PROOF LOAD TESTING OF BRIDGES USING MILITARY TANKS

What the innovation is?

The innovation is use of military tanks as proof load to verify the load carrying capacity of bridges. Evaluation can be performed using analytical methods and/or by testing. Quite often, the analytical methods lead to under-estimation of the actual strength. The load carrying capacity can be larger than analytically predicted due to unintended composite action, partial fixity of the supports, contribution of sidewalks, parapets and railing, all of which is very difficult to quantify (in practice often impossible). The minimum required load carrying capacity can be verified by application of a proof load. However, for a test to be meaningful, the proof load must considerably exceed the expected traffic loads (sometimes twice the legal load effect is required). Each M-60 or M-l tank weighs about 60 Tons, distributed over the track length of about 5m. Tanks are gradually moved (self-propelled) to the maximum moment position, with a careful monitoring of the structural response (deflection and strains). Use of tanks is considerably more efficient than placing of concrete blocks or other material (crane on-site, long closure for traffic, less flexibility).

Why is it innovative?

There are two innovative ideas: (1) use of proof load testing for evaluation of the actual strength (load carrying capacity) of bridges, and (2) use of military tanks as the proof load. Proof load testing is a powerful method of evaluation of existing structures. Military tanks provide an efficient means to accomplish this task. They represent a concentrated heavy weight spread over a short distance, and this is needed to apply twice the legal load effect. Furthermore, tanks are self-propelled which is important during the test. It saves time and reduces the traffic interruption (traffic lanes and/or bridge are closed only for 5-15 minutes at a time).

What it changed or replaced?

The developed proof load testing procedure using military tanks provides an efficient alternative to dealing with existing bridges, in particular deteriorated structures. In many practical cases, proof load test can save a bridge condemned by analytical methods. Military tanks used as proof load are relatively easy to apply (very heavy and concentrated weight) compared to concrete blocks or other material.

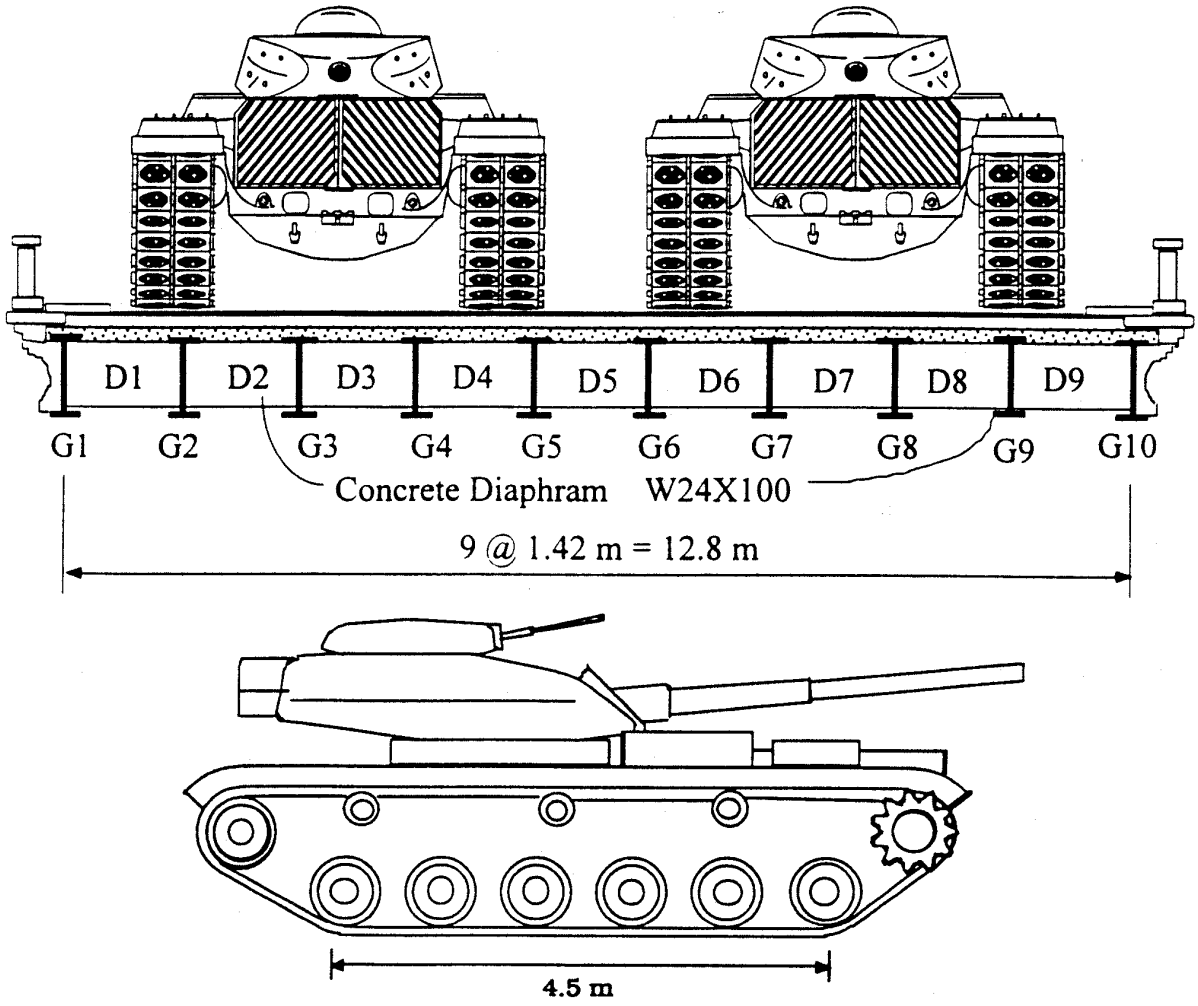
Where and when it originated?

The first proof load test of a bridge structure using military tanks in the United States was carried out in July 1995 by the University of Michigan researchers, on Mud Creek bridge (M-66) in Barry County, Michigan. Since then the research team tested about 10 bridges in Michigan.

Specific project?

The project was performed by the University of Michigan researchers, with Professor Andrzej S. Nowak as Project Director and Principal Investigator. The research work was co-sponsored by the Michigan DOT, UM Great Lakes Center for Truck and Transit Research and the National Science Foundation.

Contact: Dr. Andrzej S. Nowak • Dept. of Civil Engineering • 2370 G. G. Brown • University of Michigan
Ann Arbor, Michigan 48109-2125 • (734) 764-9299 • Fax 764-4292 • Email nowak@umich.edu



Side Elevation of M-60 Tank.