SECTION 5

DETERMINATION OF COMPOSITION OF FLOATING BRIDGE

0501. **Introduction**. Determination of composition of a floating bridge is an important basis for making out plans for the organization and command structure, distribution of equipments and employment of manpower in the bridging operation. This also includes determination of the lengths and components of the bridge, number of anchors and required facilities.

0502. **Aim**. To impart knowledge on determination of composition of floating bridge.

0503. **General.** A floating bridge consists of river part and bank part:

a. **River Part**. Composed of a number of interior bays, its length is the sum total of the width of all the interior bays, which are suitable for use in the water with a depth not less than 0.8m. An interior bay is 2.7m wide (the exact width is 2.706m, a figure which should be reckoned when the river is more than 250m wide).

b. **Bank Part**. Namely the pier, which consists of ramp bays and big ramps, can be built into a single-lane (two-lane) and single-span (two-span) pier. Its length refers to the distance from the end of the big ramp to the waterside trestle column. Usually a single-span pier is used at the closing end of the floating bridge. The trestle is suitable for the water from 0.8 –2.5m in depth. A ramp bay is 5m in length with two 3.7m long big ramps, which rest ashore in a length ranging from 0.7m to 2.7m and thus makes it possible for the pier to move within 2m.

0504. **Calculation.** Detail calculation is as under:

a. Determination of River part.

(1) Number of interior bays

$$\frac{\text{River width} - \text{distance from water edge to 0.8m deep point}}{\text{2.7m (width of an interior bay)}}$$

Number of interior bays = $\frac{129.4-(7.6+7)}{2.7}$ = 42 remainder 1.4m

Number of transporters = $\frac{42}{2}$ = 21

Number of pontoon bays = $\frac{42}{4}$ = 10

Note: Two of the ten pontoon bays are composed of five bays each,

Length of river part = 2.7 x 42 =113.4m

The remainder is to be dealt within the determination of the bank part.

(2) **Number of Transporter**

50-ton floating bridge:
Number of transporters = number of interior bays
25-ton floating bridge:

$$\text{No of transporters} = \frac{\text{No of interior bays}}{2}$$

(3) **No of Pontoon Bays.**

$$\text{No of pontoon bays} = \frac{\text{No of interior bays}}{\text{No of bays in one pontoon bay}}$$

The number of bays in one pontoon bay is decided in the light of manpower, mechanical power and current velocity. Usually a pontoon bay is composed of four bays.

(4) **Length of River Part.**

Length of river part = 2.7m x number of interior bays

0508. **Determination of Bank Part.**

a. **No of Pier Spans.**

$$\text{No of pier spans} = \frac{\text{Distance from water edge to 0.8m deep point} - 2\text{m}}{5\text{m (length of ramp bay}}$$

No of pier spans nearshore = $\frac{7.6-2}{5}$ = 1.12 remainder 0.6m
Number of pier spans farshore = $\frac{7-2}{5}$ = 1
1.4 m (remainder of river part) plus 0.6m remainder of bank part) makes 2m (total remainder). A solution from Table 6 is that one pier should be added while one interior bay reduced and the pier should be moved 0.3m to the bank side. If the total remainder is divided between the two banks, each bank gets remainder of 1 m and another solution from table 6 is that neither span nor interior bay is changed, what needs to do is to move both piers 1m towards the current.
Length of the pier nearshore = 5x 1+3.7= 8.7 m
Distance from trestles to the water edge =8.7- 0.7 = 8m
Number of ramp bays farshore = 1x2 = 2
Total number of ramp bays required = 4
Number of ramp bay transporters =4

In the above formula, 2m is the length of the part of the big ramp in the water. In this case, the pier may be moved 1m backwards or riverwards.

Table 6: Reference Solutions to Remainder of River and Bank Parts

Solution Total remainder	Increased Pier Span	Reduced Interior bay	Move pier towards bank (m)	Move pier towards current (m)
0.2				0.2
0.4				0.4
0.6				0.6
0.8				0.8
1.0				1.0
1.2				1.2
	1	1	1.1	
1.4	1	1	0.9	
1.6	1	1	0.7	
1.8	1	1	0.5	
2.0	1	1	0.3	
2.2	1	1	0.1	
2.4	1	1		0.1
2.6	1	1		0.3
2.8	1	1		0.5
3.0	1	1		0.7
3.2	1	1		0.9
3.4	1	1		1.1
3.6	1	1		1.3
	2	2	1.0	
3.8	1		1.2	
4.0	1		1.0	
4.2	1		0.8	
4.4	1		0.6	
4.6	1		0.4	
4.8			0.2	
5.0	1			
5.2	1			0.2
5.4	1			0.4
5.6	1			0.6
5.8	1			0.8
6.0	1			1.0

Solution Total remainder	Increased Pier Span	Reduced Interior bay	Move pier towards bank (m)	Move pier towards current (m)
6.2	1			1.2
	2	1	1.1	
6.4	2	1	0.9	
6.6	2	1	0.7	
6.8	2	1	0.5	
7.0	2	1	0.3	
7.2	2	1	0.1	
7.4	2	1		0.1

b. **Length of Pier and Distance from Trestle to Water Edge**.

Length of pier = (length of ramp bay x no of spans) + length of big ramp. Distance from trestle to water edge = length of pier-length of big ramp on bank.

c. **No of Ramp Bays and Transporters.**

No of ramp bays.
Single-lane= number of spans x 2 Two-lane= no of spans x 4
Number of transporters = number of ramp bays.

d. **Length of Floating Br.**

Length of floating bridge = length of river part (m) + length of bank part (m)

e. **Number of Laid Anchors.**

It can be determined according to the loading capacity of the floating bridge and current velocity by looking up Table 7.

Table 7 Number of Laid Anchors for Reference

Current velocity (m/sec)	25-ton floating bridge		50 ton floating bridge	
	Upstream anchor	Downstream anchor	Upstream anchor	Downstream anchor
less than 0.5	1/6	1/6	1/3	1/3
0.5-1.0	1/6	1/6	1/3	1/3
1.0-1.5	1/4	1/6	1/3	1/3
1.5-2.0	1/3	1/6	1/2	1/2
2.0-2.5			1/2	1/2

f. Length of floating bridge = 113.4 + 8.7 = 130. 8 (m)

g. **Number of Laid Anchors.**

From Table 7, Upstream anchor = 42x1/4 =11
Downstream anchor =42x1/6=7

h. **Solution of Measuring Error (+ 1%) of River width.**

Positive error, The river part length increases by 1.3m, plus 1.4m (the original remainder) Makes 2.7m, thus an extra interior bay is needed (43 in all). As to the remainder (0.6m) nearshore, could be solved by moving the pier,

Negative error, the river part length decreases by 1.3m. The original remainder 1.4m minus 1.3m is 0.1m, plus 0.6m (the original remainder of nearshore bank part) makes 0.7m a distance which could be covered by moving the nearshore pier toward the current.

0509-0600 Reserve.