Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook

Third Edition

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THIRD EDITION

Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook

Prepared by

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Preface

In 2011, the Applied Technology Council (ATC), with funding from the Federal Emergency Management Agency (FEMA) under Task Order Contract HSFEHQ-08-D-0726, commenced a series of projects (ATC-71-4, ATC-71-5, and ATC-71-6) to update the FEMA 154 Report, *Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook* (FEMA, 2002a). The purpose of FEMA 154, which was developed by ATC under contract to FEMA (ATC-21 Project) and published in 1988, was to provide a methodology to evaluate the seismic safety of a large inventory of buildings quickly and inexpensively, with minimum access to the buildings, and determine those buildings that require a more detailed examination. In 2002, FEMA 154 was updated to create a *Second Edition*, based on (1) experience from the widespread use of FEMA 154 by federal, state, and municipal agencies and others; (2) new knowledge about the performance of buildings during damaging earthquakes; (3) new knowledge about seismic hazards; and (4) other then-new seismic evaluation and performance prediction tools, such as the FEMA 310 report, *Handbook for the Seismic Evaluation of Buildings - A Prestandard* (FEMA, 1998). Both the original FEMA 154 *Handbook* and the *Second Edition* were accompanied by a *Supporting Documentation* report (FEMA 155), which described the technical basis for the scoring system and other guidance provided in FEMA 154.

Since the publication of the second edition of FEMA 154, there have been several initiatives that have advanced the state-of-the-art in rapid visual screening of buildings for seismic risk. One of these was the development of the FEMA P-154 *Rapid Observation of Vulnerability and Estimation of Risk* (ROVER) software for use on smart phones (FEMA, 2014), which enables users to document and transmit data gathered in the field. The rapid visual screening application of FEMA P-154 ROVER is based on the second edition of FEMA 154 and incorporates several improvements made possible by the electronic calculation capability of the device (e.g., site-specific determinations of the seismic shaking hazard). In addition, users in Oregon and Utah have suggested modifications to the FEMA 154 screening process in the course of performing extensive seismic screenings of schools and other buildings.

The objective of the *Third Edition* remains the same as its predecessors: to identify, inventory, and screen buildings that are potentially hazardous. Although some sections of the text remained unchanged from the *Second Edition*, the *Third Edition* incorporates several major enhancements, including:

- Update of the Data Collection Form, and the addition of an optional more detailed page to the form,
- Update of the Basic Scores and Score Modifiers,
- Update of the ground motion definitions,
- Preparation of additional reference guides,
- Inclusion of additional building types that are prevalent,
- Inclusion of additional considerations, such as nonstructural hazards, existing retrofits, building additions, and adjacency,
- Addition of an optional electronic scoring methodology, and
- Additional information on how to run an effective screening program.

The technical basis for the rapid visual screening procedure is documented in the FEMA P-155 report, *Rapid Visual Screening of Buildings for Potential Seismic Hazards: Supporting Documentation*, (FEMA, 2015), which was also updated to the *Third Edition.* Note that per FEMA's current report numbering system, the third editions of FEMA 154 and FEMA 155 are now referred to as FEMA P-154 and FEMA P-155, respectively.

ATC is indebted to the leadership of Bret Lizundia, Project Technical Director, and to the members of the ATC-71-4, ATC-71-5, and ATC-71-6 Project Teams for their efforts in developing this updated *Handbook.* The Project Technical Committee, consisting of Michael Griffin, William Holmes, Brian Kehoe, Keith Porter, and Barry Welliver, managed and performed the technical development efforts. Updated scores were developed by Charles Kircher. Sarah Durphy, as a Project Working Group member, provided special assistance in the development of the updated *Handbook.* Andrew Bishop, Brian Kehoe, and Scott Hiner prepared the illustrations for the report. Nicolas Luco and Kenneth Rukstales prepared the seismicity maps in the document. The Project Review Panel, consisting of Charles Scawthorn (chair), Timothy Brown, Melvyn Green, Laura Kelly, Stephanie King, John Osteraas, Steven Sweeney, and Christine Theodoropoulos, provided technical review, advice, and consultation at key stages of the work. A workshop of invited experts was convened to obtain feedback on the updated *Handbook*, and input from this group was

instrumental in shaping the final methodology and report. The names and affiliations of all who contributed to this report are provided in the list of Project Participants.

ATC also gratefully acknowledges Michael Mahoney (FEMA Project Officer), Mai Tong (FEMA Task Monitor), Erin Walsh (FEMA Task Monitor), and John Gillengerten (FEMA Technical Monitor) for their input and guidance in the preparation of this document. Ayse Hortacsu and Thomas McLane managed the project and Amber Houchen and Peter N. Mork provided report production services.

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