

National Cooperative Highway Research Program

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Hydraulics and Hydrology

## Manual for Bridge Rating Through Load Testing

*This NCHRP digest describes the research findings from NCHRP Project 12-28(13) A, "Bridge Rating Through Nondestructive Load Testing," conducted by A.G. Lichtenstein and Associates, Inc. The project developed and documented processes for performing load tests and using the test results to calculate bridge ratings. The research results are presented in the form of a manual, which provides guidelines for integrating the load testing of bridges with their load rating. The manual is supplemented with a technical report, which presents detailed data on two major technical areas—evaluating unintended composite action and establishing target proof load levels.*

### FOREWORD

This manual presents the results of a study on the use of nondestructive load testing to evaluate the carrying capacity of bridges. Recommended procedures for performing load tests and for using the results to calculate load ratings are included. The contents of this manual will be of immediate interest to bridge and structural engineers, bridge inspectors, traffic engineers, and others interested in bridge safety and the movement of traffic across bridges.

Nondestructive load testing of bridges has been used primarily as a research tool to provide better understanding of the way in which loads are carried by, and distributed through, the bridge structure. In some cases, load testing has been used to assist in the determination of bridge load-carrying capacity. From such tests, some structures have been found to possess greater load-carrying capacity than predicted by conventional analytical load rating procedures. Load-rating procedures that incorporate load test results have potential for demonstrating higher load capacity for many structures that would otherwise be determined to require load-posting based on conventional analysis alone.

NCHRP Project 12-28(13), "Nondestructive Load Testing for Bridge Evaluation and Rating," was initiated in 1987 with the objective of developing guidelines for nondestructive load testing of highway bridges to augment the analytical rating process. A 1990 follow-on project, NCHRP Project 12-28(13)A, "Bridge Rating Through Nondestructive Load Testing," developed and documented processes for performing load tests and using the test results to calculate bridge ratings. Project 12-28(13)A is the basis for this manual. The research was performed by A.G. Lichtenstein and Associates, Inc., of Paramus, New Jersey.

The research results are presented in the form of a manual that introduces the concept of nondestructive load testing (including the two major types of tests: diagnostic tests and proof tests), describes the appropriate selection of candidate bridges, provides detailed procedures for load testing, and describes how to use load test results to develop a load rating for a bridge. The manual also includes illustrative examples of both diagnostic-load-test and proof-load-test procedures. Finally, information on special topics, including evaluations for live load impact; fatigue life testing of steel bridges; and unintended composite action of bridges

# Manual For Bridge Rating Through Load Testing

**Eva Lantsoght**



## **Manual For Bridge Rating Through Load Testing:**

Manual for Bridge Rating Through Load Testing ,1998      Manual for Bridge Through Load Testing ; Bridge Rating Through Nondestructive Load Testing National Cooperative Highway Research Program,1998      Structural Materials Technology Sreenivas Alampalli,2000-02-29 The fourth Structural Materials Technology NDT Conference was held in Atlantic City New Jersey with over sixty speakers presenting on a wide variety of topics The goal of this conference was to inform engineers and researchers of the new nondestructive testing nondestructive evaluation NDT NDE technologies and techniques available for use in transportation construction The use of alternative materials is challenging NDT NDE professionals to develop new methods or modify existing techniques to address quality control quality assurance and long term monitoring of structures built or strengthened with these materials One such alternative is fiber reinforced polymer FRP products This conference included papers on this topic and a panel discussion that focused on the future of NDT NDE technologies for structures built or rehabilitated with FRP composites These proceedings contain the 62 papers that were presented at the conference arranged according to session number An author index is included      **Primer on Bridge Load Testing** ,2019 Load testing of bridges to assess bridge performance has been in practice since at least 1891 in Switzerland In times when engineering models were not as accurate and available as today a critical step in the construction of a bridge was to load test prior to opening or during the opening ceremony of the bridge Several bridges including ones in Serbia Switzerland and France collapsed during such load tests While advanced calculation methods are available to determine the ultimate capacity of existing structures load testing provides a useful alternative for such cases where current calculation methods for one reason or another cannot provide satisfactory answers to performance questions on existing bridges AASHTO s Manual for Bridge Evaluation and the 1998 Manual for Bridge Rating Through Load Testing have been generally used as a guidance to load testing This TRB E Circular TR Circular E C257 Primer on Bridge Load Testing provides significant updates to the existing documents to reflect the current state of the practice on bridge load testing It covers the preparation execution and analysis of load tests including diagnostic and proof tests If effectively used these methods can extend the useful life of existing bridges in a cost effective fashion      **Load Testing of Bridges** Eva Lantsoght,2019-06-19 Load Testing of Bridges featuring contributions from almost fifty authors from around the world across two interrelated volumes deals with the practical aspects the scientific developments and the international views on the topic of load testing of bridges Volume 12 Load Testing of Bridges Current practice and Diagnostic Load Testing starts with a background to bridge load testing including the historical perspectives and evolutions and the current codes and guidelines that are governing in countries around the world The second part of the book deals with preparation execution and post processing of load tests on bridges The third part focuses on diagnostic load testing of bridges This work will be of interest to researchers and academics in the field of civil structural engineering practicing engineers and road authorities worldwide      *Bridge*

*Engineering Handbook* Wai-Fah Chen, Lian Duan, 2014-01-24 The second edition of this bestselling handbook covers virtually all the information an engineer would need to know about any type of bridge from planning to construction to maintenance. It contains more than 2 500 tables, charts and illustrations in a practical ready to use format and an abundance of worked out examples give readers numerous step by step design procedures. Extensively updated and featuring several new chapters, this volume Construction and Maintenance covers construction inspection, bridge management systems, health monitoring, ratings, strengthening and rehabilitation, life cycle analysis and much more.

