TALL BUILDINGS AND URBAN HABITAT

ON HAZARDS OF THE HIGH-RISE

BY

LYNN S. BEEDLE

This report is based on research sponsored by the National Science Foundation, Grant No. ENV77-01578.

February 1979

Fritz Engineering Laboratory
Lehigh University
Bethlehem, PA 18015 USA

LEHIGH/FL/369--251

TABLE OF CONTENTS

Introduction

It is the purpose of this report to collect certain key documents concerning the hazard potential of tall buildings. It is prepared to accompany a slide lecture which is based upon the findings of a program at Lehigh University on tall buildings and the urban habitat. In this program a mechanism was developed to collect information to identify gaps in knowledge, to collect data of value to the designer, and to develop the means by which this data could be used in actual practice.

The organizational mechanism is the Council on Tall Buildings and Urban Habitat. The documentation is contained in its 5-volume Monograph, "The Planning and Design of Tall Buildings", the first volume of which was published in 1978 by the American Society of Civil Engineers. Mechanisms for translating the information into design use are currently in operation or are the subject of current research.

Recently in the program at Lehigh University attention has been concentrated upon the impact of tall buildings upon the urban environment and protection from natural hazards. This report is concerned with such attention.

The documentation in this report, except for the tabulation of potential hazards that appears later in the text, is in the form of appendixes to which appropriate reference is made.

The Monograph

The Monograph on the Planning and Design of Tall Buildings aims to communicate to professionals in the various fields of specialization the state-of-the-art and the most advanced knowledge about the planning, design, construction, and operation of tall buildings. It extends beyond the building itself and incorporates the role of the tall building in the urban habitat. The information is collected into five volumes. The list of volumes of the chapters is in the appendix, Schedule 12.2.

The Monograph is a treatise or a compendium of knowledge. It calls attention to the many things that must be considered in the design of a high-rise. It includes material that will be useful to those who have been involved with tall building projects in the past. The material will be essential for consideration by an otherwise experienced practitioner who might be approaching his first high-rise design.

The use of the principles described will provide more economic design consistent with needed safety, will provide buildings that more nearly meet the criteria and needs of the people who will be using them, and will result in a better urban environment.

The Monograph contains over 6000 bibliographic references. It includes over 3000 illustrations (drawings, tables, and photographs.) It also contains a list of research needs that are collected at the end of each volume.

It includes the work of more than 800 contributors. It was coordinated and edited by a small editorial committee for each of the 52 chapters that are incorporated in the five volumes. More than 1300 members of the Council on Tall Buildings and Urban Habitat were involved in the review of the various chapter drafts. As a consequence, the Monograph represents a major international effort and therefore contains many contributions from various cultures and professions.

The U.S. National Science Foundation provided the major financial support for the research and the conferences whose results led to this Monograph.

The Council on Tall Buildings and Urban Habitat, under whose auspices the Monograph has been prepared, does not take an advocacy role for tall buildings. Rather its premise is that in those situations where it is appropriate to "build tall," then the most up-to-date methodology should be used.

Great emphasis has been given in the Monograph to the systems approach and to the importance of the consideration of human factors in design -- two factors that are of overriding importance if long-term success is to be achieved in high-rise projects.

Potential Hazards

For something as solid, stable, and "safe" as the high-rise building, it may seem strange to dwell on potential hazards. And yet if these potentials are not considered in the design stage -- and anticipated as much as possible in the concept of the building itself -- then the full functional potential of this built form may not be realized.

Basically, there are two kinds of disasters: natural and man-caused. The former are primarily associated with loading. The latter are associated with man's attempt to provide shelter from (ultimately) the natural phenomena, a shelter that enables him to carry out the life and work functions.

Six categories of hazards have been identified, and they are tabulated below. In the tabulation, the particular hazard is followed by a designation of the appropriate chapter of the Monograph in which the detailed discussion may be found. In the appendix, Schedule 10B.11 provides a further comparison between disasters and tall building committees, with additional details given in the accompanying Schedule 10B.12.

1.) Hazards due to loading

Earthquake	CL-2*
Wind	CL-3
Fire	CL-4
Blast, accidental loading	CL-5
Gravity load	CL-1
Flood, rain, storm	SC-5
Landslides	SC-7
Shrinking, swelling, and subsidence of soil	SC-7

2.) Hazards in construction

Quality control of material	CL-6
Construction failures	SC-8

3.) Design Failures

Stability	CB-8, SB-4
Connections	CB-12, SB-7
Stiffness	CB-9, SB-5
Foundations	SC-7
Motion Perception	PC-13
Environmental Factors	PC-7
Mechanical and electrical systems	SC-1,2,3
Cladding, walls, partitions, floors	SC-5,6
Urban Services	PC-8,9,10,11
Architecture	PC-6
Urban Design	PC-8

* designates Monograph volume and chapter number

4.) Planning Failures

Regional planning	PC-8
Economics	PC-5
Social effects of the environment	PC-3
Systems methodology	PC-15

5.) Decision-Making Failures

Socio-political influences	PC-4
Project Management	PC-14

6.) Conceptual Failures

Philosophy of Tall Buildings	PC-1

After reviewing the list of potential hazards in tall buildings it is evident that the most important one ("concept") is listed last. As a matter of fact the entire list might be in reverse order. An error in concept can be much more serious than the failure to fully account for the most extreme wind, for example. All the same, the list has been presented in the sequence that normally comes to mind. Listed first are the forces over which man has no control.

