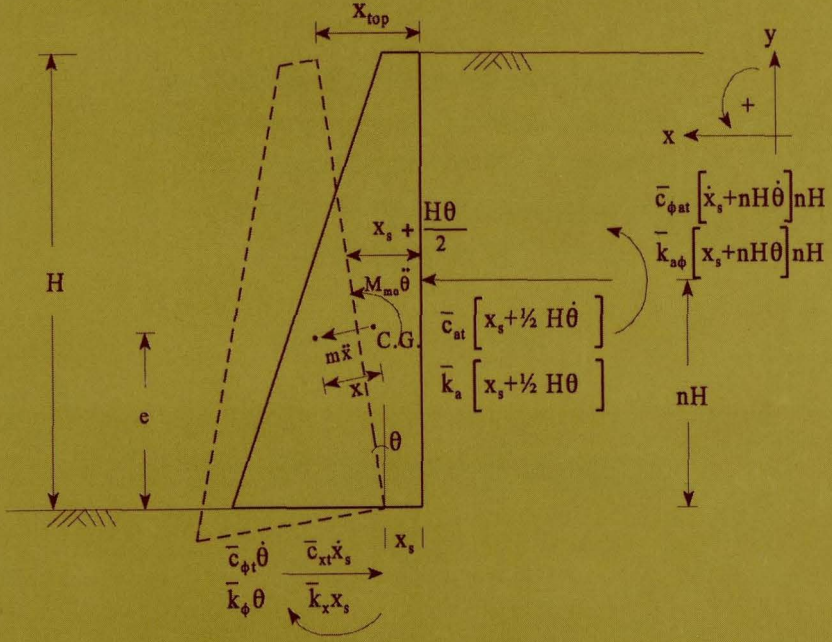
GEOTECHNICAL SPECIAL PUBLICATION NO. 60

# ANALYSIS AND DESIGN OF RETAINING STRUCTURES AGAINST EARTHQUAKES




EDITED BY SHAMSHER PRAKASH

ASCE

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# ANALYSIS AND DESIGN OF RETAINING STRUCTURES AGAINST EARTHQUAKES

**Proceedings of sessions sponsored by the Soil Dynamics Committee of The Geo-Institute of the American Society of Civil Engineers in conjunction with the ASCE National Convention in Washington, DC**

**November 10-14, 1996**

**EDITED BY SHAMSHER PRAKASH**

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Abstract:
This proceedings, *Analysis and Design of Retaining Structures against Earthquakes*, contains both invited and contributed papers, which focus on the questions of 1) dynamic earth pressures on fixed and movable rigid and flexible walls; 2) displacements in translation and rotation of walls under earthquakes; 3) behavior of fills and abutments during earthquake; and 4) centrifuge tests on walls. Both analytical and experimental data have been presented on possible behavior of retaining structures under seismic loading. A study of this volume and other published literature shows considerable effort is being devoted to determination of realistic dynamic pressures, displacement in translation and rotation of retaining structures and behavior of fills for abutments. Since a synthesis of these studies is not currently available, there are no unified and generally acceptable solutions to the above questions. However, the discussions and presentations of the papers during the session does highlight the need for such solutions and more definite descriptions of unsolved problems.

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63) DESIGN WITH RESIDUAL MATERIALS; GEOTECHNICAL AND CONSTRUCTION CONSIDERATIONS

# *PREFACE*

Retaining structure may be subjected to seismic loads and experience either deformations and/or increased earth pressures. These structures may be either rigid-masonry free-standing retaining walls for highways, sections of wing walls for hydraulic structures, and abutments of bridges. Flexible retaining structures are most often reinforced earth sections.

Rigid structures have been designed for dynamic earth pressures most of the time. A solution for displacements of rigid retaining walls was obtained by our Research Group at the University of Roorkee (India) in 1974 for the first time. Subsequently for the last two decades, their displacements were analyzed and designs based on permissible displacements were attempted. We have not reached a stage where acceptable analytical tools and design procedures for such structures are available. Studies on such structures during earthquakes is difficult because earthquakes cannot be made to order! Therefore, recourse is made to alternate studies, e.g. on centrifuge and, shake table models, and analytical studies and their comparison with performance records.

Thus this session is organized with the objective to identify the state of practice in analysis and design of retaining structures under dynamic loads and address the unsolved issues. The papers were, therefore, invited from authors both within and outside the USA. There are 5 contributions from the US and 3 from overseas. This session was held at the ASCE Fall Convention in Washington DC on November 12, 1996 and was sponsored by the Soil Dynamics Committee of the Geotechnical Engineering Division of ASCE.

It is the current practice of the Geotechnical Engineering Division that each paper published in a Geotechnical Special Publication (GSP) be reviewed for its content and quality. These special technical publications are intended to reinforce the programs presented at convention sessions or specialty conferences and to contain papers that are timely and may be controversial to some extent. Because of the need to have the GSP available at the convention, time available for reviews is generally not as long and reviews may not be as comprehensive as those given to papers submitted to the Journal of the Division. Still we had organized our review process in a timely manner. At least 2-positive reviews were obtained for each paper accepted for publication and discussion. In fact one paper will be published in the Journal based on our review process but was presented at this session. Thus there is hardly any difference in the purpose and technical status of contributions to this geotechnical special publication as compared to those in the Journal.

In accordance with ASCE policy, all papers published in this volume are eligible for discussion in the Journal of the Geotechnical Engineering Division and are eligible for ASCE awards. Reviews of papers published in this volume were conducted by the Soil Dynamics Committee of the Geotechnical Engineering Division. The following committee members or cooperating persons from the general membership reviewed these papers:

| | |
|---|---|
| T. Crespellani | Panos Dakoulas |
| Ahmed W.M. Elgamal | W.D. Liam Finn |
| Steve Kramer | Sanjeev Kumar |
| Jeen-Shang Lin | Farrokh Nadim |
| Rowland Richards, Jr. | Glenn J. Rix |
| Raj Siddharthan | Cetin Soydemir |
| A.S. Veletsos | Mishac Yegian |

Personal thanks go to Panos Dakoulas, Chairman of the Soil Dynamics Committee, for his help and support in organizing this session. I also want to thank all the experts who gave both the time and effort in reviewing the papers. Last but not least, thanks are due to all the authors who kindly accepted the invitation to contribute to this volume and to the session in Washington D.C.

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Rolla, Missouri

August 28, 1996

Session Organizer and Editor

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