**Load Testing of Bridges: Two Volume Set** Eva Lantsoght, 2022-07-30 Load Testing of Bridges featuring contributions from almost fifty authors from around the world across two interrelated volumes deals with the practical aspects, the scientific developments and the international views on the topic of load testing of bridges. Volume 12 Load Testing of Bridges Current practice and Diagnostic Load Testing starts with a background to bridge load testing including the historical perspectives and evolutions and the current codes and guidelines that are governing in countries around the world. The second part of the book deals with preparation, execution and post processing of load tests on bridges. The third part focuses on diagnostic load testing of bridges. Volume 13 Load Testing of Bridges Proof Load Testing and the Future of Load Testing focuses first on proof load testing of bridges. It discusses the specific aspects of proof load testing during the preparation, execution and post processing of such a test. Part 1 The second part covers the testing of buildings. The third part discusses novel ideas regarding measurement techniques used for load testing. Methods using non contact sensors such as photography and video based measurement techniques are discussed. The fourth part discusses load testing in the framework of reliability based decision making and in the framework of a bridge management program. The final part of the book summarizes the knowledge presented across the two volumes as well as the remaining open questions for research and provides practical recommendations for engineers carrying out load tests. This work will be of interest to researchers and academics in the field of civil structural engineering, practicing engineers and road authorities worldwide.

Field Testing and Load Rating Procedures for Steel Girder Bridges, 1999 *Evaluation of Bridge Analysis Vis-à-vis Performance*, 2004 *Research Results Digest*, 1998

**Bridge Type Specific Management of Steel Stringer Bridges** Arthur J. Helmicki, 2006 According to the National Bridge Inventory the most common type of short to medium span highway bridge in the US is the reinforced concrete RC slab on steel girder bridge with RC abutments and piers comprising approximately half of Ohio's inventory. For these bridges AASHTO currently offers a number of rating methods each of which is based solely on theoretical and design calculations. These methods are known to result in subjective conservative ratings not calibrated against field measurements and hence possibly not objectively reflecting the realities and impacts of individual bridge condition as well as design details. Visual inspections provide at best qualitative and subjective information on bridge condition which is hard to incorporate into the rating process. One result of this approach is the potentially inefficient management and maintenance practices based on conservative subjective ratings and inspection.

reports In addition there is the need to understand the true impact design and construction practices have on serviceability and safety of the bridge inventory something which cannot be explored based on the current approaches     Research Results Digest - National Cooperative Highway Research Program National Cooperative Highway Research Program,1998

**Publications Catalog** National Research Council (U.S.). Transportation Research Board,1999     **Field/laboratory Testing of Damaged Prestressed Concrete Girder Bridges** ,1999 Due to frequent accidental damage to prestressed concrete P C bridges caused by impact from overheight vehicles a project was initiated to evaluate the strength and load distribution characteristics of damaged P C bridges A comprehensive literature review was conducted It was concluded that only a few references pertain to the assessment and repair of damaged P C beams No reference was found that involves testing of a damaged bridge s as well as the damaged beams following their removal Structural testing of 2 damaged bridges was conducted in the field     **Rehabilitating and Repairing the Buildings and Bridges of the Americas** Daniel A. Wendichansky,Luis Pumarada-O'Neill,2002 This collection contains 17 papers presented at a workshop Rehabilitating and Repairing the Buildings and Bridges of the Americas Hemispheric Workshop on Future Directions held in Mayaguez Puerto Rico April 23 24 2001     *PEER Center News* ,1998     Design of Structures 2004 National Research Council (U.S.). Transportation Research Board,2004     *Progress Report* National Cooperative Highway Research Program,2002  
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## Adopting the Song of Term: An Mental Symphony within **Manual For Bridge Rating Through Load Testing**

In a world consumed by displays and the ceaseless chatter of instantaneous interaction, the melodic splendor and emotional symphony produced by the written word usually diminish in to the background, eclipsed by the constant sound and distractions that permeate our lives. Nevertheless, set within the pages of **Manual For Bridge Rating Through Load Testing** a charming literary treasure filled with organic feelings, lies an immersive symphony waiting to be embraced. Constructed by a masterful composer of language, this interesting masterpiece conducts readers on an emotional trip, skillfully unraveling the hidden melodies and profound influence resonating within each cautiously constructed phrase. Within the depths of this moving review, we will discover the book is key harmonies, analyze its enthralling publishing design, and surrender ourselves to the profound resonance that echoes in the depths of readers souls.

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