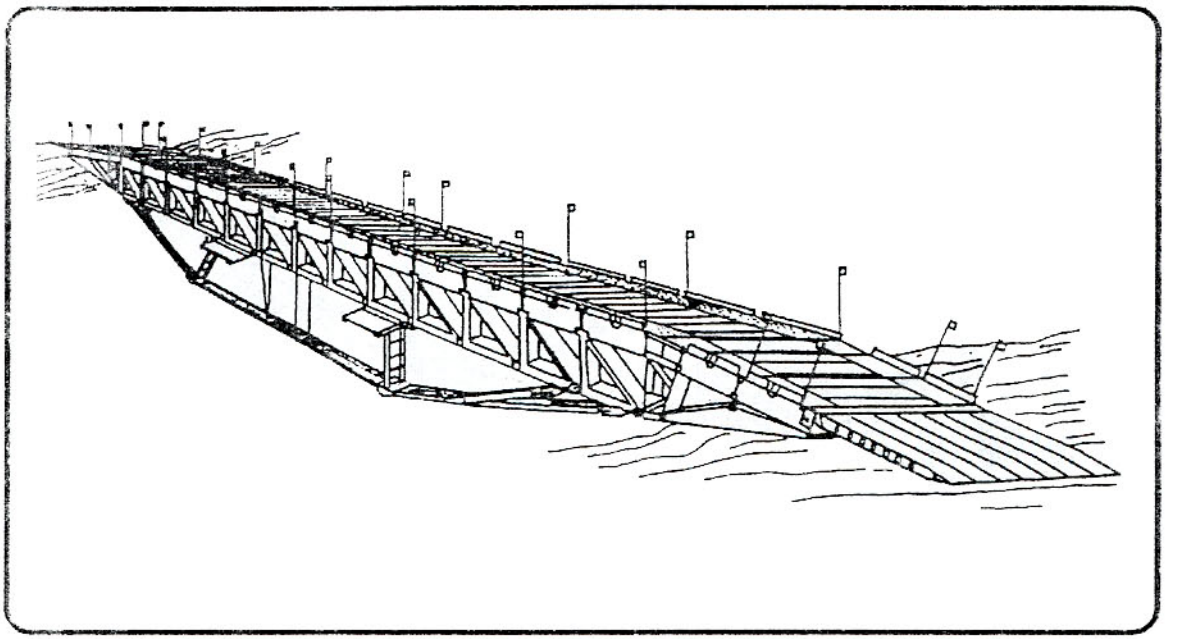
FM 5-212

MEDIUM GIRDER BRIDGE



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MEDIUM GIRDER BRIDGE

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PREFACE

This publication contains amendments to Technical Manuals (TMs) *5-5420-272-72, Operator and Organizational Maintenance Manual for Medium Girder Bridge (MGB) and 5-5420-272-72-7, Operator and Organization/ Maintenance Manual Link Reinforcement Set for the Medium Girder Bridge (MGB).*These TMs are being updated to correspond with information contained in this field manual. This publication describes design, recon reports, safety rules; and building, boom, and delaunch tables for the MGB.

The Bridging Branch, Department of Military Engineering, US Army Engineer School, has developed this design package with significant Input from Fairey Engineering, Ltd., The Royal School of Military Engineering (United Kingdom) and countless Engineer Officer Basic/Advanced Noncommissioned officer Course students attending resident instruction at Fort Belvoir.

The purpose of this publication is to standardize procedures and make the design process easy to understand. (Abbreviations for MGB design are included In the glossary.) No longer will engineers have to count boxes and squares on scaled paper to employ the MGB.

The proponent of this publication Is the US Army Engineer School, Submit changes for improving this publication on DA Form 2028 (Recommended Changes to Publications and Blank Forms), and forward it to Commandant, US Army Engineer School, ATTN: ATSE-Z-BTD-P, Fort Belvoir, VA 22060-5291.

Unless otherwise stated, whenever the masculine gender is used, both men and women are included.

Chapter 1

Medium Girder Bridge Components

The medium girder bridge (MGB) is lightweight, hand-built, bridging equipment, it can be built in various configurations to provide a full range of bridging capability for use both in the forward battle area and in the communications zone. Speed of erection by few soldiers is its major characteristic.

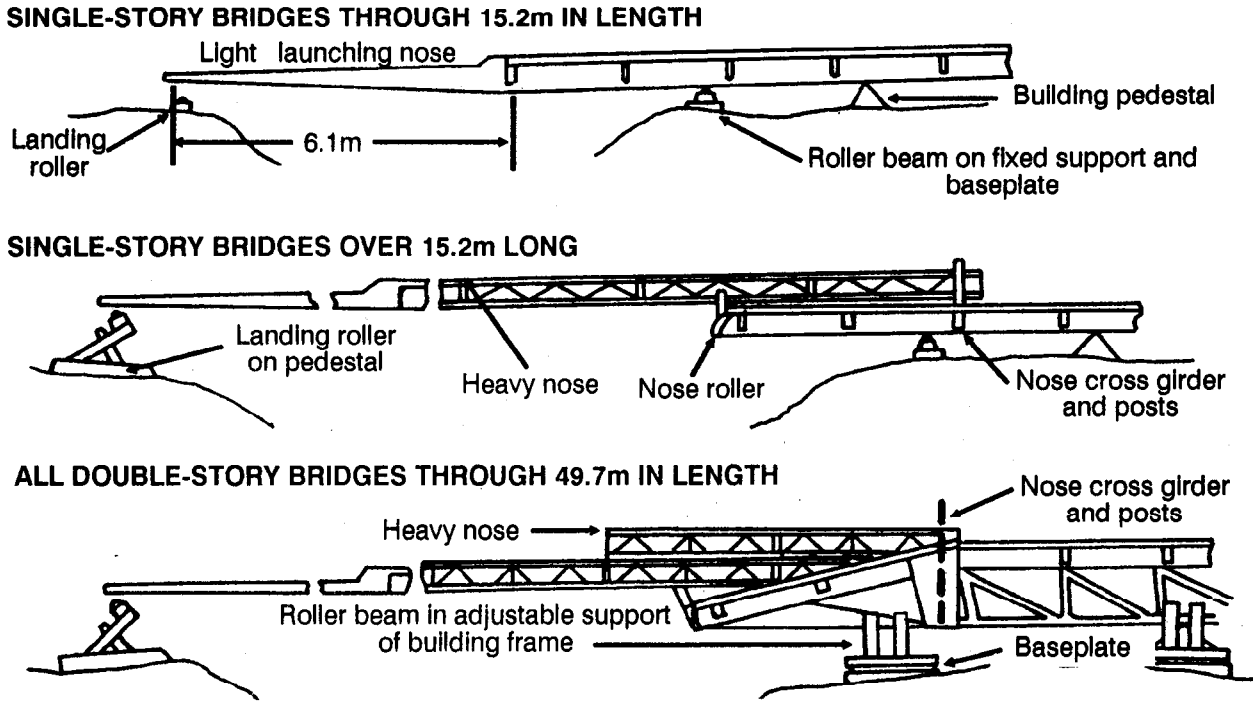
The MGB parts are fabricated from a specially developed zinc, magnesium, and aluminum alloy (DGFVE 232A). This enables a lightweight, high strength bridge to be built. All except three parts weigh under 200 kg. Most parts can be handled easily by four soldiers. The three heavier parts, used in limited quantities. are six-man loads.

The MGB is a two-girder, deck bridge. The two longitudinal girders, with deck units between, provide a 4.0m wide roadway. Girders of top panels can form a shallow, single-story configuration. This type of bridge is used for short spans that will carry light loads. A heavier double-story configuration using top panels and triangular bottom panels is used for heavy loads or longer spans. Single-story bridges can be constructed by 9 to 17 soldiers. The normal building party for double-story bridges is 25 soldiers.

The bridge can be supported on unprepared and uneven ground without grillages. It is constructed on one roller beam for single-story construction; two roller beams, 4.6m apart, for double-story construction; and on three roller beams when constructing a double-story bridge over 12 bays long. The ends of the roller beams are supported on base plates and each can be adjusted in height. No leveling or other preparation of the ground is required. Single-span bridges are launched using a centrally mounted launching nose (Figure 1).

A third configuration using the link reinforcement set (LRS) is constructed when a long, high class type of bridge is required. The LRS deepens the girder and transfers the load throughout the length of the bridge. This type of

Figure 1. **Launching nose configuration**



construction requires a building party of 34 soldiers, and is built on three roller beams.

ADVANTAGES OF THE MGB/LRS

Lightweight – no component requires more than six soldiers to lift or carry.

Easy to assemble – components have special alignment aids built into them.

Minimal maintenance – very little lubrication require.

Air transportable – in either standard pallet loads or in partially assembled bridge configurations.

Compatibility – all US components will fit MGBs in use by allies, except for launching nose cross girder (LNCG) posts.

DISADVANTAGES OF THE MGB/LRS

Length - Maximum length is 49.7m.

Military Load Class (MLC) - MLC is 60, not 70.

MAJOR PARTS (See Figure 2).

Top panel.

Bankseat beam.

Bottom panel.

Junction panel.

End taper panel.

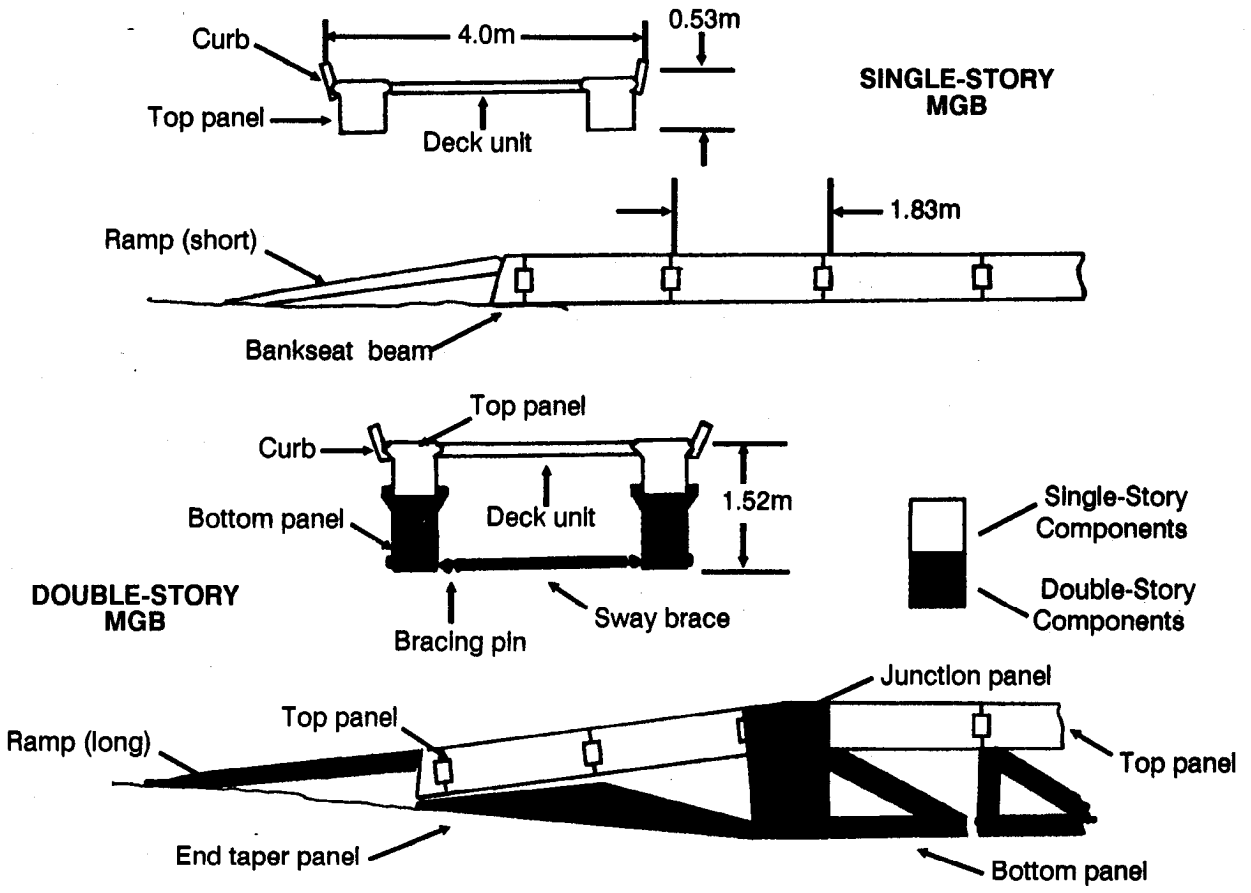
Ramps – US (long) and UK (short).

Deck unit.

ALLOCATION/CAPABILITIES

An MGB company (corps level) is issued four bridge sets, two erection sets, and two link reinforcement sets. These are divided between two platoons.

Figure 2. **Location of components in bridge configurations**



COMPONENT LISTS

Bridge Set

Item description and quantity

Bag, equipment – 8
Basket, equipment – 14
Beam assembly, bankseat – 7
Brace, sway – 19
Clip, retainer –94
Curb assembly– 42
Deck– 74
Guide assembly, marker – 24
Panel assembly, end taper –5
Panel assembly, bottom – 26
Panel assembly, junction – 5
Panel assembly, top – 34
Pin, bracing – 68
Pin, panel – 92
Pin, panel, headless -5
Ramp assembly, short – 29
Ramp assembly, long – 15

Bridge Erection Set

Item description and quantity

Adapter, push bar– 2
Bag, equipment – 2
Bar, carrying – 46
Bar assembly, launching –2
Basket, equipment – 61
Beam assembly, roller– 4
Cable, extractor – 1
Clip, retainer – 56
Girder assembly, launching –2
Girder, cross frame – 3
Girder, longitudinal* – 3
Girder, push bar – 2
Handle, carrying – 46
Jack, bridge, 15-ton – 7
MGB pallet, truck mounted – 13
Rear bumper assembly – 13
Lug, tie-down, steel – 104
Stray assembly, 5,000-pound capacity – 52
Strap assembly, 10,000-pound capacity –117
Tie-down, cargo, 10,000-pound – 26
MGB pallet, trailer mounted – 12
Adapter, pallet – 12
Bracket adapter, with hardware –48
Rear bumper assembly – 12
Strap assembly, 5,000-pound capacity – 28
Strap assembly, 10,000-pound capacity – 108
Tie-down, cargo, 10,000-pound – 48
Nose assembly, launching – 8
Nose, light, front – 5
Nose, light, rear – 5
Panel erection aid –3
Pedestal assembly, adjustable, MKI – 2
Pedestal, building – 7
Pin, anchorage** – 10
Pin, bracing – 8
Pin, launching nose –23
Pin, panel – 20
Plate, base, DS – 6
Plate, base, SS – 7
Post assembly, jacking – 4
Bracket, lifting – 4
Post, launching nose –2
Roller assembly, landing– 4

** Issued in some sets though not required.*
*** Transfer from link reinforcement set.*

[Items with separate national stock numbers (NSNs) that together with other item(s) in brackets comprise an assembly.

Roller assembly, launching – 2
Seat, building frame, jack – 5
Support assembly, adjustable – 6
Support assembly, fixed – 7
Support, jacking – 5
Sling, steel, wire – 1

Link Reinforcement Set
Item description and quantity

Anchor assembly – 4
Antiflutter tackle – 5
Bag, equipment – 2
Bar assembly, launching – 2
Basket, equipment – 4
Bearer, footwalk – 10
Bracket, jacking – 2
Capsill, bridging – 1
Clip, retainer – 150
Davit post assembly – 2
Footwalk, bridge – 4
Hammer, hand, nylon – 4
Jack, bridge, 20-ton – 2
Link, launching, two-tier – 3
Link, reinforcing, long – 20
Link, reinforcing, short – 4
[MGB pallet, truck mounted - 1
Rear bumper assembly – 1
Lug, tie-down, steel – 8
Strap assembly, 5,000-pound capacity – 4
Strap assembly, 10,000-pound capacity – 9
Tie-down, cargo, 10,000-pound – 2
[MGB pallet, trailer mounted - 1
Adapter, pallet – 1
Bracket, adapter, with hardware – 1
Rear bumper assembly – 1
Strap assembly, 5,000-pound capacity – 4
Strap assembly, 10,000-pound capacity – 9
Tie-down, cargo, 10,000-pound – 4
Nose assembly, launching – 6
Pedestal assembly, adjustable, MKII – 2
Pin, anchorage* – 10
Pin, bracing – 22
Pin, capsill – 3
Pin, launching – 40
Post, footwalk – 10
Post-tensioning assembly – 4
Puller assembly, tirfor, T-35 – 2
Roller assembly, rocking – 2
Rope, guard – 4
Seat, building frame, jack – 2
Tackle, light – 20
Wrench, ratchet, 3/4-inch – 2

Expendable Supplies and Materials (per bridge set)
Item description and unit of issue

Grease, automotive – lb can
Oil, lubricating, GP, MIL-L-7870A – gal can
Coating compound, metal retreatment – gal can
Primer coating, phenolic resin – gal can
Enamel, alkyd, camouflage forest green – gal can
Enamel, lustreless, white – gal can
Walkway compound, OD – gal can
Cleaning solvent – gal can
Lumber, softwood, 3 x 8“ x 14’ – 40 each required. Cut into lengths to obtain:
144 pieces 3“ x 8 x 36
4 pieces 3“ x 8 x 84

* *Transfer to bridge erection set.*
[Items with separate NSNs that together with other item(s) in brackets comprise an assembly.

MGB DESIGN

STEP 1. Measure the angle of repose (AR) gap. This step is common to all lengths and configurations.

Select a bridge centerline. The centerline should extend from a point approximately 15.2m on the far bank to a point approximately 45.7m on the near bank. This will ensure that there is space on the far bank for vehicle egress and space on the near bank for the R distance of any bridge length. There should be sufficient clear area extending out 3.0m on both sides of the centerline for its full length to allow for bridge construction.

Determine the location of firm ground on the near and far banks.

(1) For the field method of determining firm ground, assume the AR of the soil to be 45 degrees.

(2) At the edge of firm ground on the near bank, place the A' peg. At the edge of firm ground on the far bank, place the A peg. The distance between the two pegs is known as the AR gap. Keep in mind that the MGB must not bear on the ground at either end for more than 2.1 m (SS) or 2.3m (DS), regardless of its length.

If actual slope of bank **does not** exceed 45 degrees horizontal, place A and A' pegs as shown in **a** or **b** below.

If actual slope of bank **does** exceed 45 degrees from the horizontal, place A and A' pegs a distance H from the toe of slope which is equal to the height of the bank measured from the toe of slope to the top of the gap, as shown in **c** below.

NOTE: Gaps below are shown with one prepared and one unprepared abutment. Actual sites may be any combination of examples shown.

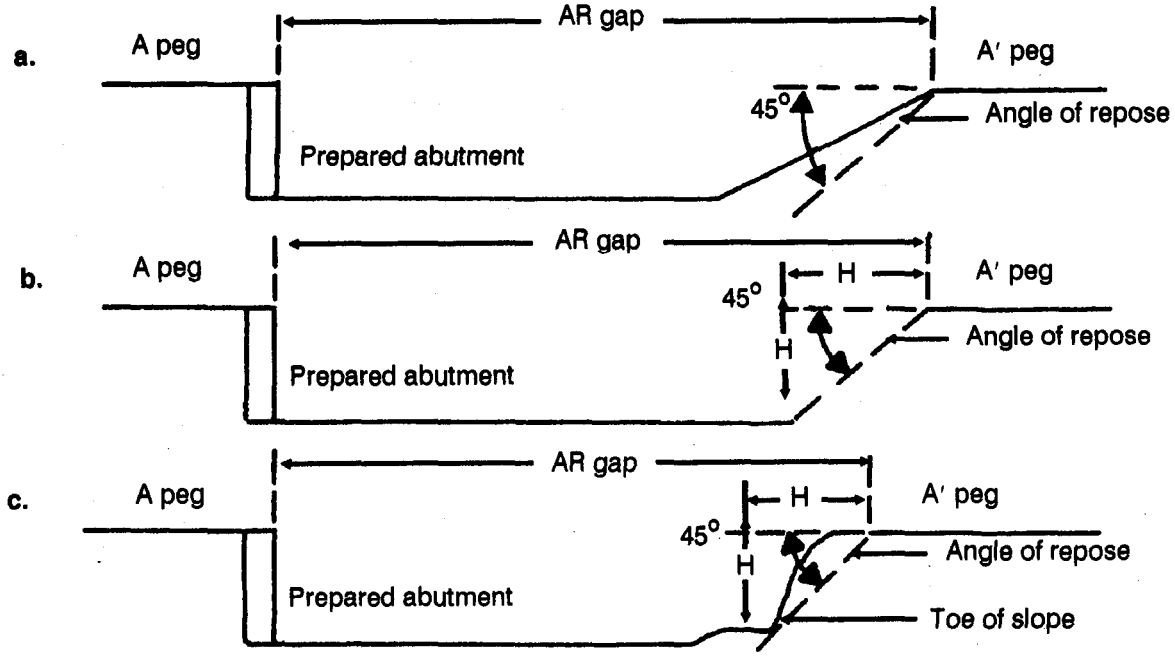
c. Measure the distance from the edge of firm ground on the near bank (A' peg locatlon) to the edge of firm ground on the far bank (A peg location) using one of the methods described below. This distance is known as the AR gap.

(1) Triangulation method.

(2) A string line with a weight attached thrown across the gap and measured while being retrieved.

(3) If in a relatively secure area and site conditions allow, a tape measure should be used.

d. Select the type of bridge to be built, based on resources available, the MLC desired, and the AR gap.



Chapter 2

MGB 4-12 BAY SS DESIGN

STEP 1. Measure the AR gap (see page 5).

STEP 2. Select a bridge.

Using column (a) of Table 1 or 2, (shown on page 7) choose a bridge length whose AR gap range brackets the AR gap measured. Always select the smallest range possible to avoid wasting assets. For example, if the AR gap measured 9.5m, choose the AR gap range of 7.4m to 9.8m, even though the range of 9.2m to 11.6m also meets the criteria. Read the bay configuration column (c), and check the MLC of the bridge column (d) to ensure that it meets what is specified by the tasking authority.

STEP 3. Read the bridge length column (b).

STEP 4. Read and note the R distance column (f).

STEP 5. Read and note the nose configuration column (e).

STEP 6. Identify key construction points as follows:

F peg – Designates the approximate location of the far bank bankseat beam. Initially placed 0.9m from A peg on far bank.

RB peg – Designates the position of the roller beam (RB). It may be located in one of two different positions depending upon launch method used, push launch (4 through 8 bays) or jack launch (4 through 12 bays).

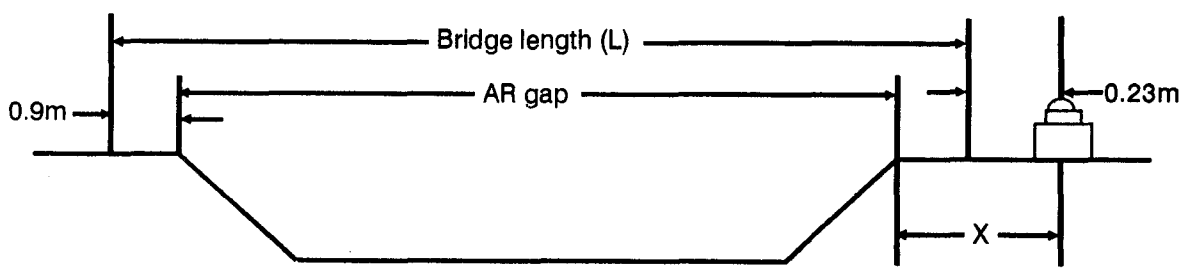
NOTE: Push launches are to be performed only in an actual wartime bridge operation. **Push launches are no longer performed for training or demonstration purposes.**

Push launch - The distance to the RB peg is calculated by using the position of the A' peg on the near bank, the bridge length (L), AR gap, minimum bearing requirement (0.9m), and the approximate distance the bridge falls in front of the roller beam (0.23 m). This distance is X.

X = (bridge length + 0.23m) - (AR gap + 0.9m)

NOTE: To adhere to minimum/maximum bearing rules without having to dig out or pack up under the end of bridge, you must ensure that the RB peg is placed between 1.113m and 2.33m from the A' peg.

Jack launch -The distance to the RB peg is calculated by using the position of A' peg on the near bank, the bridge length, AR gap, minimum bearing requirement (0.9m), and the approximate distance required behind the roller beam to attach



the jacks (0.23m). This distance is X.
X = (bridge length - 0.23m) - (AR gap + 0.9m)

NOTE: To adhere to minimum/maximum bearing rules without having to dig out or pack up under the end of bridge, you must ensure that the RB peg is placed between 0.67m and 1.87m from the A' peg.

O peg – Marks the clear distance behind the roller beam required to construct the bridge. It is positioned by measuring the R distance, Table 1 or 2, column (f), behind the RB peg.

Adjust the position of the F peg, if required, and determine the final position of the bridge on the near bank (F' peg).

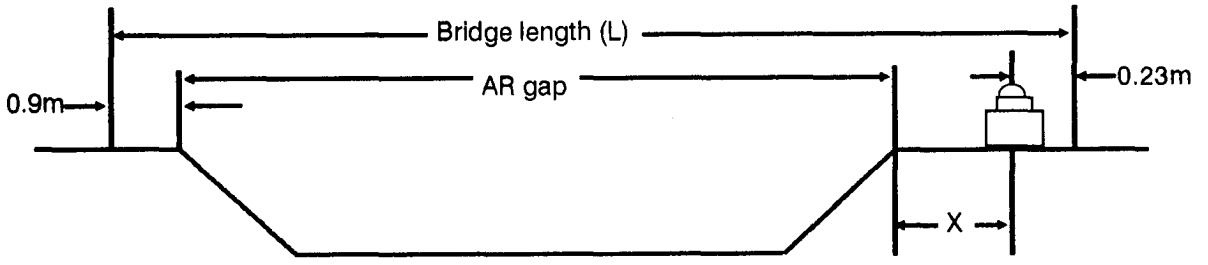


Table 1. **Bridges 4 through 8 bays SS**

Site Dimensions						Launch Design			
						RB	RB	N	N
AR Gap (a)	L (b)	Bays (c)	MLC (d)	Nose (e)	R Dist (f)	BP Only (g)	BP + DU Only (h)	BP Only (i)	BP + DU Only (j)
3.7–6.1	7.9	4	60	LLN Only	5.8	0.43	0.60	1.30	1.75
5.6–8.0	9.8	5			6.7			1.14	1.68
7.4–9.8	11.6	6	40		7.6			1.07	1.60
9.2–11.6	13.4	7	30		9.5			0.76	0.91
11.0–13.4	15.2	8			11.3			0.38	0.84

Table 2. **Bridges 9 through 12 bays SS**

Site Dimensions						Dimension N above line through ground at RB & O when rear BSB is on ground. The RB is on BP or BP & DU, & LNCG is on 4, 2, or 1.					
						LNCG Settings					
						4		2		1	
AR Gap (a)	L (b)	Bays (c)	MLC (d)	Nose (e)	R Dist (f)	BP Only (g)	BP + DU (h)	BP Only (i)	BP + DU (j)	BP Only (k)	BP + DU (l)
12.9–15.3	17.1	9	24	5N1	10.4	–0.76	–0.08	0.61	1.14	1.83	2.36
14.7–17.1	18.9	10	20		12.2	–0.99	–0.61	0.38	0.76	1.60	1.98
16.5–18.9	20.7	11		6N1		–1.37	–1.07	0.15	0.48	1.83	2.44
18.4–20.8	22.6	12	16		14.0	–2.13	–1.60	–0.46	0.08	1.07	1.60

NOTES: (These notes apply to both Table 1 and Table 2.)

