tip either backwards or forwards.
- C When constructing a bay of the bridge or launching nose, do not fully tighten the bolts until the following bay has been assembled. This is in order to allow flexibility in the structure to ease the assembly of the subsequent bay components.
- D In order to ensure adequate stability, however, do not permit more than three bays of a structure to be constructed with loose bolted connections.
- E Ensure that all bolts are tightened before finally launching the structure across the gap.
- F Do not damage parts of the bridge by imposing loads at weak points. When positioning jacks and safety packs, be aware of the loads that will be imposed upon the bridge components above them. When jacking or packing under the trusses, try to work under the strong points where the verticals or diagonals intersect with the chords of the panels. Refer to Section 1 of this manual for the allowable loads that may be applied to various positions on the Panels.
- G When jacking, always use safety “catch packs”. A “catch pack” is a pack placed adjacent to a jack, under a strong point of the structure, such that if the jack should fail or sink, the load is immediately carried by the “catch pack” and the structure cannot fall. During the jacking operations, the height of the “catch packs” should be adjusted continually such that they are always between 50 and 100mm beneath the structure.
- H The general procedure described above is that as required for the installation of a single span bridge. The general procedure for the installation of a multiple span bridge is the same as that described above, however, and any special additional requirements will be dealt with on a bridge specific erection and launching scheme.

BRIDGE INSTALLATION PROCEDURES

LAUNCHING SITE SETTING OUT



BRIDGE INSTALLATION PROCEDURES

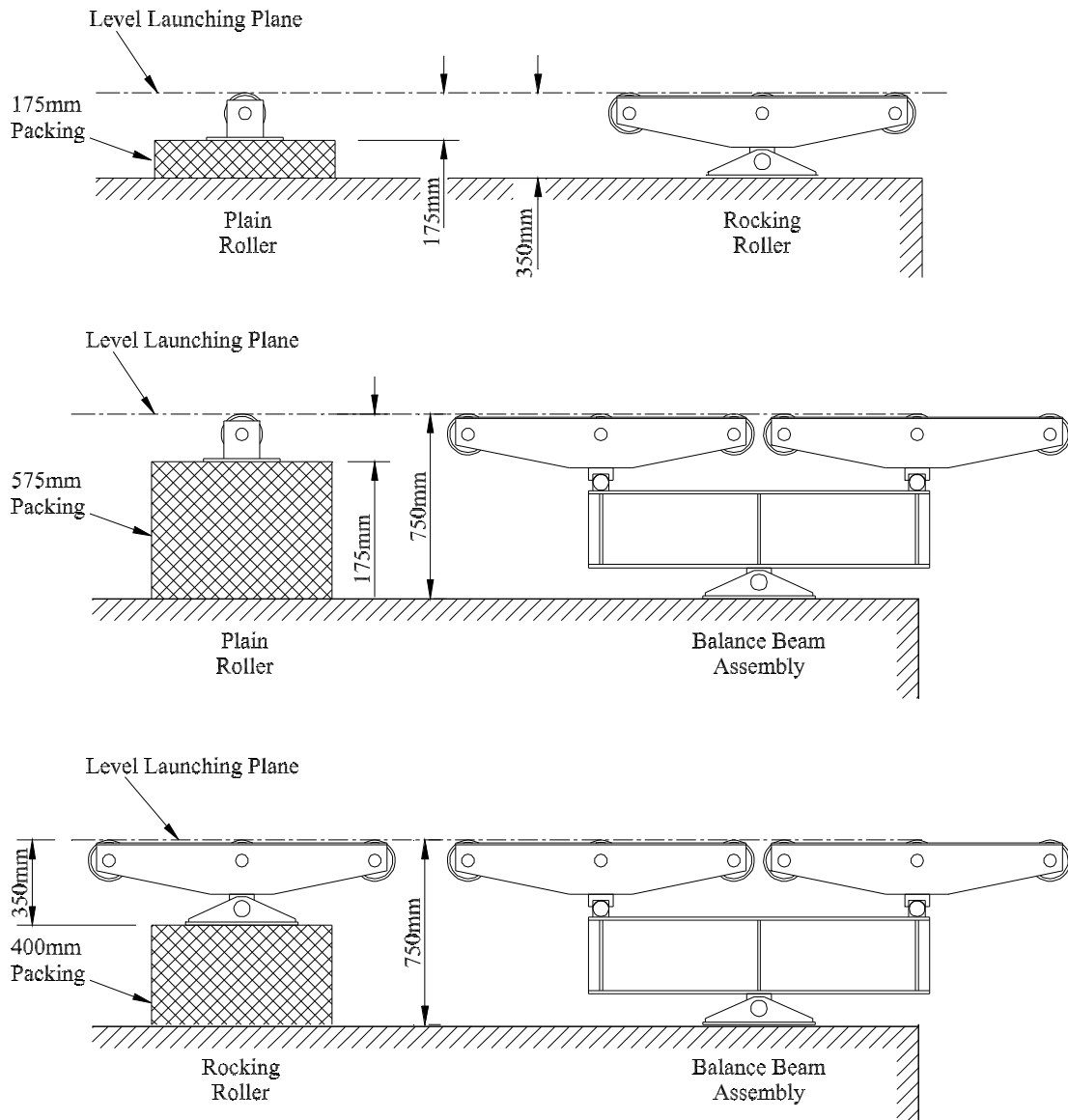
LAUNCHING SITE SETTING OUT

ROLLER POSITIONS:

The general format of the roller placement required for the launching of a bridge is shown opposite. For precise details of the type, quantity and positioning of Rollers required for the installation of a particular bridge, refer to Section 4 of this manual or to the specific launching scheme provided.

ROLLER HEIGHTS:

Where rollers of different types are used for the erection and launching of a bridge, packing must be used as necessary to ensure a level launch plane is achieved, as shown below.

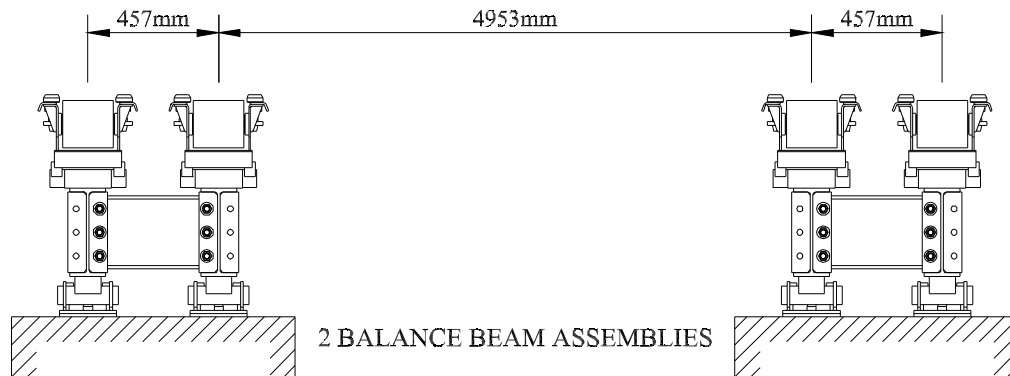
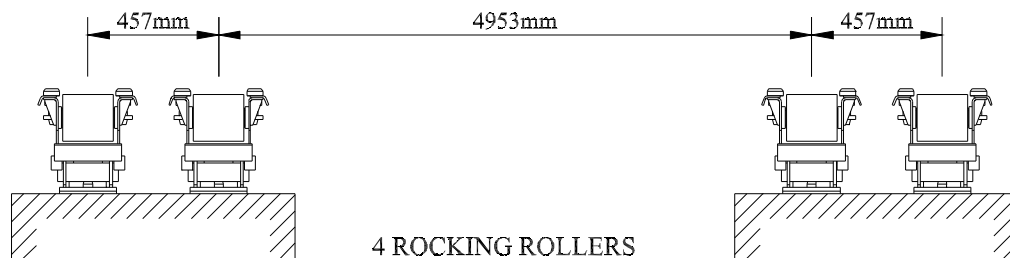
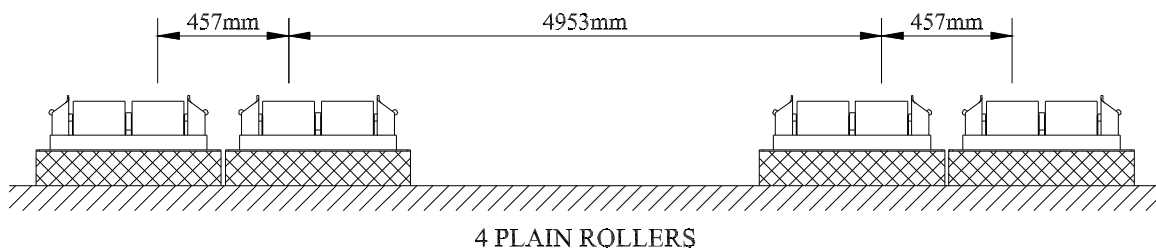
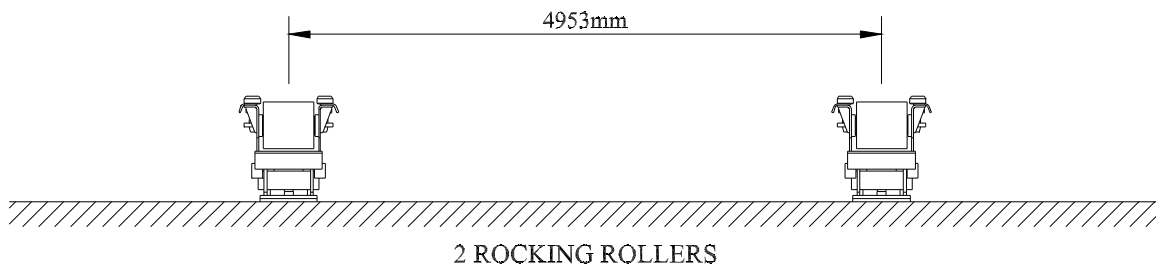
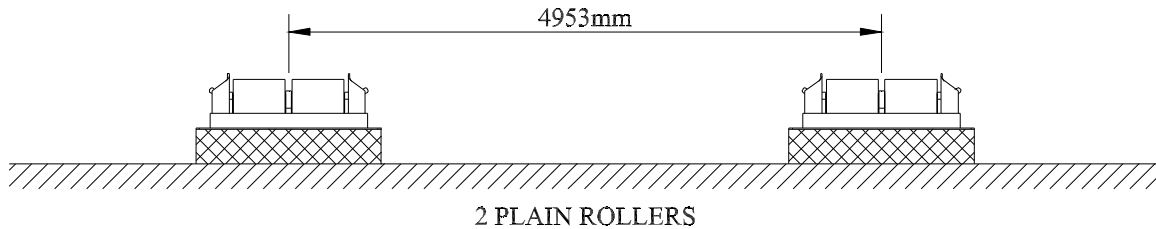


BRIDGE INSTALLATION PROCEDURES

LAUNCHING SITE SETTING OUT

TRANSVERSE ROLLER POSITIONS:

- 1 When launching bridges with “SS”, “SSR”, “DS”, “DSR2” or “TSR2” truss constructions

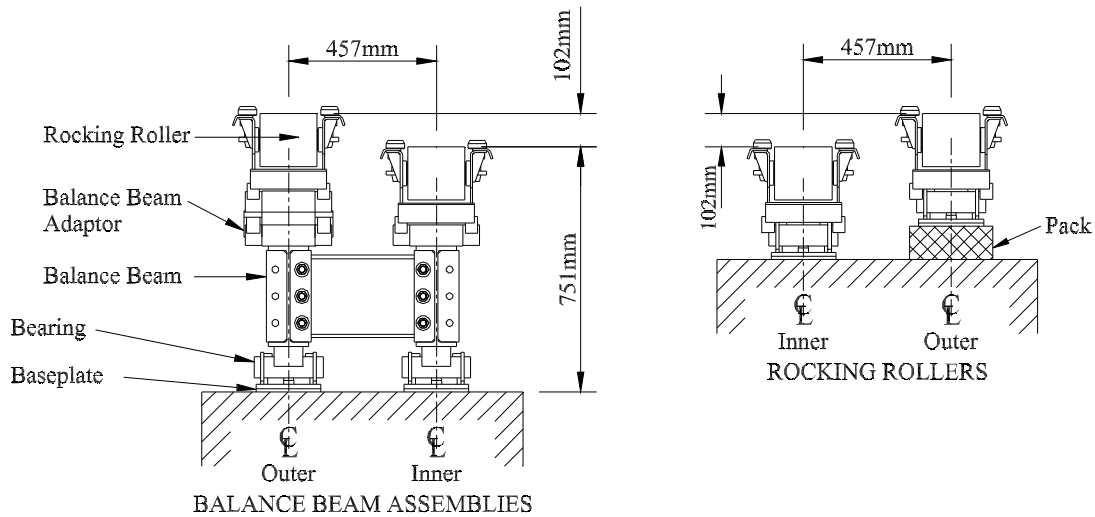


BRIDGE INSTALLATION PROCEDURES

LAUNCHING SITE SETTING OUT

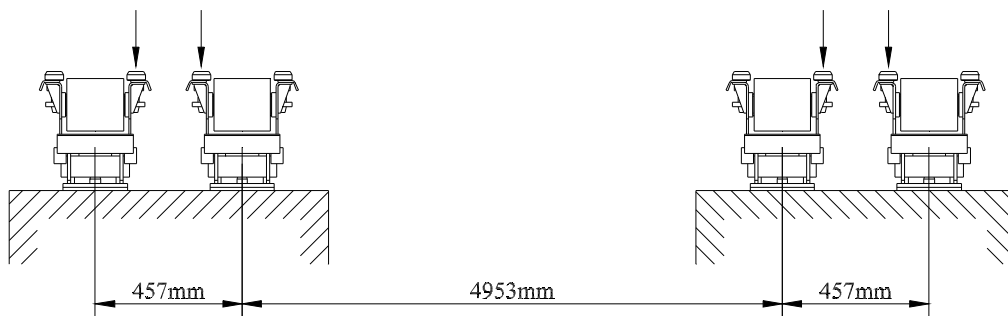
TRANSVERSE ROLLER POSITIONS:

- 2 When launching bridges with a “ DSR1 ” truss construction, it is necessary to raise the level of the Rollers under the outer Panel lines as shown below. Note, however, that the Transoms in the bays of the launching nose prior to the Drop Nose position will collide with the guides on the raised outer Rollers. To avoid this, do not install the outer Rollers until the Drop Nose has passed the roller positions.



All other setting out details are as shown on the previous page.

- 3 When launching bridges with “ TS ” or “ TSR3 ” truss constructions using Rocking Rollers, whether with or without Balance Beam assemblies, it is necessary to remove the inner guides from the Rollers, as indicated below, to avoid collision with the centre Panel lines of each truss.



Notes:

- A When launching on Rocking Rollers, whether with or without Balance Beam assemblies, the Rollers should be angled downwards towards the approaching structure to ensure that they are not knocked over as the structure mounts them.
- B Temporary packing should be installed as necessary to ensure stability of the Rollers until the structure is upon them.

BRIDGE INSTALLATION PROCEDURES

LAUNCHING LINKS

PURPOSE:

When a bridge is launched across a gap, there is a tendency for the front portion of the structure that is in cantilever to deflect downwards. This deflection is such that if no counter measures were taken the tip of the launching nose would arrive at the far bank at a level below that of the landing rollers. Launching Links are therefore fitted into the bottom chord of the launching nose, at one or more positions depending upon the span, such that the tip of the launching nose is raised sufficiently to overcome the deflection.

PARTS REQUIRED: in addition to those that are required for SS construction.

MARK NUMBER	COMPONENT DESCRIPTION	QUANTITY
MC 66	LAUNCHING LINK : COMPACT 200 NOSE	2
MC307	PANEL PIN	2
MC307A	SAFETY CIRCLIP	4
MC349	SWAYBRACE EXTENSION : 4.20m ROADWAY	2
MC431	BOLT : TRANSOM	2
MC436	NUT : M24	2

ERECTION PROCEDURE:

Pin a Launching Link to the rear of the bottom chord of each Panel of the bay that precedes the required link position. Fit the Panels of the subsequent bay by pinning the top chords to those of the panels of the previous bay as usual, but pin the bottom chords to the rear of the Launching Links.

Note that due to the introduction of the Launching Links, the distance between the Transoms in the adjacent bays at the link position is increased slightly. It is, therefore, necessary to fit Swaybrace Extensions in the bay following the link position to overcome this.

METHODS OF INSTALLATION:

The principles of three Launching Link installation methods are illustrated on the following pages. Selection of a suitable method will depend upon the particular bridge site conditions and upon the construction equipment available.

METHOD 1 incorporates Launching Links as the erection proceeds.

METHOD 2 introduces Launching Links by raising the front of the nose.

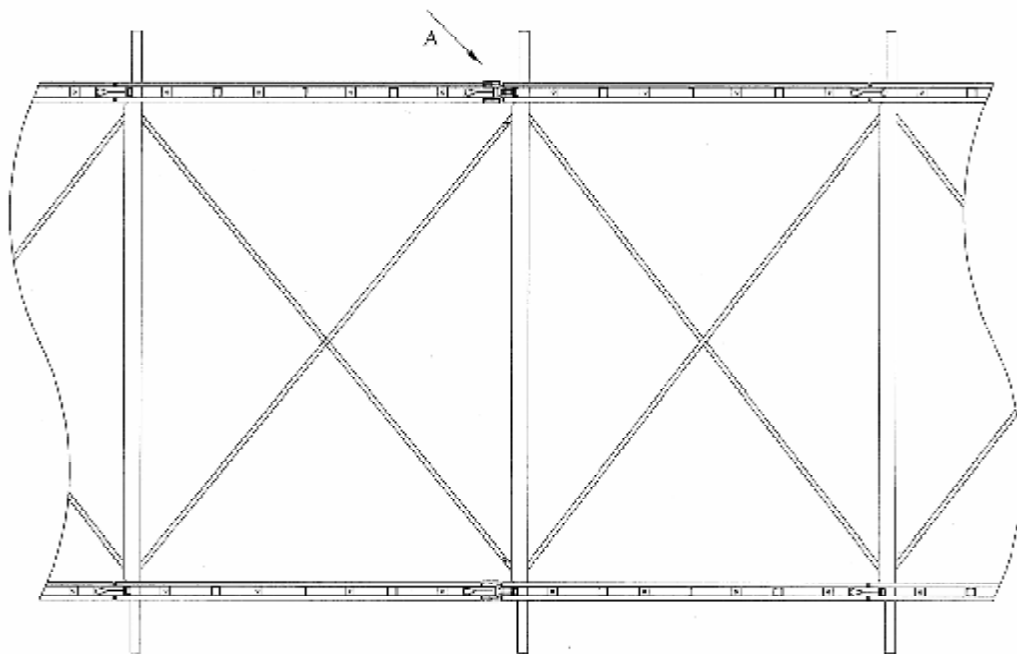
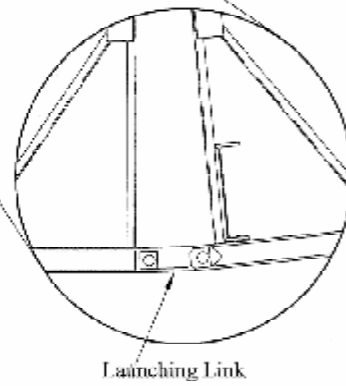
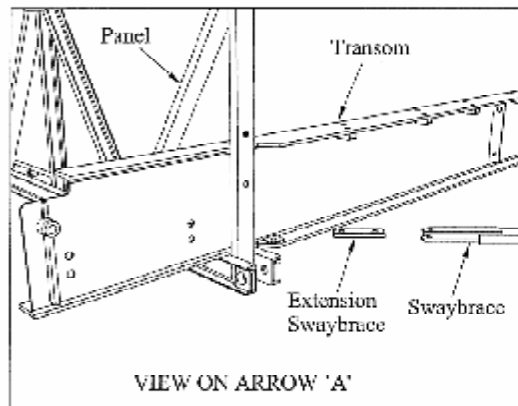
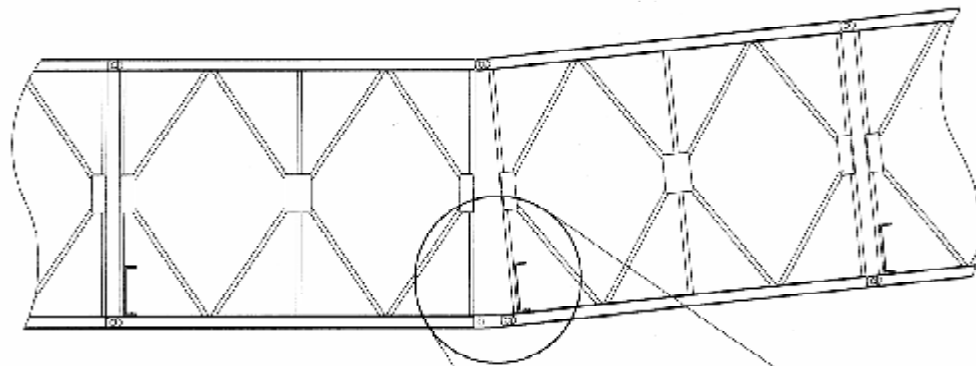
METHOD 3 constructs the bays in front of the Launching Links in reverse.

Whichever method is adopted for the installation of the Launching Links, it is most important to continually assess the position of the centre of gravity of the structure, using temporary packing as necessary to prevent the structure from tipping either backwards or forwards.

Note that Launching Links are never inserted more than four bays back from the tip of the nose. When the installation of Launching Links at the rear of the fourth bay fails to give sufficient uplift, additional Links are inserted after the first, second or third bays. Note, however, that two sets of Launching Links must never be installed at the same position. Whilst the installation of two sets of Launching Links is not illustrated here, the principles of the installation methods remain the same.

BRIDGE INSTALLATION PROCEDURES

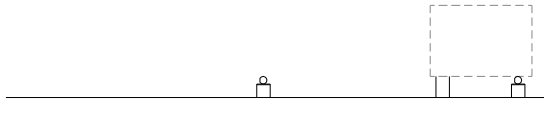
LAUNCHING LINKS



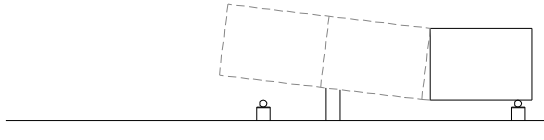
BRIDGE INSTALLATION PROCEDURES

LAUNCHING LINK INSTALLATION - METHOD 1

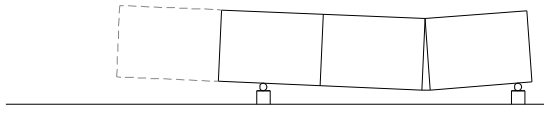
1 LAUNCHING LINKS AT THE REAR OF NOSE BAY 1:



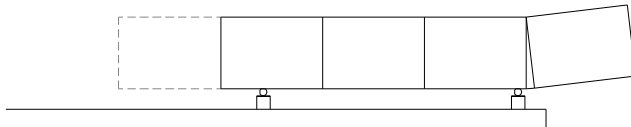
Erect bay 1, supporting the rear of the panels on packs.



Connect Launching Links to the rear of bay 1. Erect bays 2 & 3, using packs as necessary.

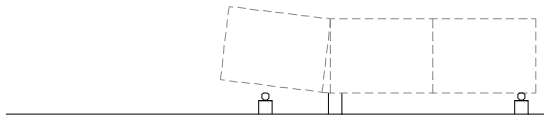


Remove the packs and lower the structure onto rollers. Erect bay 4.

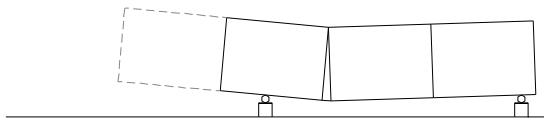


Advance the structure by 10 feet. Continue erection as directed by the specific scheme provided.

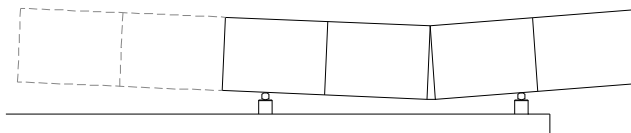
2 LAUNCHING LINKS AT THE REAR OF NOSE BAY 2:



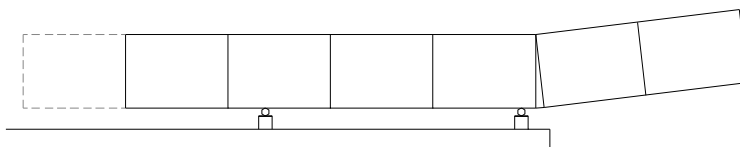
Erect bays 1 & 2, using packs as necessary. Fit Launching Links to the rear of bay 2. Erect bay 3.



Remove the packs and lower the structure onto rollers. Erect bay 4.



Advance the structure by 10 feet. Erect bays 5 & 6.



Advance the structure by 10 feet. Continue erection as directed by the specific scheme provided.

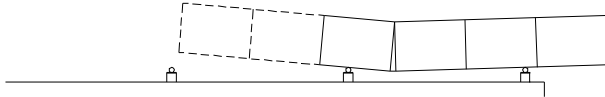
BRIDGE INSTALLATION PROCEDURES

LAUNCHING LINK INSTALLATION - METHOD 1

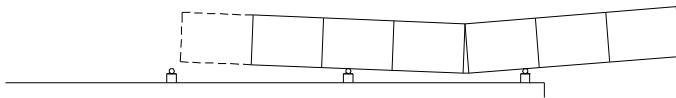
3 LAUNCHING LINKS AT THE REAR OF NOSE BAY 3:



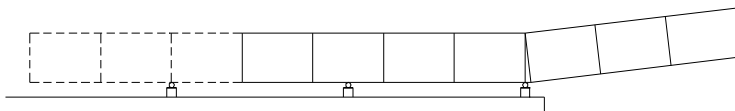
Erect bays 1, 2 & 3, using packs as necessary. Fit Launching Links to the rear of bay 3. Erect bay 4.



Advance the structure by 10 feet. Erect bays 5 & 6.

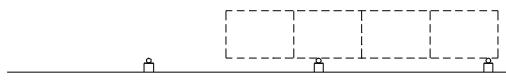


Advance the structure by 10 feet. Erect bay 7.

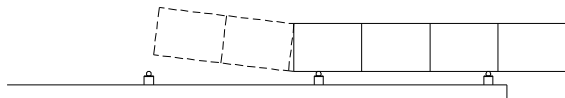


Advance the structure by 10 feet. Continue erection as directed by the specific scheme provided.

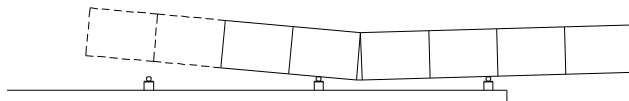
4 LAUNCHING LINKS AT THE REAR OF NOSE BAY 4:



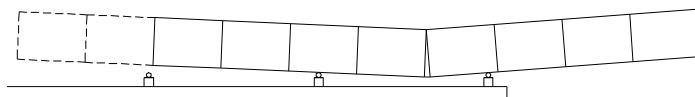
Erect bays 1, 2, 3 & 4, using packs as necessary.



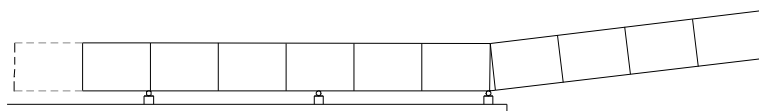
Advance the structure by 10 feet. Connect Launching Links to the rear of bay 4. Erect bays 5 & 6.



Advance the structure by 10 feet. Erect bays 7 & 8.



Advance the structure by 10 feet. Erect bays 9 & 10.

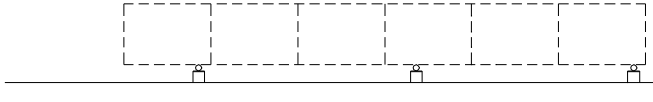


Advance the structure by 10 feet. Continue erection as directed by the specific scheme provided.

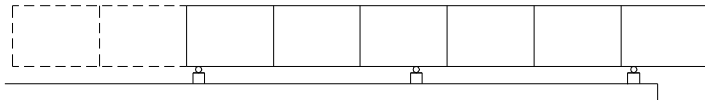
BRIDGE INSTALLATION PROCEDURES

LAUNCHING LINK INSTALLATION - METHOD 2

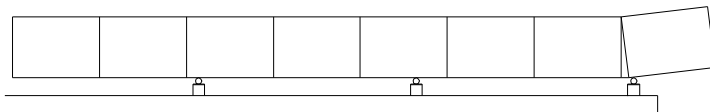
1 LAUNCHING LINKS AT THE REAR OF NOSE BAY 1:



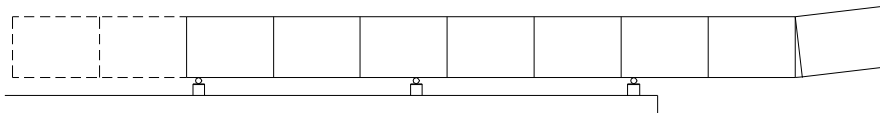
Erect bays 1 to 6, using packs as necessary.



Advance the structure.
Erect bays 7 & 8.

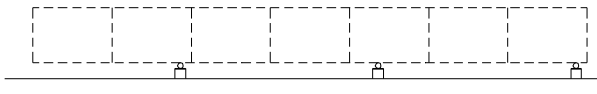


Raise the first bay and
insert Launching Links
between bays 1 & 2.

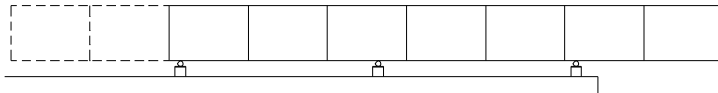


Advance the structure.
Continue erection as
directed by the specific
scheme provided.

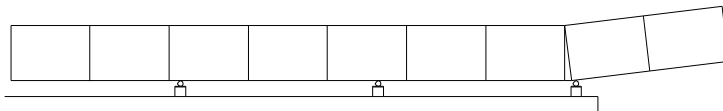
2 LAUNCHING LINKS AT THE REAR OF NOSE BAY 2:



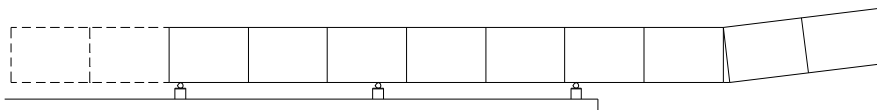
Erect bays 1 to 7,
using packs as
necessary.



Advance the structure.
Erect bays 8 & 9.



Raise bays 1 & 2 and
insert Launching Links
between bays 2 & 3.

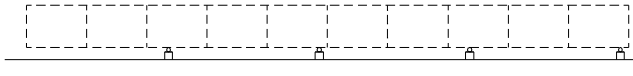


Advance the structure.
Continue erection as
directed by the specific
scheme provided.

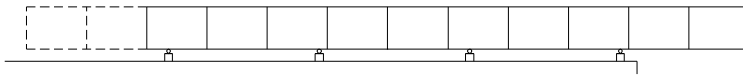
BRIDGE INSTALLATION PROCEDURES

LAUNCHING LINK INSTALLATION - METHOD 2

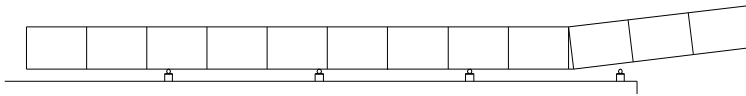
3 LAUNCHING LINKS AT THE REAR OF NOSE BAY 3:



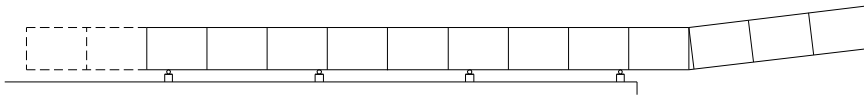
Erect bays 1 to 10, using packs as necessary.



Advance the structure.
Erect bays 11 & 12.

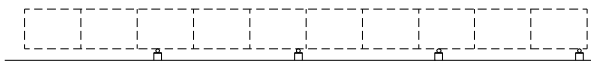


Raise bays 1 to 3 and
insert Launching Links
between bays 3 & 4.

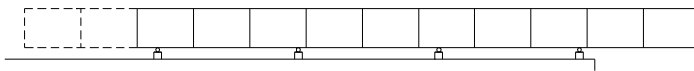


Advance the structure.
Continue erection as
directed by the specific
scheme provided.

