Plans for Crash-Tested Wood Bridge Railings for Concrete Decks

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Abstract
As part of a continuing cooperative research between the Midwest Roadside Safety Facility (MwRSF); the USDA Forest Service, Forest Products Laboratory (FPL); and the Federal Highway Administration (FHWA), several crashworthy wood bridge railings and approach railing transitions have been adapted for use on concrete bridge decks. These railings meet testing and evaluation criteria outlined in National Cooperative Research Program (NCHRP) Report 350, Recommended Procedures for the Safety Performance Evaluation of Highway Features, and include a glued-laminated timber (glulam) rail, with and without a curb, at Test Level-2 (TL-2), a glulam rail with curb at TL-4, and a glulam curb rail for low-volume roads at TL-1. In adapting the railings from a wood deck to a concrete deck, the critical consideration was railing attachment to the deck. A comparable connection was obtained by an analysis of maximum loads measured by field instrumentation during crash testing or by equating the ultimate capacity of connections used on the wood deck to those required for a concrete deck. For the convenience of the user, full drawing sets are provided in customary U.S. and S.I. units.

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Plans for Crash-Tested Wood Bridge Railings for Concrete Decks

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Introduction
Cooperative research between the Midwest Roadside Safety Facility (MwRSF); the USDA Forest Service, Forest Products Laboratory (FPL); and the Federal Highway Administration (FHWA) has resulted in the development of several crashworthy bridge railings for wood bridge decks (Faller et al. 1992). These railings involve both wood and steel systems and include crashworthy approach railing transitions. Criteria for evaluation and testing of these railings were originally based on requirements given in National Cooperative Research Program (NCHRP) Report 230, Recommended Procedures for the Safety Performance Evaluation of Highway Appurtenances (NCHRP 1981). Starting in 1993, criteria were based on NCHRP Report 350, Recommended Procedures for the Safety Performance Evaluation of Highway Features (Ross et al. 1993). In accordance with FHWA policy, those railings found acceptable under the NCHRP 230 criteria are also considered as meeting the requirements of NCHRP Report 350 without further testing. Given the success of the wood bridge railing development and crash testing, interest was expressed at the national level to adapt several of the wood bridge railings to concrete decks. These drawings include four railings that meet NCHRP 350 requirements and were adapted for concrete deck use. They include a glued-laminated timber (glulam) rail with and without a curb, at Test Level 2 (TL-2), a glulam rail with curb at TL-4, and a glulam curb rail for low-volume roads at TL-1.

In adapting the railings from a wood deck to a concrete deck, the critical consideration was railing attachment to the deck. A comparable connection was obtained by an analysis of maximum loads measured by field instrumentation during crash testing or by equating the ultimate capacity of connections used on the wood deck to those required for a concrete deck. For the convenience of the user, full drawing sets are provided in customary U.S. and S.I. units.

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Specifications


M111 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
M133 Preservatives and Pressure Treatment Process for Timber
M168 Wood Products
M180 Corrugated Sheet Steel Beams for Highway Guardrail
M232 Zinc Coating (Hot-Dip) on Iron and Steel Hardware

References


Rail Drawings In Customary U.S. Units
The bridge railings depicted on these drawings were developed and crash tested under a cooperative research agreement between the Missouri Roadside Safety Research Institute of the University of Nebraska-Lincoln, the U.S. Army Corps of Engineers, and the U.S. Department of Transportation Federal Highway Administration.
Rail Drawings In S.I. Units
The bridge railings depicted on these drawings were developed and crash tested under a cooperative research management between the Midwest Railing Safety Research Program of the University of Nebraska-Lincoln, the USDA Forest Service, Forest Products Laboratory, and the U.S. DOT Federal Highway Administration.

Crash-Tested Wood Bridge Railings for Concrete Decks
Glulam Timber Rail without Curb
NCHRP 350 Test Level 2 (TL-2)
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University of Nebraska at Lincoln

Gulian Timber Rail without Curb
NCHRP 350 Test Level 2 (TL-2)

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Curb Railing
NCHRP 350 Test Level 1 (TL-1)
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