These citations are from the QUAKELINE® database and the Earthquakes and the Built Environment Index on CD-ROM.

The QUAKELINE database is developed and maintained by the Multidisciplinary Center for Earthquake Engineering Research (MCEER), SUNY at Buffalo. Begun in 1987, the database currently includes over 35,000 records. QUAKELINE is updated on a monthly basis. An effort is made to exclude from the QUAKELINE database those items that are covered in the NTIS, COMPENDEX, and GeoRef databases. QUAKELINE is a registered trademark of The Research Foundation of the State University of New York. The QUAKELINE database is copyrighted by The Research Foundation of the State University of New York. All rights reserved.

EBEI is a cooperative effort of the Multidisciplinary Center for Earthquake Engineering Research (MCEER) at SUNY at Buffalo, the Earthquake Engineering Research Center (EERC) at U/C Berkeley, and the Newcastle Earthquake Project in Australia. It includes the QUAKELINE® database produced at MCEER and also the Earthquake Engineering Abstracts database produced by U/C Berkeley's Center, in addition to the Newcastle Earthquake Database. Also included on EBEI are records for the book collections of MCEER and EERC. EBEI contains a total of 100,000 citations. EBEI is updated twice a year.

To reduce duplication, this search may be a combination of a QUAKELINE search followed by an EBEI search, in which case the EBEI records will not include any QUAKELINE records.

In order to supply a comprehensive listing on this topic, other databases may have been consulted and included as a part of this computersearch. These databases may be copyrighted and permission might be required for their use. Use of the citations in this computersearch for purposes other than for non-profit research or education is forbidden.

All items cited in the QUAKELINE database are available in the collection of the MCEER Information Service. To obtain materials, or for information on QUAKELINE or on earthquake hazards mitigation, contact the MCEER Information Service:

Email: mceeris@acsu.buffalo.edu
Telephone (716) 645-3377 Fax: (716) 645-3379
Mail: MCEER Information Service
      c/o Science and Engineering Library
      304 Capen Hall
      SUNY at Buffalo
      Buffalo, NY 14260

* Registered in the U.S. Patent and Trademark Office
Document 1 of 28
AN 2000-0961.
AU Pujol, S. Ramfrez, J A. Sozen, M A.
TI DRIFT CAPACITY OF REINFORCED CONCRETE COLUMNS SUBJECTED TO CYCLIC SHEAR REVERSALS.
NU GRANT: NSF CMS-9416759.
NT 32 references. Tables, graphs, diagrams. Research funded by the National Science Foundation. Paper was presented during an ACI convention session sponsored by ACI Committee 341: Earthquake Resistant Concrete Bridges during 1995 or 1996. Series: ACI Special Publicaton SP-187.
AB In this paper, three different procedures were used to calculate yield displacements of 11 reinforced concrete columns tested by Wight. An acceptable agreement with experimental results was not obtained. It was concluded that the systematic error in the calculation of the yield displacement would make it a questionable quantity for normalizing experimental data on drift capacity. An alternate approach to evaluate the drift capacity of reinforced concrete columns subjected to cyclic shear reversals is proposed. (Abstract from text).

Document 2 of 28
AN 1999-0263.
AU Gulkan, P. Sozen, M A.
TI DISPLACEMENT-BASED PROCEDURE FOR DETERMINATION OF SEISMIC VULNERABILITY OF BUILDINGS.
LO EQE QE531.U7 1998 CD-ROM.
NU GRANT: NSF CMS-9496280. INTAG-TOKI.
NT 12 pages. 7 references. Graphs, diagrams. Research funded by the National Science Foundation and the Government Housing Administration of Turkey through the Scientific and Technical Research Establishment of Turkey. Availability refers to CD-ROM rather than to individual papers. 6th US National Conference on Earthquake Engineering. 6NCEE.
AB Structural design criteria expressly lined to controlling local (interstory) or global (top story) drift may be used in conjunction with the customary tools of seismic design, which are usually based on the fulfillment of capacity criteria. The authors examine the observed drift demands imposed by near-field events, and match this against the calculated ground story drifts on building frames idealized as shear beams with the assistance of the drift spectrum which may be used as a complementary device besides the response spectrum. The amount of structural walls or combination of columns and filler walls required to keep ductility to prescribed limits is formulated on the basis of elementary earthquake engineering theory. (Adapted from authors' abstract).
Models of 16 multistory reinforced concrete structures were tested to compare their responses to earthquake ground motions. The discussion emphasizes the role of drift control in planning and proportioning the earthquake resistant structural systems. Included in the discussion is the classification of structural systems. The author also considers the consequences of deviations in the strength distributions within a structure. (Abstract adapted from text).
effect and shear resistance. (Abstract adapted from text).

Document 6 of 28
AN 1995-2159.
AU Konwinski, Colleen. Pan, Austin. Ramirez, Julio. Sozen, Mete.
TI NOTE ON SHEAR STRENGTH OF REINFORCED CONCRETE BRIDGE PIERS.
NU GRANT: NSF CMS-9416759.
NT 6 references. Diagrams, graph. Research funded by the National Science Foundation.
AB This note summarizes perspectives on shear failure of bridge piers in the course of an investigation of the bridge damage caused by the 1994 Northridge earthquake. The case history of a single reinforced concrete bridge is discussed to provide the framework for inferences about the possibility of determining the circumstances leading to failure. The Fairfax-Washington Undercrossing (to be called the Fairfax Bridge) carries Interstate 10 over Fairfax and Washington in Los Angeles. It is a reinforced concrete bridge supported by two walls and five sets of piers. This paper focuses on the four piers of bent 3 supporting the northwest segment of the deck. Linear response displacement spectra for the period range of interest are shown for both horizontal components of three strong-motion records. (Abstract adapted from text).

Document 7 of 28
AN 1994-0088.
AU Garcia, Luis E. Sarria, Alberto. Sozen, Mete A.
TI OBSERVED BEHAVIOR UNDER LATERAL LOAD OF A FIVE STORY LARGE PANEL PRECAST BUILDING AND ITS MATHEMATICAL MODELING.
NT 13 references. Graphs, diagrams.
AB Results from lateral-load tests to failure of a five story building composed entirely of precast panels are reported. The overall dimensions of the building were 18.78 by 7.94 by 12.25 meters. Total weight of the building was 460 metric tons. Lateral load was applied at each story to simulate maximum load distribution in an earthquake. The building was loaded in one principal direction at the time, but response in both principal directions was determined experimentally. The maximum base shear reached was close to 40 percent of the weight of the building. An analytical model was developed to organize the observed relationships between load and deformation in terms of stiffness and strength properties of the individual elements and failure mechanisms. Using friction data from collateral dynamic tests, the analytical model was used to describe bounds of response for base excitations representing strong ground motion corresponding to different types of soil conditions. (Authors' abstract).

Document 8 of 28
AN 1993-3144.
AU Sozen, Mete A. Matthiesen, R B.
TI ENGINEERING REPORT ON THE MANAGUA EARTHQUAKE OF 23 DECEMBER 1972.
NT 111 pages. References. About 70 pages of photographs, maps, diagrams, graphs.
AB This document presents observations of the damage caused by the Managua, Nicaragua earthquake of December 1972, along with a summary
of the strong motion measurements taken during the December 1972 event. The seismicity of Nicaragua is presented through an article authored by Francisco Hansen A. The document also considers other relevant factors contributing to the earthquake's impact such as local soil and geological conditions. The relative seismic performance of engineered vs non-engineered structures, and shear wall vs frame type structures is reviewed. The effect of building damage upon emergency exits within various city buildings is also described. Additionally, the publication briefly considers the social impact of the earthquake, both in terms of economic losses and the disruption of vital services within the city.

Document 9 of 28

AN 1993-1482.
AU Garcia, Luis E. Sozen, Mete A.
TI LATERAL LOAD BEHAVIOUR OF LARGE PANEL PRECAST BUILDINGS.
SO Structural Concrete, IABSE Colloquium, Stuttgart, 1991.
International Association for Bridge and Structural Engineering, Zurich, 1991, pages 299-304.
LO SEL TA5.1483 V.62.
NT 6 references. Graphs, diagrams, table. Title and summary for this paper also provided in French and German. Colloquium organized by the Institut fur Tragwerksentwurf und Konstruktion, Universitat Stuttgart. Series: IABSE report volume 62.
AB This paper describes the observed behavior of a large panel concrete precast building under simulated seismic loads and its mathematical modeling. This mathematical model, calibrated by a series of static tests was used to study the dynamic response of the structure for different types of earthquake motions. (Abstract adapted from text).

Document 10 of 28

AN 1992-2699.
AU Sozen, M A. Shibata, Akenori.
TI EVALUATION OF THE PERFORMANCE OF THE BANCO DE AMERICA BUILDING MANAGUA, NICARAGUA.
NT 14 references. Graphs, tables.
AB An 18-story reinforced concrete building, headquarters of Banco de America, was subjected to very strong ground motions during the 1972 Managua earthquake. The studies summarized in this paper evaluate the damage potential of the ground motion and the performance of the structure. (Authors' abstract).

Document 11 of 28

AN 1991-1510.
AU Berg, Glen V. Bolt, Bruce A. Sozen, Mete A. Rojahn, Christopher.
TI EARTHQUAKE IN ROMANIA MARCH 4, 1977: AN ENGINEERING REPORT.
LO SEL TA658.44.E225 1980.
NT 39 pages. 16 references. Graphs, diagrams, photographs.
AB This is a report on the destructive Romania earthquake of March 4, 1977. In addition to describing building damage in Bucharest, the locale hardest hit by the earthquake, where apartment buildings, large hotels, hospitals, and a computing center were all significantly damaged, the report also reviews suspected fault mechanisms involved in the earthquake, strong motion records obtained during the event, and the earthquake resistant design criteria specified in Romania's building code at the time of the earthquake. Changes made to this code in light of the 1977 earthquake are discussed and provisions of the resultant building code are compared to those of representative American seismic design codes. Spectral
and structural analyses for various sites and structures in the area are also presented.

