A Study On Mobile Bridge Inspection Unit

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Abstract

The inspections are the key activity in the due performance of the assets. In case of bridges, proper inspections are even more important, since the problems in the bridges have severe impact on safety and train running. The arrangements,which can be provided to enable the inspections of bridges to be carried out safety and conveniently. There are some advanced methods for inspecting inaccessible areas such as remote operated vehicles and cameras etc but the bridge structures are not that important and the extent of traffic not increased so much on Indian railways as to justify the expenditure on such costly techniques. The existing bridges in India are more than 50 years and were designed for less volume of traffic, slower speed and lighter loads. The various factors have resulted in deterioration of bridges and the need for their maintenance, rehabilitation or replacement has increased manifold. Thus, it has become essential to have an effective system for inspection of bridges at faster speed and regular intervals. The equipment used for this purpose is known as mobile bridge inspection unit. Mobile bridge inspection unit(MBIU) are used to manage information of bridges and to assure their long term health under budgetary constraints.

Keywords: Mobile bridge inspection unit, safety, bridge inspection.

Introduction

The aim of inspection is to identify and quantify the deterioration caused by applied loads and other factors such as dead and live loads, physical and chemical influence of the environment. Inspection is also necessary to identify the effect of any built in imperfections. Inspection may also help to increase the life of older bridges. Above are some types of deterioration which appear in early life of the bridge, which if not repaired promptly can reduce considerably the length of service of the building. Keep the records systematically about the structure which shall be helpful for its future course of action. Timely forecast and attending the repairs will reduce their high maintenance and repair cost. The present system of inspections of bridges in India is predominantly visual, relying primarily on human skill and judgment. The visual inspections of bridges have not been replaced even in systems where advanced tools for bridge inspections have been adopted. It is postulated that for carrying out proper inspections, the inspecting official shall be comfortably stationed at a location not more than 4 m away from any structure. As the distance from the surface increases or the discomfort of to detect the potentially harmful defects at nascent stage diminish disproportionately. To meet this objective, the bridge shall have some structures called inspection arrangements.

Types of inspection

Inspection of bridges is done in three modes:-

* Routine inspection.
* Principal inspection.
* Special inspection.

Problems In Current System Of Inspections*:*

As seen above, the current system of inspections is not very sound and suffers from various problems:

* The inspecting officials do not have proper place to stand while doing inspections and therefore the attention is divided between personal safety and inspections. Consequently, the quality of inspections suffers.
* All the officials are not able to the inspections and only daredevil kind of personnel not afraid of heights and precarious locations are able to inspect after taking risks.
* With no systematic thought on the inspection arrangements, 'local' solutions are found and mostly Poor quality inspection is done and recorded in the bridge registers.
* Specific problems in inspections where the river bed is not accessible or the height is more are as follows
  1. Plate girders
  2. Open web girders
  3. Ballasted deck (Composite/PSC) girders:
  4. Piers/ abutments:
  5. Protection Works:

Mobile Bridge Inspection Unit (MBIU)

Mobile Bridge Inspection Unit is a basic characteristic of field tasks. A bridge inspector has to move most of the time in order to do the job at hand. The inspector walks over, under or around the bridge or in some cases climbs the bridge. The application of mobile computing techniques can facilitate the inspector’s activities allowing him to concentrate on the details of inspection tasks. These techniques include portable PCs, wearable computers, Head-Mounted Displays (HMDs), digital cameras, wireless communications, and speech and handwriting recognition. A mobile arrangement can be in the form of track mounted or boat mounted or on road inspection capsule used for inspecting and maintaining all parts of bridge. A mobile arrangement can be in the form of track mounted or boat mounted or on only road inspection capsule used for inspecting and maintaining all parts of bridge.

Objective Of MBIU Inspection

To determine, whether the bridge is structurally safe and sound and to decide the action to be taken to make it safe.

* To identify the actual potential sources of trouble at the earliest possible stage.
* To record the state of the structure systematically and periodically.
* If situation warrants, to improve speed restrictions on the bridge till the repairs of the bridge are carried out.
* To determine whether major rehabilitation of the bridge is necessary to cope with the natural environment and the traffic passing over it.
* Keep the records systematically about the structure which shall be helpful for its future course of action. Timely forecast and attending the repairs will reduce their high maintenance and repair cost.

Classification Of Mobile Bridge Inspection Unit

Broadly mobile bridge inspection unit is classified in two categories:-

1. Cage type.
2. Platform type.

CAGE TYPE:

It consists of Truck chassis, Hydraulic jacks quantity – 4 nos, which are used to level the truck descending vertically. An articulated telescopic boom consisting of a telescopic main boom mounted on the turn table by means of hydraulic system.



PLATEFORM TYPE:

This type of unit is provided with working platform, heavier in weight, therefore truck chassis and stabilization system should be selected carefully to keep tyres / stabilizers ground pressure on bridge deck within permissible limit during its translating and stabilization operation. In India this limit is taken as 5kg/cm2. Bottom boom of a longer span can be better inspected by providing mobile platform moving on rails/ angles fixed to the bottom boom of the girder. Where the HFL is high and waterway is inadequate as to allow the inspection cradles or pathway to be provided below the bottom of girder, the inspection of underside of girder can be better inspected by providing a traveling platform moving on the side pathway or on rails fixed to the girder. An Arrangement of this type has been demonstrated by the Southern Railway. With the use of cradles on Piers/ abutments, this arrangement can be easily used for inspections. This can be used with or without the side pathway.

 

Conclusion

Proper inspection is a pre-requisite for any bridge management system, and a properly planned inspection arrangement is a pre-requisite for proper inspections. The planning for the inspection arrangements is a vital area which requires careful thought and planning. Once the field people are facilitated, the railways can go in for asking the better quality of inspections. Furthermore, the system has a rule-based expert system that is used for data analysis and probabilistic diagnosis based on the location and the context of the inspection tasks in order to give the inspector suitable support. Mobility techniques are expected to facilitate the on-site activities and data collection, and improve safety under the severe field conditions. Future development will include further testing of the proposed prototype to improve its functionalities and usability in practical situations.

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