These elemental forces of nature -- earthquake, wind, and fire -- are a part of man's earliest writings because they are part of our earliest experience. Moses is recorded in the book of Numbers (Ch. 16), for example, as calling the chosen to come out from the tents of the wicked because the "evil doers" were to be destroyed. Listen to the description:

> And as he finished speaking all these words, the ground under them split asunder; and the earth opened its mouth and swallowed them up. (v. 31,32)
>
> And fire came forth from the Lord and consumed the 250 men offering incense. (v. 35)

The vision of Isaiah (Ch. 24 and 25) is no more reassuring:

> Behold, the Lord will lay waste the earth and make it desolate, and He will burst its surface and scatter its inhabitants.

The inhabitants of earth are scorched,
and few men are left.

The city of chaos is broken down,
every house is shut up so that none
can enter.

For the windows of heaven are opened
and the foundations of the earth tremble.
The earth is utterly broken, the earth
is rent asunder. The earth is violently
shaken.

Thou hast made the city a heap.
The palace of aliens is a city no
more. It will never be rebuilt.

As a matter of fact one might well be led to abandon all hope for the city, were it not for the vision of the ultimate city given to us in the book of Revelations.

Research Needs

One of the first reports published by the Tall Building Council was its list of research needs. The preparation of the Monograph provided opportunity to update that report. The results are included in an appendix to each of the five volumes, a section being included for each of the fifty-two chapters.

The Monograph presentation is not on the basis of "failure" or "hazard", but rather the emphasis is placed on planning or design criteria that must be met in order that the structure be safe and functional. And thus it is in this context that one should review the tabulation of research needs provided in Section 11 of the appendix to this report, a tabulation in which only a selected number of chapters is included.

Rather than retype the selected "Research Needs" section of the Monograph (see Section 11 of the appendix,) sheets have been incorporated directly from the source current at this time (Feb. 1979). Volume CB is published, SB is in page proof/galley, CL is going into galley, SC is in complete manuscript form, and PC is complete except for one chapter.

... And Support

Who is going to pay for all of this research? That's an interesting question. Industry pays for some. Clients pay for some. Local and state governments pay for some. Agencies of the federal government pay for some. The next questions follow: How much is "some" and when is that "some" appropriate to each category.

Industry can be expected to support research, either external or in-house, when one of two conditions apply:

a) The results of the research may improve their competitive position relative to other materials or systems.

b) There has been a documented failure -- or a demonstrable hazard of failure if existing practice is continued.

In certain circumstances, segments of the construction industry respond to research needs that expand the pool of available knowledge, irrespective of the above two needs. However the grants (through fellowships or gifts to universities or foundations) are relatively small in comparison with the need. This is true in spite of the fact that the construction industry is the largest industry in the United States. It has not been possible to marshall sizable support for basic engineering research, partly because the industry is so fragmented.

On most unusual projects a client may pay for some research. Wind tunnel tests and motion perception studies are two examples that would apply to tall buildings of great height. In aggregate the amount of such research is modest, and the results may or may not reach the profession at large in a form that has general applicability. (It takes a major effort -- such as that which resulted in the tall building Monograph -- to achieve dissemination).

What about local and state government? Here the amount of research support is very small indeed and depends on a particular and usually isolated need or interest. There is no "construction trust fund" for building research that could compare with the "Highway Trust Fund" that provides matching federal money to the states for transportation research. Some such fund is needed.

And that leaves the federal government. Much as one would hope it might be otherwise, it is finally the federal agencies that bear the burden of supporting most of the "Research Needs" that have been cited earlier. There are three situations that provide the justification and which sometimes mean that the federal government is the only available source of funds:

a) Public safety is involved to an extent that goes beyond the ability (or requirement) of particular industries to respond.

b) There are potentials for economy that go beyond those that could appeal to the competitive instinct of an industry. It is the public at large that stands to benefit.

c) The problem is beyond the scope of any single industry or profession. Problems related to the built or man-made environment are cases in point, and the tall building as part of the urban habitat is a particular one. It is typical of a class of problems in which engineering is important but in which a complete and satisfactory solution is not possible without the full participation of other disciplines -- sometimes the arts, sometimes the humanities, but especially the social sciences.

More research support is needed of programs in these three categories. One would hope that eventually there will be a recognizable unit charged with supporting basic research in the general field "Engineering and the Man-Made Environment". It's where some of our most important problems lie.

Implementation

One of the major elements of a research project is that of implementation. The results of research cannot be allowed simply to end up in reports and books. Research findings must be utilized in design, else the effort loses its value.

The Schedules in Section 29 of the Appendix represent techniques that either have been used or are the basis of current research effort. They are briefly described in the following.

Schedule 29.1: Implementation Components

This is a tabulation of components in the implementation process. It is a collection of various mechanisms that may be used to be certain that research results find their way into practice. Some of these mechanisms have already been successfully used.

Schedule 29.4: Work Plan for Implementation into Codes or Specifications

This is the work plan for transferring new information contained in the Monograph into codes and specifications, having particularly in mind such documents as the ACI Code and the AISC Specification. Work with the latter is currently in progress.

Schedule 29.5: Work Plan for "City Thrust"

This is an outline of a suggested plan designed to establish a long-term mechanism for incorporation of "the latest information" about tall buildings into city codes, ordinances, and statutes.

Bibliography

An essential component of the implementation process is the provision of up-to-date bibliographic information. In the belief that the future requirements will involve computer search techniques, automated procedures have been stressed in the Lehigh program. Two such computer-generated bibliographies have been prepared. Current activity has as its target the development of a continuing mechanism for data base update, working with major systems such as Lockheed and SDC. A sample is included in Section 10B.13 of the appendix.

Summary

1. The hazards identified in this paper are grouped as follows: Hazards due to loading; hazards in construction; and hazards associated with design, planning, decision-making, and conceptual failures.

2. The major hazards are treated in the Monograph on Planning and Design of Tall Buildings, not as hazards per se, but as planning and design criteria that must be met.

3. Research needs (selected from the Monograph) are identified in particular areas, especially those related to hazards due to loading.