1. An extra 0.075m of clearance can be obtained by lifting on the nose to remove the pin sag. Where levels are estimated, this should not be taken into account during design but left to compensate for any errors in calculating the value of H (for SS 4 through 8 bays).

2. An extra 0.6m of clearance can be obtained by lifting on the nose to remove the pin sag (for SS 9 through 12 bays).

3. Any additional packing under the RB will increase the vertical interval N by three times the thickness of the packing. For example, if the packing is 0.075m thick, N will be increased by 0.225m.

4. The table incorporates an allowance to ensure that the nose clears the landing roller (LR) when it is positioned 0.230m in front of point F.

Bearing Check. The minimum/maximum bearings for-any SS bridge up to and including 12 bays are shown in Table 3.

Table 3. **Bearings**

Bearing	Near Bank	Far Bank
Minimum	0.9m	0.9m
Maximum	2.1m	2.1m

To calculate the actual locations of the F and F' pegs, the following procedure is used:

Near bank bearing =
bridge length - (AR gap + 0.9m) where –

- Bridge length is obtained from column (b) of Table 1 or 2.
- The AR gap was measured by you in the first step of this design procedure.
- An assumption of 0.9m is made at this point in the calculation sequence because we know that this is the minimum acceptable bearing allowable on the far bank.

If the near bank bearing is within acceptable limits, you do not have to adjust the position of the F peg. Its final position will be the initial value that you assumed of 0.9m from the A peg. The F' peg will be located at a distance equal to the near bank bearing measured from the A' peg on near bank.

If the near bank bearing is greater than the maximum allowable (2.1m), you must do one of the following:

Move the F peg further away from its present assumed location to a point where the amount of bearing on the near bank is less than or equal to 2.1m, and greater than or equal to 0.9m. This will allow the F' peg to be placed at a suitable distance from the A' peg. The RB peg must be moved toward the gap the same distance the F peg is moved away from the gap. This will also move the O peg towards the gap.

Dig out the soil from the near bank until the maximum allowable bearing is not exceeded.

Crib up under the end of bridge upon completion.

Physically locate the key construction points on the ground and take elevations relative to the RB peg.

Locate O, RB, F, F', A, and A' pegs. Estimate elevations of F and O pegs relative to the RB peg. A positive value indicates a point higher than the RB peg and a negative value indicates a value lower than the RB peg. The RB peg will always be 0.0 elevation. Place the elevations on the baseline as shown in Figure 3.

Push launch:
X = (L + 0.23m) - (AR gap + 0.9m)

Jack launch:
X = (L- 0.23m) - (AR gap + 0.9m)

Check bearing to make sure you have not made a mistake.
Bearing FB + AR gap + Bearing NB = L

The critical points and definitions used in planning, designing, construction and launching of single-span MGB areas shown in Figure 4.

STEP 7. Slope check.

Ensure that the difference in elevation between the F' and F peg does not exceed one-tenth of the total bridge length. If it does, you will have to crib up, undertake a major construction project, or choose another centerline.

Figure 3. **Key construction points**

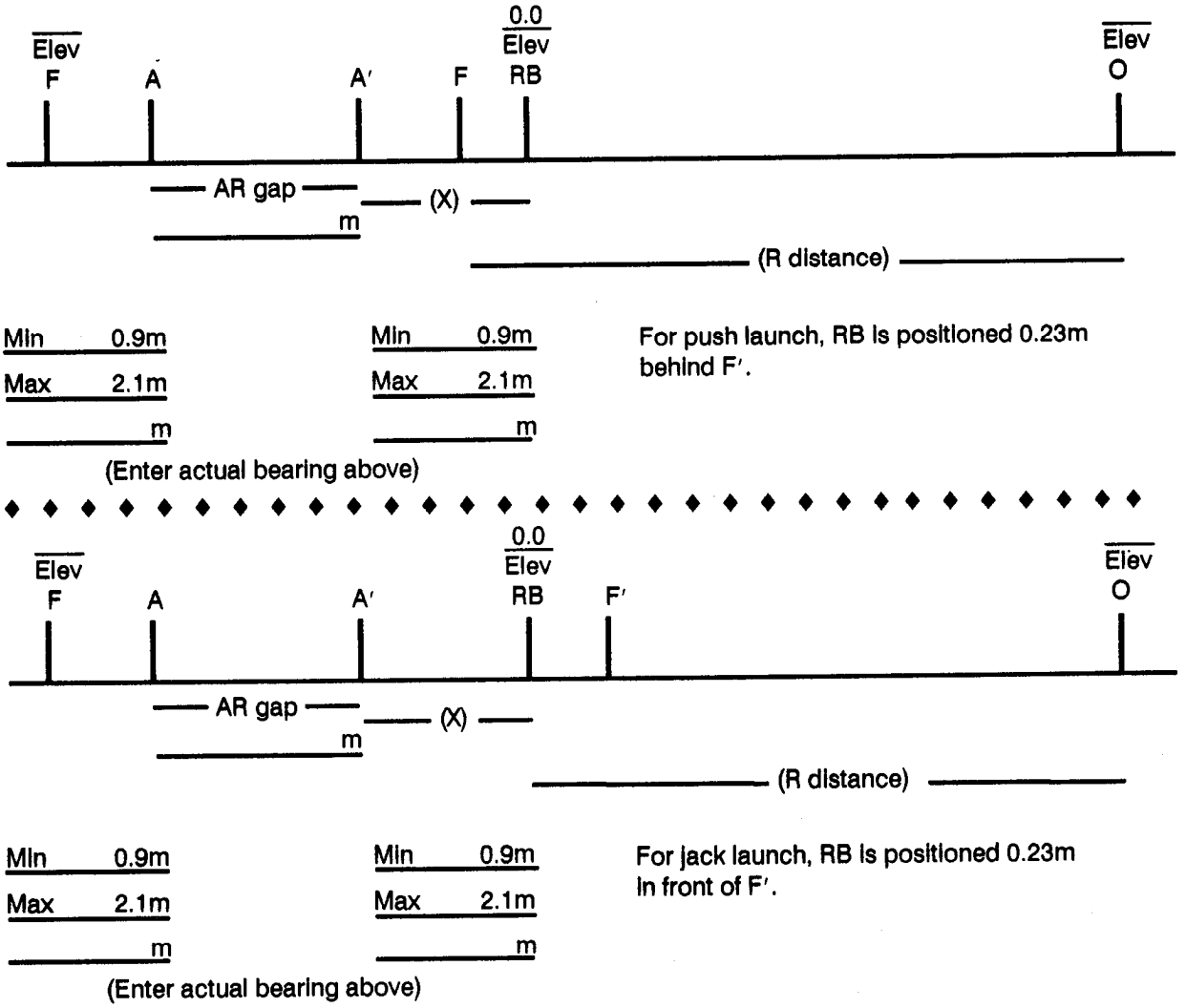
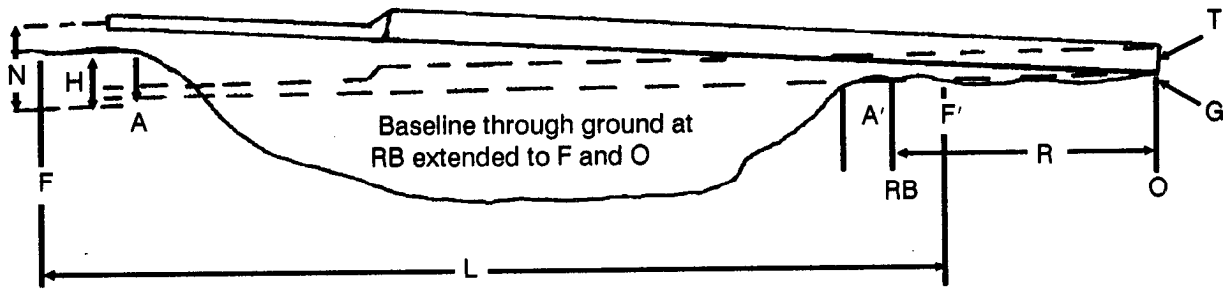


Figure 4. **SS MGB site layout**



STEP 8. Calculate the far bank height (H) relative to a baseline drawn through the ground level at the RB and O pegs as follows:

$$H = HtF + \frac{[HtO \times (L \pm A0.23)] + 0.23 \text{ if push launch}}{R \text{ distance } -0.23 \text{ if jack launch}}$$

STEP 9. Launch design:

4 through 8 bays:

RB packing. From Table 1 (page 7), columns (i) and (j), choose a nose lift N which is greater than H. If none is available, additional packing will be required under the deck unit (DU) (Table 1 and note 3 on page 8).

From column (i) and (j) or by calculation, determine the amount of packing required for the nose lift (N) required.

9 through 12 bays:

Choose an LNCG setting from Table 2, columns (g), (h), (i), (j), (k), or (l) to give a nose lift N greater than H.

If N is not greater than H, see note 3 (page 8) to increase N by additional packing.

STEP 10. Loads required. From Table 4, determine the truck and trailer loads required for the bridge.

STEP 11. From Table 5, extract the following information:

Construction time_____

Manpower requirements_____

STEP 12. Final design:

Bays _____

LNCG setting_____

Packing required _____

Bearing: NB _____ FB_____

Truck and trailer loads _____

Manpower required_____

Time to construct_____

Table 4. **MGB pallets SS**

Pallet Type	Number of Bays								
	4	5	6	7	8	9	10	11	12
Erection	1	1	1	1	1	1	1	1	1
Bridge	2	2	3	3	4	4	5	5	5
Total	3	3	4	4	5	5	6	6	6

Note: More vehicles are required to transport personnel. Erection pallets may only be partial depending on bridge being constructed.

Table 5. **Work parties and building times on good sites (firm dry ground)**

(a)	Single-Story		
	5 Bays 9.8m MLC 60 (b)	8 Bays 15.2m MLC 60 (c)	12 Bays 22.6m MLC 60 (d)
Work party	1 + 8	1 + 16	1 + 16
Time by day (hours)	1/2	3/4	1
Time by night (hours)	3/4	1	1 1/4

Note: For disposition of work parties, see Table 32, page 40.

CHAPTER 3

MGB 1-12 BAY DS DESIGN

STEP 1. Measure the AR gap (see page 5).

STEP 2. Select a bridge.

Using column (a) of Table 6, on page 12, choose a bridge length whose AR gap range brackets the AR gap measured. Always select the smallest range possible to avoid wasting assets. For example, if the AR gap measured 16.2m, choose the AR gap range of 14.0m to 16.3m, even though the range of 15.8m to 18.1m also meets the criteria. Read the bay configuration column (c), and check the MLC of the bridge column (d) to ensure that it meets what is specified by the tasking authority.

STEP 3. Read the bridge length column (b).

STEP 4. Read and note the R distance column (f).

STEP 5. Read and note the nose construction column (e).

STEP 6. Identify key construction points.

These points are constant for any DS bridge construction up to and including 2E + 12 bays (Figure 5).

F peg - Designates the approximate location of the far bank bankseat beam. Initially placed 0.9m from A peg on far bank.

FRB peg - Designates the position of the front roller beam (FRB). It is placed 0.9m from the A' peg on the near bank as measured to the centerline (℄) of the roller beam.

RRB peg - designates the position of the rear roller beam (RRB). It is placed 4.6m from the FRB (measured ℄ to ℄).

O peg - Marks the clear distance behind the front roller beam required to construct the bridge. It is positioned by measuring the R distance, Table 6, column (f), behind the FRB peg.

Figure 5. **Key construction points for DS MGB 1 through 12 bays**

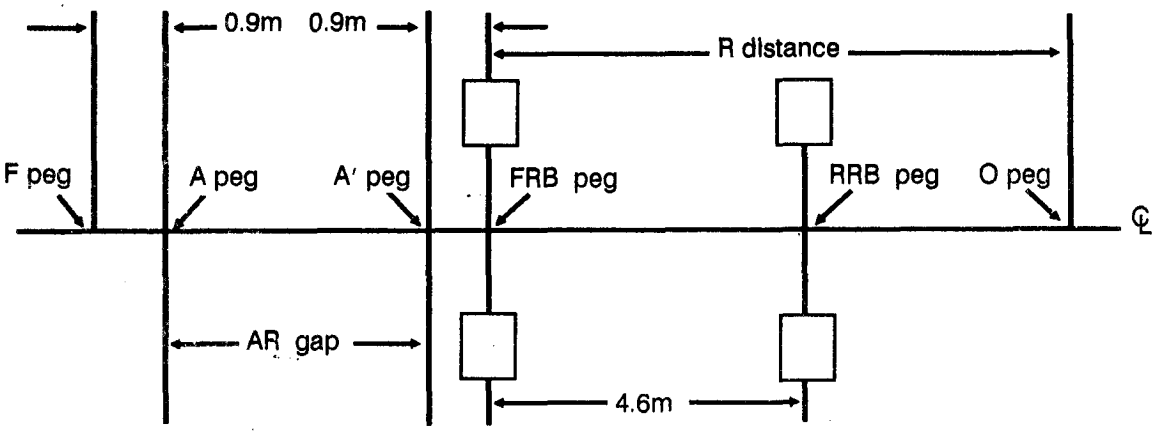


Table 6. **DS MGB design 2E + 1 through 2E + 12 bays (all measurements are in meters)**

Site Dimensions						Rule 1 D for given LNCG setting with FRB in lowest position				Rule 2 Nose lift N using various LNCG settings and FRB in lowest position				Launch Design: Other methods of adjusting N & T — Rule 3 Raise FRB & RRB by 0.69m		Rule 4a Lower RRB to increase N	Rule 4b Lower FRB to increase T
AR Gap (a)	Brg Lgth (b)	2E + # of bays (c)	MLC (d)	Nose* Const (e)	R Dist (f)	W Dist (g)	Hole #6 ** (h)	Hole #4 ** (i)	Hole #2 ** (j)	Tail Lift T (k)	Hole #6 ** (l)	Hole #4 ** (m)	Hole #2 ** (n)	N (o)	T (p)	N (q)	T (r)
6.7 – 9.0	11.3	1	All DS MGB are MLC 60	2N1	10.0	–	–	–	–	0.55	1.02	1.48	2.04	N Rule 3 = N Rule 2 + 0.69m	1.24	1.75 (1.24–G)	0.2 (N Rule 3 – H)
8.5 – 10.8	13.1	2		3N1	11.9	–	–	–	–		0.89	1.53	2.30				
10.3 – 12.6	14.9	3			12.2	–	–	–	–		0.86	1.50	2.28				
12.2 – 14.5	16.8	4			13.1	–	–	–	–		0.81	1.45	2.23				
14.0 – 16.3	18.6	5		4N1	14.9	–	–	–	–	0.52	0.70	1.52	2.51		1.21	1.75 (1.21–G)	
15.8 – 18.1	20.4	6				–	–	–	–		0.65	1.48	2.47				
17.7 – 20.0	22.3	7			15.8	13.1	0.70	0.31	–0.09		0.53	1.36	2.36				
19.5 – 21.8	24.1	8		5N1	16.6	15.0	0.67	0.25	–0.20	0.46	0.49	1.48	2.69		1.15	1.75 (1.15–G)	
21.3 – 23.6	25.9	9			17.7	16.5	0.64	0.21	–0.30		0.33	1.35	2.55				
23.1 –25.4	27.7	10			18.5	17.6	0.60	0.12	–0.40		0.25	1.28	2.49				
25.0 – 27.3	29.6	11		6N1	20.4	19.5	0.50	0.04	–0.43	0.40	0.16	1.23	2.63		1.09	1.75 (1.09–G)	
26.8 – 29.1	31.4	12			21.6	19.2	0.46	–0.06	–0.58		–0.20	1.02	2.47				

* Each nose includes a complete light nose.

** Nose cross girder setting 6, 4, and 2 is the position of the cross girder resting on the 6th, 4th, and 2d hole from the bottom of the LNCG post.

Bearing Check. The minimum/maximum bearings for any DS bridge up to and including 2E + 12 bays are shown in Table 7.

Table 7. **Bearings**

Bearing	Near Bank	Far Bank
Minimum	1.4m	0.9m
Maximum	2.3m	2.3m

To calculate the actual locations of the F and F' pegs, the following procedure is used:

Near bank bearing =
bridge length - (AR gap + 0.9m) where–

- Bridge length is obtained from column (b) of Table 6.
- The AR gap was measured by you in the first step of this design procedure.
- An assumption of 0.9m is made at this point in the calculation sequence because we know that this is the minimum acceptable bearing allowed on the far bank.

If the near bank bearing is within acceptable limits, you do not have to adjust the position of the F peg. Its final position will be the initial value that you assumed of 0.9m from the A peg. The F' peg will be located at a distance equal to the near bank bearing measured from the A' peg on the near bank.

If the near bank bearing **is greater than** the maximum allowable (2.3m), you must do one of the following:

Move the F peg further away from its present location to a point where the amount of bearing on the near bank **is less than or equal to** 2.3m, and **greater than** or **equal to** 1.4m. This will allow the F' peg to be placed at a suitable distance from the A' peg.

Crib up the near bank end of bridge to where the maximum allowable bearing **is not** exceeded.

Dig out the soil from the near bank until the maximum allowable bearing is not exceeded.

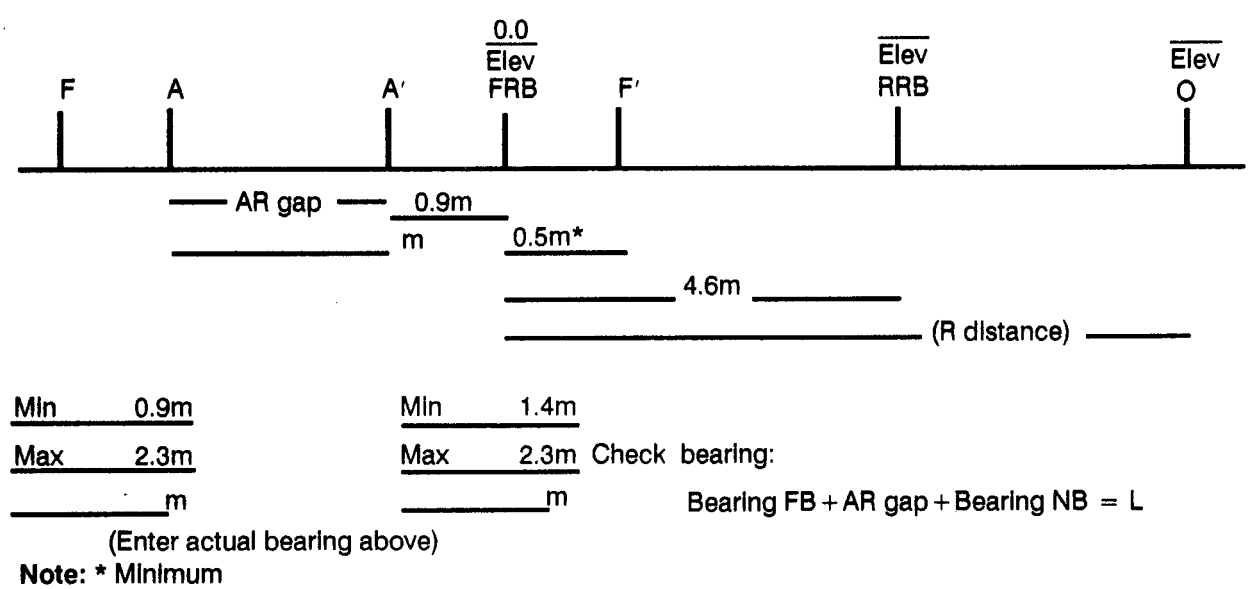
Physically locate the key construction points (Figure 6) on the ground and take elevations relative to the FRB.

Locate O, RRB, F', FRB, A', A, and F pegs on the ground along the centerline of the bridge.

Estimate elevations of F, RRB, and O pegs relative to the FRB peg. Positive value indicates that a point is above the FRB peg and a negative value indicates that a point is below the FRB peg. The FRB peg will always be 0.0 elevation.

Place the key construction point elevations and distances on the baseline below (Figure 6).

Figure 6. **Key construction points**



STEP 7. Slope check.

Ensure that the difference in elevation between the F and F' pegs does not exceed one-tenth of the total bridge length. If it does, you are either going to have to crib up, undertake a major construction project, or choose another centerline. Note that the elevation of the F' peg cannot be lower than the elevation of the FRB or the bridge will not receive full bearing. In these cases, the normal procedure is to crib up or fill in until the elevation of the F' peg is at least as high as the FRB. Otherwise, you would have to remove the soil next to the bank to the level of the F' peg, This rule also applies to the F peg.

STEP 8.

Calculate the far bank height (H), near bank tail clearance (G) relative to the baseline, and the distance of water below a line joining FRB and F (C) using these formulas:

$$H = HtF + \frac{HtRRB \times (L - 0.5)}{4.6}$$

$$G = HtO - \frac{HtRRB \times R\ distance}{4.6}$$

$$C = HtWL - \frac{HtF \times W\ distance}{(L - 0.5)}$$

STEP 9. *RULE 1*

If both bank heights **are greater than** 0.6m above the waterline, go to RULE 2. See Table 6, page 12.

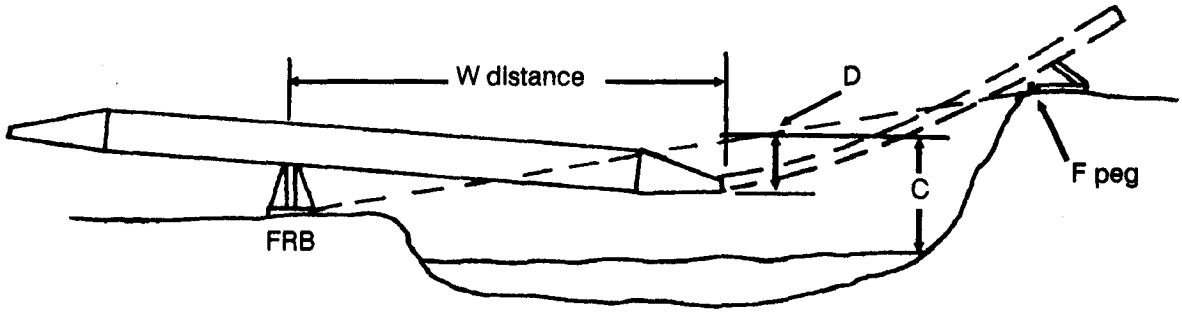
If either or both bank heights **are less than** 0.6m from the waterline, choose an LNCG setting from column (h), (i), or (j) so that C **is greater than** D to avoid immersion in water, and go to RULE 2.

If C **is greater than** D, go to RULE 2.

If C **is not greater than** D and the water is not flowing, go to RULE 2.

If C **is not greater than** D and immersion in water **is less than** 0.3m and the current speed is less than 5 meters per second (reps), it is not essential to adjust the LNCG setting. Therefore, go to RULE 2.

If C **is not greater than** D and the current speed **is greater than** 5 mps, another site must be chosen.

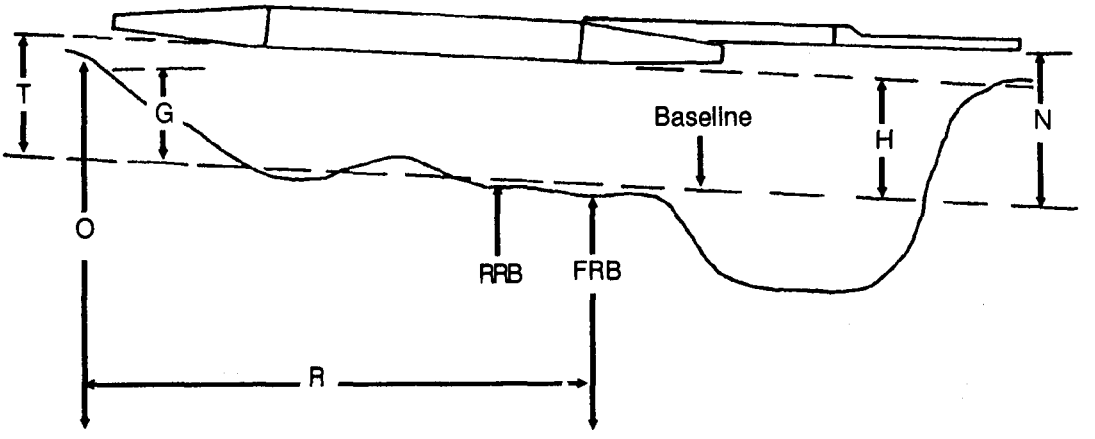


Definitions:

C – Distance of waterline below line joining banks at a distance W from FRB (negative number).

D – Deflection of end taper panel line joining banks at critical distance W.

W – Distance of end taper panel from FRB for maximum deflection.



STEP 10. *RULE 2*

Using the LNCG settings from RULE 1, choose a setting from column (l), (m), or (n) (whichever is allowable from RULE 1) which gives an N greater than H. If none of the choices meet the criterion, choose the highest value available.

Check to see if the T value from column (k) **is greater than** G. If N **is not greater than** H, or if T **is not greater than** G, proceed to RULE 3.

If N **is greater than** H and T **is greater than** G, the LNCG setting chosen has adequate nose lift and the bridge selected has adequate tail clearance.

STEP 11. *RULE 3*

Raise both the FRB and RRB by 0.69m to increase nose clearance (N) and tail clearance (T).

N RULE 3 = N RULE 2 + 0.69m

T RULE 3 = Value obtained from column (p).

If N RULE 3 **is not greater than** H and T RULE 3 **is greater than** G, proceed to RULE 4a, column (q)

If N RULE 3 **is greater than** H and T RULE 3 **is not greater than** G, proceed to RULE 4b, column (r).