Document 12 of 28
AN 1991-1154.
AU Sozen, Mete A.
TI EXAMPLE AND AN OPINION ON SCOPE OF STRENGTH EVALUATION FOR BUILDING STRUCTURES.
NU GRANT: NSF CEE-8217190.
NT 13 references. Tables, diagrams, graphs, drawing. US/Japan Cooperative Earthquake Engineering Research Program sponsored by the National Science Foundation.
AB This is the outline of a talk on the reevaluation of earthquake resistance of reinforced concrete building structures. According to the author, evaluation of existing buildings is better kept simple. A simple analysis tempered by judgment will suffice in most cases. It is very unlikely that spending more professional resources on analysis routines will automatically identify the buildings with subtle vulnerabilities. The Imperial County Services Building is a good example. It is very unlikely that calculation alone would have identified the problem, and it is very likely that a structural engineer who was informed of similar events would have avoided the conditions at the east end of the structure because it is difficult to explain the failures by considering forces in one direction at a time. (Adapted from author's abstract).

Document 13 of 28
AN 1990-2149.
AU Bariola, Juan J. Sozen, Mete A.
TI DYNAMIC STABILITY OF ADOBE WALLS.
NU 3 references. Graphs, tables, photographs.
AB This investigation studies the stability of adobe walls during earthquakes. Eleven specimens were tested with an earthquake simulator to understand the influence of the following variables: 1) type of ground motion; 2) slenderness (thickness/height ratio); 3) wall thickness. Five specimens were tested with a soft-soil ground motion and another five to stiff-soil ground motion. Behavior of all specimens in the earthquake-simulation tests was characterized by cracking at base followed by rocking motion. Failure occurred by overturning (short specimens) or by upper-level cracking (tall specimens). An analytical model, that incorporates both the deformable- and rigid-body motions of the wall, was successful in indicating the susceptibility of the walls to overturning. (Authors' abstract).

Document 14 of 28
AN 1990-1346.
AU Bariola, J. Sozen, M A.
TI SEISMIC TESTS OF ADOBE WALLS.
SO Earthquake spectra, volume 6, number 1, February 1990, pages 37-56.
NU ISSN: 8755-2930.
AB The object of this investigation was to study the stability of adobe walls during earthquakes. Nine earthquake simulation tests were made to investigate the influence of the following variables: 1) type of
ground motion; 2) slenderness (thickness/height ratio); 3) wall thickness. Six specimens were tested with a soft-soil ground motion and five with a stiff soil ground motion. Behavior of all specimens was characterized by cracking at the base followed by rocking motion. Failure occurred by overturning (short specimens) or by upper-level cracking (tall specimens). An analytical model was successful in calculating the susceptibility of the walls to overturning. Experimental and analytical results indicate that failure depends primarily on ground motion acceleration level and wall slenderness. (Adapted from authors' abstract).
The work described in this report is part of an investigation of the resistance of reinforced concrete structures to earthquake motions with the overall objective of developing a realistic analytical model for the calculation of the response of reinforced concrete systems subjected to earthquakes. The investigation comprises the analyses and testing of simplified components and models of reinforced concrete structures subjected to controlled base motions. This report contains results and analyses of static and dynamic tests of one-story, one-bay frames. A total of eleven specimens representing either one-eighth or one-fourth scale models of such frames were tested. (Abstract adapted from text).
This report provides a description of the response of engineered construction in Guatemala City to the earthquakes of 4 and 6 February 1976 as evaluated from observations made by the authors during the period 8 to 14 February 1976. (Abstract adapted from text).

This study evaluates the probability of flexural failure in reinforced concrete elements proportioned according to the concepts contained in the specifications for reinforced concrete of the Architectural Institute of Japan and the American Concrete Institute (ACI). Specifications. Strength.

One of the functions of the National Academy of Engineering Committee on Earthquake Engineering Research is to obtain information on the geological and structural effects of earthquakes. Because of quick reaction to the news of the earthquake, it was possible for the authors to observe and record a substantial portion of the critical structural damage caused by the earthquake before it was disturbed by operations of demolition or repair. This report describes the on site observations and preliminary studies made by the members of the NAE Earthquake Inspection Team. Brief descriptions of the city, surrounding terrain and types of construction are provided in Chapter 2 along with the magnitude and effects of the earthquake. An estimate of the maximum ground motion is obtained in Chapter 3 on the basis of the observed slabs of two simple structures. Chapter 4 presents a record of what is known to the team members about five of the buildings which collapsed completely. Four cases of major structural damage are described in Chapter 5. Chapter 6 and 7 contain studies of damage to specific structures: the Petunia II building, and the Macuto-Sheraton Hotel, both reinforced concrete
structures. (Abstract adapted from text).

Document 23 of 28
AN 1988-3588.
AU Sozen, Mete A.
TI EARTHQUAKE SIMULATION IN THE LABORATORY.
LO SEL TH1095.E34 v.3.
NU GRANT: NSF ENV 76-22252.
NT 18 references. Graphs, figures. Research supported by the National Science Foundation.
ID Earthquake simulators. Laboratory tests. Reinforced concrete structures.
AB This paper attempts to discredit the myth of the earthquake simulator as the total and final arbiter and develop a basis for its use as a laboratory tool for structural research related to reinforced concrete. (Abstract from text).

Document 24 of 28
AN 1988-1672.
AU Sozen, M A. Newmark, N M. Housner, G W.
TI IMPLICATIONS ON SEISMIC STRUCTURAL DESIGN OF THE EVALUATION OF DAMAGE TO THE SHERATON–MACUTO.
LO SEL TA654.6.W67 4th v.3.
NT 3 references. Tables, diagrams, graphs, photographs.
AB The main building of the Sheraton-Macuto Hotel is an eleven-story reinforced concrete structure. A significant feature of the structural system is that, in one direction the lateral forces are carried in the top seven stories by a pair of parallel slender shear walls which are supported by heavy columns in the lower four stories. During the earthquake of 29 July 1967, severe damage was sustained by the columns supporting the shear walls. Analyses of possible causes for the column failures suggest that the columns failed primarily because of the lack of ductility, a shortcoming aggravated by the increase of axial load and the failure of some of the connecting girders in shear. The damage to the building emphasizes the importance of considering in design the deformations of the entire structure under the influence of earthquake forces to make certain that all structural elements have compatible ductility and of insuring that enough web reinforcement is provided to develop the flexural capacity of beams and columns. (Authors' abstract).

Document 25 of 28
AN 1988-1653.
AU Sozen, M A. Otani, S. Gulkan, P. Nielsen, N N.
TI UNIVERSITY OF ILLINOIS EARTHQUAKE SIMULATOR.
LO SEL TA654.6.W67 4th v.3.
NU GRANT: NSF GK-890. NSF GK-1118X.
NT Photographs, diagrams, graphs. Research supported by grants from the National Science Foundation.
AB The University of Illinois Earthquake Simulator is an experimental facility designed to subject small-scale structures to vibratory base motions, of a regular or random character, in one horizontal direction. The facility has been in operation since February 1968. This paper describes the facility and its capabilities. (Abstract from text).

Document 26 of 28
AN 1988-1019.
AU Sozen, Mete A. Lopez, Ricardo R.
This paper contains the results of a parametric study of the displacement response of multi-story reinforced concrete frames to the strong ground motion experienced in parts of Mexico City founded on soft soil and to a ground motion that represents ground motion on stiff soil. Nonlinear response analyses were obtained of 8-, 12-, and 16-story frames with various strength and stiffness combinations. (Abstract from text).

The object of the investigation was to study the response of interior reinforced concrete plate-column connections. Eight specimens were tested, 5 "statically" and 3 "dynamically" (rate of loading significant). Other experimental variables were reinforcement ratio and the amount of superimposed vertical load. The specimens had certain common characteristics. Nominal slab dimensions were 1.8 by 1.8 m.; slab thickness was 76mm. The column was square dimensions of 0.3 by 0.3m. The reinforcement layout in the slab was isotropic. The statically tested specimens provided information on the influence of the change in reinforcement ratio and the amount of superimposed vertical load on the response to horizontal loading. An analysis model (the "grid model") was dynamically tested specimens were used to obtain data on the response of the specimens the observed hysteresis and calculated damping. (Abstract from text).
Output for Set: 3
Total Matches: 69
Total Records Output: 69
Date: Monday, April 01, 2002

Record 1.
Title: Transverse reinforcement for columns of RC frames to resist earthquakes.
Author: Pujol, Santiago; Sozen, Mete; Ramirez, Julio
Source: Journal of Structural Engineering; vol. 126 Iss. 4, pages 461-466; Apr. 2000  ISSN: 0733-9445

EEA Abstract:
An approximate formulation to determine the amount of transverse reinforcement for columns of reinforced concrete (RC) frames in seismic areas is presented. It is based on observations that suggested that the main function of transverse reinforcement is to confine the core subjected to a complex state of stress rather than simply resist shear or improve deformability under axial compression. The combined effects of shear and axial stresses are assumed to be a function of the maximum drift ratio and they are interpreted using Coulomb's failure criterion. A comparison between results obtained with the model developed and current design recommendations suggests that the required amount of transverse reinforcement specified in ACI 318-95 can be reduced safely for "flexible" columns (ratio of column height to effective depth approximately equal to 6) under low amplitude displacement cycles (ratio of lateral displacement to column height less than or equal to 3%) and "short" columns (ratio of column height to effective depth approximately equal to 4) under combinations of relatively low shear and axial stresses.