4. Suggested mechanisms for "technology transfer" are included as samples of the steps that must be taken to assure that new knowledge finds its way into practice as quickly as possible.

5. An essentially negative prospect can be transformed into a positive good for society when all of the appropriate factors pertaining to high-rise buildings are taken into account in their concept, their planning, their design, and in their management and operation.

6. The most important factors to keep in mind are these:

   a) Use the information that is already available.
   b) Consider the total system. A concept that considers only part of the building system or part of the urban system runs the risk of failure.
   c) Buildings are meant for people. Perhaps the greatest hazard of all is to neglect those factors that affect human reaction to the built environment.

Council on Tall Buildings and Urban Habitat

D. Sfintesco Chairman C.T.I.C.M. Paris
F. R. Khan Vice-Chairman Skidmore, Owings & Merrill Chicago
L. S. Beedle Director Lehigh University Bethlehem
G. W. Schulz Secretary Universitat Innsbruck Innsbruck

OBJECTIVE

The Council on Tall Buildings and Urban Habitat, an international activity sponsored by engineering, architectural, and planning professionals, was established to study and report on all aspects of the planning, design, construction, and operation of tall buildings. Such structures find application primarily as commercial and residential facilities in both industrial and developing countries. A major focus of the Council is a comprehensive MONOGRAPH on tall buildings for use by those responsible for their planning and design.

The Council is also concerned with the role of the tall buildings in the urban environment and their impact thereon. This involves a systematic study of the whole problem of providing adequate space for life and work, considering not only technological factors, but social and cultural aspects as well.

The Council is not an advocate for tall buildings per se; but in those situations in which they are viable, it seeks to encourage the use of the latest knowledge in their implementation.

NEED

The need for a comprehensive examination of all aspects of the topic is recognized throughout the world and stems from the following:

- The exploding population, generally urban, creating an increasing demand for tall buildings.
- The consequent requirement of economy in construction.
- The evident neglect of human factors in urban design at the expense of livability and quality of life.
- The considerable volume of research related to multistory buildings that is underway throughout the world—largely uncoordinated on an international scale.
- The new research required in the field, and the necessity for establishing priorities of such research.

ACTIVITIES

The major thrusts of the Council are:

- International Information Source
  Comprehensive MONOGRAPH; data base on building heights and other characteristics; bibliography; conference proceedings; planning and design data base.
- Identification and Stimulation of Needed Research
  Survey and report on current research and on future research needs; stimulate research on the most important topics.
- Utilization of Findings
  Implementation of the results of Council work; application to design practice; incorporation into codes, specifications, and standards.
- Planning and Environmental Criteria
  Improved methodology considering social effects of the environment; role of the high-rise; decision-making parameters.
- Exchange of Information
  International, regional, and local conferences with proceedings; periodic technical forums; dissemination of reports and proceedings; Newsletter.
- Approaches for Developing Countries
  Identification of unique solutions appropriate to developing nations; case studies.

ORGANIZATION

The professional society sponsors are:

International Association for Bridge and Structural Engineering (IABSE)
American Society of Civil Engineers (ASCE)
American Institute of Architects (AIA)
American Institute of Planners (AIP)
International Federation for Housing and Planning (IFHP)
International Union of Architects (UIA)

Prior to 1977, the Council on Tall Buildings and Urban Habitat was known as the "Joint Committee on Tall Buildings," a group originally formed by ASCE and IABSE in 1969. In 1973, as a result of the increased emphasis on planning and environmental criteria, AIA AIP, International Federation for Housing and Planning (IFHP) and the International Union of Architects (UIA) were invited to join the forming organizations as equal participants.

From the beginning, strong liaison ties were established with AIA, AIP, CIB, CEB, ECCS, FIP, HUD, NAE, NBS, Gosstroy, and the Chicago Committee on Hi-Rise Buildings.

In 1974 the Council was admitted as a consulting non-governmental organization to United Nations' UNESCO under category C.

The Steering Group is the "Board" of the Council. An Executive Committee carries out the policy of the Steering Group. Officers are a Chairman, Vice-Chairman, Director, and Secretary. The Headquarters are located at Lehigh University, Bethlehem, Penna., U.S.A.

The major activities of the Council are carried out within five groups as follows:

Planning and Environmental Criteria for Tall Buildings
Tall Building Systems and Concepts
Tall Building Criteria and Loading
Structural Design of Tall Steel Buildings
Structural Design of Tall Concrete and Masonry Buildings

Each group is composed of topical committees. The officers of each group include group coordinators and group editors as indicated on the following pages. Within each group are specialty committees appropriate to the topic. Officers of a committee include a chairman, vice chairman and editor(s). Some committees are also divided into sub-committees (A, B, etc.). In such committees, additional officers are appointed to facilitate the major output, the MONOGRAPH.

Direct financial support is by the National Science Foundation and the American Iron and Steel Institute. Additional sponsors include Skidmore, Owings and Merrill, International Business Machines Corporation and the Architectural Institute of Japan.

LIAISON ORGANIZATIONS AND NATIONAL REPRESENTATION

Liaison organizations represented on the Council include (1) the founding, organizing, and sponsoring groups; (2) organizations that have their base in the major cities; (3) international organizations; (4) state and regional organizations; (5) professional societies; (6) government organizations; and (7) representatives of owner, developer, financial, and user interests. The liaison relationship assists in eliminating duplication of effort.

Committees on the national and local level afford opportunity both for liaison, for exchange of information, and for implementation of topics of unique concern to them.

MEMBERSHIP

Membership of the Council includes those who participate actively as a member of a committee, group, or other category. Currently there are over 1,200 members from more than 70 countries, 500 cities and 1,000 organizations. The Council membership represents a wide spectrum of professional specialization.