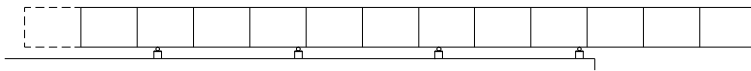
4 LAUNCHING LINKS AT THE REAR OF NOSE BAY 4:



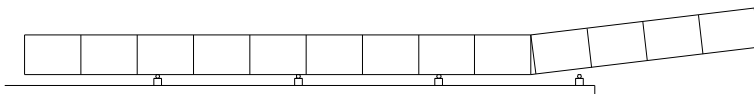
Erect bays 1 to 10, using
packs as necessary.



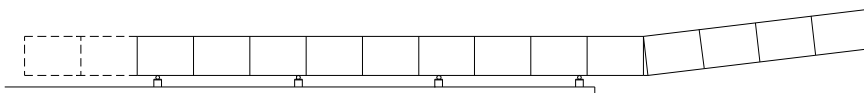
Advance the structure.
Erect bays 11 & 12.



Advance the structure.
Erect bay 13.



Raise bays 1 to 4 and
insert Launching Links
between bays 4 & 5.

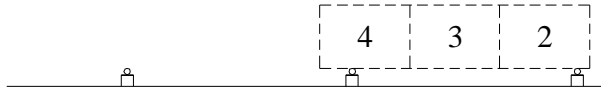


Advance the structure.
Continue erection as
directed by the specific
scheme provided.

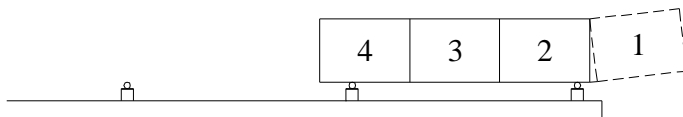
BRIDGE INSTALLATION PROCEDURES

LAUNCHING LINK INSTALLATION - METHOD 3

1 LAUNCHING LINKS AT THE REAR OF NOSE BAY 1:

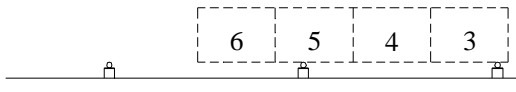


Erect bays 2 to 4, using packs as necessary.

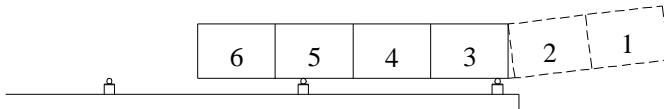


Erect bay 1 in front of bay 2 and insert Launching Links between bays 1 and 2.

2 LAUNCHING LINKS AT THE REAR OF NOSE BAY 2:

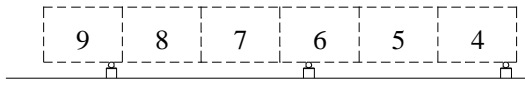


Erect bays 3 to 6, using packs as necessary.

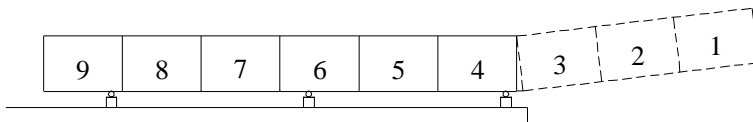


Erect bays 2 and 1 in front of bay 3, inserting Launching Links between bays 2 and 3.

3 LAUNCHING LINKS AT THE REAR OF NOSE BAY 3:

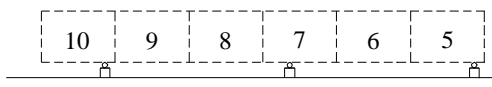


Erect bays 4 to 9, using packs as necessary.

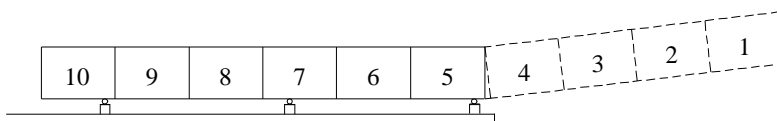


Erect bays 3, 2 and 1 in front of bay 4, inserting Launching Links between bays 3 & 4.

4 LAUNCHING LINKS AT THE REAR OF NOSE BAY 4:



Erect bays 5 to 10, using packs as necessary.



Erect bays 4, 3, 2 & 1 in front of bay 5, inserting Launching Links between bays 4 & 5.

BRIDGE INSTALLATION PROCEDURES

LAUNCHING LINKS

NOTES PERTAINING TO THE METHODS OF INSTALLATION

- 1 The illustrations depict typical examples of the principles of Launching Link installation only. For any specific bridge, refer to the appropriate launching scheme drawing provided.
- 2 Assess the position of the centre of gravity of the structure at each stage of the chosen procedure and ensure that the structure does not tip, either backwards or forwards, using temporary packs for stability as necessary.
- 3 Avoid any accidental movement of the structure during Launching Link installation, either by spiking the Rollers or by providing some other form of suitable restraint.
- 4 Avoid overloading the construction rollers during Launching Link installation. The maximum load on a Compact Plain Roller (MBB58) should not exceed 6 tonnes and the maximum load on a Compact Rocking Roller (MBB59) should not exceed 18 tonnes.
- 5 Take additional care when jacking under a sloping panel.
- 6 As required, raise and lower both trusses simultaneously.
- 7 When moving the structure, ensure that the rollers are not pushed forwards as the raised section of the nose comes to bear on them.
- 8 Check the alignment of the structure after every movement.
- 9 When using Method 2 to install the Launching Links, during the initial stages of erection, the following components may be temporarily omitted:
 - a Panel Pins that connect the bottom chords at the junction where links will be fitted.
 - b Swaybraces in the bay following the Launching Link position.
- 10 If considering the use of Method 3, note that a crane of sufficient capacity and reach to fit the components in the front bays of the nose will be required.
- 11 When using Method 3, give due consideration to the safety of the workers on the nose and note that reverse construction of bays of Compact 200 bridging is less easy than normal construction.
- 12 Method 3 may be safer to employ with the structure positioned further back on the construction area rollers, but pay particular attention to Notes 4, 7 and 8 above.
- 13 The erection procedures for the various truss construction types described on the following pages assume that the Launching Links are installed by Methods 1 or 2.

BRIDGE INSTALLATION PROCEDURES

DROP NOSE BOLTS

PURPOSE:

When launching a bridge that has a reinforced truss construction, it is desirable to have a transition within the launching nose to an unreinforced truss construction in order to provide a lighter and more economical launching nose.

As a level underside to the structure must be maintained, such that it passes smoothly over the construction rollers, a step in the level of the panels is required at this transition point. To achieve this, the bay preceding the transition point has Chord Reinforcements attached only to the top chords of the Panels and the bay following the transition point has Chord Reinforcements attached only to the lower chords of the Panels. The Panels and Chord Reinforcements are then connected as shown in the diagram opposite and as described in the erection procedure below.

In order to maintain the shear strength at the transition point, it is necessary to fit Drop Nose Bolts at the rear of the bay preceding the transition point, clamping the Chord Reinforcements to the top chords of the Panels in addition to the requisite quantity of Chord Bolts.

PARTS REQUIRED: in addition to those that are required for two bays of SS construction.

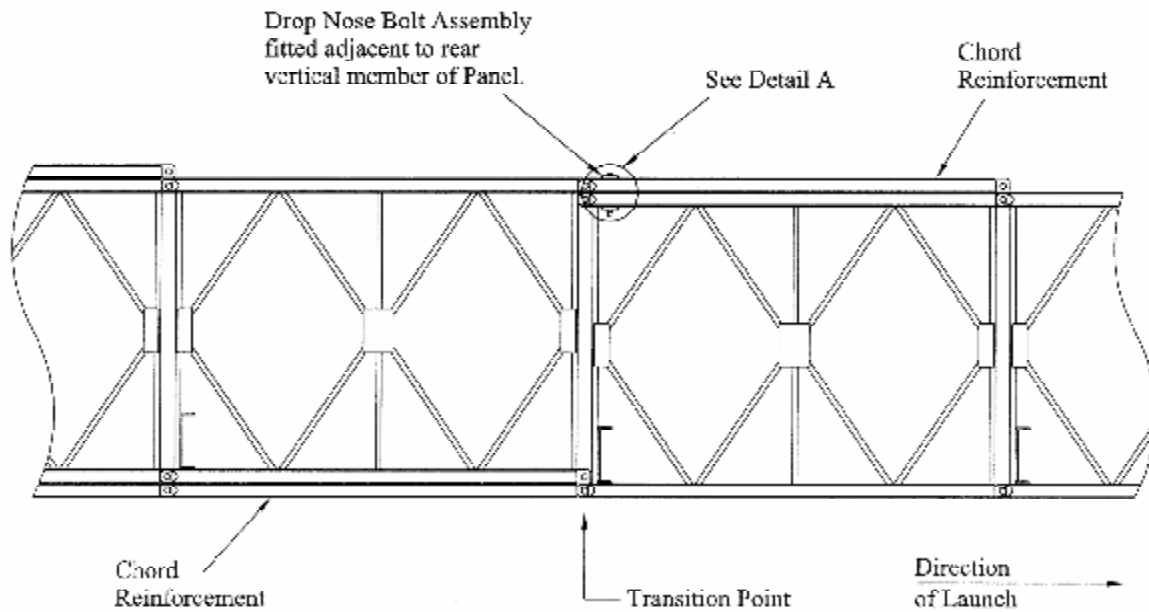
MARK NUMBER	COMPONENT DESCRIPTION	QUANTITY
MC304	CHORD REINFORCEMENT : SUPER	4
MC433	BOLT : CHORD	16
MC436	NUT : M24	16
MC268	BOLT ASSEMBLY : DROP NOSE	2

ERECTION PROCEDURE:

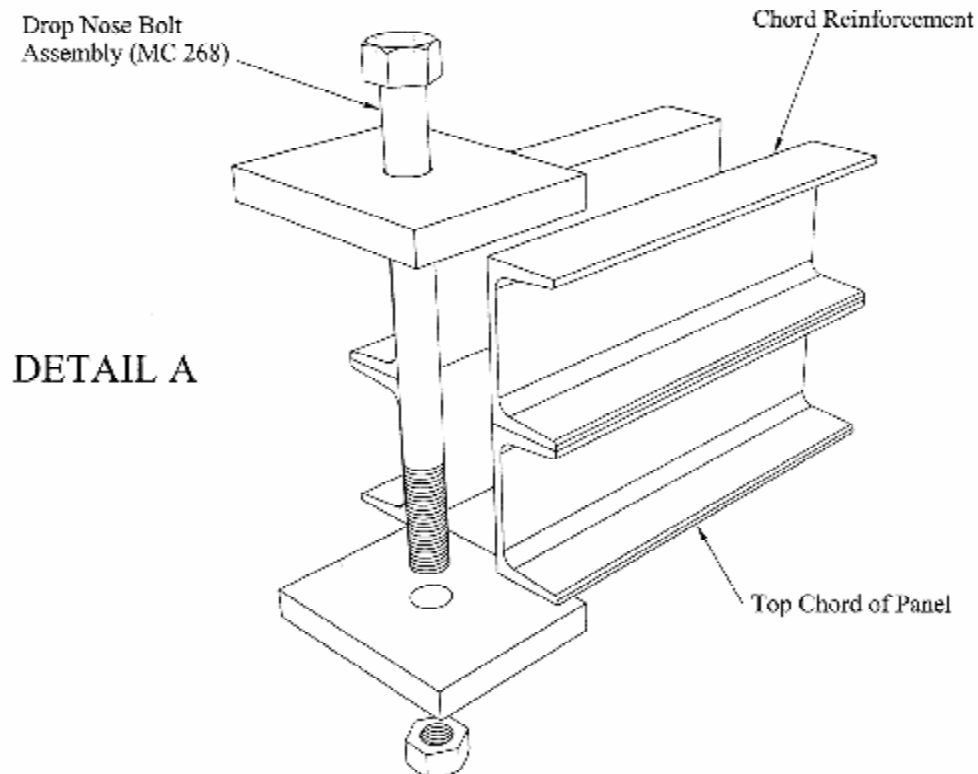
- 1 Erect the bay preceding the transition point in SSD construction. To do this, construct the bay in SS construction, as described on page 6:24, and then bolt a Chord Reinforcement to the top of each Panel with four Chord Bolts, as described on page 6:35.
- 2 Fit a Drop Nose Bolt assembly to each truss at the rear of the bay, to clamp the rear ends of the Chord Reinforcements onto the top chords of the Panels. The Drop Nose Bolt assemblies must be positioned as close as possible to the rear vertical members of the Panels.
- 3 Erect the bay following the transition point in SSN construction. To do this, first bolt a Chord Reinforcement to the bottom chord of each of two Panels with four Chord Bolts, as described on page 6:35, then fit the Panel and Chord assemblies to those of the previous SSD bay. This is achieved by pinning the top chord of each Panel to the Chord Reinforcements that are on top of the Panels of the preceding bay and pinning the Chord Reinforcements to the bottom chord of each of the Panels in the preceding bay. Refer to the diagram opposite.
- 4 Finally, fit the Transom, Rakers and Swaybraces as per a normal SS bay. Note that despite the difference in the level of the Panels on either side of the transition point, Swaybraces may be fitted as normal.

BRIDGE INSTALLATION PROCEDURES

DROP NOSE BOLTS



ELEVATION SHOWING POSITION OF DROP NOSE BOLT ASSEMBLY



BRIDGE ERECTION PROCEDURES

PRELIMINARY ERECTION NOTES

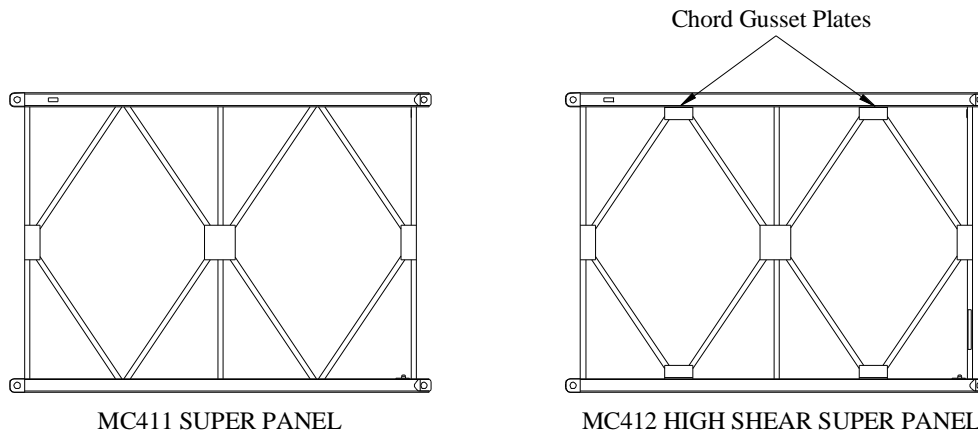
COMPACT 200 SUPER PANELS:

There are two types of Compact 200 Super Panel, which are described as follows:

MC411 = PANEL : SUPER & MC412 = PANEL : SUPER : HIGH SHEAR

The Compact 200 High Shear Super Panel, as the name would suggest, has a higher shear capacity (of 35 tonnes) compared to that of the Compact 200 Super Panel (of 23 tonnes). Depending upon the span and the design loading, High Shear Panels may be required to be used in the construction of up to three bays at each end of a span.

It is essential to use the correct type of Panel to construct each bay of a bridge. It is easy to identify an MC412 High Shear Super Panel, however, both visually and by touch, as it has a gusset plate at the intersection of the diagonals with the chords, whereas the MC411 Super Panel does not. This is illustrated in the diagrams below:



TRANSOM BRACING:

Vertical Braces are required to be fitted between the Transoms in all of the bays of a bridge. They are not required between the Transoms in any of the bays of a launching nose, however, and they are also temporarily omitted from the first bay of a bridge prior to launching.

PARTS REQUIRED:

MARK NUMBER	COMPONENT DESCRIPTION	QUANTITY
MC222	VERTICAL BRACE	2
MC430	BOLT : BRACING	5
MC436	NUT : M24	5

ERECTION PROCEDURE:

- 1 Fit two Vertical Braces between the vertical plates at the centre of adjacent Transoms, such that each one spans from the top of the plate on one Transom to the bottom of the plate on the other. Connect them with Bracing Bolts, which is most easily achieved by passing the Bracing Bolt through the Vertical Brace first and then through the plate on the Transom.
- 2 Connect the Vertical Braces back to back where they cross at their centres, with a Bracing Bolt.

BRIDGE ERECTION PROCEDURES

PRELIMINARY ERECTION NOTES

TRUSS BRACING:

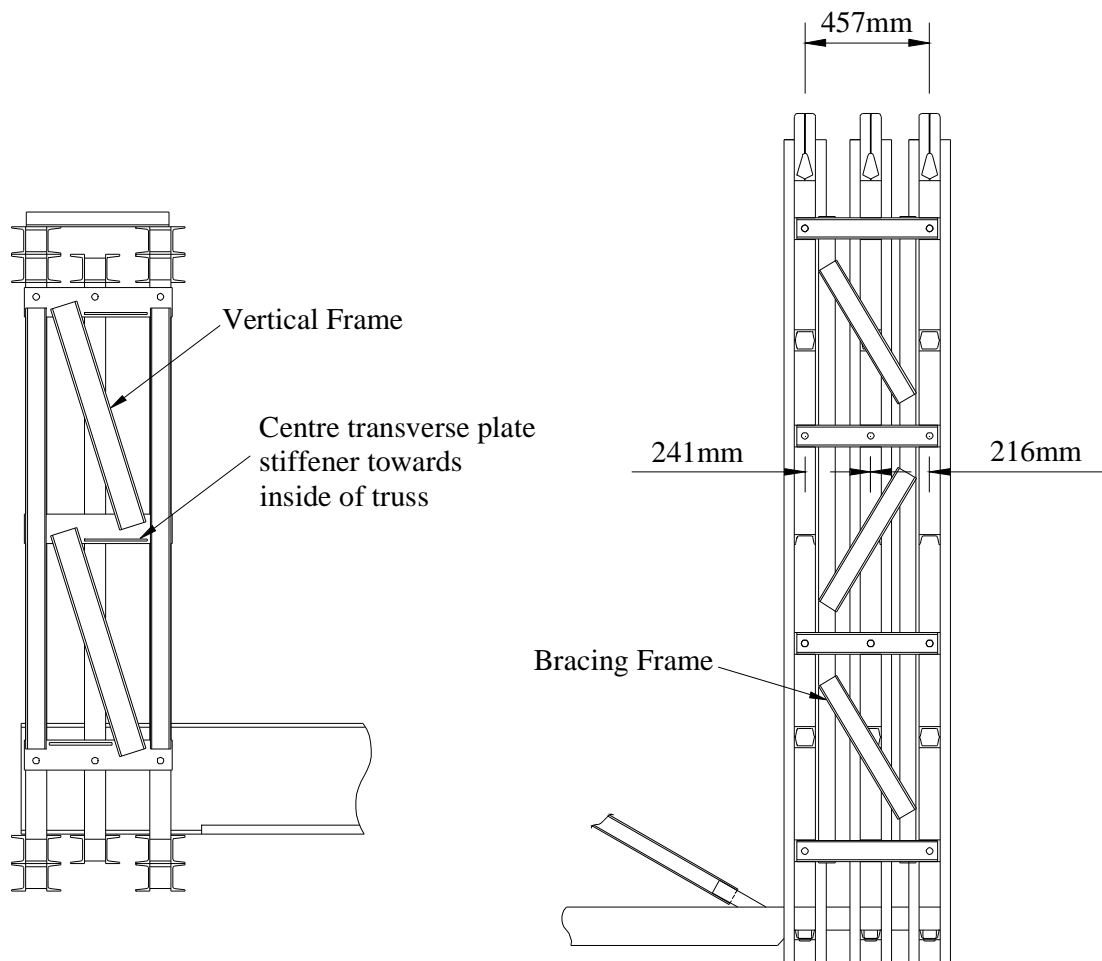
Single Panel truss constructions have only one type of truss bracing, the Raker, which is connected diagonally between the top of the rear (female) vertical of the Panel and the end of the Transom.

Double and triple Panel truss constructions have two types of truss bracing, the Vertical Frame and the horizontal Bracing Frame. Vertical Frames are connected across the rear (female) verticals of the Panels, connecting also, at the bottom, to the Transoms. Bracing Frames are connected across the top chords of the Panel lines of each truss.

When constructing triple Panel truss constructions, as the outer and inner Panels are not positioned symmetrically about the centre Panel, the Vertical Frames and Bracing Frames must be fitted with a specific orientation.

When fitting Vertical Frames, ensure that the stiffener on the central transverse plate is towards the inside of the truss in order to provide the correct orientation.

When fitting horizontal Bracing Frames, there is no orientation feature. It is therefore necessary to ensure that the frame is oriented such that the holes for its connection to the centre Panel are 241mm from those that connect it to the inner Panel.



TRUSS BRACING ORIENTATION

BRIDGE ERECTION PROCEDURES

FIRST BAY OF SINGLE SINGLE TRUSS

PARTS REQUIRED:

MARK NUMBER	COMPONENT DESCRIPTION	QUANTITY
MC411 / MC412	PANEL : SUPER / PANEL : SUPER : HIGH SHEAR	2
NLC18039	TRANSOM : 4.20m ROADWAY : MLC110W	1
MC458	RAKER	2
MC431	BOLT : TRANSOM	6
MC436	NUT : M24	6

ERECTION PROCEDURE:

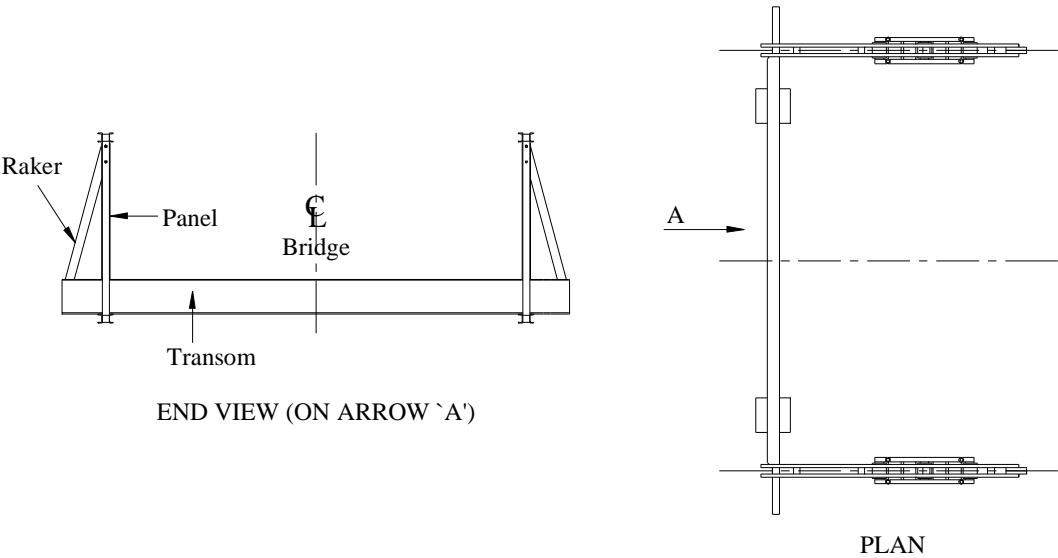
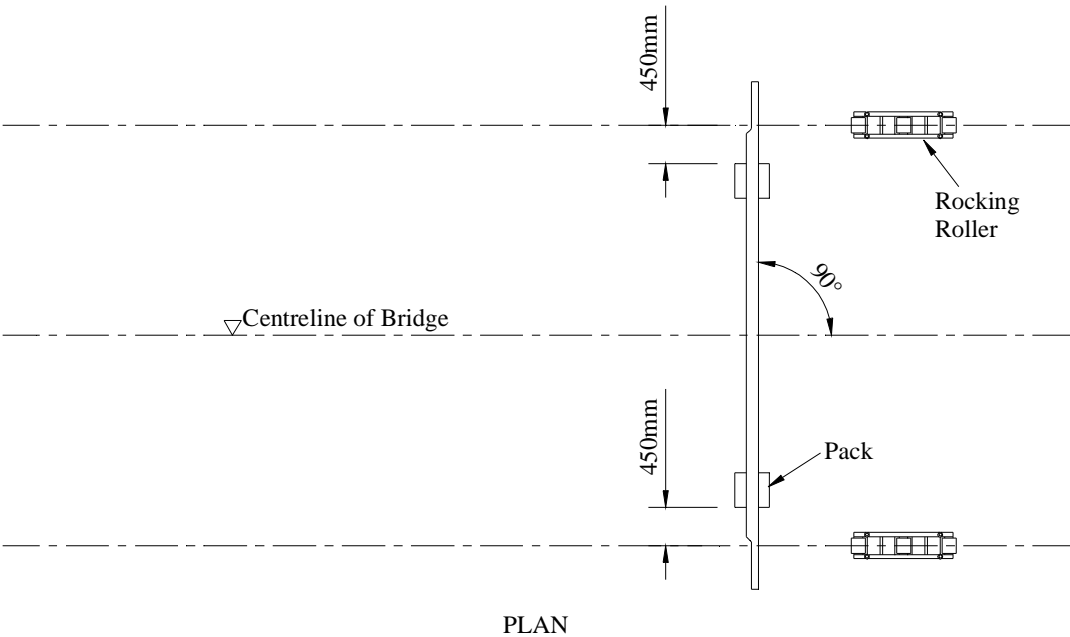
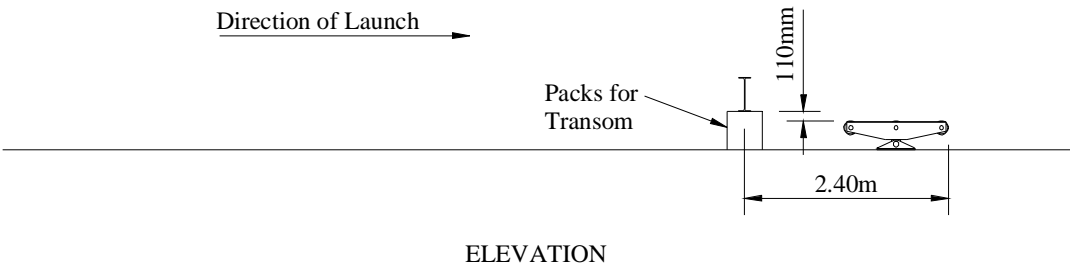
- 1 Construct two packs, each one at approximately 450mm inside each bridge truss position and 2.4 metres behind the front wheel of the rollers on the launching abutment. The height of each pack must be approximately 110mm above the level of the rollers.
- 2 Place a Transom onto the two packs such that the cut back portions at either end of the flanges are on the side furthest away from the launching rollers. Adjust the position of the Transom, such that it is centred on, and at right angles to, the centreline of the bridge.
- 3 Lift a Panel, ensuring that the transom seat is at the bottom, then, with the male end is towards the gap to be bridged, feed the female end onto one end of the Transom. Engage the transom seat peg into the inner peg-hole in the bottom flange of the Transom and allow the male end of the Panel to rest upon the launching rollers. Hold the Panel in this position.
- 4 Connect the Panel to the Transom with a Transom Bolt, passing the bolt through the Panel vertical first and then through the Transom web.
- 5 Connect a Raker between the top of the Panel Vertical and the end of Transom web with two Transom Bolts, passing the bolts through the Raker in the same direction as used for the Panel to Transom connection.
- 6 Ensure that this assembly of the Transom and Panel is stable, on packs and rollers, the Panel can then be released.
- 7 Repeat stages “ 3 ”, “ 4 ”, “ 5 ” and “ 6 ” at the other end of the Transom.

Notes:

- A During this initial procedure, take particular care regarding the stability of the transom and of the rollers.
- B Swaybraces and Vertical Braces are not fitted in this first bay.

BRIDGE ERECTION PROCEDURES

FIRST BAY OF SINGLE SINGLE TRUSS



BRIDGE ERECTION PROCEDURES

SECOND & SUBSEQUENT BAYS OF SINGLE SINGLE TRUSS

PARTS REQUIRED:

MARK NUMBER	COMPONENT DESCRIPTION	QUANTITY
MC411 / MC412	PANEL : SUPER / PANEL : SUPER : HIGH SHEAR	2
NLC18039	TRANSOM : 4.20m ROADWAY : MLC110W	1
MC458	RAKER	2
MC134	SWAYBRACE : 4.20m ROADWAY	2
MC307	PANEL PIN	4
MC307A	SAFETY CIRCLIP	8
MC430	BOLT : BRACING	1
MC431	BOLT : TRANSOM	10
MC436	NUT : M24	11

ERECTION PROCEDURE:

- 1 Pin a Panel to each of the Panels of the preceding bay.
- 2 Fit a Transom into the rear of these Panels and secure it to each Panel with a Transom Bolt, passing the bolt through the Panel vertical first and then through the Transom web.
- 3 Fit a Raker to each truss, between the top of the Panel Vertical and the end of Transom web, connecting each with two Transom Bolts, passing the bolts through the Raker in the same direction as used for the Panel to Transom connection.
- 4 Fit Swaybraces between the Transom in this bay and the Transom in the previous bay, securing them to the bottom flanges of the Transoms with Transom Bolts. These Bolts should be entered downwards, so that the nuts are at the bottom.
- 5 If the bay is a bridge bay (not a nose or tail bay) fit Vertical Braces between the Transoms.

Notes:

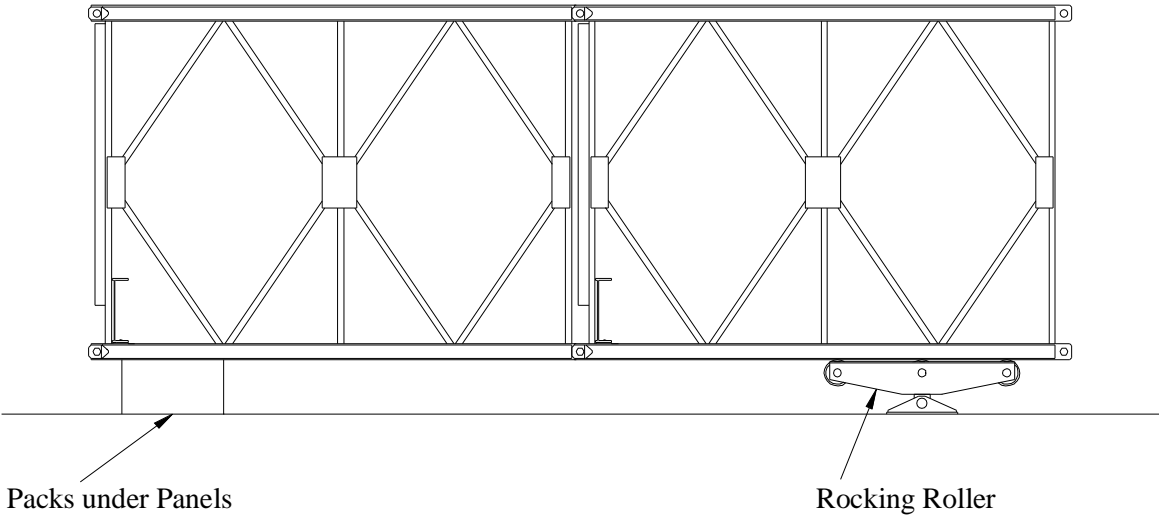
- A When constructing the second bay of Single Single truss, place packing to support the rear of the Panels as necessary to ensure stability.
- B Remove any packing from under preceding bays when it is no longer required for stability.
- C The packs under the Transom in the first bay must be removed in order to fit the Swaybraces in the second bay.
- D Rakers are not fitted to the last bay of a bridge, the quantities of parts required to construct this bay are therefore reduced by two Rakers, four Transom Bolts and four M24 nuts.

Note that if a tail bay is required for launching, however, Rakers are fitted temporarily to the last bay of the bridge and the quantities of parts required for that bay are not reduced, but Rakers are not fitted to the rear of the tail bay and the quantities for the tail bay are reduced instead.