Publication Type: Journal Article
Call Number: 600/A47/v.126(4)
Record ID: EEA-1209377
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 2.
Title: Charting for discovery: a research program for autoadaptive media in civil engineering systems.
Author: Frosch, Robert Joseph; Sozen, Mete Avni
Institutional Author: Purdue University School of Civil Engineering; Purdue University. School of Civil Engineering
Source: West Lafayette, Ind.: School of Civil Engineering, Purdue University, 1999; vi, 69 leaves; 28 cm.
Series: Structural engineering; CE-STR-99-02.
Conference: NSF Workshop on Autoadaptive Media in Civil Engineering (1998: Sonoma, Calif.)

Key Terms: Smart structures » Congresses; Smart materials » Congresses; Structural control [Engineering] » Congresses; Structural engineering » Congresses; Smart materials; Smart structures; Structural control [Engineering]; Structural engineering

MCEER Abstract:
Autoadaptive media are materials, mechanisms, devices, and structures that can modify, monitor, or control their own characteristics to respond appropriately to external stimuli. The objective of the workshop was to explore the potential of autoadaptive media in civil engineering systems and to set flexible goals to stimulate research interest.

EERC Abstract:
Autoadaptive media are materials, mechanisms, devices, and structures that can modify, monitor, or control their own characteristics to respond appropriately to external stimuli. The objective of the workshop was to explore the potential of autoadaptive media in civil engineering systems and to set flexible goals to stimulate research interest.

Language: English
Publication Type: Monograph
Record ID: MCEER-EDQ0671; EERC-006416
Database: COMPOSITE RECORD | MCEER LIBRARY | EERC LIBRARY

Record 3.
Title: Procedure for determining seismic vulnerability of building structures.

Author: Gulkan, Polat; Sozen, Mete A.

Source: ACI Structural Journal; vol. 96 Iss. 3, pages 336-342; May-June 1999 ISSN: 0889-3241

Key Terms: Masonry-reinforced concrete infill wall-frame interaction » story drift; Infill walls » vulnerability; Erzincan, Turkey earthquake, Mar. 13, 1992 » damage ranking; Mortar bond strength

EEA Abstract: A rationalization for ranking reinforced concrete frame buildings with masonry infill walls with regard to seismic vulnerability is presented. The method essentially requires only the dimensions of the structure as input, and is expressed in terms of where its attributes are located in a two-dimensional plot of masonry wall and column percentages. It is shown that increasing drift at the ground story (which is a reasonable expression of increasing vulnerability) is attained by decreasing either attribute. It is shown that a more robust estimate of the contribution of the filler wall to frame stiffness should be based on the compression-tension strength of its mortar rather than elastic modulus, either of the masonry or of the mortar.

Publication Type: Journal Article
Call Number: 515/A451S/v.96(3)
Record ID: EEA-1005051
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 4.

Title: A displacement-based procedure for determination of seismic vulnerability of buildings.

Author: Gulkan, P.; Sozen, M. A.


Key Terms: Unreinforced brick infill walls; Reinforced concrete frames » displacement-based design; Hollow brick infill walls » story drift; Erzincan, Turkey » governmental buildings » public buildings

EEA Abstract: Structural design criteria expressly linked to controlling local (interstory) or global (top story) drift may be used in conjunction with the customary tools of seismic design, which are usually based on the fulfillment of capacity criteria. The authors examine the observed drift demands imposed by near-field events and match this against the calculated ground story drifts on building frames. The frames are idealized as shear beams using the drift spectrum, which may be used as a complementary device to the response spectrum. The amount of structural walls or combination of columns and filler walls required to keep ductility to prescribed limits is formulated on the basis of elementary earthquake engineering theory.

Publication Type: paper
Call Number: CF 10
Record ID: EEA-324269
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 5.

Title: Proceedings of the first Coordination Committee Meeting, U.S.-Japan Cooperative Research Program on Mitigation of Urban Earthquake Hazard.

Author: Sozen, Mete Avni; Ohtani, Shunsuke

Institutional Author: United States-Japan Cooperative Research Program on Mitigation of Urban Earthquake Hazard Coordination Committee Meeting (1st: 1998: Tokyo, Japan); National Science Foundation (U.S.); Japan Monbusho

Source: [Tokyo, Japan?: University of Japan?, 1998?]; 72 p.: ill.; 30 cm.

Key Terms: Earthquake resistant design » Research » Congresses; Earthquake engineering » Research » Congresses; Earthquakes » Safety measures » Congresses; Buildings » Earthquake effects » Congresses

Language: English

Publication Type: Monograph
Call Number: MCEER: TA658.44.U176 1998 [Science and Engineering Library]
Record ID: MCEER-EDN9519
Database: MCEER LIBRARY

Record 6.

Title: Seismic vulnerability assessment of low-rise buildings in regions with infrequent earthquakes.

Author: Hassan, A. F.; Sozen, M. A.


Key Terms: Lowrise structures » seismic evaluation; Reinforced concrete structures » damage prediction; School buildings » failure; Erzincan, Turkey earthquake, Mar. 13, 1992 » lowrise structures

EEA Abstract: This paper presents a simplified method of ranking reinforced concrete, low-rise, monolithic buildings according to their vulnerability to seismic damage. The ranking process requires only
the dimensions of the structure. The process is tested using a group of buildings that suffered various levels of damage during the Erzincan earthquake of 1992. The ranking procedure reflected the observed damage satisfactorily.

Major Topics: Earthquake-Resistant Design -- Buildings
Publication Type: Journal article
Call Number: 515/A451S
Record ID: EEA-270375
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 7.
Title: Drift-driven design for earthquake resistance of reinforced concrete.
Author: Sozen, M. A.
Source: Berkeley: Earthquake Engineering Research Center, University of California; The EERC-CUREe Symposium in Honor of Vitelmo V. Bertero, January 31-February 1, 1997, Berkeley, California, pages 1-8; Jan. 1997 ISSN: 02710323
Key Terms: Displacements [structural] » reinforced concrete structures; Story drift
EEA Abstract: It is suggested that reinforced concrete structures should be proportioned on the basis of drift and then checked for lateral strength rather than being proportioned for strength and then checked for drift. A simple heuristic procedure for determining drift of reinforced concrete structures in the nonlinear range of response is described.
Publication Type: monograph
Call Number: 400/E37/1997
Document Numbers: UCB/EERC-97/05
Record ID: EEA-318892
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 8.
Title: A displacement-based procedure for determination of seismic vulnerability of buildings.
Author: Gulkan, P.; Sozen, M. A.
Source: [Istanbul?]: [Istanbul Technical Univ.?]; First Japan-Turkey Workshop on Earthquake Engineering; Vol. 1, pages 83-100; [1997?]
Key Terms: Reinforced concrete frames » nonlinear analysis; Masonry-reinforced concrete infill wall-frame interaction » story drift; Lowrise structures » damage prediction
EEA Abstract: This paper presents a rationalization for ranking reinforced concrete frame buildings with infill walls with regard to seismic vulnerability. The method requires the actual or preliminary dimensions of the structure as input. It expresses where, in a two-dimensional plot of column and masonry wall percentages, these attributes are located. It is shown that increasing drift at the ground story, where severe damage usually occurs, is attained when either of these attributes is decreased. It is argued that a more meaningful estimate of the contribution of the filler wall to frame stiffness should be based on the strength of its mortar rather than on the elastic modulus either of the masonry or of the mortar.
Publication Type: Paper
Call Number: 400/J26/1997/v.1
Record ID: EEA-326042
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 9.
Title: Mete A. Sozen symposium: a tribute from his students.
Author: Kreger, Michael E. 1957-; Sozen, Mete Avni 1930-; Wight, James K.
Institutional Author: American Concrete Institute
Source: Farmington Hills, Mich.: American Concrete Institute, 1996.; vi, 460 p., ill., 23 cm.
Series: Publication SP; 162.
Notes: Includes bibliographical references and index
Key Terms: Reinforced concrete construction
Language: English
Publication Type: Monograph
Call Number: EERC: 620.2 M48 1996 [EERC]
Record ID: EERC-011299
Database: EERC LIBRARY

Record 10.
Title: Shear strength of reinforced concrete columns subject to seismic loading.
Author: Konwinski, C.; Ramirez, J. A.; Sozen, M. A.
Key Terms: Reinforced concrete bridge columns » ductility; Shear strength » reinforced concrete bridge
columns

EEA Abstract:

Because shear failure of reinforced concrete piers has been one of the dominant causes of serious damage to bridge structures subjected to strong ground motion, it is important to evaluate the vulnerability of existing bridge columns to earthquake. Such evaluations are to be made in different regions with different seismicities and construction traditions by professionals with different backgrounds. Therefore, the methods, besides having to be consistent with the latest knowledge, need to be explicit and have the appropriate balance of labor against quality of result. Current methods of shear strength evaluation may be divided into two classes: (a) traditional methods based on the assumption of a monotonic increase in shear (ACI 318, ACI-ASCE JC 426) and (b) methods based on recognition of cycles of load into the nonlinear range of response (ATC-6, UCB, UCSD). This paper summarizes the results of an investigation of the various choices available for estimating shear strength. The studies were made considering the uncertainties in estimating the earthquake effect and shear resistance. Those relating to geotechnical factors were not considered.

Major Topics: Structural Dynamics -- Properties of Materials, Structural Components

Publication Type: paper

Call Number: 630/N27/1995

Record ID: EEA-265775

Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 11.

Title: Stiffness of reinforced concrete walls resisting in-plane shear.

Author: Sozen, M. A.; Moehle, J. P.

Institutional Author: Electric Power Research Institute


Notes: "30 April 1993." -- "Prepared for Electric Power Research Institute, 3412 Hillview Ave., Palo Alto, Calif." -- Includes bibliographical references -- Research project 3094-01

Key Terms:
Reinforced concrete structures » dynamic properties; Reinforced concrete shear walls » stiffness » displacements [structural] » dynamic properties; Floor response spectra » reinforced concrete shear walls; Nuclear power plants » floor response spectra; Concrete » cracking » floors » shear walls; Experimentation » concrete » nuclear power plants » reinforced concrete shear walls; Reinforced concrete » nuclear power plants; Cracks » concrete; Buildings, reinforced concrete; Concrete walls; Reinforced concrete construction

EEA Abstract:
Reinforced concrete walls, with height to length ratios of approximately two and less, are commonly used in power-plant structures to resist earthquake effects. Determination of wall stiffness is of particular importance for establishing design forces on attached equipment. Available experimental data indicate differences between the measured initial stiffness and the stiffness calculated by assuming the wall to be uncracked. The work reported was undertaken to investigate the causes of the observed differences. Force-displacement data from three experimental investigations were analyzed in detail. The availability of detailed experimental information enabled studies of the effect on stiffness of flexural and shear cracks in the concrete and yielding of the flexural reinforcement. A procedure is presented for constructing the force-displacement relationship for walls resisting in-plane shear. Effects on floor response spectra of the observed changes in stiffness are discussed. Possible increases with time of the strength and stiffness characteristics of concrete used in nuclear plant structures are estimated with the help of experimental data obtained over a duration of approximately 20 years.

Major Topics: Structural Dynamics -- Properties of Materials, Structural Components

Language: English

Publication Type: Technical report | Monograph

Call Number: EEA: 400/E67/TR-102731 | EERC: 400 E67 TR-102731 [EERC]


Record ID: EEA-251975 | EERC-016337

Database: COMPOSITE RECORD | EARTHQUAKE ENGINEERING ABSTRACTS | EERC LIBRARY

Record 12.

Title: Behavior-based method to determine design shear in earthquake-resistant walls.

Author: Eberhard, M. O.; Sozen, M. A.

Source: Journal of Structural Engineering, Vol. 119 Iss. 2, pp. 619-640; 1993. ISSN: 07339445

Key Terms:
Shaking table tests » reinforced concrete structures » reinforced concrete walls; Base shear » reinforced concrete walls; Reinforced concrete structures » design » nonlinear response; Reinforced concrete walls » design » nonlinear response; Multistory structures » design » nonlinear response; Reinforced concrete wall-frame interaction » design » nonlinear response; Experimentation » reinforced concrete walls » reinforced concrete wall-frame interaction

EEA Abstract:
For earthquake-resistant design of reinforced concrete structures, the shear force for frame elements is established on the basis of the proportions and flexural strength of the element according to the American Concrete Institute Standard 318-89 (1989); the Applied Technology Council Standard 3-06 (1989); and the Uniform Building Code, published in 1988. In this paper, a similar procedure is proposed for walls in medium-rise, reinforced concrete buildings. Results of small-scale dynamic tests of nine- and ten-story structures with walls are presented to
provide data with which to evaluate methods of estimating base shear. The need to take into account variations of inertial force distribution with base-motion intensity is supported by experimentally observed behavior, modal analysis, and nonlinear response-history analysis. After discussing other factors that influence maximum base shear, such as strain rate, strain hardening, and systematic experimental error, a design procedure for estimating shear demand for walls that reflects observed behavior is proposed.

Major Topics: Earthquake-Resistant Design -- Buildings

Publication Type: Journal article
Call Number: EEA: 600/A47
Record ID: EEA-236976
Database: EARTHQUAKE ENGINEERING ABSTRACTS
Record 16.
Title: Experiments and analyses to study the seismic response of reinforced concrete frame-wall structures with yielding columns: a report to the National Science Foundation.
Author: Eberhard, Marc O.; Sozen, Mete Avni 1930-
Institutional Author: University of Illinois at Urbana-Champaign
Source: Urbana, Ill.: University of Illinois at Urbana-Champaign, 1989.; Civil engineering studies, Structural research series, no, 548; xiv, 424 p., ill., 29 cm.
Series: UIU-ENG-89-2007
Notes: "September 1989" -- Thesis (Ph.D.)--University of Illinois at Urbana-Champaign, 1989 -- Includes bibliography (p. 421-424) -- Research grant ECE 84-18691
Key Terms: Buildings; Concrete walls; Earthquake resistant design; Reinforced concrete construction
Language: English
Publication Type: Monograph
Call Number: EERC: 525 E23 1989 [EERC]
Record ID: EERC-005437
Database: EERC LIBRARY

Record 17.
Title: Seismic drift of reinforced concrete structures.
Author: Shimazaki, K.; Sozen, M. A.
Key Terms: Reinforced concrete structures » nonlinear response » dynamic properties; Hysteresis » reinforced concrete structures; Single degree-of-freedom systems » nonlinear response; Strength » reinforced concrete structures; Stiffness » reinforced concrete structures; Ground motion » reinforced concrete structures; Displacements [structural]; Story drift; Deterministic methods » drift; Nonlinear oscillators » response
EEA Abstract: Nonlinear displacement response of reinforced concrete structures is investigated by a parametric study of single degree-of-freedom systems with appropriate hysteresis properties. Strength, stiffness, and the type of ground motion are the main variables considered. It is shown that a set of dimensionless parameters defining the three variables can be used to determine whether the displacement response can be satisfactorily determined using linear response analysis.
Major Topics: Structural Dynamics -- Deterministic Behavior of Nonlinear Structures
Publication Type: Journal article
Call Number: EEA: 500/H34
Record ID: EEA-150792
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 18.
Title: Seismic drift of reinforced concrete structures.
Author: Shimazaki, K.; Sozen, M. A.
Institutional Author: Hazama-gumi, Kabushiki Kaisha
Source: S.l.: Hazama-gumi, Ltd., 1984; 1 v. (various pagings), ill., 28 cm.
Notes: Caption title -- "Special research paper"--cover -- Draft -- Includes bibliographical references -- NSF grant no, CEE-81-14977
Key Terms: Earthquake resistant design; Reinforced concrete construction
Language: English
Publication Type: Monograph
Call Number: EERC: 520 S435 1984 [EERC]
Record ID: EERC-015858
Database: EERC LIBRARY

Record 19.
Title: A SDOF model to study nonlinear dynamic response of large- and small-scale R/C test structures.
Author: Rothe, D. H.; Sozen, M. A.
Institutional Author: University of Illinois at Urbana-Champaign
Source: Univ. of Illinois: (Urbana), 112 p.; 1983.
Key Terms: Single degree-of-freedom structures » nonlinear response; Reinforced concrete structures » nonlinear response; Pseudodynamic tests » reinforced concrete structures; Multidegree-of-freedom systems » nonlinear response; Hysteresis » reinforced concrete structures; Buildings, Reinforced concrete; Reinforced concrete construction; Structural dynamics
EEA Abstract: This study compares the results of earthquake simulation tests of small-scale reinforced concrete structural models with those of pseudodynamic tests of a large-scale reinforced concrete structure. Comparisons were made by analyzing both sets of test results with the help
of a single degree-of-freedom (SDOF) model. To develop the analytical model, the multidegree-of-
freedom system was reduced to a SDOF system assuming that the displaced shape remains
essentially constant during the test. A hysteresis model based on observation of small- and
large-scale tests of reinforced concrete structures was developed. Measured response histories
of one large-scale and three small-scale reinforced concrete structures were compared with the
calculated response histories of the SDOF models based on the properties of the tested
structures. The sensitivity of the calculated response of the SDOF model due to plausible
variations in assumptions of input parameters was also investigated.

Major Topics: Structural Dynamics -- Deterministic Behavior of Nonlinear Structures

Language: English

Publication Type: Technical report | Monograph


Document Numbers: Report: Civil Engineering Studies, Structural Research Series No. 512, UILU-
ENG-83-2018

Record ID: EEA-131000654 | EERC-014654

Database: COMPOSITE RECORD | EARTHQUAKE ENGINEERING ABSTRACTS | EERC LIBRARY

Record 20.

Title: A study of the causes of column failures in the Imperial County Services Building during the
15 October 1979 Imperial Valley earthquake.

Author: Kreger, M. E.; Sozen, M. A.

Source: Univ. of Illinois: (Urbana), 321 p.; 1983.

Notes: UILU-ENG-83-2013 -- Also published as thesis (Ph.D.)--University of Illinois at Urbana-
Champaign, 1983 -- "A report to the National Science Foundation."

Key Terms: Southern California » structural damage; Response spectra » reinforced concrete columns;
Reinforced concrete structures » nonlinear response; Reinforced concrete columns » nonlinear
response; Imperial County Services Building, El Centro, California » failure analysis; Free
vibration tests » reinforced concrete structures; Experimentation » reinforced concrete columns
| Buildings; Columns, Concrete; Earthquakes; Imperial County Services Building (El Centro,
Ca.); Public buildings; Structural failures

EEA Abstract:
This is an investigation of specific causes of failure in the Imperial County Services Building in El
Centro, California, caused by the Oct. 15, 1979, earthquake. Studies performed included an
experimental analysis of the structural system in the N-S direction. Conclusions on the time and
causes of critical column failure are discussed.

Major Topics: Structural Dynamics -- Experimental Investigations

Language: English

Publication Type: Technical report | Monograph

Call Number: EEA: 545.2/K74/1983 | EERC: 545.2 K74 1983 [EERC]

Document Numbers: Report: Civil Engineering Studies, Structural Research Series No. 509, UILU-
ENG-83-2013

Record ID: EEA-131000858 | EERC-009669

Database: COMPOSITE RECORD | EARTHQUAKE ENGINEERING ABSTRACTS | EERC LIBRARY

Record 21.

Title: Lateral-load tests of R/C slab-column connections.

Author: Morrison, D. G.; Hirasawa, I.; Sozen, M. A.