MONOGRAPH

The original focus around which the Council was organized is the MONOGRAPH. It is not only a treatise on the subject of tall buildings, but it also constitutes a mechanism for international exchange, cooperation, and progress.

Subject areas of the MONOGRAPH are arranged into five volumes that correspond to the group titles listed earlier. They cover environmental aspects, including philosophy, architecture, social and political aspects, transportation and other planning aspects; service systems, structural systems; the various loading systems; structural safety, foundations, and structural design methods and limit states—the latter covering both steel and concrete buildings.

Publication is by ASCE. The first of the series is due in early 1978.

CURRENT INFORMATION SYSTEMS AND DATA BASES

Name of Data Base	Operational Mode	Subject Areas (Data Base Contents)	Services Provided	Affiliation
DIALOG-Lockheed Information Systems	on-line, interactive	.Scientific and Technical Data Bases# .Educational, Psychological, Sociological Business Data Bases#	.Current Awareness .Cumulative Search	Lockheed Information Systems Division
LITE (Legal Information Through Electronics)	on-line, interactive	.Military Law and regulations .Military Codes, etc.	.on-line, interactive search for the Armed Forces	U.S. Department of Defense
ORBIT-System Development Corporation	on-line, interactive	.Science and Technology* .Social Science* .Business*	.Current Awareness .Cumulative Search	Systems Development Corporation
MEDLINE	on-line, interactive	.Current Medical Literature	.Current Awareness .Cumulative Search	National Library of Medicine
ASIAC-U.S. Air Force	on-line, interactive	.Structural Dynamics .Structural Mechanics .Structural Stability	.Current Awareness .Cumulative Search	U.S.Air Force Flight Dynamics Laboratory, W-P AFB, Ohio
SPINES-Data Exchange System on Science and Technology	on-line, interactive	.Architecture .Urban Planning .Urban Sociology .Urban Transportation	.At present, the Data Base is in development stage	UNESCO-Paris (United Nations)

*Under these general groups there are several data bases such as CHEMDEX, COMPENDEX, ENERGYLINE, ISMEC, LABERDOC, NTIS, MANAGEMENT, etc., etc.

Under these categories there are several data bases such as CHEMABSTRACT, COMPENDEX, INSPEC, SCISEARCH, BIOSIS, SOCIAL SCIENCE CITATION INDEX, etc.

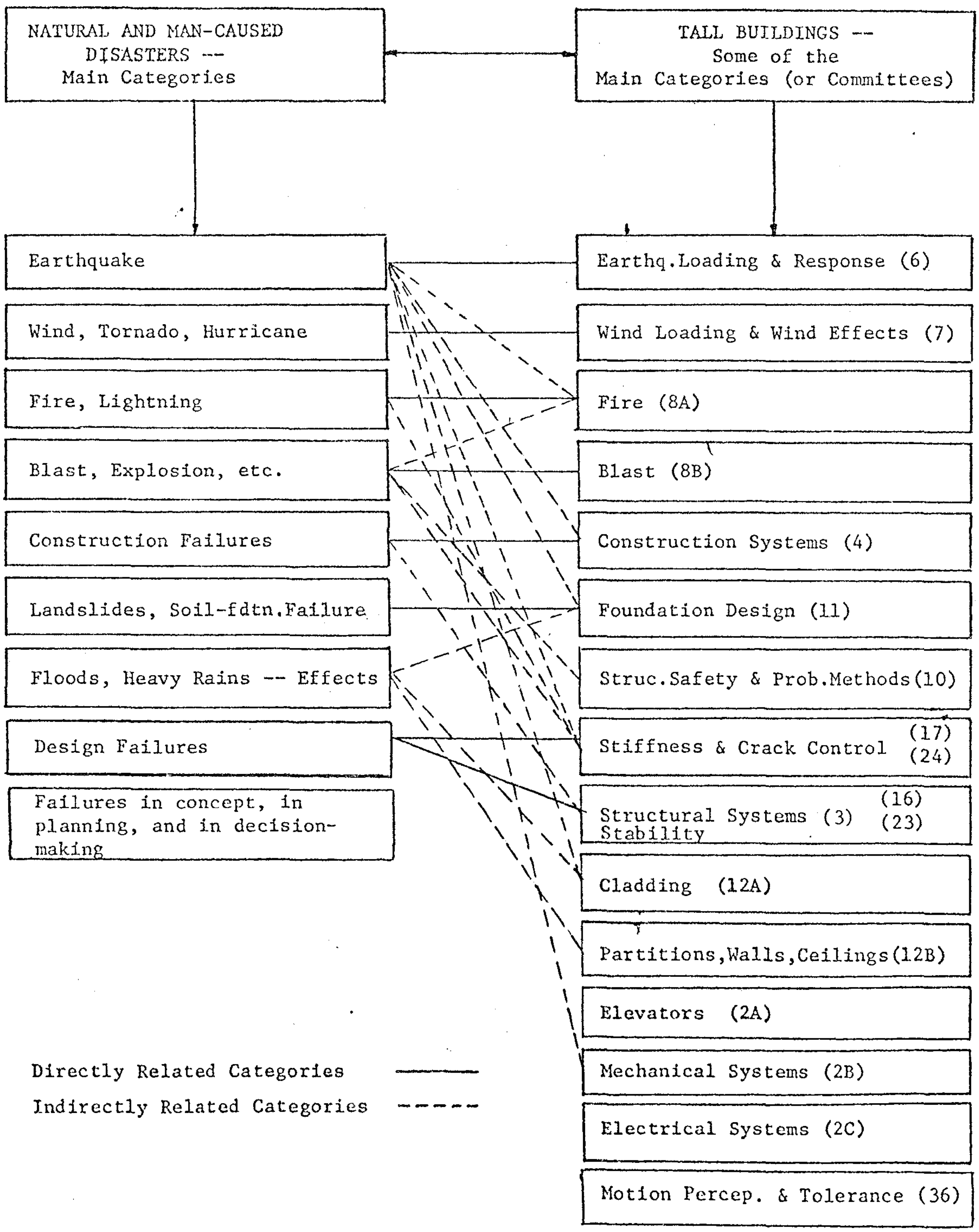
Name of Data Base	Operational Mode	Subject Areas (Data Base Contents)	Services Provided	Affiliation
STORE (Structures Oriented Retrievable Exchange)	on-line, interactive	.Computer program library on structural mechanics	.User oriented, interactive computer programs for sophisticated analysis	U.S. Navy, Office of Naval [illegible]
NTIS (National Technical Information Service)	on-line, interactive	.Uses DIALOG and ORBIT systems and also NTIS Data Base to search technical, scientific, etc., Data Bases	.They do the document search and retrieval on request	U.S. Department of Commerce
EPIC		.Damaged structures		(Mike Salgo?)
ACOMPLIS (A computerized London information service)	off-line (?)	.On all aspects of urban planning and management (predominantly British in contents, but includes American and European references)	.Retrospective search .Keyword Index out of context	Greater London Council Research Library
ARKISYST (A world-wide information system in architecture and planning	on-line, interactive	.Architecture .Urban Planning .Urban Sociology .Urban Transportation	(At the feasibility stage)	UNESCO, UIA and Spanish Government
NISEE-National Information Service on Earthquake Engineering	mainly a library service	.On all aspects of earthquake engineering and related fields	.Abstract journ. .Loan by mail .Reference .Literature searches .Computer program search	University of California-Berkeley, Nat[illegible] Science Foundat[illegible]

