

NE RLY HQ
Gorakhpur.
W/29/O/A/
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Bridge Circular No.10 (1990)

Sub : Afflux - Measurement.

1.0 Definition:

- 1.1 The afflux is defined as the rise in flood level of the river upstream of the bridges, as a result of constriction to the natural flow by the bridge.

2.0 Calculation of afflux:

- 2.1 For a non-scourable bed, a popular formula for estimation of afflux at a bridge given by Molesworth is ;

$$h = (V^2/17.88) + 0.01524 \times (A/a)^2 - 1)$$

where h is afflux in metre; V is velocity in metre per second in unobstructed condition of the stream; A is cross sectional area of unobstructed stream in square metre; 'a' is cross-sectional area of the stream at bridge site.

- 2.2 It is difficult to calculate afflux when the river spills and spreads on upstream and downstream. Which channels are active is not easily found.

- 2.3 In sandy river since the bed gets scoured, the estimation of afflux is difficult because of unstable boundary condition. The calculations get more complicated when the river carries flash flood and the condition may be inadequate to develop full scour.

- 2.4 It is better to measure & record the afflux & scour at site over the years, rather than calculate them by some empirical formula.

3.0 Adverse effect of afflux:

- 3.1 Afflux on a bridge is also an indication of velocity of flow & aggrading or degrading characteristics.

- 3.2 If the bed material is erodable, the foundation may get exposed. When the afflux is more than a metre, piping/undermining may take place and the bridge may get washed away. It may also cause hydraulic jump which may cause eddies. This, in turn, may develop deep scour hole on the downstream side.

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3.3 At important and problem bridges, it is necessary to collect the hydrological data from the site in regard to gauge, velocity discharge and the afflux during the monsoon period.

4.0 Afflux Measurement & Documentation:

4.1 For measuring afflux, gauges should be erected on upstream and downstream of important and problem bridges, as per enclosed type plan No. SK/6/90.

4.2 The sectional AEN, PWI/IOW will observe velocity and afflux at the bridge, when the river/stream is in high spate. These observations of (a) afflux, (b) discharge, (c) HFL, (d) velocity under the bridge and (e) damage due to floods, will be recorded in the Bridge Register every year in a tabular form as under, so that comparative picture is seen at a glance:

Year	Max ^m Afflux <i>m/ft</i>	Max ^m Dis- charge <i>cumecs</i>	Max ^m HFL	Max ^m Velo- city. <i>m/sec</i>	Damage due to flood.
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4.3 Good documentation in this regard will help in evolving appropriate and economic measures to protect the bridge against flood damage.

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- DRM(Engg.), IZN, LJN, BSB, SEE, SPJ,
- CE(Con.)/GKP for information.
- CBE, CGE, CTE, CE(West), CE(East) for information.
- Dy:CE(Br.)/HQ, Dy:CE(FCW)