

INTERNATIONAL WORKSHOP ON EARTHEN BUILDINGS IN SEISMIC AREAS

CONFERENCE REPORT

I. INTRODUCTION

A. Description of The Conference

1. Background

Although adobe is used as a building material in areas of high seismic risk in the United States and is the predominant building material in many seismically active regions of the developing countries, very little effort has been expended in formulating a systematic body of knowledge of seismic behavior and design of such structures. During this century alone nearly one million people have died in earthquakes, with more than 80% of these deaths occurring in collapsed unreinforced masonry and adobe buildings. Most of the research conducted to date has been applied to engineered structures, typically of reinforced concrete or steel construction. Little has been written about ways of applying existing earthquake engineering knowledge to buildings using traditional materials and methods. Recognizing this problem, the University of New Mexico and INTERTECT jointly hosted a conference to bring together researchers and implementers in order to compile the work to date, so that an international effort could be directed toward reducing one of the major seismic hazards.

2. Goals and Objectives

In May 1981, an International Workshop on Earthen Buildings in Seismic Areas was convened in Albuquerque at the University of New Mexico. The workshop, jointly hosted by the Engineering College of the University and INTERTECT (a Dallas-based consulting firm), was sponsored by the National Science Foundation, the Office of Foreign Disaster Assistance (Agency for International Development), and Appropriate Technology

International. The emphasis of the workshop was on non-engineered adobe houses in seismic areas, although information about related forms of earthen and unreinforced masonry structures was also presented and discussed.

The workshop brought together a select invited group of domestic and foreign researchers and implementers to achieve the following objectives:

- a. To develop a clear statement of the problems associated with earthen low-rise buildings in seismic areas;
- b. To define the existing state of the art in regard to earthen building materials, design and construction methods in seismic regions;
- c. To identify and categorize existing national and international research findings in related areas and seek to establish their applicability to the seismic design and construction of earthen buildings;
- d. To identify appropriate channels for technology transfer across international boundaries and to explore social and economic barriers to such transfer;
- e. To identify opportunities for cooperative international research;
- f. To identify and describe the gaps in the present body of knowledge and to define research needs.

3. Workshop Organization

The primary responsibility for planning and implementing the workshop rested with an executive committee composed of four individuals:

- a. Dr. Gerald W. May
Professor of Civil Engineering
Dean of the College of Engineering
University of New Mexico
- b. Dr. Golden Lane
Senior Research Engineer
New Mexico Engineering Research Institute
University of New Mexico

- c. Mr. Frederick C. Cuny
Executive Chairman
INTERTECT
Dallas, Texas
- d. Ms. Jinx Parker
Program Manager
INTERTECT
Dallas, Texas

Working with the Executive committee was an advisory board consisting of leading researchers in the field. The functions of the advisory board were:

- a. To help in identifying participants;
- b. To help in identifying topic areas and discussion agendas for the work groups;
- c. To recommend resource people for discussion groups;
- d. To help develop a list of topics for presentations or to identify other contributors; and
- e. To comment on the proceedings drawn up by the discussion groups.

The individuals who served on the advisory board were:

- a. Dr. John A. Blume
Past President, Earthquake Engineering Research Institute
President, URS/J.A. Blume & Associates
- b. Dr. Aybars Gurpinar
Principal Research Associate
D'Appolonia, Inc.
Brussels, Belgium
- c. Dr. Julio Vargas Neumann
Department of Engineering
Pontificia Universidad Catolica
Lima, Peru
- d. Mr. Roberto Meli
Institute of Engineering
Universidad Autonoma de Mexico
Mexico, D.F.

- e. Dr. Mete Sozen
Professor of Civil Engineering
University of Illinois
Urbana, Illinois
- f. Dr. Eric Carlson
Deputy, Director, Appraisal
U.N. Centre for Human Settlements (HABITAT)
Nairobi, Kenya
- g. Dr. Nicholas Ambraynes
Imperial College of Science and Technology
University of London
London, U.K.
- h. Dr. Jai Krishna
Past President, International Association of
Earthquake Engineering
Professor Emeritus, University of Roorkee
Roorkee, India

The Executive Committee met with members of the Advisory Board in Istanbul in September 1980 at the 7th World Conference on Earthquake Engineering. During this meeting, the Advisory Board reviewed the plans, suggested a number of topics for discussion and identified a number of candidates to receive invitations to the conference.

4. Inter-disciplinary Participation

It was decided that not only outstanding earthquake engineers and researchers would be invited to participate in the conference, but also building officials and staff from housing agencies and other practitioners involved with the actual implementation of housing improvement. In all, five particular types of candidates were sought. They included:

- a. Engineers and architects involved in earthquake engineering research, both in structures and materials;

b. Personnel from governments, voluntary agencies and foreign aid organizations involved in the implementation of modification programs;

c. Experts on social, economic and cultural aspects of the overall problem;

d. Officials experienced with building codes involving earthen buildings and persons from lending institutions familiar with the problem of financing improvements to earthen buildings in seismic areas.

