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A STUDY ON CORROSION DISTRESS IN KAMPLI BRIDGE

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ABSTRACT

Kampli is considered to be one of the prominent place of Karnataka located in Bellary district having sound historical importance with focus on Gandugali Kumar Rama a sub-ruler comes under Vijaynagar empire. It is a very small city situated at 154^0 North latitude 76.62^0 East longitude and 414 meters elevation above sea level. The population of this place read 36,641. This place is also known for agriculture, commerce and trade of high quality rice through number of Rice Mills. Kampli even though a small town known for Jewelry business. This city is border of Bellary district with Tungabhdra river pathway and it is near to another commercially important taluka head quarter Gangavathi of Koppal district.

KEYWORDS: agriculture, commerce , trade of high quality rice.

INTRODUCTION :

The two commercially important districts are connected through Bridge constructed across Tungabhadra river, popularly known as **Kampli Bridge**. Over the last 50 years this bridge connected and fulfilled aspirations of lives of two district people and became an inseparable way for transportation. No other major road connects these two places. In addition this is the only route to reach Hospet from Gangavathi and nearby places.

About Kampli Bridge.

The bridge was constructed in 1961 with vision to provide connectivity to Gangavathi by road. It took almost about a decade for the construction. At that time it was a very big civil engineering project. Several Engineers team rendered their quality oriented service.

This bridge is one kilometer in length and about 30-32 feet broad. The roof slab of the bridge rests on 36 columns, each one cover the overall breadth of the slab. These columns appears to be load bearing one and situated at equal distances from each other. For their construction stone masonry are predominately used. The construction at the very outset appears to be of high quality with respect to workmanship assembly and symmetry. In the center of columns H- steel column frame might have been used achieving extra strength.

The roof slab of the bridge made of high quality reinforced concrete. Between two roof slab sheets spacing is provided, which helps to sustain vibrations, The width of the concrete is roughly about 1.3 feet. Even today also wide cracks are not observed on the upper part (road) of the bridge. Over the length through out of the bridge bracing panels are provided, they serve not only as indicators for the vehicles pass through the bridge but also to some extent act like safety barriers. The over all bridge site presents a very beautiful view to an observer apart from its service.

Even though the bridge covers kilometer length and spread over wide, the major drawback is its height from the river bed. The maximum height of the slab of the bridge from the flowing river bed may be about 35=40 feet. Across the bridge area the river water inflow and stoppage is not appreciable. Therefore, this part of the river belt seasonally made use for agriculture purpose. The river water level decrease drastically in winter and almost drains off in summer and also the stagnant water prone to pollution. The practices in the river area are not hygienic. In addition, sand removal is also a constant practice. As a result of soil erosion naturally or artificially support the growth of unwanted vegetation which increases the unhealthy environment.

Corrosion of Reinforcement and Deterioration

In rainy season, when Tungabhadra dam reservoir water level at Hospet increase due to inflow and exceed in its storage capacity, the extra water is discharged from the dam. As a result water flow towards Kampli increases. If the discharge water is more than 80,000 cusecs continuously, every year the bridge get completely submerged. Since the bridge is located nearby Fort area, like flood the houses nearby (even nearby villages sometimes) get inundated with water. The transportation from Hospet to Gangavathi and Gangavathi to Kampli completely stops. During this submerge period the bridge become completely invisible and as a result the vehicular traffic become stand still. When Tungabhdra river overflows some areas of Hampi also get blocked. During this period all vehicles moving from Gangavathi to Hospet take a round additional route via Boodagumpa. This makes an additional 10 Kms journey.

This situation generally remain for about 7-8 days and in every rainy season this type of delink takes place 3-4 times. On an average every year the bridge get submerged for 20 days. Due to the effect of water for a continuous time period in rainy season over 50 years, in addition alternate wetting-drying the corrosion cracks have been observed.