If N RULE **3 is greater than** H and T RULE 3 is **greater than** G, the bridge has adequate nose and tail clearance for launching.

STEP 12. *RULE 4a*

Lowering the RRB. If there is ample tall clearance, some increase in N can be obtained by keeping the FRB in its highest position and lowering the RRB to its lowest position. The mathematical equation for this process is shown under column (q).

N RULE 4a = N RULE 3 + Value N calculated from the equation shown under column (q).

T RULE 4a = T RULE 3

STEP 13. *RULE 4b*

Lowering the FRB. If there is ample nose clearance, some increase in T can be obtained by keeping the RRB in its highest position and lowering the FRB to its lowest position. The mathematical equation for this process is shown under column (r).

T RULE 4b = T RULE 3 + Value T calculated from the equation shown under column (r).

N RULE 4b = N RULE 3

STEP 14. Loads required.
From Table 8, determine the truck and trailer loads required for the bridge.

STEP 15. From Table 9, extract the following information:
Construction time_____
Manpower requirements_____

STEP 16. Final design:
2E +_____ bays
LNCG setting _____
FRB setting _____
RRB setting _____
Bearing: NB _____ FB _____
Truck and trailer loads _____
Manpower required _____
Time to construct _____

Table 8. **MGB pallets DS**

Pallet Type	Bays											
	1	2	3	4	5	6	7	8	9	10	11	12
Erection	1	1	1	1	1	1	1	1	1	1	1	1
Bridge	5	5	5	6	6	6	7	7	7	8	8	8
Total	6	6	6	7	7	7	8	8	8	9	9	9

Note:
More vehicles are required to transport personnel.

Table 9. **Work parties and building times on good sites (firm dry ground)**

(a)	Double-Story 4 Bays 16.8m MLC 60 (b)	8 Bays 24.1m MLC 60 (c)	12 Bays 31.4m MLC 60 (d)
Work party	1 +24	1 + 24	1 + 24
Time by day (hours)	3/4	1	1 1/2
Time by night (hours)	1 1/4	1 1/2	2

Notes:
1. All timings exclusive of work on approaches.
2. Add 20 percent for untrained personnel.
3. Add 30 percent for adverse site conditions.
4. For disposition of work parties, see Table 32, page 40.

CHAPTER 4

MGB 13-22 BAYS WITHOUT LRS

(where water level or any obstructions are at least 2.7m below bank heights)

STEP 1. Measure the AR gap (see page 5).

STEP 2. Select a bridge.

Using column (a) of Table 10, choose a bridge whose AR gap range brackets the AR gap measured. Always select the smallest range possible to avoid wasting assets. For example, if the AR gap measured 34.2m, choose the AR gap range of 32.3m to 34.6m, even though the range of 34.1m to 36.4m also meets the criteria. Read the bay configuration column (c). Check the MLC of the bridge column (d) to ensure that it meets what is specified by the tasking authority.

STEP 3. Read the bridge length column (b).

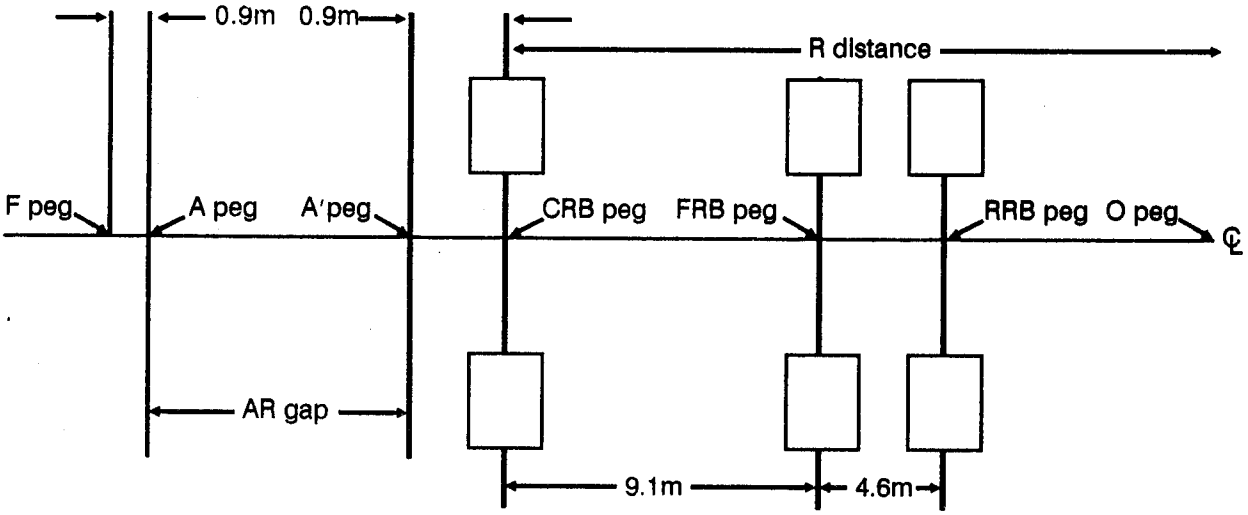
STEP 4. Read the R distance column (f).

Table 10. **DS MGB 2E + 13 through 2E + 22 bays without LRS (where water or any obstructions are at least 2.7m below bank heights)**

Site Dimensions						Launch Design							
						Rule 1 Nose lift N with nose cross girder at –				Other methods of adjusting N & T			
										Rule 2 Raise RRB & CRB by 0.25m		Rule 3a Lower RRB to Increase N	Rule 3b Lower CRB to Increase T
AR Gap (a)	Brg Lgth (b)	2E + # of Bays (c)	MLC (d)	Nose Const * (e)	R Dist (f)	Tail Lift T (g)	Hole #6 ** (h)	Hole #4 ** (i)	Hole #2 ** (j)	N (k)	T (l)	N (m)	T (n)
28.6–30.9	33.2	13	50	6N1	27.4	0.40	–0.07	1.49	2.68	2.93	0.65	1.9 (0.82–G)	0.2 (2.93–H)
30.5–32.8	35.1	14		7N1	28.7	0.37	–0.38	1.00	2.65	2.90	0.62	1.9 (0.79–G)	0.2 (2.90–H)
32.3–34.6	36.9	15	40			0.34	–0.49	0.90	2.55	2.80	0.59	1.9 (0.76–G)	0.2 (2.80–H)
34.1–36.4	38.7	16			29.6	0.30	–0.61	0.79	2.43	2.68	0.55	1.9 (0.72–G)	0.2 (2.68–H)
35.9–38.2	40.1	17	30	8N1	29.3	0.27	–0.15	0.75	2.69	2.94	0.52	1.9 (0.69–G)	0.2 (2.94–H)
37.8–40.1	42.4	18				0.24	–1.33	0.54	2.54	2.79	0.49	1.9 (0.66–G)	0.2 (2.79–H)
39.6–41.9	44.2	19	24	6N1 + 3N2	34.8	0.21	–2.04	–0.19	1.72	1.97	0.46	1.9 (0.63–G)	0.2 (1.97–H)
41.4–43.7	46.0	20			38.4		–1.93	–0.31	1.61	1.86			0.2 (1.86–H)
43.3–45.6	47.9	21	20			0.18	–2.65	–0.52	1.17	1.42	0.43	1.9 (0.69–G)	0.2 (1.42–H)
45.7–47.4	49.7	22	16		40.1	0.15	–2.58	–0.68	1.04	1.29	0.40	1.9 (0.57–G)	0.2 (1.29–H)

* Each nose includes a complete light nose.
** Nose cross girder setting 6, 4, and 2 is the position of the cross girder resting on the 6th, 4th, and 2d hole from the bottom of the LNCG post.

Figure 7. **Key construction points for DS MGB 13 through 22 bays without LRS**



STEP 5. Read and note the nose construction column (e).

STEP 6. Identify key construction points.

These are constant for any DS bridge construction 13 through 22 bays without LRS (Figure 7).

F peg – Designates the approximate location of the far bank end of bridge. It is initially placed 0.9. from A peg on far bank.

CRB peg – Designates the location of the capsill roller beam. It is placed 0.9m from the A' peg on near bank as measured to the centerline of the capsill roller beam.

FRB peg – Designates the location of the front roller beam. It is placed 9.1m from the CRB peg to the centerline of the front roller beam.

RRB peg – Designates the location of the rear roller beam. It is placed 4.6m from the the FRB peg (measured centerline to centerline).

O peg – Marks the clear distance behind the capsill roller beam required to construct the bridge. It is positioned by measuring the R distance, Table 10, column (f), behind the CRB peg.

Table 11. **Bearings**

Bearing	Near Bank	Far Bank
Minimum	1.4m	0.9m
Maximum	2.3m	2.3m

Bearing Check. The minimum/maximum bearings for any DS bridge 2E + 13 through 2E + 22 bays are shown in Table 11.

To calculate the actual locations of the F and F' pegs, the following procedure is used:

Near bank bearing =
bridge length - (AR gap + 0.9m) where –

- Bridge length is obtained from column (b) of Table 10.
- The AR gap was measured by you in the first step of this design procedure.
- An assumption of 0.9m is made at this point in the calculation sequence because we know that this is the minimum acceptable bearing allowed on the far bank.

If the near bank bearing is within acceptable limits, you do not have to adjust the position of the F peg. Its final position will be the initial value that you assumed of 0.9m from the A peg. The F' peg

will be located at a distance equal to the near bank bearing measured from the A' peg on the near bank.

If the near bank bearing **is greater than** the maximum allowable (2.3m), you must do one of the following:

Move the F peg further away from its present assumed location to a point where the amount of bearing on near bank **is less than** or **equal to** 2.3m, and **greater than** or **equal to** 1.4m. This will allow the F' peg to be placed at a suitable distance from the A' peg.

Crib up the near bank end of bridge until the maximum allowable bearing **is not** exceeded.

Dig out the soil from the near bank until the maximum allowable bearing **is not** exceeded.

Physically locate the key construction points (Figure 8) on the ground and take elevations relative to the CRB peg.

Locate the O, RRB, FRB, CRB, F', A´, A, and F pegs on the ground along the centerline of the bridge.

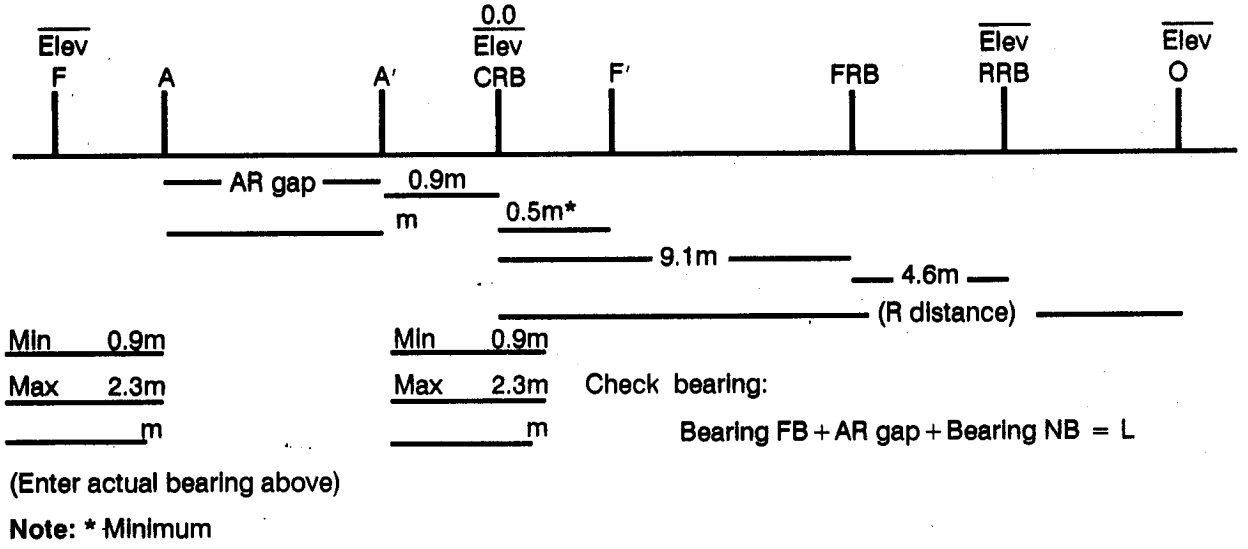
Estimate elevations of F, RRB, and O pegs relative to the CRB. A positive value indicates that a point is above the CRB and a negative value indicates that it is below the CRB. The CRB will always be 0.0 elevation.

Place the key construction point elevations on the baseline below, Figure 8.

STEP 7. Slope check.

Ensure that the difference in elevation between the F' and F pegs does not exceed one-tenth of the total bridge length, if it does, you will have to crib up, undertake a major construction project, or choose another site. Note that the elevation of the F' peg cannot be lower than the elevation of the CRB peg or the bridge will not receive full bearing. In these cases, the normal procedure is to crib up or fill in until the elevation of the F' peg is at least as high as the CRB peg. Otherwise, you would have to remove the soil next to the bank to the level of the F' peg. This same rule applies to the F peg.

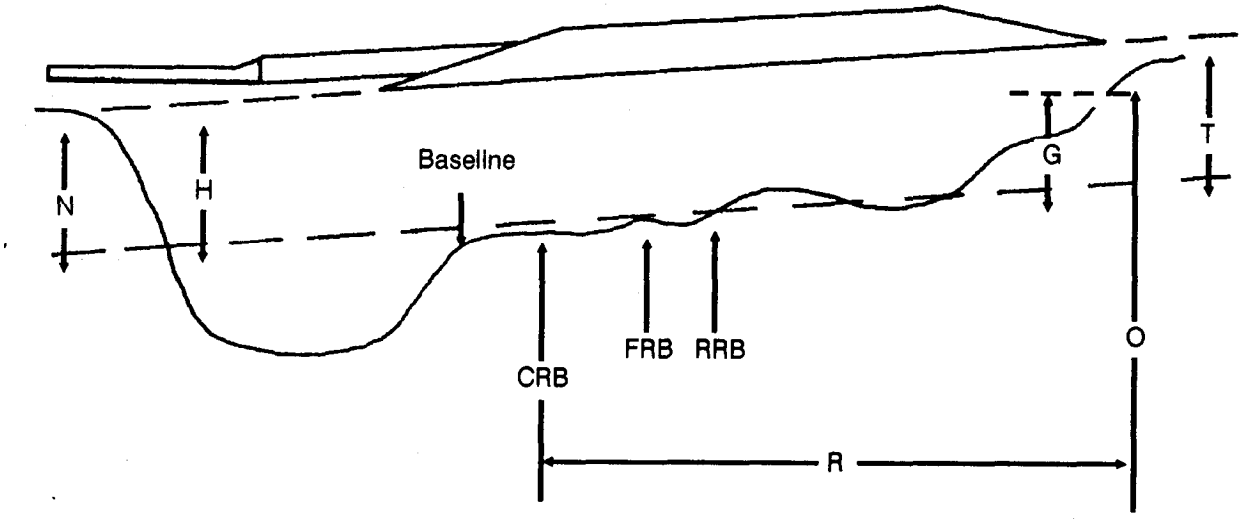
Figure 8. **Key construction points**



STEP 8.

Calculate the far bank height (H) and the near bank tall clearance (G) relative to the baseline using these formulas:

$$H = HtF + \frac{HtRRB \times (L - 0.5)}{13.7} \qquad G = HtO - \frac{HtRRB \times R\ distance}{13.7}$$



STEP 9. *RULE 1*

Use an LNCG setting to give adequate nose clearance (N) and tall clearance (T). See Table 10, page 17.

Choose a setting from column (h), (i), or (j) which gives an N greater than H. If none of the three choices meet the criteria, choose the highest value available.

Check to see if the T value from column (g) **is greater than** G.

If N **is not greater than** H, proceed to RULE 2, or if T **is not greater than** G, proceed to RULE 2.

If N **is greater than** H and T **is greater than** G, the LNCG setting chosen has adequate nose clearance and the bridge selected has adequate tail clearance.

STEP 10. *RULE 2*

Raise both the capsill roller beam (CRB) and rear roller beam (RRB) by 0.253m to increase nose clearance (N) and tail clearance (T).

N RULE 2 = Value obtained from column (k).

T RULE 2 = Value obtained from column (l).

If N RULE 2 **is not greater than** H and T RULE 2 **is greater than** G, proceed to RULE 3a.

If N RULE 2 **is greater than** H and T RULE 2 **is not greater than** G, proceed to RULE 3b.

If N RULE 2 **is greater than** H and T RULE 2 **is greater than** G, the bridge has adequate nose and tail clearance for launching.

STEP 11. *RULE 3*

Lowering the RRB. If there is ample tall clearance, some increase in N can be obtained by keeping the CRB in its highest position and lowerlng the RRB to its lowest position. The mathematical equation for this process is shown under column (m).

N RULE 3a = N RULE 2 + Value N calculated from the equation shown under column (m).

STEP 12. *RULE 3b*

Lowering the CRB. If there is ample nose clearance, some increase in T can be obtained by keeping the RRB in its highest position and lowering the CRB to its lowest position. The mathematical equation for this process is shown under column (n).

T RULE 3b = T RULE 2 + Value calculated from the equation shown under column (n).

STEP 13. Loads required.
From Table 12, determine the the truck and trailer loads required for the bridge.

STEP 14. From Table 13, extract the following information:
Construction time_____
Manpower requirements_____

STEP 15. Final design:
2E +_____ bays
LNCG setting _____
CRB setting _____
RRB setting _____
Bearing: NB _____ FB_____
Truck and trailer loads _____
Manpower required _____
Time to construct _____

Table 12. **MGB pallets without LRS**

Pallet Type	Bays									
	13	14	15	16	17	18	19	20	21	22
Erection	1	1	1	1	1	1	1	1	1	1
Bridge	9	9	9	10	10	10	11	11	11	12
Total	10	10	10	11	11	11	12	12	12	13

Note:
More vehicles are required to transport personnel.

Table 13. **Work parties and building times on good sites (firm dry ground)**

(a)	Double-Story Single-Span 13-22 Bays Without LRS		
	13 Bays 33.2m MLC 50 (b)	18 Bays 42.4m MLC 30 (c)	22 Bays 49.7m MLC 16 (d)
Work party	1 +24	1 + 24	1 + 24
Time by day (hours)	1 1/2	1 3/4	2
Time by night (hours)	3	2 3/4	3

Notes:
1. All timings exclusive of work on approaches.
2. Add 20 percent for untrained personnel.
3. Add 30 percent for adverse site conditions.
4. For disposition of work parties, see Table 32, page 40.

CHAPTER 5

MGB 13-22 BAYS WITH LRS

(where water level or any obstructions are at least 3.7m below bank heights)

STEP 1. Measure the AR gap (see page 5).

STEP 2. Select a bridge.

Using column (a) of Table 14, choose a bridge whose AR gap range brackets the AR gap measured. Always select the smallest range possible to avoid wasting assets. For example, if the AR gap measured 40.2m, choose the AR gap range of 37.8m to 40.5m even though the range of 39.8m to 42.4m also meets the criteria. Read the bay configuration column (c). Check the MLC of the bridge column (d) to ensure that it meets what is specified by the tasking authority.

STEP 3. Read the bridge length column (b).

STEP 4. Read the R distance column (f).

STEP 5. Read the nose construction column (e).

STEP 6. Identify key construction points.

These are constant for any DS bridge construction 13 through 22 bays with LRS (Figure 9).

F peg – Designates the approximate location of the far bank end of bridge. It is initially placed the distance shown under far bank minimum column, Table 15, from the AR peg on the far bank.

CRB peg – Designates the location of the CRB. It is placed 2.7m from the A' peg on the near bank as measured to the centerline of the CRB.

FRB peg – Designates the location of the FRB. It is placed 9.1 m from the CRB peg to the centerline of the FRB.

RRB peg – Designates the location of the RRB. It is placed 4.6m from the FRB peg (measured centerline to centerline).

O peg – Marks the clear distance behind the CRB required to construct the bridge. It is positioned by measuring the R distance, Table 14, column (f) behind the CRB peg.

Figure 9. **Key construction points for DS MGB 13 through 22 bays with LRS**

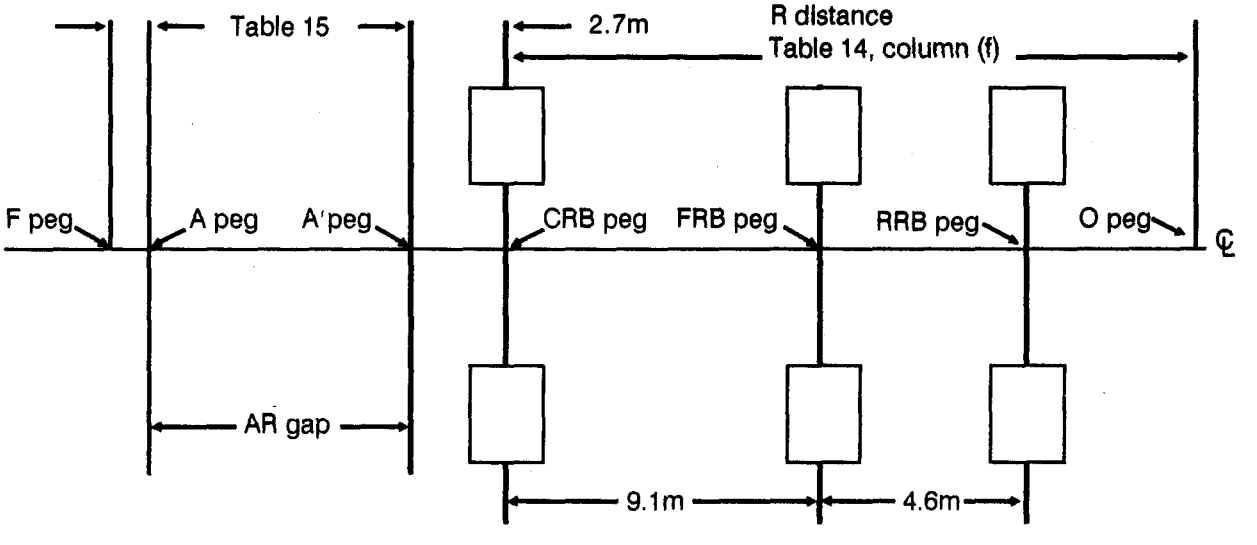


Table 14. **DS MGB 2E + 13 through 2E + 22 bays with LRS (where water or any obstructions are at least 3.7m below bank heights)**

Site Dimensions						Launch Design				
						Rule 1 Nose lift N with nose cross girder at –				Rule 2 Lower RRB to increase N
AR Gap (a)	Brg Lgth (b)	2E + # of Bays (c)	MLC (d)	Nose Const * (e)	R Dist (f)	Tail Lift T (g)	Hole #6 ** (h)	Hole #4 ** (i)	Hole #2 ** (j)	N (k)
28.6–31.4	33.2	13	All MLC 60	7N1	27.4	0.40	0.48	1.87	3.52	1.9 (0.82–G)
30.5–33.3	35.1	14			28.7	0.37	0.31	1.72	3.35	1.9 (0.79–G)
32.3–34.7	36.9	15				0.34	0.25	1.64	3.29	1.9 (0.76–G)
34.1–36.9	38.7	16		8N1	29.6	0.30	–0.62	1.27	3.25	1.9 (0.72–G)
35.9–38.7	40.6	17			29.3	0.27	–0.77	1.12	3.10	1.9 (0.69–G)
37.8–40.6	42.4	18		6N1 + 3N2		0.21	–1.06	0.80	2.71	1.9 (0.66–G)
39.8–42.4	44.2	19			34.8		–1.46	0.40	2.32	1.9 (0.63–G)
41.4–44.2	46.0	20			38.4		–1.75	0.11	2.03	
43.3–45.6	47.9	21				0.18	–2.08	0.05	1.75	
45.1–46.5	49.7	22			40.1	0.15	–2.44	–0.31	1.40	1.9 (0.57–G)

* Each nose includes a complete light nose.
** Nose cross girder setting 6, 4, and 2 is the position of the cross girder resting on the 6th, 4th, and 2d hole from the bottom of the LNCG post.

Bearing Check. The minimum/maximum bearings for any DS bridge 2E + 13 through 2E + 22 bays are shown in Table 15.

Table 15. **Bearings**

Bridge Length 2E +	Near Bank Minimum	Far Bank Minimum
13, 14, 16 through 20 bays	0.9m	0.9m
15 bays	1.1m	1.1m
21 bays	1.14m	1.14m
22 bays	1.6m	1.16m
Maximum bearing for all DS MGB with LRS		

To calculate the actual locations of the F and F' pegs, the following procedure is used:

Near bank bearing =
bridge length - (AR gap + far bank bearing)
where –

- Bridge length is obtained from column (b) of Table 14.
- The AR gap was measured by you in the first step of this design procedure.
- Far bank bearing is obtained from the appropriate column in Table 15.

If the near bank bearing is within acceptable limits, you do not have to adjust the position of the F peg. Its final position will be the initial value obtained from Table 15 as measured from the A

peg. The F' peg will be located at a distance equal to the near bank bearing measured from the A' peg on the near bank.

If the near bank bearing **is greater than** the maximum allowable (2.3m), you must do one of the following:

Move the F peg further away from its present location to a point where the amount of bearing on near bank **is less than or equal to** 2.3m and **greater than or equal to** the value given in Table 15 for minimum bearing.

Crib up the near bank end of bridge to where the maximum allowable bearing is not exceeded.

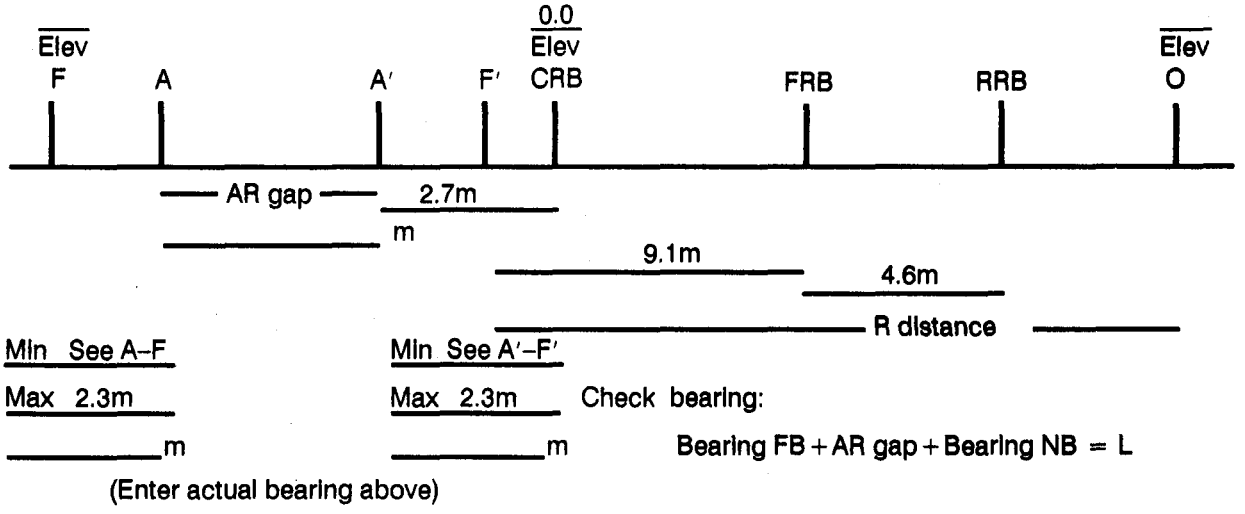
Dig out the soil from the near bank until the maximum allowable bearing is not exceeded.

