CONSTRUCTION OF ROAD UNDER BRIDGE BY BOX PUSHING METHOD

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ABSTRACT

The intersection of railway track and the road at a similar level is alluded to a level intersection. In the urban territories the level intersection are for the most part observed by qualified railway work force who screen the train development and close the level intersection entryway to stop the meddling road traffic yet such shutting of doors prompts blockage in road traffic and furthermore makes loss of time road clients. Road under extension and road over scaffold are considered as answers for keeping away from level intersections of roads and railway track. There are 3 principle methods in development of road under extension. Box pushing method, Cut and spread method, Rolling procedure utilizing RH support. In this we examine about the executes, soil rubbing, impacts required, limit of jacks and there utilizations, skew edges and at square edges.

Keywords: Road Under Bridge, Level Crossing, Box Pushing Method and RUB etc…

1. INTRODUCTION

Level intersections keep on being the weakest connection, most dangerous component and wellspring of mishaps on Railway track from security perspective. Because of increment in train speed and non-recognition of principles by road clients, these are progressively basic. In spite of the fact that, the all out number of mishaps happening on the Indian Railways is appearing dynamic decay, level intersection mishaps are as yet drifting at around a similar level. With the developing stimulus on urbanization and increment in the road arrange, the interest for giving road under scaffolds by end of level intersections is on the ascent. To develop such openings with least disturbance not exclusively to the train benefits yet additionally to general society and related framework is a test to the Railway Engineers guarantee the best wellbeing gauges yet in addition will be financially savvy over the long haul.

One of the measures started to lessen the quantity of level intersections is supplanting of level intersections with ROB's/RUB's and restricted stature metros which dispenses with mishaps at level intersections other than critical improvement in operational advantages and upgraded wellbeing.

Development of RUB's offers amazing operational influence both for Railways and Highways and offers win – win circumstance for all end clients for example person on foot traffic , road traffic and rail traffic. It is the most secure techno – socio – monetary answer for the current issue at rail – road interface.

1.1 PROBLEM IN HAND

With the presentation of fast trains on a few courses and the plans of the Indian Railways to join the rapid club in a matter of seconds, the wellbeing angle/end of level intersections must be examined in detail since the speed of the moving toward train will be a lot higher thus will be the peril of mishap at LC's, in spite of the way that a large portion of the mishaps at level intersections are because of the recklessness of the road clients, Railways must be all the more professional dynamic to improve the security.

With the nonstop increment in the rail traffic just as road traffic, the interface among rail and road traffic is bound to increase as we continue towards turning into a created country. Evaluation separators for example Road over scaffolds/Road under extensions/metros, along these lines.