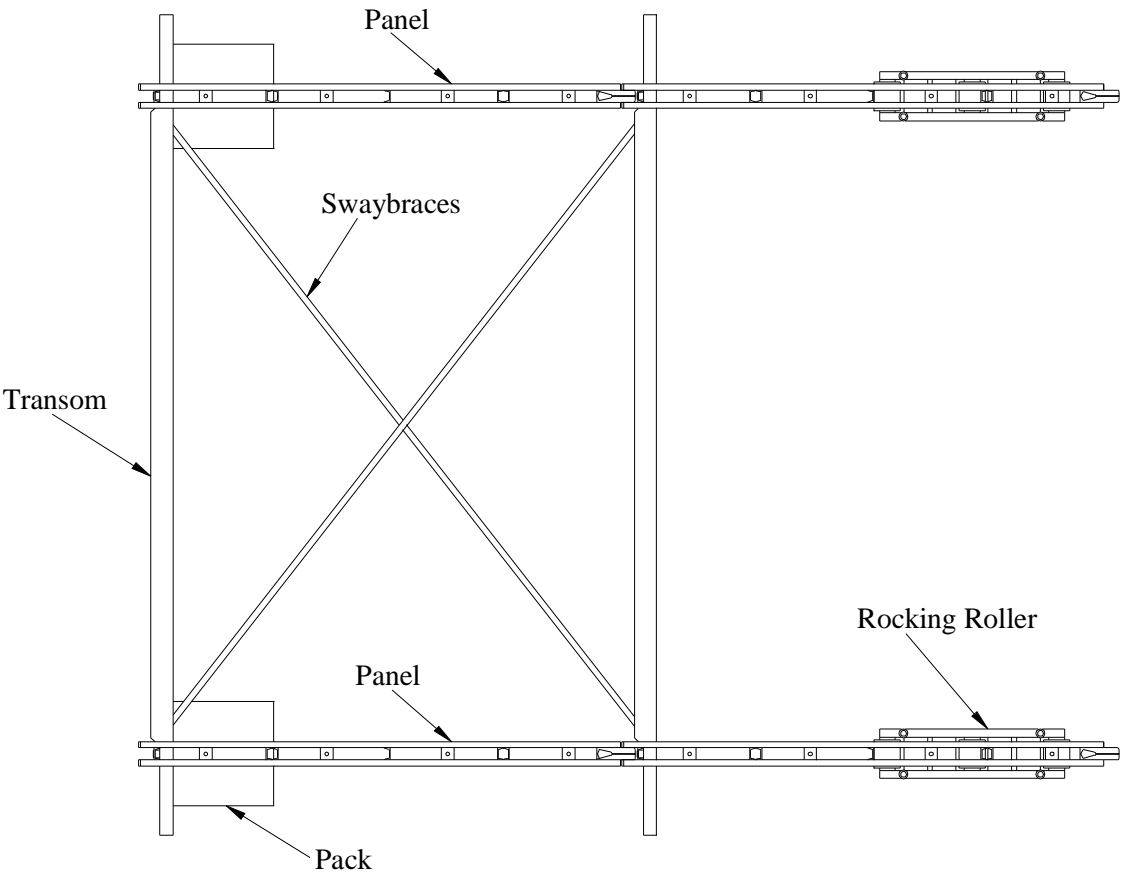
- E If applicable, refer also to the pages that follow regarding erection of Chord Reinforced trusses.

BRIDGE ERECTION PROCEDURES

SECOND & SUBSEQUENT BAYS OF SINGLE SINGLE TRUSS



ELEVATION



PLAN

BRIDGE ERECTION PROCEDURES

FIRST BAY OF DOUBLE SINGLE TRUSS

PARTS REQUIRED:

MARK NUMBER	COMPONENT DESCRIPTION	QUANTITY
MC411 / MC412	PANEL : SUPER / PANEL : SUPER : HIGH SHEAR	4
NLC18039	TRANSOM : 4.20m ROADWAY : MLC110W	1
MC312	VERTICAL FRAME	2
MC358	BRACING FRAME	2
MC134	SWAYBRACE : 4.20m ROADWAY	2
MC307	PANEL PIN	4
MC307A	SAFETY CIRCLIP	8
MC430	BOLT : BRACING	17
MC431	BOLT : TRANSOM	12
MC436	NUT : M24	29

ERECTION PROCEDURE:

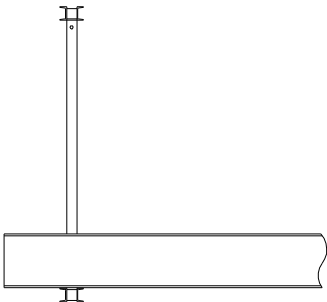
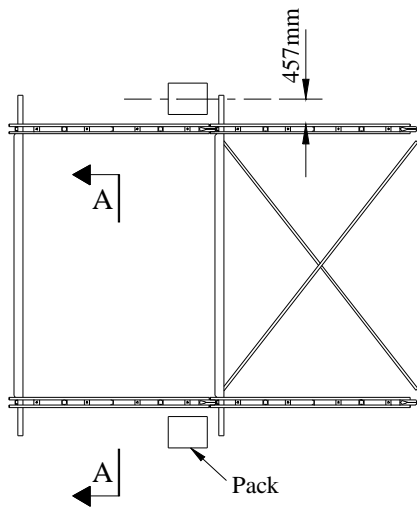
- 1 Pin a Panel to each of the Panels of the preceding bay.
- 2 Fit a Transom into the rear of these Panels.
- 3 Construct a pack positioned 457mm outside one of the Panels just fitted and at a similar distance behind the Transom of the preceding bay. The top of the pack must be approximately level with the underside of the Panels just fitted.
- 4 Lift a Panel, ensuring that the transom seat is at the bottom, then, with the male end towards the gap to be bridged, feed the female end onto the end of the Transom. Engage the Transom Seat peg into the outer peg-hole in the bottom flange of the Transom and allow the male end of the Panel to rest upon the pack just constructed. Ensure that the Panel is parallel to its neighbour and hold the Panel in this position.
- 5 Fit a Vertical Frame to the rear of the Panels, connecting it using four Transom Bolts, two at the top and two at the bottom. Pass the bolts through the Vertical Frame first and then through the Panel vertical (and Transom). When this frame has been fitted, the Panel may be released.
- 6 Fit a Bracing Frame between the two Panels, connecting it to the underside of the top chords at the chord bolt positions using eight Bracing Bolts. These bolts should be entered downwards.
- 7 Repeat steps “ 3 ”, “ 4 ”, “ 5 ” and “ 6 ” for the opposite truss.
- 8 Fit Swaybraces between the Transoms.
- 9 If the bay is a bridge bay (not a nose bay) fit Vertical Braces between the Transoms.

Notes:

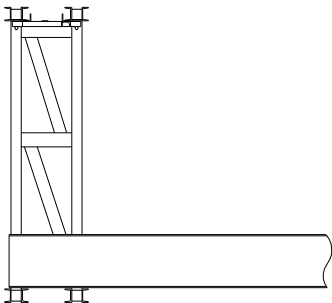
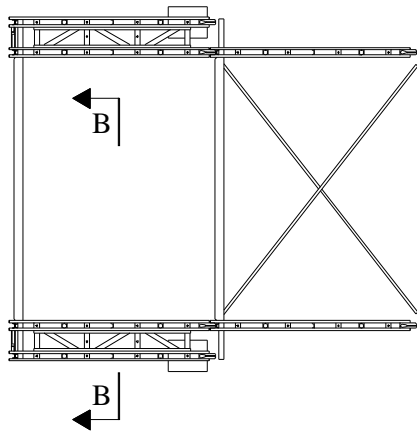
- A The structure must not be rolled forwards until at least one more bay of Double Single truss has been erected.
- B If applicable, refer also to the pages that follow regarding erection of Chord Reinforced trusses.

BRIDGE ERECTION PROCEDURES

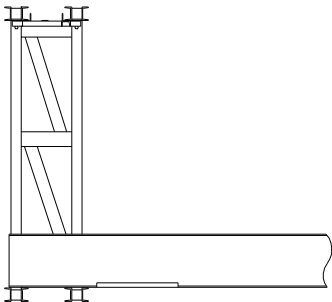
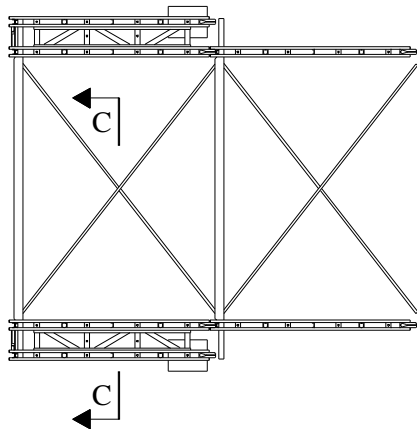
FIRST BAY OF DOUBLE SINGLE TRUSS



PART SECTION A-A



PART SECTION B-B



PART SECTION C-C

BRIDGE ERECTION PROCEDURES

SECOND & SUBSEQUENT BAYS OF DOUBLE SINGLE TRUSS

PARTS REQUIRED:

MARK NUMBER	COMPONENT DESCRIPTION	QUANTITY
MC411 / MC412	PANEL : SUPER / PANEL : SUPER : HIGH SHEAR	4
NLC18039	TRANSOM : 4.20m ROADWAY : MLC110W	1
MC312	VERTICAL FRAME	2
MC358	BRACING FRAME	2
MC134	SWAYBRACE : 4.20m ROADWAY	2
MC307	PANEL PIN	8
MC307A	SAFETY CIRCLIP	16
MC430	BOLT : BRACING	17
MC431	BOLT : TRANSOM	12
MC436	NUT : M24	29

ERECTION PROCEDURE:

- 1 Pin a Panel to each of the Panels of the preceding bay.
- 2 Fit a Transom into the rear of these Panels.
- 3 Fit a Vertical Frame to the rear of each truss.
- 4 Fit a Bracing Frame to the top of each truss.
- 5 Fit Swaybraces between the Transoms.
- 6 If the bay is a bridge bay (not a nose or tail bay) fit Vertical Braces between the Transoms.

Notes:

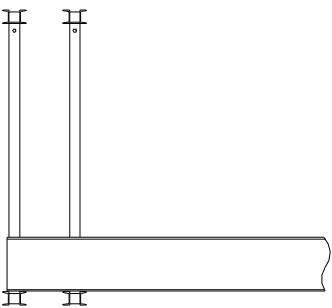
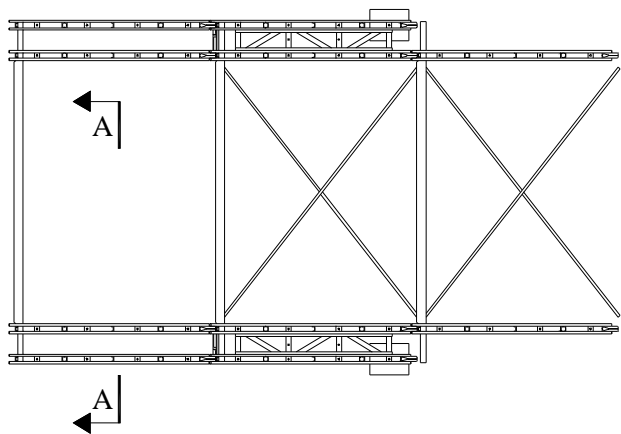
- A When constructing the second bay of Double Single truss, the outer Panels should be supported at their rear ends by temporary packing until the Vertical Frames have been fitted.
- B Bracing Frames are not required in the first bay of a bridge when in service, however, they are required, and therefore temporarily fitted, in the first bay of a bridge for launching.
- C Bracing Frames are sometimes borrowed from the penultimate bay of a bridge, in order to use them temporarily in the first bay for launching. In such cases, the quantities of parts required to construct the penultimate bay are reduced by two Bracing Frames and sixteen Bracing Bolts.
- D Neither Bracing Frames nor Vertical Frames are fitted to the last bay of a bridge. The Transom is connected directly to the Panels using four Transom Bolts, two per truss. The quantities of parts required to construct the last bay of a bridge are therefore reduced by two Bracing Frames, sixteen Bracing Bolts, two Vertical Frames and four Transom Bolts.

Note that if a tail bay is required for launching, however, Vertical Frames are fitted temporarily to the last bay of a bridge and the quantities for that bay are then reduced as per the penultimate bay at “C” above, but neither Bracing Frames nor Vertical Frames are fitted to the tail bay and the quantities for the tail bay are reduced as per “D” above instead.

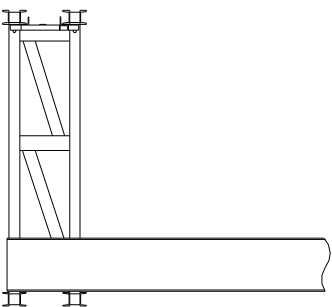
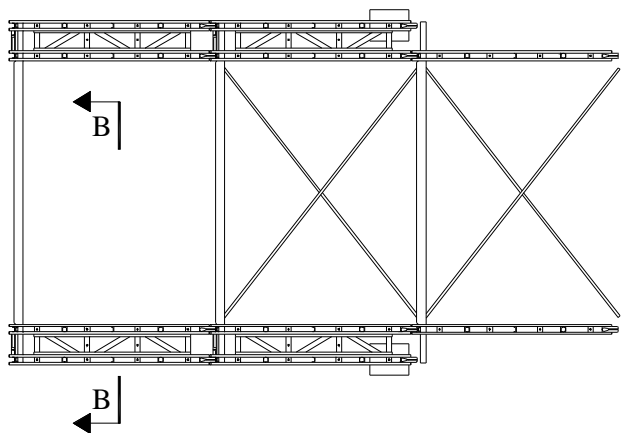
- E If applicable, refer also to the pages that follow regarding erection of Chord Reinforced trusses. If the trusses are of Chord Reinforced construction, the Chord Bolts are also used to connect the Bracing Frames to the Panels. Hence, the quantities of parts required for such bays are reduced by eight Bracing Bolts for DSR1 construction or sixteen Bracing Bolts for DSR2 construction.

BRIDGE ERECTION PROCEDURES

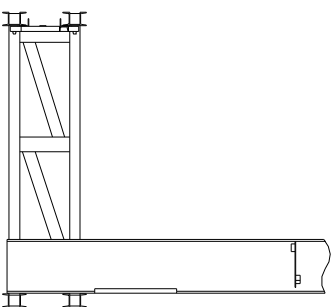
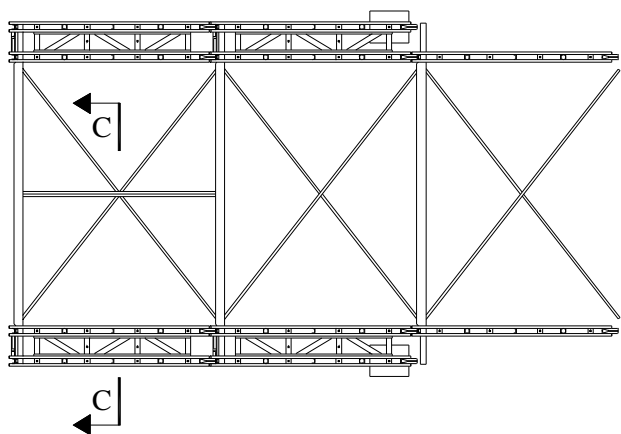
SECOND & SUBSEQUENT BAYS OF DOUBLE SINGLE TRUSS



PART SECTION A-A



PART SECTION B-B



PART SECTION C-C

BRIDGE ERECTION PROCEDURES

FIRST BAY OF TRIPLE SINGLE TRUSS

PARTS REQUIRED:

MARK NUMBER	COMPONENT DESCRIPTION	QUANTITY
MC411 / MC412	PANEL : SUPER / PANEL : SUPER : HIGH SHEAR	6
NLC18039	TRANSOM : 4.20m ROADWAY : MLC110W	1
MC312	VERTICAL FRAME	2
MC358	BRACING FRAME	2
MC134	SWAYBRACE : 4.20m ROADWAY	2
MC307	PANEL PIN	8 *
MC307A	SAFETY CIRCLIP	16 *
MC430	BOLT : BRACING	21
MC431	BOLT : TRANSOM	14
MC436	NUT : M24	35

Quantities marked thus “ * ” assume that the previous bay is of Double Single truss construction, if it is of Single Single truss construction, halve these quantities. All other quantities remain the same.

ERECTION PROCEDURE - if the previous bay is of SINGLE SINGLE truss construction:

- 1 Pin a Panel to each of the Panels of the preceding bay.
- 2 Fit a transom into the rear of these panels.
- 3 Construct a pack that extends from 50mm to 500mm outside one of the Panels just fitted at approximately 500mm behind the Transom of the preceding bay. The top of the pack must be approximately level with the underside of the Panels just fitted.
- 4 Lift a Panel, ensuring that the transom seat is at the bottom, then, with the male end towards the gap to be bridged, feed the female end onto the end of the Transom. Engage the Transom Seat peg into the peg-hole in the bottom flange of the Transom that is adjacent to the inner panel. Ensure that the Panel is parallel to its neighbour then allow it to rest upon the pack at the front and support the Panel in this position by constructing an additional pack at the rear. Fit another Panel outside this one in a similar manner, but engaging the Transom Seat peg into the outer peg-hole in the bottom flange of the Transom, and hold it in position parallel to its neighbour.
- 5 Fit a Vertical Frame to the rear of the panels, connecting it using five Transom Bolts, two at the bottom and three at the top. Pass the bolts through the Vertical Frame first and then through the Panel vertical (and Transom). Note that the centre Panel is not connected at the bottom to the Transom (and Vertical Frame). When this frame has been fitted, the Panels may be released.
- 6 Fit a Bracing frame onto the top of the Panels. Connect it to the inner and outer Panels using eight Bracing Bolts, four per Panel, and to the centre Panel using two Bracing Bolts.
- 7 Repeat steps “ 3 ”, “ 4 ”, “ 5 ” and “ 6 ” for the opposite truss.
- 8 Fit Swaybraces between the Transoms.
- 9 Fit Vertical Braces between the Transoms.

BRIDGE ERECTION PROCEDURES

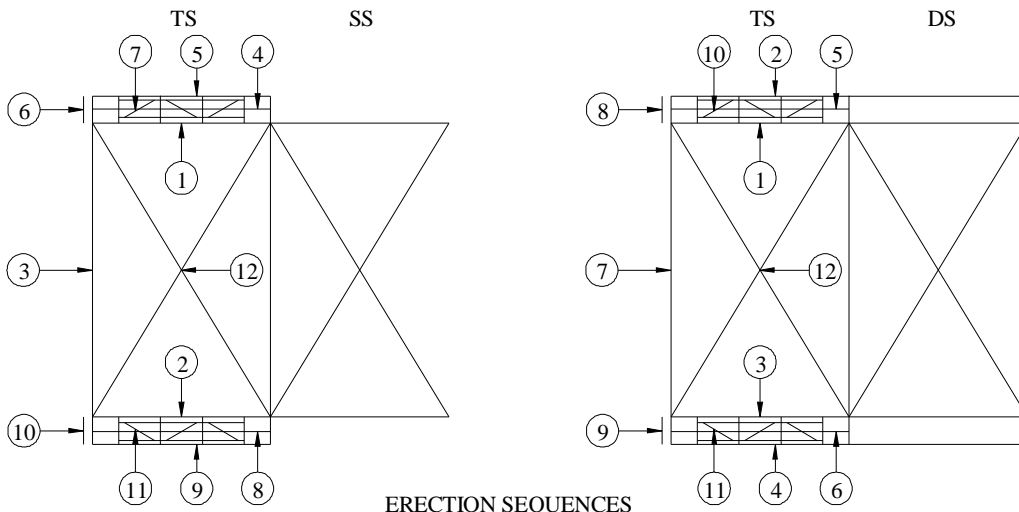
FIRST BAY OF TRIPLE SINGLE TRUSS

ERECTION PROCEDURE - if the previous bay is of DOUBLE SINGLE truss construction:

- 1 Pin a Panel to each of the Panels of the preceding bay.
- 2 Construct four packs, two per truss, to support the new centre Panels. Each pair of packs should be positioned centrally between two of the Panels just fitted and approximately two metres apart longitudinally. The top of each pack must be approximately level with the underside of the Panels just fitted.
- 3 Lift a Panel, ensuring that the transom seat is at the bottom, then, with the male end towards the gap to be bridged, feed it between the two panels of one truss. Place the Panel onto the packs such that it is parallel to and level with its neighbours and positioned 241mm from the inner Panel, centre to centre. Support the Panel in this position.
- 4 Repeat this process to position a Panel similarly in the other truss and support it in position also.
- 5 Fit a transom into the rear of the panels, engaging all six transom seat pegs into the appropriate peg-holes in the bottom flange of the Transom.
- 6 Fit a Vertical Frame to the rear of the panels of each truss, connecting each one using five Transom Bolts, two at the bottom and three at the top. Pass the bolts through the Vertical Frame first and then through the Panel vertical (and Transom). Note that the centre Panel is not connected at the bottom to the Transom (and Vertical Frame). When the Vertical Frames have been fitted, the centre Panels may be released.
- 7 Fit a Bracing frame onto the top of the Panels of each truss. Connect each one to the inner and outer Panels using eight Bracing Bolts, four per Panel, and to the centre Panel using two Bracing Bolts.
- 8 Fit Swaybraces between the Transoms.
- 9 Fit Vertical Braces between the Transoms, if they are required in this bay.

Notes:

- A The structure must not be rolled forwards until at least one more bay of bridge has been erected.
- B If applicable, refer also to the pages that follow regarding erection of Chord Reinforced trusses.



BRIDGE ERECTION PROCEDURES

SECOND & SUBSEQUENT BAYS OF TRIPLE SINGLE TRUSS

PARTS REQUIRED:

MARK NUMBER	COMPONENT DESCRIPTION	QUANTITY
MC411 / MC412	PANEL : SUPER / PANEL : SUPER : HIGH SHEAR	6
NLC18039	TRANSOM : 4.20m ROADWAY : MLC110W	1
MC312	VERTICAL FRAME	2
MC358	BRACING FRAME	2
MC134	SWAYBRACE : 4.20m ROADWAY	2
MC307	PANEL PIN	12
MC307A	SAFETY CIRCLIP	24
MC430	BOLT : BRACING	21
MC431	BOLT : TRANSOM	14
MC436	NUT : M24	35

ERECTION PROCEDURE:

- 1 Pin a Panel to each of the Panels of the preceding bay.
- 2 Fit a Transom into the rear of these Panels.
- 3 Fit a Vertical Frame to the rear of each truss.
- 4 Fit a Bracing Frame to the top of each truss.
- 5 Fit Swaybraces between the Transoms.
- 6 Fit Vertical Braces between the Transoms.

Notes:

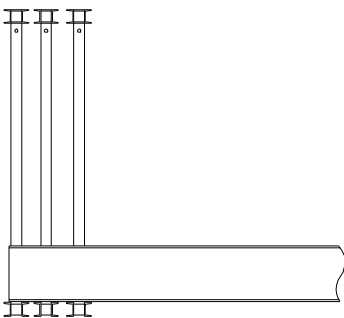
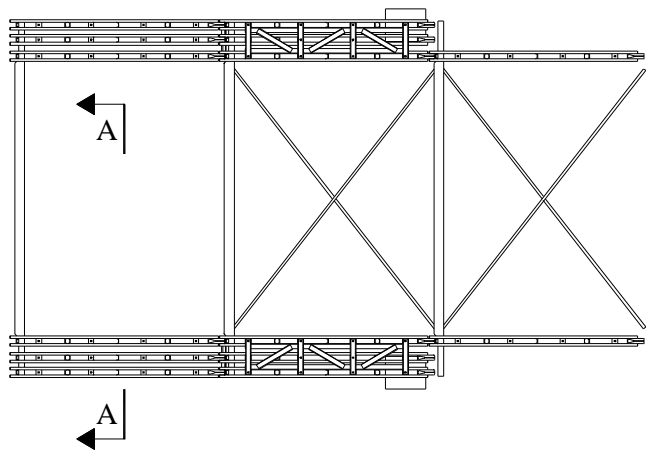
- A When constructing the second bay of Triple Single truss, the centre and outer Panels should be supported at their rear ends by temporary packing until the Vertical Frames have been fitted.
- B Bracing Frames are not required in the first bay of a bridge when in service, however, they are required, and therefore temporarily fitted, in the first bay of a bridge for launching.
- C Bracing Frames are sometimes borrowed from the penultimate bay of a bridge in order to use them temporarily in the first bay for launching. In such cases, the quantities of parts required to construct the penultimate bay are reduced by two Bracing Frames and twenty Bracing Bolts.
- D Neither Bracing Frames nor Vertical Frames are fitted to the last bay of a bridge. The Transom is connected directly to the Panels using four Transom Bolts, two per truss. The quantities of parts required to construct the last bay of a bridge are therefore reduced by two Bracing Frames, twenty Bracing Bolts, two Vertical Frames and six Transom Bolts.

Note that if a tail bay is required for launching, however, Vertical Frames are fitted temporarily to the last bay of a bridge and the quantities for that bay are then reduced as per the penultimate bay at “C” above, but neither Bracing Frames nor Vertical Frames are fitted to the tail bay and the quantities for the tail bay are reduced as per “D” above instead.

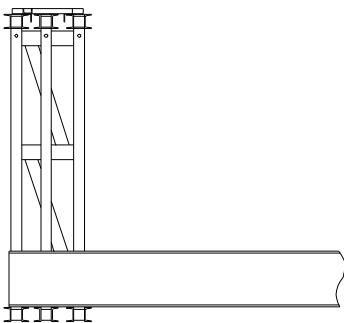
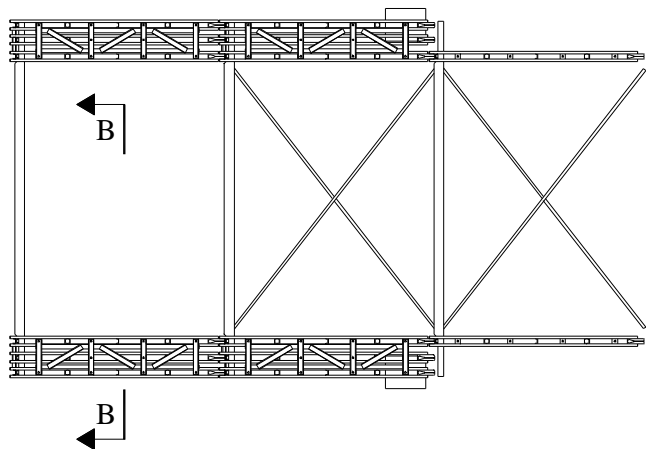
- E If applicable, refer also to the pages that follow regarding erection of Chord Reinforced trusses. Note that if the trusses are of TSHR2H construction, the Bracing Frames are not connected to the centre Panels of each truss, the quantities of parts required to construct such bays are therefore reduced by four Bracing Bolts.

BRIDGE ERECTION PROCEDURES

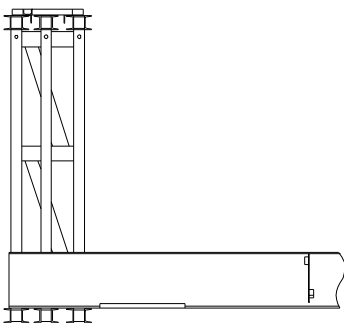
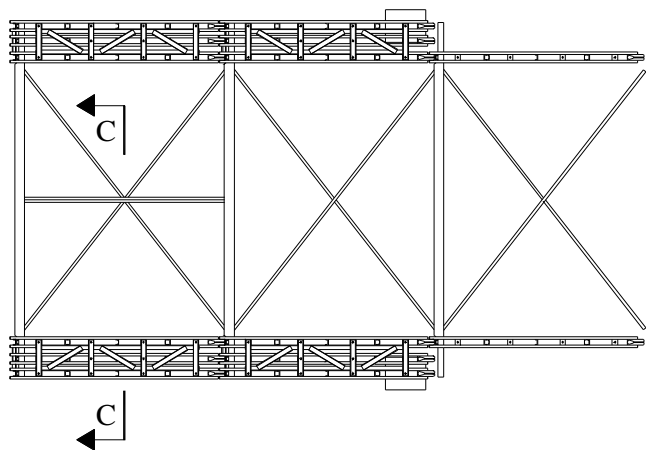
SECOND & SUBSEQUENT BAYS OF TRIPLE SINGLE TRUSS



PART SECTION A-A



PART SECTION B-B



PART SECTION C-C

BRIDGE ERECTION PROCEDURES

CHORD REINFORCED TRUSSES

GENERAL NOTES:

When a bridge span is required to be of Chord Reinforced truss construction, Chord Reinforcements are required to be attached to both the top and the bottom chords of the Panels in all internal bays of the span. They are not required, however, in either the male end bay or the female end bay.

In “ SSR ”, “ DSR2 ” and “ TSR3 ” truss constructions, Chord Reinforcements are to be attached to all panel lines. In “ DSR1 ” truss construction, however, they are to be attached only to the inner panel line of each truss, and in “ TSR2 ” truss construction, they are to be attached only to the inner and outer panel lines of each truss.

When launching a bridge of Chord Reinforced truss construction, some bays of the launching nose, both the male and female end bays of the bridge and, when required, the tail bay will need to have Chord Reinforcements attached to either the top chords only or the bottom chords only.

Such truss constructions are denoted by the use of the suffix letters “ D ” and “ N ” respectively. For example, “ SSD ” truss construction has Chord Reinforcements attached to the top chords only whereas “ SSN ” truss construction has Chord Reinforcements attached to the bottom chords only.

Furthermore, as per the bridge truss constructions, such bays may not require Chord Reinforcements to be attached to all of the panel lines. For example, “ DSN1 ” truss construction requires Chord Reinforcements to be attached to the bottom chords of the inner panel line of each truss only.

PARTS REQUIRED:

The following parts are those that are required for Chord Reinforcement purposes only, and are in addition to those parts that are necessary to construct the appropriate bay of unreinforced truss construction, as listed on the previous pages.

MARK NUMBER	COMPONENT DESCRIPTION	SS _H D _H SS _H N _H DS _H N _{1H} TS _H N _{1H}	SS _H R _H DS _H R _{1H} DS _H N _{2H} TS _H N _{2H}	DS _H R _{2H} TS _H R _{2H}	TS _H R _{3H}
MC304	CHORD REINFORCEMENT : SUPER	2	4	8	12
MC433	BOLT : CHORD	8	16	32	48
MC436	NUT : M24	8	16	32	48
MC307	PANEL PIN	2	4	8	12
MC307A	SAFETY CIRCLIP	4	8	16	24

The quantities of Panel Pins and Safety Circlips required may be reduced from those listed above, depending upon the truss construction of the preceding bay.

BRIDGE ERECTION PROCEDURES

CHORD REINFORCED TRUSSES

ERECTION PROCEDURE *for* BOTTOM CHORD REINFORCEMENT:

Chord Reinforcements are most easily attached to the bottom chords of Panels before the Panels are connected to the main structure, as follows:

- 1 Place a Panel, of the type appropriate for the bay being erected, flat on the ground.
- 2 Place a Chord Reinforcement alongside the bottom chord of the Panel, ensuring that the male ends of both the Chord and the Panel are facing in the same direction and that the attachment blocks in the Chord Reinforcement are on the side adjacent to the Panel chord.
- 3 Insert four Chord Bolts into the holes in the four attachment blocks in the Chord Reinforcement and through those in the bottom chord of the Panel. Fit nuts onto the bolts, but do not fully tighten them.
- 4 Attach this assembly to the main structure, connecting the top and bottom chords of the Panel to those of the preceding bay before connecting the Chord Reinforcement to that of the preceding bay, using Panel Pins secured with Safety Circlips.

ERECTION PROCEDURE *for* TOP CHORD REINFORCEMENT:

Chord Reinforcements are most easily attached to the top chords of Panels after the Panels have been connected to the main structure, as follows:

- 1 Construct a bay following the same procedure as used to erect an unreinforced bay, but with Chord Reinforcements pre-attached to the bottom chords of the Panels, as per the above method, where applicable.
- 2 Place Chord Reinforcements on top of the relevant Panels, ensuring that the male ends of both the Chords and the Panels are facing in the same direction and that the attachment blocks in the Chord Reinforcements are on the side adjacent to the Panel chords.
- 3 Insert four Chord Bolts into the holes in the four attachment blocks in the Chord Reinforcement and through those in the top chord of the Panel. Fit nuts onto the bolts, but do not fully tighten them.
- 4 Connect the Chord Reinforcements to those on top of the preceding bay, where applicable, using Panel Pins secured with Safety Circlips.