Physically locate the key construction points (Figure 10) on the ground and take elevations relative to the CRB peg. Locate the O, RRB, FRB, F', A', A, and F pegs on the ground along the bridge centerline. Estimate elevations of F, RRB, and O pegs relative to the CRB peg. A positive value indicates a point is above the CRB peg and a negative value indicates it is below the CRB peg. The CRB peg will always be 0.0 elevation. Place key construction point elevations on the baseline (Figure 10).

STEP 7. Slope check.

Ensure that the difference in elevation between the F' and F peg does not exceed one-twentieth of the total bridge length. If it does, you will have to crib up, undertake a major construction project, or choose another site. Note that the elevation of the F' peg cannot be lower than the elevation of the CRB peg or the bridge will not receive full bearing. In these cases, the normal procedure is to crib up or fill in until the elevation of the F' peg is at least as high as the CRB peg. Otherwise, you would have to remove soil next to the bank, level with the F' peg. This same rule applies to the F peg.

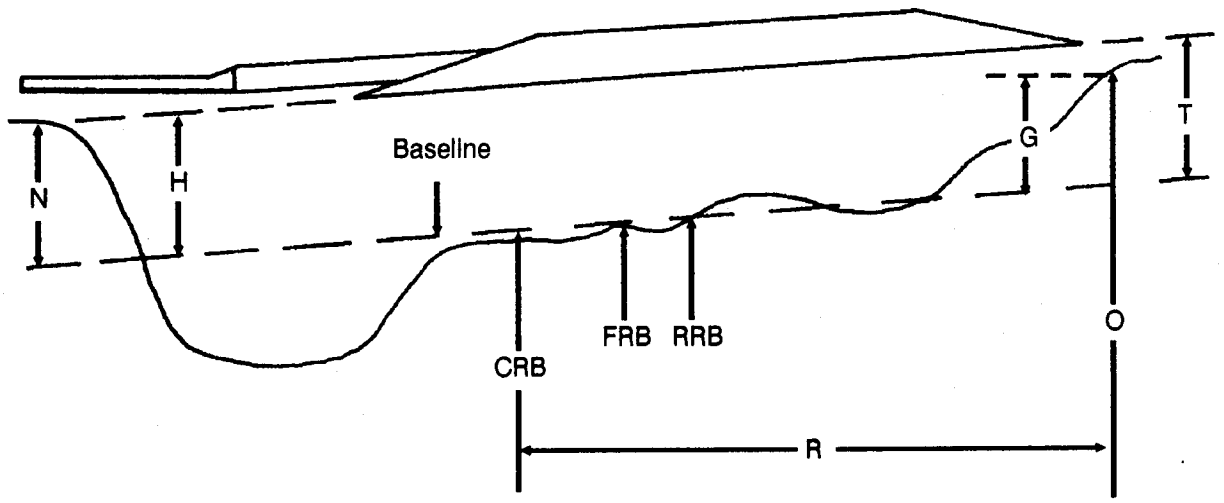
Figure 10. **Key construction points**



Number of Bays	Minimums	
	A to F	A' to F'
13, 14, 16 thru 20 bays	0.9m	0.9m
15 bays	1.1m	1.1m
21 bays	1.14m	1.14m
22 bays	1.6m	1.6m

STEP 8.
Calculate the far bank height (H), and the near bank tall clearance (G) relative to the baseline.

$$H = HtF + \frac{HtRRB \times (L - 0.5)}{13.7} \qquad G = \frac{HtO - HtRRB \times R\ distance}{13.7}$$



STEP 9. *RULE 1*
Use the LNCG setting to give adequate nose clearance (N) and tail clearance (T). See Table 14, page 23.

Choose a setting from column (h), (i), or (j) which gives an N **greater than** H. If none of the three choices meet the criteria, choose the highest value available.

Check to see if the value from column (g) **is greater than** G.

If N **is not greater than** H or if T **is not greater than** G, proceed to RULE 2.

If N **is greater than** H and T **is greater than** G, the LNCG setting chosen has adequate nose clearance and the bridge selected has adequate tail clearance.

STEP 10. *RULE 2*
Lowering the RRB. If there is ample tail clearance, some increase in N can be obtained by keeping the CRB in its highest position and lowering the RRB to its lowest position. See Table 14, column (k), for values.

STEP 11. Loads required.
From Table 16, determine the truck and trailer loads required for the bridge.

Table 16. **MGB DS with LRS**

	Bays									
Type	13	14	15	16	17	18	19	20	21	22
Erection	1	1	1	1	1	1	1	1	1	1
Bridge	9	9	9	10	10	10	11	11	11	12
Link	2	2	2	2	2	2	2	2	2	2
Total	12	12	12	13	13	13	14	14	14	15

STEP 12. From Table 17, extract the following information:

Construction time

Manpower requirements _____

STEP 13. Final design:

2E +_____ bays

LNCG setting _____

CRB setting _____

RRB setting _____

Bearing: NB _____ FB _____

Truck and trailer loads _____

Manpower required _____

Time to construct _____

Table 17. **Work parties and building times on good sites (firm dry ground)**

(a)	Double-Story Single-Span 13-22 Bays With LRS		
	13 Bays 33.2m MLC 60 (b)	18 Bays 42.4m MLC 60 (c)	22 Bays 49.7m MLC 60 (d)
Work party	2 +32	2 + 32	2 +32
Time by day (hours)	2	2 3/4	3
Time by night (hours)	3	4	4 1/2

Notes:
1. All timings exclusive of work on approaches.
2. Add 20 percent for untrained personnel.
3. Add 30 percent for adverse site conditions.
4. For disposition of work parties, see Table 32, page 40.

CHAPTER 6

MGB DESIGN PRO FORMA

(all measurements are in meters)

SS 4 Through 12 Bays

Grid _____

Recon Officer _____

Map Ref _____

Unit _____ MLC _____

1. Measure AR gap A to A' _____

NOTE: Use Tables 18 or 19 (page 28) to obtain the answers to the following:

2. Select bridge _____

3. Bridge length _____

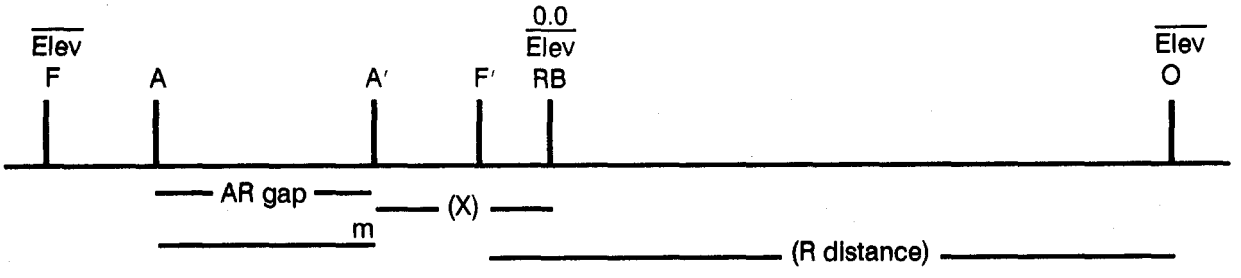
4. R distance _____

5. Nose construction _____

6. Key construction points, dimensions, and elevations. Calculate the distance from the RB to the A' peg (X), where –

Push launch:
X = (bridge length + 0.23m)
- (AR gap + 0.9m)

Jack launch:
X = (L- 0.23m) - (AR gap + 0.9m)



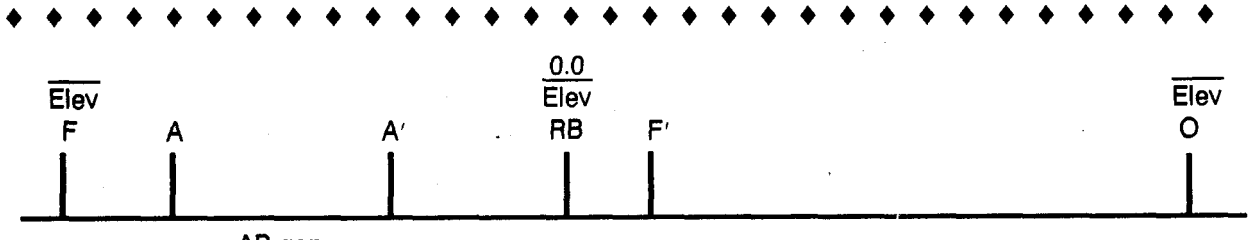
Min 0.9m
Max 2.1m
_____ m

Min 0.9m
Max 2.1m
_____ m

(Enter actual bearing above)

For **push launch**, RB is positioned 0.23m behind F'.

Note: Push launches are to be performed only in an actual wartime operation.



Min 0.9m
Max 2.1m
_____ m

Min 0.9m
Max 2.1m
_____ m

(Enter actual bearing above)

For jack launch, RB is positioned 0.23m in front of F'.

Table 18. **Bridges 4 through 8 bays SS**

Site Dimensions						Launch Design			
						RB	RB	N	N
AR Gap (a)	L (b)	Bays (c)	MLC (d)	Nose (e)	R Dist (f)	BP Only (g)	BP + DU Only (h)	BP Only (i)	BP + DU Only (j)
3.7–6.1	7.9	4	60	LLN Only	5.8	0.43	0.60	1.30	1.75
5.6–8.0	9.8	5			6.7			1.14	1.68
7.4–9.8	11.6	6	40		7.6			1.07	1.60
9.2–11.6	13.4	7	30		9.5			0.76	0.91
11.0–13.4	15.2	8			11.3			0.38	0.84

Table 19. **Bridges 9 through 12 bays SS**

Site Dimensions						Dimension N above line through ground at RB & O when rear BSB is on ground. The RB is on BP or BP & DU, & LNCG is on 4, 2, or 1.					
						LNCG Settings					
						4		2		1	
AR Gap (a)	L (b)	Bays (c)	MLC (d)	Nose (e)	R Dist (f)	BP Only (g)	BP + DU (h)	BP Only (i)	BP + DU (j)	BP Only (k)	BP + DU (l)
12.9–15.3	17.1	9	24	5N1	10.4	–0.76	–0.08	0.61	1.14	1.83	2.36
14.7–17.1	18.9	10	20		12.2	–0.99	–0.61	0.38	0.76	1.60	1.98
16.5–18.9	20.7	11	16	6N1		–1.37	–1.07	0.15	0.48	1.83	2.44
18.4–20.8	22.6	12			14.0	–2.13	–1.60	–0.46	0.08	1.07	1.60

Notes:

1. An extra 0.075m of clearance can be obtained by lifting on the nose to remove the pin sag. Where levels are estimated, this should not be taken into account during design but left to compensate for any errors in calculating the value of H (for SS 4 through 8 bays).

2. An extra 0.6m of clearance can be obtained by lifting on the nose to remove the pin sag (for SS 9 through 12 bays).

3. Any additional packing under the RB will increase the vertical interval N by three times the thickness of the packing, for example if the packing is 0.075m thick, N will be increased by 0.225m.

4. The table incorporates an allowance to ensure that the nose clears the LR when it is positioned 0.230m in front of point F.

7. Slope check.

Ensure that the difference in elevation between the F' and F peg does not exceed one-tenth of the actual bridge length. If it does, you will have to crib up, undertake a major construction project, or find another centerline.

8. Calculate H:

for push launch –

$$H = HtF + \frac{[HtO \times (L + 0.23)]}{R \text{ distance}}$$

for jack launch –

$$H = HtF + \frac{[HtO \times (L - 0.23)]}{R \text{ distance}}$$

9. Launch design:

4 through 8 bays (from Table 18)
Choose a packing where N > H from columns (i) or (j) Packing _____ from columns (g) or (h)

9 through 12 bays (from Table 19)
Choose an LNCG setting where N > H from columns (g), (h), (i), (j), (k), or (l) LNCG setting ____ Packing _____

10. Loads required.

From Table 20, determine the truck and trailer loads required for the bridge.

11. From Table 21, extract the following information:

Construction time _____

Manpower requirements_____

12. Final design:

Bays_____

LNCG setting _____

Packing required _____

Bearing: NB _____ FB_____

Truck and trailer loads _____

Manpower required _____

Time to construct _____

Table 21. **Work parties and building times on good sites(firm dry ground)**

(a)	Single-Story 5 Bays 9.8m MLC 60 (b)	8 Bays 15.2m MLC 60 (c)	12 Bays 22.6m MLC 60 (d)
Work party	1 + 8	1 + 16	1 + 16
Time by day (hours)	1/2	3/4	1
Time by night (hours)	3/4	1	1 1/4

Note: For disposition of work parties, see Table 32, page 40.

Table 20. **MGB pallets SS**

Pallet Type	Number of Bays 4	5	6	7	8	9	10	11	12
Erection	1	1	1	1	1	1	1	1	1
Bridge	2	2	3	3	4	4	5	5	5
Total	3	3	4	4	5	5	6	6	6

Note: More vehicles are required to transport personnel. Erection pallets may only be partial depending on bridge being constructed.

DS 2E + 1 Through 2E + 12 Bays

Grid _____ Recon Officer _____

Map Ref _____

Unit _____ MLC _____

1. Measure AR Gap A to A' _____

NOTE: Use Table 22 to obtain the answers to the following:

2. Select bridge _____

3. Bridge length _____

4. R distance _____

5. Nose construction _____

6. Key construction points, dimensions, and elevations (as shown below).

7. Slope check.
Ensure that the difference in elevation between the F and F' pegs does not exceed one-tenth of the total bridge length. If it does, you will have to crib up, undertake a major construction project, or find another centerline.

8. Calculate C, H, and G:

$$C = \frac{HtWL - HtF \times W\ distance}{(L - 0.5)}$$

$$H = HtF + \frac{HtRRB \times (L - 0.5)}{4.6}$$

$$G = HtO - \frac{HtRRB \times R\ distance}{4.6}$$

9. *RULE 1.* (if both bank heights > 0.6m, go to RULE 2.)
Choose an LNCG setting that ensures depth of C > depth of D.

LNCG settings permitted — — —

10. *RULE 2.* LNCG setting to give N > H and T >G.
Choose an LNCG setting so that N > H.

LNCG setting chosen _____

NOTE: The setting chosen cannot be lower than that chosen in RULE 1.
if N ≯ H and/or T ≯ G, go to RULE 3

11. *RULE 3.* Raise the FRB and RRB by 0.69m
N RULE 3 = N RULE 2 + 0.69m N = ____

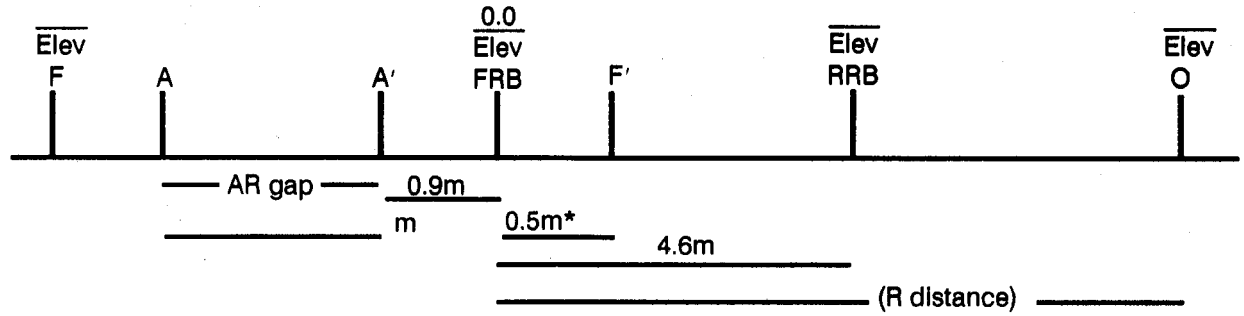
Check N Rule 3 > H – Yes/No

Check T > G Yes/No – column (p) T = ____

If Yes, design is OK.

if N RULE 3 ≯ H, go to RULE 4a.

if T RULE 3 ≯ G, go to RULE 4b.



Min 0.9m
Max 2.3m
m

Min 1.4m
Max 2.3m
m

(Enter actual bearing above)

Check bearing:

Bearing FB + AR gap + Bearing NB = L

Note: * Minimum

Table 22. **DS MGB design 2E + 1 through 2E + 12 bays (all measurements are in meters)**

Site Dimensions						Rule 1 D for given LNCG setting with FRB in lowest position				Rule 2 Nose lift N using various LNCG settings and FRB in lowest position				Launch design: Other methods of adjusting N & T			
														Rule 3 Raise FRB & RRB by 0.69m		Rule 4a Lower RRB to increase N	Rule 4b Lower FRB to increase T
AR Gap (a)	Brg Lgth (b)	2E + # of Bays (c)	MLC (d)	Nose* Const (e)	R Dist (f)	W Dist (g)	Hole #6 ** (h)	Hole #4 ** (i)	Hole #2 ** (j)	Tail Lift T (k)	Hole #6 ** (l)	Hole #4 ** (m)	Hole #2 ** (n)	N (o)	T (p)	N (q)	T (r)
6.7 – 9.0	11.3	1	All DS MGB are MLC 60	2N1	10.0	–	–	–	–	0.55	1.02	1.48	2.04	N Rule 3 = N Rule 2 + 0.69m	1.24	1.75(1.24–G)	0.2 (N Rule 3 – H)
8.5 – 10.8	13.1	2		3N1	11.9	–	–	–	–		0.89	1.53	2.30				
10.3 – 12.6	14.9	3			12.2	–	–	–	–		0.86	1.50	2.28				
12.2 – 14.5	16.8	4			13.1	–	–	–	–		0.81	1.45	2.23				
14.0 – 16.3	18.6	5		4N1	14.9	–	–	–	–	0.52	0.70	1.52	2.51		1.21	1.75(1.21–G)	
15.8 – 18.1	20.4	6				–	–	–	–		0.65	1.48	2.47				
17.7 – 20.0	22.3	7			15.8	13.1	0.70	0.31	–0.09		0.53	1.36	2.36				
19.5 – 21.8	24.1	8		5N1	16.8	15.0	0.67	0.25	–0.20	0.46	0.49	1.48	2.69		1.15	1.75(1.15–G)	
21.3 – 23.6	25.9	9			17.7	16.5	0.64	0.21	–0.30		0.33	1.35	2.55				
23.1 –25.4	27.7	10			19.5	17.6	0.60	0.12	–0.40		0.25	1.28	2.49				
25.0 – 27.3	29.6	11		6N1	20.4	18.5	0.50	0.04	–0.43	0.40	0.16	1.23	2.63		1.09	1.75(1.09–G)	
26.8 – 29.1	31.4	12			21.6	19.2	0.46	–0.06	–0.58		–0.20	1.02	2.47				

* Each nose includes a complete light nose.

** Nose cross girder setting 6, 4, and 2 is the position of the cross girder resting on the 6th, 4th, and 2d hole from the bottom of the LNCG post.

12. *RULE 4a.* Lower RRB
N RULE 4a = N RULE 3 + answer to column (q). Check N > H

13. *RULE 4b.* Lower FRB
T RULE 4b = T RULE 3 + answer to column (r). Check T > G

14. Loads required.
From Table 23, determine the truck and trailer loads required for the bridge.

15. From Table 24, extract the following information:
Construction time _____
Manpower requirements _____

16. Final design:
2E + _____ bays
LNCG setting _____
FRB setting _____
RRB setting _____
Bearing: NB _____ FB _____
Truck and trailer loads _____
Manpower required _____
Time to construct _____

Table 23. **MGB pallets DS**

Pallet Type	Bays											
	1	2	3	4	5	6	7	8	9	10	11	12
Erection	1	1	1	1	1	1	1	1	1	1	1	1
Bridge	5	5	5	6	6	6	7	7	7	8	8	8
Total	6	6	6	7	7	7	8	8	8	9	9	9

Note: More vehicles are required to transport personnel.

Table 24. **Work parties and building times on good sites (firm dry ground)**

(a)	Double-Story		
	4 Bays 16.8m MLC 60 (b)	8 Bays 24.1m MLC 60 (c)	12 Bays 31.4m MLC 60 (d)
Work party	1 + 24	1 + 24	1 + 24
Time by day (hours)	3/4	1	1 1/2
Time by night (hours)	1 1/4	1 1/2	2

Notes:
1. All timings exclusive of work on approaches.
2. Add 20 percent for untrained personnel.
3. Add 30 percent for adverse site conditions.
4. For disposition of work parties, see Table 32, page 40.

DS 2E + 13 Through 2E + 22 Bays Without LRS (where water level or any obstructions are at least 2.7m below bank heights)

Grid _____

Recon Officer _____

Map Ref _____

Unit _____

MLC _____

1. Measure AR gap A to A' _____

NOTE: Use Table 25 to obtain the answers to the following:

2. Select bridge. 2E + _____ bays

3. Bridge length _____

4. R distance _____

5. Nose construction _____

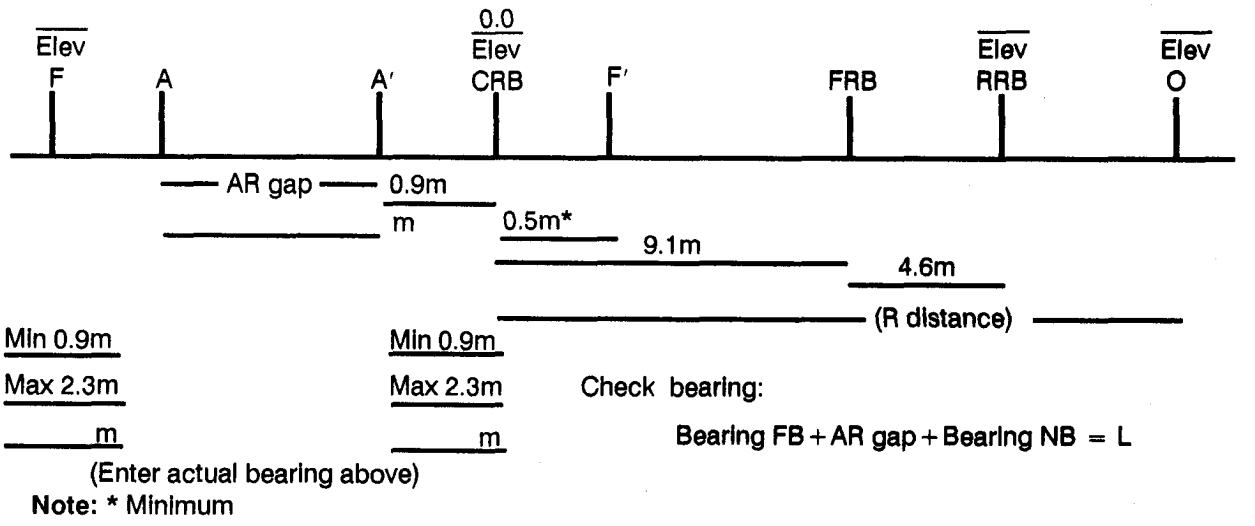
Table 25. **DS MGB 2E + 13 through 2E + 22 bays without LRS (where water or any obstructions are at least 2.7m below bank heights)**

Site Dimensions						Launch Design							
						Rule 1 Nose lift N with nose cross girder at –				Other methods of adjusting N & T			
										Rule 2 Raise RRB & CRB by 0.25m		Rule 3a Lower RRB to increase N	Rule 3b Lower CRB to increase T
AR Gap (a)	Brg Lgth (b)	2E + # of Bays (c)	MLC (d)	Nose Const * (e)	R Dist (f)	Tail Lift T (g)	Hole #6 ** (h)	Hole #4 ** (i)	Hole #2 ** (j)	N (k)	T (l)	N (m)	T (n)
28.6–30.9	33.2	13	50	6N1	27.4	0.40	–0.07	1.49	2.68	2.93	0.65	1.9 (0.82–G)	0.2 (2.93–H)
30.5–32.8	35.1	14		7N1	28.7	0.37	–0.38	1.00	2.65	2.90	0.62	1.9 (0.70–G)	0.2 (2.90–H)
32.3–34.6	36.9	15	40			0.34	–0.49	0.90	2.55	2.80	0.59	1.9 (0.76–G)	0.2 (2.80–H)
34.1–36.4	38.7	16			29.6	0.30	–0.61	0.79	2.43	2.68	0.55	1.9 (0.72–G)	0.2 (2.68–H)
35.9–38.2	40.1	17	30	8N1	29.3	0.27	–0.15	0.75	2.69	2.94	0.52	1.9 (0.69–G)	0.2 (2.94–H)
37.8–40.1	42.4	18				0.24	–1.33	0.54	2.54	2.79	0.49	1.9 (0.66–G)	0.2 (2.79–H)
39.6–41.9	44.2	19	24	6N1 + 3N2	34.8	0.21	–2.04	–0.19	1.72	1.97	0.46	1.9 (0.63–G)	0.2 (1.97–H)
41.4–43.7	46.0	20			38.4		–1.93	–0.31	1.61	1.86			0.2 (1.86–H)
43.3–45.6	47.9	21	20			0.18	–2.65	–0.52	1.17	1.42	0.43	1.9 (0.60–G)	0.2 (1.42–H)
45.1–47.4	49.7	22	16		40.1	0.15	–2.58	–0.68	1.04	1.29	0.40	1.9 (0.57–G)	0.2 (1.29–H)

* Each nose includes a complete light nose.

** Nose cross girder setting 6, 4, and 2 is the position of the cross girder resting on the 6th, 4th, and 2d hole from the bottom of the LNCG post.

6. Key construction points, dimensions, and elevations.



7. Slope check.

Ensure that the difference in elevation between the F' and F pegs does not exceed one-tenth of the total bridge length. If it does, you will have to crib up, undertake a major construction project, or find another site.

8. Calculate H and G:

$$H = \frac{HtF + HtRRB \times (L - 0.5)}{13.7}$$

$$G = \frac{HtO - HtRRB \times R\ distance}{13.7}$$

9. *RULE 1.* LNCG setting to give N > H and T > G.

Choose an LNCG setting so that N > H.

LNCG setting chosen _____

Then check If T > G

If N > H and/or T > G, go to RULE 2.