1.2 Methods of Elimination of Level Crossing`S

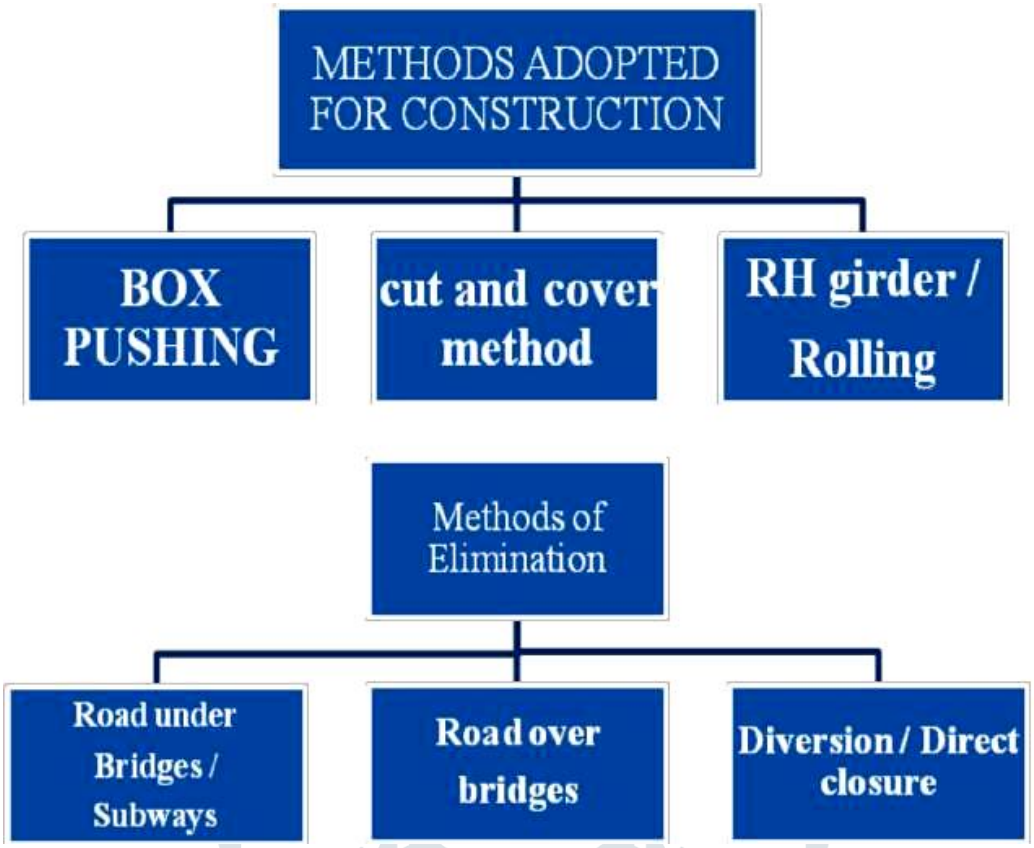

Fig-1: Methods of elimination of level crossings

Before taking up the work followings are to be guaranteed:- Feasible Level Crossing's to be distinguished, State Government agree to be acquired, Sanction of work, Preparation of GAD, definite gauge, offering and so forth. CRS assent to be acquired, Execution of the work effectively forms the base to the throwing of the box sections and furthermore empowers jacking of the fragments. It goes about as a medium to exchange the whole jacking power into the ground. The helper push bed likewise might be developed relying on hand necessity, which thusly helps in sparing of fortification, time, work and use.

2. ROAD OVER BRIDGES

A bridge is a span structure is built to physical obstacles such as a body of water, valley, or road, for the purpose of passage over the obstacle. Designs of bridges vary depending on the function of the bridge, the nature of the terrain where the bridge is constructed, the material used to make it and the funds available to build it.

Fig -2: I section girder on ROB.

3. ROAD UNDER BRIDGES

The movement of traffic in both perpendicular directions which is above and below is said to be road under bridge. This may vary in location. The road above the water bodies is also said to be road under bridge

Fig -3: Box pushing method of RUB.

4. METHODS OF CONSTRUCTION

Flow Chart -2: Methods of Construction ROB and RUB Out of the above three methods, Box pushing is the latest and is widely used in our country. The advent of Box pushing technique has revolutionized the construction world and proven to be an ideal and the best as it is non – intrusive, best suited for construction of underpasses and subways in urban areas in a manner that minimizes disruption to road traffic, constraints of space and time.

4.1. Procedure of Box Pushing

A properly designed RCC thrust bed is casted at appropriate location. Generally the top layer of 50mm is finished with screwing layer to obtain a perfect level surface. This thrust bed along with the connected thrust walls and shears keys

Fig -4: Foundation of road in Box Pushing in RUB.

4.2. Casting of RCC Box Segments

Over the all around set and leveled push bed, RCC box portions are casted. The front substance of the box will be thrown in an incline to coordinate with the state of the bleeding edge which is fabricated from structural steel and is incorporated into the solid. The front line is given all round the box and it additionally goes about as a shield keeping soil from top and sides from slipping. A back shield is given which houses and aides the consequent sections while supporting the soil. In the event of more than one section in a range, the vital break game plan with MS plate is given at pre-decided areas while throwing the boxes for obliging the jacks amid pushing. A middle of the road cutting shield with MS plate is additionally required to be given relying in the vicinity conditions, sort of soil, size of box and so on

Fig 5: MS Plate/Front Shield for Box Pushing in RUB.

4.3. Pushing of Box Segments

Under reasonable speed limitation, the fragments are jacked into the bank by methods for pressure driven jacks of appropriate limit introduced at the backside of the section taking response through a get together of steel sticks and bars.

Measures like GI drag sheets are given to decrease drag impact and parallel development of overburden. Further epoxy covering on sides and top of the box portions is likewise connected to lessen the soil grinding. So as to diminish the erosion between the push bed and box portion, two layers of polyethylene sheet sandwiched with a layer of oil is given. Network course of action with rails/channels/timbers and so forth was additionally given at destitute areas to guarantee the security particularly in non-durable sort soils. Controlled impacting with due safety measures is additionally done in the event that where shake is experienced.

The box is jacked into the dike in a controlled and staged way with concurrent unearthing of material from inside manual/hardware after each phase of jacking. All through the whole procedure of jacking, arrangement is observed by optical instruments at customary interims. Correction of arrangement is accomplished through jacks. The jacking of portions, if there should arise an occurrence of more than one of every a range, first fragment will pursue the second section for each stroke.

Fig 5: Pushing of Box Segment with help of Piston.

5. MATERIALS USED

5.1. Thrust Bed

The push bed for the most part comprises of push divider, push bed with stick pockets on bed, keys for extra opposition. The essential element of the push bed is to give fundamental opposition expected to the jacking activity. For this reason, a well-structured RCC section will be built outside the scaffold with its top dimension being kept precisely at the proposed base dimension of the RCC box. Push bed will have appropriate pockets at various areas for lodging jacking pins intended for opposing the pushing power applied by pressure driven jacks as the box is being jacked through the bank. Over the push bed, 50mm screed is to be given to get careful line, dimension of the bed for pushing task. At pockets area, precast spread squares are given to cover the stick pockets amid pushing activity.

