ISSN : 0973 - 8355

www.ijmmsa.com

INTERNATIONAL JOURNAL OF MATHEMATICAL, MODELLING, SIMULATIONS AND APPLICATIONS

IJMMSA

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INTERNATIONAL JOURNAL OF MATHEMATICAL, MODELLING, SIMULATIONS AND APPLICATIONS
IJMMSA

ISSN 0973-8355www.ijmmsa.com

Vol 10,Issuse 2.June 2022

REHABILITATION OF BRIDGES AND BUILDINGS BY USING GRUNTINGTECHNIQUES

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ABSTRACT-Current bridge structures are rapidly degrading, and this has become a significant technical and economic issue in many countries, even the most advanced. Because of this, bridge repair is one of the most critical civil engineering projects. There must be an initial examination and evaluation of the bridge in order to ascertain its true technical state and the appropriate rehabilitation procedures or materials. In most countries, the causes of bridge deterioration are nearly identical. It is possible to extend the useful life of a structure through the practice of repair and rehabilitation in civil engineering. When a structure is damaged, deteriorates, or is destroyed, the term "repair and rehabilitation" refers to the process of restoring it to its original condition. The ultimate goal of Repair & Rehabilitation is to restore a structure's structural integrity in order to maximize the structural utility. An overview of the Repair and Rehabilitation of Heritage Buildings is included in this paper's content Repair and rehabilitation play a critical part in the current state of building research because of their importance in building applications. When it comes to preserving the integrity of historic architecture, this is an essential tool. The preservation and restoration of historic structures is becoming a more pressing issue around the world, particularly in wealthy nations. A comparison of the costs, lifespan, and adaptability of several solutions is used to find the best and most cost-effective remedy for each of the primary flaws found.

INTRODUCTION

The goal of the rehabilitation is to return the structure to its original state as closely as possible. Structures that are in need of repair must be brought back into operation without losing their utility or putting their safety at risk. Building supplies, machinery, and equipment are rare in India because the country is still developing. In addition, new development has gotten more expensive and time-consuming during the last few decades. Accordingly, it is imperative that this be addressed.importance to conserve basic raw materials such ascement,steel,etc.,forthe newdevelopmental work

Reinforced concrete is being extensively used inconstruction since 1940. In the beginning, it wasthought that the reinforced concrete was permanentand maintenance-free, but in the course of time it isexperiencedthatthereinforcedconcretealsor equires maintenance and without it It has a low life expectancy..

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It is imperative that we conserve our nation's cultural heritage through preserving old buildings, structures, historic monuments, and temples that represent the nation's history and traditions. This means that to ensure a long service life, regular maintenance and repair of these structures is required. Construction materials' prices continue to rise on a daily basis. Rather than trying to build something new, it's preferable to find ways to extend the life of any existing structure by regular maintenance and repair.

OBJECTIVESOFREHABILITATION

The following are the aims of structural rehabilitation:

In order to prevent more damage and provide effective defense,

ii) In order to improve next performance

In order to restore the structural system to its original state as closely as feasible.

For example, a hurricane or an earthquake could cause the structure to collapse.

v) To alleviate pain, erase flaws, and improve the overall appearance

I. LITERATUREREVIEW

The soffits of reinforced concrete beams and slabs can be strengthened or repaired using epoxy bonded mild steel plates. Because it increases the strength and rigidity of beams and minimizes crack widths in concrete, flexural performance is improved in existing structures. This method has been employed in a wide variety of countries.

This repair teelmic|tie has been studied extensively by Hussain dal. and his colleagues in terms of plate thickness, end anchorage, and ultimate load and failure mode. They recommended that the beams be fixed so that the maximum shear and peeling stress at the interface does not exceed the limitation value.

Epoxy resins were used as binders in a study by Jones et al. to examine the failure of glued steel plates. As the steel plates came to an abrupt halt in the concrete, they peeled off. In the adhesive layer at the plate's ends, there were shear and peel tensions. Steel plates bolted together instead of epoxy resins were shown to reduce peel failure.

Combinationofferrousproductwithcementiscalled Ferrocement.Itisconsideredasahighlyversatile form of composite material made up ofcementmortarandlayersofwiremeshcloselyboundtogethertocreateastiffstructuralform.Ferrocement is obtained by impregnating very richcement mortar into layers of wire mesh, cured for aspecified period of time. Ferrocement has a bettercorrosionresistanceanddurabilityduetotheintegrity of the mortar which prevents the attack onthereinforcement.

Research by Adimurthy et al. J looked at the use of ferrocement jacketing to repair structurally distressed, shear deficient reinforced concrete beams Damaged beams' shear strength increased as the extent of damage grew, according to a study. Beams in all categories were successfully repaired using the technique of ferrocement jacketing, demonstrating that the method is suitable for repairing distressed concrete structures.

