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PROBLEMS IN PROTECTING HIGH EMBANKMENT WITHOUT COMPROMISING THE ROAD SAFETY - CASE STUDY

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ABSTRACT

Nowadays, NHAI is taking up the access controlled green highways as expressways. Since, the road is access controlled, the majority of the alignment is going through either in high cutting or in high filling with VUPs, VOPs, FLYOVERs, INTER-CHANGEs etc and hence, the alignment is going through high embankments. Therefore, embankment of road needs more protection against scour due to rains.

Accordingly, IRC -SP -99 -2013 Manual for expressways has come up with certain protection measures like kerb channel (photo 1 a) with concrete chutes (photo 1 b) along the slope of the embankment on toe side after paved shoulder as directed by IRC SP 42. It guides the storm water to the plain concrete chute and reduce the damage of the embankment from scour.

But it has got certain problems and that will be discussed by the author in this paper.

Keywords: High Eembankment Protection, Road Safety, Scour Prevention, Expressway Design, Stormwater Management

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Photo no. 1

(a)

(b)

PROBLEMS

In high intense rainfall areas like Western Ghats, the above explained set-up given in manual is not sufficient. Even though the flow of storm water along the embankment slope is stopped as per the procedure narrated in the manual, the intense rainfall of drop lets will scour the embankment. Therefore additional embankment protections are being implemented in one of the project which will be explained in coming chapters.

PURPOSE OF THIS PAPER

Actually, the section 2-2 in Fig 4.25 of IRC SP 42 shown below is not clear about the dimensions (distances/coordinates) and levels of kerb channel with respect to MBCB shown in Photo 1(a). That means the distance between the kerb channel and MBCB is not mentioned in the fig 4.25 of IRC SP 42. Because of this, lot of confusion is there in the site and hence the author is writing this paper to do the work as per general road safety norms.

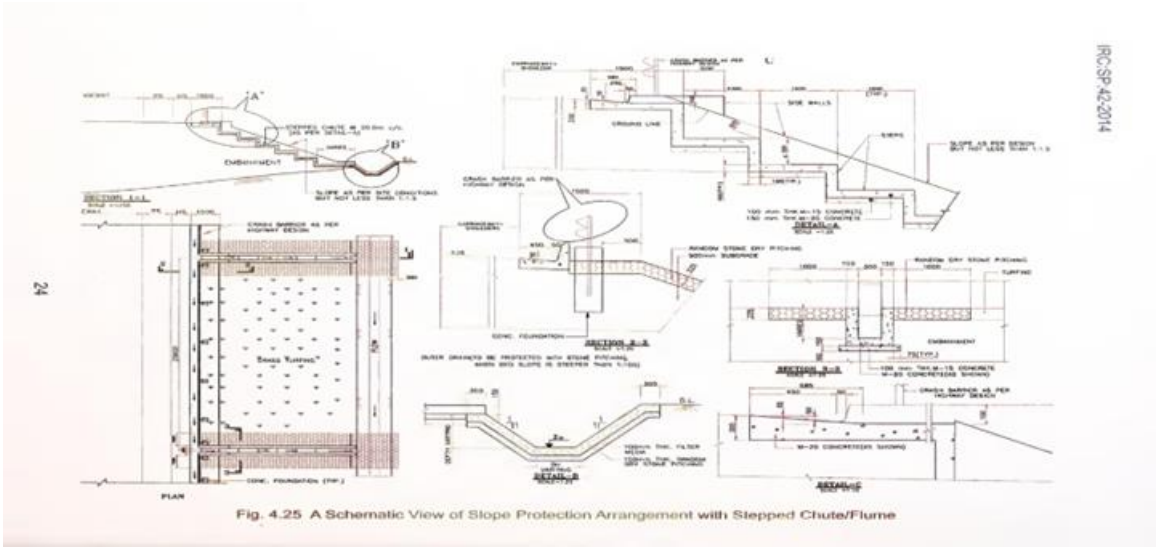

Fig. 4.25 A Schematic View of Slope Protection Arrangement with Stepped Chute/Flume

ADDITIONAL EMBANKMENT PROTECTIONS

Generally, embankment is protected through turfing, if the embankment height is less than 6m and pitching is done if it is more than 6m. In high rain fall areas, the turfing is not effective and pitching is not workable in boulder scare area.

Therefore, geo-green and geo-cell mats as shown in photo 2 & 3 are being provided in cut & fill sections respectively.

Photo no. 2

Photo no. 3

The geo-green is made out of coconut fibre prepared in the form of mats which shall be spread on the slope and fixed with nails to the ground. At every 2m, along the slope as shown in photo 4, a rope will be tied to keep the mat in position as well as to retain the soil with grass seeds on the mat as shown in photo 5. These seeds will penetrate into the mat through roots and grass will raise on the slope as shown in photo 5 and embankment will be protected from scour.

Photo no. 4

Photo no. 5

The geo-cell is a dimond net made out of synthetic plastic connected to each other as shown in photo 3. This is spread on the slope and fixed to the ground with nails as shown in photo 3. After that the cells are filled either with GSB coarser grade as shown in photo 6 or soil with slope protection plant seeds are being spread as shown in photo 7.

Photo no. 6

Photo no. 7

The above system will protect the embankment from droplets of high intense rain. But, if the storm water is allowed on the embankment slope without kerb channel & concrete chute, the above system will not work. For that IRC –SP-99-2013 is provided with kerb channel and concrete chutes along the slope of the embankment as shown in photo 1(a) & 1 (b). But, it has got 2 limitations for the road users.

The kerb channel top is higher than the top of BC as shown in photo1 (a).

The kerb channel is inside (towards) MCW (main carriageway) than MBCB (metallic beam crash barrier) as shown in photo1 (b).

Hence, the vehicle hits the kerb channel before it hits the MBCB, in case of accident and the primary function of the the MBCB is defeated. Therefore, the kerb channel top level shall be provided up to the BC (bituminous concrete) top level as shown in photos 8. Accordingly, the respective clause of IRC- SP- 99 -2013 shall be corrected in future.

Photo No.8

CONCLUSION

The MBCB is fixed on the road to stop the vehicle with little damage, when it is off the road during accidents. But, the kerb channel is being fixed in front of MBCB, the vehicle hits the kerb channel, before it hits the MBCB and therefore the very purpose of MBCB is defeated. Hence, a small correction shall be made in site as explained above by the author to solve this problem.

REFERENCE

[1] IRC-SP-99-2013 –Manual of Specifications and standards for Expressways.

[2] IRC-SP-42 -guidelines on road drainage.

[3] MoRTH - manual of standards & specifications.

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