Box pushing work under Relieving Girder at higher speed

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Synopsis

Large numbers of Level Crossings are being eliminated on Indian Railways by providing Road Under bridges. One of the most efficient method of construction of Road Under Bridges is by providing Relieving Girder under the running track so that the traffic flow is not disturbed while construction. So far the Relieving Girders were provided on make shift arrangements of CC Cribs with Speed restriction of 20 kmph which were considered as the only option. However, an effort was made to provide better base to the Girders which would allow up gradation of Speed restriction to 40 kmph which would save time and provide greater stability and safety to the running traffic. Every work site of RUB using relieving girder will consume Engineering Allowance (EA) of 5 minutes which hampers the progress and demand of all other obligatory works adversely. By operating at a Speed restriction of 40 kmph instead of 20kmph, more EA availability is ensured enabling more engineering works at a time.

The paper deals with the efforts of the above aspect i.e design, development and use of Base Crib elaborating the arrangements made, the results obtained and the precautions needed to get maximum efficiency of the system.

1. Introduction:

Railways have initiated various approaches to implement zero

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accident mission. One of the major shares of accidents in Indian Railways is of mishaps at Level Crossing Gates. To achieve zero mission objective, Railway Level Crossings form the weakest link in the network of any Railway. Railways being the largest national carrier in India are faced with the obligation to allow communication across the Railway lines vis-a-vis maintaining the punctuality and safety of its passengers and road users as well. At the same time existence of the level crossings may, in spite of all the latest signalling techniques like interlocking etc, pose a time demand which adversely affect the punctuality. Besides the unmanned level crossings, day by day, are becoming the biggest liability of the railway looking to the accident statistics. Manned level crossings, though, being relatively safe as compared to unmanned level crossings may create a safety hazard in the event of intoxicated driving/carelessness/mechanical failures etc of a road user.

Railways have planned to eliminate over 6000 Level Crossings by way of construction of RUBs and ROBs by 2019. There are a total of 28,607 level crossings across the country of which 19,267 are manned and 9340 are unmanned. Out of these 6,388 are on broad gauge network and need priority attention for elimination. Due to decreasing man power and to eliminate human errors in operation, RUBs are planned all over the Indian Railways to eliminate Manned Level Crossings along with the Unmanned Level Crossings.

Golden Quadrilateral project linking four Metros with high-speed trains is the top most priority of the government. The thrust area of the project is to provide higher speed with increased safety. As a part of this project too, Railways have targeted elimination of Level crossings by constructing Road Under Bridges.

2. Bearing

Conventional System of Bearing

System of providing relieving girder for Road under bridges is an age old system. However, earlier the relieving girder were supported on a staging prepared with CC Cribs. This method of using CC Cribs is basically a matrix or lattice structure. CC Cribs were placed on one another with clamping arrangements to

achieve the desired height. The CC Cribs come in typical dimension of 2 feet x 2 feet x 6 feet. Since the height of individual cribs is fixed, any further "part increase" in height is being filled by providing wooden sleepers/packings. Availability of good quality even sized wooden sleepers is again a cause of concern these days. The tying of sleepers on either side of cribs and clamping of the cribs involve labour involvement which may vary with efficiency of the workmen. Placement of the crib structure takes longer period while working in Traffic blocks. This system was suitable for a limiting height and for a speed potential of 20 kmph.

New System

Since there are various constraints like availability of blocks, maintenance difficulties etc, it was the call of the time to improve upon the old system using CC Cribs. The system adopted to replace the use of CC Crib structure as a base of relieving girder is primarily a monolithic structure.

The Base Crib is made of size 3200 x 3200 mm with a height of 500 mm. A frame work of ISA 150x150x16 mm is made on all four sides with a 25 mm thick MS plate on top and bottom. Wooden Sleepers are embedded in the frame in 3 layers with approximately 11 nos in each layers laid parallel and perpendicular to the track alternatively. The weight of the composite structure works out to 9 to 10 MT per bearing. C – Bar or tie bar of 6 mm dia tied to bind 2 sleepers together. Manufacturing of the structure can be done at site or in workshops and thus, higher quality can be maintained. Speed is

gradually increased from 20 kmph to the maximum permissible speed of 40 kmph.