10. *RULE 2.* Raise the CRB and RRB by 0.253m

Check N > H – Yes/No column (k)

Check T > G – Yes/No column (l)

If Yes, design is OK.

If N ≯ H, go to RULE 3a.

If T ≯ G, go to RULE 3b.

11. *RULE 3a.* Lower RRB

N RULE 3a = N RULE 2 + answer to column (m) Check N > H

12. *RULE 3b.* Lower CRB

T RULE 3b = T RULE 2 + answer to column (n) Check T > G

13. Loads required.

From Table 26, determine the truck and trailer loads required for the bridge.

Table 26. **MGB pallets without LRS**

Pallet Type	Bays									
	13	14	15	16	17	18	19	20	21	22
Erection	1	1	1	1	1	1	1	1	1	1
Bridge	9	9	9	10	10	10	11	11	11	12
Total	10	10	10	11	11	11	12	12	12	13

Note:
More vehicles are required to transport personnel.

14. From Table 27, extract the following information:

Construction time _____

Manpower requirements _____

15. Final design:

2E + _____ bays

LNCG setting _____

CRB setting _____

RRB setting _____

Bearing: NB _____ FB _____

Truck and trailer loads _____

Manpower required _____

Time to construct _____

Table 27. **Work parties and building times on good sites (firm dry ground)**

(a)	Double-Story Single-Span 13-22 Bays Without LRS		
	13 Bays 33.2m MLC 50 (b)	18 Bays 42.4m MLC 30 (c)	22 Bays 49.7m MLC 16 (d)
Work party	1 +24	1 + 24	1 + 24
Time by day (hours)	1 1/2	1 3/4	2
Time by night (hours)	3	2 3/4	3

Notes:
1. All timings exclusive of work on approaches.
2. Add 20 percent for untrained personnel.
3. Add 30 percent for adverse site conditions.
4. For disposition of work parties, see Table 32, page 40.

DS 2E + 13 Through 2E + 22 Bays With LRS (where water level or any obstructions are at least 3.7m below bank heights)

Grid _____

Recon Officer _____

Map Ref _____

Unit _____

MLC _____

1. Measure AR gap A to A' _____

NOTE: Use Table 28 to obtain the answers to the following:

2. Select a bridge _____

3. Bridge length _____

4. R distance _____

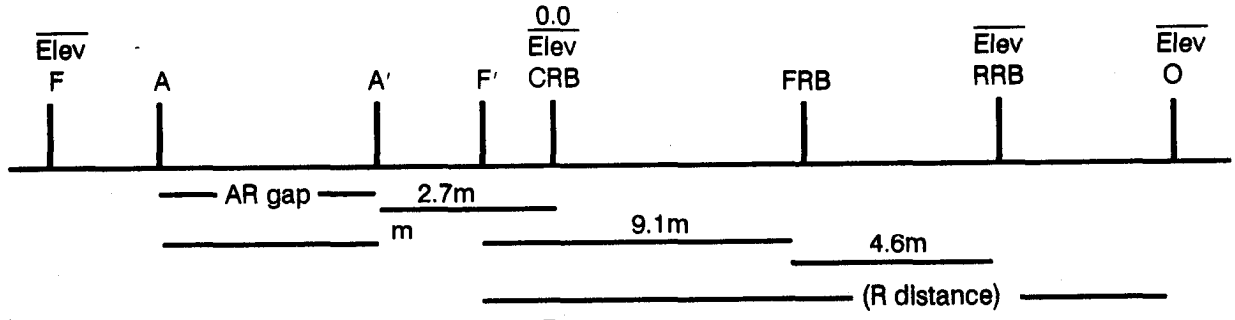
5. Nose construction _____

Table 28. **DS MGB 2E + 13 through 2E + 22 bays with LRS(where water or any obstructions are at least 3.7m below bank heights)**

Site Dimensions						Launch Design				
						Rule 1 Nose lift N with nose cross girder at –				Rule 2 Lower RRB to increase N
AR Gap (a)	Brg Lgth (b)	2E + # of Bays (c)	MLC (d)	Nose Const * (e)	R Dist (f)	Tail Lift T (g)	Hole #6 ** (h)	Hole #4 ** (i)	Hole #2 ** (j)	N (k)
28.6–31.4	33.2	13	All MLC 60	7N1	27.4	0.40	0.48	1.87	3.52	1.9 (0.82–G)
30.5–33.3	35.1	14			28.7	0.37	0.31	1.72	3.35	1.9 (0.79–G)
32.3–34.7	36.9	15				0.34	0.25	1.64	3.29	1.9 (0.76–G)
34.1–36.9	38.7	16		8N1	29.6	0.30	–0.62	1.27	3.25	1.9 (0.72–G)
35.9–38.7	40.6	17			29.3	0.27	–0.77	1.12	3.10	1.9 (0.69–G)
37.8–40.6	42.4	18		6N1 + 3N2			–1.06	0.80	2.71	1.9 (0.66–G)
39.8–42.4	44.2	19			34.8	0.21	–1.46	0.40	2.32	
41.4–44.2	46.0	20			38.4		–1.75	0.11	2.03	1.9 (0.63–G)
43.3–45.6	47.9	21				0.18	–2.08	0.05	1.75	
45.1–46.5	49.7	22			40.1	0.15	–2.44	–0.31	1.40	1.9 (0.57–G)

* Each nose includes a complete light nose.
** Nose cross girder setting 6, 4, and 2 is the position of the girder resting on the 6th, 4th, and 2d hole from the bottom of the post.

6. Key construction points, dimensions, and elevations.



Min See A–F

Max 2.3m

m

Min See A'–F'

Max 2.3m

m

(Enter actual bearing above)

Check bearing:

Bearing FB + AR gap + Bearing NB = L

Number of Bays	Minimums	
	A to F	A' to F'
13, 14, 16 thru 20 bays	0.9m	0.9m
15 bays	1.1m	1.1m
21 bays	1.14m	1.14m
22 bays	1.6m	1.6m

7. Slope check.

Ensure that the difference in elevation between the F' and F peg does not exceed one-twentieth of the total bridge length. If it does, you will have to crib up, undertake a major construction project, or find another centerline.

8. Calculate H and G

$$H = HtF + \frac{HtRRB \times (L - 0.5)}{13.7}$$

$$G = HtO - \frac{HtRRB \times R\ distance}{13.7}$$

9. *RULE 1.* LNCG setting to give N > H and T > G. Choose an LNCG setting to give N > H.

If N ≯ H, go to RULE 2. If T ≯ G, choose another site, or prepare to dig out under NB end of bridge prior to launch.

10. *RULE 2.* Lower RRB

N Rule 2 = N RULE 1 + answer to column (k) Check N > H

11. Loads required.

From Table 29, determine the truck and trailer loads required for the bridge.

Table 29. **MGB DS with LRS**

Type	Bays									
	13	14	15	16	17	18	19	20	21	22
Erection	1	1	1	1	1	1	1	1	1	1
Bridge	9	9	9	10	10	10	11	11	11	12
Link	2	2	2	2	2	2	2	2	2	2
Total	12	12	12	13	13	13	14	14	14	15

12. From Table 30, extract the following information:

Construction time _____

Manpower requirements _____

Table 30. **Work parties and building times on good sites (firm dry ground)**

(a)	Double-Story Single -Span 13-22 Bays With LRS		
	13 Bays 33.2m MLC 60 (b)	18 Bays 42.4m MLC 60 (c)	22 Bays 49.7m MLC 60 (d)
Work party	2 +32	2 + 32	2 + 32
Time by day (hours)	2	2 3/4	3
Time by night (hours)	3	4	4 1/2

Notes:
1. All timings exclusive of work on approaches.
2. Add 20 percent for untrained personnel.
3. Add 30 percent for adverse site conditions.
4. For disposition of work parties, see Table 32, page 40.

13. Final design:

2E + _____ bays

LNCG setting _____

CRB setting _____

RRB setting _____

Bearing: NB _____ FB _____

Truck and trailer loads _____

Manpower required _____

Time to construct _____

V Distance. The V distance, for delaunching purposes, is the distance from the FRB/CRB to the LRP for DS bridges requiring a launching nose. The V distance must never exceed the distance given in Table 31. Exceeding the V distance may result in failure of the launching nose.

Table 31. **V distance for all double-story bridges**

	Length of Bridge 2E + Number of Bays											
	1	2	3	4	5	6	7	8	9	10	11	12
Brg Lgth (m)	11.3	13.1	14.9	16.8	18.6	20.4	22.3	24.1	25.9	27.7	29.6	31.4
Normal Site												
Nose Conf	2N1	3N1			4N1			5N1			6N1	
V Distance	11.6	13.7	15.5	17.0	19.2	21.0	22.6	24.7	26.5	28.0	30.2	32.0
Restricted Site												
Nose Conf	3N1	4N1		4N1/ 5N1	5N1 or 6N1			6N1 or 7N1			7N1 or 8N1	
V Distance	11.9	13.7	15.5	17.4	19.2	21.0	22.9	24.7	26.5	28.3	30.2	32.0

	Length of Bridge 2E + Number of Bays Without LRS									
	13	14	15	16	17	18	19	20	21	22
Brg Lgth (m)	33.2	35.1	36.9	38.7	40.5	42.4	44.2	46.0	47.9	49.7
Normal Site										
Nose Conf	6N1	7N1			8N1			6N1 + 3N2		
V Distance	33.5	35.7	37.5	39.0	41.1	43.0	48.3	49.1	49.7	50.3
Restricted Site										
Nose Conf	8N1								6N1 + 3N2	
V Distance	33.4	35.2	37.0	38.9	40.7	42.5	44.3	46.2	48.0	49.8

	Length of Bridge 2E + Number of Bays With LRS									
	13	14	15	16	17	18	19	20	21	22
Brg Lgth (m)	33.2	35.1	36.9	38.7	40.5	42.4	44.2	46.0	47.9	49.7
Normal Site										
Nose Conf	7N1			8N1		6N1 + 3N2				
V Distance	34.6	36.4	37.6	39.9	42.4	43.7	45.5	47.5	48.6	49.5

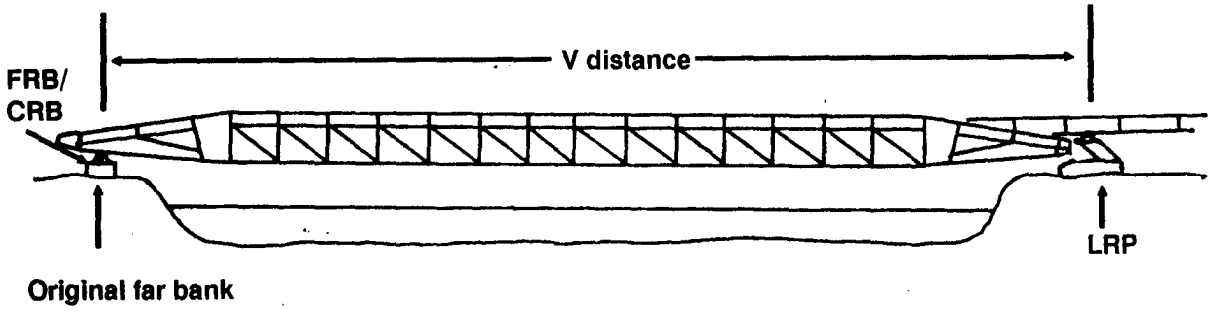


Table 32. **Disposition of work parties**

Bridge Length	Work Party	Main Tasks	Performed by Numbers
4 and 5 Bays SS	1 + 8	Supervisor Left hand side panels and launching nose. Right hand side panels and roller beam.	NCO 1*, 2, 3, and 4 5*, 6, 7, and 8
6 – 8 Bays SS	1 + 16	Supervisor Left hand side panels and launching nose. Right hand side panels and roller beam. Left hand side panels. Right hand side panels.	NCO 1*, 2, 3, and 4 5*, 6, 7, and 8 9*, 10, 11, and 12 13*, 14, 15, and 16
9 – 12 Bays SS	1 + 16	Supervisor Left hand side panels. Right hand side panels. Near and far bank bankseat beam and launching nose. Miscellaneous tasks.	NCO 1*, 2, 3, and 4 5*, 6, 7, and 8 9*, 10, 11, 12, 13, and 14 15 and 16
* Party Leader, responsible for inserting pins and locking rollers.			
All Double-Story 2E + 1 through 2E + 22 Bays, with or without LRS	1 + 24	Supervisor Left hand side party leader, responsible for all pins and left side jacks. Left hand side girder and building frame (FRB). Numbers 1 through 4–top panels, 5 through 8–bottom panels. Near and far bank bankseat beam and launching nose. Right hand side party leader, responsible for all pins and right side jacks. Right hand side girder and building frame (RRB). Numbers 17 through 20–top panels, 21 through 24–bottom panels.	NCO 15 1*, 2, 3, 4, 5*, 6, 7, and 8 9*, 10, 11, 12, 13, and 14 16 17*, 18, 19, 20, 21*, 22, 23, and 24
* Party Leader, responsible for inserting all pins.			
Link Reinforcement Party	1 + 8	Supervisor Left hand side reinforcement. Right hand side reinforcement.	NCO 25*, 26, 27, and 28** 29*, 30, 31, and 32**
* Responsible for all pins, his side. ** Responsible for opening jacks and locking CRB rollers. LRS party under supervision of NCO will download, unstrap, unload, and position all LRS components on site in preparation for use.			

Appendix A

Safety Rules (for all MGBs)

Rule	Reason
1. Do not throw tie-down straps across loads or vehicles when strapping or unstrapping loads.	To prevent injury to personnel and damage to equipment.
2. Do not drop, throw, or shove components off loads or vehicles.	To prevent injury to personnel and damage to equipment.
3. Always check all tie-down straps prior to crane-lifting pallets onto vehicles.	To prevent injury to personnel and damage to equipment.
4. Check tightness of tie-down straps during convoy rest stops.	To prevent injury to personnel and damage to equipment.
5. Do not drop pallets without rubber bumpers.	To prevent damage to equipment.
6. Do not put fingers or hands into pin holes or between components being moved.	To prevent injury to personnel.
7. Ensure that all members of work party are fully aware of action to take place prior to start of action.	To prevent injury to personnel and damage to equipment.
8. Do not use any type of metal object to drive pins or shoot bolts. If a pin or shoot bolt has to be driven, use a rubber/nylon-faced hammer or a block of wood.	To prevent damage to equipment.
9. Do not use carrying bars on bridge during booming procedures. **USE HANDS ONLY ON BRIDGE.**	To prevent injury to personnel and damage to personnel.
10. Do not position yourself between girders during booming of bridge. **STAY OUTSIDE OF GIRDERS.**	To prevent injury to personnel.
11. Do not release roller locks until bridge is being held by manpower or vehicle.	To prevent injury to personnel and damage to equipment.
12. Do not try to boom a bridge larger than 2E + 8 bays by manpower. Always use a 5-ton truck (loaded). If any doubt exists as to the ability of work party to boom by hand, **USE A TRUCK.**	To prevent injury to personnel and damage to equipment.
13. Do not engage roller locks while bridge is moving over rollers.	Roller locks will break, or bridge will skew over rollers.

Rule	Reason
14. Ensure that all roller locks are engaged before disconnecting vehicle from bridge.	To prevent injury to personnel and damage to equipment.
15. Ensure that jack seat is always positioned on support pins or capsill pins in holes 1, 2, or 3 from bottom of adjustable support. **NEVER USE HOLES 4, 5, OR 6 FOR JACK SEAT.**	To prevent injury to personnel and damage to equipment.
16. Monitor the jack-up of roller beams and/or capsill to ensure that they are not jacked too high. The fixed pins must never get within 2.5cm (1 inch) of the top of the adjustable support vertical posts.	To prevent injury to personnel and damage to equipment.
17. Ensure that all personnel are clear of the bridge during booming/launching/ relaunching.	To prevent injury to personnel.
18. Ensure that the push vehicle is centered over bridge centerline and is in line with the bridge throughout the boom/launch/delaunch.	To prevent damage to equipment. Bridge will skew over rollers
19. Always use a loaded vehicle (LRD load) to boom/launch/delaunch all DS bridges.	To increase vehicle traction.
20. Always use the access holes in the side of the LRP to operate the jack. Keep hands and feet clear of the LRP base when operating the jack.	To prevent serious injury to personnel.
21. Ensure that the jack heads are properly seated in jack hoods prior to applying load to the jack.	To prevent damage to equipment.
22. Ensure that the jacks are properly placed for the bridge that is being raised/lowered.	To prevent injury to personnel and damage to equipment.
23. Monitor jacking operation to ensure that the bridge is lowered/raised as evenly as possible.	To prevent injury to personnel and damage to equipment.
24. Use CG and boom markers in correct position at all times.	Improperly placed markers can result in bridge tipping down at the heavy end.
25. Never jack the near end of bridge if the far end is up on the LR or LRP.	LR and LRP are not equipped with a lock; bridge is free to roll.

Rule	Reason
26. Put lock pins in panel, bracing, and nose pins as identified below: **a.** Bracing pins - **ALL** **b.** Nose pins - **ALL** **c.** Panel pins – **ALL,** except where bottom panel connects to top panel. Shoot bolt jaw traps ridge on pin against panel. **d.** Headless panel pins - **ALL,** both ends of pin. Be especially watchful with the pins in the LNCG and posts.	Pins can vibrate out at certain stages of construction or as traffic crosses.
27. Ensure that support pins are fully seated in the adjustable supports.	Jack seat bears on pin taper and pushes pin out.
28. Put lock pins in support pins if bridge to be constructed is 2E + 13 or larger.	To prevent pins from vibrating out.
29. During launching, the LRP must be placed at the given (or higher) LZ number when the published CG is over the roller which is nearest the gap.	Launching equipment will be overloaded.
30. When delaunching, check the V distance to ensure that it does not exceed the V distance given in Table 31, page 39.	Launching equipment will be overloaded.
31. Jack on far bank only when near bank end is on locked rollers and **PUSH BAR is DISCONNECTED from BRIDGE.**	Vertical movement is limited when vehicle is connected. **a.** Jacking up under nose as it crosses far bank may buckle light nose, overload nose cross girder, or over-compress push bar. **b.** Jacking down may over tension push bar. Launch equipment will be overloaded.

Appendix B

MGB BUILDING, BOOM, AND DELAUNCH TABLES

This appendix provides the MGB user with a complete set of building, boom, and delaunch tables required to construct/disassemble any length of MGB on the various types of sites that may be encountered. It is limited to the bridge lengths that can be constructed with US Army MGB sets. It does not provide instructions for MGBs constructed on piers or on floating supports.

It is strongly advised that only experienced users attempt to use this appendix. Personnel new to the MGB must use *TM 5-5420-272-72 for MGB* **and** *TM 5-5420-212-12-1 for MGB with Link Reinforcement Set.*

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Table 33. **Building and boom table 4 through 8 bay single-story – normal site**

Brg Lgth	# of Bays	Nose Conf	Cntr Wt	Spec Notes	Add	Boom to & Add	Boom to & Add	Boom to & Add	Boom to & Add	Boom to & Add	Boom to & Add	Boom to & Add	Boom to & Add	Boom to & Add	Boom to & Add	Boom to & Add	Boom to & Add	Complete By
7.9	4	LLN ONLY	–	Notes a, b, & c	bay 2 Note d	1p2 bay 3	1p7 bay 4	2p3 BSB	2p7 LR*	4p7	–	–	–	–	–	–	–	Notes e & h
9.8	5		–					2p3 bay 5	2p7 BSB	3p3 LR*	5p7	–	–	–	–	–	–	
11.6	6		5D						2p7 bay 6	3p3 BSB	3p7 5D**	4p2 LR*	6p7	–	–	–	–	Notes e, f, & h
13.4	7		4D 2TP							3p3 bay 7	3p7 8**	4p3 BSB	4p7 4D**	5p2 LR*	7p7	–	–	Notes e, f, g, & h
15.2	8		5D 4TP								3p7 8	4p3 9**	4p7 10**	5p3 BSB	5p7 5D**	6p2 LR*	8p7	

Notes:
a. Build LLN and bay 1 over BP.
b. Boom BSB over RB.
c. Put BP under 1p7 after BSB is over RB.
d. Put BP under 2p4 after bay 2 is added.
e. Remove front section of LLN before push launch. **Push launches** are no longer permitted during training exercises or demonstrations. The push launch is to be performed on actual wartime bridge operations **ONLY.**
f. Move counterweight deck units to final position.
g. Remove counterweight panels and refit BSB from temporary position to normal end of bridge position.
h. Put bridge on ground.

* Landing roller placed 23cm from the tip of LLN.
** Deck units or top panels used as counterweight.

Table 34. **Delaunch table 4 through 8 bay single-story – normal site**

Brg Lgth	# of Bays	Nose Conf	Cntr Wt	Spec Notes	Rem/ Add Cntr Wt	Spec Notes	Del to & Rcvr	Boom to & Rem	Boom to & Rem	Boom to & Rem	Boom to & Rem	Boom to & Rem	Boom to & Rem	Boom to & Rem	Boom to & Rem	Boom to & Rem	Boom to & Rem
7.9	4	LLN ONLY	–	Notes a, b, c, & d	–	–	2p7 LR	–	–	–	–	–	–	–	2p3 BSB	1p7 bay 4	1p2 Note e + bay 3
9.8	5		–		–	–	3p3 LR	–	–	–	–	–	–	2p7 BSB	2p3 bay 5		
11.6	6		5D*		/5D*	–	4p2 LR	–	–	–	–	3p7 5D*	3p3 BSB	2p7 bay 6			
13.4	7		8 + BSB + 4D*	Note a	BSB/ 8 + + 4D*	Notes b, c, & d	5p2 LR	4p7 4D*	–	–	4p3 BSB	3p7 bay 8	3p3 bay 7				
15.2	8		9 + 10 + BSB + 5D*		BSB/ 9 + 10 + BSB + 5D*		6p2 LR	5p7 5D*	5p3 BSB	4p7 10	4p3 9						

Table 34. **(continued)**

# of Bays	Boom to & Rem	Boom to & Rem	Complete By
4	BSB Note f + bay 2	Note g + bay 1	Notes h & i
5			
6			
7			
8			

Notes:

a. Install RB under RBSB.
b. Attach LLN.
c. Install LR.
d. Put BP 3.7m behind RB.
e. Move BP to 2p7.
f. Move BP to 1p7.
g. Move BSB to BP.
h. Remove LLN.
i. Remove BSB.

* Number of deck units used as counterweight.

Table 35. **Building and boom table 9 through 12 bay single-story – normal site**

Brg Lgth	# of Bays	Nose Conf	Spec Notes	Add	Boom to & Add	Boom to & Add	Boom to & Add	Boom to & Add	Boom to & Add	Spec Notes	Boom to	Spec Notes
17.1	9	5N1	Notes a thru f	4+1N1+5+2N1+6+3N1+4N1+5N1*	–	–	–	1p5 LRP**	6p6 7 thru 9 + BSB	Notes g and h	9p6	Note i
18.9	10				1p4 7	2p0 8		2p4 LRP**	8p6 9 + 10 + BSB		10p6	
20.7	11	6N1			1p4 7+ 6N1	–	–	1p5 LRP**	7p6 8 thru 11 + BSB		11p6	
22.6	12				1p4 7+ 6N1	1p5 8	2pl 9	2p4 LRP**	9p6 10 thru 12 + BSB		12p6	

Notes:

a. Build bays 1, 2, and 3.
b. Boom to 1p2.
c. Put BP under 1p7 after bay 1 is added.
d. Put BP under 2p7 after bay 2 is added.
e. Put BP under 3p7 after bay 3 is added.
f. LLN added.
g. Remove LLN.
h. Remove LNH sections after they have passed 1.5m beyond LRP.
i. Put bridge on ground by lowering LRP first, then use jacks to lower near bank end.

* The LRP is no longer placed on the light launching nose. Position LRP on top of the first heavy launching nose (1N1) and secure with a tie-down strap.
** Landing roller is placed 23cm from tip of LLN.

Table 36. **Delaunch table 9 through 12 bay single-story – normal site**

Brg Lgth	# of Bays	Nose Conf	Spec Notes	Del to and Rem	Spec Notes	Del to & Rcvr	Boom to & Rem	Boom to & Rem	Boom to & Rem	Boom to & Rem	Put BP at & Rem	Boom to	Put BP at & Rem	Spec Notes
17.1	9	5N1	Notes a thru d	6p6 BSB + 9 thru 7	Note e	1p5 LRP*	–	–	–	1p2 5N1 + 4N1 + 3N1 + 6 + 2N1 + 5 1N1 + 4	2p7 3	BSB	1p7 2 + 1	Note g
18.9	10			8p6 BSB + 10 + 9		2p4 LRP*	2p0 8	1p4 7	–					
20.7	11	6N1		7p6 BSB + 11 thru 8		1p5 LRP*	–	–	1p4 6N1 + 7					
22.6	12			9p6 BSB + 12 thru 10		2p4 LRP*	2p1 9	1p5 8						

Notes:

a. Position RB under RBSB.
b. Position center of LR (in LRP) 2.7m from BSB.
c. Position BP 4.6m behind RB.
d. Add 3 LNH. Reposition LRP base 23cm from BSB. Add 4th LNH.
e. Add 5N1 and LLN.
f. Add 5N1, 6N1, and LLN.
g. Remove BSB, clear site.

* Position and secure LRP on top of heavy launching nose (1N1).

Table 37. **Building and boom table 9 through 12 bay single-story – restricted site**

Brg Lgth	# of Bays	Nose Conf	Cntr Wt	Notes	Add	Spec Notes	Rem	Lau to & Rem	Lau to & Rem	Notes	Add	Lau to & Rem	Lau to & Rem/ Add	Lau to & Rem	Lau to & Rem/ Add	Lau to & Complete By
17.1	9	6N1	2TP 4D**	Notes a thru h	4 + BSB* + 1N1 + 2N1 + 3N1 + 2TP4D** + 4N1 + 5N1 + 6N1***	Tip bridge to put launching nose on far bank. Remove LRP and put under launching nose.	2TP 4D	2p7 LLN (F)	4p7 LLN (R) BSB	Note i	5 thru 8	6p7 1N1 & 2N1	8p7 3N1 /9	9p7	BSB	BSB Notes j & k
18.9	10							–	4p7 LLN BSB				8p7 2N1/ 9 + 10	10p7 3N1		
20.7	11	7N1	4TP 4D**		4 + BSB* + 1N1 + 2N1 + 3N1 + 4TP 4D** + 4N1 thru 7N1***		4TP 4D	2p7 LLN (F)	4p7 LLN (R) BSB			6p7 1N1	8p7 2N1 + 3N1/ 9 + 10 + 11	10p7 4N1	11p7 /BSB	
22.6	12							–	4p7 LLN BSB				8p7 2N1/ 9 thru 12	10p7 3N1	12p7 4N1/ BSB	

Notes:
a. Build bay 1.
b. Position BP under 1p7 after bay 1 is added.
c. Build bay 2.
d. Position BP under 2p4 after bay 2 is added.
e. Boom to 1p0.
f. Build bay 3.
g. Position BP under 3p7 after bay 3 is added.
h. Add LLN.
i. Place BSB to side of site near rear of bridge.
j. Lower LRP, remove last three LNH.
k. Put bridge on ground.

