

# INDIAN RAILWAY BRIDGE MANUAL

(Edition 1998)

## ADVANCE CORRECTION SLIP NO.12 DATED 18.12.2007

1. Para No. 217.2(a) (i) :

"Delete one heavy coat of ready-mixed paint red lead priming to IS:102"

**And**

Read Para No. 217.2(a) (i) as under:

"Priming coat: One coat of ready mixed paint zinc chromate priming to IS:104, followed by one coat of ready mixed paint red oxide zinc chrome priming paint to IS: 2074.

**OR**

Two coats of zinc chromate red oxide primer to IRS - P-31."

2. Para No.217.2(b) (i):

"Delete two coats of ready mixed paint red lead priming to IS:102."

**And**

Read Para No. 217.2(b) (i) as under:

"Priming coat: One coat of ready mixed paint zinc chromate priming to IS:104, followed by one coat of zinc chrome red oxide priming to IS: 2074."

# INDIAN RAILWAYS BRIDGE MANUAL

(Edition 1998)

## ADVANCE CORRECTION SLIP NO.13 DATED 22.01.2008

Existing Para No.317 may be replaced as under:

### **317: Approval of bridge drawings for doublings, gauge conversions, new lines and other bridge works:**

- (i) In case of doublings/ gauge conversions, General Arrangement Drawings for all major bridges, bridges where linear waterway is being reduced or vertical clearances are inadequate and where construction is likely to affect any of the existing bridges, shall be approved by Chief Bridge Engineer.
- (ii) General Arrangement Drawings for bridges constructed on new lines, which affect the existing bridges, shall require the approval of Chief Bridge Engineer.
- (iii) General Arrangement Drawings for all bridge works on open line shall require approval of Divisional Railway Manager and Chief Bridge Engineer.

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ADVANCE CORRIGENDUM-SLIP NO. 14 DATED 20.03.2008

i) Delete the existing Para No 310 of Chapter III and insert as under:

**310. Design Discharge For Foundations (Qf)**

To provide for an adequate margin of safety against any abnormal flood exceeding the design discharge (Q) the foundations, protection works and training works except free board, shall be designed for a higher flood discharge. This discharge shall be computed by increasing the design discharge (Q) estimated according to para 309, by the percentage indicated below :

i)	Catchment up to 500 Sq.km	30%
ii)	Catchment more than 500 Sq.km and upto 5,000 Sq.km.	30% to 20% (decreasing with increase in area)
iii)	Catchment more than 5,000 Sq.km. and upto 25,000 Sq.km.	20% to 10% (decreasing with increase in area)
iv)	Catchment more than 25,000 Sq.km	Less than 10% (at the discretion of the Chief Bridge Engineer).

ii) Delete the existing Para No 312 (4) of Chapter III and insert as under:

**312**

4 While rebuilding bridges on existing lines or building new bridges on parallel doublings, the clearance stipulated above can be relaxed by Principal Chief Engineer/Chief Bridge Engineer with the consideration to the past history, to the extent shown below provided:

- a) adoption of the prescribed values of clearance would result in heavy expenditure and/or serious difficulties in construction, and
- b) the clearance can be safely reduced from those stipulated under sub para 1 above

Discharge (Cumecs)	Reduced Clearance (mm)
Less than 3	300
3 to 30	300 - 400 (Pro-rata)
31 to 300	400 - 1200 (Pro-rata)

This is in accordance with para 4.8.3 of IRS Bridge Sub Structure & Foundation code

iii) Delete the existing Para No313 (2) and 313 (3) of Chapter III and insert as under:

313.

2. In special circumstances, where the free board can be safely reduced and where adoption of the prescribed values would result in heavy expenditure and/or serious difficulties in construction, the free board may be relaxed at the discretion of the Principal Chief Engineer/Chief Bridge Engineer as indicated below:

<b>Discharge (Cumecs)</b>	<b>Minimum free board (mm)</b>
Less than 3	600
3 to 30	750
More than 30	No relaxation is permissible

3. While executing works other than rebuilding a bridge or extending it for doubling purpose, the existing free board may be retained after taking measures for safety as considered necessary by Principal Chief Engineer/Chief Bridge Engineer.

# INDIAN RAILWAYS BRIDGE MANUAL

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ADVANCE CORRIGENDUM SLIP NO. 15 DATED. 05.08.2008

1.0 Para 410 (2) (b) : Para 410 (2) (b) is replaced as below:

" The minimum factor of safety with static or dynamic formula shall be 2.5. The value to be selected for the factor of safety shall, however, take into account, the allowable total settlement and differential settlement of the structure as a whole.

The ultimate load capacity should be obtained, whenever practicable, from a load test (initial) (as per IS: 2911(Part 4)-1985).

Factor of safety for assessing safe load on piles from load test data should be increased in unfavorable conditions where :

(i) settlement is to be limited or unequal settlement avoided as in the case of accurately aligned machinery or a superstructure with fragile finishing.

