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Identification of static and dynamic responses for concrete bridges through electrical systems

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Abstract

Identification of static and dynamic responses of concrete bridges through the electrical systems make a significant contribution in determining the ease and accuracy with high technical and functional status of bridges in a short period of time.

Electrical systems using the latest technology are embedded in a variety of devices developed to give information on a single feature to the detailed information of ensemble that come with detailed instructions requiring their awareness.

Type of inspection to be adopted on a bridge is determined after a careful monitoring of his behavior since the start of construction and during the whole operation.

Tracking behavior of bridges should be conducted throughout the life of the bridge since construction and is a systematic collection and exploitation of information derived from observation and measurements of phenomena that characterize the properties and sizes of bridges in the process of interaction with the environment and technology.

Behavioral properties, and phenomena and their characteristic sizes, are chosen for each bridge separately, so that by means of assessment criteria and conditions related quality of construction intended to allow assessment of its suitability for operation, namely completion of the qualities that make it match.

KEYWORDS: bridge, identification, electrical system, static, dynamic

1. INTRODUCTION

Identification of static and dynamic responses of concrete bridges via electrical systems makes a significant contribution in determining the ease and accuracy with high technical and functional status of bridges in a short period of time.

Fixing activities of the state elements are of different types of bridges using a series of simple tools (ruler, tape measure, plumb line, etc..) - That do not require lengthy preparation and can be performed by persons without advanced expertise - or

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complex (electrical systems) - which requires qualified personnel specially trained to use inspection devices.

Starting from visual inspection, carried out with the naked eye, which provides information on the bridge surface to be drawn from roughly the type of effort within the state of elements, depending on location and form of surface degradation, can lead to a detailed inspection bridge construction elements, individually or jointly requested using electrical systems incorporating the latest technology.

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2. CURRENT MONITORING

2.1. Current monitoring of bridge structure

Current tracking performance monitoring activity consists of observation bridges and registration issues, phenomena and parameters that can indicate changes in structural capacity to meet the requirements of strength, stability and durability established by the project.

Current tracking applies to all bridges of any type or class of importance.

Tracking the current bridge is made by direct visual examination and if appropriate means of measuring the permanent or temporary household.

The organization's current criminal behavior of new or existing bridges it is for the owners, who run their own means or with staff and where staff has the necessary

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means to carry out this task, the current follow-up work may contract with a company authorized this activity.

Tracking behavior of the current bridge is made in accordance with the instructions provided in the current tracking performance projects. If old bridges have current follow instructions, they can order a specialized firm.

2.2. In depth inspection of bridges

Expanded inspection covers a detailed examination in terms of strength, stability and sustainability of all structural and nonstructural, areas previously repaired and strengthened, and in special cases the land and adjacent areas.

This activity is performed in special cases the safety and durability of bridges such as:

a. Significant damage reported in the current activity tracking;

b. by exceptional events on bridges (earthquakes, explosions, landslides, etc..) and conditions affecting the use of the bridge in comfort and safety;

c. change the operating conditions of the bridge.

Extended over a bridge inspection will be performed by certified specialists with experience in experimental research works.

In the expanded use inspection devices, equipment, tools, equipment and nondestructive test methods and / or partially destructive.

In order to ensure the practical possibility of making such extensive inspections, will provide conditions for access to structural and nonstructural elements, joints, etc..

The inspection concludes with an extensive written report which shall include separate observations on the degradation found (type, cause, degree and effect thereof), the necessary measures to be taken to remove these degradation effects and, where appropriate, extend current measures (past) time performance monitoring.

Conducting extensive inspection report is included in the technical to that bridge and will take all possible measures for implementation of interventions, repair or consolidation included in this report.

3. SPECIAL MONITORING OF BRIDGES

ISSN 1582-3024

Tracking is an activity specific performance monitoring consists of measuring bridges, recording, processing and interpretation of systematic parameter values that define the extent to which bridges maintain the requirements of strength, stability and durability established by the project.

Special tracking the behavior of bridges is established to:

a) The new bridges of exceptional importance or established by the project;

b) dangerous bridges in service with the development recommended by the results of technical expertise or extensive inspections;

c) request of the owner, the State Construction Inspection, Public Works, Town and Country Planning or bodies recognized by the specialized fields.

When establishing special criminal behavior and bridges that will encompass the current prosecution.

Follow the bridges are made special means of observation and measurement of complex and specialized, tailored to the specific objectives of each case and taking into account the provisions of the current technical regulations, standards, norms, technical instructions, technical guides).

Organization is the owner of the special prosecution.

Special follow-up activity is a permanent or temporary, its duration being established on a case by case basis in accordance with the project which was established special prosecution. Special tracking can be short term or long term.