Details of the Study & Observations:

The detailed physical examination of the bridge reveals the following observations:

1) In all inner face of roof slabs typical corrosion cracks have been observed. In number of slabs reinforcing bars are exposed to outer atmosphere. This indicates that, the process of corrosion might have initiated about 10-12 years back. The roof slabs, especially in middle and terminal are severely damaged. In some of the middle slabs the bars buckled out from the reinforcement frame work.
2) The process of carbonation in most of the slabs are observed along with heavy damp patches. The phenolthalein indicator test in few selected areas substantiates the loss of alkalinity of the concrete suggest the acceleration of corrosion.
3) At the middle area on upper face of the roof big holes are formed due to collapse of concrete appears to be very dangerous. On road cracks can be observed.
4) Every year after rainy season the bracings of bridge damage severely/few collapsed completely as well and get repaired partially.
5) The highest damage can be observed in the wide stone masonry bridge columns. It is more predominant in columns located at the middle and also terminal columns of the bridge. Very wide cracks formed separating the stone framework can be commonly observed. In some of the columns prone to settlement, This is the most dangerous development, alarm that the bridge may collapse at any time.
6) In few slabs bulging of the core concrete is also noticed. This is harmful.
7) On Kampli bridge the movement of vehicles round the clock is regular and busy. Even though heavy vehicle transportation is banned the regular movement of buses & other moderately heavy vehicles can produce vibrations in roof.

The deteriorations are presented in photographs. All above observations prevails that, the Kampli bridge presents a severely damaged picture that resemble dilapidated and neglected structure. Even though few steps were taken such as minor repairs but they fail to protect the bridge for a long

time, rather its problem was not taken technically serious. Now, the transportation of heavy vehicles on the bridge route are banned, but it is very late. The deterioration already occurred is not only severe but also serious. There is an emergency to take steps urgently so as to protect and restore the age old serviceable and historically significant bridge.

General Restoration Measures Recommended

The Kampli bridge may become completely unserviceable in couple of years. In view of this, already an alternate bridge construction work is already initiated nearby Bukkasagara Village. Still there is need to strengthen restore the bridge to enhance its life time service. So that in addition to the new bridge, this can also be used as an alternative for light vehicles. We recommend following restoration measures which can be implemented in consultation with expert team of engineers.

1. The moderately affected inner roof slab area are marked and extent of corrosion is ensured. Then wash with water and the porous concrete is to be chipped off, If bars are exposed outside then the scales on them are removed and the bars are coated with zinc rich coatings are applied, On the affected area surroundings 2 mm holes are drilled. Further using high grade sulphate resistant cement(53 grade) concrete is to be prepared and with high pressure concrete is applied and the surface is made uniform.
2. The areas where cracks are wide chicken mesh is provided, The cracks are sealed by using surface sealants and concrete.
3. For the restoration of carbonation affected areas and concrete bulged cites, the loose concrete is chipped of and surface coatings are to be applied before covering.
4. At the middle of the bridge, alternatively a minimum of 10 supporting new columns with technically required design are to be constructed for strengthening.
5. Similar four new alternative terminal columns are to be provided.
6. Stone masonry columns are to be strengthened by standard methods.
7. The weak bracings are to be removed and reconstructed.
8. To avoid submerge of the bridge during rainy season steps are to be taken. To achieve this, wherever possible increase the depth of river flow bed.
9. The unwanted vegetation growth should be avoided.
10. For the maintenance of the bridge an expert committee comprising an Engineer to be appointed which can inspect technically at least once in three month.

CONCLUDING REMARKS:

The physical observations and study of the bridge on technical concepts clearly reveals that the bridge reduced its capacity drastically. It is severely damaged and may be likely to collapse in future any time. Since the workmanship as already delineated still appears to be good and call for immediate technical restoration measures so that it may still render its service to the mankind by increasing it life time up to another 25-30 years. In addition, it is historical and became part of the life linking two commercially important places. Our concern is that the story of this bridge should not become that of Anegundi bridge.

PHOTOGRAPHS: