ATC-20-3

Case Studies in Rapid Postearthquake Safety Evaluation of Buildings

by
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Preface

In September 1989, Applied Technology Council (ATC) published *Procedures for Postearthquake Safety Evaluation of Buildings,* also known as ATC-20. This was the first document to provide comprehensive guidelines for postearthquake building safety evaluation. Less than a month later, the October 17, 1989 Loma Prieta earthquake struck Northern California. This magnitude 7.1 event caused 62 deaths and more than $5 billion damage.

ATC-20 and the companion *Field Manual: Post-earthquake Safety Evaluation of Buildings* (ATC-20- 1) were used by many local building departments as the basis for building safety evaluation after the Loma Prieta earthquake. Many of the individuals involved in the safety evaluations had little or no prior training in using the ATC-20 methodology. In some instances, building inspectors and engineers were given only the assessment forms and placards and told to begin inspections. Some received copies of the ATC-20-1 field manual. One planeload of volunteers from Southern California was given the ATC-20-1 document to read on the flight to the damaged area.

Since the Loma Prieta earthquake, numerous ATC-20 training seminars have been held throughout California and in other seismically active regions of the United States. An often-heard comment at these sessions is that additional training would be useful. In response to this need, the Applied Technology Council has developed this report, designated ATC-20-3. This document provides in-depth training in the Rapid Evaluation technique, the initial safety evaluation intended to determine if a building is apparently safe, unsafe, or in need of further evaluation. Over 50 case studies are included that illustrate safety evaluation in a variety of situations and for different building types. For the most part, these case studies discuss actual postearthquake situations, including numerous examples from the January 17, 1994 Northridge earthquake that caused 60 deaths and more than $15 billion damage in the Los Angeles area. The report also includes a presentation of the Rapid Evaluation procedure, so that the reader need not study a copy of ATC-20 before being able to use this document.

While this report was in preparation, ATC finalized the ATC-20-2 report, *Addendum to the ATC-20 Postearthquake Building Safety Evaluation Procedures.* ATC-20-2 reports the results of a study funded by the National Science Foundation after the 1989 Loma Prieta earthquake. The recommendations of the ATC-20-2 report are incorporated in this document where appropriate. Some of these recommendations call for changes in postings: the LIMITED ENTRY placard has been renamed RESTRICTED USE and the AREA UNSAFE category has been eliminated.

The original ATC-20 document was written for use by individuals trained in building design and construction. However, experience with the 1989 Loma Prieta, 1992 Landers, 1992 Cape Mendocino, and 1994 Northridge earthquakes showed that there are seldom enough individuals trained in building construction and design to perform the necessary inspections in the immediate aftermath of damaging earthquakes. Therefore, this document was written for a wider audience and is intended for use by public works agency personnel, fire fighters, police officers, military personnel, facility managers, and other disaster workers, as well as those individuals normally charged with postearthquake safety evaluation of buildings: civil and structural engineers, architects, and building safety officials.

R.P. Gallagher Associates, Inc., a structural and earthquake engineering firm with experience in damage assessment and seismic evaluation of buildings, served as the project subcontractor and prepared this manual. Ronald P. Gallagher, structural engineer and principal author of ATC-20, served as principal-in-charge for this work.

Members of the Project Engineering Panel who provided overall review and guidance for the project and offered many valuable comments were: David R. Bonneville, Robert A. Bruce, Richard L.

Hubinger, Laurence M. Kornfield, Kenneth A. Luttrell, Richard A. Ranous and Calvin N. Wong. Nancy Sauer edited the report and Rodney Sauer prepared the camera-ready copy of this document. The affiliations of these individuals are provided in the list of project participants.

The following individuals were very helpful in providing photographs and information for case studies used in this document: David Bonneville and James Malley of H.J. Degenkolb Associates; John Egan of Geomatrix Consultants; Ronald Hamburger of EQE International; and Onder Kustu of OAK Engineering.

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