Key Terms: Vertical loads » reinforced concrete joints; Stiffness » reinforced concrete joints; Static
loads » reinforced concrete joints; Reinforced concrete slabs » nonlinear response; Reinforced
concrete » joints; Lateral loads » reinforced concrete joints; Joints » reinforced concrete;
Flat-plate structures; Experimentation » reinforced concrete joints

EEA Abstract:
The response of interior reinforced concrete plate column connections in a laterally loaded
structure is investigated. Nine specimens were tested, five statically and four dynamically, to
simulate earthquake loading. This paper describes results from statically tested specimens.
Experimental variables include reinforcement ratio and amount of superimposed slab load.
Statically tested specimens provided data on influence on stiffness and strength of
reinforcement amount and slab load. In the range of joint rotations less than 4 percent,
strength was controlled by torsional stiffness of the slab. Slab shear failures were observed
for the specimens with slab load at joint rotations over 4 percent. A numerical model was
developed to enable calculation of the overall moment-rotation response.

Major Topics: Structural Dynamics -- Deterministic Behavior of Nonlinear Structures

Publication Type: Journal article

Call Number: EEA: 600/A47/v.109(11)

Record ID: EEA-131000637

Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 22.

Title: Lateral drift of reinforced concrete structures subjected to strong ground motion.

Author: Sozen, M. A.

Source: Bulletin of the New Zealand National Society for Earthquake Engineering, Vol. 16
Iss. 2, pp. 107-122; 1983.
Key Terms:
Reinforced concrete structures » nonlinear analysis; Drift

EEA Abstract:
The author describes a simplified method for estimating lateral drift of reinforced concrete structures subjected to strong earthquake motion. The method is modeled after spectral-response analysis with simplifications based on observed characteristics of nonlinear dynamic response of reinforced concrete structures. Its application is limited to the types of structures and ground motions considered in its development. However, the method can be readily calibrated for other types of structures or modified for different foundation conditions.

Major Topics: Structural Dynamics -- Deterministic Analytical Methods

Publication Type: Journal article
Call Number: EEA: 400/N4/v.16(2)
Record ID: EEA-131001095
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 23.
Title: Lateral drift of reinforced concrete structures subjected to strong ground motion.
Author: Sozen, Mete Avni 1930-
Source: 1983; 12, 13 p., ill., 30 cm.
Notes: Manuscript

Key Terms:
Earth movements; Reinforced concrete construction

Language: English
Publication Type: Monograph
Call Number: EERC: No call number [EERC - Reprint]
Record ID: EERC-016335
Database: EERC LIBRARY

Record 24.
Title: Damage assessment from dynamic response measurements.
Author: Yao, J. T. P.; Toussi, S.; Sozen, M. A.

Key Terms:
Systems identification » structural damage; Mathematical models » structural damage; Hysteresis » structural damage; Finite element method » structural damage; Damage » structural response; Dynamic testing; Earthquake damage prediction; Structural failures

EEA Abstract:
The objective of this paper is to present a state-of-the-art review of the techniques for damage assessment of existing structures. Relevant literature is critically reviewed. Recent research results on mathematical formulation and identification of interstory hysteretic behavior are summarized and presented. Emphasis is placed on the analysis and usage of dynamic response measurements for damage assessment purposes.

Major Topics: Structural Dynamics -- Deterministic Analytical Methods

Language: English
Publication Type: Monograph
Call Number: EERC: No call number [EERC - Reprint]
Record ID: EEA-122000788 | EERC-019679
Database: COMPOSITE RECORD | EARTHQUAKE ENGINEERING ABSTRACTS | EERC LIBRARY

Record 25.
Title: Experiments to study earthquake response of R/C structures with stiffness interruptions: a report to the National Science Foundation.
Author: Moehle, Jack P.; Sozen, Mete Avni
Institutional Author: National Science Foundation (U.S.)

Key Terms:
Reinforced concrete construction » Testing; Buildings » Earthquake effects | Buildings; Nonlinear response; Reinforced concrete construction

Language: English
Publication Type: Monograph
Record ID: MCEER-ADN0381 | EERC-011532
Database: COMPOSITE RECORD | MCEER LIBRARY | EERC LIBRARY
Record 26.
Title: Simple nonlinear seismic analysis of R/C structures.
Author: Saidi, M.; Sozen, M. A.
Source: Journal of the Structural Division, ASCE; vol. 107 Iss. ST5, pages 937-952; May 1981
Notes: Proc. Paper 16270
Key Terms:
- Stiffness » reinforced concrete structures
- Reinforced concrete frames » analysis
- Reinforced concrete frames » nonlinear response
- Reinforced concrete wall-frame interaction » analysis
- Reinforced concrete wall-frame interaction » nonlinear response
- Nonlinear systems » analysis
- Multistory structures » analysis
- Hysteresis » reinforced concrete structures
- Framed structures » analysis
- Framed structures » nonlinear response
- Computer applications » reinforced concrete frames
- Computer applications » reinforced concrete wall-frame interaction

EEA Abstract:
A simple analytical model is developed for the calculation of the seismic displacement history response of reinforced concrete frame and frame-wall structures. The computer cost for the model is approximately three percent of that for a MDOF system. A structure is idealized as a "single-degree" system consisting of a mass mounted on a rigid bar connected to the ground by a hinge and a nonlinear rotational spring. The primary force-deformation relationship for the spring is obtained by static analysis of the multistory structure. To account for stiffness changes during an earthquake, a simple hysteresis model comprising only four rules is developed. The model is examined for eight small-scale, ten-story reinforced concrete test structures, and the analytical results are compared with the measured response histories. The model is shown to be successful in most instances.

Major Topics: Structural Dynamics -- Deterministic Analytical Methods
Publication Type: Journal Article
Call Number: 600/A47
Record ID: EEA-111001576
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 27.
Title: Significant developments in engineering practice and research: a tribute to Chester P. Siess.
Author: Siess, Chester Paul; Sozen, Mete Avni
Institutional Author: American Concrete Institute
Source: Detroit, Mich. (P.O. Box 19150, Detroit 48219): American Concrete Institute, 1981; xix, 403 p.: ill.; 23 cm.
Series: Publication SP; 72.
Key Terms:
- Engineering » Congresses
- Siess, Chester Paul
- Festschriften
Language: English
Publication Type: Monograph
Call Number: MCEER: TA5.S53 [Science and Engineering Library]; DDC Call No.: 693/.5
Record ID: MCEER-ABEL9507
Database: MCEER LIBRARY

Record 28.
Title: Experimental study of small-scale R/C columns subjected to axial and shear force reversals.
Author: Gilbertsen, N. D.; Moehle, J. P.
Institutional Author: National Science Foundation (U.S.)
Source: Univ. of Illinois: (Urbana), 95 p.; 1980.
Notes: Additional author listed on report documentation page: M.A. Sozen -- "A report to the National Science Foundation"--Report cover -- NSF/RA-800495 -- PB81-192767 -- UILL-ENG-80-2015 -- Includes bibliographical references
Key Terms:
- Simulation » earthquakes
- Reinforced concrete columns » dynamic properties
- Reinforced concrete columns » nonlinear response
- Hysteresis » reinforced concrete columns
- Experimentation » reinforced concrete columns
- Cyclic loads » reinforced concrete columns
- Axial loads » reinforced concrete columns
- Columns, Concrete
- Earthquake engineering
- Reinforced concrete construction

EEA Abstract:
The objective of this work was to study experimentally the inelastic response of small-scale reinforced concrete column specimens. Dimensions, materials, and reinforcement ratios were selected to be similar to the first-story columns of the nine-story, three-bay frames subjected to earthquake simulations on the Univ. of Illinois earthquake simulator. Columns tested with constant axial load were representative of interior columns in the three-bay frames. Columns tested with varying axial loads were intended to provide insight into the behavior of exterior columns. The specimens were subjected to a series of shear force or simultaneous shear and axial force reversals. Specimen behavior was studied using measured hysteretic relations, crack patterns, and comparisons of measured and calculated response.
Record 29.

**Title:** Effect of wall height on earthquake response of reinforced concrete multi-story frame-wall structures.

**Author:** Sozen, M. A.; Moehle, J. P.

**Source:** Istanbul: Turkish National Committee on Earthquake Engineering et al.; Proceedings of the Seventh World Conference on Earthquake Engineering, pages 439-446; [1980?]

**Notes:** Vol. 6

**Key Terms:**
- Stiffness » reinforced concrete structures
- Shaking table tests » reinforced concrete structures
- Reinforced concrete structures » dynamic properties
- Multistory structures » dynamic properties

**EEA Abstract:**
A series of four small-scale multistory reinforced concrete structures were tested, using the Univ. of Illinois earthquake simulator. The objective of the tests was to investigate the influence of abrupt changes in building stiffness on earthquake response. This paper contains a description of the test structures and some of the test results.

Record 30.

**Title:** A naive model for nonlinear response of reinforced concrete buildings.

**Author:** Saiidi, M.; Sozen, M.

**Source:** Istanbul: Turkish National Committee on Earthquake Engineering et al.; Proceedings of the Seventh World Conference on Earthquake Engineering, pages 8-14; [1980?]

**Notes:** Vol. 7

**Key Terms:**
- Reinforced concrete structures » nonlinear response
- Nonlinear structures » analysis
- Mathematical models » reinforced concrete structures
- Multistory structures » nonlinear response

**EEA Abstract:**
A simple and economical model is introduced for the calculation of the nonlinear displacement-response histories of multistory structures subjected to strong earthquakes. A structure is idealized as a mass connected to a rigid bar that in turn is connected to the ground by a hinge and a rotational spring. The calculated responses are compared with measured experimental results from dynamic testing of eight small-scale ten-story model structures. Satisfactory correlation between the analytical and experimental results has been observed.

Record 31.