Notes:

- A Double truss constructions have Bracing Frames connected to the underside of the top chords of the Panels. Where a Panel is to be top chord reinforced, the Chord Bolts are utilised to connect both the Chord Reinforcements and the Bracing Frame to the Panel, hence, it is necessary to fit the Bracing Frame over the protruding ends of the Chord Bolts before attaching the Nuts.
- B Triple truss constructions have Bracing Frames attached to the top of the trusses. Where a bay is to be top chord reinforced, the Bracing Frames are connected to the Chord Reinforcements in the same manner as they would otherwise be connected to the top chords of the Panels in unreinforced truss constructions.

BRIDGE ERECTION PROCEDURES

STEEL DECKING

PARTS REQUIRED *for* INTERNAL BAYS *of* BRIDGE:

MARK NUMBER	COMPONENT DESCRIPTION	QUANTITY
MC360	STEEL DECK	4
MC378	SCREW : STEEL DECK	16
MC379	NUT : STEEL DECK SCREW	16
MC300	KERB : STEEL DECK	2
MC430	BOLT : BRACING	8
MC436	NUT : M24	8

ERECTION PROCEDURE:

- 1 Locate eight Deck Screw Nuts, one into each of the four housings situated underneath the top flanges of the two adjacent Transoms of the bay.
- 2 Place four Steel Deck units, one at a time, to span between the adjacent Transoms of the bay, locating them such that the holes in their top plates are directly above the appropriate holes in the top flanges of the Transoms.
- 3 Ensure that all of the Deck Screw Nuts are correctly aligned in their housings and then insert the Deck Screws down through the Decks and into them. Secure the Deck Screws to the Nuts, but do not fully tighten them until the decking has been placed in the following bay.
- 4 Attach a Kerb to the side of each outer Deck Unit using four Bracing Bolts, one in each of the two outermost holes at either end of the Kerb. No bolt is required in the centre hole of the Kerb.

PARTS REQUIRED *for* END BAYS *of* BRIDGE:

The following parts are required in addition to those listed above for an internal bay of bridge.

MARK NUMBER	COMPONENT DESCRIPTION	QUANTITY
MC364	DECK INFILL : 4.20m ROADWAY	1
MC378	SCREW : STEEL DECK	8
MC379	NUT : STEEL DECK SCREW	8

ERECTION PROCEDURE:

- 1 Fit Steel Deck units and Kerbs to the end bay of the bridge in the same way as described above for an internal bay.
- 2 Place a Deck Infill onto the outer half of the top flange of the Transom at the end of the bridge, such that the holes in the top plate are directly above the holes in the top flange of the Transom. Bolt the Deck Infill to the Transom with Deck Screws and Nuts, in the same manner as used to connect the Deck Units.

BRIDGE ERECTION PROCEDURES

ENDS *of* BRIDGE - SINGLE TRUSS

PARTS REQUIRED:

MARK NUMBER	COMPONENT DESCRIPTION	FEMALE END of BRIDGE	MALE END of BRIDGE
MC317	END POST : MALE	2	-
MC318	END POST : FEMALE	-	2
MC307	PANEL PIN	4	4
MC307A	SAFETY CIRCLIP	8	8
NLC18039	TRANSOM : EW : MLC110W	-	1
MC431	BOLT : TRANSOM	-	2
MC436	NUT : M24	-	2
NLC19030	BEARING : FIXED	2	-
NLC19031	BEARING : SLIDING	-	2
NLC19541	BASEPLATE : TRIPLE BEARING	2	2

ERECTION PROCEDURES:

These procedures describe the general assembly of the parts only, refer also to the following pages that give details of the associated jacking procedures.

A FEMALE END (TAIL) OF BRIDGE

- 1 Pin a Male End Post to the rear of each Panel.
- 2 Place a Triple Bearing Baseplate with a Fixed Bearing located on the inner pair of pegs beneath each truss, such that the Bearings are directly below the End Posts.
- 3 Lower the Bridge onto the Bearings, locating the half-round cups on the bottom of the Posts over the round bars of the Bearings.

B MALE END (NOSE) OF BRIDGE

- 1 Pin a Female End Post to the front of each Panel.
- 2 Fit a Transom Bolt outwards through the Transom location plate at the bottom of each End Post.
- 3 Place a Transom onto the End Posts, engaging the transom seat pegs into the inner peg-holes in the bottom flange at each end of the Transom.
- 4 Insert the Transom Bolts through the web of the Transom, fit Nuts and tighten, ensuring that the heads of the Bolts are properly located in the hexagonal recesses within the End Posts.
- 5 Place a Triple Bearing Baseplate with a Sliding Bearing located on the inner pair of pegs beneath each truss, such that the Bearings are directly below the End Posts.
- 6 Lower the Bridge onto the Bearings, locating the half-round cups on the bottom of the Posts over the round bars of the Bearings.

BRIDGE ERECTION PROCEDURES

ENDS *of* BRIDGE - DOUBLE TRUSS

PARTS REQUIRED:

MARK NUMBER	COMPONENT DESCRIPTION	FEMALE END	MALE END
MC317	END POST : MALE	4	-
MC318	END POST : FEMALE	-	4
MC307	PANEL PIN	8	8
MC307A	SAFETY CIRCLIP	16	16
MC329	TIE BEAM	2	2
NLC18039	TRANSOM : EW : MLC110W	-	1
MC430	BOLT : BRACING	4	4
MC431	BOLT : TRANSOM	-	4
MC436	NUT : M24	4	8
NLC19030	BEARING : FIXED	4	-
NLC19031	BEARING : SLIDING	-	4
NLC19541	BASEPLATE : TRIPLE BEARING	2	2

ERECTION PROCEDURES:

These procedures describe the general assembly of the parts only, refer also to the following pages that give details of the associated jacking procedures.

A FEMALE END (TAIL) OF BRIDGE

- 1 Pin a Male End Post to the rear of each Panel, ensuring that the Tie Beam location plate at the top of each End Post is on the outside.
- 2 Fit a Bracing Bolt outwards through the Tie Beam location plate at the top of each End Post.
- 3 Place a Tie Beam over the ends of the Bracing Bolts on each truss, fit Nuts and tighten, ensuring that the heads of the Bolts are properly located in the hexagonal recesses within the End Posts.
- 4 Place a Triple Bearing Baseplate with two Fixed Bearings, located on the inner and outer pairs of pegs, beneath each truss such that the Bearings are directly below the End Posts.
- 5 Lower the Bridge onto the Bearings, locating the half-round cups on the bottom of the Posts over the round bars of the Bearings.

B MALE END (NOSE) OF BRIDGE

- 1 Pin a Female End Post to the front of each Panel.
- 2 Fit a Bracing Bolt outwards through the Tie Beam location plate at the top of each End Post and connect a Tie Beam to each truss as described above.
- 3 Fit a Transom Bolt outwards through the Transom location plate at the bottom of each End Post.
- 4 Place a Transom onto the End Posts, engaging the transom seat pegs into the inner and outer peg-holes in the bottom flange at each end of the Transom.
- 5 Insert the Transom Bolts through the web of the Transom, fit Nuts and tighten, ensuring that the heads of the Bolts are properly located in the hexagonal recesses within the End Posts.
- 6 Place a Triple Bearing Baseplate with two Sliding Bearings, located on the inner and outer pairs of pegs, beneath each truss such that the Bearings are directly below the End Posts.
- 7 Lower the Bridge onto the Bearings, locating the half-round cups on the bottom of the Posts over the round bars of the Bearings.

BRIDGE ERECTION PROCEDURES

ENDS *of* BRIDGE - TRIPLE TRUSS

PARTS REQUIRED:

MARK NUMBER	COMPONENT DESCRIPTION	FEMALE END	MALE END
MC317	END POST : MALE	6	-
MC318	END POST : FEMALE	-	6
MC307	PANEL PIN	12	12
MC307A	SAFETY CIRCLIP	24	24
MC329	TIE BEAM	2	2
NLC18039	TRANSOM : EW : MLC110W	-	1
MC430	BOLT : BRACING	6	6
MC431	BOLT : TRANSOM	-	4
MC436	NUT : M24	6	10
NLC19030	BEARING : FIXED	6	-
NLC19031	BEARING : SLIDING	-	6
NLC19541	BASEPLATE : TRIPLE BEARING	2	2

ERECTION PROCEDURES:

These procedures describe the general assembly of the parts only, refer also to the pages that follow for details of the associated jacking procedures.

A FEMALE END (TAIL) OF BRIDGE

- 1 Pin a Male End Post to the rear of each Panel, ensuring that the Tie Beam location plate at the top of each End Post is on the outside.
- 2 Fit a Bracing Bolt outwards through the Tie Beam location plate at the top of each End Post.
- 3 Place a Tie Beam over the ends of the Bracing Bolts on each truss, fit Nuts and tighten, ensuring that the heads of the Bolts are properly located in the hexagonal recesses within the End Posts.
- 4 Place a Triple Bearing Baseplate with three Fixed Bearings, one located on each of the three pairs of pegs, beneath each truss such that the Bearings are directly below the End Posts.
- 5 Lower the Bridge onto the Bearings, locating the half-round cups on the bottom of the Posts over the round bars of the Bearings.

B MALE END (NOSE) OF BRIDGE

- 1 Pin a Female End Post to the front of each Panel.
- 2 Fit a Bracing Bolt outwards through the Tie Beam location plate at the top of each End Post and connect a Tie Beam to each truss as described above.
- 3 Fit a Transom Bolt outwards through the Transom location plate at the bottom of the inner and outer End Posts of each truss.
- 4 Place a Transom onto the End Posts, engaging all of the transom seat pegs into the peg-holes.
- 5 Insert the Transom Bolts through the web of the Transom, fit Nuts and tighten, ensuring that the heads of the Bolts are properly located in the hexagonal recesses within the End Posts.
- 6 Place a Triple Bearing Baseplate with three Sliding Bearings, one located on each of the three pairs of pegs, beneath each truss such that the Bearings are directly below the End Posts.
- 7 Lower the Bridge onto the Bearings, locating the half-round cups on the bottom of the Posts over the round bars of the Bearings.

BRIDGE ERECTION PROCEDURES

SPAN JUNCTIONS

PARTS REQUIRED:

Due to the variability of potential multiple span bridge formats, it is not possible to provide a simple list of the parts that are required to join two bridge spans together. To ascertain the quantities of the parts that are required for a specific case, refer to the tables given in Section 3 of this manual, but note that these parts are only those required for the bridge when in service. Additional components will be required temporarily for launching, for details of these refer to Section 4 of this manual or to the specific Launching and Erection scheme provided.

ERECTION PROCEDURE:

This procedure describes the general assembly of the parts required at a span junction only, refer also to the pages that follow for details of the associated jacking procedures.

- 1 Construct all except the last bay of the leading span, using the appropriate procedures described earlier in this Section, but note the following:
 - a If some of the bridge spans are required to be of chord reinforced truss construction whilst others are not, those that are not and all span junctions will require chord reinforcements to be attached to the bottom chords temporarily for launching.
 - b Some bays of the bridge that are not required to be of chord reinforced truss construction when the bridge is in service, including adjacent span junctions, may be required to be of chord reinforced truss construction temporarily for launching.

For a particular bridge, refer to the specific Launching and Erection scheme provided for precise details of the required construction of such bays.

- 2 Construct the last bay of the leading span as if it were the end bay of the bridge, taking due account of the above notes as appropriate, but with the following variations:
 - a If the leading span is of double or triple panel truss construction, fit a Vertical Frame to the rear and a Bracing Frame to the top of each truss.
 - b When fitting the decking, whether before or after launching, fit internal bay parts only.
- 3 Connect a Male Span Junction Post to the rear of each Panel of the last bay of the leading span.

Note that if the leading span is of triple panel truss construction, it is necessary to connect the Span Junction Posts to the centre panel of each truss first before connecting those to the inner and outer panels of each truss.

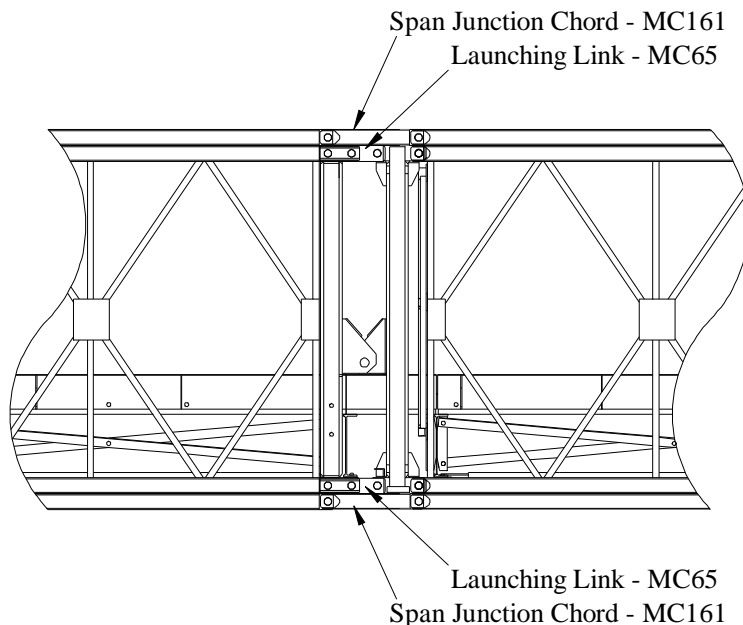
- 4 Connect a Female Span Junction Post to each of the Male Span Junction Posts of the panel lines that are to continue into the next span, with a Span Junction Pin secured with a Safety Clip.
- 5 Lock the top and bottom chords at the span junction for launching by pinning Span Junction Launching Links (MC65) in between both the top and bottom jaws of the Span Junction Posts.
- 6 Fit the Span Junction Swaybraces.

BRIDGE ERECTION PROCEDURES

SPAN JUNCTIONS

ERECTION PROCEDURE - continued:

- 7 Construct the trailing span using the appropriate procedures described earlier in this Section, taking due account of the above notes as appropriate, but with the following variations:
 - a If the trailing span truss is required to have more panel lines than that of the leading span, fit a Female Span Junction Post to the front of each of the extra panel lines in the first bay of the trailing span.
 - b Fit a Transom to the Female Span Junction Posts, connecting it to them in the same manner as that used to connect a Transom to Female End Posts.
 - c If the trailing span is of double or triple panel truss construction, fit a Bracing Frame to the top of each truss in the first bay.
 - d When fitting the decking, whether before or after launching, do so as follows:
 - i Fit span junction decking between the last bay of the leading span and the first bay of the trailing span, as shown in Section 5 of this manual.
 - ii Fit internal bay components to the first bay and not end of bridge components.
 - iii If this is the last span of the bridge, fit end of bridge components to the last bay.



TEMPORARY ARRANGEMENT AT A SPAN JUNCTION DURING LAUNCHING

Note that Span Junction Chords are only fitted to the top of a span junction if the bridge bays on either side are required to be of chord reinforced truss construction.

BRIDGE INSTALLATION PROCEDURES

JACKING

PRELIMINARY NOTES:

- 1 Before raising one end of a bridge on Jacks, ensure that the other end is safely supported and cannot move.
- 2 Ensure that both trusses are raised and lowered simultaneously.
- 3 When two Jacks are used beneath a pair of Jacking Frames on each truss, ensure that the load is shared equally between the Jacks.
- 4 Always have a catch pack positioned under a strong point of the structure for safety, in case of Jack failure.
- 5 Never work under a structure that is supported only by Jacks.
- 6 Never support both ends of the bridge on Jacks simultaneously.
- 7 It is advisable to fix the Bearing Baseplates to concrete foundations, using four 24mm diameter by 200mm long bolts per Baseplate. If this is to be done, however, the bolts must be installed under the Bearing Baseplates, in pockets within the foundations, before the bridge is lowered onto the Bearings. Subsequently, once the bridge has been installed upon the Bearings, the bolts can be fixed in position with grout.

PARTS REQUIRED:

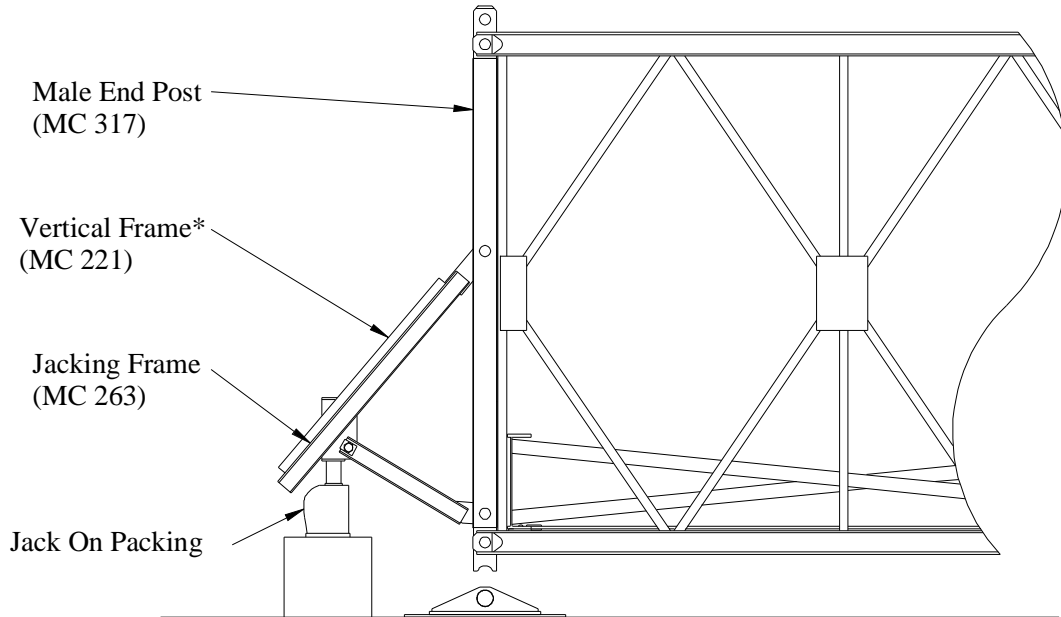
MARK NUMBER	COMPONENT DESCRIPTION	AT AN ABUTMENT		AT A SPAN JUNCTION
		TOTAL JACKING LOAD		
		< 40 tonnes	> 40 tonnes	
MC263	JACKING FRAME	2	4	-
MC307	PANEL PIN	4	8	-
MC307A	SAFETY CIRCLIP	8	16	-
MC221	VERTICAL FRAME : JACKING	-	2	-
MC430	BOLT : BRACING	-	8	-
MC436	NUT : M24	-	8	-
NLC9017	JACK : 35t / 150mm	2	4	4
NLC9169	PLATE : JACK HEAD	2	4	-
NLC13139	JACKING BEAM : SPAN JUNCTION	-	-	2

Note that the quantities of parts tabulated above are those that are required for jacking operations at one abutment or one pier. Components should be transferred from one jacking position to another as necessary during the jacking procedure.

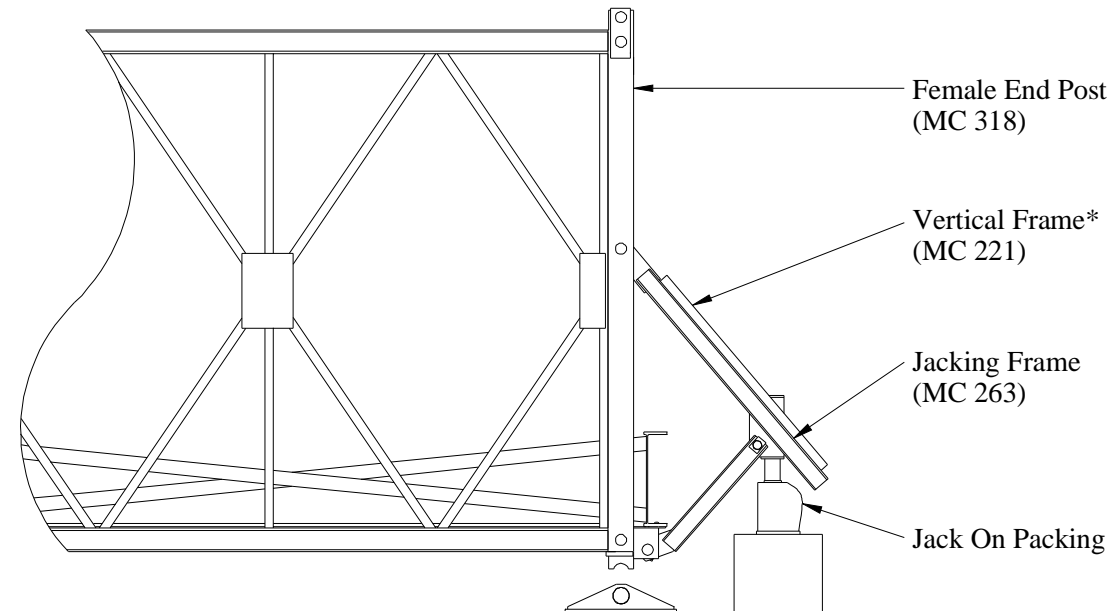
BRIDGE INSTALLATION PROCEDURES

JACKING SINGLE SPAN BRIDGES

FEMALE END OF BRIDGE:



MALE END OF BRIDGE:



Note that Vertical Frames (MC221) are only fitted when a pair of Jacking Frames are required to be used on each truss, as is necessary when the total jacking force at the end of the bridge is in excess of 40 tonnes (20 tonnes per truss).

BRIDGE INSTALLATION PROCEDURES

JACKING SINGLE SPAN BRIDGES

JACKING AT THE REAR (FEMALE) END OF A BRIDGE:

A BRIDGE SPANS WITH UNREINFORCED TRUSSES:

- 1 Spike the launching and landing rollers to prevent any movement of the bridge.
- 2 Remove any counterweight that has been used for launching from the end bays of the bridge.
- 3 If the tail bay is of single panel truss construction, pin an End Post to the rear of each Panel of the tail bay.
- 4 If the tail bay is of double panel truss construction and the jacking load at this end of the bridge is 40 tonnes or less, pin an End Post to the rear of the inner Panel of each truss of the tail bay.
- 5 If the tail bay is of double panel truss construction and the jacking load at this end of the bridge exceeds 40 tonnes, pin an End Post to the rear of each Panel of the tail bay.
- 6 Pin a Jacking Frame to each End Post.
- 7 If the tail bay is of double panel truss construction and two Jacking Frames are fitted side by side on each truss, brace the Jacking Frames by connecting a Vertical Frame to each pair, using four Bracing Bolts.
- 8 Place a 35 tonne Jack on a stable pack beneath each Jacking Frame.
- 9 Raise both sides of the bridge, simultaneously, by 50 millimeters.
- 10 Remove the launching rollers from beneath the female end of the bridge.
- 11 Place stable packs, of equal height, beneath the Panels of the last bay of the bridge. Position the packs as close as possible to the junction of the bridge and the tail, but clear of the joint so as to facilitate the removal of the tail bay.
- 12 Lower both sides of the bridge, simultaneously, onto the packs.
- 13 Dismantle the tail bay.
- 14 Pin a Male End Post to the rear of each Panel of the female end bay of the bridge.
- 15 If the bridge trusses are of double or triple panel construction, connect a Tie Beam across the End Posts of each truss.
- 16 If the bridge trusses are of single panel construction, pin a Jacking Frame to each End Post.
- 17 If the bridge trusses are of double or triple panel construction and the jacking load at this end of the bridge is 40 tonnes or less, pin a Jacking Frame to the inner End Post of each truss only.
- 18 If the bridge trusses are of double or triple panel construction and the jacking load at this end of the bridge exceeds 40 tonnes, pin a Jacking Frame to the inner and outer End Posts of each truss. Brace the Jacking Frames on each truss by connecting a Jacking Vertical Frame between each pair, using four Bracing Bolts.
- 19 Place a 35 tonne Jack on a stable pack beneath each Jacking Frame.

BRIDGE INSTALLATION PROCEDURES

JACKING SINGLE SPAN BRIDGES

JACKING AT THE REAR (FEMALE) END OF A BRIDGE:

A BRIDGE SPANS WITH UNREINFORCED TRUSSES - continued:

- 20 Raise both sides of the bridge, simultaneously, off the packs under the end of the bridge.
- 21 Decrease the height of the packs under the end of the bridge.
- 22 Lower both sides of the bridge, simultaneously, onto the packs.
- 23 Continue to lower the bridge in stages, by decreasing the height of the packs under the Jacks and the End Posts alternately, until the End Posts are located on the Bearings.

If the longitudinal slope of the bridge approaches 1:100 during this process, however, lower the bridge onto stable packs under the End Posts and proceed to the other end of the bridge.

B BRIDGE SPANS WITH CHORD REINFORCED TRUSSES:

- 1 Spike the launching and landing rollers to prevent any movement of the bridge.
- 2 Remove any counterweight that has been used for launching from the end bays of the bridge.
- 3 If the tail bay is of single panel truss construction, pin an End Post to the rear of each Panel of the tail bay.
- 4 If the tail bay is of double panel truss construction and the jacking load at this end of the bridge is 40 tonnes or less, pin an End Post to the rear of the inner Panel of each truss of the tail bay.
- 5 If the tail bay is of double panel truss construction and the jacking load at this end of the bridge exceeds 40 tonnes, pin an End Post to the rear of each Panel of the tail bay.
- 6 Pin a Jacking Frame to each End Post.
- 7 If the tail bay is of double panel truss construction and two Jacking Frames are fitted side by side on each truss, brace the Jacking Frames by connecting a Vertical Frame to each pair, using four Bracing Bolts.
- 8 Place a 35 tonne Jack on a stable pack beneath each Jacking Frame.
- 9 Raise both sides of the bridge, simultaneously, by 50 millimeters.
- 10 Remove the launching rollers from beneath the female end of the bridge.
- 11 Place stable packs, of equal height, beneath the Panels of the last bay of the bridge. Position the packs as close as possible to the junction of the bridge and the tail, but clear of the joint so as to facilitate the removal of the Chord Reinforcements from the tail bay.
- 12 Lower both sides of the bridge, simultaneously, onto the packs.
- 13 Remove the Chord Reinforcements from the tail bay.
- 14 Raise both sides of the bridge, simultaneously, off the packs under the end of the bridge.

BRIDGE INSTALLATION PROCEDURES

JACKING SINGLE SPAN BRIDGES

JACKING AT THE REAR (FEMALE) END OF A BRIDGE:

B BRIDGE SPANS WITH CHORD REINFORCED TRUSSES - continued:

- 15 Move the packs so that they are under the front of the tail bay, positioned as close as possible to the junction of the bridge and the tail, but clear of the joint so as to facilitate the removal of the Chord Reinforcements from the end bay of the bridge.
- 16 Lower both sides of the bridge, simultaneously, onto the packs.
- 17 Remove the Chord Reinforcements from the end bay of the bridge.
- 18 Raise both sides of the bridge, simultaneously, off the packs under the tail bay.
- 19 Move the packs so that they are under the last bay of the bridge, positioned as close as possible to the junction of the bridge and the tail, but clear of the joint so as to facilitate the removal of the tail bay.
- 20 Lower both sides of the bridge, simultaneously, onto the packs.
- 21 Dismantle the tail bay.
- 22 Pin a Male End Post to the rear of each Panel of the female end bay of the bridge.
- 23 If the bridge trusses are of double or triple panel construction, connect a Tie Beam across the End Posts of each truss.
- 24 If the bridge trusses are of single panel construction, pin a Jacking Frame to each End Post.
- 25 If the bridge trusses are of double or triple panel construction and the jacking load at this end of the bridge is 40 tonnes or less, pin a Jacking Frame to the inner End Post of each truss only.
- 26 If the bridge trusses are of double or triple panel construction and the jacking load at this end of the bridge exceeds 40 tonnes, pin a Jacking Frame to the inner and outer End Posts of each truss. Brace the Jacking Frames on each truss by connecting a Jacking Vertical Frame between each pair, using four Bracing Bolts.
- 27 Place a 35 tonne Jack on a stable pack beneath each Jacking Frame.
- 28 Raise both sides of the bridge, simultaneously, off the packs under the end of the bridge.
- 29 Decrease the height of the packs under the end of the bridge.
- 30 Lower both sides of the bridge, simultaneously, onto the packs.
- 31 Continue to lower the bridge in stages, by decreasing the height of the packs under the Jacks and the End Posts alternately, until the End Posts are located on the Bearings.

If the longitudinal slope of the bridge approaches 1:100 during this process, however, lower the bridge onto stable packs under the End Posts and proceed to the other end of the bridge.

BRIDGE INSTALLATION PROCEDURES

JACKING SINGLE SPAN BRIDGES

JACKING AT THE FRONT (MALE) END OF A BRIDGE:

A BRIDGE SPANS WITH UNREINFORCED TRUSSES:

- 1 Spike the launching and landing rollers to prevent any movement of the bridge.
- 2 Dismantle all bays of the launching nose except for the last bay that is adjacent to the bridge.

Note that in order to dismantle the penultimate bay of the launching nose, it is necessary to temporarily disconnect the Swaybraces in the last bay of the launching nose.
- 3 If the last bay of the launching nose is of single panel truss construction, pin a Female End Post to the front of each Panel.
- 4 If the last bay of the launching nose is of double panel truss construction and the jacking load at this end of the bridge is 40 tonnes or less, pin a Female End Post to the front of the inner Panel of each truss only.
- 5 If the last bay of the launching nose is of double panel truss construction and the jacking load at this end of the bridge exceeds 40 tonnes, pin a Female End Post to the front of each Panel.
- 6 Fit a Transom onto the End Posts and reconnect the Swaybraces in the last bay of the launching nose.
- 7 Pin a Jacking Frame to each End Post.
- 8 If the last bay of the launching nose is of double panel truss construction and two Jacking Frames are fitted side by side on each truss, brace the Jacking Frames by connecting a Vertical Frame to each pair, using four Bracing Bolts.
- 9 Place a 35 tonne Jack on a stable pack beneath each Jacking Frame.
- 10 Raise both sides of the bridge, simultaneously, by 50 millimeters.
- 11 Remove the landing rollers from beneath the male end of the bridge.
- 12 Place stable packs, of equal height, beneath the Panels of the first bay of the bridge. Position the packs as close as possible to the junction of the bridge and the nose, but clear of the joint so as to facilitate the removal of the last bay of the nose.
- 13 Lower both sides of the bridge, simultaneously, onto the packs.
- 14 Dismantle the last bay of the launching nose.

Note that in order to dismantle the last bay of the launching nose, it is necessary to temporarily disconnect the Swaybraces in the male end bay of the bridge.
- 15 Pin a Female End Post to the front of each Panel of the male end bay of the bridge.
- 16 If the bridge trusses are of double or triple panel construction, connect a Tie Beam across the End Posts of each truss.
- 17 Fit a Transom onto the End Posts.

BRIDGE INSTALLATION PROCEDURES

JACKING SINGLE SPAN BRIDGES

JACKING AT THE FRONT (MALE) END OF A BRIDGE:

A BRIDGE SPANS WITH UNREINFORCED TRUSSES - continued:

- 18 Reconnect the Swaybraces in the male end bay of the bridge
- 19 Fit Vertical Braces in the male end bay of the bridge.
- 20 If the bridge trusses are of single panel construction, pin a Jacking Frame to each End Post.
- 21 If the bridge trusses are of double or triple panel construction and the jacking load at this end of the bridge is 40 tonnes or less, pin a Jacking Frame to the inner End Post of each truss only.
- 22 If the bridge trusses are of double or triple panel construction and the jacking load at this end of the bridge exceeds 40 tonnes, pin a Jacking Frame to the inner and outer End Posts of each truss. Brace the Jacking Frames by connecting a Vertical Frame to each pair, using four Bracing Bolts.
- 23 Place a 35 tonne Jack on a stable pack beneath each Jacking Frame.
- 24 Raise both sides of the bridge, simultaneously, off the packs under the end of the bridge.
- 25 Decrease the height of the packs under the end of the bridge.
- 26 Lower both sides of the bridge, simultaneously, onto the packs.
- 27 Continue to lower the bridge in stages, by decreasing the height of the packs under the Jacks and the End Posts alternately, until the End Posts are located on the Bearings.

If the longitudinal slope of the bridge approaches 1:100 during this process, however, lower the bridge onto stable packs under the End Posts and proceed to the other end of the bridge.

