

**AN INVESTIGATION OF THE CORRELATION BETWEEN  
EARTHQUAKE GROUND MOTION AND BUILDING PERFORMANCE**

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R. B. MATTHIESEN\*

WILLIAM B. JOYNER

Contracting Officer's Representatives

Prepared by

APPLIED TECHNOLOGY COUNCIL

2471 E. Bayshore Road, Suite 512

Palo Alto, California

ROLAND L. SHARPE

Principal Investigator

PROJECT ENGINEERING PANEL

James C. Anderson

Vitelmo V. Bertero

Eric Elsesser

Donald R. Strand

SUBCONTRACTOR

URS/J.A. Blume & Assoc.

Sigmund Freeman

Investigator

LITERATURE SEARCH

Bahram S. Safavi

\*Deceased

November 1982

## PREFACE

Starting in 1981 Applied Technology Council (ATC), under contract to the U.S. Geological Survey (USGS), conducted a series of studies relating various seismic risk ground-motion parameters and structural performance of buildings during earthquakes. These studies were carried out in recognition of the generally accepted observation that structural response and damage of structures exposed to recorded high intensity ground motions do not appear to correlate with response predicted for existing lateral force-resisting structural systems using current methods of analysis.

In the first phase of this project, the subject of this report, ATC assembled a 4-person Project Engineering Panel, composed of researchers and practicing engineers, to conduct an initial investigation of this lack of correlation. This effort included an investigation of the ultimate capacities of several different types of buildings and a literature survey of existing research reports pertaining to parameters used in seismic design, and seismic risk and hazard (design zone) mapping. The ultimate capacities of buildings were evaluated for ATC by Sigmund Freeman, initially of URS/J.A. Blume and Associates and later with Wiss, Janney, Elstner, and Associates, and the literature survey was carried out by Bahram Safavi, a graduate student at Stanford University. Dr. R. B. Matthiesen was the initial USGS Contracting Officer's Representative (COR) until his death in late 1981. Dr. William Joyner then assumed the role of COR.

The primary goal of this study was to develop background data and investigate on a preliminary basis the relationship between earthquake-induced ground motion and building performance. A secondary goal was to develop recommendations regarding ground motion parameters and other factors pertaining to seismic design and seismic risk mapping.

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