**Title:** Simple and complex models for nonlinear seismic response of reinforced concrete structures.

**Author:** Saiidi, M.; Sozen, M. A.

**Source:** Dept. of Civil Engineering, Univ. of Illinois: (Urbana); Structural Research Series 1465, 188 p.; 1979.

**Notes:** "UILU-ENG-79-2013." -- "National Science Foundation Research Grant PFR 78-16318." -- "Based on a doctoral dissertation by M. Saiidi." -- Bibliography: p. 68-71

**Key Terms:**
- Reinforced concrete structures » nonlinear response
- Nonlinear analysis » reinforced concrete structures
- Mathematical models » reinforced concrete structures
- Hysteresis » reinforced concrete structures
- Buildings

**EEA Abstract:**
The object of this study was to simplify the nonlinear seismic analysis of reinforced concrete structures. The work consisted of two independent parts. The first was to study the influence of calculated responses to hysteresis models used in the analysis, and to determine whether satisfactory results could be obtained using less complicated models. For this part, a multidegree-of-freedom analytical model was developed to work with three hysteretic systems previously proposed in addition to two systems introduced in this report. The results of experiments on a small-scale, ten-story reinforced concrete frame were compared with the
analytical results using different hysteretic systems. In the other part of the study, an economical, simple single degree-of-freedom model was introduced to calculate non-linear displacement-response histories of structures.

Major Topics: Structural Dynamics -- Deterministic Behavior of Nonlinear Structures
Language: English
Publication Type: Technical report | Monograph
Call Number: EERC: 530 S23 1979 [EERC]
Record ID: EEA-91000847 | EERC-014788
Database: COMPOSITE RECORD | EARTHQUAKE ENGINEERING ABSTRACTS | EERC LIBRARY

Record 32.
Title: Experimental study of frame-wall interaction in reinforced concrete structures subjected to strong earthquake motions.
Author: Abrams, Daniel Paul; Sozen, Mete Avni
Source: Urbana, Ill.: University of Illinois at Urbana-Champaign, 1979; xiii, 386 p.: ill., plans; 28 cm.
Series: Civil engineering studies. Structural research series; no. 460. | Civil engineering studies.Structural research series, no. 460.
Key Terms: Walls » Testing; Structural frames » Testing; Reinforced concrete construction; Buildings » Earthquake effects » Simulation methods » Buildings; Reinforced concrete frames; Walls
Language: English
Publication Type: Monograph
Call Number: MCEER: TA638.2.C58 no.460 [Science and Engineering Library] | EERC: 530 A22 1979
Record ID: MCEER-ADL8644 | EERC-000099
Database: COMPOSITE RECORD | MCEER LIBRARY | EERC LIBRARY

Record 33.
Title: Earthquake-simulation tests of a ten-story reinforced concrete frame with a discontinued first-level beam.
Author: Moehle, J. P.; Sozen, M. A.
Notes: "UILU-ENG-78-2014."
Key Terms: Time histories » reinforced concrete frames; Stiffness » reinforced concrete frames; Shaking table tests » reinforced concrete frames; Reinforced concrete frames » linear response; Physical models » reinforced concrete frames; Multistory structures » dynamic properties; Energy dissipation » reinforced concrete frames | Reinforced concrete frames; Tall buildings
EEA Abstract: A small-scale, ten-story, reinforced concrete frame structure with relatively flexible lower stories was subjected successfully to simulated earthquakes of increasing intensity on the Univ. of Illinois earthquake simulator. The test structure comprised two frames situated opposite one another with strong axes parallel to a horizontal base motion and with story masses spanning between. The frames had relatively tall first and last stories and a discontinued first floor-level, exterior-span beam. Earthquake simulation tests were complemented by free-vibration tests and steady-state sinusoidal tests at a series of frequencies bounding the apparent fundamental frequency. This report documents the experimental work, presents data (including time-response histories), and discusses the observed dynamic response in relation to stiffness, strength, and energy dissipation capacity.

Major Topics: Structural Dynamics -- Experimental Investigations
Language: English
Publication Type: Technical report | Monograph
Call Number: EERC: 520 M62 1978 [EERC]
Record ID: EEA-81001220 | EERC-011530
Database: COMPOSITE RECORD | EARTHQUAKE ENGINEERING ABSTRACTS | EERC LIBRARY

Record 34.
Title: Experimental study of the dynamic response of a ten-story reinforced concrete frame with a tall first story.
Author: Healey, T. J.; Sozen, M. A.
Key Terms: Shaking table tests » reinforced concrete frames; Reinforced concrete frames » dynamic properties; Overturning » reinforced concrete frames; Multistory frames » dynamic properties; Mode shapes » reinforced concrete frames; Damping » reinforced concrete frames
EEA Abstract: This report documents the experimental work and presents the response data obtained from three
earthquake simulation tests of a ten-story reinforced concrete frame. Changes in the dynamic properties of the test structure, such as apparent frequencies and equivalent damping, are discussed. Observed maximum lateral displacements are compared with those obtained from modal spectral analysis.

Major Topics: Structural Dynamics -- Properties of Linear Structures
Publication Type: Technical report
Record ID: EEA-8100869
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 35.
Title: Effect of beam strength and stiffness on dynamic behavior of reinforced concrete coupled walls.
Author: Lybas, J. M.; Sozen, M. A.
Source: Univ. of Illinois: (Urbana); Structural Research Series 444; 1977.
Series: Civil engineering studies.Structural research series, no. 444.
Key Terms:
Coupled walls » nonlinear response; Cyclic loads » walls; Experimentation » reinforced concrete walls; Hysteresis » reinforced concrete walls; Lateral loads » walls; Mathematical models » reinforced concrete walls; Physical models » reinforced concrete walls; Reinforced concrete walls » nonlinear response; Stiffness » reinforced concrete beams; Viscous damping; Walls » nonlinear response | Reinforced concrete construction; Walls
EEA Abstract:
This report describes a study aimed at developing an understanding of the response of reinforced concrete coupled wall systems to seismic loading. The study had analytical and experimental phases. Five test structures (approximately one-twelfth scale) were subjected to one component of the earthquake base motion measured at El Centro, California (1940). The base motions were strong enough to cause yielding of the test structures. A sixth test structure was subjected to slowly applied cyclic lateral loading. The experimental program is outlined, and the results are presented. The details of experimental procedures, along with the characteristics of the test specimens and materials, are given. An analytical study of the static hysteretic response of the test structures was undertaken. The effect of the hysteresis relations of the members on the overall hysteresis relation of the structure was studied. Equivalent viscous damping factors, consistent with the calculated overall structure hysteresis relation, were determined. The variation of damping factor with response mode and response amplitude was studied. The study of static hysteretic response is presented. The feasibility of simulating the observed dynamic responses with a linear viscously damped analytical model was investigated. Both response spectrum analyses and response history analyses were performed. Finally, the experimental results were compared with the results of the analytical studies.

Major Topics: Structural Dynamics -- Deterministic Behavior of Nonlinear Structures
Language: English
Publication Type: Technical report | Monograph
Call Number: EERC: 515 L9 1977 [EERC]
Record ID: EEA-7000692 | EERC-010608
Database: COMPOSITE RECORD | EARTHQUAKE ENGINEERING ABSTRACTS | EERC LIBRARY

Record 36.
Title: Inelastic responses of reinforced concrete structures to earthquake motions.
Author: Gulkan, P.; Sozen, M. A.
Source: American Concrete Inst.: (Detroit), pp. 109-115; 1977.
Notes: Reprinted from Journal of the American Concrete Institute, 71, 12, Dec. 1974, 604-610.
Key Terms:
Damping » reinforced concrete structures; Design; Energy dissipation » reinforced concrete structures; Experimentation » reinforced concrete structures; Lateral loads » reinforced concrete frames; Reinforced concrete frames » nonlinear response; Reinforced concrete structures » nonlinear response; Stiffness » reinforced concrete structures
EEA Abstract:
Two basic characteristics of reinforced concrete structures play an important role in determining response to strong ground motions. They are the changes in stiffness and energy dissipation capacity. Both can be related to the maximum displacement. Results of dynamic tests of reinforced concrete frames are used to illustrate the effects on dynamic response of changes in stiffness and energy dissipation capacity. It is shown that maximum inelastic response can be interpreted in terms of linearly elastic analysis by reference to a fictitious linear structure whose stiffness and damping characteristics are determined as a function of the assumed or known maximum displacement. This leads to a simplified method for estimating the design base shear taking account of inelastic response.

Major Topics: Structural Dynamics -- Deterministic Behavior of Nonlinear Structures
Publication Type: Technical report
Record ID: EEA-7000667
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 37.
Title: Substitute-structure method to determine design forces in earthquake-resistant reinforced
concrete frames.

**Author:** Shibata, A.; Sozen, M. A.

**Source:** Meerut, India: Sarita Prakashan; Proceedings, Sixth World Conference on Earthquake Engineering, pages 1905-1910; 1977

**Notes:**
- Vol. II

**Key Terms:**
- Energy dissipation » reinforced concrete frames; Multistory frames » nonlinear response;
- Reinforced concrete frames » design; Substitute structure method » frames

**EEA Abstract:**

The substitute structure method of determining seismic design forces in multistory reinforced concrete frames is described. The method, which recognizes energy dissipation in the nonlinear range of response, utilizes substitute linear models and response spectra. The paper includes a description of the substitute structure method, an example of its use in determining design forces in an eight-story frame, and the results of a nonlinear response analysis of the designed frame to earthquake motions.