A BRIDGE SPANS WITH CHORD REINFORCED TRUSSES:

- 1 Spike the launching and landing rollers to prevent any movement of the bridge.
- 2 Dismantle all bays of the launching nose except for the last bay that is adjacent to the bridge.
Note that in order to dismantle the penultimate bay of the launching nose, it is necessary to disconnect the Swaybraces in the last bay of the launching nose.
- 3 If the last bay of the launching nose is of single panel truss construction, pin a Female End Post upside down to the front of each Panel.
- 4 If the last bay of the launching nose is of double panel truss construction and the jacking load at this end of the bridge is 40 tonnes or less, pin a Female End Post upside down to the front of the inner Panel of each truss only.
- 5 If the last bay of the launching nose is of double panel truss construction and the jacking load at this end of the bridge exceeds 40 tonnes, pin a Female End Post upside down to the front of each Panel.
- 6 Pin a Jacking Frame to each End Post.

BRIDGE INSTALLATION PROCEDURES

JACKING SINGLE SPAN BRIDGES

JACKING AT THE FRONT (MALE) END OF A BRIDGE:

B BRIDGE SPANS WITH CHORD REINFORCED TRUSSES - continued:

- 7 If the last bay of the launching nose is of double panel truss construction and two Jacking Frames are fitted side by side on each truss, brace the Jacking Frames by connecting a Vertical Frame to each pair, using four Bracing Bolts.
- 8 Place a 35 tonne Jack on a stable pack beneath each Jacking Frame.
- 9 Raise both sides of the bridge, simultaneously, by 50 millimeters.
- 10 Remove the landing rollers from beneath the male end of the bridge.
- 11 Place stable packs, of equal height, beneath the Panels of the first bay of the bridge. Position the packs as close as possible to the junction of the bridge and the nose, but clear of the joint so as to facilitate the removal of the Chord Reinforcements from the bottom of the last bay of the launching nose.
- 12 Lower both sides of the bridge, simultaneously, onto the packs.
- 13 Remove the Chord Reinforcements from the bottom of the last bay of the launching nose.
- 14 Raise both sides of the bridge, simultaneously, off the packs.
- 15 Reposition the packs so that they are under the Panels of the last bay of the launching nose. They should be placed as close as possible to the junction of the bridge and the nose, but clear of the joint so as to facilitate the removal of the Chord Reinforcements from the bottom of the first bay of the bridge.
- 16 Lower both sides of the bridge, simultaneously, onto the packs.
- 17 Remove the Chord Reinforcements from the end bay of the bridge.
- 18 Raise both sides of the bridge, simultaneously, off the packs.
- 19 Reposition the packs so that they are again under the Panels of the first bay of the bridge. They should be placed as close as possible to the junction of the bridge and the nose, but clear of the joint so as to facilitate the removal of the last bay of the launching nose.
- 20 Lower both sides of the bridge, simultaneously, onto the packs.
- 21 Dismantle the last bay of the launching nose.

Note that in order to dismantle the last bay of the launching nose, it is necessary to temporarily disconnect the Swaybraces in the male end bay of the bridge.
- 22 Pin a Female End Post to the front of each Panel of the male end bay of the bridge.
- 23 If the bridge trusses are of double or triple panel construction, connect a Tie Beam across the End Posts of each truss.
- 24 Fit a Transom onto the End Posts.

BRIDGE INSTALLATION PROCEDURES

JACKING SINGLE SPAN BRIDGES

JACKING AT THE FRONT (MALE) END OF A BRIDGE:

B BRIDGE SPANS WITH CHORD REINFORCED TRUSSES - continued:

- 25 Reconnect the Swaybraces in the male end bay of the bridge.
 - 26 Fit Vertical Braces in the male end bay of the bridge.
 - 27 If the bridge trusses are of single panel construction, pin a Jacking Frame to each End Post.
 - 28 If the bridge trusses are of double or triple panel construction and the jacking load at this end of the bridge is 40 tonnes or less, pin a Jacking Frame to the inner End Post of each truss only.
 - 29 If the bridge trusses are of double or triple panel construction and the jacking load at this end of the bridge exceeds 40 tonnes, pin a Jacking Frame to the inner and outer End Posts of each truss. Brace the Jacking Frames by connecting a Vertical Frame to each pair, using four Bracing Bolts.
 - 30 Place a 35 tonne Jack on a stable pack beneath each Jacking Frame.
 - 31 Raise both sides of the bridge, simultaneously, off the packs under the end of the bridge.
 - 32 Decrease the height of the packs under the end of the bridge.
 - 33 Lower both sides of the bridge, simultaneously, onto the packs.
 - 34 Continue to lower the bridge in stages, by decreasing the height of the packs under the Jacks and the End Posts alternately, until the End Posts are located on the Bearings.
- If the longitudinal slope of the bridge approaches 1:100 during this process, however, lower the bridge onto stable packs under the End Posts and proceed to the other end of the bridge.

BRIDGE INSTALLATION PROCEDURES

JACKING MULTIPLE SPAN BRIDGES

JACKING AT THE ENDS OF A MULTIPLE SPAN BRIDGE:

The jacking procedures to be adopted at the male and female ends of a multiple span bridge are the same as those described on the previous pages for a single span bridge. Note, however, that before the ends of a multiple span bridge can be lowered it is necessary to unlock all of the span junctions, by removing all Span Junction Launching Links and Span Junction Chord Reinforcements using the method described in the following procedure.

JACKING AT A SPAN JUNCTION:

- 1 Spike the launching rollers at the rear of the trailing span and the landing rollers at the front of the leading span to prevent any movement of the bridge.
- 2 Insert a Span Junction Jacking Beam between the Span Junction Posts of each truss, below the jaws of the Span Junction, and tie them loosely, but securely, to the Posts.
- 3 Place a 35 tonne Jack on a stable pack on either side of each truss at the span junction, such that one is beneath each end of each Span Junction Jacking Beam.

If the span junction is supported by a pier that comprises braced boxes of Compact 200 Panels, as shown in the lower right hand diagram opposite, position a pair of Bearing Beams to support each of the Jacks.

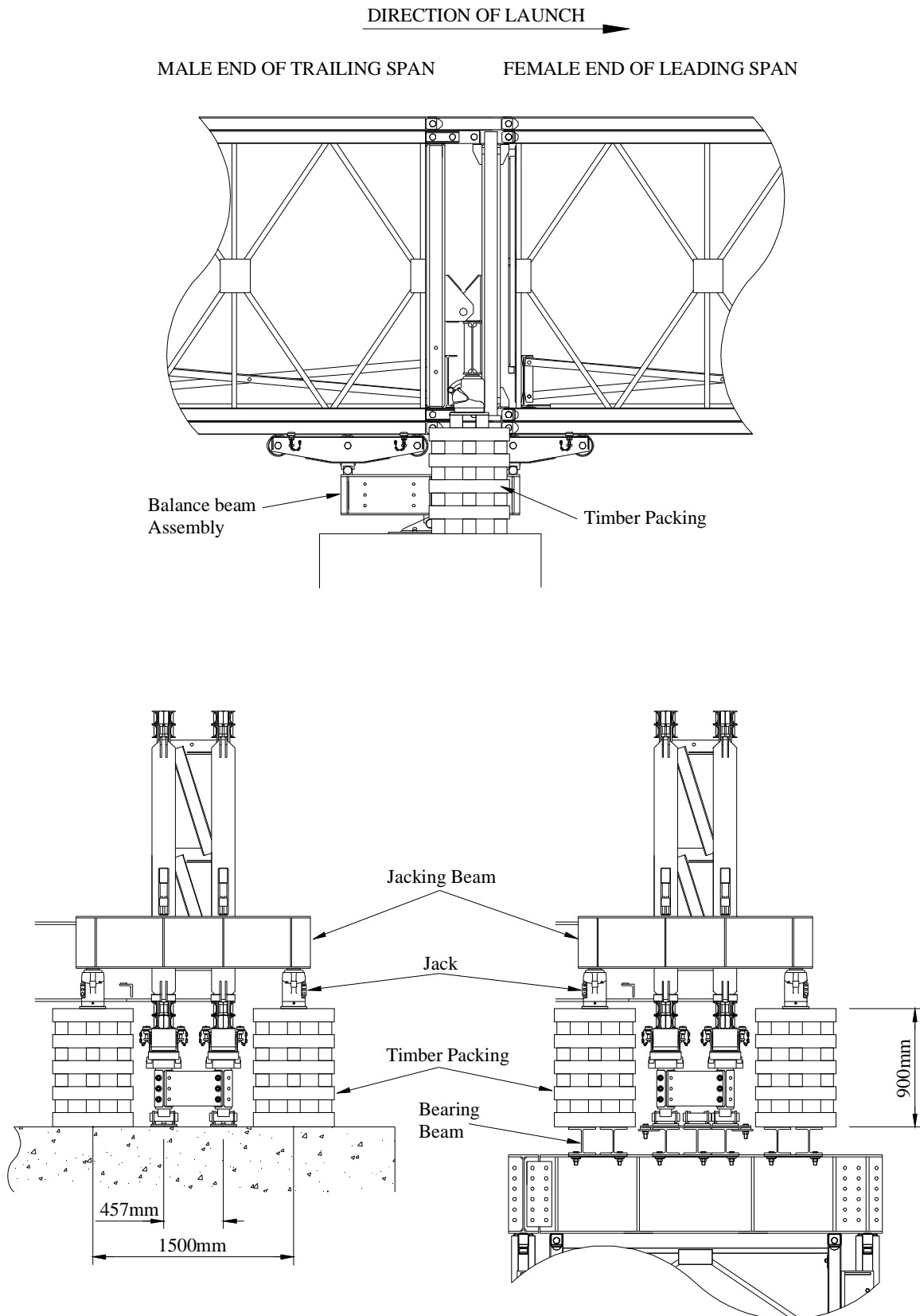
- 4 Raise both sides of the bridge, simultaneously, by 50 millimeters.
- 5 Remove the launching rollers from beneath the span junction.
- 6 Place stable packs, of equal height, beneath each truss at the span junction. These packs should be lower than the rollers, so as to relieve the tension in the top chord sufficiently to facilitate the removal of the Span Junction Launching Links and Span Junction Chord Reinforcements.
- 7 Lower both sides of the bridge, simultaneously, onto the packs.
- 8 Remove the Span Junction Launching Links. Note that in order to ease this it may be necessary to lower the span junction further, relative to the adjacent abutments and / or piers.
- 9 If Chord Reinforcements have been temporarily fitted to the Panels in the end bays of the bridge spans for launching, remove them now.
- 10 If Span Junction Chord Reinforcements have been temporarily fitted for launching, raise both sides of the bridge, simultaneously, by 50 millimeters and remove them.
- 11 Reposition the packs so that they are beneath either the Male or the Female Span Junction Posts of each truss.
- 12 Lower both sides of the bridge, simultaneously, onto the packs.
- 13 Lower the span junction in stages, by decreasing the height of the packs under the Jacks and the Span Junction Posts alternately, until the Span Junction Posts are located on the Bearings.

If the longitudinal slope of the bridge approaches 1:100 during this process, however, lower the bridge onto stable packs under the End Posts and proceed to the other end of the bridge.

Furthermore, if the bridge comprises more than two spans, it will be necessary to unlock the adjacent span junctions by the above method before lowering the structure onto the Bearings.

BRIDGE INSTALLATION PROCEDURES

JACKING AT A SPAN JUNCTION



SECTION 7

EMERGENCY RAMPS

EMERGENCY RAMPS

INSTALLATION

PARTS REQUIRED:

MARK NUMBER	COMPONENT DESCRIPTION	LENGTH OF RAMP (BAYS)			
		2	3	4	5
NLC12195	RAMP PACK PLATE : 4.20m ROADWAY	1	1	1	1
NLC12068	RAMP SUPPORT BEAM : 4.20m R/WAY	1	2	3	4
NLC19545	BEARING PLATE : RAMP TOE	1	1	1	1
NLC22055	EXPANSION PLATE	3	4	5	6
MC360	STEEL DECK	8	12	16	20
MC300	KERB : STEEL DECK	4	6	8	10
NLC12197	CLAMP PLATE : RAMP DECK	4	6	8	10
NLC19546	RAMP TOE	4	4	4	4
MC378	SCREW : DECK CLAMP	32	48	64	80
MC379	NUT : DECK CLAMP	32	48	64	80
MC430	BOLT : BRACING	34	51	68	85
MC436	NUT : M24	34	51	68	85

Notes:

- A The lengths of ramps given in the above table are in “bays”, where one bay is 3.048 metres.
- B The quantities of the components listed above are for one ramp at one end of a bridge. Where a ramp is required at each end of a bridge, add together the quantities appropriate to the length of ramp required at each end. Note Expansion Plates NLC22057 are only required at the end of bridge fitted with sliding bearings.
- C The standard “Ramp Sets” comprise two ramps each of 3 bays, with a nominal overall length of approximately 10.5 metres. This will be adequate for most applications, however, where the approaches are on an uphill gradient such that longer ramps are required at the ends of a bridge, it will be necessary to combine the components of two ramp sets.
- D The general arrangement diagrams given on the following pages depict a logistic bridge in an elevated position, typical of that required to over-bridge an existing damaged structure. At each end is a 3 bay ramp with an inclination of approximately 10% on a level approach, typical of that required for dual purpose civilian and military use. The actual pack heights required beneath the Ramp Supports on a given site will vary depending upon the lengths of ramps required and the topography, however, the principles remain the same.

EMERGENCY RAMPS

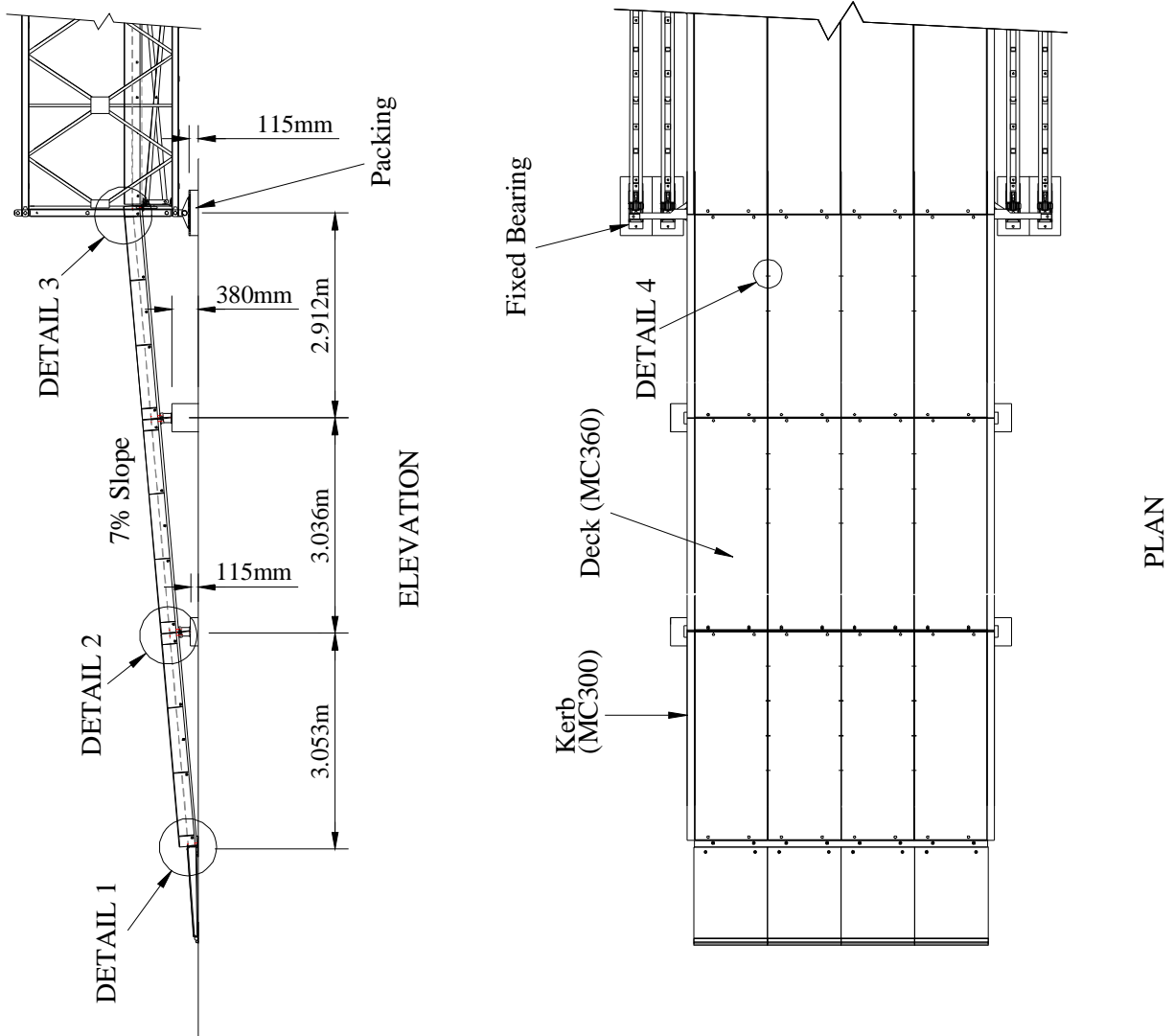
INSTALLATION

ERECTION PROCEDURE:

- 1 Construct packs to support the the Ramp Support Beams of a quantity and at levels appropriate to the required length of ramp and the topography of the site. These support packs should either be formed with concrete or be constructed from good quality timber. Note that they must provide adequate support to the full width of the Ramp Support Beams, that is the full width of the roadway, as the Ramp Support Beams are not designed to span across any gap.
- 2 Place a Ramp Support Beam onto each of the support packs
- 3 Position the Ramp Toe Bearing Plate.
- 4 At the sliding end of the bridge, Expansion Plates must be positioned under the Ramp Supports, the Ramp Toe Bearing Plate and the end of the Ramp Toe.
- 5 Place a Pack Plate onto the top flange of the Transom at the end of the bridge. Note that this must be done prior to fitting the Decks to the end bay of the bridge. At the rear (female) end of the bridge where Decks have been placed for launching, it will be necessary to temporarily raise them in order to insert the Pack Plate.
- 6 Insert Nuts for the Deck Screws into the housings on the underside of the top flange of the end of bridge Transom and those of all Ramp Support Beams and the Ramp Toe Bearing Plate.
- 7 Place Steel Decks in the last bay of the bridge, such that they are supported on the Pack Plate on the end of bridge Transom, and secure them with Deck Screws.
- 8 Place Steel Decks in the upper bay of the ramp, such that they are supported on the Pack Plate on the end of bridge Transom at the top and on a Ramp Support Beam at the bottom, and secure them with Deck Screws.
- 9 Place Steel Decks in all of the other bays of the ramp, such that they span between adjacent Ramp Support Beams, and secure them with Deck Screws.
- 10 In each bay of the ramp, side bolt the adjacent Steel Decks together using three Bracing Bolts per connection in the three innermost holes in the side channels of the Decks.
- 11 Fit a Kerb to the sides of the outer Steel Decks in the end bay of the bridge and in all bays of the ramp. This connection is made in the normal manner using four Bracing Bolts, one in each of the two outermost holes at either end of the Kerb, but additionally it is necessary to insert Deck Clamp Plates between the Kerbs and the Decks at the junction of each successive bay.
- 12 Fit Ramp Toes to the Ramp Toe Bearing Plate and secure using 2 Deck Screws per Toe.
- 13 Ensure that all of the ramp components are properly aligned then tighten all Bolts and Screws.

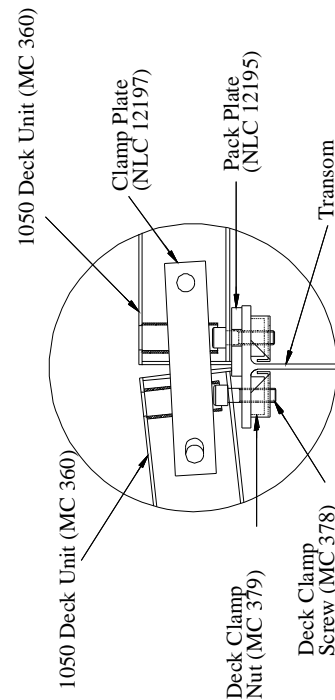
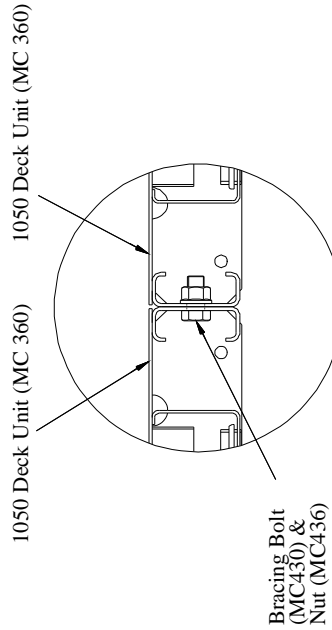
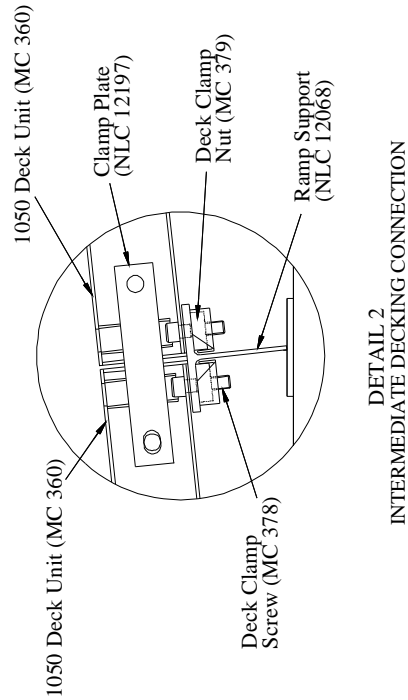
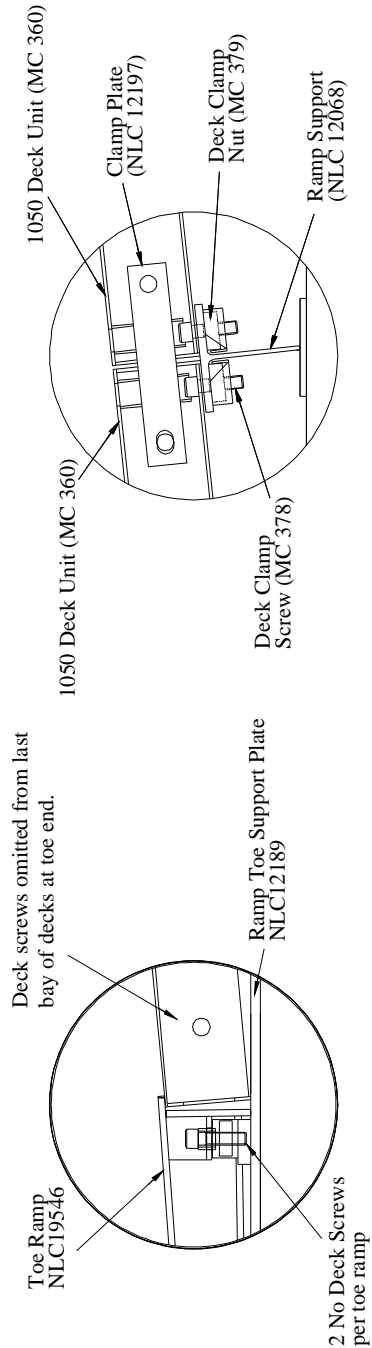
EMERGENCY RAMPS

FEMALE END OF BRIDGE – GENERAL ARRANGEMENT



EMERGENCY RAMPS

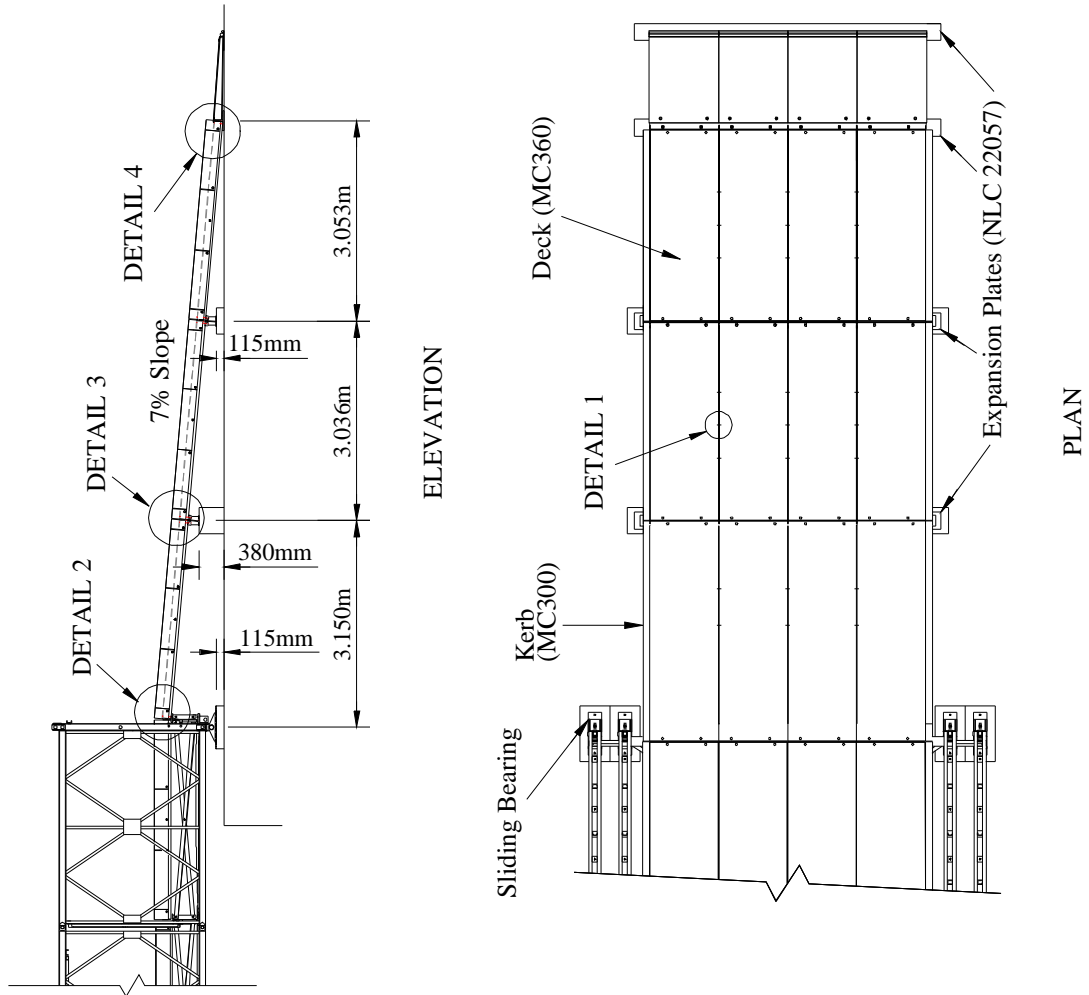
FEMALE END OF BRIDGE – CONNECTION DETAILS



Note: All panels and kerbs have been omitted for clarity

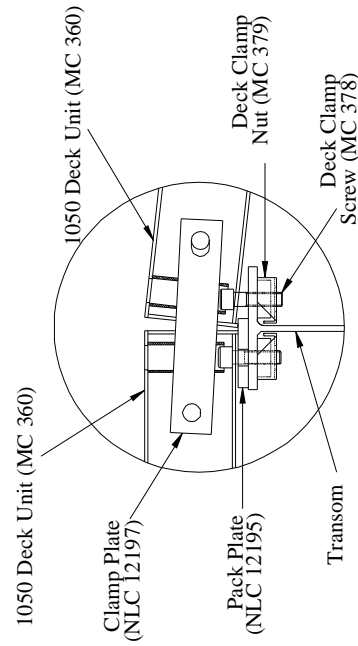
EMERGENCY RAMPS

MALE END OF BRIDGE – GENERAL ARRANGEMENT

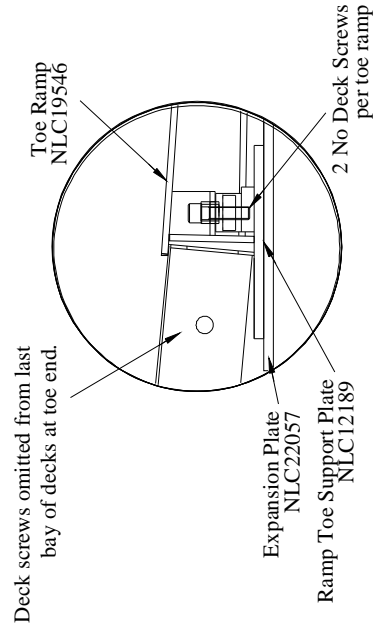


EMERGENCY RAMPS

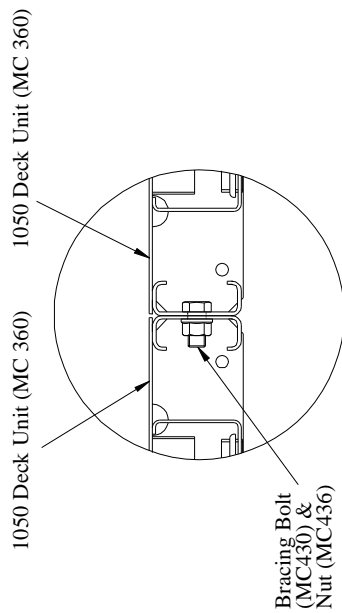
MALE END OF BRIDGE – CONNECTION DETAILS



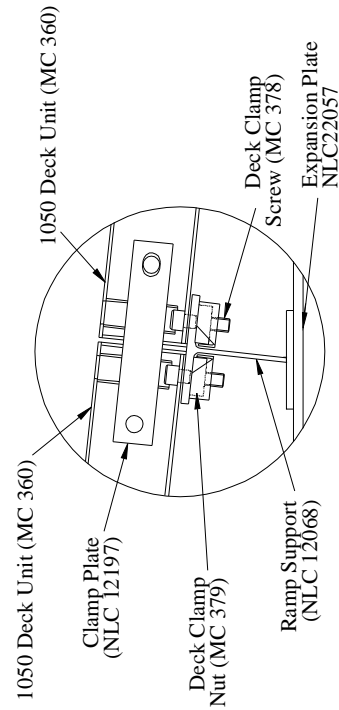
DETAIL 2
DECKING TO TRANSOM CONNECTION



DETAIL 4
END OF RAMP DETAIL



DETAIL 1
DECK UNIT TO DECK UNIT CONNECTION



DETAIL 3
INTERMEDIATE DECKING CONNECTION

Note: All panels and kerbs have been omitted for clarity

SECTION 8

FIXED PIERS

FIXED PIERS

GENERAL DETAILS

Where a gap to be bridged is too wide to be economically crossed by a single span structure, it is necessary to provide intermediate piers and install a multiple span bridge. It is a design feature of the logistic support bridge that in addition to single spans it may also be erected to form multiple span structures. This can be done using span junction equipment (refer to Section 6 of this publication) in conjunction with the fixed pier set equipment.

The positioning of intermediate piers is often dictated by the local geology and topography of the site. Otherwise, the positioning and quantity of piers depends upon the most economic balance between the cost and speed of positioning the piers and the cost and speed of the bridge construction appropriate to the varying span lengths.

One pier set comprises all of the components required to construct a pier with a maximum nominal height of 10 metres that is able to support two adjacent bridge spans either of up to 61 metres (20 bays) each in TSHR3H++ construction to carry MLC80T / 70W loading, or of up to 51 metres (17 bays) each in TSHR3H++ construction to carry MLC80T / 110W loading.

The fundamental component of the pier set is the Compact 200 Super Panel (MC411). This panel is the same component that is used to form the trusses of the bridge and the launching nose. Its purpose within the pier set is to form vertical box tower bays, the panels being connected in a square using angle brackets, that provide the main structural strength of the pier. The vertical box tower bays are pinned together on top of one another using Panel Pins (MC307) in the same manner as used for the panel to panel connection of the bridge trusses. The fixed pier must be supported on concrete pier foundations, the foot of the pier being pinned into double female eye soleplates that are then bolted and cast into the concrete foundation.

The pier is braced using a series of bolted horizontal struts and diagonal. Four external pier cap beams are pinned to the top of the uppermost box panels of each tower, to form a perimeter square, and two internal pier cap beams are bolted and braced between the external pier cap beams transversely to the direction of the bridge. Pier cap bearing beams are clamped to the internal pier cap beams to support the triple bearing baseplates of the bridge, which are in turn clamped to the pier cap bearing beams. During bridge installation, the rollers are supported on bearings fitted to the bearing baseplates on top of each box tower of each pier.