Name of Data Base	Operational Mode	Subject Areas (Data Base Contents)	Services Provided	Affiliation
WELDASERCH INFORMATION SERVICE	on-line (through DIALOG-Lockheed)	.worldwide listing of references on welding, metallurgy and related fields	.Retrospective search .Abstract service .Bibliographies .Current Awareness service	American Welding Society, Welding Research Council and Welding Institute (in England)
SSIE-Smithsonian Information Exchange	on-line (through SDC Search Service)	on-going research: .Agricultural Sciences .Behavioral Sciences .Medical Sciences .Social Sciences .Physical and Engineering Sciences	.File searches .Bibliographies	Smithsonian Institute
SCISEARCH	on-line (through DIALOG-Lockheed)	.Physical and Life Sciences		Institute of Scientific Information

INTERACTION DIAGRAM

FOR

DISASTER CATEGORIES AND TALL BUILDING TOPICAL AREAS*



*See Schedule 10B.12 for details.

15

TABLE FOR DISASTER DATA BASE
SUB-CATEGORIES AND TALL BUILDING CATEGORIES

EARTHQUAKE	
Natural and Man-Made Disasters Subcategories	Tall Building Main Categories) (or committees)
A. Code requirements: earthquake risk	Earthquake Loading and Response (6) Structural Safety and Probabilistic Methods (10) Commentary on Structural Standards (13,20)
B. Soil-foundation effects in earthquakes	Earthquake Loading and Response (6) Foundation Design (11)
C. Ground motion and measurement	Earthquake Loading and Response (6)
D. Dynamic response	Earthquake Loading and Response (6) Gravity Loads and Temperature Effects (5) Design Methods Based on Stiffness (17) Stiffness and Crack Control (24) Cladding (12A) Motion Perception and Tolerance (36)
E. Field observations	Earthquake Loading and Response (6)
F. Analysis and design	Earthquake Loading and Response (6) Load Factor (Limit States) Design (19) Limit States Design (26) Structural Systems (3) Selection of Structural Systems (21A) Gravity Loads and Temperature Effects (5) Quality Criteria (9)
G. Damage evaluation and repair	Earthquake Loading and Response (6)
H. Economic and social consequences	Earthquake Loading and Response (6)
I. Human behavior in disaster	Fire (8A) Earthquake Loading and Response (6)

WIND	
Natural and Man-Made Disasters Subcategories	Tall Building Committees (or categories)
A. Code requirements: risk	Wind Loading and Wind Effects (7) Structural Safety and Probabilistic Methods (10) Commentary on Structural Standards (13,20)
B. Wind tunnel modeling	Wind Loading and Wind Effects (7)
C. Meteorological factors	Wind Loading and Wind Effects (7)
D. Damage evaluation and repair	Wind Loading and Wind Effects (7)
E. Dynamic response	Gravity Loads and Temperature Effects (5) Wind Loading and Wind Effects (7) Design Methods Based on Stiffness (17,24) Motion Perception and Tolerance (36)
F. Analysis and design	Wind Loading and Wind Effects (7) Load Factor (Limit States) Design (19,26) Structural Systems (3,21A) Quality Criteria (9)
G. Wind loading mechanisms	Wind Loading and Wind Effects (7)

17

FIRE	
Natural and Man-Made Disasters Subcategories	Tall Building Committees (or categories)
A. Code requirements: philosophy of risk	Fire (8A) Structural Safety and Probabilistic Methods (10) Commentary on Structural Standards (13,20)
B. Structural behavior	Gravity Loads and Temperature Effects (5) Load Factor (Limit States) Design (19,26) Structural Systems (3,21A) Quality Criteria (9)
C. Damage and repair; structural protection	Fire (8A) Cladding (12A)
D. Non-structural aspects	Fire (8A)
E. Design-architectural	Fire (8A) Architectural-Structural Interaction (12)
F. Economic, social consequences	Fire (8A)
G. Panic behavior	Fire (8A)