5.2. Front Shield

It is a MS Plate which is made up of mild steel material and used in the site for cutting the soil surface under the railway track. It has cutting edges in the front which helps to cut the soil and move the box segment easily.

5.3. Rear Shield

It is made up of mild steel will be fixed on rear end of the first unit of the box. This is connected to the back side of the RCC box segment which helps the box to move properly with out and tilting under the railway track.

5.4. Drag Sheets / Epoxy Coating

Drag sheets are provided at the top of box if required. Or the top of the box is coated with epoxy coating to reduce the friction between the box and the soil.

5.5. Jacking Operation

For pushing the box unit, the jacking (if found necessary to control the alignment) will be placed behind the RCC box along the axis of the pockets and the jacking pins will be inserted in pockets of thrust bed. Jacking rig will help in maintaining the alignment of the box.

Fig 7: Pushing of Box Segment with help of Piston.

The way toward keeping up of legitimate arrangement of railroad track when the box portion is pushing under the track is said to jack activity. The jack is utilized to migrate the track to the first position when the box section is moving.

While the pushing of first portion is in advancement, second section of the box will be thrown on contiguous region of the push bed. After complete throwing and relieving of second box unit, a similar will be moved hanging in the balance of arrangement of the pushing on push bed, the second portion of the box will be situated in line and dimension of first box pushed, by reasonably working the water driven jacks and joined to the main section through the back shield to frame the transitional jacking station (IJS). The IJS likewise empowers pushing of individual units one by one by taking response against the back units, in this way decreasing the complete jacking power required at once. For pushing of first box, second box will be held at back by pins and jacks will be given at IJS.

Sticks and jacks will currently be moved on primary purpose bed behind second box unit and the second unit will be pushed close shield of the main box unit by pressure driven jacks arrangement may likewise kept to put water powered jacks in the dividers and top piece of the second box which are utilized for any alteration of the arrangement required amid the jacking task.

The above procedure of pushing first section subsequent to unearthing and evacuation of soil and pushing of second fragment to close the hole made in IJS as portrayed above will be kept taking consideration that a base cover of about 200mm is constantly accessible to the highest point of front segment of second fragment as the back shield is forestalling the soil above and onside of the box. Amid the way toward jacking the two units in a steady progression arrangement of the box and level will be checked proceeding and after each pushing activity and in the event of misalignment it will be amended by altering the task of various water driven jacks.

5.6. Plumb Bob

This is a process to know that the box is moving in the correct position or not.

Axis lines are drawn on the box slab which gives the information of box moment.

5.7. Piston

It is a cylindrical machine which is used to push the constructed box to its position in road under bridge.

The pressure which is applied to push the box is of 400kN to 600KN.

5.8. Pockets

Pockets are holes which are made at the construction site and filled with red sand of 70cm height before covering up with concrete.

Pockets are used for marking at the construction site after RCC work.

After the RCC work the red sand is removed and counter box is laced in the pockets.

5.9. Counter Box

It is an iron rectangular box on 70cm height and 800 kgs of weight. Counter box is placed in pocked for the support of piston.

- Time of fulfillment is less.
- Saving in labor and Machinery.
- No contribution of crane and substantial hardware.
- Less contribution of different Departments

6.2. Disadvantages of Box Pushing

- Needs prepared staff and talented supervision.
- Imposition of alert request exists for a more drawn out period.
- No extent of night working.
- Once the vertical and parallel arrangement of box exasperates it turns out to be practically difficult to redress it.

6.3. Problems Encountered During Box Pushing

- Tilting of box.
- Shifting of longitudinal arrangement.
- Failure of stick stash.
- Leaking of joints.
- Occurrence of rock layer.
- Occurrence of hard shake.
- Occurrence of collapsible strata.
- Unexpected floods amid box pushing.
- Disturbance in track geometry.

7. CONCLUSIONS

- Box pushing work implies in any event halfway working in visually impaired, so issues more often than not come up amid execution of work.
- Box pushing work requires close supervision and checking and regularly the hazardous conditions create at these destinations.
- Track must be observed consistently to see indications of hurling, settlement, misalignment and so on.
- LWR must be cut and site separated amid box pushing.
- Work must be done under square insurance/alert request as it were.

REFERENCES

1. Highway Engineering- S.P.BINDRA, DHANPAT RAI & SONS- 4th Edition
2. Text Book of Railway Engineering- S.C.SAXENA & S. ARORA, DHANPAT RAI & SONS- New Delhi
3. Dock & Harbour Engineering- HASMUKH P OZA, GUTAM H OZA
4. Parsa Bhavana et al., design aspects of flexible pavement and quality control management, International Journal of Advanced in Management, Technology and Engineering Sciences, Volume 8, Issue II, FEB/2018
5. Highway CapacityManual 2010 (fifth edition) TRB, Washington DC (2010)
6. Harkey et al., 2008 D.L. Harkey, S. Raghavan, B. Jongdea, *et al.* Crash Reduction Factors for Traffic Engineering and ITS Improvement NCHRP Report No. 617 Transportation Research Board, Washington DC (2008)