Fixed Pier Dimensions

As stated above, the maximum nominal height of pier that can be built using the components of one fixed pier set is 10 metres, the configuration of this being a 3 bay high box tower pier. Smaller piers can be built using reduced quantities of components from one fixed pier set, comprising either a 2 bay high or a 1 bay high box tower pier (refer to Figure 1). Furthermore, by combining the components of two fixed pier sets, taller piers can be built comprising either 4, 5 or 6 bay high box tower piers, however, it must be noted that the wind resistance of piers in excess of 10 metres is reduced from a mean wind speed of 45 metres per second to 30 metres per second.

The actual heights of the fixed piers, measured from the underside of the pier soleplates up to the underside of bridge bearing baseplates are as follows:

- The height of a 1 bay high box tower pier is 4.03 metres
- The height of a 2 bay high box tower pier is 7.08 metres
- The height of a 3 bay high box tower pier is 10.13 metres
- The height of a 4 bay high box tower pier is 13.18 metres
- The height of a 5 bay high box tower pier is 16.23 metres
- The height of a 6 bay high box tower pier is 19.28 metres

As required to suit site topography, increments in height between the fixed pier heights given above must be achieved by adjustment of the thickness of the concrete foundations to the piers. The nominal longitudinal and transverse dimensions of the footprint of the fixed pier in plan are 2.90 metres and 8.30 metres respectively, it is therefore recommended that the concrete pad foundation is 3.5 metres long by 9 metres wide (refer to Figure 3).

FIXED PIERS

GENERAL DETAILS

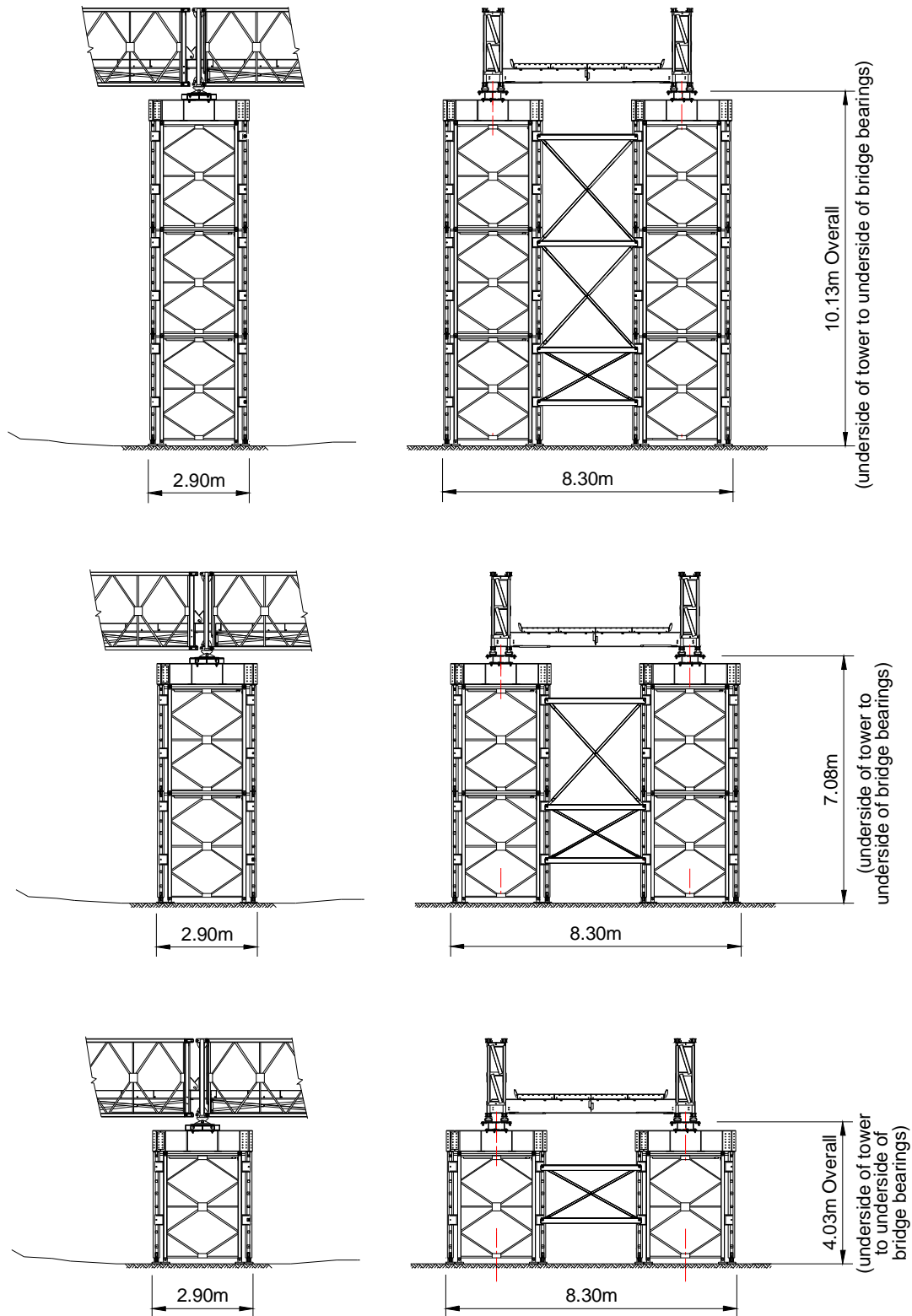


Fig 1 Overall dimensions of one, two and three bay high fixed piers

FIXED PIERS

GENERAL ARRANGEMENT

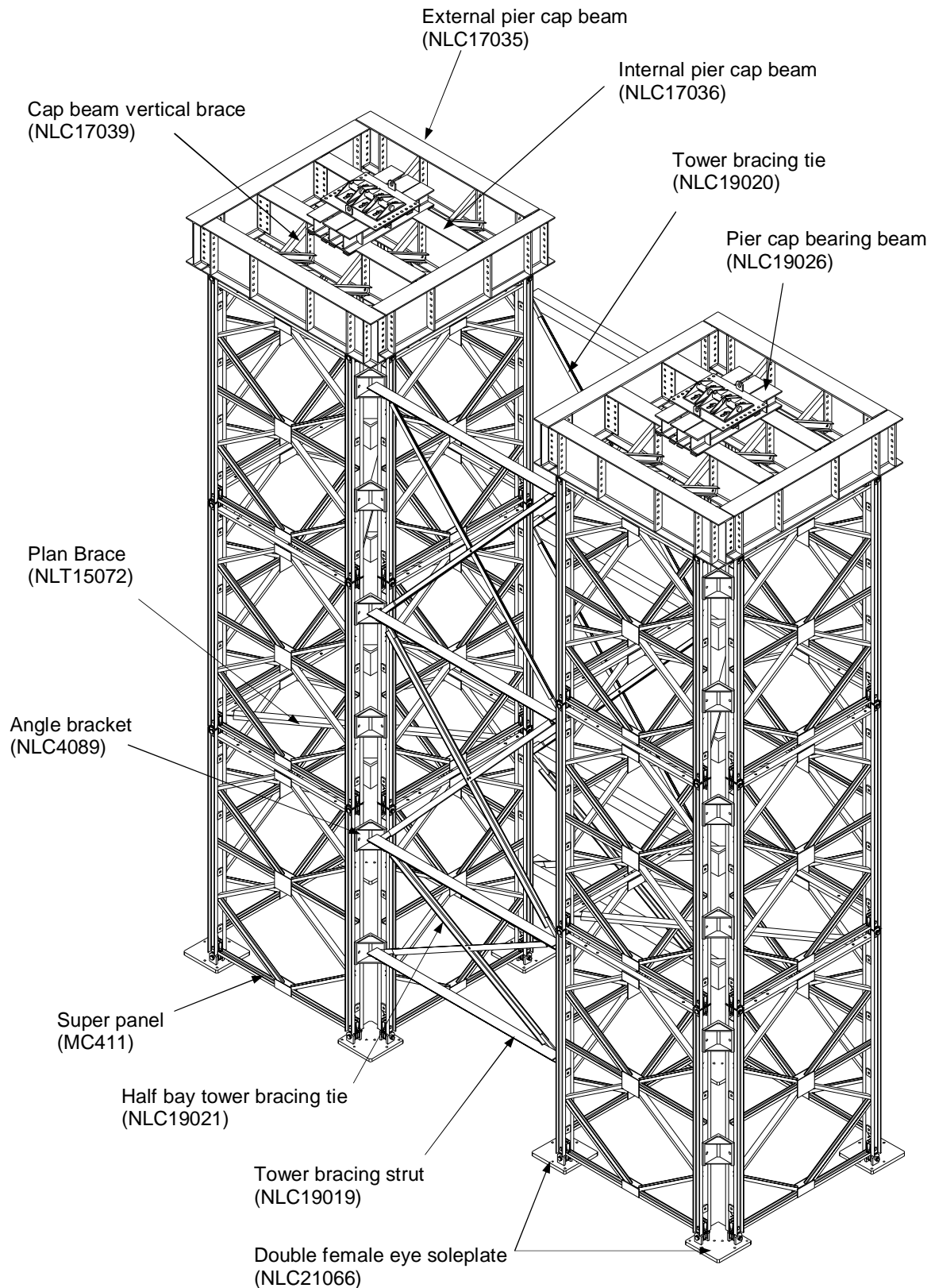


Fig 2 General arrangement of a 3 bay high fixed pier

FIXED PIERS

PARTS LISTS

Table 1 lists the quantities of parts required to construct fixed piers from one to six bays in height. Note that the standard fixed pier set contains all of the components required to construct a pier of up to three bays high and that the components of two fixed pier sets must be combined in order to construct a pier of 4, 5 or 6 bays high.

TABLE 1 PARTS REQUIRED FOR FIXED PIERS

MARK NUMBER	COMPONENT DESCRIPTION	HEIGHT OF PIER (BAYS)					
		1	2	3	4	5	6
MC411	Panel : Super	8	16	24	32	40	48
NLC4089	Angle Bracket : C200 Box Tower	16	32	48	64	80	96
NLT15072	Brace : Plan : C200 Box Tower	0	4	8	12	16	16
NLC21066	Soleplate : Female Eye : Double	8	8	8	8	8	8
NLC19019	Strut : Tower Bracing	4	6	8	10	12	14
NLC19020	Tie : Tower Bracing	0	4	8	12	16	16
NLC19021	Tie : Tower Bracing : Half Bay	4	4	4	4	4	8
NLC17035	Beam : Pier Cap : External	8	8	8	8	8	8
NLC17036	Beam : Pier Cap : Internal	4	4	4	4	4	4
NLC17037	Plate : Connection : Cap Beam	32	32	32	32	32	32
NLC17039	Brace : Vertical : Cap Beam	24	24	24	24	24	24
NLC19026	Beam : Bearing : Pier Cap	14	14	14	14	14	14
NLC19027	Clamp : Bearing Beam	8	8	8	8	8	8
NLC19028	Clamp : Bearing Baseplate	12	12	12	12	12	12
MC307	Panel Pin	32	48	64	80	96	112
MC307A	Circlip : Safety	64	96	128	160	192	224
MC430	Bolt : Bracing	50	52	54	56	58	60
MC431	Bolt : Transom	240	248	256	264	272	280
MX2320	Bolt : Pier Brace / Anchor	64	68	72	76	80	84
MC433	Bolt : Chord	24	52	80	108	136	164
MC436	Nut : M24	378	420	462	504	546	588
NLC17057	Plate : Washer : 15mm (Anchor)	56	56	56	56	56	56
MC267	Plate : Washer : 8mm (Shim)	48	48	48	48	48	48
NLE1022	Lifting Bolt Assembly : 3 tonne	4	4	4	4	4	4

FIXED PIERS

ERECTION PROCEDURE

The following erection procedure is for a 3 bay high pier and assumes that a crane with adequate capacity is available for lifting the box panel assemblies and pier cap beam assemblies into position.

Pier Foundation

Construct a suitable concrete foundation to support the fixed pier at the required level. Note that if the pier is to be built on a flood plain, the concrete foundation must be of sufficient height such that the steel pier components will be above the maximum water level.

Figure 3 provides a plan view and enlarged details of the required geometry of the concrete foundation for a fixed pier. Note that the overall dimensions given are the minimum recommended only and may have to be increased to suit site conditions.

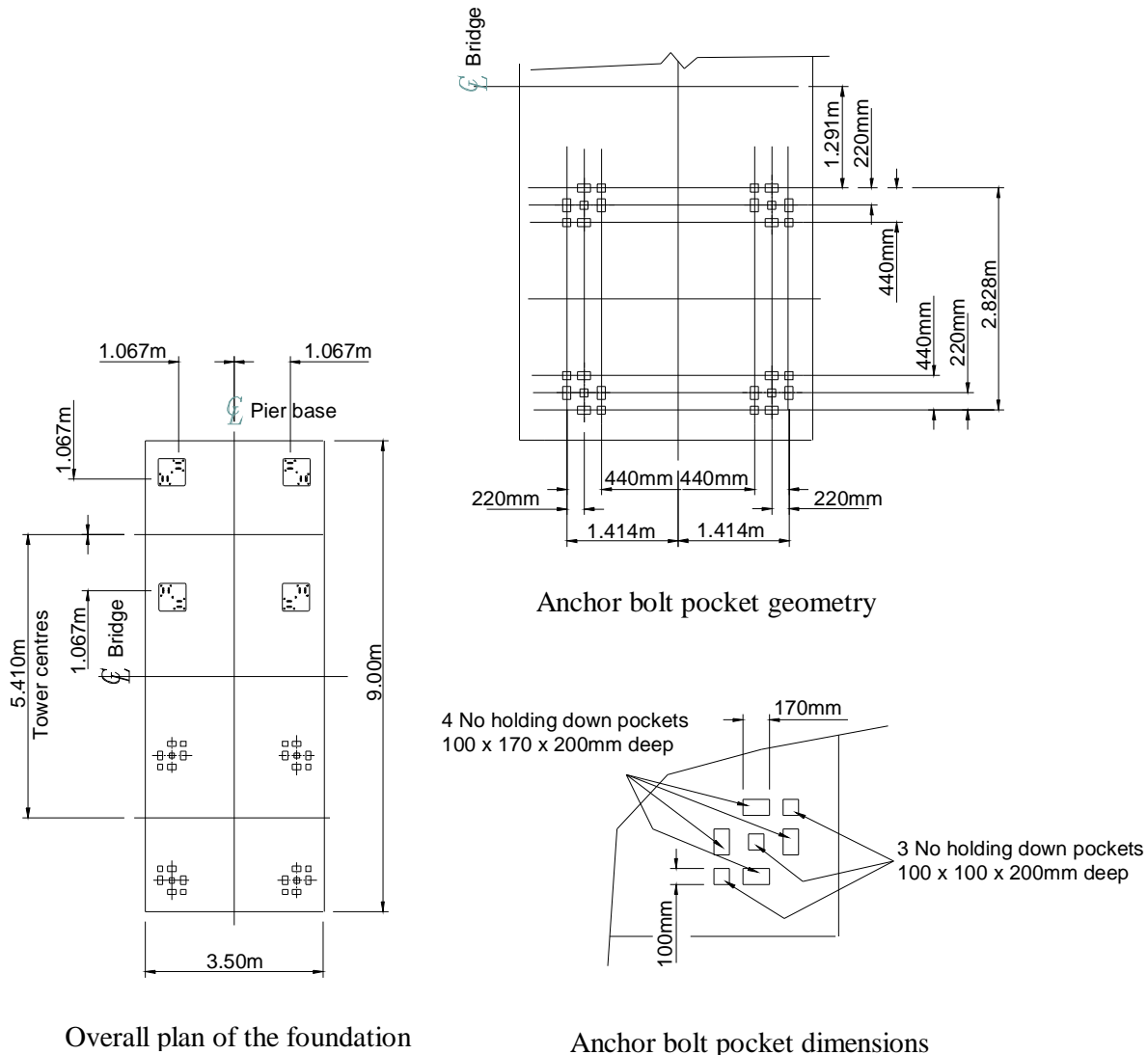


Fig 3 Concrete foundations for fixed piers

FIXED PIERS

ERECTION PROCEDURE

Lower tier panel box assembly

The two lower tier panel box assemblies of a pier must be constructed on a level surface using the procedures described below and detailed in Figure 5. Note that all of the bolted connections must be made hand tight only. The bolts of any tier must not be fully tightened until the subsequent tier (or pier cap beam assembly when appropriate) has been assembled and attached.

Place a panel flat on the ground, supporting it on four evenly positioned packs (2 per chord) each one approximately 100 mm high. Connect two angle brackets to each chord using chord bolts (MC433) and nuts (MC436), passing the bolts from the outside through the bracket first and then through the panel chord. Note, the angle brackets must be fitted to the second and fourth chord reinforcement connection positions from the male end of the panel and must be facing upwards. Refer to Stage 1 of Figure 5.

Lift and place four pier cap bearing beams (NLC19026) onto the side of the panel adjacent to the bottom chord to act as counterweight. Refer to Stage 2 of Figure 5.

Lift a second panel by its top chord and bolt its bottom chord to the angle brackets that are attached to the top chord of the first panel, using chord bolts (MC433) and nuts (MC436), ensuring that the male eyes of the second panel are adjacent to those of the first panel. Before releasing the second panel from the crane ensure that the assembly is stable, securing the panels to each other by hand tightening all of the bolts. Refer to Stage 3 of Figure 5.

Lift a third panel by its bottom chord and bolt its top chord to the angle brackets that are attached to the bottom chord of the first panel, again using chord bolts (MC433) and nuts (MC436), ensuring that the male eyes of the third panel are adjacent to those of the first panel. Before releasing the third panel from the crane ensure that the assembly is stable, securing the panels to each other by hand tightening all of the bolts. Refer to Stage 4 of Figure 5.

Place a fourth panel flat on the ground, again supporting it on four evenly positioned packs (2 per chord) each one approximately 100 mm high. This panel must be placed with the male eyes at the same end as those of the first panel, but with the chords the opposite way around such that if the panels were on top of each other, the top chord of the fourth panel would be over the bottom chord of the first panel. Connect two angle brackets to each chord using pier brace bolts (MX2320) and nuts (MC436), but this time passing the bolts from the inside through the chord first and then out through the bracket. Note, the angle brackets must be fitted to the second and fourth chord reinforcement connection positions from the male end of the panel, but this time facing downwards.

Lift the fourth panel with the angle brackets attached by both its top and bottom chords so that it remains horizontal and with a guy rope attached for guidance, then connect it to the top of the part assembled pier box, using chord bolts (MC433) and nuts (MC436), passing the bolts from the outside through the bracket first and then through the panel chord, ensuring that the top chord of the fourth panel is connected to the bottom chord of the third panel and the bottom chord of the fourth panel is connected to the top chord of the second panel. Also ensure that the male eyes of all panels are adjacent when connected. Refer to Stage 5 of Figure 5 where the final orientation of the panels is shown, “ T ” representing the top chords of the panels and “ B ” representing the bottom chords of the panels.

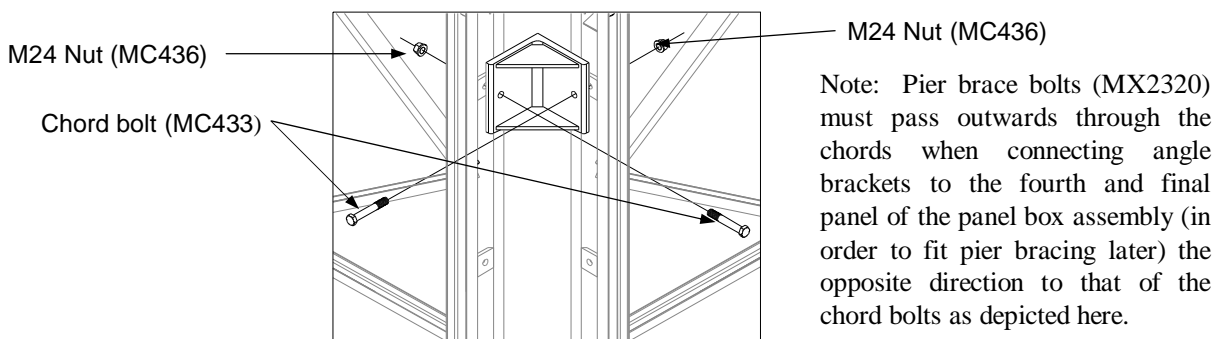
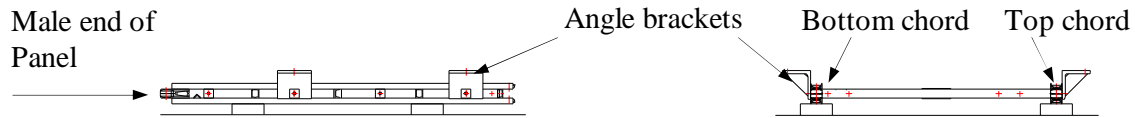


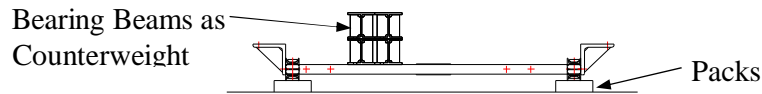
Fig 4 Angle bracket to panel connection
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FIXED PIERS

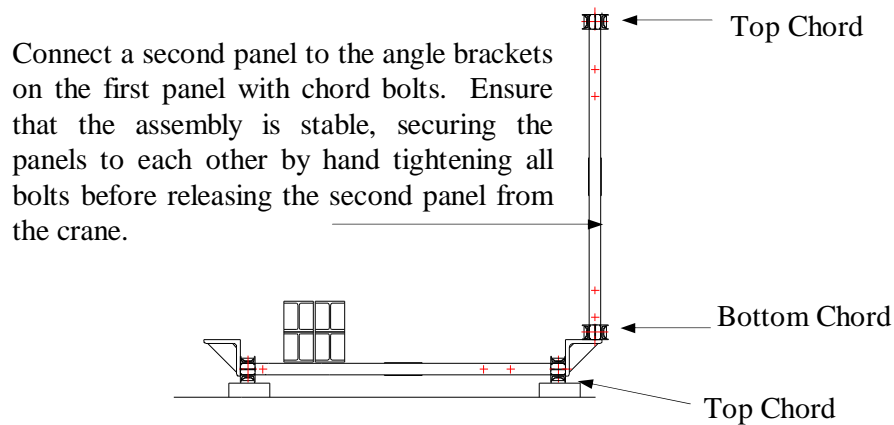
ERECTION PROCEDURE



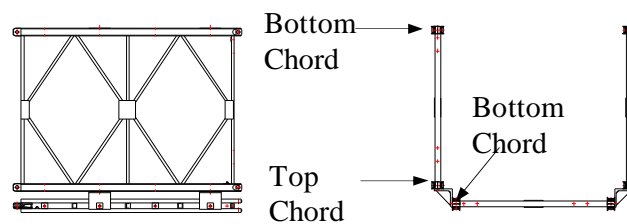
Stage 1 Connecting angle brackets to the first panel



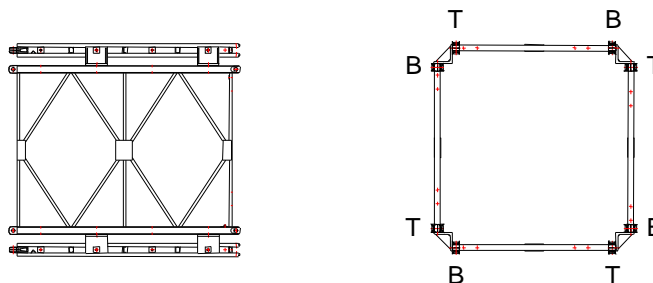
Stage 2 Using pier cap bearing beams as counterweight



Stage 3 Connecting the second panel



Stage 4 Connecting the third panel



Stage 5 Connecting the fourth panel

Fig 5 Lower tier panel box assembly

FIXED PIERS

ERECTION PROCEDURE

Connection of double female eye soleplates

When the lower tier panel box assemblies have been constructed, double female eye soleplates (NLC21066) must be connected to the male ends of each assembly before they are lifted and placed onto the pier foundation. Four double female eye soleplates are required per lower tier panel box assembly, one per corner. The soleplates are lifted using a lifting bolt assembly (NLE1022), as depicted in Figure 7 below, and connected to the male eyes at each corner of the panel boxes using panel pins (MC307) and safety clips (MC307A). Refer to Figure 6 for the connection details and note that the View on Arrow A in Figure 6 shows the recommended pin directions for fitting the double female eye soleplates to the panels.

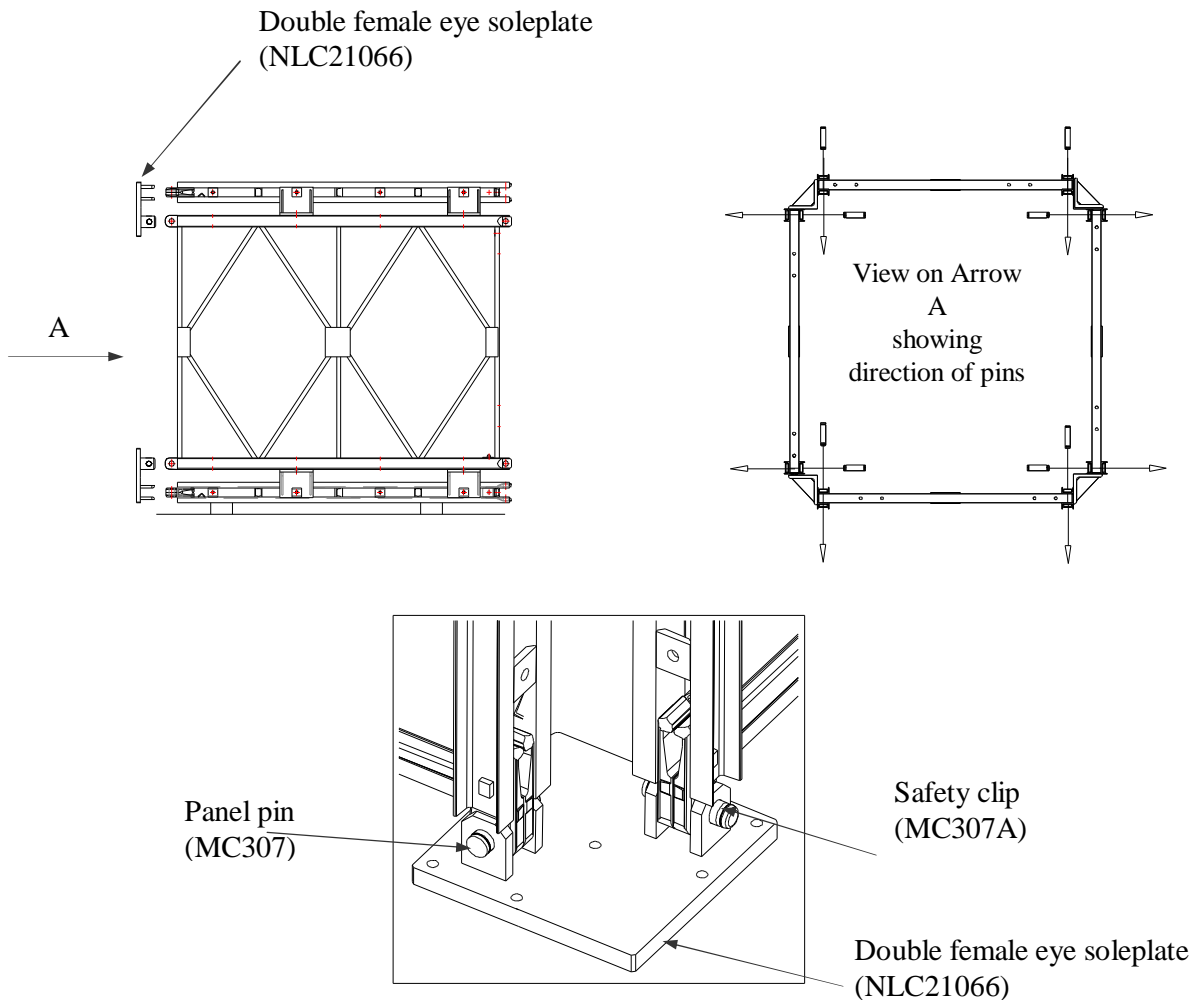


Fig 6 Connection of double female eye soleplates

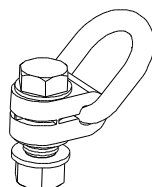


Fig 7 Lifting Bolt Assembly (NLE1022)

FIXED PIERS

ERECTION PROCEDURE

Connection of plan braces

Two plan braces are connected to the top of each panel box assembly while the box assembly is still in the horizontal position. The plan braces are fitted diagonally across between opposite pairs of panels of the box, refer to Figure 8 which shows the required format of the plan braces. The first brace is fitted to the rear of the panel verticals of one pair of opposite panels, connecting it to the panel vertical adjacent to the top chord of each of panel using a transom bolt (MC431) and nut (MC436). The second brace is then fitted such that it crosses over the top of the first brace and is fitted to the front of the panel verticals of the other pair of opposite panels, again connecting it to the panel vertical adjacent to the top chord of each of panel using a transom bolt (MC431) and nut (MC436). Finally, the plan braces are bolted together at the centre where they cross, back to back, using a bracing bolt (MC430) and nut (MC436). Refer to Figures 9 and 10 for plan brace connection details, noting that the bolts at the ends of the plan braces (Figure 9) must not be tightened until the centre bolt (Figure 10) has been located.

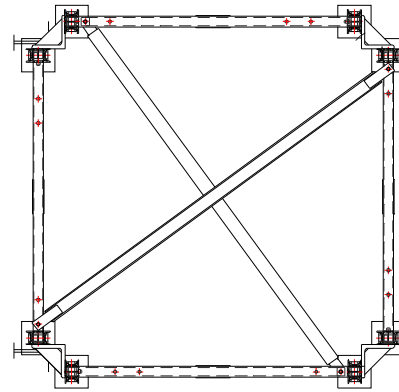


Fig 8 Plan brace format

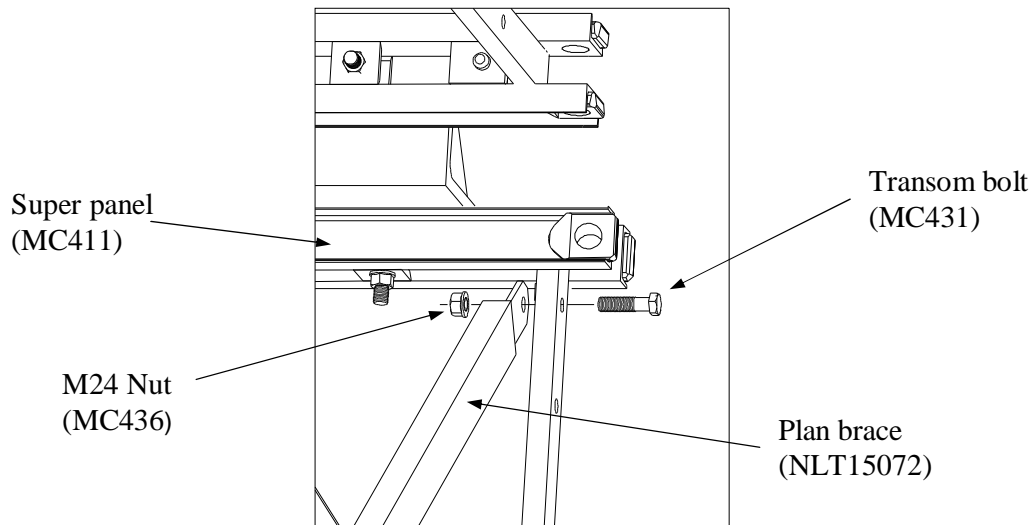


Fig 9 Plan brace to panel connection

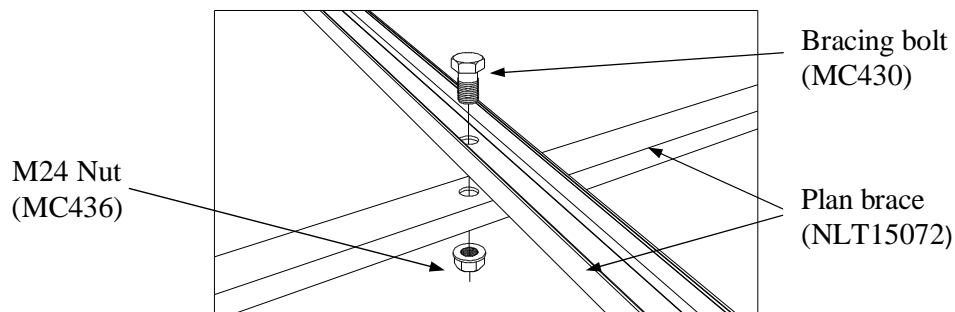


Fig 10 Plan brace to plan brace cross-over connection

FIXED PIERS

ERECTION PROCEDURE

Lifting a panel box assembly from horizontal to vertical.