BLAST	
Natural and Man-Made Disaster Subcategories	Tall Building Committees (or categories)
A. Code requirements: risk	Blast (8B) Structural Safety and Probabilisitc Methods (10) Commentary on Structural Standards (13,20)
B. Loadings; structural behavior	Blast (8B) Load Factor (Limit States) Design (19,26) Structural Systems (3,21A) Gravity Loads and Temperature Effects (5) Quality Criteria (9)
C. Structural details	Blast (8B) Cladding (12A)
D. Damage evaluation and repair	Blast (8B)
E. Economic, social consequences	Blast (8B)
F. Panic behavior	Fire (8A)

LANDSLIDES	
Natural and Man-Made Disasters Subcategories	Tall Building Committees (or categories)
A. Code requirements	Commentary on Structural Standards (13,20) Structural Safety and Probabilistic Methods (10)
B. Soil-Foundation effects	Foundation Design (11)
C. Structural effects; analysis and design	Structural Systems (3,21A) Foundation Design (11) Limit States Design (19,26)

20

FLOOD AND STORM	
Natural and Man-Made Disasters Subcategories	Tall Building Committees (or categories)
A. Code requirements	Commentary on Structural Standards (13,20) Structural Safety and Probabilistic Methods (10)
B. Soil-foundation effects	Foundation Design (11)
C. Loads	Gravity Loads and Temperature Effects (5) Wind Loading and Wind Effects (7) Cladding (12A)

S.D.C. CITATIONS

P0111548

```
************************************************************************
*                                                                      *
*        THIS IS AN OFF-LINE CITATION LIST GENERATED BY                *
*                                                                      *
*                            _ORBIT__IV                                *
*                                                                      *
*              S.D.C.'S INTERNATIONAL SEARCH SERVICE                   *
*                                                                      *
*                                                                      *
************************************************************************
```

TALL BUILDING DISASTERS

NUMBER OF CITATIONS PRINTED = 26 OCTOBER 30, 1978

THIS SEARCH WAS PERFORMED ON COMPENDEX EI 1978

REQUESTED BY
BEEDLE

PLEASE SEND THIS LISTING TO

SHARON SIEGLER
MART SCIENCE AND ENGINEERING LIBRARY, BLDG. 8, LEHIGH UNIVERSITY
BETHLEHEM, PA. 18015

22

TALL BUILDING DISASTERS

-1-
AN - 76-050772
TI - ON THE WIND FLOW AROUND A TALL BUILDING.
AU - Ishizaki, Hatsuo; Yoshikawa, Yuzo
SO - Disaster Prev Res Inst Kyoto Univ Bull v 25 pt 2-3 Sep 1975 p 27-35
JC - DPKBAN
CC - 402; 408; 443; 651
IT - BUILDINGS--Wind Effects
XR - AERODYNAMICS
ST - TALL BUILDINGS
AB - Local strong wind in the vicinity of the tall building is a serious problem for pedestrians and adjacent structures. The paper describes measurements of wind speeds on the plaza of an existing tall building, Kobe Shoko Boeki Center Building. The results of the observations are presented, along with conclusions on the characteristics of such flow. 10 refs.

-2-
AN - 76-036534
TI - RESPONSE TO STOCHASTIC WIND OF N-DEGREE TALL BUILDINGS.
AU - Saul, William E.; Jayachandran, P.; Peyrot, Alain H.
OS - UNIV OF WIS, MADISON
SO - ASCE J Struct Div v 102 n 5 May 1976 p 1059-1075
JC - JSDEAG
CC - 402; 408; 443; 723; 931
IT - BUILDINGS--Wind Stresses
XR - STRUCTURAL DESIGN--Wind Effects; STRUCTURAL ANALYSIS--Computer Applications; COMPUTER SIMULATION
ST - TALL BUILDINGS; WIND FORCES; DYNAMIC LOADS; STOCHASTIC PROCESSES
AB - Herein, wind is modeled as a planar multivariate stochastic process whose temporal and spatial correlation structure is specified from measured wind data. Wind forces are simulated in the time domain at specified floor levels of a tall building on the digital computer. The tall building is modeled as a planar multidegree-of-freedom system and its dynamic response to wind samples are obtained to yield displacement, velocity, acceleration, and rate of change of acceleration time histories. Response calculation by superposition of a finite number of normal modes illustrates participation of each and the effect of damping on each. The contribution of higher modes to the response is suggested to be significant for serviceability and human comfort. Even though strength and stability criteria are sufficiently calculable by the fundamental mode, the higher response parameters such as acceleration and the rate of change of acceleration have significant contributions from the higher modes and could be important factors in the assessment of human awareness levels and serviceability criteria. 15 refs.

Research Needs

Vol. PC - PLANNING AND ENVIRONMENTAL CRITERIA

Com. 31. URBAN PLANNING

1. Are new towns an alternative to more tall buildings? What is the role of high-rise structures in new towns?

2. What is the relationship between optimum suburban land use and tall buildings?

3. To what extent and to what height can tall buildings be used in metropolitan regions for manufacturing function formerly associated with single-story plants?

4. What are the guidelines for the incorporation of "amenities" within, adjacent to, or in the vicinity of tall buildings?

5. How can we optimize the esthetics of cities through the planning of tall buildings?

Vol. PC - PLANNING AND ENVIRONMENTAL CRITERIA

Com. 37. SOCIAL EFFECTS OF THE ENVIRONMENT

1. Why don't some people like to live in tall buildings?

2. Is aggressiveness in cities caused by crowding in tall buildings?

3. How human beings use buildings and are affected by them.

4. Investigate the difference in the symbolism of tall buildings to the average or poor in various cultures with reference to social polarization, job and housing opportunity, equality of accomodations for equals. What are the socio-political reasons for the different attitudes?

5. Is living-working-shopping within the same building a positive or negative factor on social behavior of the occupants?