It was found that ferrocement can be used to repair reinforced concrete beams. In addition to not requiring any form work, this approach has a very low dead weight, which means that the design load parameter does not change.

Kaushik discussed the use of precast Ferrocement plates to enhance reinforced concrete beams. Strengthening reinforced concrete beams with Ferrocement can boost their ultimate strength by 37%, as well as other structural features. He also looked into the use of mild steel plates mounted to the beam's tension side to strengthen reinforced concrete beams. Ferrocement is the name given to the material created by mixing ferrous sludge with cement. Cement mortar and a variety of other materials are used to create this incredibly versatile composite material.wire mesh closely bound together to create a stiffstructuralform.Ferrocementisobtainedbyimpregnating very rich cement mortar into layers ofwire mesh, cured for a specified period of time.Ferrocement has a better corrosion resistance anddurability due to the integrity of the mortar whichpreventstheattackonthereinforcement.

Adimurthy et al. investigated the rehabilitation ofstructurallydistressed,sheardeficientreinforcedconcrete beams using ferrocement jacketing. Thestudy concluded that the shear strength of damagedbeams increased with increase in level of damage.The ferrocement jacketing remained firmly bondedwith the parent concrete for all categories of beamsindicatingadaptabilityofthetechniqueofferrocementjacketingforrehabilitationofthedistressedconcretestructures.

Anwar et al. studied the rehabilitation technique forreinforced concrete beams using ferrocement. Thistechniquehasseveraladvantageslike,noformworkisrequired,thedeadweightoftherehabilitationmaterialisalmostnegligibleandhencethe designloadparameterdoesnotgetchanged.

Kaushik discussed the strengthening of reinforcedconcrete beams using precast Ferrocement plates.The study concluded that the ultimate strength, andtheotherstructuralcharacteristicsofreinforcedconcretebeamscouldbesignificantlyincreased(37%) by strengthening with Ferrocement. He alsostudiedthestrengtheningofreinforcedconcretebeamsusingmildsteelplatesattachedtothetensionsideofthebeam.

III BRIDGE REHABILITATIONTECHNIQUES

According to Section, bridge condition surveys, tests, analyses, and reports will reveal the amount of problems and the goals for repair. As a result of the discovered inadequacies, this section gives particular bridge rehabilitation techniques. Each structural element has its own subsection in this section. In Section, you'll find a brief explanation of each method.

For each bridge restoration project, the department provides a number of standard procedures that can be used as a guide. Section does not attempt to cover all of INDOT's bridge-rehabilitation methods, but it does provide as a starting point. The highway-engineering literature is a good source of information for designers working on specific projects. For further in-depth information, refer to the INDOT Standard Specifications.

REHABILITATIONTECHNIQUES

Listed below are a few examples of bridge-deck restoration techniques. If it's a good fit, then the designer should consult with the Production Management Division's Bridge Rehabilitation Team about implementing it. The following are some of the methods:

Patching a BD-1 disc
Injection of BD-2 Epoxy Resin
A Low Viscosity Crack Repair Sealant, BD-3BD-4 ConcreteOverlay
BD-5CathodicProtection
BD-6DeckDrainageImprovementsBD-7 UpgradeBridgeRailings
BD-8 Upgrade Guardrail-to-Bridge-RailingTransitions
BD-9 Joint EliminationBD-10ConcreteSealants
BD-11CorrosionInhibitors

BD-12PrefabricatedBridgeDeck

REHABILITATIONTECHNIQUES

Briefdescriptionsofbridge-deckrehabilitationtechniqueswhichmaybeconsideredareshownbelow. The designer should review the technique,determineitsapplicabilitytotheproject,anddiscuss implementation of the technique with theProductionManagementDivision’sBridgeRehabilitationTeam.Thetechniquesincludethefollowing:

BD-1Patching
BD-2EpoxyResinInjection
BD-3LowViscositySealantforCrackRepairBD-4 ConcreteOverlay
BD-5CathodicProtection
BD-6DeckDrainageImprovementsBD-7 UpgradeBridgeRailings
BD-8 Upgrade Guardrail-to-Bridge-RailingTransitions
BD-9 Joint EliminationBD-10ConcreteSealants
BD-11CorrosionInhibitors

BD-12PrefabricatedBridgeDeck

IVBRIDGEANDBUILDINGWIDENING

1. For the following reasons, it may be required to enlarge an existing bridge.

2. First, the current bridge may be too narrow, especially in terms of the shoulder width.

5. An expansion of a roadway segment's carrying capacity may necessitate installing more driving lanes.

9. For example, increasing the length of an acceleration lane for an interstate road, adding a truck-climbing lane, or adding a weaving segment at the center of a cloverleaf interchange, bridges can be enlarged to accommodate an additional lane.

10. During the planning and design stages, during construction, and throughout its service life, a bridge expansion can pose numerous issues. Construction and maintenance headaches should be taken into account when designing the widening.