**Major Topics:** Structural Dynamics -- Deterministic Behavior of Nonlinear Structures

**Publication Type:** Paper

**Call Number:** 400/W66/1977/v.II

**Record ID:** EEA-7000742

**Database:** EARTHQUAKE ENGINEERING ABSTRACTS

---

**Record 38.**

**Title:** Multi-story walls subjected to simulated earthquakes.

**Author:** Sozen, M. A.; Aristizabal, D.; Lybas, J. M.

**Source:** Meerut, India: Sarita Prakashan; Proceedings, Sixth World Conference on Earthquake Engineering, pages 3221-3226; 1977

**Notes:**
- Vol. III

**Key Terms:**
- Experimentation » walls; Illinois, Univ. of; Multistory walls » linear response; Reinforced concrete structures » linear response; Slender walls » linear response

**EEA Abstract:**

An experimental investigation of the response to earthquake motions of reinforced concrete structural systems is in progress at the Univ. of Illinois. This report describes some results from studies of slender walls.

**Major Topics:** Structural Dynamics -- Experimental Investigations

**Publication Type:** Paper

**Call Number:** 400/W66/1977/v.III

**Record ID:** EEA-7000943

**Database:** EARTHQUAKE ENGINEERING ABSTRACTS

---

**Record 39.**

**Title:** Behavior of ten-story reinforced concrete walls subjected to earthquake motions.

**Author:** Aristizabal-Ochoa, J. D.; Sozen, M. A.

**Source:** Univ. of Illinois: (Urbana), 378 p.; 1976.

**Key Terms:**
- Walls » nonlinear response; Tall buildings » nonlinear response; Reinforced concrete structures » design; Reinforced concrete structures » nonlinear response spectra; Experimentation » reinforced concrete structures; Beams » nonlinear response

**EEA Abstract:**

Tall reinforced concrete structures resist lateral forces as frames (shear beams) or as cantilevers (flexure beams). The tests discussed in this report were designed to investigate the response of reinforced concrete systems resisting lateral forces primarily in the flexure-beam mode. The small-scale test structures represented slender walls coupled by beams. A secondary but important objective of the experimental program was to demonstrate the consequences of flexural yielding in the wall prior to yielding of the beams.

**Major Topics:** Structural Dynamics -- Experimental Investigations

**Language:** English

**Publication Type:** Technical report | Monograph

**Call Number:** EERC: 520 O26 1976 [EERC]

**Document Numbers:**
- EERCC-000920

**Database:** COMPOSITE RECORD | EARTHQUAKE ENGINEERING ABSTRACTS | EERC LIBRARY

---

**Record 40.**

**Title:** Structural walls subjected to simulated earthquakes.

**Author:** Sozen, M. A.; Otani, S.

**Source:** Japan Earthquake Engineering Promotion Society: (Tokyo); Proceedings of the Review Meeting, U.S.-Japan Cooperative Research Program in Earthquake Engineering with Emphasis on the Safety of School Buildings, pages 118-134; 1976

**Key Terms:**
- Multistory walls » experimentation; Illinois, Univ. of, Urbana

**EEA Abstract:**

This is a progress report on recent tests at the Univ. of Illinois, Urbana, investigating the earthquake response of multistory structural walls.
Record 41.
Title: Use of linear models in design to reflect the effect of nonlinear response.
Author: Shibata, A.; Sozen, M. A.
Key Terms: Response spectra » reinforced concrete structures; Reinforced concrete structures » design; Equivalent linear models » hysteretic systems
EEA Abstract:
A method to determine design forces for earthquake-resistant design of reinforced concrete structures is described. The method, which recognizes energy dissipation in the nonlinear range of response, utilizes linear models and response spectra. The paper contains discussions of (1) equivalent linear earthquake response of single-degree-of-freedom hysteretic system, (2) description of the substitute structure method, and (3) a design example using the method.

Major Topics: Earthquake-Resistant Design -- Buildings
Publication Type: paper
Call Number: 400/R471/1975
Record ID: EEA-61000664
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 42.
Title: Substitute-structure method for seismic design in R/C.
Author: Shibata, A.; Sozen, M. A.
Source: Journal of the Structural Division, ASCE; vol. 102 Iss. ST1, pages 1-18; Jan. 1976
Notes: Proc. Paper 11824
Key Terms: Reinforced concrete structures » design; Nonlinear response; Multistory structures » design; Mathematical models » reinforced concrete structures; Frames » design
EEA Abstract:
A method is proposed to determine design forces for earthquake-resistant design of reinforced concrete structures. The method uses a modified linear model of the structure and recognizes the effect of energy dissipation in the nonlinear range of response. Thus, the designer is provided with a procedure, at the level of linear spectral response analysis, with explicit options about the levels of inelastic response in different elements of a multistory reinforced concrete structure. The paper contains analytical tests of two-story to 10-story frames designed according to the proposed method.

Major Topics: Earthquake-Resistant Design -- Buildings
Publication Type: Journal Article
Call Number: 600/A47
Record ID: EEA-61000969
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 43.
Title: Preliminary notes on structural damage caused by Guatemala earthquakes of 4 and 6 February 1976.
Author: Roesset, Jose M.; Sozen, Mete Avni 1930-
Institutional Author: National Research Council (U.S.) Panel on Earthquakes
Notes: Caption title -- "Notes based on inspection of urban construction during 8-14 Feb. 1976 for the Panel on Earthquakes, Committee on Natural Disasters of the Commission on Sociotechnical Systems, National Research Council."
Key Terms: Earthquakes
Geographical Area: Central America; Guatemala
Language: English
Publication Type: Monograph
Call Number: EERC: No call number [EERC - Reprint]
Record ID: EERC-016336
Database: EERC LIBRARY

Record 44.
Author: Sozen, Mete Avni; Matthiesen, R. B.
Institutional Author: National Research Council (U.S.) Committee on Natural Disasters
Notes:
Record 45.
Title: Strength decay of RC columns under shear reversals.
Author: Wight, J. K.; Sozen, M. A.
Source: Journal of the Structural Division, ASCE; vol. 101 Iss. ST5, pages 1053-1065; May 1975
Notes: Proc. Paper 11311
Key Terms: Reinforcement; Reinforced concrete columns » nonlinear response; Experimentation » columns
EEA Abstract:
The decay in shear strength of tied reinforced concrete columns during earthquake loading was investigated by subjecting 12 column specimens to several reversals of loading to deflections larger than the yield deflection. The principal variables of the test program were the axial load, the transverse reinforcement ratio, and the total deflection per cycle. The test specimens were able to develop the expected yield moment in the first quarter cycle and maintain that load for some inelastic deflection. However, the repetition of these deflections resulted in a decay in the strength of the member. Experimental data are used to examine the mechanism of strength decay, which is related to crushing and spalling of the shell concrete, yielding of the transverse reinforcement, and abrasive rubbing of concrete along inclined cracks. The results of this investigation indicate that the transverse reinforcement must be proportioned to carry the total shear required to develop the ultimate moment capacity of the column.
Major Topics: Structural Dynamics -- Experimental Investigations
Publication Type: Journal Article
Call Number: 600/A47
Record ID: EEA-51000678
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 46.
Title: Engineering report on the Managua earthquake of 23 December 1972.
Author: Sozen, M. A.; Matthiesen, R. B.
Key Terms: Nicaragua » seismicity; Managua, Nicaragua » earthquakes, Dec. 23, 1972
EEA Abstract:
The inspection of Managua was sponsored by the Panel on Earthquakes of the Committee on Natural Disasters. Included as an introduction and as background information is an abstract of a presentation on the seismicity of Nicaragua given in 1972 prior to the earthquake.
Major Topics: Earthquake Damage -- Specific Earthquakes
Publication Type: Other/topical paper
Record ID: EEA-610001079
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 47.
Title: Effect of strain rate on yield stress of model reinforcement.
Author: Sozen, Mete A.; Staffier, Stephen R.
Institutional Author: University of Illinois (Urbana-Champaign campus)
Series: Civil engineering studies, structural research series no. 415. UILU-ENG-75-75-2002
Notes: Report on a research project sponsored by the National Science Foundation -- Bibliography: p. 25-26
Key Terms: Reinforced concrete frames; Shear walls
Language: English
Publication Type: Monograph
Call Number: EERC: 530 S685 1975 [EERC]
Record ID: EERC-016434
Database: EERC LIBRARY

Record 48.
Title: The substitute-structure method for earthquake-resistant design of reinforced concrete frames.
Author: Shibata, A.; Sozen, M. A.
Institutional Author: University of Illinois at Urbana-Champaign. Dept. of Civil Engineering
Source: Dept. of Civil Engineering, Univ. of Illinois: (Urbana), 34 p.; 1974.
Key Terms: Reinforced concrete structures » nonlinear response; Reinforced concrete frames » design; Earthquake resistant design; Reinforced concrete construction; Structural frames
EEA Abstract: The substitute-structure method is a procedure for determining the design forces, corresponding to a given type and intensity of earthquake motion represented by the design spectrum, for a reinforced concrete structure. The objective of the method is to establish the minimum strengths the components of the structure must have so that a tolerable response displacement is not likely to be exceeded. Its central and significant feature is that it provides a simple vehicle for taking account of the inelastic response of reinforced concrete in the design of multidegree-of-freedom (1) use of linear response models for dynamic analysis, (2) choice in setting limits of tolerable response in different elements of the structure, and (3) deliberate consideration of displacements in the design process.