* Used as counterweight. Secure to girders with **SHOOT BOLTS ONLY**.
** Counterweight components.
*** LRP is no longer placed on the light launching nose. Position LRP on top of first heavy launching nose (1N1) and secure with a tie-down strap.

Table 38. **Delaunch table 9 through 12 bay single-story – restricted site**

Brg Lgth	# of Bays	Nose Conf	Cntr Wt	Notes	Del to & Rem	Del to & Rem	Del to & Add/ Rem	Del to & Add	Del to & Add/ Rem	Add	Del to & Add	Del to & Add/ Rcvr	Remove	Rem & Complete By
17.1	9	6N1	2TP 4D**	Notes a thru c	9p7 BSB Note d	–	8p7/ 9	6p7 1N1	4p7 LLN (R)/ 8 thru 5	BSB*	2p7 LLN (F)	1p0 Note e 2TP 4D**/ LRP ***	6N1 thru 4N1 + 2TP4D** +3N1+2N1 +1N1+BSB +4	3+LLN Note f +2+1+ Notes g & h
18.9	10				10p7 BSB Note d	–	8p7 2N1/ 10+9							
20.7	11	7N1	4TP 4D**		11p7 BSB Note d	9p7 3N1	8p7 2N1/ 11 thru 9					1p0 Note e 4TP 4D**/ LRP ***	7N1 thru 4N1+4TP– 4D**+3N1+ 2N1+1N1+ BSB+4	
22.6	12				12p7 BSB Note d	10p7 3N1	8p7 2N1/ 12 thru 9							

Notes:

a. Position RB under RBSB.
b. Position center of LR (in LRP) 2.7m from BSB.
c. Add 3 LNH. Reposition LRP base from BSB. Add 4th LNH.
d. Place BSB to side of site near rear of bridge.
e. Position BP 4.6m behind RB.f. Position BP under 2p7 before removing bay 3.
g. Position BP under 1p7 before removing bay 2.
h. Remove BSB and clear site.

* Used as counterweight, secure to girders with **SHOOT BOLTS ONLY.**
** Counterweight components.
*** Position and secure LRP on top of heavy launching nose (1N1).

Table 39. **Building and boom table 2E + 1 through 2E + 12 bay double-story – normal site**

Brg Lgth	2E + # of Bays	Nose Conf	Build E + 1 Place	Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Lau to Place LRP under LZ #	Complete By
11.3	1	2N1	RRB 1p3	2N1 + E (1p0)*	–	–	–	(1p0) 3–See note	Continue launch until RBSB overhangs FRB by 0.5m OR far bank BSB touches F peg. Lower far bank end of bridge. Put near bank end of bridge on ground.
13.1	2	3N1	RRB 1p6	3N1 + 2 + E (1p2)*	–	–	–	(1p2) 8–See note	
14.9	3		RRB under 1p4	2 + 3 + 3N1 (1p6)*	2p4 E (1p6)	–	–	(1p6) 5–See note	
16.8	4			2 + 3 + 3N1 + 4 (Ap2)*	3p0 E (2p3)	–	–	(2p3) 4–See note	
18.6	5	4N1			3p0 5 + E (2p5)	–	–	(2p5) 8–See note	
20.4	6				3p0 5 + 6 (2p3)	4p0 E (3p1)	–	(3p1) 5–See note	
22.3	7				3p0 5 + 6 + 7 (2p2)	4p4 E (3p6)	–	(3p6) 4–See note	
24.1	8	5N1		2 + 3 + 5N1 + 4 + 5 (Bp5)*	3p2 6 + 7 + 8 (2p5)	4p6 E (3p7)	–	(3p7) 8–See note	
25.9	9					4p0 9 + E (4p3)	–	(4p3) 5–See note	
27.7	10					4p6 9 + 10 (3p5)	5p7 E (5p0)	(5p0) 3–See note	
29.6	11	6N1		2 + 3 + 6N1 + 4 + 5 (Bp7)*	3p0 6 + 7 + 8 (2p3)	4p4 9 + 10 + 11 (3p7)	6p1 E (5p2)	(5p2) 8–See note	
31.4	12						6p1 12 + E (5p6)	(5p6) 5–See note	

Note:
Nose sections are removed after they have passed 1.5m beyond LRP. Leave the last three nose sections in place until the far bank end of bridge has been lowered to the ground. Reposition the LRP and remove the last three nose sections.

* LRP is no longer placed on the light launching nose. Position LRP on top of first heavy launching nose (1N1) and secure with a tie-down strap.

Table 40. **Delaunch table 2E + 1 through 2E + 12 bay double-story – normal site – near bank**

Brg Lgth	2E + # of Bays	Nose Conf	Spec Notes	Del to & Add	Del to & Rcvr	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem	Complete By
11.3	1	2N1	Notes a, b, and c	Dp0 RRB	(1p0) LRP*	–	–	–	1p3 E+2N1	Remove RRB. Disassemble bay 1 and the end of bridge and clear site of all equipment.
13.1	2	3N1	Notes a, b, and d		(1p2) LRP*	–	–	–	1p6 E+3N1	
14.9	3				(1p6) LRP*	–	–	2p4 E (Bp0)	1p4 3N1+3	
16.8	4				(2p3) LRP*	–	–	3p0 E (Ap2)	1p4 4+3N1 +3+2	
18.6	5	4N1	Notes a, b, d, and e		(2p5) LRP*	–	–	3p0 E+5 (Ap2)	1p4 4+4N1 +3+2	
20.4	6				(3p1) LRP*	–	4p0 E (1p6)	3p0 6+5 (Ap2)		
22.3	7				(3p6) LRP*	–	4p4 E (2p2)	3p0 7, 6, & 5 (Ap2)		
24.1	8	5N1			(3p7) LRP*	–	4p6 E (2p5)	3p2 8, 7, & 6 (1p0)	1p4 5+4+5N1 +4+3+2	
25.9	9				(4p3) LRP*	–	4p6 E+9 (2p5)			
27.7	10				(5p0) LRP*	5p7 E (3p5)	4p6 10+9 (2p5)			
29.6	11	6N1			(5p2) LRP*	6p1 E (3p7)	4p4 11 thru 9 (2p3)	3p0 8, 7, & 6 (1p0)		
31.4	12				(5p6) LRP*	6p1 E+12 (3p7)			1p4 5+4+6N1 +4+3+2	

Notes:

a. Position FRB under RBSB.
b. Position center of LR (in LRP) 2.7m from BSB.
c. For 2E + 1 only, add 2 LNH and LLN rear section. Reposition LRP base 23cm from BSB.
d. For 2E + 2 through 2E + 12, add 3 LNH. Reposition LRP base 23cm from BSB.
e. Add remaining nose sections.

* Position and secure LRP on top of heavy launching nose (1N1).

Table 41. **Delaunch table 2E + 1 through 2E + 12 bay double-story—normal site—original far bank**

Brg Lgth	2E + #of Bays	Nose Conf	Spec Notes	Del to & Add	Del to & Rcvr	Boom to & Rem	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem	Boom to & Rem	Complete By
11.3	1	2N1	Notes a, b, c	Dp0 RRB	(1p0) LRP*	1p3 E (Bp7)	–	–	–	2N1 (Bp3)	–	–	Remove RRB and TP2. Disassemble bay 1 and the end of the bridge and clear site of all equipment.
13.1	2	3N1	Notes a, b, & d		(1p2) LRP*	1p6 E (Bp5)	–	–	–	3N1 + Pin at A + BP2 (BPI)	–	–	
14.9	3				(1p6) LRP*	2p4 E (Bp0)	–	–	–	1p7 3N1 + Pin at A + BP3 (Ap2)	–	1p4 TP3 + BP2	
16.8	4				(2p3) LRP*	3p0 E (Ap1)	–	–	–	1p7 BP4 + 3N1 (1p3)	2p0 Pin at A	1p4 TP4 + 3 + BP2	
18.6	5	4N1			(2p5) LRP*	3p0 E (1p2)	–	–	–	1p7 TP5 + BP4 + 4N1 (1p3)			
20.4	6		Notes a, b, d, & e		(3p1) LRP*	4p0 E (1p6)	–	–	3p0 6 + BP5 (1p0)				
22.3	7				(3p6 LRP*	4p4 E (1p6)	–	–	3p0 7 + 6 + BP5 (Bp0)				
24.1	8	5N1			(3p7) LRP*	4p6 E (2p3)	–	3p6 BP8 (2p0)	3p0 TP8 + 7 + BP6 (1p0)	1p7 TP6 + 5 + BP4 + 5N1 (1p3)			
25.9	9				(4p3) LRP*	4p6 E (2p3)	–						
27.7	10				(5p0) LRP*	5p7 E (3p3)	4p6 BP10 (3p3)	3p6 TP10 + 9 + BP8 (2p0)					
29.6	11	6N1			(5p2) LRP*	6p1 E (3p7)	4p6 11 + BP10 (3p5)			1p7 TP6 + 5 + BP4 + 6N1 (1p3)			
31.4	12				(5p6) LRP*	6p1 E (4p3)	4p6 12 + 11 BP10 (3p1)						

Notes:

a. Position FRB under RBSB.
b. Position center of LR (in LRP) 2.7m from BSB.
c. For 2E + 1 only, add 2 LNH and LLN rear section. Reposition LRP base 23cm from BSB.
d. For 2E + 2 through 2E + 12, add 3 LNH. Reposition LRP base 23cm from BSB.
e. Add remaining nose section.

* Position and secure LRP is positioned and secured on top of heavy launching nose (1N1).

Table 42. **Building and boom table 2E + 1 through 2E + 12 bay double-story – restricted site**

Brg Lgth	2E + # of Bays	Nose Conf	Build E + 1 Place RRB	Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Lau to Place LRP under LZ #	Lau to & Rem	Lau to & Add
11.3	1	3N1	1p3	3N1 (Cp1)*	–	–	–	–	–	(Bp1) 3–See note	Bp1 RRB	1p4 E
13.1	2	4N1	1p6	2 + 4N1 (Bp7)*	–	–	–	–	–	(Bp7) 8–See note	Ap3 RRB	2p4 E
14.9	3		1p4		–	–	–	–	–	(Bp7) 2–See note		2p4 3
16.8	4				1p7 3 (Bp2)	2p4 4 (Ap2)	–	–	–	(Ap2) 3-See note	1p6 RRB	4p4 E
		5N1		2+ 5N1 (Cp1)*	–	–	–	–	–	(Cp1) 6–See note	Bp6 RRB	2p4 3
18.6	5				1p5 3 (Bp4)	2p4 4 (Bp0)	–	–	–	(Bp0) 2–See note	1p4 RRB	4p4 5
		6N1		2+ 5N1 (Cp4)*	–	–	–	–	–	(Cp4) 6–See note	Bp4 RRB	2p4 3
20.4	6	5N1		2 +3+5N1 + 4 (Bp0)*	2p6 5 (1p0)	–	–	–	–	(1p0) 2–See note	2p0 RRB	5p4 6
		6N1		2+6N1 (Bp4)*	–	–	–	–	–	(Cp4) 1–See note	Bp4 RRB	2p4 3
22.3	7	5N1		2+3+5N1 (Bp4)*	2p2 4+ 5 (1p0)	3p2 6 (1p4)	3p7 7 (2p0)	–	–	(2p0) 2-See note	3p0 RRB	7p4 E
		6N1		2+ 3 + 6N1 (Bp7)*	1p7 4 (Bp2)	–	–	–	–	(Bp2) 2-See note	1p2 RRB	4p4 5
24.1	8					2p4 5 (Ap2)	3p0 6 (1p2)	–	–	(1p2) 2-See note	2p2 RRB	6p4 7
25.9	9	7N1		2+3+6N1 + 4 (Cp2)*	–	–	–	–	–	(Bp5) 4-See note	Apl RRB	4p4 5
		6N1		2+3+6N1 (Bp7)*	1p7 4+ 5 (Ap2)	3p0 6 (1p2)	3p4 7 (1p6)	4p0 8 (2p3)	–	(2p3) 3-See note	3p3 RRB	8p4 9
		7N1		2 +3+7N1 (Cp2)*	2p1 5 (Bp0)	–	–	–	–	(Bp0) 1–See note	1p4 RRB	5p4 6

Table 42. **Building and boom table 2E + 1 through 2E + 12 bay double-story—restricted site (continued)**

2E + # of Bays	Lau to & Add (CG)	Lau to & Add (CG)	Lau to & Add (CG)	Lau to & Add (CG)	Complete By
1	–	–	–	–	Continue launch until RBSB overhangs FRB by 0.5m **OR** far bank BSB touches F peg. Lower far bank end of bridge. Put near bank end of bridge on ground.
2	–	–	–	–	
3	3p4 E	–	–	–	
4	–	–	–	–	
	3p4 4	4p4 E	–	–	
5	5p4 E	–	–	–	
	3p4 4	4p4 5	5p4 E	–	
6	6p4 E	–	–	–	
	3p4 4	4p4 5	5p4 6	6p4 E	
7	7p4 E	–	–	–	
	4p4 5	5p4 6	6p4 7	7p4 E	
8	7p4 8	8p4 E	–	–	
	5p4 6	6p4 7	7p4 8	8p4 E	
9	9p4 E	–	–	–	
	6p4 7	7p4 8	8p4 9	9p4 E	

Note:
Nose sections are removed after they have passed 1.5m beyond LRP. Leave the last three nose sections in place until the far bank end of bridge has been lowered to the ground. Reposition the LRP and remove the last three sections.

(Table 42 continued on next page)

Table 42. **Building and boom table 2E + 1 through 2E + 12 bay double-story – restricted site (continued)**

Brg Lgth	2E + # of Bays	Nose Conf	Build E+1 Place RRB	Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Lau to Place LRP under LZ #	Lau to & Rem
27.7	10	6N1	1p4	2+3+6N1 (Bp7)*	1p7 4+ 5 (Ap2)	3p0 6+ 7 (1p6)	4p0 8 (2p3)	4p4 9 (2p7)	5p1 10 (3p3)	(3p3) 3-See note	4p3 RRB
		7N1		2+3+7N1 (Bp5)*	2pl 5 (Bp0)	2p6 6 (1p0)	3p2 7 (1p4)	–	–	(1p4) 1-See note	2p4 RRB
29.6	11			2+3+7N1+ 4+5 (Bp0)*	2p6 6+ 7 (1p4)	3p6 8 (2p1)	4p2 9 (2p5)	–	–	(2p5) 2-See note	3p5 RRB
		8N1		2+3+8N1+ 4+8N1 (Cp0)*	1p6 5 (Bp3)	2p3 6 (Ap2)	–	–	–	(Ap2) 1-See note	1p6 RRB
31.4	12	7N1		2+3+7N1+ 4+5 (Bp0)*	2p7 6+ 7 (1p4)	3p6 8+ 4 (2p5)	4p7 10 (3p1)	5p3 11 (3p5)	–	(3p5) 2-See note	4p5 RRB
		8N1		2+3+7N1+ 4+8N1 (Cp0)*	1p6 5 (Bp3)	2p3 6 (Ap2)	3p0 7 (1p2)	3p4 8 (1p6)	–	(1p6) 1-See note	2p6 RRB

2E + # of Bays	Lau to & Add	Lau to & Add	Lau to & Add	Lau to & Add	Lau to & Add	Lau to & Add	Complete By
10	10p E	–	–	–	–	–	Continue launch until RBSB overhangs FRB by 0.5m OR far bank BSB touches F peg. Lower far bank end of bridge. Put near bank end of bridge on ground.
	7p4 8	8p4 9	9p4 10	10p4 E	–	–	
11	9p4 10	10p4 11	11p4 E	–	–	–	
	6p4 7	7p4 8	8p4 9	9p4 10	10p4 11	11p4 E	
12	11p4 12	12p4 E	–	–	–	–	
	8p4 9	9p4 10	10p4 11	11p4 12	12p4 E	–	

Note:
Nose sections are removed after they have passed 1.5m beyond LRP. Leave the last three nose sections in place until the far bank end of bridge has been lowered to the ground. Reposition the LRP and remove the last three sections.

* LRP is no longer placed on top of the light launching nose. Position LRP on top of first heavy launching nose (1N1) and secure with a tie-down strap.

Table 43. **Delaunch table 2E + 1 through 2E + 12 bay double-story—restricted site—near bank**

Brg Lgth	2E + # of Bays	Nose Conf	Spec Notes	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Add	Del to & Rcvr	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Complete By
11.3	1	3N1	Notes a thru d	1p4 E	–	–	–	–	Bp1 RRB	(Cp1) LRP*	–	–	–	–	1p3 3N1	Remove RRB. Disassemble bay 1 and the end of bridge and clear site of all equipment
13.1	2	4N1		2p4 E	–	–	–	–	Ap3 RRB	(Bp7) LRP*	–	–	–	–	1p6 4N1 + 2	
14.9	3			3p4 E	2p4 3	–	–	–			–	–	–	–	1p4 4N1 + 2	
16.8	4			4p4 E	–	–	–	–	1p6 RRB	(Ap2) LRP*	2p4 4 (Bp2)	1p7 3 (Bp7)	–	–		
		5N1			3p4 4	–	–	–	Bp1 RRB	(Cp1) LRP*	–	–	–	–	1p4 5N1 + 2	
18.6	5			5p4 E	4p4 5	–	–	–	1p4 RRB	(Bp0) LRP*	2p2 4 (Bp4)	1p5 3 (Cp1)	–	–		
		6N1				3p4 4	–	–	Bp4 RRB	(Cp4) LRP*	–	–	–	–	1p4 6N1 + 2	
20.4	6	5N1		6p4 E	5p4 6	–	–	–	2p0 RRB	(1p0) LRP*	2p6 5 (Bp0)	2p4 4 (Bp4)	–	–	1p4 5N1 +3+2	
		6N1				4p4 5	3p4 4	2p4 3	Bp4 RRB	(Cp4) LRP*	–	–	–	–	1p4 6N1 + 2	
22.3	7	5N1		7p4 E	–	–	–	–	3p0 RRB	(2p0) LRP*	3p7 7 (1p4)	3p2 6 (1p0)	2p25+ 4(Bp4)	–	1p4 5N1 +3+2	
		6N1			6p4 7	5p4 6	4p4 5	–	1p2 RRB	(Bp2) LRP*	1p7 4 (Bp7)	–	–	–	1p4 6N1 + 3	
24.1	8			8p4 E	7p4 8	6p4 7	–	–	2p2 RRB	(1p2) LRP*	3p0 6 (Ap2)	2p4 5 (Bp2)	1p7 4 (Bp7)	–	1p4 6N1 +3+2	
		7N1					5p4 6	4p4 5	Ap1 RRB	(Bp5) LRP*	–	–	–	–	1p4 4+7N1 +3+2 (Bp3)	
25.9	9	6N1		9p4 E	8p4 9	–	–	–	3p3 RRB	(2p3) LRP*	4p0 8 (1p6)	3p4 7 (1p2)	3p0 6 (Ap2)	1p75+ 4 (Bp7)	1p4 6N1 +3+2	
		7N1				–	–	–	1p4 RRB	(Bp0) LRP*	2p1 5 (Bp5)	–	–	–	1p4 4+7N1 +3+2 (Bp3)	

Notes: a. Position FRB under RBSB.
b. Position center of LR (in LRP) 2.7m from BSB.
c. Add 3 LNH. Reposition LRP base 23cm from BSB.
d. Add remaining nose sections.
* Position and secure LRP on top of heavy launching nose (1N1).

(Table 43 continued on next page)

Table 43. **Delaunch table 2E + 1 through 2E + 12 bay double-story—restricted site—near bank (continued)**

Brg Lgth	2E + # of Bays	Nose Conf	Spec Notes	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Add	Del to & Rcvr	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Complete By
27.7	10	6N1	Notes a thru d	10p4 E	–	–	–	–	–	4p3 RRB	(3p3) LRP*	5p1 10 (2p7)	4p4 9 (2p3)	4p0 8 (1p6)	1p4 6N1 + 3 + 2 (Bp3)	Remove RRB. Disassemble bay 1 and the end of bridge and clear site of all equipment.
		7N1			9p4 10	8p4 9	7p4 8	–	–	2p4 RRB	(1p4) LRP*	3p2 7 (1p0)	2p6 6 (Bp0)	2p1 5 (Bp5)	1p4 7N1 + 3 + 2 (Bp3)	
29.6	11			11p4 E	10p4 11	9p4 10	–	–	–	3p5 RRB	(2p5) LRP*	4p2 9 (2p1)	3p6 8 (1p4)	2p6 7 + 6 (Bp0)	1p4 5 + 4 + 7N1 + 3 + 2 (Bp3)	
		8N1					8p4 9	7p4 8	6p4 7	1p6 RRB	(Ap2) LRP*	2p3 6 (Bp3)	1p6 5 (Cp0)	–	1p4 8N1 + 4 + 7N1 + 3 + 2 (Bp3)	
31.4	12	7N1		12p4 E	11p4 12	–	–	–	–	4p5 RRB	(3p5) LRP*	5p3 11 (3p1)	4p7 10 (2p5)	3p6 9 + 8 (1p4)	1p4 7N1 + 4 + 6N1 + 3 + 2 (Bp3)	
		8N1				10p4 11	9p4 10	8p4 9	–	2p6 RRB	(1p6) LRP*	3p4 8 (1p2)	3p0 7 (Ap2)	2p3 6 (Bp3)	1p4 8N1 + 4 + 7N1 + 3 + 2 (Bp3)	

Notes:

a. Position FRB under RBSB.

b. Position center of LR (in LRP) 2.7m from BSB.

c. Add 3 LNH. Reposition LRP base 23cm from BSB.

d. Add remaining nose sections.

* Position and secure LRP on top of heavy launching nose (1N1).

Table 44. **Delaunch table 2E + 1 through 2E + 12 bay double-story – restricted site – original far bank**

Brg Lgth	2E + # of Bays	Nose Conf	Spec Notes	Del to and Rem	Del to and Rem	Del to and Rem	Del to and Rem	Del to and Rem	Del to Add	Del to and Rcvr	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem	Boom to & Rem	Complete By
11.3	1	3N1	Notes a thru d	1p4 Note e	Bp0 D	–	–	–	Bp1 RRB	(Cp1) LRP*	–	–	1p4 3N1 (Bp3)	1p7 Pin at A	1p4	Remove RRB and TP2.
13.1	2	4N1		2p4 Note e	1p4 D + BP2	–	–	–	Ap3 RRB	(Cp1) LRP*	–	–	1p7 4N1 (Bp0)	2p0 Pin at A		
14.9	3			3p4 Note e	2p4 D + BP3	–	–	–		(Bp5) LRP*	–	–	1p7 4N1 (Ap2)		1p4 TP3 + BP2	
16.8	4			4p4 Note e	3p4 D + BP4	–	–	–	1p6 RRB	(Bp0) LRP*	2p4 TP4	–	1p7 4N1 (1p3)			Disassemble bay 1 and the end of bridge and clear site of all equipment.
		5N1				–	–	Ap1TP4 + BP3	Ap3 RRB	(Bp7) LRP*	–	–	1p4 5N1 (Ap2)			
18.6	5			5p4 Note e	4p4 D + BP5	–	–	–	1p4 RRB	(Ap2) LRP*	2p2 TP5 + BP4 (Bp3)	–	1p5 5N1 (1p3)		1p4 TP4 thru BP2	
		6N1				–	1p7 TP5 + BP4	Ap1 TP4 + BP3	Bp1 RRB	(Cp2) LRP*	–	–	1p4 6N1 (1p3)			
20.4	6	5N1		6p4 Note e	5p4 D + BP6	–	–	–	2p0 RRB	(1p2) LRP*	2p6 TP6 + BP5 (1pC)	2p2 TP5 + BP4 (1p6)	1p5 5N1 (1p3)			
		6N1				2p7 TP6 + BP5	1p7 TP5 + BP4	Ap1 TP4 + BP3	Bp2 RRB	(Cp2) LRP*	–	–	1p4 6N1 (1p3)			

Notes:

a. Position FRB under RBSB.
b. Position center of LR (in LRP) 2.7m from BSB.
c. Add 3 LNH. Reposition LRP base 23cm from BSB.
d. Add remaining nose sections.
e. Remove the end of bridge (E) except for the junction panel (D).

* Position and secure LRP on top of heavy launching nose (1N1).

(Table 44 continued on next page)

Table 44. **Delaunch table 2E + 1 through 2E + 12 bay double-story – restricted site – original far bank (continued)**

Brg Lgth	2E + # of Bays	Nose Conf	Spec Notes	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Add	Del to & Rcvr	Boom to & Rem (CG)	Boom to & Rem (CG)
22.3	7	5N1	Notes a thru d	7p4 Note e	6p4 D	–	–	–	3p0 RRB	(1p6) LRP*	3p7 BP7 (1p5)	3p2 TP7 + BP6(1p2)
		6N1			6p4 D + BP7	3p7 TP7 + BP6	2p7 TP6 + BP5	–	1p6 RRB	(Bp0) LRP*	–	–
24.1	8			8p4 Note e	7p4 D + BP8	4p7 TP8 + BP7	–	–	2p2 RRB	(1p4) LRP*	3p0 TP7 + BP6 (1p0)	2p4 TP6 + BP5(Bp0)
		7N1					3p7 TP7 + BP6	2p7 TP6 + BP5	Ap1 RRB	(Bp3) LRP*	–	–
25.9	9	6N1		9p4 Note e	8p4 D + BP9	–	–	–	3p3 RRB	(2p5) LRP*	4p0 TP9 + BP8(1p6)	3p4 TP8 + BP7(1p2)
		7N1				5p7 TP9 + BP8	4p7 TP8 + BP7	3p7 TP6 + BP6	1p4 RRB	(Ap2) LRP*	2p1 TP6 + BP5(Bp3)	–
27.7	10	6N1		10p4 Note e	9p4 D + BP10	–	–	–	4p3 RRB	(3p1) LRP*	5p1 BP10	4p4 TP10 + BP9(2p5)
		7N1				6p7 TP10 + BP9	5p7 TP9 + BP8	–	3p0 RRB	(1p6) LRP*	–	3p2 TP8 + BP7(1p2)

2E + # of Bays	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem	Boom to & Rem	Complete By
7	2p2 TP6 + BP5 (Ap2)	–	1p7 TP5 + BP4 + 5N1 (1p3)	2p0 Pin at A	1p4 TP4 thru BP2	Remove RRB and TP2. Disassemble bay 1and the end of the bridge and clear site of all equipment.
	–	–	1p7 TP5 + BP4 + 6N1 (1p3)			
8	–	–				
	–	–	1p7 TP5 + BP4 + 7N1 (1p3)			
9	3p0 TP7 + BP6 (Ap2)	–	1p7 TP6 thru BP4 + 6N1 (1p3)			
	–	–	1p7 TP5 thru BP4 + 7N1 (1p3)			
10	4p0 TP9 + BP8 (2p0)	3p0 TP8 + BP7 + BP6 (1p0)	1p7 TP5 thru BP4 + 6N1 (1p3)			
	2p6 TP7 + BP6 (Ap2)	2p1 TP6 + BP5 (Bp3)	1p7 TP5 + BP4 + 7N1 (1p3)			

Notes:

a. Position FRB under RBSB.
b. Position center of LR (in LRP) 2.7m from BSB.
c. Add 3 LNH. Reposition LRP base 23cm from BSB.
d. Add remaining nose sections.
e. Remove the end of bridge (E) except for the junction panel (D).