A panel box assembly must be lifted from its horizontal construction alignment to the required vertical alignment using two 2 - leg chains. Both legs of one chain must be attached around the female end vertical and centre gusset plate of the upper horizontal panel of the box and both legs of the other chain must be attached around the female end vertical and centre gusset plate of the lower horizontal panel of the box. To ensure a safe system of work is established, it is recommended that guy ropes are attached to the male end vertical and centre gusset plate of the upper and lower horizontal panels of the box. During the lift, personnel situated at a safe distance from the assembly can then assist in controlling the load from any adverse swinging until the crane can adopt the correct jib position to lower the assembly. It must be noted that as the box is lifted all of the load will initially be taken by the 2 - leg chain attached to the lower panel of the box, the second 2 - leg chain attached to the upper panel will only come into play as the centre of gravity of the box passes over the fulcrum point of the lift. To minimise any adverse swinging as this transition occurs the crane operator must endeavour to keep the cranes lifting block directly above the centre of gravity of the box.

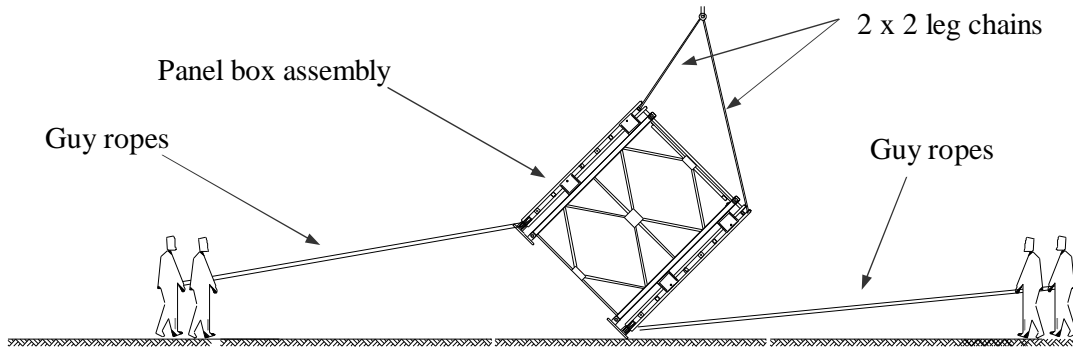


Fig 11 Lifting a panel box assembly from horizontal to vertical

Positioning lower tier panel box assemblies

The two lower tier panel box assemblies must be lifted as described above and positioned on packing directly above their required anchorage positions on the foundations, ensuring that the angle brackets that are fitted with pier brace bolts (MX2320) are on the inside face of each tower leg. The packing must comprise steel shims and be approximately 20mm thick to enable the anchor bolts to be grouted in place upon completion of the pier (sixty 8mm plate washers (MC267) are supplied in the fixed pier set for this purpose). Before each lower tier panel box is seated, seven anchor bolt assemblies, each comprising a pier brace bolt (MX2320), a 15mm plate washer (NLC17057) and a nut (MC436), must be attached to each double female eye soleplate as shown in Figure 12. Note, however, that the anchor bolts must not be grouted in place until the pier is complete, in order to ensure that the correct alignment of the pier is achieved and to allow for greater flexibility during construction.

Ensure that the angle brackets attached with the pier brace bolts (MX2320) are on the inside face of each tower leg

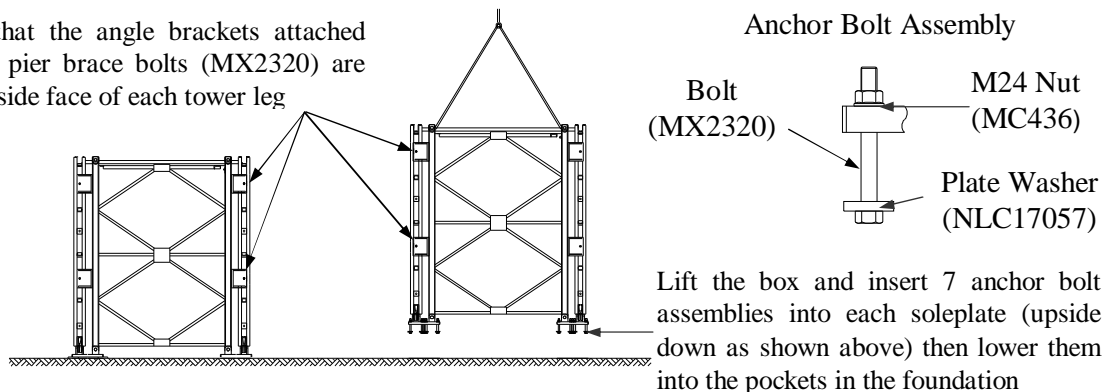


Fig 12 Positioning lower tier panel box assemblies

FIXED PIERS

ERECTION PROCEDURE

Lower tier tower bracing

When both lower tier panel box assemblies have been lifted into position, half bay tower bracing ties and tower bracing struts must be fitted between them on both sides of the towers following the procedure described below, refer to Figure 13. Note that the bracing ties have two holes at each end, the holes at the very end of the ties are used for connecting them to the towers, the holes adjacent to those are used for lifting the component using the lifting bolt assembly (NLE1022), refer to Figures 14 and 15.

The bracing is to be fitted to the lower tier in the following sequence. Note that it will be necessary to temporarily remove the nuts (MC436) from the pier brace bolts (MX2320) in turn as each bracing component is fitted. These nuts must be replaced immediately after each fitment.

Fit a half bay tower bracing tie (NLC19021) from the top left angle bracket to the bottom right angle bracket with the toe of the angle facing into the centre of the pier.

Fit a half bay tower bracing tie (NLC19021) from the top right angle bracket to the bottom left angle bracket with the toe of the angle facing out from the face of the pier, then connect the ties together at the centre where they cross with a bracing bolt (MC430).

Fit a tower bracing strut (NLC19019) across the bottom angle brackets and over the bracing ties with the toe of the angle facing out and at the top. Note that it will be necessary for personnel to hold the bracing ties in position at the bottom while the strut is fitted.

Once the lower tier bracing is complete, ensure that all bolts are hand tight, but do not fully tighten any bolts until the subsequent tier has been constructed. Finally, check the shims under the soleplates and adjust as necessary to ensure that both towers of the pier are level.

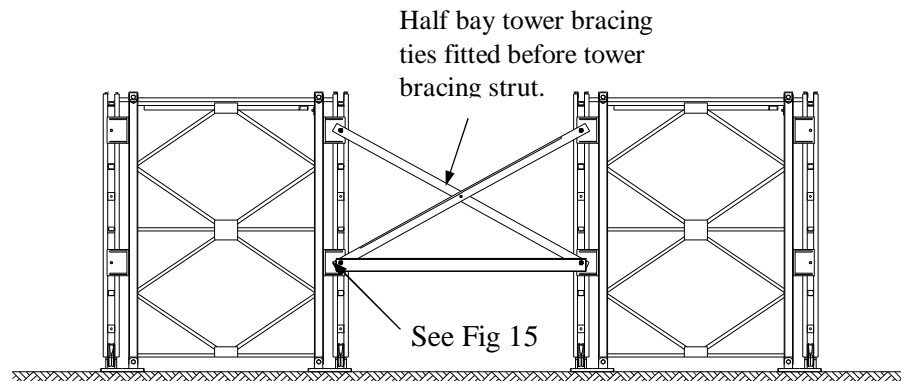


Fig 13 Lower tier bracing.

Lifting bolt
assembly
(NLE1022)

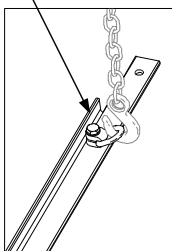
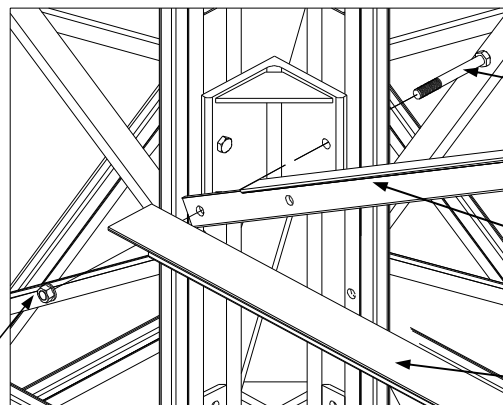


Fig 14 Lifting bolt location



Pier brace bolt
(MX2320)

Half bay tower
bracing tie
(NLC19021)

Tower bracing
strut
(NLC19019)

M24 Nut (MC436)

Fig 15 Half bay tower bracing tie, tower bracing strut and angle bracket connection.

FIXED PIERS

ERECTION PROCEDURE

Intermediate tier assembly and bracing

Construct the two panel box assemblies that will form the intermediate tier of the tower legs of a pier in a similar manner to that described previously and detailed in Figure 5. When fitting the angle brackets to the chords of the fourth panel that will form the inside face of each leg, however, note that chord bolts (MC433) are used to connect the brackets closest to the male eye of each assembly and pier brace bolts (MX2320) are only used to connect the angle brackets closest to the female eye of each assembly. Ensure that all chord bolts (MC433) pass through the angle brackets first (from out to in) and all pier brace bolts (MX2320) pass through the panel chord first (from in to out). Finally, fit plan bracing to the panel box assemblies as detailed in Figures 8, 9 and 10.

Lift the panel box assemblies and, ensuring the angle brackets connected with pier brace bolts (MX2320) are positioned on the inside face of each tower leg, pin them to the lower tier. Refer to Figures 16 and 17 for the sequence, directions and details of the panel pin connections.

Fit tower bracing to each side of the intermediate tier (refer to Figure 18) in the following manner. Note that it will be necessary to temporarily remove the nuts (MC436) from the pier brace bolts (MX2320) in turn as each bracing component is fitted. These nuts must be replaced immediately after each fitment.

Fit a tower bracing tie (NLC19020) from the top left angle bracket of the second tier to the top right angle bracket of the lower tier with the toe of the angle facing into the centre of the pier.

Fit a tower bracing tie (NLC19020) from the top right angle bracket of the second tier to the top left angle bracket of the lower tier with the toe of the angle facing out from the face of the pier, then connect the ties together at the centre where they cross with a bracing bolt (MC430).

Fit a tower bracing strut (NLC19019) across the top angle brackets of the lower tier and over the bracing ties with the toe of the angle facing out and at the top, refer to Figure 19. Note that it will be necessary for personnel to hold the bracing ties in position at the joint while the strut is fitted.

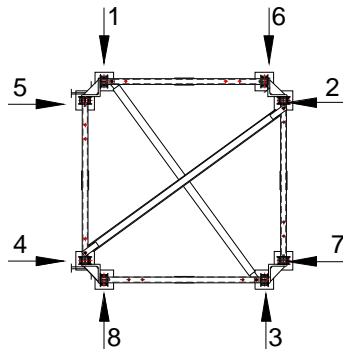


Fig 16 Panel pin sequence and directions

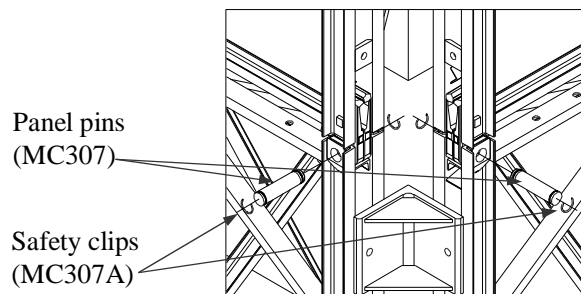


Fig 17 Panel to panel connection

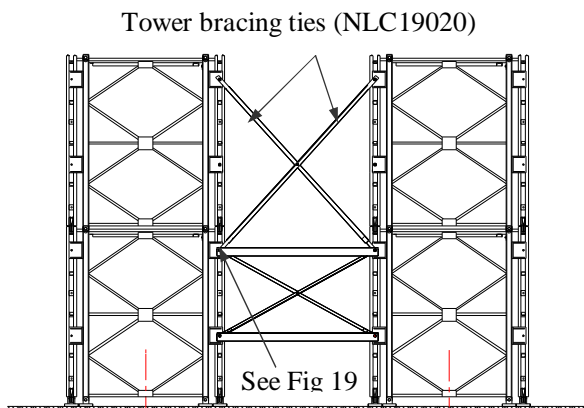


Fig 18 Intermediate tier bracing

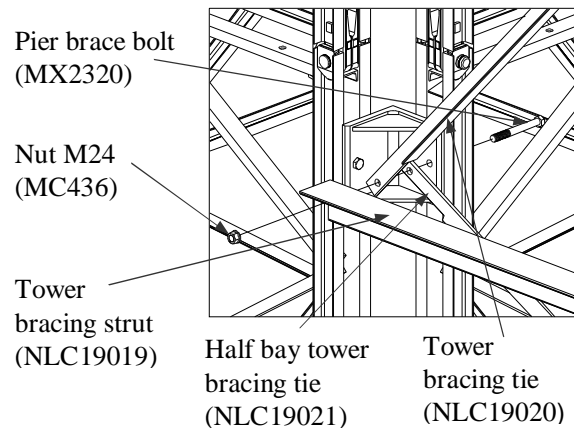


Fig 19 Tower bracing ties, tower bracing strut and angle bracket connection.

FIXED PIERS

ERECTION PROCEDURE

Upper tier assembly and bracing

Construct the two panel box assemblies that will form the upper tier of the tower legs of a pier in a similar manner to that described previously and detailed in Figure 5. When fitting the angle brackets to the chords of the fourth panel that will form the inside face of each leg, however, note that chord bolts (MC433) are used to connect the angle brackets closest to the male eye of each assembly and pier brace bolts (MX2320) are only used to connect the angle brackets closest to the female eye of each assembly. Ensure that all chord bolts (MC433) pass through the angle brackets first (from out to in) and all pier brace bolts (MX2320) pass through the panel chord first (from in to out). Note that plan bracing is not fitted to the panel box assemblies of the upper tier.

Lift the panel box assemblies and, ensuring the angle brackets connected with pier brace bolts (MX2320) are positioned on the inside face of each tower leg, pin them to the lower tier. Refer to Figures 16 and 17 for the sequence, directions and details of the panel pin connections.

Fit tower bracing to each side of the upper tier (refer to Figure 20) in the following manner. Note that it will be necessary to temporarily remove the nuts (MC436) from the pier brace bolts (MX2320) in turn as each bracing component is fitted. These nuts must be replaced immediately after each fitment.

Fit a tower bracing tie (NLC19020) from the top left angle bracket of the upper tier to the top right angle bracket of the intermediate tier with the toe of the angle facing into the centre of the pier.

Fit a tower bracing tie (NLC19020) from the top right angle bracket of the upper tier to the top left angle bracket of the intermediate tier with the toe of the angle facing out from the face of the pier, then connect the ties together at the centre where they cross with a bracing bolt (MC430).

Fit a tower bracing strut (NLC19019) across the top angle brackets of the intermediate tier, over the bracing ties, with the toe of the angle facing out and at the top, refer to Figure 21. Note that it will be necessary for personnel to hold the bracing ties in position at the joint while the strut is fitted.

Fit a tower bracing strut (NLC19019) across the top angle brackets of the upper tier, over the bracing ties, with the toe of the angle facing out and at the top, refer to Figure 22. Note that it will be necessary for personnel to hold the bracing ties in position at the joint while the strut is fitted.

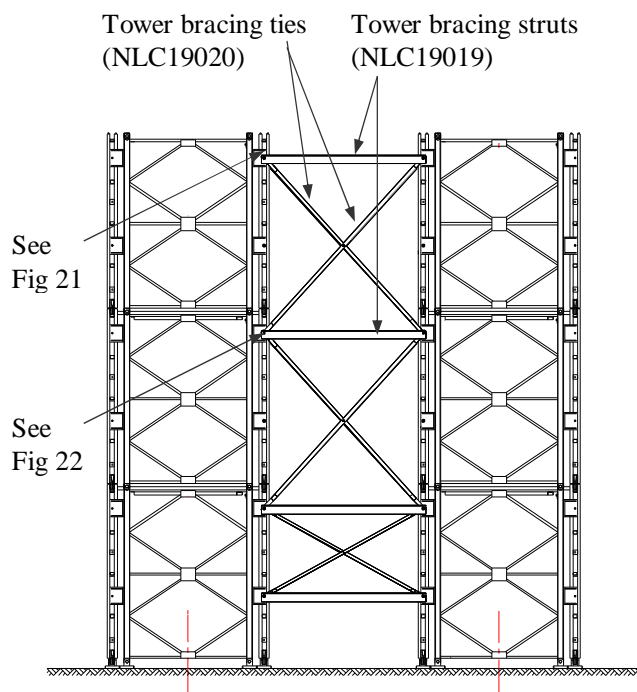


Fig 20 Upper tier bracing

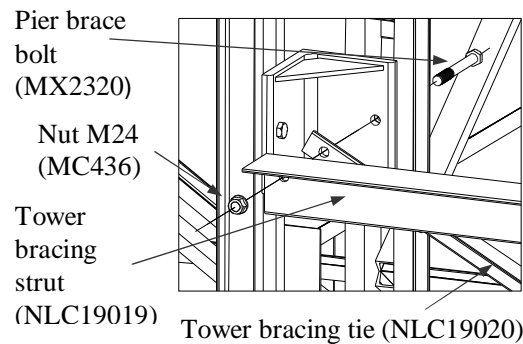


Fig 21 Tower bracing tie, tower bracing strut and angle bracket connection.

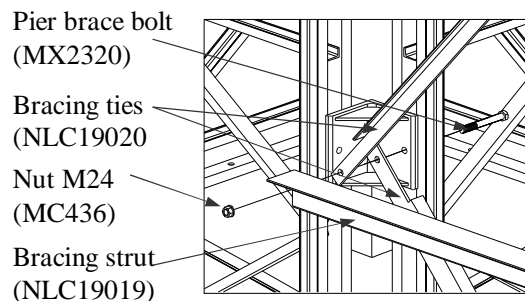


Fig 22 Tower bracing ties, tower bracing strut and angle bracket

FIXED PIERS

ERECTION PROCEDURE

Construction and connection of pier cap beam assemblies

When the two towers of a pier have been constructed and braced together to the required height, construct and connect a pier cap beam assembly to the top of each one using the following procedure:

On a level area of ground, place four external pier cap beams (NLC17035) to form a square, refer to Stage 1 of Figure 23. Connect the beams together using two connection plates (NLC17037) with twelve transom bolts (MC431) and nuts (MC436) per corner, refer to Figures 25 and 26, but do not fully tighten, for now leave the nuts and bolts hand tight only.

Fit two internal pier cap beams (NLC17036) transversely across between the external pier cap beams, refer to Stage 2 of Figure 23. Connect the internal beams to the external beams using two connection plates (NLC17037) with twelve transom bolts (MC431) and nuts (MC436) each end, refer to Figures 25 and 27, but do not fully tighten, for now leave the nuts and bolts hand tight only.

Fit two rows of vertical braces in the three bays between the parallel external and internal pier cap beams, refer to Stage 3 of Figure 23. Connect the vertical braces to the beams using a bracing bolt (MC439) and nut (MC436) at the end of each brace, refer to Figures 25 and 28, but do not fully tighten, for now leave the nuts and bolts hand tight only.

Fit three pier cap bearing beams (NLC19026) on top of and spanning over the two internal pier cap beams, refer to Stage 4 of Figure 23. The two outer beams must be equally spaced on either side of the tower centre-line, however, the centre of the inner beam will be 12.5mm to the outside of the tower centre-line, refer to Figure 25. Connect the pier cap bearing beams to the internal pier cap beams using two bearing beam clamp plates (NLC19027) with three transom bolts (MC431) and nuts (MC436) per clamp plate, refer to Figures 25 and 29, but do not fully tighten, for now leave the nuts and bolts hand tight only.

Using two 2 - leg chains and four lifting bolt assemblies (NLE1022), connected as shown in Figure 24, lift the assembly and pin it to the top of a pier tower leg in the same manner as described previously to connect the subsequent tiers of the tower leg together. Refer to Figures 16 and 30 for the sequence, directions and details of the panel pin connections.

Fully tighten all bolts of the pier cap beam assembly except for those that are clamping the pier cap bearing beams to the internal pier cap beams, refer to Figure 29, which for now should still be left hand tight only.

Repeat the above procedure for the construction and connection of the second pier cap beam assembly to the second tower leg of the pier. Once the pier cap beam assemblies have been fitted, fully tighten all remaining hand tight bolts in the upper tier of the pier and fix the anchor bolts into the foundation with cement grout.

Take two triple bearing baseplates (NLC19541) from the bridge set and fit one to the top of each pier tower leg, ensuring that each is orientated correctly with the 241mm lateral spacing between the dowels towards the inside of the pier, refer to Figure 25. Connect the triple bearing baseplates to the pier cap bearing beams using two bearing baseplate clamp plates (NLC19028) with two transom bolts (MC431) and nuts (MC436) per clamp plate, refer to Figures 25 and 31. Ensure that the bearing baseplates are fitted centrally on the pier cap bearing beams and then fully tighten the nuts and bolts.

Measure across between the two tower legs and ensure that the centre to centre distance between the bearing baseplates is 5.41 metres, adjusting the position of the pier cap bearing beams on the internal pier cap beams as necessary, then fully tighten the bolts connecting the pier cap bearing beams to the internal pier cap beams, refer to Figure 29.

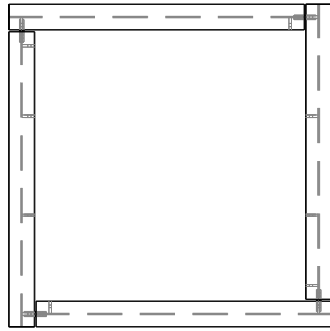
Take the required amount of bridge bearings (as appropriate to the truss construction of the bridge to be supported) from the bridge set and fit them onto the bearing baseplates, ensuring that the bearings are seated properly over the dowels on the baseplates. Note that these bridge bearings are also used to support the rollers during the launching of the bridge.

During bridge installation, in order to provide a suitable jacking surface to raise the bridge off the rollers and lower it onto the bearings, four additional pier cap bearing beams (NLC19026) are temporarily required per tower leg. Clamp a pair on either side of the permanent pier cap bearing beams in a similar manner to that

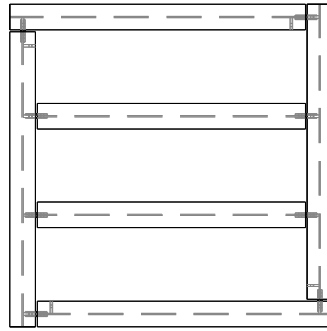
described in above, but this time using two bearing baseplate clamp plates (NLC19028) with two transom bolts (MC431) and nuts (MC436) per clamp plate.

FIXED PIERS

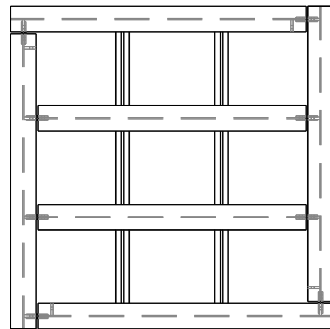
ERECTION PROCEDURE



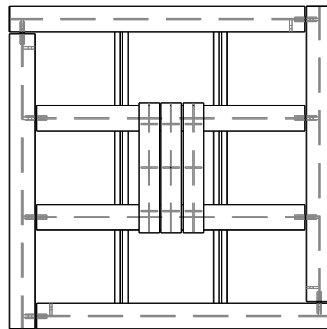
Stage 1



Stage 2

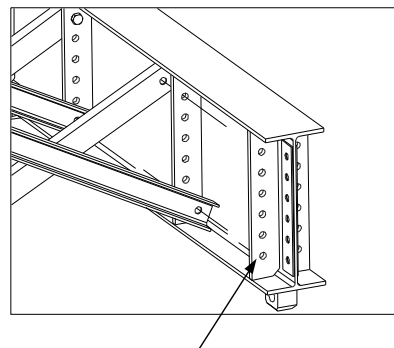
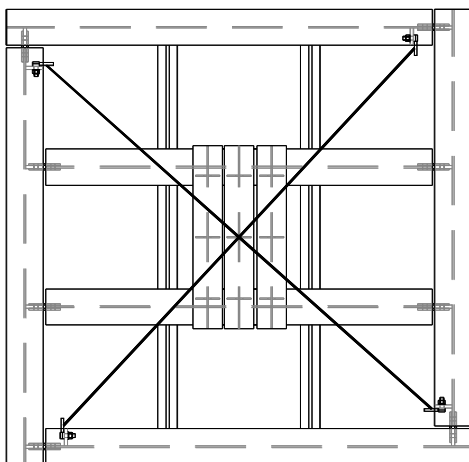


Stage 3



Stage 4

Fig 23 Construction stages of pier cap beam assembly



Use lifting bolt assembly in the bottom holes of the stiffeners in the four corners of the assembly

Fig 24 Lifting points on the pier cap beam assembly

FIXED PIERS

ERECTION PROCEDURE

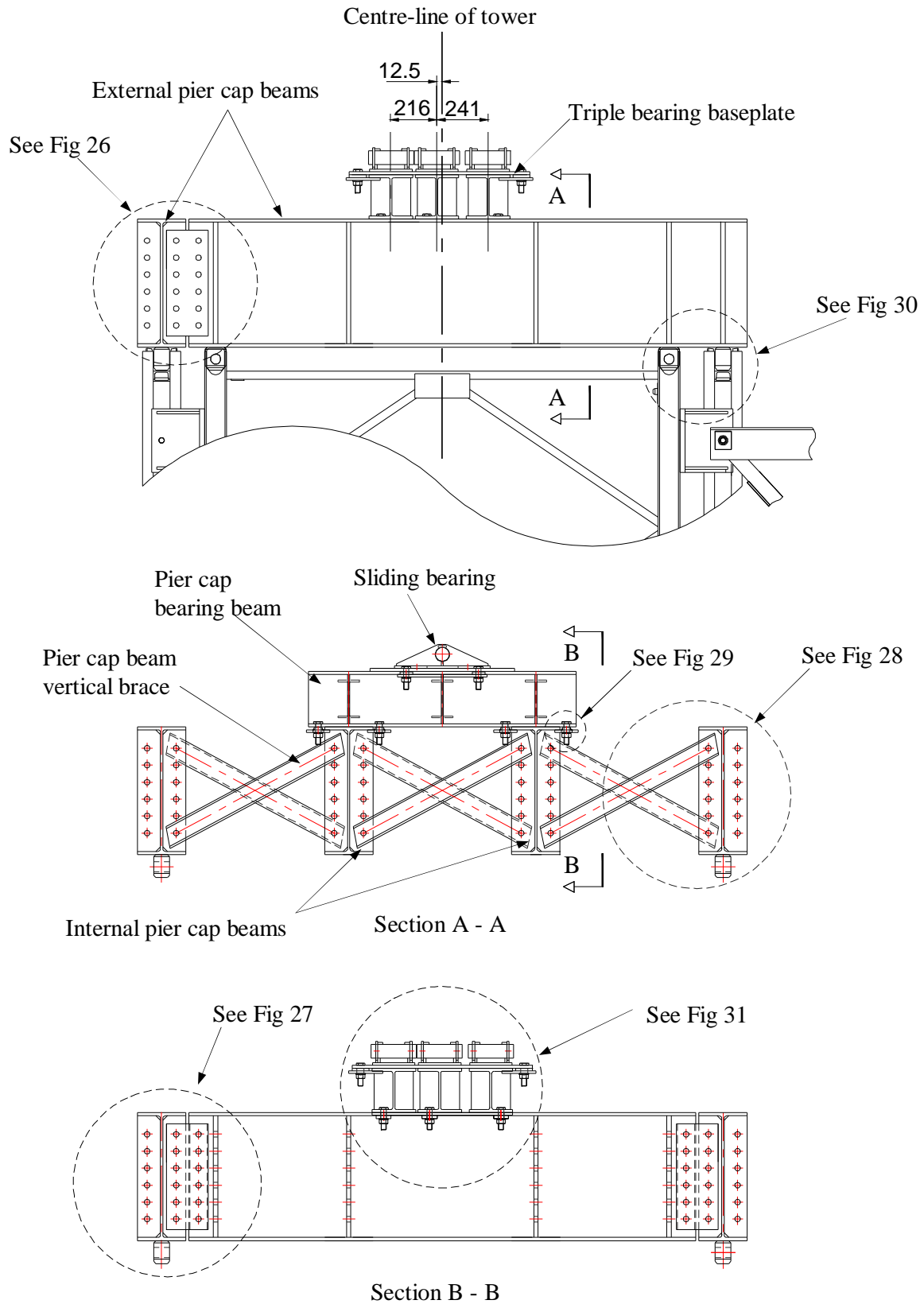


Fig 25 General arrangement of pier cap beam assembly connections

FIXED PIERS

ERECTION PROCEDURE

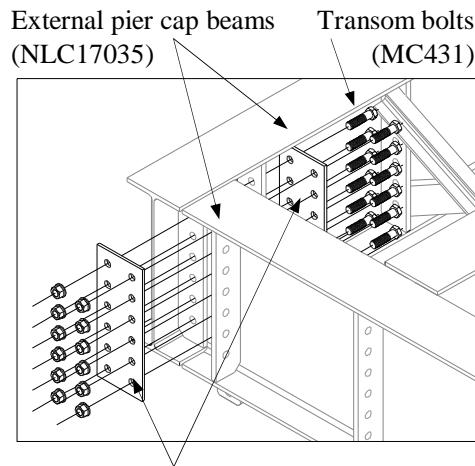


Fig 26 External pier cap beam

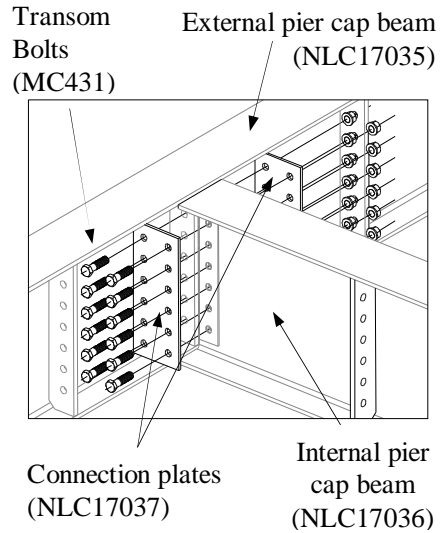


Fig 27 Internal pier cap beam connections

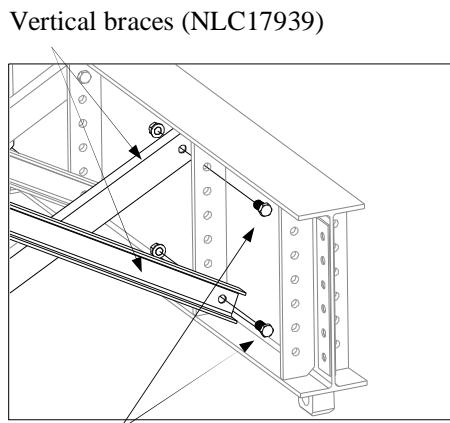


Fig 28 Vertical brace connections

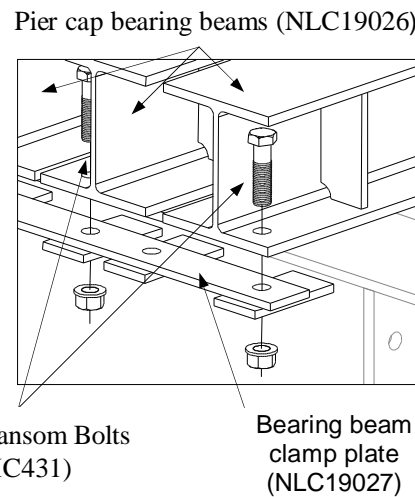


Fig 29 Bearing beam clamp connection

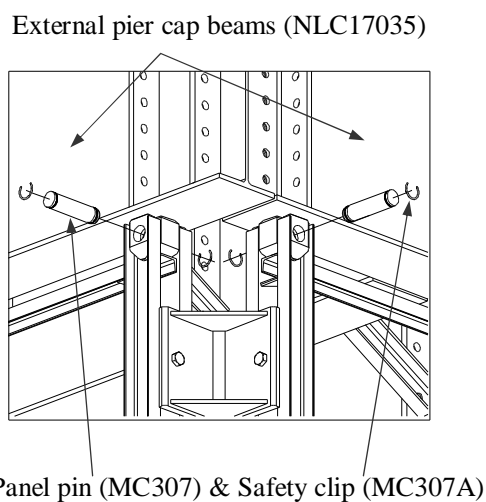


Fig 30 Pier cap beam to panel connections

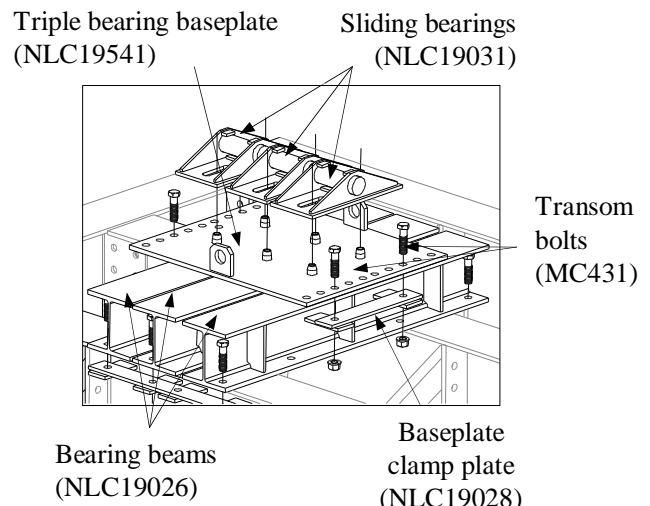


Fig 31 Baseplate to bearing beam connection

FIXED PIERS

ERECTION PROCEDURE

Piers less than three bays high

Piers less than three bays high can be constructed from the components of one pier set as follows:

A one bay high pier, as depicted in Figure 32, is constructed as per the lower tier of a three bay high pier, as described previously, but with plan braces omitted and pier cap beam assemblies fitted to the top instead.