6. Impact-visual, social, economic, physical, environmental.

7. Investigation of various rules regarding the relation between the height of the buildings and their spacing, and this for every environmental factor.

8. Identifying projects - those seeking to define the age, family structure, socio economic status, rental/purchase payments (preferably related to some index i.e. average weekly or monthly earnings) in relation to standard and type of accomodation (public authority, private development, rehousing projects and so on).

9. Attitudinal projects - seeking consumer response from the people and groups housed to the physical environment provided. Such projects should encourage consumers to articulate needs and preferences, firmly relating them to socio economic criteria, experience and national or local preferences. Participatory research should be encouraged and aspects of consumer involvement in management could be included.

10. Management - though not specifically a matter of design, limited available evidence indicates that design intentions can be radically affected by management policies (eligibility, rental policies, maintenance of buildings, ancilliary facilities, involvement or otherwise of tenants). These factors are particularly relevant for public authority tenants but co-operative arrangements between purchasers and various management techniques used are also relevant.

11. Behavioral - there is a constant concern that tall buildings by their very nature can act to modify social and cultural responses of residents. Difficulties arise with research projects in this area because they tend to ignore the socio-political factors operating. Consequently there is a need for careful psychological investigations which are assessed within the context.

12. Environmental - two aspects need to be considered (a) tall buildings in relation to the overall environment of cities or districts (b) tall buildings in relation to their immediate vertical and horizontal environment. Once again these aspects need to be assessed within the socio-political context of differing cultures.

Vol. SC - TALL BUILDING SYSTEMS AND CONCEPTS

Com. 4. CONSTRUCTION

1. How to move construction workers and equipment within a tall building during the construction process.

2. Difference in construction techniques depending on story height (can this be cataloged for various ranges of story heights? Note influence of industrialization).

3. Effect of past failures on improved construction techniques.

4. Support of adjacent work during installation of large foundations.

5. Protection of the public at work site.

6. How to incorporate prefabricated systems into tall building construction?

7. Is there a way to design for demolition?

8. Methods to eliminate annoying floor vibrations. Devices or techniques are needed which can be used at the time of construction or after the structure is occupied.

9. How to speed up construction time. In the field of reinforced concrete, one floor per week seems about "standard" for industrialized countries, but for many others--and even some fairly advanced countries--it can take up to three weeks per floor.

10. Evaluation of workmanship in the field.

11. During mixing, what technique is available to determine how strong concrete will be after it is in place.

12. Compile information concerning actual straightness of columns after erection.

13. What is the effect on mechanical properties of reinforced concrete and prestressed concrete as a result of fire.

14. More information and research into the fire rating of bare steel members as part of a structural system.

Vol. SC - SYSTEMS AND CONCEPTS

Com. 11. FOUNDATION DESIGN

1. How does the interaction of the building with its foundation influence its design - especially under lateral load?

2. What is consistent foundation safety as compared with the superstructure safety - from standpoint of deformation - from standpoint of rupture?

3. Lateral load criteria on earth retaining structures.

4. Pressure distribution at the base of tall building foundation.

5. Soil structure interaction - static and dynamic forces.

6. Mechanism of interaction of piles with soil.

7. How does the nonuniform settlement of foundation influence the superstructure?

8. Concrete plates on soft soil for bearing of heavy load.

9. Differential settlement (or lack of it) when low-rise buildings adjoin high-rise buildings.

Vol. CL - TALL BUILDING CRITERIA AND LOADING

Com. 6. EARTHQUAKE LOADING AND RESPONSE

1. What is the existing earthquake disaster potential in major cities in seismic regions?

2. What are relative merits of different structural systems with regard to earthquake loading?

3. What field observations should be made and how have past measurements influenced earthquake resistant design?

4. Installation of strong motion recorders to obtain world-wide earthquake properties.

5. Development of improved strong motion instruments, such as magnetic type analog or digital systems, which can be coupled directly into computer systems.

6. Installation of strong motion instruments in different soil systems, including measurement of motions at different depths.

7. Development of methods for characterizing nonlinear soil properties as required for mathematical modeling.

8. Development of nonlinear finite element soil response analysis procedure.

9. Dynamic, cyclic, and nonlinear tests of structural components.

10. Dynamic, cyclic, and nonlinear tests of large-scale complete building structures.

11. Field tests of typical structures of all types in the elastic range and correlation with analytical results.

12. Development of modeling techniques to represent nonlinear structural performance at small scale.

13. Develop means of prescribing the seismic input to the building in terms of energy or ductility requirements as well as strength and stiffness limits.

14. Effect of earthquake on nonstructural aspects of design.

15. Detailed studies of buildings of all types damaged by earthquake, including damage range from slight to total.

16. Develop techniques for minimizing damage to nonstructural components.

17. Develop guidelines for design which provide for low-cost repairs after major earthquakes.

18. Develop guidelines for design which minimizes the life hazard in case of a very severe earthquake.

19. Nonlinear analysis of tall concrete framed structures subjected to earthquake loading.

20. In-plane effects to floor slabs near openings and discontinuities.

21. Progressive collapse and earthquake resistant design of high-rise masonry and precast concrete bearing wall buildings.

Vol. CL - TALL BUILDING CRITERIA AND LOADING

Com. 7. WIND LOADING AND WIND EFFECTS

1. What is the response mode of different structural configurations to wind loading, and what is the mechanism that leads to the response?

2. Usefulness of wind tunnel data as compared with field observations.

3. Effect of wind on mechanical exhausts and inlets, also on street level ventilation.

4. Design criteria for flying debris.

5. Human response criteria for the wind climate in pedestrian areas. (Acceptability of wind conditions as affected by physiological variations, age, temperature, and gustiness; trade-off with ventilation needed in hot countries and to alleviate pollution.)