4. IMPORTANT POINTS IN MONITORING

a. Changes in the position of objects in relation to the construction environment of their implantation directly manifested by visible movements (horizontal, vertical or inclined) or visible side effects (separation sidewalks, stairs and other elements, the occurrence of joints, cracks, uprooting), the occurrence of fissures and cracks in the areas of continuity of roads and bridges in the right path joint elements decks or the opening or closing the gaps of various types of construction elements, ground swelling or cracking due to landslides in the slopes of the various facilities, embankments;

b. Changes in building shape objects directly manifested obvious vertical or horizontal deformations and rotations, bending bars or other structural elements, the occurrence of defects in the functioning of joints that shearing or tearing rivets and bolts, cracks in welds, weak links etc.;

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c. Changes in the level of protection and comfort offered by the manufacturer in terms of sealing, waterproofing, antivibratorii or aesthetic, manifested by surface wetting, infiltration of water, construction material softening, liquefaction of the ground after quakes, peeling or cracking of the coatings, changing color surfaces, condensation, mildew, mold unpleasant etc.

d. Defects and degradation with implications for the functionality;

e. clogging leaks, disruptions in the position and stability of running the means of movement, bumps, ditches, pits, roads clothing, cleanliness and mobility elements of the bridge bearing, functional open joints etc.

f. Defects and deterioration in the structure of resistance fissures and cracks, corrosion and metal components to the concrete reinforcement and prestressed defects manifested by spots, cracks, flaking, erosion, etc.., weakening or destruction of joints, the pile afuieri and collected, bearing leaks on appliances, rotting or weakening of the elements of wood or plastic, etc..

5. NEW DEVICES FOR MONITORING

5.1. 3D displacement and deformation

Current strain measurements are limited to specific measurements or two-dimensional geometry. Research has been directed to develop optical techniques to measure the movements and deformations in three dimensions. Dimensional measurements will make a more precise description of the interaction elements of the bridge.

It is known that the inspection is usually limited to visual inspection and only when absolutely necessary, use the measurements using specific equipment (sclerometru Schmidt, betonoscop, pahometru etc.). In the visual inspection is very difficult to draw clear conclusions about the quality of concrete, unless you can see with the naked eye, the visible aggregate concrete surface area due to erosion of cement paste or embed them crack lengths, apertures and depths different.

Using digital cameras openings can be estimated with a reasonable accuracy of the various cracks, crack opening is not possible to view less than 0.1 mm.

5.2. Deformation indicator

Deformation indicators can be used to monitor the response to a known useful load. Bonded sheets of indicators can be used on flat items axis, and a single filament

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yarn, glued sheets of indicators can be used on cables. Portable strain reading can be used to monitor all deformations of a central area near the bridge.

Location of deflection indicators chosen by the state of individual elements, accessibility and objectives of the test load. A strain instrumentation, well-designed indicators can give you valuable information about:

• Distribution system load current cross deck

• Partition loading between parts of a multi-element

• Effectiveness of various elements of the main structural system

• Influence of damaged or defective items.

Strain instrumentation data indicators have recently been interpreted to measure the weight of vehicles crossing the bridge. This is known as weighing in motion.

5.3. Laser sensors

When the structure breaks or cracks suffering, suffering a weak point bending higher than projected. A laser beam can be directed to a strategically placed sensor structure. As low yield point, the sensor moves. When this shift is greater than the tolerance level, an alarm is activated. A computer can record the magnitude and rate of change of strain. This method can be used to detect potential structural break.

3. CONCLUSIONS

The choice of instrumentation monitoring and evaluation of the characteristics of bridge elements is essential to accurately determine the technical condition in which the structure.

This problem arises when defects and degradation can't be accurately determined and evaluated by ordinary means, by simple visual inspection and analysis.

Adopting a method with a high degree of confidence involving the use of electrical systems which often involve considerable acquisition costs, costs to be amortized by a high demand service.

Equipment used to evaluate the various features of the bridge began to include increasingly more technology and more science. Thus a detailed inspection of bridge structures may be spread from field phase, which must be performed by a specialized team in the use of data gathering, and ends at the "office" where they are used widely in the increasing range of computer software extremely high performance.

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It is necessary to prepare people in charge of making the determinations to be prepared in courses organized by the equipment manufacturer, on request, or preparing to be included in initial purchase price.

Structural assessment of bridges in use is a complex process, requiring an integrated range of components and procedures. The construction of new bridges need to be adopted and developed: administrative decisions and engineering solutions that are technically and financially very mild but can lead to avoidance of situations in which the bridges were in operation.

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