Major Topics: Earthquake-Resistant Design -- Buildings
Language: English
Publication Type: Technical report | Monograph
Call Number: EERC: 500 C485 no. 412 [EERC]
Record ID: EEA-41000954 | EERC-019981
Database: COMPOSITE RECORD | EARTHQUAKE ENGINEERING ABSTRACTS | EERC LIBRARY

Record 50.
Title: Simulated earthquake tests of r/c frames.
Author: Otani, S.; Sozen, M. A.
Source: Journal of the Structural Division, ASCE; vol. 100 Iss. ST3, pages 687-701; Mar. 1974
Notes: Proc. Paper 10435
Key Terms: Steel » strain hardening; Reinforcement; Reinforced concrete structures » design; Reinforced concrete frames » nonlinear response; Multistory frames » nonlinear response
EEA Abstract: The inelastic response of reinforced concrete multistory frames was investigated by subjecting small-scale, one-bay, three-story reinforced concrete frames to a series of strong base motions simulating one horizontal component of representative earthquake acceleration records. The test results were evaluated from the perspective of analytical methods routinely and economically available to a structural design office: linear dynamic response analysis and static limit analysis based on elasto-plastic response. Linear dynamic analyses provided a good qualitative understanding of the observed inelastic behavior. The observed maximum base shears and overturning moments were much higher than the values predicted by the limit analysis due to strain-hardening of the steel. It is concluded that strain-hardening characteristics of the reinforcing steel must be explicitly considered in the earthquake-resistant design of reinforced concrete structures, especially in relation to design of web reinforcement, foundations, and columns.
Major Topics: Structural Dynamics -- Experimental Investigations
Publication Type: Journal Article
Call Number: 600/A47
Record ID: EEA-41000741
Database: EARTHQUAKE ENGINEERING ABSTRACTS

Record 51.
Title: R/C column earthquake response in two dimensions.
Author: Aktan, A. E.; Pecknold, D. A.; Sozen, M. A.
Source: Journal of the Structural Division, ASCE; vol. 100 Iss. ST10, pages 1999-2015; Oct.
The earthquake responses of a spirally reinforced concrete column carrying a concentrated mass and subjected to the simultaneous action ("biaxial response") of both horizontal components of normalized 1940 El Centro, 1962 Taft, and 1971 Pacoima Dam accelerograms were studied. Two different masses, corresponding to initial elastic periods of 0.65 sec and 1.5 sec were considered. The column force-displacement characteristics were synthesized from idealized stress-strain properties for steel and confined and unconfined concrete, using a discretization of the column cross section combined with finite element techniques. Maximum displacements were significantly larger in biaxial response when the excitation was sufficiently intense in relation to the column strength to cause appreciable inelastic deformation. If planar analysis indicates inelastic response in a column resisting earthquake effects in both horizontal directions, the effects of the axial load (P - Delta effect) may be more critical and the required "ductility" may be larger than that based on planar analysis.
The work presented in this report was undertaken to investigate the mode of failure for a reinforced concrete column subjected to several reversals of loading to deflections larger than the yield deflection. A discussion of the type of failure observed during the testing of twelve column specimens is included. The discussion emphasizes the need to consider the possible reduction in shear strength of reinforced concrete members loaded to deflections which correspond to strains in the concrete compression zone leading to splitting cracks.

Major Topics: Structural Dynamics -- Deterministic Behavior of Nonlinear Structures

Key Terms: Reinforced concrete columns » nonlinear response; Mathematical models » columns; Experimentation » columns; Deflections; Cracks; Columns, Concrete; Materials

Record 56.

Title: Response of three-story reinforced concrete frames subjected to simulated earthquake motions.
Author: Otani, S.; Sozen, M. A.
Source: Rome; International Assn. for Earthquake Engineering; Preprints, Fifth World Conference on Earthquake Engineering, 4 pages; 1973

Key Terms: Reinforced concrete frames » nonlinear response; Simulated earthquakes » structural response; Multistory frames » nonlinear response

EEA Abstract:
The inelastic response of small-scale three-story one-bay reinforced concrete frames to earthquake motions was investigated through experimental and analytical studies. The test specimens withstood, without collapse, base motions with maximum accelerations approximately six times the calculated base shear coefficient corresponding to the formation of collapse mechanism. Calculated linearly elastic response was not favorable in predicting the measured maximum response. Calculated nonlinear response showed reasonable agreement with the measured response.

Major Topics: Structural Dynamics -- Deterministic Behavior of Nonlinear Structures

Publication Type: Paper

Record 57.

Title: Calculated inelastic structural response to uniaxial and biaxial earthquake motions.
Author: Pecknold, D. A. W.; Sozen, M. A.
Source: Rome; International Assn. for Earthquake Engineering; Preprints, Fifth World Conference on Earthquake Engineering, 4 pages; 1973

Key Terms: Structural displacement » interstory; Simulated earthquakes » structural response; Pacoima Dam, Los Angeles » accelerograms; Olive View Medical Center, Los Angeles; Interstory
Inelastic dynamic response analyses of the Olive View Medical Center were carried out for four different ground motions: the 1971 Pacoima Dam record scaled to two different maximum accelerations; the El Centro 1940 record; and an artificially generated earthquake. Several of the analyses included the effects of biaxial interaction due to two horizontal components of ground motion acting simultaneously. For all cases studied there was a significant increase in maximum story drifts due to biaxial interaction effects.

**Major Topics:** Structural Dynamics -- Deterministic Behavior of Nonlinear Structures

**Publication Type:** Paper

**Call Number:** 400/W66/1973

**Record ID:** EEA-31000734

**Database:** EARTHQUAKE ENGINEERING ABSTRACTS

---

A series of small-scale models of prestressed concrete reactor vessels, with and without perforations in the end slab, were loaded to failure. All vessels failed in shear. The presence of penetrations did not decrease the strength of the end slab. The behavior of the vessels is described. Using a finite element model, the stress conditions in the end slab at the failure load are evaluated. A method for calculating the shear strength of a deep slab is described. The method consists of three consecutive steps. First, calculate the load at which the inclined crack is initiated. Second, determine the shape of the load-carrying dome that is carved out inside the slab. Third, calculate and evaluate the stress conditions in the dome.

**Major Topics:** Structural Dynamics -- Experimental Investigations

**Publication Type:** Journal article

**Call Number:** EEA: QE1/N47

**Record ID:** EEA-31000908

**Database:** EARTHQUAKE ENGINEERING ABSTRACTS

---

This paper presents a description of tests and analysis of spirally reinforced columns subjected to idealized earthquake loading. The object of the investigation was to develop hysteresis curves to be used in the dynamic analysis of structures supported by "spiral" columns.

**Major Topics:** Structural Dynamics -- Experimental Investigations

**Publication Type:** Paper

**Call Number:** 400/W66/1973

**Record ID:** EEA-31000983

**Database:** EARTHQUAKE ENGINEERING ABSTRACTS

---

An 18-story reinforced concrete building, headquarters of Banco de America, Managua, Nicaragua, was subjected to very strong ground motions during the 23 Dec. 1972 Managua earthquake. The studies summarized in this paper evaluate the damage potential of the ground motion and the performance of the structure.

**Major Topics:** Earthquake Damage -- Buildings

**Publication Type:** Conference paper

**Call Number:** EEA-31001443

**Record ID:** EEA-31001443

**Database:** EARTHQUAKE ENGINEERING ABSTRACTS

---

Record 61.
Record 65.
Title: A model to simulate the response of concrete to multi-axial loading.
Author: Roy, Hedley, E. H.; Sozen, Mete Avni 1930-
Institutional Author: University of Illinois at Urbana-Champaign. Dept. of Civil Engineering
Source: Urbana: University of Illinois, 1963.; Civil engineering studies., Structural research series, no. 268; xii, 227 p., ill., 28 cm.
Key Terms: Columns, Concrete; Deformations [Mechanics]; Reinforced concrete
Language: English
Publication Type: Monograph
Call Number: EERC: 500 C485 no. 268 [EERC]
Record ID: EERC-019974
Database: EERC LIBRARY

Record 66.
Title: An experimental study of limit design in reinforced concrete flat slabs,
Author: Sozen, Mete Avni 1930-; Xanthakis, Manuel
Institutional Author: University of Illinois at Urbana-Champaign. Dept. of Civil Engineering
Source: Urbana, Ill.: University of Illinois, 1963.; Civil engineering studies., Structural research series, no. 277; x, 159 p., ill., 28 cm.
Notes: Issued also as Manuel Xanthakis' thesis (M. S.). University of Illinois -- Bibliography: p. 67-68
Key Terms: Concrete slabs; Reinforced concrete
Language: English
Publication Type: Monograph
Call Number: EERC: 500 C485 no. 277 [EERC]
Record ID: EERC-019975
Database: EERC LIBRARY

Record 67.
Title: Strength and behavior in flexure of prestressed concrete beams.
Author: Siess, Chester P.; Sozen, Mete A. 1930-; Warwaruk, Joseph
Institutional Author: University of Illinois. Engineering Experiment Station. Bulletin; . no. 464
Series: Engineering experiment station bulletin; no. 464
Notes: Bibliographical references: p. 96
Key Terms: Building materials
Language: English
Publication Type: Monograph
Call Number: EERC: 515 W284 1962 [EERC]
Record ID: EERC-018878
Database: EERC LIBRARY

Record 68.
Title: An experimental study of a flat slab floor reinforced with welded wire fabric.
Author: Jirsa, J. O.; Siess, Chester Paul 1916-; Sozen, Mete A. 1930-
Institutional Author: University of Illinois at Urbana-Champaign. Dept. of Civil Engineering
Source: Urbana, Ill.: Dept. of Civil Engineering, University of Illinois at Urbana-Champaign, 1962.; Civil engineering studies., Structural research series, no. 249; ix, 161 p., ill., 28 cm.
Notes: "June 1962." -- A report to the Reinforced Concrete Research Council, Office of the Chief of Engineers, U.S. Army... Cover -- Bibliography: p. 60
Key Terms: Concrete slabs; Reinforced concrete
Language: English
Publication Type: Monograph
Call Number: EERC: 500 C485 no. 249 [EERC]
Record ID: EERC-019976
Database: EERC LIBRARY

Record 69.
Title: The equivalent frame analysis for reinforced concrete slabs.
Author: Corley, William Gene; Siess, Chester Paul 1916-; Sozen, M. A.
Institutional Author: University of Illinois at Urbana-Champaign. Dept. of Civil Engineering;