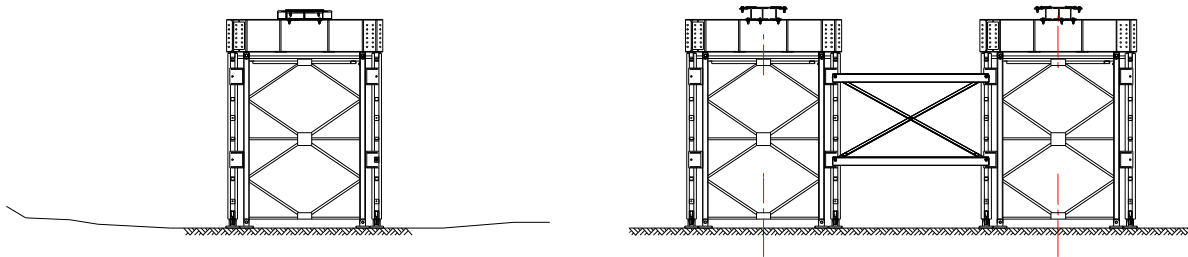


Fig 32 One bay high pier.

A two bay high pier, as depicted in Figure 33, is constructed as per the lower and upper tiers of a three bay high pier, as described previously, with the intermediate tier omitted.

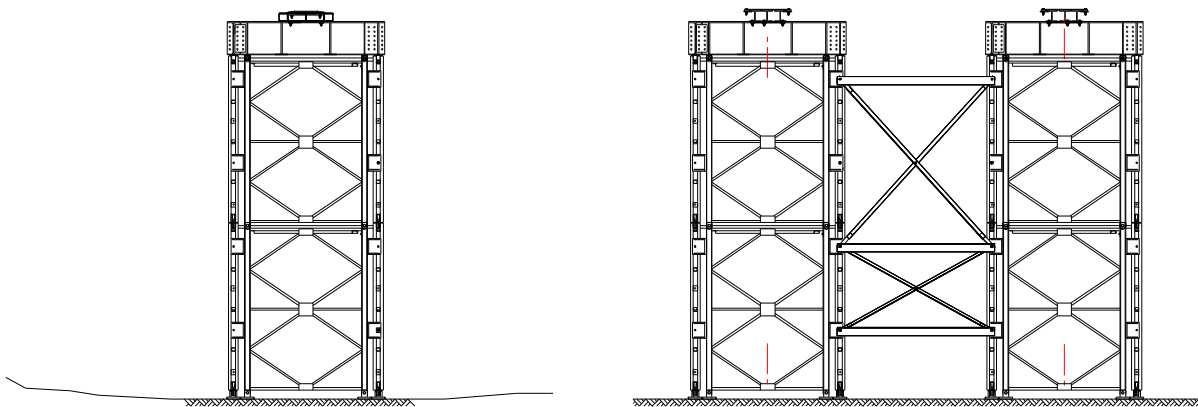


Fig 33 Two bay high pier

Piers greater than three bays high

Piers greater than three bays high, up to a maximum of six bays, can be constructed by combining the components of two pier sets as follows:

Four bay high and five bay high piers are constructed in the same manner as a three bay high pier, as described previously, but with additional intermediate tier bays between the lower and the upper tiers.

A six bay high pier is also constructed in the same manner as a three bay high pier but with additional intermediate tier bays between the lower and the upper tiers, however, the upper tier of a six bay high pier is fitted with half bay tower bracing ties, as depicted in Figure 34, and single plan braces are fitted at the junctions of bays 4 & 5 and bays 5 & 6 instead of cross-over pairs as normal (and as used here in all lower bays of the pier).

FIXED PIERS

ERECTION PROCEDURE

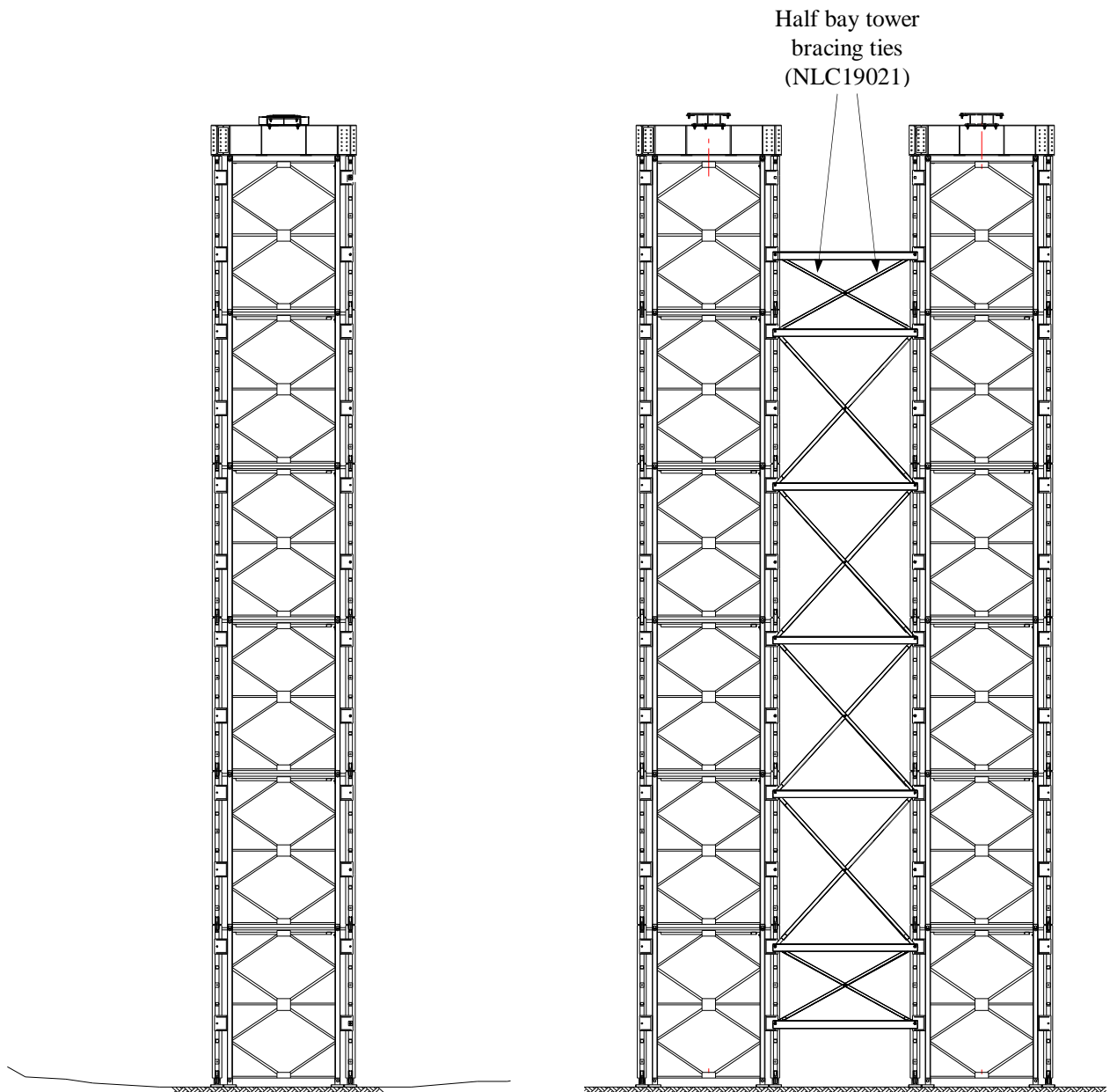


Fig 34 Six bay high pier.

FIXED PIERS

DISMANTLING PROCEDURE

The general dismantling procedure for a pier is essentially the reverse of the erection procedure described previously. The only exception is the method of dismantling the panel box assemblies once they have been removed from the tower legs of the pier, which is carried out while they are vertical as opposed to the horizontal manner in which they were constructed. The recommended procedure for dismantling the panel box assemblies is described below. Particular points to note during the dismantling of a pier are as follows:

In accordance with the pier erection procedures, lifting bolt assemblies (NLE1022) must be used when disconnecting and lowering the pier cap beam assemblies and the tower bracing ties from the pier during dismantling.

Before attempting to remove a pier cap beam assembly from the top of a pier tower leg, slightly loosen all of the bolts in the upper tier of the pier and also the bolts at the four corners of the pier cap beam assembly that connect the outer pier cap beams together. This will provide a sufficient degree of freedom such that the pier cap beam assembly will lift clear of the tower freely and easily.

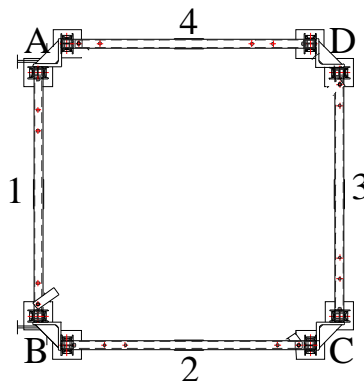
Once a pier cap beam assembly has been removed from a tower leg of the pier, it must be set down on level ground in a stable condition such that it can be dismantled into its component parts using the reverse of the construction procedure given previously on Page 8:16.

Before attempting to remove a panel box assembly of one tier from a pier tower, slightly loosen all bolts in the adjacent tier of the pier below. This will provide a sufficient degree of freedom such that the panel box assembly will lift clear of the tower freely and easily.

Once a panel box assembly has been removed from a tower leg of the pier, it must be set down vertically on level ground in a stable condition such that it can be dismantled into its component parts using the procedure given on the following page.

When removing pier bracing components, ensure that the crane has been connected to the component to be removed and taken the load sufficiently before removing the nuts from the bolts that connect the component to the pier.

When only the lower tier panel box assemblies remain, remove the panel pins connecting them to the double female eye soleplates then lift the assemblies clear of the soleplates and set them down vertically on level ground in a stable condition such that they too can be dismantled into their component parts using the procedure given on the following page.



Plan on panel box assembly

Fig 35 Key diagram for dismantling sequence of panel box assemblies

FIXED PIERS

DISMANTLING PROCEDURE

Dismantling panel box assemblies

The recommended procedure, with reference to Figure 35, for the dismantling of a panel box assembly into its component parts once it has been removed from a tower leg of a pier and set down vertically on level ground in a stable condition is as follows:

- Attach a crane to panel **1** and take a “bite” on the load.
- Remove the bolts attaching the two angle brackets at **A** to panel **4**, and those attaching the two angle brackets at **B** to panel **2**.
- Lift out panel **1**, with the angle brackets at **A** and **B** still attached, and lay the panel to one side with the angle brackets uppermost.
- Remove the angle brackets at **A** and **B** from panel **1**, then store the brackets and stack the panel.
- Attach a crane to panel **2** and take a “bite” on the load.
- Remove the bolts attaching the two angle brackets at **C** to panel **3**.
- Lift out panel **2**, with the angle brackets at **C** still attached, and lay the panel to one side with the angle brackets uppermost.
- Remove the angle brackets at **C** from panel **2**, then store the brackets and stack the panel.
- Using a two-legged chain, attach one chain leg around the centre gusset plate of the female end vertical at the top of panel **3** and the other chain leg around the centre gusset plate of the female end vertical at the top of panel **4**, then take a “bite” on the load.
- Attach a guy rope at **C** to the chord of panel **3**, attaching it at the intersection of the panel diagonals and chords in the lower half of the panel, and another in a similar manner at **A** to the chord of panel **4**.
- Remove the bolts attaching the two angle brackets at **D** to panel **4**.
- Ensure that all personnel are standing clear at a safe distance from the structure, and then slowly lift the two panels clear of the ground with the crane and allow them to slowly swing together, using the guy ropes for control.
- Lay the panels down on top of one another on the ground, again using the guy ropes for control, and ensure that they are stable.
- Remove the chain from the lower panel then lift the upper panel clear and place it to one side.
- Remove the remaining angle brackets and store them, then stack the two panels.

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SECTION 9

INSPECTION & MAINTENANCE

INSPECTION

INSPECTION PROCEDURES

INTRODUCTION:

Maintaining the good condition of Mabey Compact 200 Panel Bridging Equipment can be achieved by carrying out general visual inspections of erected bridges and more detailed inspections of individual bridge components, either in-situ or when returned for storage.

It is recommended that an initial bridge inspection is carried out approximately one month after traffic has commenced crossing a structure, when particular attention should be paid to checking the tightness of all bolted connections. Thereafter, routine site inspections and maintenance should be undertaken at regular intervals.

The required frequency of such periodic maintenance depends upon the intensity of use of the structure. Where a structure is in continuous use by a heavy volume of traffic, and especially when a high proportion of this traffic comprises heavy goods vehicles, the intervals between inspections should be shorter, say every three to six months. Where a structure is on a minor road and subject only to light traffic, the intervals between inspections can be much longer, however, as a general guide we would recommend that all bridges should be inspected at least once a year.

A GENERAL VISUAL INSPECTION:

- 1 Check that all Panel Pins and Safety Clips are fitted.
- 2 Check all Bolt locations for loose connections or absent fittings.
- 3 Check that Swaybraces and Vertical Braces are fitted in each bay of the bridge.
- 4 Where the bridge trusses are of chord reinforced construction, check that Chord Reinforcements are fitted to both the top and bottom chords of the Panels in every intermediate bay of the bridge.
- 5 Where the bridge trusses are of “SS” construction, check that Rakers are fitted to each side of every intermediate transom.
- 6 Where the bridge trusses are of “DS” or “TS” construction, check that Vertical Frames are fitted to each side of every intermediate transom and that Bracing Frames are fitted to the top of each truss in every intermediate bay of the bridge.
- 7 Check that the Bearings are free to perform as designed and that they are not buried.
- 8 Check the Abutments for uneven settlement, cracking and, if by a river, for scour erosion.
- 9 Check the approaches and ensure that there is a smooth transition onto the bridge.

INSPECTION

INSPECTION PROCEDURES

B DETAILED COMPONENT INSPECTION:

Note that some of the inspection procedures detailed below can only be properly carried out after the equipment has been dismantled and returned to the stockyard. When a bridge is being inspected in-situ, however, follow the guidelines as far as is practicable.

1 PANELS

- a Panel chords, verticals and diagonals should be inspected for buckling, twisting or any form of mechanical damage which may have been caused by vehicular collision. The vertical at the female end of the Panel should also be inspected for wear or damage at the position where the Transom connects to it and also adjacent to where the top flange of the Transom is situated.
- b Panel eyes should be inspected for elongation or stretching of the pin holes. This can be caused if a bridge has been overloaded and will, therefore, be of particular significance when a bridge has been subjected to “Risk” crossings by vehicles that are heavier than the specified regular design loading.
- c If the Panels are in the stockyard, pin hole diameters can be checked using the “Spade Gauge” supplied by Mabey & Johnson Ltd. When carrying out an in-situ inspection of a bridge, the condition of the pin holes can be assessed by measuring the sag of the bridge and comparing it to the theoretical deflection (refer to Section D).
- d Pin holes and bolt holes should be checked for burrs or similar obstructions, which may be remedied by reaming the holes.
- e Welds should be checked for visible distress or cracks.
- f Check for any damage to the galvanising and for any significant corrosion.

2 CHORD REINFORCEMENTS

- a Chord channels should be inspected for buckling, twisting or any form of mechanical damage which may have been caused by vehicular collision.
- b Chord eyes should be inspected for elongation or stretching of the pin holes in a similar manner to that described above for the Panels. Again, this will be of particular significance when a bridge has been subjected to “Risk” crossings by vehicles that are heavier than the specified regular design loading.
- c Pin holes and bolt holes should be checked for burrs or similar obstructions, which may be remedied by reaming the holes.
- d Welds should be checked for visible distress or cracks.
- e Check for any damage to the galvanising and for any significant corrosion.

INSPECTION

INSPECTION PROCEDURES

3 TRANSOMS

- a The top flange should be checked for wear caused by the deck units.
- b The web should be checked for damage around the bolt holes where the Transom attaches to the Panel. This type of damage can be caused by vehicles braking hard on a bridge, especially if the bridge has been overloaded and will, therefore, be of particular significance when a bridge has been subjected to “Risk” crossings by vehicles heavier than the specified regular design loading.
- c Bolt holes should be checked for burrs or similar obstructions, which may be remedied by reaming the holes.
- d Welds should be checked for visible distress or cracks.
- e Check for any damage to the galvanising and for any significant corrosion.

4 DECK UNITS & KERBS

- a The deck plate and, where appropriate, anti-skid wearing surface should be checked for any damage due to vehicle passage, especially if tracked vehicles have been crossing the structure which can cause damage by accelerating or braking hard, or by tracking sideways on the bridge.
- b The welds joining the trough stringers to the deck plate should be checked for visible distress or cracks. This type of damage can be caused if a bridge has been overloaded and will, therefore, be of particular significance when a bridge has been subjected to “Risk” crossings by vehicles which are heavier than the specified regular design loading.
- c Kerbs should be checked for collision damage and, if present, the side channels of the decks to which they are attached should also be checked for bending or associated damage.
- d Check for any damage to the galvanising and for any significant corrosion.

5 SWAYBRACES & VERTICAL BRACES

- a Swaybraces should be inspected for straightness, particularly their connecting lugs with which they attach to the Transom.
- b Vertical Braces should be inspected for straightness, as should the vertical plate on the Transom where they attach.
- c Bolt holes should be checked for burrs or similar obstructions, which may be remedied by reaming the holes.
- d Welds should be checked for visible distress or cracks.
- e Check for any damage to the galvanising and for any significant corrosion.

INSPECTION

INSPECTION PROCEDURES

6 RAKERS, VERTICAL FRAMES & HORIZONTAL BRACING FRAMES

- a All of these items should be inspected for buckling, twisting or any form of mechanical damage which may have been caused by vehicular collision.
- b Bolt holes should be checked for burrs or similar obstructions, which may be remedied by reaming the holes.
- c Welds should be checked for visible distress or cracks.
- d Check for any damage to the galvanising and for any significant corrosion.

7 END POSTS

- a End Posts should be inspected for straightness and for any damage due to vehicular collision.
- b Pin holes and bolt holes should be checked for burrs or similar obstructions, which may be remedied by reaming the holes.
- c Welds should be checked for visible distress or cracks.
- d Check for any damage to the galvanising and for any significant corrosion.

8 PANEL PINS

- a Panel Pins should be inspected for signs of wear or damage and also for pitting due to corrosion.
- b The safety clip grooves should be checked for any burrs or damage.

9 BOLTS & NUTS

- a In-situ, all Bolts and Nuts should be checked for tightness.
- b Bolts and Nuts should be inspected for damage to the threads.
- c Bolts, especially longer ones such as the Chord Bolts, should be inspected for straightness and for any signs of wear or damage to the shanks.
- d Check for any damage to the galvanising and for any significant corrosion.

10 LAUNCHING ROLLERS

- a Ensure that both the main rollers and the guide rollers turn freely, applying grease as necessary, and check that they are not damaged or unduly worn.
- b Check the guide plates for damage and straighten as required.

INSPECTION

INSPECTION PROCEDURES

C BRIDGE INSPECTION REPORT:

For each bridge inspected, it is recommended that a “Bridge Inspection Report Summary Sheet” is used to note any defects observed in the structure, on a bay by bay basis following the inspection guidelines given previously. Additional sheets should be appended as necessary to describe the observations in more detail. The measured deflection of the bridge trusses under dead load only should also be recorded along with details of the type and volume of the traffic using the structure.

BRIDGE INSPECTION REPORT SUMMARY SHEET - typical suggested layout:

BRIDGE NAME / LOCATION: _____ ROUTE: _____

SPAN: _____ bays TRUSS CONSTRUCTION: _____ LOAD CLASS: _____

FEMALE END APPROACH				
FEMALE ABUTMENT				
END POSTS & BEARINGS				
BAY	AS VIEWED FROM THE FEMALE END TOWARDS THE MALE END			
No	LEFT HAND TRUSS	RIGHT HAND TRUSS	TRANSOM	DECK & KERB
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
END POSTS & BEARINGS				
MALE ABUTMENT				
MALE END APPROACH				

MEASURED DEAD LOAD DEFLECTION: LEFT = _____ mm RIGHT = _____ mm

TYPE & VOLUME OF TRAFFIC: _____

INSPECTION

INSPECTION ANALYSIS

D THEORETICAL BRIDGE DEFLECTION CALCULATION:

1 REQUIRED INPUT

In order to calculate the theoretical deflection of a single simply supported bridge span, the following information must be known:

“W”	=	Weight per Bay of Bridge (tonnes)
“P”	=	Applied Point Load (tonnes)
“N”	=	Number of Bays of Bridge
“L”	=	Span of Bridge (metres)
“I”	=	Inertia of Bridge (cm ⁴)
“X _{SU} ”	=	Deflection Coefficient for Shear due to Uniform Loading
“X _{SP} ”	=	Deflection Coefficient for Shear due to a Point Load
“X _{PH} ”	=	Deflection Coefficient for Pin Hole Sag

2 DEFLECTION CALCULATION

The total theoretical deflection of a single simply supported bridge span will be the sum of the following individual deflection components:

a ELASTIC DEFLECTION - due to the elongation of the tension chord

- i Elastic deflection due to Dead (Uniform) Load “D_{ED}” = $62.31 \times W \times N \times L^3 / I$
- ii Elastic deflection due to Live (Point) Load “D_{EL}” = $99.70 \times P \times L^3 / I$

b SHEAR DEFLECTION - due to the elongation of the tension web members

The Shear Deflections are “S” % of the Elastic Deflections calculated above, where:

- i % age of Elastic deflection due to Dead (Uniform) Load “S_U” = X_{SU} / N^2
- ii % age of Elastic deflection due to Live (Point) Load “S_P” = X_{SP} / N^2

c PIN HOLE SAG - due to the difference in diameter between the pins and pin holes

- i Bridge spans with an Even Number of Bays “D_{PH}” = $X_{PH} \times N^2 / 8$
- ii Bridge spans with an Odd Number of Bays “D_{PH}” = $X_{PH} \times (N^2 - 1) / 8$

3 DEFLECTION DATA

TRUSS CONSTRUCTION	INERTIA (cm ⁴)	DEFLECTION COEFFICIENTS		
		X _{SU}	X _{SP}	X _{PH}
SSH	1 531 074	1111	1389	2.4424
SSHRH	3 368 494	2444	3055	2.2300
DSH	2 422 384	1111	1389	2.4424
DSHR1H	4 899 568	2027	2534	2.3362
DSHR2H	6 736 988	2444	3055	2.2300
TSH	3 633 576	1111	1389	2.4424
TSHR2H	8 268 062	2197	2747	2.3008
TSHR3H	10 105 482	2444	3055	2.2300

INSPECTION

INSPECTION ANALYSIS

E BRIDGE CAPACITY ASSESSMENT:

Having inspected a bridge in-situ, it is necessary to assess whether or not the design live loading can still be carried by the structure. It may be necessary to reduce the capacity of a bridge for any of the various reasons that follow, however, it should be noted that the criteria given are intended for use as a guide only. It is the responsibility of the inspecting Engineer to apply his own limitations, which may vary depending upon the acceptable factor of safety against failure and the necessity of specific vehicles to cross the structure.

1 STRUCTURAL INADEQUACY OF PRIMARY LOAD CARRYING MEMBERS

a Reduction in cross sectional area of a component due to corrosion or mechanical damage:

<u>Reduction in Cross Sectional Area</u>	<u>Reduction of Component Capacity</u>
0 to 5 %	10 %
5 to 10 %	20 %
11 to 15 %	30 %
16 to 20 %	40 %
> 20 %	100 %

b Lateral deflection of the compression chords of the trusses:

<u>Ratio of Deviation to Arc Length</u>	<u>Reduction of Component Capacity</u>
< 1:500	0 %
1:500 to 1:350	10 %
1:350 to 1:200	40 %
> 1:200	100 %

c Excessive vertical deflection of the trusses:

If the actual deflection of a bridge measured on site exceeds the theoretical dead load deflection calculated, and this is not obviously attributable to any mechanical damage, the probable cause is that the Panel Pins in the tension chord have “bedded in” to the pin holes. In such cases the bridge load carrying capacity should be unaffected.

If the difference between the actual measured deflection and the theoretical deflection “D” is significantly greater than the theoretical Pin Hole sag “P”, then the pin holes may have stretched due to overloading. In such cases the bending capacity of the bridge may need to be reduced, please refer to the Engineering Department at Mabey & Johnson Ltd for advice.

Theoretical Deflection	E = Elastic	S = Shear	P = Pin Hole	Total
Actual Deflection as measured on site				
Difference between Theoretical and Actual Deflections “D”				

INSPECTION

INSPECTION ANALYSIS

E BRIDGE CAPACITY ASSESSMENT – continued:

1 STRUCTURAL INADEQUACY OF PRIMARY LOAD CARRYING MEMBERS

d Damaged Primary Members:

The extent of any damage to any of the components of a structure, whether due to corrosion, fatigue cracks or vehicular collision, should be assessed and an appropriate reduction in the capacity of the element under consideration should be applied.

The effect upon the structure as a whole will vary depending upon the following:

- i The degree of damage to the individual element.
- ii The position of the element within the structure.
- iii The degree of structural redundancy of the element.
- iv Whether the structure was originally capable of sustaining more than the required live load.
- v The required factor of safety against failure.

2 MISSING OR UNSERVICEABLE SECONDARY COMPONENTS:

- a All missing or unserviceable components should be replaced as soon as possible.
- b When carrying out a bridge inspection, it is recommended that the inspection team carry a small number of each type of Nut and Bolt, together with the relevant Wrenches and Spanners, so that any loose or missing bolts can be remedied immediately.
- c If any Rakers, Vertical Frames or Horizontal Bracing Frames are missing or severely damaged, the bridge should be deemed unserviceable until they are replaced.
- d In addition to sustaining the lateral wind forces, Swaybraces are also of importance in providing a stiff lateral support to anchor the “U” frames at the Transom positions. The effect of any missing or unserviceable Swaybraces must be assessed and the bridge capacity reduced as appropriate until they are replaced.

3 STRUCTURAL INADEQUACY OF ABUTMENTS:

The condition of the bridge abutments should be assessed and an appropriate reduction in the bridge capacity applied where defects exist.

If any scour erosion of the river banks is evident, appropriate measures should be taken to prevent any detrimental effect on the bridge. Any defects in the approaches should also be remedied to ensure a smooth transition onto the bridge is achieved.

MAINTENANCE

REPAIRS

B PROTECTIVE TREATMENT FOR CORRODED OR REPAIRED AREAS:

There are two preferred protective treatment methods that may be used in different situations. These are as follows:

1 SYSTEM 1:

This system is recommended for the renovation of small areas of corrosion or staining and for the protective coating of welded repairs. The method of preparation and application is as follows:

- a Remove all loose material and contaminants.
- b Thoroughly clean the area with a wire brush to remove all corrosion.
- c Apply a coat of “Metaflux 70-43” aerosol zinc rich paint and allow to dry.
- d Apply a further 3 coats allowing individual coat to dry before the next application.

This method will give between 20 and 30 microns of dry film thickness coverage per coating, giving a finished protective thickness of between 80 and 120 microns.

2 SYSTEM 2

This system is normally recommended for the renovation of large areas of corrosion. Manufacturers data sheets complete with a preparation and application method sheet (BEP2 FORM) are available from the Quality Control Department of Mabey & Johnson Ltd. The basic procedure is as follows:

- a Apply item 155, which is a passivating wash, to the galvanised surfaces that are to be painted. Note that item 155 is acidic, it is therefore essential to avoid all contact with skin and clothing.
- b Allow the passivating wash to dry.
- c Normally the galvanised surface will turn black in colour, which indicates that the preparation treatment has worked. This is not always the case, however, but provided that the instructions for the use, application and curing time have been adhered to, the surface will support the next treatment stage.
- d Brush off any residues left by the passivating wash.
- e Apply item 14R3, a zinc phosphate primer and undercoat, to the prepared surfaces.
- f Allow to dry as per the manufacturers recommendations.
- g Apply item 173 MIO, an acrylated rubber high build, to the prepared surfaces.
- h Allow to dry as per the manufacturers recommendations.

This method will give between 40 and 60 microns of dry film thickness for the primer coat and between 50 and 80 microns of dry film thickness for the top coat, giving a finished protective thickness of between 90 and 140 microns.

MAINTENANCE

STORAGE

A PRE-STORAGE MAINTENANCE:

- 1 On return to store after use, it is suggested that major items, such as Panels, Transoms and Decks, are power washed.
- 2 Pin holes in the Panels and the Chord Reinforcements should be cleaned out with a water jet and, when dry, have a film of grease applied all over the inner surface.
- 3 Panel Pins should be cleaned with a mixture of kerosine and oil and left to dry. This results in a thin protective film being left on the surface.
- 4 Bolts should have the Nuts run up and down their threads, to check for freedom of movement. If necessary, lightly brush the threads with a wire brush to assist. Prior to storage, clean the Nuts and Bolts with a mixture of kerosine and oil and leave to dry. This results in a thin protective film being left on the surface.

B GENERAL STORAGE PROCEDURES:

- 1 The main components of Mabey Compact 200 Panel Bridges can be stored either under cover or in open weather conditions.
- 2 It is recommended, however, that the smaller items, such as Launching Rollers, Tools, Jacks, Panel Pins and Bolts, should be stored under cover in a locked area or container.
- 3 The actual positioning and stacking of components will be dependent upon the stores handling plant available, however, it is recommended that like components are stored together.
- 4 Items should be stored away from stagnant water and on hard standing ground where possible.
- 5 Items should be stored on timber supports to enable easy access for forklift trucks, or for lifting chains if using an excavator or crane for handling.
- 6 If items such as Transoms are to be stacked in layers, one on top of another, again use timber to separate the layers. This not only makes access easier, but also allows for better evaporation of standing water.
- 7 Items to be stored out in the open should always be stacked in the above manner, so as to minimise water trapping and retention and therefore minimise corrosion.

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