Advantages of the system

1. Being a monolithic structure, it provides greater stability to the girders.
2. Structure can be easily lifted and placed in position by cranes.
3. Time is saved on account of placement by cranes. So time of block required is less.

4. Being a strong structure it gives better safety for the traffic movement.
5. Saves EA, thereby providing more time for obligatory track works.
6. Lesser earth work required as compared to CC Cribs.
7. Chances of settlement reduce as it is a composite structure.
8. Sturdy and safe design : Compact unit having sleepers well bounded with each other and in frame does not give way and hence more reliable.

Results Obtained

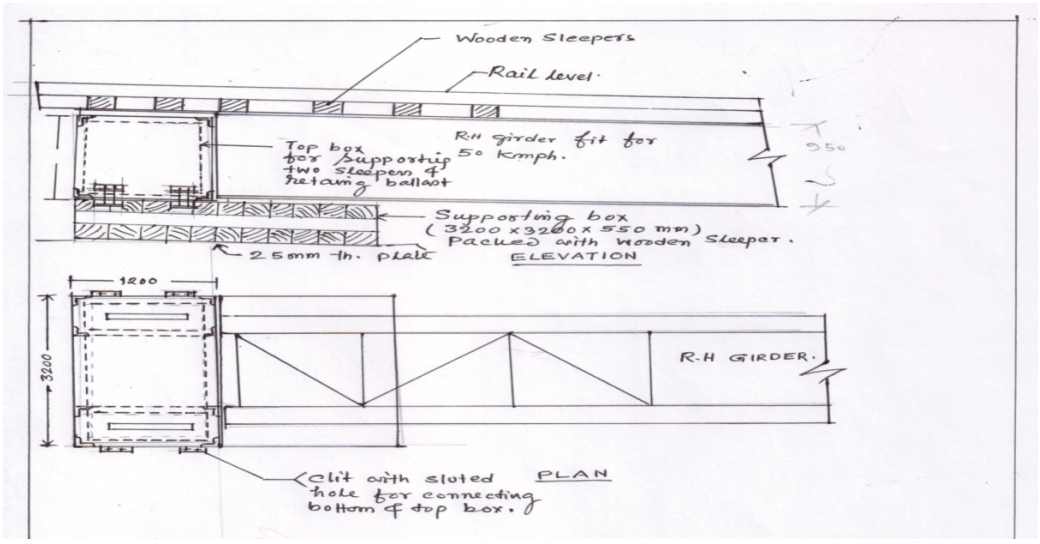
After inserting the newly developed base crib and relieving girder, the speed restriction was gradually increase from 20 to 40 kmph within 3 days. No noticeable settlement of base crib was observed which justifies that the crib used was of sturdy design fit for 40

kmph. No specific efforts were required for maintaining the level and alignment. Since the depth of the crib is lesser than that of conventional CC Cribs, problems of settlement of earthwork was not observed during the rainy season without any further imposition of speed restrictions.

Further Improvements

When the base Crib was inserted for the first time, it was observed that there is a requirement of end Crib or stool to fill up the gap at the end of the relieving girders. This stool or end crib can be made in the similar manner and design as the base crib. The size of the stool is 3200mm x1325mm x depth of girder. The stool can also be lifted and placed by the cranes which will result in saving time. Instead of wooden sleepers, steel channel sleepers or composite sleepers can be used for better track geometry.

Sketch & Drawing



The drawing to be followed is "Temporary support of Box Crib for relieving girders for length upto 20.40 m" having drawing no PCE-24019-HQ-TP-2016.

Precautions to be taken

Though the new system has been found fit for 40 kmph but some precautions are required to obtain the best of the results:

- Wooden Sleepers to be used in the Base crib should be of sound quality.
- The sleepers should be placed side by side touching each other.
- The sleepers should be bound side by side by 6 mm bars so as to make them work as a single unit.
- Single plate should be used on top and bottom sides.
- The space after the removal of Base crib and stool should be back filled with good quality quarry dust.
- Use of composite sleepers or steel channel sleepers with insulated fittings.
- Use of speed gun to monitor speed of trains.