Participants from each of these groups were identified and letters were sent to them. If they indicated interest, and their interests were compatible with the workshop scope, letters of invitation to participate in the conference were sent. The list of actual participants present at the conference is included in Section B of this chapter. In all, 16 countries were represented by the 87 participants.

5. Topic Areas

The conference scope was organized into five primary topic areas:

- a. Subject Area 1: Structures
- b. Subject Area 2: Materials
- c. Subject Area 3: Social, Economic and Cultural Aspects
- d. Subject Area 4: Program Implementation
- e. Subject Area 5: Codes, Specifications and Standards

6. Workshop Structure

a. Format of the Workshop

The Workshop was structured so that a maximum of interaction occurred in small discussion groups. It spanned a period of 4 days, with 2-1/2 days of intensive work sessions. During the first two days, morning plenary sessions were conducted wherein keynote presentations were made to provide background

and structure for the work sessions that followed in the afternoon. Each participant received a schedule with assignments to a particular session at a specific time (based on pre-workshop selection of preferred topic areas by the participants) and was able to attend three of the five work sessions during the course of the Workshop. At each group session, the participants were asked to review the state-of-the-art, identify research needs, and identify the resource persons actively engaged in the field. Each group was chaired by a respected researcher or practitioner who guided the discussions and, with the assistance of a recorder, prepared a summary of each session. Three of the 15 discussion sessions were conducted in Spanish especially for the Spanish-speaking participants from Latin America. At the end of the Workshop, the session leaders and recorders from each subject area met to prepare a brief report on the findings of the different groups on that subject area and summarized the findings to the final full plenary session.

b. Briefing Papers

In order to provide the participants with an overview of each subject area and to identify some of the key issues and topics for the work sessions, the Executive Committee elected to prepare a set of briefing papers for conference participants. These briefing papers, which are included in the Appendix, identified areas of concern, described existing research, and provided a list of bibliographic sources for each of the topics.

c. Conference Papers

Each of the invited conference participants was asked to prepare a paper on his or her field of expertise. Some of these papers were printed prior to the conference and distributed so that participants could refer to them throughout the conference. A complete set of these papers are included in the Proceedings.

d. Conference Library

Each of the participants was asked to bring copies of relevant publications on the topic of earthen buildings in seismic areas which could be displayed at the conference and used as a temporary reference library. At the end of the conference, many of the participants elected to leave the publications with the University of New Mexico to form a basis for a library which could be used to facilitate further exchange of information.

e. Field Trips

Two field trips were conducted during the conference. These included a visit to a large adobe brick production yard which produces stabilized adobe for use in the Albuquerque region, and a visit to the construction sites of several modern homes of stabilized adobe in the Albuquerque area. The following day the participants visited the historic Indian Pueblo of Tesuque, New Mexico, about 80 miles north of Albuquerque to observe adobe buildings several centuries old. They also inspected the test site of the Thermal Mass Study, a project sponsored by the Department of Housing and Urban Development and the Department of Energy, which is exploring the thermal properties of adobe buildings.

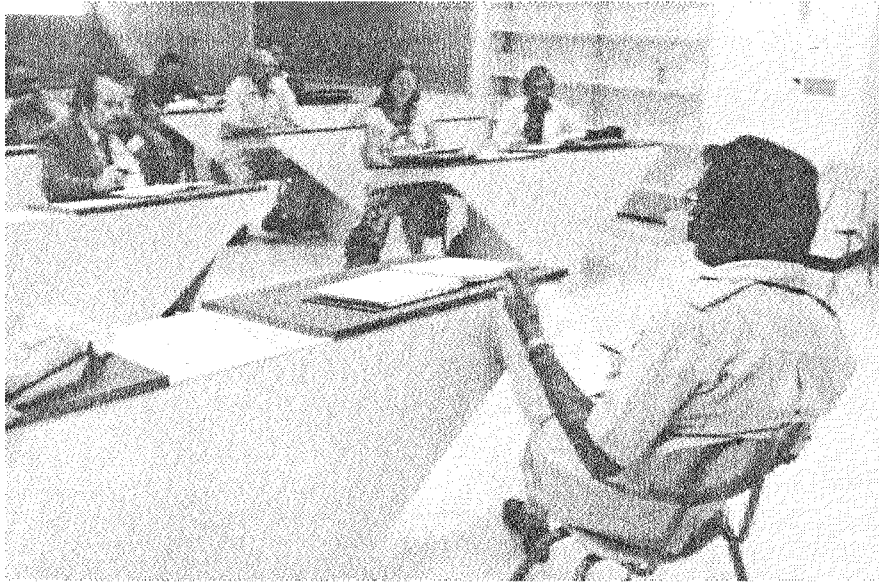


Figure 2. Discussion Group in Session.



Figure 3. Discussion Group in Session.