(ii) large impact or vibrating loads are expected.

(iii) the properties of the soil may be expected to deteriorate with time , and

(iv) the live load on a structure carried by friction piles is a considerable portion of the total load and approximates to the dead load in its duration."

2.0 Para 418(5) : '300 mm' is replaced by '300 mm or of appropriate'.

3.0 Para 430 : Para 430 is replaced as below:

**"Construction of the top plug:** The construction of the top plug should be started only after the sand filling has settled thoroughly and tested by ramming."

4.0 Para 3(ii) of 606 is proposed for deletion and Para 3(i) be renumbered as 3.

# INDIAN RAILWAYS BRIDGE MANUAL

(Edition 1998)

**ADVANCE CORRIGENDUM SLIP NO. 16 DATED. 13.08.2008**

Existing Para 317 (iii) may be replaced as under :

317 : (iii) General Arrangement Drawings for all bridge works on open line shall require approval of Chief Bridge Engineer.

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**ADVANCE CORRIGENDUM SLIP NO. 17 DATED 15.09.2008**

Para 318 may be inserted as below:

**Para 318: Approval of bridge drawings for Dedicated Freight Corridor lines :**

" General Arrangement Drawings for all major bridges on Dedicated Freight Corridor lines, bridges where linear waterway is being reduced or vertical clearances are inadequate and where construction is likely to affect any of existing bridges, shall be approved by Chief Bridge Engineer."

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# INDIAN RAILWAYS BRIDGE MANUAL

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## ADVANCE CORRIGENDUM SLIP NO. 18 DATED 17.12.2008

Add new para 224 in IRBM as below:

### **224 Dismantling of arch bridges:**

1. In case of running lines, prior CRS sanction for methodology/safety precautions, drawings etc. shall be obtained for dismantling work of the arch bridge.
2. Arch is a structure, which transmits heavy horizontal thrust to abutments and piers. In case of abutments, this load is resisted by heavy section of abutment and soil fill behind it. At piers, in case of multi span arches, horizontal thrust due to dead load is balanced. If both spans are loaded, horizontal thrust due to live load also gets balanced, but, in case of only single span being loaded, pier has to bear unbalanced horizontal thrust. Piers are, therefore, designed to take up only unbalanced horizontal thrust which is quite less as compared to total thrust at abutment.
3. Whenever in multi span arches, if one span is dismantled, large unbalanced horizontal thrust comes on pier and there can be collapse of pier along with other spans. Following procedure, suitable for both single and multi span arches, can be followed to safely dismantle arch bridges:
  - (a) **Dismantling with explosives:** - Explosives can be used to bring down all spans of an arch bridge at one go. This will require cordoning off the area likely to be affected by the explosion and long time to remove the debris thereafter. This method can only be used if the arch is not near habitated area and experts can be engaged to take up such work.



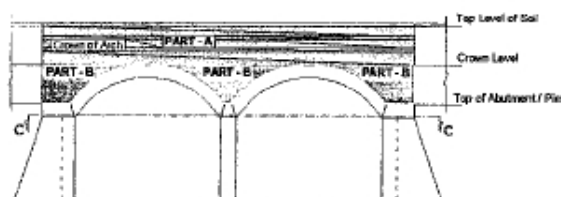
**(b) Dismantling with machinery:** - Special type of machinery with long jib can be used to dismantle one span of arch in one go. As unbalanced horizontal thrust may cause collapse of all or few other spans of the bridge, whole work should be planned in a single block and all the spans should be dismantled in one block. It must be ensured that work is completed in the block and no portion of the arch is left without dismantling in the block. This procedure will require cordoning off the whole area and engaging suitable machinery.

**(c) Part-by-part dismantling:** - The above two methods, though safe, may not be possible under many circumstances. In part-by-part dismantling method, dismantling is done in such a systematic manner that at no point, there is excessive unbalanced horizontal thrust on piers.

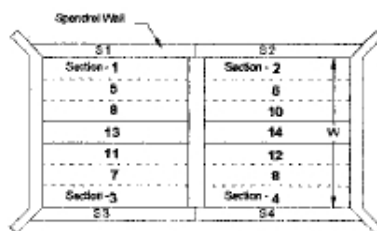
Step by step procedure shall be as under :-

(i) Divide the depth of soil into two parts, i.e. **Part 'A'** from top of soil to the depth up to the level of Crown of arch. **Part 'B'** is from Crown level to the top of Abutment / Pier as shown in Fig. 1(a).

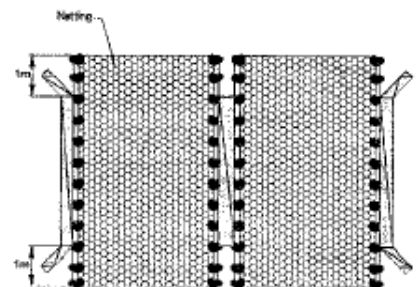
(ii) Divide the width (W) of Bridge into equal parts each about 50cm wide for the width of each span as shown in Fig. 1(b). ( Fig 1(b) shows bridge divided into seven parts, it will be more for wider bridges). No. of divisions should be odd number.



