

NE RLY HQ
Gorakhpur.
W/29/O/A/Pt.I/1
April 27, 1989.

Bridge Circular No. 6 of 1989.

The Divisional Railway Manager(Engg.),
N.E.Railway,
IZN, LJJ, BSB, SEE, SPJ.

Sub:- Fixing of Danger level on bridges.

1. Pursuant to the recommendations of 65th BSC meeting (Feb.89) guide lines are given below for fixing danger level.
2. Indian Railways Way and Works Manual-appendix to Chapter X reads as under:-

"DANGER AND ALERT LEVELS"

Every bridge must have the danger level distinctly painted on its abutment or pier. This level will indicate that if water level reaches this mark the safety of the bridge is likely to be adversely affected and all traffic may have to be suspended.

The marking of danger level should be done with great care. A thorough study with reference to the highest flood level, and the scoured depth so far experienced, should be made and the danger level marked at a height which will really constitute a danger to the bridge structure.

Adequate and satisfactory arrangements should be made for observing and reporting danger levels."

3. MAIN CAUSES OF DANGER TO A BRIDGE OR FORMATION.

- (a) Overtopping of approach embankments and/or guide bunds.
- (b) Floating trees and other debris hitting against the arch, slab or girder due to inadequate vertical clearances.
- (c) Scour around foundations of bridges or near the toes of the embankments or guide bund due to high velocity or due to oblique flow.
- (d) Undue afflux (heading up of flood water) at the upstream of bridge causing damage to formation and track away from the bridge.

4. FACTORS TO BE CONSIDERED FOR FIXING DANGER LEVELS(DL)

Fixing of DL at a higher level than necessary may lead to serious damages and endanger the safety. Fixing of DL at lower level than necessary may result in unnecessary restriction to traffic. In either case, the object gets defeated if adequate attention is not paid.

In fixing danger level, following factors should be considered:-

- (a) The nature of the soil;
- (b) the depth of the foundations, existence or absence of drop/curtain walls, floorings;
- (c) the maximum permissible scour level at various points;
- (d) the highest recorded flood level & the level of the approaches & top of the guide bunds, free-board available;
- (e) vertical clearances & type of float sam anticipated;
- (f) the velocity of flow & afflux;
- (g) likelihood of flash floods;
- (h) past history;
- (i) flow pattern such as obliquity of flow and flow along the approaches; &
- (j) sudden rise of flood water level.

5. BROAD GUIDE LINES FOR FIXING DANGER LEVELS

5.1 For bridges with;

- (a) no past history of damage or serious threat to the bridge;
- (b) adequate free board for approach banks and protection works;
- (c) anticipated afflux not more than 0.5 metre; &
- (d) no history of excessive scour endangering the safety;

following broad guide lines are given below.

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5.2 GIRDER BRIDGES AND SLAB BRIDGES

LINEAL WATER WAY

DL BELOW BOTTOM OF GIRDER/SLAB

- | | |
|--|---|
| (a) Upto 6.10 meters | 150 mm to 300 mm depending on the span and site conditions. |
| (b) More than 6.10 meters and upto 12.20 meters | 450 mm |
| (c) More than 12.20 meters and upto 30.50 meters | 600 mm |
| (d) More than 30.50 meters but less than 61.00 meters. | 750 mm |
| (e) 61.0 meters and more | 1200 mm |
| (f) Important bridges | 1800 mm |

5.3

ARCH BRIDGES

SPAN OF ARCH

DL BELOW THE CROWN OF THE ARCH.

- | | |
|---|---|
| (i) All spans | 1/3rd to 2/3rd rise depending upon site conditions and span or 300 mm, whichever is more. |
| (ii) For large or multiple span arches or open spandrel type. | Rise. |

5.4 BOX CULVERTS

DL at the bottom of the slab.

5.5 PIPE CULVERTS

DL at the top of opening.

5.6 BALANCING CULVERTS AND BALANCING ARCHES.

Danger level at 50 mm below top of piers/abutments in case of the girder and slab bridges or the crown intrados of the arch.

6. On bridges where danger to bridge has occurred or the bridge has been seriously threatened even though the HFL was less than the DL, the DL must be lowered.

7. In cases where floods higher than danger level have occurred in the past; several times without causing any damage to the structure, revising of the danger level is called for.
8. Fixing of the DL on any new bridge or any revision to the existing DL will be done with the approval of DEN/Sr.DEN incharges, who would record the reasons for revising the DL in case of any revision.

9. ACTION TO BE TAKEN FOR OPERATION OF TRAIN SERVICES WHEN FLOOD WATER LEVEL IS APPROACHING OR HAS REACHED DL

- 9.1 The DL should be considered as alert level and if the flood water level is approaching the DL the patrolman and/or stationary watchman should arrange to send an immediate message to the gang mate and PWI who should immediately reach the site and take charge of the situation.

Pending the arrival of the PWI the patrolman and/or stationary watchman should be prepared to protect the bridge and stop the train if the danger to the bridge is apprehended.

- 9.2 When the flood water level reaches the DL the patrolman and/or stationary watchman must protect both sides of the bridge, stop trains and send information by the quickest possible means to the Station Master, who must arrange to communicate the same immediately to the adjacent Station Master, the gang mate and PWI.

The PWI or his assistant should immediately proceed to site and allow the trains beyond vulnerable point if he is satisfied that the track and bridge are safe.

- 9.3 If the flood water level has reached the DL or is above the DL, the train services may be resumed provided:-

- (a) The engineering official (not below the rank of PWI gr.III) has taken the soundings, done probing and examined the bridge and its approaches and has found the bridge and its approaches safe.
- (b) The engineering official has tested the bridge by cutting off the train engine and has found the bridge and its approaches safe.
- (c) The engineering official pilots each and every train till the flood water level has gone below the danger level.

10. INSTRUCTIONS TO PATROLMEN, STATIONARY WATCHMEN, MATES AND KEYMEN.

Divisional/Sr. Divisional Engineers, AENs & PWIs during their inspections should ensure that patrolmen, stationary watchmen, mates and keymen and other P.Way staff are well conversant with the above mentioned instructions.

11. RECORDING/REPORTING OF DL.

The DL should be recorded in the Bridge Inspection Register. All such incidences when flood water level reaches or exceeds the DL should be reported at once with full particulars, by the AEN to DEN who in turn will report to the Central Engineering Control immediately.

12. This supersedes all previous instructions on the subject.

13. This issues with the approval of Chief Engineer.

DA
(80 spare copies for field staff & Officers)

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