11. A structure's enlargement should be planned to blend in with the aesthetics of the existing structure. The work should, if at all possible, improve the aesthetics of the bridge.

12. The primary goals of bridge widening can be summed up as follows.

13. Make that the new structure's components match those of the old.

14. Match the old bearing types to the new ones.beams.

15. Donotperpetuatefatigue-pronedetails.

It is not warranted to modify the existing structuresolely becauseofrevisionsintheLRFDBridgeDesign Specifications which are not reflected in theexistingstructure.

DESIGNCRITERIA

StructuralCapacity

Figure 72-7A, Historic-Bridge Structural Capacity, should be used to determine the structural capacity. According

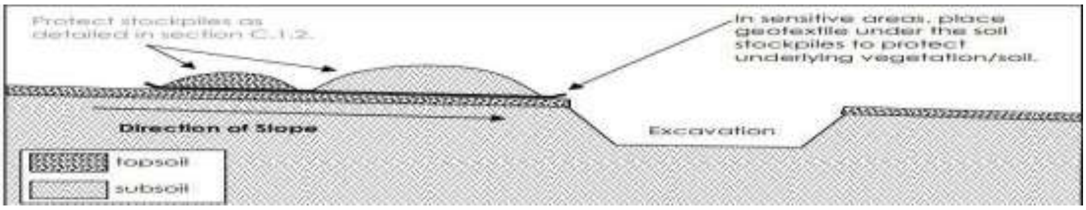

Fig.: BASIC SEPARATION OF TOPSOILANDSUB-SOILS.

HydraulicCapacity

Improvements may consist of removal of sand barsordebris,channelclearing,oraddingasupplemental structure. If a bridge is to remain inplace and its approaches are realigned, the removalofexistingroadwayfillisanoptiontowardimprovingthehydrauliccapacity.

BridgeWidth

Theminimumbridgewidthshouldbeinaccordance with Historic-Bridge Minimum Clear-RoadwayWidth.

BridgeRailing

Bridge railing may be left in place if there is nodocumentedcrashhistoryorotherevidenceofcrashhistorywithinthepast5yearssuchasdamagedrailingorconcernsbylocalpoliceagencies. If only slightly damaged,railing shouldbe replaced in kind. If there is evidence of crashhistory within the past 5 years, the possible causesshould becorrected,ornewbridgerailing.

ApproachGuardrail

Approach guardrail, if in place, should remain. Ifnotinplace,itmaybeomittedifthereisnodocumentedcrashhistoryorotherevidenceofcrashhistorywithinthelast5years,suchasvehicles hitting the ends of the bridge railing orvehiclesleavingtheroadway.

1. AnacceptanceletterfromFHWAthatapprovesthedeviceforuse;and

2.

Completedetailsforthedeviceassucces sfullycrashtested.

DesignSpeed

The existing posted speed should be used as thedesignspeed.Iftheroadisnotposted,anengin eering speed study should be performed andtheroadshouldbepostedbetweenlogicalter mini.

V. CONCLUSIONSCONCLUSIONS

Inthis study two steel bridge concepts are developedusinginnovativetechnologiesandtec hniques that will accelerate the construction ofbridges. Both concepts are based on modular unitsmade of steel girders and concrete deck and arepresentedindiscussedinthisreport..Thefirst conceptismadeofall-prefabricatedsystemincludingthedeckslab,wh ereasthesecondismade of prefabricated steel girder system includinga cold-formed steel form that will receive cast inplaceconcretedeck.Parameterssuchasnorma lweightconcrete(NWC)versuslightweight(LWC) ,normalstrengthconcrete(NSC)versushigh strength concrete (HSC), and 8 inch versus 6inchslabarestudiedandcomparedforperforma nceandcost.Advancedoptimizationtechniques are utilized to optimize the two conceptsandtocomparebetweentheresultingdi fferentsystemsandassesstheinfluenceofthestu diedparametersoncost.

Thefollowingconclusionscanbedrawnfromthe study:

Maximumspanlengthsthatcanbeachieved

A 200-kilogram load has the following possible maximum span lengths, roughly: NSC and HSC: 225 and 250 feet, respectively; (iii) NWC and LWC: 225 and 250 feet, respectively There is a difference between the 8in. and 6in. LWC precast slabs in length: 146 feet and 167 feet for the 8in. precast and 6in. LWC precast slabs, respectively;

Thickness of the slab's impactWith a lowered slab thickness from 8 inches to 6 inches, the greatest length attained with 200 kips total weight is raised from 130 feet to about 153 feet—a 17.70 percent increase in length.

A 13.70 percent increase in length is also possible with Precast LWC when the slab thickness is decreased from 8 to 6 inches, which increases the maximum length for 200 kg of weight from 146 to 166 feet.

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