SECTIONAL ELEVATION  
Fig. 1(a)



PLAN  
Fig. 1(b)



Section CC  
Fig. 1(c)

- (iii) Engage four parties to remove soil. First party will start removing soil from the **Section 'A1'**. It means start removing soil in the **section- 1** from top level and depth upto the level of crown of arch i.e. **Part 'A'** as shown in the sketch. Second party will simultaneously remove the soil from **Section- 2 Part 'A'** i.e., **A2**. It means soil from top level to the depth up to the crown. Third and four parties shall work in section A3 & A4.
- (iv) After completing A1, A2, A3 & A4, follow the sequence Section – A5, A6, A7, A8, and then A9, A10, A11 & A12 and then A13 & A14. After this exercise Section A is cleared. This procedure ensures that there are no unbalanced lateral forces.
- (v) Similarly follow the same sequence for removing soil of Part – B.
- (vi) Provide thick nylon netting supported on piers so as to arrest any falling debris as shown in fig 1(c).
- (vii) Now each of four parties should break spandrel wall S1, S2, S3 & S4 simultaneously under block, as some debris can fall on track.
- (viii) After breaking spandrel wall, arch barrel of section 1, 2, 3 & 4 shall be broken under block protection by each of four parties. In next block, section 5, 6, 7 & 8 shall be broken and so on.
- (ix) At the end, last middle section 13 and 14 will remain (since arch has been divided into odd numbers of parts), which should be dismantled by pulling it down with the help of ropes or some long jib machinery. While dismantling last section, no person should be on top of the arch.
- (x) Afterwards piers can be dismantled in systematic manner from top to bottom.

In case of 3 span arches, no. of parties required shall be 6, in case of 4 span arches, no. of parties required shall be 8 and so on.

4. General

- (a) The dismantling of arches should be done under proper supervision and as per approved scheme of dismantling.
  - (b) At major dismantling sites, minimum level of supervision shall be Senior Section Engineer(in-charge), who should be nominated by Dy. Chief Engineer/Sr. DEN in writing.
  - (c) Dismantling Plan should be approved by Chief Bridge Engineer in case of Open Line Organization or H.O.D. In case of Construction Organization. Dismantling plan should invariably mention the sequence of dismantling operations, equipments to be used for dismantling, area likely to be affected by debris, any adjacent buildings likely to be affected and action to be taken thereof.
  - (d) Proper barricading should be done to stop access of unauthorized personnel near the dismantling area. Wherever necessary, assistance of RPF should be taken to prevent people from coming close to dismantling area. Signages warning people not to enter the danger zone should also be displayed.
  - (e) Proper announcement through Public Address System should be done at regular intervals to keep the onlookers away from the major dismantling affected zone.
  - (f) The adjacent buildings likely to be affected by dismantling should also be evacuated.
  - (g) In area where law and order is likely to be affected, assistance of local police should be taken to keep people away from dismantling area.
  - (h) Dismantling would be done under rail and road traffic diversions/blocks.
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## ADVANCE CORRIGENDUM SLIP NO. 19 DATED 11.1.2010

New para 318 inserted vide correction slip No.17 dt.15.9.08 is modified as below:

### **Para 318: Approval of bridge drawings for Dedicated Freight Corridor lines:**

(i) "General Arrangement Drawings for bridges on Dedicated Freight Corridor lines where alignment is on de-tour, far off from the existing track, where linear waterway is being reduced or vertical clearances are inadequate and where new bridge (during construction or during service) is likely to affect any of existing bridges, shall be approved by Chief Bridge Engineer.

(ii) General Arrangement Drawings for bridges on Dedicated Freight Corridor lines where alignment is near the existing track, all major bridges and bridges where linear waterway is being reduced or vertical clearances are inadequate and where new bridge (during construction or during service) is likely to affect any of existing bridges, shall be approved by Chief Bridge Engineer."

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**INDIAN RAILWAYS BRIDGEMANUAL**

**(Edition 1998)**

**ADVANCECORRECTION SLIP NO. 20 DATED 7.6.2010**

Para 1104 (5) vide correction slip No.20 dt.7.6.10 is replaced as below:

“Scrutinyby Territorial HOD & CBE and action thereon:

The registers should then be forwarded by the Divisional Engineer to the Territorial HOD by a specified date, who will examine each register, issue orders regarding matters referred to him duly endorsing the registers to the effect. In cases where bridge matters are referred bydivisional engineer to HQ’s office,then those bridge registers should also be seen by CBE after scrutiny by THOD. The registers should then be returned to the Divisional Engineer latest by a specified date. Subsequent action taken on the Territorial HOD’s and CBE’s orders should be entered in the register bythe Assistant Engineers.”

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