* Position and secure LRP on top of heavy launching nose (1N1).

Table 44. **Delaunch table 2E + 1 through 2E + 12 bay double-story – restricted site – original far bank (continued)**

Brg Lgth	2E + # of Bays	Nose Conf	Spec Notes	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Add	Del to & Rcvr	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)
29.6	11	7N1	Notes a thru d	11p4 Note e	10p4 D + BP11	7p7 TP11 + BP10	–	–	–	3p5 RRB	(2p7) LRP*	4p2 TP10 + BP9 (2p3)	3p6 TP9 + BP8 (1p6)	2p6 TP8 + BP7 (1p2)	–
		8N1					6p7 TP10 + BP9	5p7 TP9 + BP8	4p7 TP8 + BP7	3p0 RRB	(1p6) LRP*	2p3 TP7 + BP6 (Bp1)	–	–	–
31.4	12	7N1		12p4 Note e	11p4 D + BP12	–	–	–	–	4p5 RRB	(3p5) LRP*	5p3 TP12 + BP11 (3p3)	4p7 TP11 + BP10 (2p7)	3p6 TP10 + BP9 (2p3)	2p6 TP8 + BP7 (1p2)
		8N1				8p7 TP12 + BP11	7p7 TP11 + BP10	6p7 TP10 + BP9	–	3p1 RRB	(2p0) LRP*	3p4 TP9 + BP8 (1p4)	3p0 TP8 + BP7 (Bp1)	2p3 TP7 + BP6 (Bp1)	–

2E + # of Bays	Boom to & Rem (CG)	Boom to & Rem	Boom to & Rem	Complete By
11	1p7 TP7 thru BP4 + 7N1 (1p3)	2p0 Pin at A	1p4 TP4 thru BP2	Remove RRB and TP2. Disassemble bay 1 and the end of bridge and clear site of all equipment.
	1p7 TP6 thru BP4 + 8N1 (1p3)			
12	1p7 TP7 thru BP4 + 7N1 (1p3)			
	1p7 TP6 thru BP4 + 8N1 (1p3)			

Notes:
a. Position FRB under RBSB.
b. Position center of LR (in LRP) 2.7m from BSB.
c. Add 3 LNH. Reposition LRP base 23cm from BSB.
d. Add remaining nose sections.
e. Remove the end of bridge (E) except for the junction panel (D).

* Position and secure LRP on top of heavy launching nose (1N1).

Table 45. **Building and boom table 2E + 13 through 2E + 22 bay double-story (wo/LRS)–normal site**

Brg Lgth	2E + # of Bays	Nose Conf	Cntr Wt	Build E + 1 Place RRB	Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Lau to Place LRP under LZ #	Lau to & Rem
33.2	13	6N1	–	1p4	2+3+ (6N1*+4) +5 (Ap2)	3p0 6+7 +8 (2p3)	4p4 9+ 10+11 (4p0)	11p0 12+13 +E (6p2)	(6p2) 3-See note	7p2 FRB +RRB
35.1	14	7N1	–		2+3+ (7N1*+4) +5+6 (1p0)	3p2 7 thru 9 (2p5)	4p7 10 thru 12 (4p2)	11p0 13+14 +E (6p4)	(6p4) 7-See note	7p4 FRB +RRB
36.9	15		–					11p0 13 thru 15+E (7p1)	(7p1) 5-See note	8p1 FRB +RRB
38.7	16		–					11p0 13 thru 16 +E (7p5)	(7p5) 3-See note	8p5 FRB +RRB
40.5	17	8N1	–		2+3+ (7N1*+4) +5+ (8N1**+6) (Ap2)	3p0 7 thru 9 (2p3)	4p5 10+11 +12 (3p7)	10p7 10 thru 17+E (8p0)	(8p0) 8-See note	9p0 FRB +RRB
42.4	18		–					10p7 10 thru 18 +E (8p4)	(8p4) 5-See note	9p4 FRB +RRB
44.2	19	6N1 + 3N2	20D + 6C		2+3+ (6N1*+4) +5+ (3N2**+6) (Bp2)	2p4 7 thru 9 (2p0)	4p0 10 thru 13 (4p0)	11p0 14 thru 19+ E+20D+6C (9p0)	(9p0) 2-See note	10p0 FRB +RRB
46.0	20							11p0 14 thru 20+ E+20D+6C (9p7)	(9p7) 4-See note	10p7 FRB +RRB
47.9	21							11p0 14 thru 21+ E+20D+6C (10p3)	(10p3) 5-See note	11p3 FRB +RRB
49.7	22							11p0 14 thru 22+ E+20D+6C (10p7)	(10p7) 6-See note	11p7 FRB +RRB

* LLN + given number of LNH are added at this time. LRP is no longer placed on top of the light launching nose. Position LRP on top of first heavy launching nose (1NI) and secure with a tie-down strap.
** Nose completed by adding 8th LNH or 6 LNH required for 3N2 (double-story nose).

Table 45. **Building and boom table 2E + 13 through 2E + 22 bay double-story (wo/LRS)–normal site (continued)**

2E + # of Bays	Complete By	
13	Continue launch until RBSB overhangs CRB by 0.5m **OR** far bank BSB touches F peg. Lower far bank end of bridge. Put near bank end of bridge on ground.	**Note:** Nose sections are removed after they have passed LRP by 1.5m. Leave the last three nose sections in place until far bank end of bridge has been lowered to the ground. Reposition the LRP and remove the last three nose sections.
14		
15		
16		
17		
18		
19		
20		
21		
22		

Table 46. **Delaunch table 2E + 13 through 2E + 22 bay double-story (wo/ LRS) – normal site – near bank**

Brg Lgth	2E + # of Bays	Nose Conf	Cntr Wt	Spec Notes	Del to & Add	Del to & Rcvr	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Complete By
33.2	13	6N1	–	Notes a thru c	9p0 FRB&RRB	(6p2) LRP ***	6p4 E+13+12 (4p0)	4p2 11+10+9 (2p3)	2p5 8+7+6 (Ap2)	1p4 5+(6N1+4) +3+2	Remove RRB. Disassemble bay 1 and the end of bridge and clear site of all equipment.
35.1	14	7N1	–		10p0 FRB&RRB	(6p4) LRP ***	6p6 E+14+13 (4p2)	4p4 12 thru 10 (2p5)	2p7 9 thru 7 (1p0)	1p4 6+5+ (7N1+4) +3+2	
36.9	15		–		11p0 FRB&RRB	(7p1) LRP ***	7p3 E+15 thru 13 (4p2)				
38.7	16		–		12p0 FRB&RRB	(7p7) LRP ***	8p1 E+16 thru 13 (4p2)				
40.5	17	8N1	–		13p0 FRB&RRB	(8p0) LRP ***	8p2 E+17 thru 13 (3p7)	4p1 12+11+10 (2p3)	2p5 9 thru 7 (Ap2)	1p4 (6+8N1*)+5 +(7N1**+4) +3+2	
42.4	18		–		14p0 FRB&RRB	(8p4) LRP ***	8p6 E+18 thru 13 (3p7)				
44.2	19	6N1+ 3N2	20D +6C		15p0 FRB&RRB	(9p0) LRP ***	9p2 6C+20D+E+19 thru 14 (4p0)	4p2 13 thru 10 (2p0)	2p2 9 thru 7 (Bp2)	1p4 (6+3N2*)+5 +(4+6N1**) +3+2	
46.0	20				16p0 FRB&RRB	(9p7) LRP ***	10p1 6C+20D+E+20 thru 14 (4p0)				
47.9	21				17p0 FRB&RRB	10p3 LRP ***	10p5 6C+20D+E+21 thru 14 (4p0)				
49.7	22				18p0 FRB&RRB	10p7 LRP ***	11p1 6C+20D+E+22 thru 14 (4p0)				

Notes:

a. Remove all curbs, ramps, and deck units (except those required for counterweight).
b. Position CRB under RBSB.
c. Install launching nose.

* Remove 8th LNH or all of 3N2 (double-story nose).
** Remove remainder of launching nose.
*** Position and secure LRP on top of heavy launching nose (1N1).

Table 47. **Delaunch table 2E + 13 through 2E + 22 bay double-story (wo/LRS) – normal site – original far bank**

Brg Lgth	2E + # of Bays	Nose Conf	Cntr Wt	Spec Notes	Del to & Add	Del to & Rcvr	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem	Boom to & Rem	Complete By
33.2	13	6N1	–	Notes a thru c	9p0 FRB&RRB	(6p2) LRP ***	6p4 E thru BP12 (4p1)	4p4 TP12 thru BP9 (2p4)	2p6 TP9 thru BP6 (1p0)	1p7* TP7 thru BP4 + 6N1 (1p0)	2p0 Pin at A	1p4 TP4 thru BP2	Remove RRB and TP2. Disassemble bay 1 and the end of bridge and clear site of all equipment
35.1	14	7N1	–		10p0 FRB&RRB	(6p4) LRP ***	6p6 E thru BP13 (4p4)	4p6 TP13 thru BP10 (2p7)	3p1 TP10 thru BP7 (1p2)	1p7* TP7 thru BP4 7N1 (1p3)			
36.9	15		–		11p0 FRB&RRB	(7p1) LRP ***	7p3 E thru BP13 (4p4)						
38.7	16		–		12p0 FRB&RRB	(7p5) LRP ***	7p7 E thru BP13 (4p4)						
39.6	17	8N1	–		13p0 FRB&RRB	(8p0) LRP ***	8p2 E thru BP13 (4p1)	4p4 TP13 thru BP10 (2p4)	2p6 TP10 thru BP7 (1p0)	1p7* TP7 thru BP5 + 8N1 + BP4 + 7N1 (1p3)			
42.4	18		–		14p0 FRB&RRB	(8p4) LRP ***	8p6 E thru BP13 (4p1)						
44.2	19	6N1 + 3N2	20D + 6C		15p0 FRB&RRB	(9p0) LRP ***	9p2 6C + 20D + E thru BP13 (3p6)	4p0 TP13 thru BP10 (2p2)	2p4 TP10 thru BP7 (Bp0)	1p7** TP 7 + BP6 + 3N2 + TP6 thru BP4 + 6N1 (1p3)			
46.0	20				16p0 FRB&RRB	(9p7) LRP ***	10p1 6C + 20D + E thru BP13 (3p6)						
47.9	21				17p0 FRB&RRB	(10p3) LRP ***	10p5 6C + 20D + E thru BP13 (3p6)						
49.7	22				18p0 FRB&RRB	(10p7) LRP ***	11p1 6C + 20D + E thru BP13 (3p6)						

Notes:

a. Remove all curbs, ramps, and deck units (except those required for counterweight).
b. Position CRB under RBSB.
c. Install launching nose.

* Remove entire launching nose after removal of BP4.
** Remove 8th LNH (after BP5), or all of 3N2 (after BP6). Remove remainder of nose (7N1 or 6N1) after removal of BP4.
*** Position and secure LRP on top of heavy launching nose (1N1).

Table 48. **Building and boom table 2E + 13 through 2E + 22 bay double-story (wo/LRS) – restricted site**

Brg Lgth	2E + # of Bays	Nose Conf	Cntr Wt	Build E + 1 Place RRB	Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Lau to Place LRP under LZ #	Lau to & Add	Lau to & Add	Complete By
33.2	13	8N1	38D	1p4	2+3 + 6N1* + 4+5 + 8N1 (Bp3)	2p3 6 thru 8 (1p6)	4p0 TP9 +TP10 (2p3)	4p5 38D (3p4)	–	–	–	–	(3p4) 7 See note	7p6 BP9 +BP10+ 11+12+13	12p6 E	Continue launch until RBSB over-hangs FRB by 0.5m OR far bank BSB touches F peg. Lower far bank end of bridge. Put near bank end of bridge on ground.
35.1	14						4p0 9+10 TP10+TP11 (2p7)	5p1 38D (4p0)	–	–	–	–	(4p0) 4 See note	8p6 BP10 +BP11+12 +13+14	13p6 E	
36.9	15						4p0 9+10+ TP11+TP12 (3p4)	5p6 38D (4p5)	–	–	–	–	(4p5) 2 See note	9p6 BP11 +BP12+13 +14+15	14p6	
38.7	16						4p0 9+10 (3p0)	5p2 11+12 +TP13+ TP14(4p4)	6p6 38D (5p6)	–	–	–	(5p6) 2 See note	11p6 BP13 +BP14+ 15 thru E	–	
40.5	17							5p2 11+12 (4p0)	6p2 13+14 +TP15+ TP16 (5p5)	7p7 38D (6p7)	–	–	(6p7) 3 See note	13p6 BP15 +BP16+ 17 thru E	–	
42.4	18						4p0 9 thru 11 (3p3)	5p5 12 thru 14 (5p0)	7p2 15+ 16+TP17+ TP18 (6p5)	8p7 38D (7p7)	–	–	(7p7) 3 See note	15p6 BP17+ BP18+E	–	
44.2	19		58D + 12D						7p2 15 thru 17 (6p5)	8p7 TP18 +TP19 (7p1)	9p2 58D (9p0)	11p2 BP18 +BP19 (9p3)	(9p3) 6 See note	16p6 E+ 12D	–	
46.0	20									8p7 18+ TP19+ TP20(7p5)	9p7 58D (9p4)	11p6 BP19 +BP20 (9p7)	(9p7) 3 See note	14p6 E+ 12D	–	
47.9	21	6N1 + 3N2			2+3+ 6N1* +4+5 +3N2 +6 (Bp2)	2p4 7+ 8+ 9 (2p0)	4p2 10 thru 13 (4p0)	6p2 14 thru 16 (5p5)	7p6 17+18 (6p5)	8p7 19+ TP20+ TP21 (7p6)	10p0 58D (10p1)	11p7 BP20 +BP21 (9p7)	(10p0) 8 See note	14p6 E+ 12D	–	
49.7	22								7p6 17 thru 19 (6p5)	9p4 20+ TP21+ TP22 (8p2)	10p4 58D (10p1)	12p3 BP21 (10p3)	(10p3) 4 See note	16p6 BP22+ E+12D	–	

Note:
Nose sections are removed after they have passed LRP by 1.5m. Leave the last 3 nose sections in place until far bank end of bridge has been lowered to the ground. Reposition LRP and remove last 3 nose sections.

* Complete 6N1 nose added after bay 3; remainder of nose is added after bay 5. LRP is no longer placed on top of the light launching nose . Position LRP on top of first heavy launching nose (1N1) and secure with a tie-down strap.

Table 49. **Delaunch table 2E + 13 through 2E + 22 bay double-story (wo/LRS) – restricted site – near bank**

Brg Lgth	2E + # of Bays	Nose Conf	Cntr Wt	Spec Notes	Del to & Rem	Del to & Rem	Del to & Rcvr	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem	Complete By
33.2	13	8N1	38D	Notes a thru c	12p6 E	7p6 13 thru 11 + BP10 + BP9	(3p4) LRP ***	4p5 38D (2p3)	–	–	–	–	4p0 TP10 + TP9 (1p6)	2p3 8 thru 6 (Bp3)	1p4* 8N1 + 7N1 + 5 + 4 + 6N1 + 3 + 2	Remove RRB. Disassemble bay 1 and the end of bridge and clear site of all equipment.
35.1	14				13p6 E	8p6 14 thru 12 + BP11 + BP10	(4p0) LRP ***	5p1 38D (2p7)	–	–	–	–	4p0 TP11 thru 9 (1p6)			
36.9	15				14p6 E	9p6 15 thru 13 + BP12 + BP11	(4p5) LRP ***	5p6 38D (3p4)	–	–	–	–	4p0 TP12 thru 9 (1p6)			
38.7	16				–	11p6 E thru 15 + BP14 + BP13	(5p6) LRP ***	6p6 38D (4p4)	–	–	–	5p2 TP14 thru 11 (3p0)	4p0 10 + 9 (1p6)			
40.5	17				–	13p6 E + 17 + BP16 + BP15	(6p7) LRP ***	7p7 38D (5p5)	–	–	6p2 TP16 thru 13 (3p0)	5p2 12 + 11 (3p0)				
42.4	18				–	15p6 E + BP18 + BP17	(7p7) LRP ***	8p7 38D (6p5)	–	–	7p2 TP18 thru 15 (5p0)	5p5 14 thru 12 (3p3)	4p0 11 thru 9 (1p6)			
44.2	19		58D + 20D		–	14p6 12D + E	(9p3) LRP ***	11p2 BP19 + BP 18 (9p0)	9p2 58D (7p1)	8p7 TP19 + TP18 (6p5)	7p2 17 thru 15 (5p0)					
46.0	20				–		(9p7) LRP ***	11p6 BP20 + BP19 (9p4)	9p7 58D (7p5)	8p7 TP20 thru 18 (6p5)						
47.9	21	6N1 + 3N2			–	16p6 12D + E	(10p0) LRP ***	11p7 BP21 + BP20 (9p5)	10p0 58D (7p6)	8p7 TP21 thru 19 (6p5)	7p6 18 + 17 (5p6)	6p2 16 thru 14 (4p0)	4p2 13 thru 10 (2p0)	2p4 9 thru 7 (Bp2)	1p4** 6 + 3N2 + 5 + 4 + 6N1 + 3 + 2	
49.7	22				–		(10p3) LRP ***	12p3 BP22 + BP21 (10p1)	10p4 58D (8p2)	9p4 TP22 thru 20 (7p2)	7p6 19 thru 17 (5p6)					

Notes:

a. Remove all curbs, ramps, and deck units, except those that are required for counterweight.

b. Position CRB under RBSB.

c. Install launching nose.

* Remove 8th and 7th LNH prior to removal of bay 5; then remove remainder of nose after removal of bay 4.

** Remove 3N2 (double-story nose) prior to removal of bay 5; then remove remainder of nose after removal of bay 4.

*** Position and secure LRP on top of heavy launching nose (1N1).

Table 50. **Delaunch table 2E + 13 through 2E + 22 bay double-story (wo/LRS) – restricted site – original far bank**

Brg Lgth	2E + # of Bays	Nose Conf	Cntr Wt	Spec Notes	Del to & Rem	Del to & Rem	Del to & Rcvr	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)
33.2	13	8N1	38D	Notes a thru c	12p6 E	7p6 BP13 thru BP10 + BP9	(3p4) LRP*	–	4p5 38D(2p3)	–	–
35.1	14				13p6 E	8p6 BP14 thru BP11 + BP10	(4p0) LRP*	–	5p1 38D(2p7)	–	–
36.9	15				14p6 E	9p6 BP15 thru BP12 + BP11	(4p6) LRP*	–	5p6 38D(3p4)	–	–
38.7	16				–	11p6 E + BP16 thru BP14 + 13	(6p6) LRP*	–	6p6 38D(4p4)	–	–
40.5	17				–	13p6 E + BP17 thru BP16 + BP15	(6p7) LRP*	–	7p7 38D(5p5)	–	6p2 TP16 thru BP13 (4p1)
42.4	18				–	15p6 E + BP18 + BP17	(7p7) LRP*	–	8p7 38D(6p5)	–	7p2 TP18 thru BP15 (5p2)
44.2	19		58D + 12D		–	14p6 12D + E	(9p3) LRP*	11p2 BP19 + BP18 (9p0)	9p2 58D(7p1)	8p7 TP19 thru TP18 (6p3)	7p2 BP17 thru BP16 (5p6)
46.0	20				–		(9p7) LRP*	11p6 BP20 + BP19 (9p4)	9p7 58D(7p5)	8p7 TP20 thru BP18 (6p3)	7p2 TP18 thru BP17 (5p6)
47.9	21	6N1 + 3N2			–	16p6 12D + E	(10p0) LRP*	11p7 BP21 + BP20 (9p5)	10p0 58D(7p6)	8p7 TP21 thru BP19 (7p3)	7p6 TP19 thru BP17 (4p2)
49.7	22				–		(10p3) LRP*	12p3 BP22 + BP21 (10p1)	10p4 58D(8p2)	9p4 TP22 thru BP19 (7p3)	

* Position and secure LRP on top of heavy launching nose (1N1).

Table 50. **Delaunch table 2E + 13 through 2E + 22 bay double-story (wo/LRS) – restricted site – original far bank (continued)**

2E + # of Bays	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem	Boom to & Rem	Boom to & Rem	Complete By
13	–	4p0 TP10 + TP9 (1p6)	–	2p3 BP8 thru BP6 (Bp0)	1p7* 8N1 + TP6 thru BP4	2p0 Pin at A	1p4 TP4 thru BP2	Remove RRB and TP2. Disassemble bay 1 and the end of bridge and clear site of all equipment.
14	–	4p0 TP11 thru BP9 (2p0)	–	2p3 TP9 thru BP6 (Bp0)				
15	–	4p0 TP12 thru BP9 (2p0)	–					
16	5p2 TP14 thru BP11 (3p1)	4p0 TP11 thru BP9 (2p0)	–	2p4 TP9 thru BP7 (1p0)	1p7** TP7 + BP6 + 8N1 + 7N1 + TP6 thru BP4 +6N1	2p0 Pin at A	1p4 TP4 thru BP2	
17	5p2 TP13 thru BP11 (3p1)		–					
18	5p5 TP15 thru BP12 (3p4)	4p0 TP12 thru BP10 (2p4)	3p4 TP10 thru BP9 (2p0)					
19	6p2 TP17 thru BP14 (4p2)	4p4 TP14 thru BP12 (3p2)	3p4 TP12 thru BP10 (2p2)	2p4 TP10 thru BP7 (Bp0)				
20					1p7*** TP7 + BP6 + 3N2 + TP6 thru BP4 + 6N1	2p0 Pin at A	1p4 TP4 thru BP2	
21								
22								

Notes:

a. Remove all curbs, ramps, and deck units except those required for counterweight.

b. Position CRB under RBSB.

c. Install launching nose.

* Remove entire launching nose for 2E + 13 through 2E + 15 prior to removal of TP6 (top panel, bay 6).

** For 2E + 16 through 2E + 20 bay bridges remove 8th and 7th LNH prior to removal of TP6, then remove the remainder of the nose after removal of BP4 (bottom panel, bay 4).

*** For 2E + 21 and 2E + 22 bay bridges remove 3N2 (double-story nose) prior to removal of TP6, then remove remainder of nose after removal of BP4.

Table 51. **Building and boom table 2E + 13 through 2E + 22 bay double-story (w/LRS) – normal site**

Brg Lgth	2E + # of Bays	Nose Conf	Cntr Wt	Build E+1 Place	Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Spec. Notes	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Boom to & Add (CG)	Lau to & Add
33.2	13	7N1	–	1p4	2+3+ (5N1*+4) +5+ (7N1*+6) (Ap1) **	3p0 7 thru 9 (2p5)	4p7 10 thru 12 (4p2)	10p0 AA(L) (4p2)	Do not disconnect vehicle until AA(S) has been fitted which will require continuing boom to 11p0	11p0 AA(S) +1LL+13 + E (6p0)	–	–	–	–
35.1	14		–							11p0 AA(S) +1LL+13 thru E (6p4)	13p6 LT-4p7 (6p4)	–	–	(6p4) PT+3LL
36.9	15		–							11p0 AA(S) +1LL+13 thru E (7p0)	13p0 LT-4p7	14p0 PT+1LL+ 1SL+1LL	–	(7p0)
38.7	16	8N1	–		2+3+ (5N1* + 4) +5+ (8N1*+6) (Ap3) **	2p7 7 thru 9 (2p3)	4p5 10 thru 12 (4p0)	10p0 AA(L) (4p0)		11p0 AA(S) +1LL +13 thru E (7p2)	12p6 LT-4p7	14p0 PT+3LL	–	(7p2) LT-6p7
40.5	17		–							11p0 AA(S) +1LL+13 thru E (7p7)		14p0 PT+2LL +1SL	–	(7p6) LT-6p7 + ILL
42.4	18	6N1 + 3N2	–		2+3+ (6N1*+4) +5 +(3N2*+6) +7 (Ap2) **	2p7 8 thru 10 (2p3)	4p5 11 thru 13 (4p0)			11p0 AA(S)+1LL + 14 thru17 (6p0)	13p0 13+E+LT-4p7 (7p0)	14p0 PT+3LL (8p0)	15p0 LT-6p7 (8p0)	(8p0)
44.2	19		8D								13p0 18+19+LT-4p7 (7p4)	14p0 PT+E +8D+2LL+ 1SL (8p5)	15p0 LT-6p7+1LL (8p5)	(8p5)
46.0	20		20D + 6C								13p0 18 thru 20 LT-4p7 (7p4)	14p0 E+20D +6C+3LL (9p6)	15p0 LT-6p7 (9p6)	(9p6) LT-8p7 +1LL
47.9	21		30D + 6C								13p0 18 thru 21 LT-4p7 (8p0)	14p0 PT+3LL (8p0)	15p0 LT-6p7 E+3D+1LL (9p4)	(9p4) LT-8p7 +1LL
49.7	22										13p0 18 thru 22 LT-4p7 (8p4)	14p0 PT+3LL (8p4)	15p4 LT-6p7 E+3D+1LL (10p0)	(10p0) LT-8p7

* Assemble launching nose to include section indicated.
** LRPs are no longer placed on top of the light launching nose.
Position first LRP on top of first heavy launching nose (1N1) and the second LRP on top of the sixth heavy launching nose (6N1). Secure both LRPs with tie-down straps.

