LTRC RESEARCH PROJECT CAPSULE

OCTOBER 2008

05-1GT

TECHNOLOGY TRANSFER PROGRAM

Field Demonstration of New Bridge Approach Slab Designs and Performance

JUST THE FACTS

Start Date:
July 7, 2008

Duration:
36 months

End Date:
July 7, 2011

Funding:
Federal SPR Funds

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SPECIAL POINTS OF INTEREST:

- Problem Addressed
- Objectives of Research
- Methodology Used
- Implementation Potential

PROBLEM

A normal bridge approach slab in Louisiana is a reinforced concrete slab. It connects the bridge deck to the adjacent paved roadway. Its intended functions are:

1. To span the void that may develop below the slab due to soil erosion or embankment settlement;
2. To minimize slab deflection, which could result in settlement near the abutment;
3. To provide a ramp for the differential settlement between the embankment and the abutment (this function is affected by the length of the approach slab and the magnitude of the differential settlement); and
4. To provide a better seal against water percolation and erosion of the embankment.

The results from previous studies indicate that concrete bridge approach slabs still have a settlement problem and generate a feeling of a "bump" while driving on or off bridges even though most of these approach slabs are still structurally sound and could have a rating of "fair" or above. Field observations indicate that either faulting or a sudden change in slope grades of approach slabs causes this "bump" feeling which is due to the fact that the concrete approach slabs lost their contact supports underneath. The major reason is the settlement of the embankments on which the slabs are built. When settlement occurs, the slabs will bend in a concave manner and cause a sudden change in slope grades. Loads will also be redistributed to the ends of the approach slabs (i.e., to bridge abutments and the subgrade near pavement roadway). Due to the redistribution of loading, faulting at the joints between the roadway pavement/approach slab joint (R/S joint) and the approach slab/bridge deck joint (S/D joint) occurs.

The Louisiana Department of Transportation and Development (LADOTD) has launched a major effort to solve this problem by changing the design of approach slabs where settlement is expected. The basic idea is to make approach slabs strong enough to compensate for the partial loss of existing contact supports.

The Louisiana Transportation Research Center (LTRC) initiated the following three research projects in response to this need and the results have been recommended for implementation:

- Rideability of a Deflected Bridge Approach Slab
- Determination of Interaction between Bridge Concrete Approach Slab and Embankment Settlement
- Investigate the Potential Use of Geosynthetic Reinforced Soil Foundation (RSF) to Support Shallow Footing

OBJECTIVES

The objective of this proposed research project is to perform field tests on concrete approach slabs to validate the findings and design recommendations developed in the previous research projects and update the design and construction guidelines of the LADOTD for bridge approach slabs to mitigate the bridge end "bump" problem.

METHODOLGY

The proposed research work will be a joint effort of research by LTRC and LADOTD Design and Construction Sections. Three field test sections of concrete approach slabs will be built. The testing sites will be selected for various expected embankment settlement and construction methods. The testing sites will be instrumented and monitored during and after the construction to verify the assumptions made in the design and analyze the concrete approach slabs. The field instrumentation program will include both geotechnical and structural performance monitoring. The geotechnical instrumentation will include inclinometers, vertical pressure cells, strain gages, and survey targets. The instrumentation aims at evaluating the field performance of the whole geotechnical system at the bridge ends, such as embankment settlement, effect of compaction requirement on settlement, performance of reinforced soil foundation, and ride comfort of approach slabs. The objective of the structural instrumentation is to monitor the approach slab and abutment performance, such as the slab and abutment deformation and strength, and confirm the performance of designed structures recommended by the previous research project. It will include strain gages embedded in the concrete slab to measure the reinforcement strain, crack gauges to measure the concrete cracking, and tilt gauges to monitor the abutment rotation.

IMPLEMENTATION POTENTIAL

By the end of this research project, a modified design and construction guideline for bridge approach slabs supported by embankments will be developed for implementation. It will consider factors such as the ride comfort, the highway functional classes or design speed limits, the slab lengths, the flexural rigidity (EI) of approach slabs, the potential differential settlements between bridge abutments and approach embankments, and the redistribution of contact stress underneath approach slabs, among others. The final report will cover the issues of approach slab design, embankment construction, embankment settlement estimation, and control.

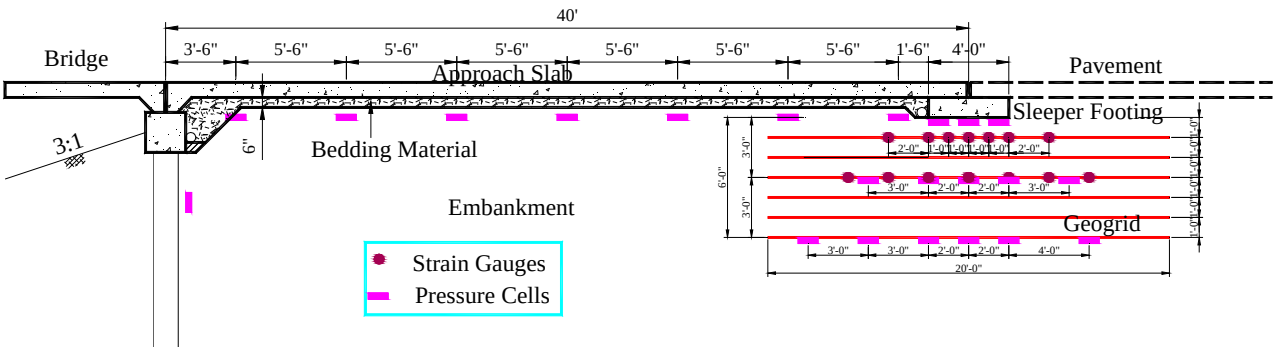

Figure 1
Proposed geotechnical instrumentation

Louisiana Transportation Research Center *sponsored jointly by the*
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For more information about LTRC's research program, please visit our Web site. ***www.ltrc.lsu.edu***