Proof Load Testing in Michigan

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Proof load testing can be used as an efficient method for verifying the minimum strength of existing bridges, particularly structures with questionable load-carrying capacity due to extensive corrosion or other forms of deterioration. For the proof load test to be meaningful, a heavy load must be used. The target proof load can be calculated using the draft report on National Cooperative Highway Research Program Project 12-28(13). To reduce the risk of collapse during the test, the load is increased in several steps until a prespecified load limit is reached. If the target proof load is reached successfully with no distress, the structure is deemed adequate to support legal loads.

Because of the heavy truck loads allowed in Michigan, a proof load of about twice the legal limit is used. It is, however, difficult to find a vehicle that can be loaded to the level of twice the legal load. An innovative idea at the University of Michigan was to use M-60 military tanks, provided by the Michigan National Guard. Each tank weighs over 490 kilonewtons (kN). This load is distributed over a small track of 4.5 meters. For spans of up to 20 meters, two such tanks are required.

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M-60 military tanks were used by the University of Michigan for proof load testing.

The test results are closely monitored for any sign of distress. Strains and deflections are measured. In all tested bridges, the maximum strains/stresses were much smaller than had been predicted by analysis because of unintended composite action; partial fixity of supports; and additional stiffness due to the presence of parapets, sidewalks, railings, and the like.

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The objective of the NDE Validation Center is to provide FHWA, researchers, industry, and state highway agencies with quantitative, independent, and reliable validation of NDE methods. Scheduled to open in April 1998, the center will develop specimens and methodologies to validate NDE performance both in the laboratory and in the field, and will serve as a resource for the highway and bridge inspection community. The laboratory and field testing elements to be used include validation protocols, component specimens, and test bridges.

Validation Protocols. The primary role of the NDE Validation Center will be to develop and execute effective test protocols for validating the performance of NDE technologies and methods. Component specimens and test bridges will serve as a critical resource in the process by simulating the many factors that affect NDE reliability. Testing at the center will help define the proper application and limitations of NDE technologies and methods, and determine their ability to provide quantitative measurements of flaw size, material properties, or structural condition. The validation process will provide performance parameters for NDE methods, procedures, and systems to enhance safety and maintenance inspections of the highway system.

Component Specimens. The NDE Validation Center will develop, test, and catalog a library of bridge component specimens containing flaws. The specimen library will contain a significant distribution of flaws of different types and sizes, suitable for determining the probability of detection for NDE. These component specimens will play a critical role in the validation process, allowing for quantitative evaluation of NDE technologies and methods at the center. Component specimens will be available on loan to researchers and state highway agencies wishing to evaluate new or currently used technologies.

Test Bridges. Instrumented test bridges will be used as field test sites. Decommissioned highway bridges containing flaws at critical locations will be used to evaluate NDE technologies and methods under realistic environmental conditions. A fully characterized and instrumented bridge that is open to traffic will be used to test NDE methods affected