Table 51. **Building and boom table 2E + 13 through 2E + 22 bay double-story (w/LRS) – normal site (continued)**

2E + # of Bays	Place LRP under LZ #		Launch to & Add	Launch to & Add/ Remove	Launch to & Add/ Remove	Launch to & Add	Lau to & Add	Launch to & Add/ Remove	Lau to Add PT-Bay # /Rem	Add/ Remove	Lau to & Add/ Remove	Lau to & Add/ Remove	Lau to & Add/ Remove	Complete By
13	#7	Nose sections are not removed until they are 3.0m beyond LRP. Remove last three when far end of bridge is on ground. Reposition LRP and remove last three nose sections.	6p2 PT + LT-4p7 + 1LL + 1SL + 1LL	7p4 LT-6p7 AF-7p1 / LLN (F)	8p4 LT-7p7 / LLN (R)	–	–	–	10p6 9/ RRB	1LL + LT-10p1 / 1N1	12p2 AA / FRB + 2N1	13p2 AA(S)	Dp2 AA(L) / 3N1	Continue launch until RBSB overhangs CRB by 0.5m **OR** far bank BSB is within 1.83m of A peg. Reposition LRP, install JRB, remove CRB. Continue launch until desired bearing is obtained. Lower far bank end of bridge. Put near bank end of bridge on ground.
14	#4		–	7p4 LT-6p7 AF-7p1	9p4 LT-8p7 / LLN(F)&(R)	–	–	–	11p6 10/ RRB	1LL + LT-11p1 / 1N1	13p2 AA / FRB + 2N1	14p2 AA(S)	Dp2 AA(L)	
15	#3		7p4 LT-6p7	8p4 LT-7p7 + AF-8p1	10p4 LT-9p7 / LLN(F)	–	–	–	12p6 11/ RRB	1LL + LT-12p1 /LLN(R)	14p2 AA / FRB 1N1 + 2N1	15p2 AA(S)	Dp2 AA(L) / 3N1	
16	#7		–	9p4 LT-8p7 AF-9p1 + 1LL / LLN(F)	11p4 LT-10p7/ LLN(R) + 1N1	–	–	–	13p6 12/ RRB	1LL + LT-13p1 / 2N1	15p2 AA / FRB + 3N1	16p2 AA(S)	Dp2 AA(L) / 4N1	
17	#5		–		10p4 LT-9p7	–	–	12p4 LT-11p7 / LLN(R) + 1N1	14p6 13/ RRB	1LL + LT-14p1 / 2N1	16p2 AA / FRB + 3N1	17p2 AA(S)		
18	#9		–		11p4 LT-10p7 + 1LL / LLN(R)	–	–	13p4 LT-12p7 / 1N1	15p6 14/ RRB	1LL + LT-15p1 / 2N1	17p2 AA / FRB + 3N1 + 4N1	18p2 AA(S)	Dp2 AA(L) / 5N1	
19	#7		9p4 LT-8p7 + 1LL	10p4 LT-9p7 + AF-10p1 / LLN (F)	12p4 LT-11p7 + 1LL / LLN (R)	–	–	14p4 LT-13p7 / 1N1	16p6 15/ RRB	1LL + LT-16p1 / 2N1	18p2 AA / FRB + 3N1 + 4N1	19p2 AA(S)		
20			–	11p4 LT-10p7 AF-11p1 + 1LL/ LLN(F)	13p4 LT-12p7 + 1LL / LLN(R)	–	–	15p4 LT-14p7 / 1N1	17p6 16/ RRB	1LL + LT-17p1 / 2N1	19p2 AA / FRB + 3N1 + 4N1	20p2 AA(S)		
21	#2		–		12p4 LT-11p7 / LLN (R)	14p4 LT-13p7 + 1LL	15p0 27D + 6C	16p4 LT-15p7 / 1N1 + 2N1	18p6 / RRB	1LL + LT-18p1 / 3N1	20p2 AA / FRB + 4N1	21p2 AA(S)		
22			–		13p4 LT-12p7 + 1LL / LLN (R)	15p0 LT-14p7 1LL + 37D + 6C	–	17p4 LT-16p7 / 1N1 + 2N1	19p6 / RRB	1LL + LT-19p1 / 3N1	21p2 AA / FRB + 4N1	22p2 AA(S) / 5N1	Dp2 AA(L)	

Table 52. **Delaunch table 2E + 13 through 2E + 22 bay double-story (w/LRS) – normal site – near bank**

Brg Lgth	2E + # of Bays	Nose Conf	Cntr Wt	Spec Notes	Del to & Rem	Del to & Rem/ Repos	Del to & Rem/ Add	Del to & Rem/ Add	Rem PT from Bay #	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Rem	Del to & Rcvr
33.2	13	7N1	–	Notes a thru f	Dp2 AA(L)	13p2 AA(S) / LRP*	12p2 AA / FRB	10p4 LT-10p1 1LL/ RRB	–	–	–	–	8p4 LT-7p7 +1LL	7p4 LT-6p7 AF-7p1 + 1SL	6p2 LT-4p7 1LL + PT	(6p0) LRP **
35.1	14		–			14p2 AA(S) / LRP*	13p2 AA / FRB	11p4 LT-11p1 1LL/ RRB	–	–	–	–	9p4 LT-8p7 +1LL	7p4 LT-6p7 AF-7p1 + 1LL	–	(6p4) LRP **
36.9	15		–			15p2 AA(S) / LRP*	14p2 AA / FRB	12p4 LT-12p1 1LL/ RRB	–	–	–	–	10p4 LT-9p7 +1LL	8p4 LT-7p7 AF-8p1 + 1SL	7p4 LT-6p7	(7p0) LRP **
38.7	16	8N1	–			16p2 AA(S) / LRP*	15p2 AA / FRB	13p4 LT-13p1 1LL/ RRB	–	–	–	–	11p4 LT-10p7 +1LL	9p4 LT-8p7 AF-9p1 + 1LL	–	(7p2) LRP **
40.5	17		–			17p2 AA(S) / LRP*	16p2 AA / FRB	14p4 LT-14p1 1LL/ RRB	13	12p4 LT-11p7 +1LL	–	–	10p4 LT-9p7 +1LL	9p4 LT-8p7 AF-9p1 + 1SL	–	(7p6) LRP **
42.4	18	6N1 + 3N2	–			18p2 AA(S) / LRP*	17p2 AA / FRB	15p4 LT-15p1 1LL/ RRB	14	13p4 LT-12p7 +1LL	–	–	11p4 LT-10p7 +1LL	9p4 LT-8p7 AF-9p1 + 1LL	–	(8p0) LRP **
44.2	19		8D			19p2 AA(S) / LRP*	18p2 AA / FRB	16p4 LT-16p1 1LL/ RRB	15	14p4 LT-13p7 +1LL	–	–	12p4 LT-11p7 +1LL	10p4 LT-9p7 AF-10p1 + 1LL	9p4 LT-8p7 +1SL	(8p5) LRP **
46.0	20		20D + 6C			20p2 AA(S) / LRP*	19p2 AA / FRB	17p4 LT-17p1 1LL/ RRB	16	15p4 LT-14p7 +1LL	–	–	13p4 LT-12p7 +1LL	11p4 LT-10p7 AF-11p1 + 1LL	–	(9p6) LRP **
47.9	21		30D + 6C			21p2 AA(S) / LRP*	20p2 AA / FRB	18p4 LT-18p1 1LL/ RRB	17	16p4 LT-15p7 +1LL	15p0 27D +6C	14p4 LT-15p7 +1LL	12p4 LT-11p7 +1LL	11p4 LT-10p7 AF-11p1 + 1LL	–	(9p4) LRP **
49.7	22		40D + 6C			22p2 AA(S) / LRP*	21p2 AA / FRB	19p4 LT-19p1 1LL/ RRB	18	17p4 LT-16p7 +1LL	–	15p0 LT-14p7 1LL + 37D +6C	13p4 LT-12p7 +1LL	11p4 LT-10p7 AF-11p1 + 1LL	–	(10p0) LRP **

Notes:

a. Remove all curbs, ramps, and deck units (except those required for counterweight).
b. Release tension on reinforcing links. Raise link chain to high position.
c. Position JRB under end of bridge.
d. Install launching nose.
e. Position CRB 2.3m from JRB.
f. Delaunch until end of bridge is on CRB. Remove JRB.

* One LRP is placed and secured on heavy nose at this time.
** Second LRP is placed and secured on first heavy nose at this time.

Table 52. **Delaunch table 2E + 13 through 2E + 22 bay double-story (w/LRS) – normal site – near bank (continued)**

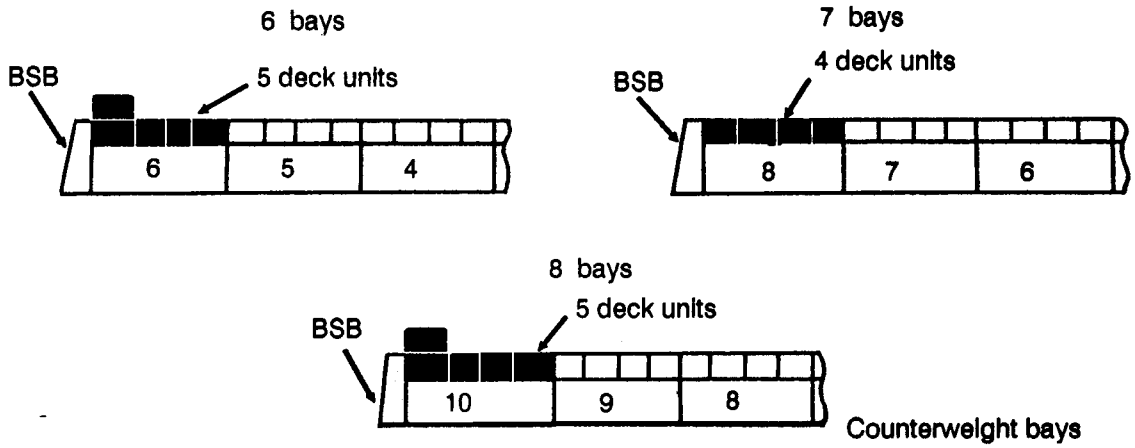
2E + # of Bays	Remove	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem	Spec Notes	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Boom to & Rem (CG)	Complete By
13	–	–	–	–	11p0 + 1LL AA(S)	Do not disconnect vehicle until **AA(L)** has been removed, which will require continuing boom to **10p0**.	10p0 AA(L) E + 13	4p7 12 thru 10 (2p5)	3p0 9 thru 7 (Ap1)	1p4 (6 + 7N1) + 6N1 + 5 (4 + 5N1*) + 3 + 2 (Bp3)	Remove RRB. Disassemble bay 1 and the end of bridge and clear site of all equipment.
14	1LL + PT	–	–	12p7 LT-4p7			10p0 AA(L) E thru 13				
15	–	–	14p0 PT + 1LL	13p0 LT-4p7							
16	LT-6p7 + 1LL	–		12p6 LT-4p7				4p5 12 thru 10 (2p3)	2p7 9 thru 7 (Ap3)	1p4 (6 + 8N1) + 7N1 + 6N1 + 5 + (4 + 5N1*) + 3 + 2 (Bp3)	
17	LT-6p7 + 1LL	–									
18	–	15p0 LT-6p7 (8p0)	14p0 PT + 1LL (7p7)	13p0 LT-4p7 (6p0)			10p0 AA(L) 17 thru 14	4p5 13 thru 11 (2p3)	2p7 10 thru 9 (Ap2)	1p4 7 + (6 + 3N2**) 5 + (4 + 6N1*) + 3 + 2 (Bp3)	
19	–	15p0 LT-6p7 + 1LL	14p0 PT + 1LL + 8D + E	13p0 LT-4p7 19 + 18							
20	LT-8p7	15p0 LT-6p7 (9p6)	14p0 PT + 1LL 20D + E (7p4)	13p0 LT-6p7 20 thru 18 (6p0)							
21	LT-8p7	15p0 LT-6p7 + 1SL + 3D + E (8p0)	14p0 PT + 1LL (8p0)	13p0 LT-4p7 21 thru 18 (6p0)					2p7 10 thru 8 (Ap2)		
22	LT-8p7 + 1LL	15p4 LT-6p7 + 1LL + 3D + E (8p4)	14p0 PT + 1LL (8p4)	13p0 LT-4p7 22 thru 18 (6p0)							

* Remove remaining launching nose at this time.
** Remove all of 3N2 launching nose assembly.

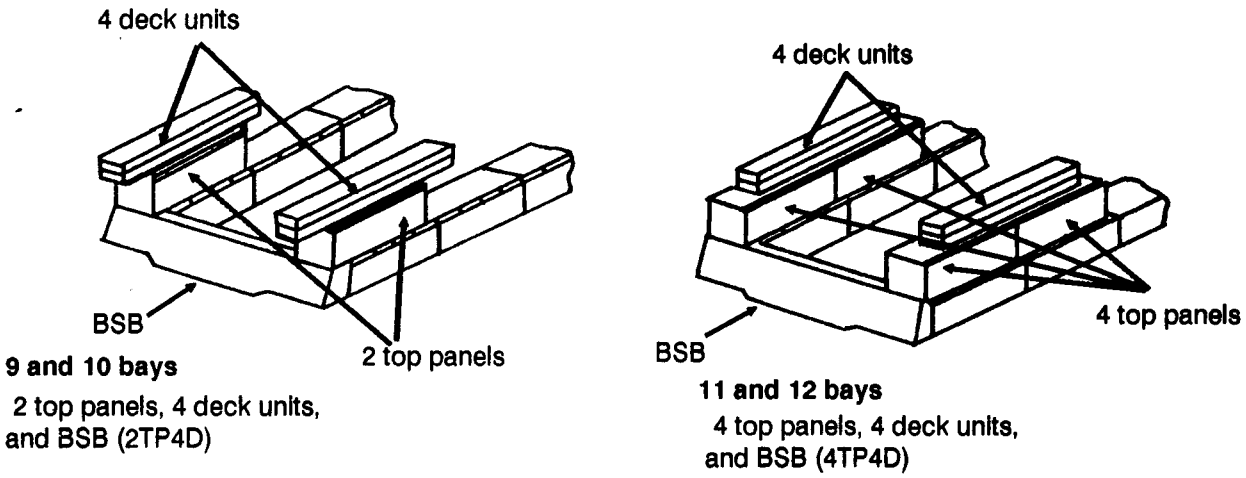
Appendix C

COUNTERWEIGHTS FOR MGBs

Counterweights for 6 through 8 bays single-story



Counterweights for 9 through 12 bays single-story (on restricted sites)

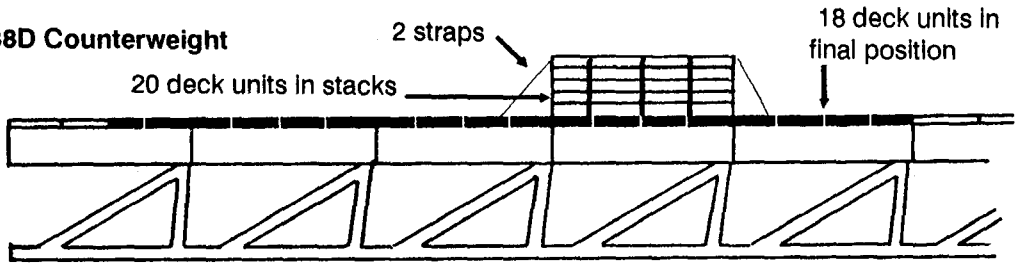


9 and 10 bays
2 top panels, 4 deck units, and BSB (2TP4D)

11 and 12 bays
4 top panels, 4 deck units, and BSB (4TP4D)

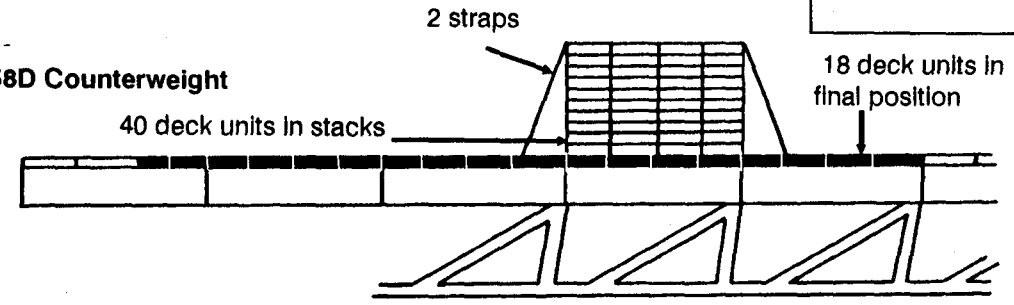
Counterweights for 2E + 13 through 2E + 22 bays double-story without LRS (on restricted sites)

38D Counterweight



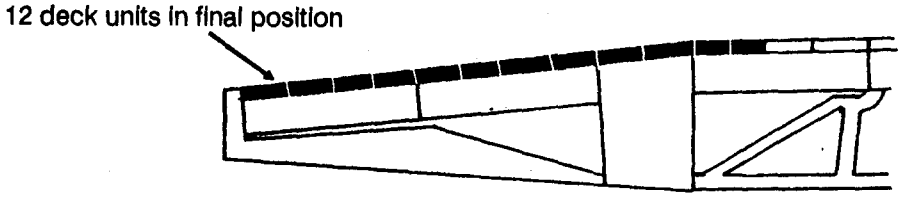
	Brg Lgth	Stack on Bay
38D Comprised of: stack of 20 deck units with 18 deck units in final position.	13 14 15 16 17 18	7 8 9 11 13 15

58D Counterweight



	Brg Lgth	Stack on Bay
58D Comprised of: stack of 40 deck units with 18 deck units in final position.	19 20 21 22	16 17 18 19

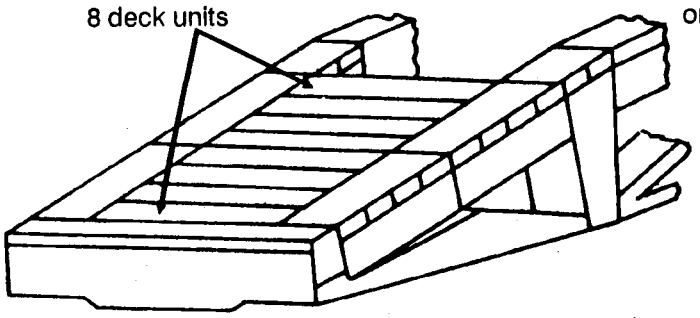
12D Counterweight



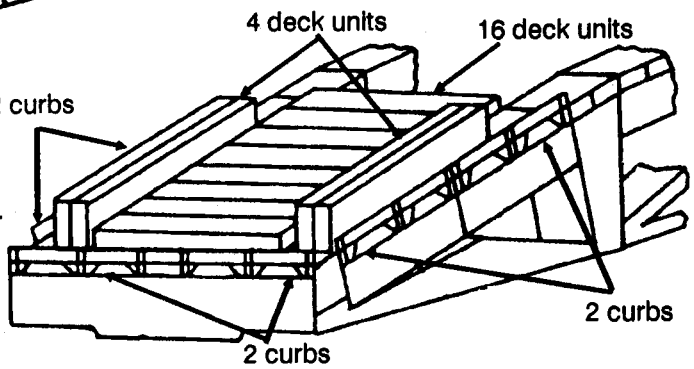
	Brg Lgth	Stack on Bay
12D Comprised of: 10 deck units in end of bridge. 2 deck units in rear of last bay.	19 20 21 22	– – – –

Counterweights for 2E + 13 through 2E + 22 bays double-story with LRS (on normal sites)

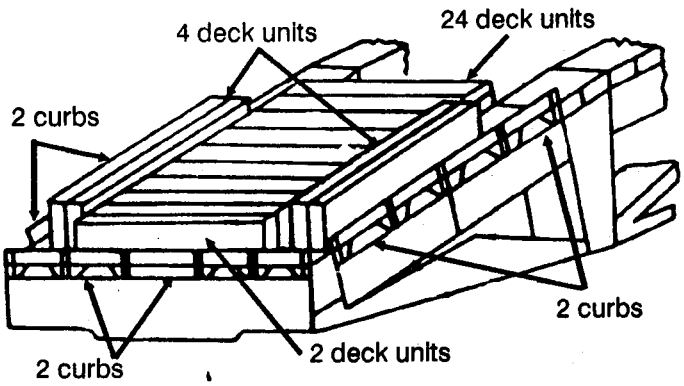
For 2E + 19 bays, place 8 deck units on end of bridge as shown.



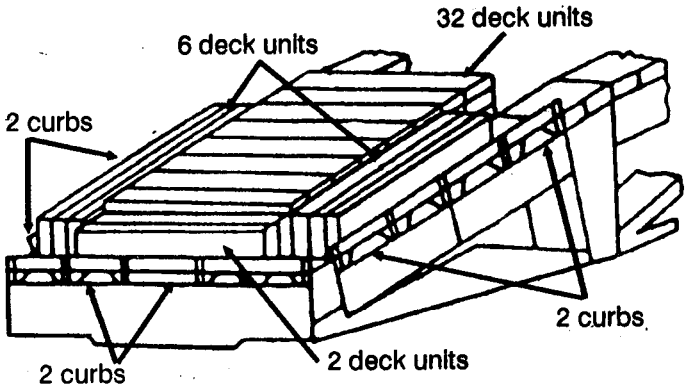
For 2E + 20 bays, place 20 deck units and 6 curbs on end of bridge, as shown.



For 2E + 21 bays, place 30 deck units and 6 curbs on end of bridge as shown.



For 2E + 22 bays, place 40 deck units and 6 curbs on end of bridge as shown.



GLOSSARY

ABBREVIATIONS, DEFINITIONS, ACRONYMS, AND BREVITY CODES

A – Indicates edge of gap, far bank.

A' – Indicates edge of gap, near bank.

AA – Anchor assembly.

AA(L) – Long link of anchor assembly.

AA(S) – Short link of anchor assembly.

AF – Antiflutter tackle.

AR – Angle of repose which is marked on site with A (far bank) and A (near bank) pegs.

AR Gap - The distance from the edge of firm ground (A') on the near bank to the edge of firm ground (A) on the far bank.

BES – Bridge erection set.

Boom Marker – Carrying bar (painted orange) which marks the position of the next booming or launching point.

BP – Building pedestal (SS only), baseplate (SS and DS)

brg — bridge

BSB — Bankseat beam.

C – Distance of water below line joining FRB and F at distance W from FRB (negative). Fine for up to 2E + 12 bays. For 2E + 13 through 2E + 22 bays DS bridges, a CRB is required.

CG Marker – Carrying bar (painted blue) which marks the center of gravity of the bridge during construction.

cm — centimeter

cntr — counter

conf — configuration

const — construction

CRB — Capsill roller beam. This type of roller beam must be used for 2E + 13 through 2E + 22 bays DS bridges with or without LRS.

℄ — Centerline.

D — Deflection of bridge during launch in relation to line joining FRB and F pegs.

del — delaunch

dist — distance

DS — Double-story bridge construction.

DU — Deck unit.

E — End of bridge.

elev — elevation

F — Final position of the far end of bridge as marked with the F peg.

F' — Final position of the near end of bridge as marked with the F' peg.

FB — Far bank

FRB — Front roller beam.

G — Distance between O peg and baseline.

gal — gallon

H — Far bank height at F peg, relative to the baseline.

Ht — Height.

kg — kilogram

L — Length of bridge.

LAU — Launch.

lb — pound

lgth — length

LLN — Light launching nose.

LNCG — Launching nose cross girder,

LNH — Launching nose heavy.

LR — Landing roller. Used by itself for 4 through 8 bays of SS. Used in LRP for all other bridge lengths.

LRD — Long ramp and deck pallet. This is last pallet to be off-loaded on a bridge site. Should be loaded onto push vehicle to maintain a proper counterweight.

LRP — Landing roller pedestal (MK I for 2E + 1 through 2E + 12 bays DS, MK II for 2E + 13 through 2E + 22 bays DS with or without LRS).

LRS — Link reinforcement set.

LT — Light tackle.

LZ — Landing zone.

m — meter

max — maximum

MGB — medium girder bridge

min — minimum

MLC — Military load class.

mps — meters per second

N — Nose tip height above baseline.

N1 — Launching nose heavy, one story high.

N2 — Launching nose heavy, two stories high.

NB — Near bank

NCQ — noncommissioned officer

NSN — national stock number

O — Distance R from RB (single-story), FRB (double-story), and CRB (double-story with or without LRS) as marked with the O peg.

PT — Post-tensioning assembly.

R — Maximum distance to the rear of the bridge during construction (excluding push bar and vehicle).

RB — Roller beam.

rcvr — recover

rem — remove

RRB — Rear roller beam.

spec — special

SS — Single-story bridge construction.

T — Height of near bank end of bridge in relation to baseline.

thru — through

TM — technical manual

V — For relaunching purposes, the maximum allowable distance between the FRB or CRB to the LRP for bridges requiring a launching nose.

W — Distance of end taper panel from FRB for maximum deflection.

WL — Waterline.

wt — weight

1LL — One long reinforcing link.

1SL — One short reinforcing link.

6N1, 7N1, and 8N1 — Types of single-story nose construction. The first number shows the number of heavy nose sections used. The N1 means single-story nose.

6N1 + 3N2 — Type of double-story nose construction. The 6N1 is explained above. The 3N2 means that three heavy nose sections are used in second story. The N2 means double-story nose.

2 + 3 + or 8 through 10 — Describes number of bays to be added or removed. The 2 + 3 + means add second and third bays, or remove third and second bays if numbers reversed, 3 +2 +. Similarly, the 8 through 10 means add bays 8 through 10, or remove bays 10 through 8, if reversed.

Boom to — Movement of bridge until panel point given is over RB (for SS) or RRB (for DS).

Launch to — Movement of bridge until panel point given is over RB, FRB, or CRB.

3D, 8D, 20D, 27D + 6C, and 37D + 6C — Counterweight codes giving the number of deck units and curbs used.

(4p0), (2p4), and (Bp3) — Examples of the way that the center of gravity (CG) is shown.

SYMBOLS

$>$	is greater than	$<$	is less than
$\geq$	is greater than or equal to	$\leq$	is less than or equal to
$\ngtr$	is not greater than		

REFERENCES

REQUIRED PUBLICATIONS

Required publications are sources that users must read in order to understand or to comply with this publication.

Technical Manuals (TMs)

5-5420-212-12 Operator and Organizational Maintenance Manual for Medium Girder Bridge (MGB)

5-5420-212-12-1 Operator and Organizational Maintenance Manual Link Reinforcement Set for the Medium Girder Bridge

RELATED PUBLICATIONS

Related publications are sources of additional information. They are not required in order to understand this publication.

Military Engineering Volume III, Part III, Medium Girder Bridge, Army Code No 71133, British Army. This publication is available from the Publications Section, Headquarters, Royal School of Military Engineering, Brompton Barracks, Chatham, Kent, England, ME3 8NQ.

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