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Repair and Rehabilitation of Reinforced concrete Bridge

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Abstract: This paper reviews works on repairing of deteriorated reinforced concrete bridge. Every structural element should be designed for a particular type of loading as well as for adopting of different types of environment. However, many civil structures like reinforced concrete bridge are often required to be repaired to restore the structural integrity and to protect the reinforcement from sever weathering condition. Recently repairing is gradually increasing with the increase of age of concrete structures. In some instances, it may be more economical to accept the need for maintenance or repair at suitable intervals than to attempt to build a structure that will be maintenance-free under severe conditions for a long period. In the present era, there are so many buildings and bridges which collapse fully or partially due to lack of maintenance, improper construction method and material. They need repairing to make them safe. Repair are always neglected or delayed by many people in most of structures and financial ability and so it leads to major hazards. Hence it is needed proper repair and reconstruction application.

In this project we focus on cracks heeling, concrete jacketing and other techniques on bridge which required maintenance and repairing of structure which have more than of their certain life and which has affected by weathering conditions, improper techniques in construction etc.

The process involve in this project are: -

- Scope of repair and rehabilitation
- Health assessment of the existing structure in adherence with latest tools
- Repair and retrofitting methods and
- Post retrofitting evaluation for behaviour of the structure.

Keywords: - Repair, Rehabilitation, Retrofitting.

1. INTRODUCTION:

In recent years the condition appraisal and refurbishment of existing bridges has become a standing problem for bridge owners and administrators in all developed countries. Many in-service bridges in fact exhibit dimensional, structural and functional deficiencies as they were designed for performances levels which were progressively made inadequate by more and more demanding traffic conditions and structural safety requirements. Increasing number of vehicles, heavier weight/axle loads, higher traffic volumes, increasing speeds of vehicles and related dynamic effects are in fact reflected in the updating process of codes and standards for road and railway bridges. In addition, deterioration and damage propagation effects are undermining the efficiency of all components in any existing bridge typology. Existing bridges, which are under-designed for such service conditions, typically would need on one side interventions, to widen the deck and protect different types of lanes, in order to enhance the safety of users, and, on the other side, measures to counteract different phenomena of "mechanical damage''. These processes are emphasized by, and/or emphasize, decay connected to environmental (chemical or physical) actions, in a general context of poor or completely lacking maintenance procedures. Such situation is made even more complicated in Italy, where in addition to the above-mentioned types of "vulnerabilities'' affecting existing bridge structures, also the fragility connected to seismic actions is to be taken into account. Owing to the above described situation, keeping a transportation network efficient is becoming an overwhelming task for the public agencies in charge, especially considering that not enough resources are available to tackle the "entire problem'' in due time. This is openly recognized by codes and standards, where, for example, it said that (ISO 13822, 2010) "The continued use of existing structures is of great importance because the built environment is a huge economic and political asset, growing larger every year. The assessment of existing structures is now a major engineering task''.

Strengthening can often be a cost-effective alternative to the replacement of the old structures, especially if indirect and social costs related to the closure of the corresponding road connections are evaluated in relation to the traffic demand. Thus, structural engineers are increasingly called upon to devise ways for extending the life of bridges whilst observing tight cost constraints.

Establishing principles for the assessment and retrofitting of existing structures is essential because s for the assessment and rehabilitation of existing structures is essential as repair and retrofitting are based on an approach that is substantially different from the design of new structures, and require knowledge beyond the scope of design codes. The ultimate goal is to

limit construction intervention to a strict minimum, a goal that is clearly in agreement with the principles of a sustainable development.

2. SCOPE OF WORK:

The focus of this work is to determine the effectiveness of the bridge rehabilitation with respect to different aspect such as strain measurement, vibration measurement, deflection measurement, temperature measurement etc. The project contains following task:

A) Strengthening of RCC Bridge at Talagudam (ALER), Warangal.

B) Replacement of Bearing by lifting the spans using Hydraulic jacks.

3. AIMS AND OBJECTIVES:

The aims and objectives of "Repair and Rehabilitation of Reinforced concrete Bridge" are as follows:

a) To strengthen the bridge using different techniques.

b) To know the different types of damages in the concrete structures.

c) To know the behaviour of bridge before and after rehabilitating structure.

4. DETAILS OF BRIDGE:

The bridge to be repaired or strengthen is located at Talagudam (Aler), Warangal District of Telangana state. It consists of three spans of 16.5m each with 7.5m carriage way including kerbs and two number of Abutments and piers respectively. The estimated weight (dead load) of each span is 300Tons.

5. MATERIAL AND CHEMICALS:

Nafufill KM 250 HS: Fibre reinforced, highly sulphate resistant PCC concrete replacement.

SikaRep Microcrete-4: Ready to use non-shrink, cementitious micro concrete.

MC-Einpresshilfe EH: Grouting Aid for Mortars and concrete.

Zentrifix- KMH: Mineral corrosion protection coat and bond coat.

Dr. Fixit Powercrete: Coating system for waterproof and repairs.

6. STEPS:

The following steps are carried out during repair and rehabilitation of RCC Bridge:

A) Removing and Redoing of bulb portions of Girders

B) Treatment of web portions of the Girders

C) Strengthening of Diaphragm Beam

D) Cement Grouting

E) Bearing Replacement

F) Treatment of Expansion Joints.

Fig 1. Removing and Redoing of bulb portions of Girder.

Fig 2. Treatment of Web portions of the Girder.

Fig 3. Replacement of Bearing.

Fig 4. Deteriorated old bearing and newly replaced bearing.

Fig 5. Newly Designed Bearing.

Fig 6. Girder after Treatment

Fig 7. Treatment of Expansion Joints.

7. CONCLUSIONS:

• The strength of Diaphragm beam is achieved by providing shear connectors with 6mm dia rods at 250mm c/c distance.

• The bearings are replaced with new bearings of 400X300X80 mm with internal layers of 12mm dia and 5 Steel layers.

• Expansion joints are treated by providing 16mm dia 3 no's at Top and 12mm dia bars at Bottom in longitudinal direction of the joint and longitudinal bars are welded to the studs.

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