6. Deflection criteria for response to lateral loads.

7. The behavior of columns under combined biaxial static and dynamic bending and axial forces due to wind and gravity load.

8. For what wind levels should a tall building be designed?

9. What are the factors that should be considered and how can these factors be treated in wind loading analysis: wind velocity, surface roughness of the surrounding environment, the effect of adjacent buildings, the structural shape of the building itself.

10. Performance of full scale wind and response (stress) measurements on tower like structures and tall buildings in order to check and verify theoretical methods.

11. Minimum acceptable levels of wind-induced motion/acceleration for tall buildings.

12. Analysis of long-time meteorological wind speed records (e.g. records exactness - records in relation to the real speeds, mean speeds of the various time periods, influence of wind directions).

13. Design criteria to prevent occupant discomfort in high winds. Available data are insufficient on the levels of velocity, acceleration and jerk which are preceptible. Little information is available on the cost to an owner of occupant discomfort.

14. Noise (aerodynamic squeaking connections) during high winds.

15. As far as wind is concerned, what about the "space in between"?

16. A better definition is needed of the schemes for the deflection or alleviating of gusts at street level.

17. Design criteria for tornado, hurricane, and typhoon forces.

18. Interference effects of tall buildings on each other.

19. Combined wind and temperature effects.

20. Response of glass to wind loading.

21. Significance of the stack effect on glass and cladding loads.

22. The optimum design of structure in combined high wind, high earthquake-prone regions.

Vol. CL - TALL BUILDING CRITERIA AND LOADING

Com. 8A - FIRE

1. Improved methods of protecting personnel during fire.

2. Techniques for interrupting "stack effect" in very tall buildings.

3. Incorporation of improved fire detection systems.

4. How does the actual fire development in building influence the structural protection requirements?

5. Physiological reaction to smoke, toxic gasses, and high temperatures; psychological reactions (panic) of humans to such events.

6. Determine the extent of structural damage which can reasonably be admitted in case of fire with regard to the possibilities of repair and to the serviceability after fire (for steel and reinforced concrete).

7. How can earlier fire detection and control be achieved?

8. Mechanism of smoke movement in a tall building.

9. How to increase speed of communication with fire department upon the detection of a fire situation.

10. How can one minimize the damage due to fire initiated during earthquake, flood, or hurricane?

11. Protection of people in adjoining areas and adjoining properties.

12. Standardization, reliability research, and new improved emergency power plant provisions.

13. What fire safety features are necessary for various occupancies rather than prohibiting any particular occupancy?

14. A logical and scientific method of utilizing the building's domestic water system should be developed to supply the building's sprinkler system.

15. Methods of insuring positive protection and reliability of elevators should be developed to allow their use as legal exits in emergencies.

16. The Systems Approach to fire safety should be developed for use as a legitimate substitute for present specification type legal requirements.

17. Facilitate the action of firemen fighting fire inside tall buildings and to control idle spectators and the curious.

Vol. SB - STRUCTURAL DESIGN OF TALL STEEL BUILDINGS

Com. 16 - STABILITY

1. What are the major stability problems that are unique to tall steel buildings?

2. What more effective techniques can be devised for accomodating the "effective length" problem?

3. What constitutes bracing?

4. What is the interaction of columns and bents when some are underloaded and others are fully loaded?

5. Instability of columns and beam-columns associated with the use of heavy shapes and high-strength steels. Also, instability effects caused by thermal loading.

6. Buckling failure of biaxially loaded beam-column systems under gravity loads.

7. Instability failure of three-dimensional building systems under combined gravity and lateral loading, including instability effects caused by the $P\Delta$ moment.

8. Stability problems of novel structural systems (tube system or tube-in-tube system and staggered truss systems).

9. Stability of structures under dynamic and repeated loading.

10. A practical, economical method for the design of columns is an urgent need. There is dissatisfaction with the effective length concept for the design of columns in unbraced frames, and there is reluctance to use the full-scale second-order analysis techniques that are available.

11. Sensitivity of tall framed structures to imperfections.

Vol. SB - STRUCTURAL DESIGN OF TALL STEEL BUILDINGS

Com. 17 - STIFFNESS

1. What are the design criteria needed to prevent undue floor vibrations?

2. What are the human response factors to lateral motion? How can these factors be incorporated into design? Acceleration-frequency effect on comfort requirement.

3. How can the stiffening effects of the cladding be quantified?

4. How does one optimize the stiffness of a tall building with respect to its strength?

5. Develop expressions for "distribution of masses" for determining the allowable statical deformation.

6. Behavior of connections with respect to strength and deformation capacity.

7. What is the influence of building movement on the endurance of structural elements (fatigue, wear, etc.)?

8. Motion studies on existing structures; comparison with theory.

9. What are the interaction effects of frames, membranes, and bracings?

10. What is the tolerable lateral deflection limit under static and dynamic loads?

11. Theoretical prediction of the damping characteristics of structural elements and assemblages.

12. What is the seismic resistance of combined systems of steel and reinforced concrete?

13. What are the seismic damping influences of various curtain walls, partitions, stairwells, partial structural walls?

14. What is the seismic resistance of various existing structural systems?

Vol. SB - STRUCTURAL DESIGN OF TALL STEEL BUILDINGS

Com. 18 - FATIGUE AND FRACTURE

1. When does wind loading require a consideration of fatigue?

2. When is fracture a design criterion in tall steel buildings? What special precautions are necessary during construction in very cold temperature prior to cladding? What about exposed steel?

3. Develop design criteria for fracture.

4. When is inspection for fatigue or fracture, or both, necessary?

5. Low-cycle and high-cycle fatigue of T-type fillet welds in repeated out-of-place bending.

6. Fatigue of partial and full composite continuous beams.

7. Develop realistic design criteria for fatigue of building structure.

Vol. CB - STRUCTURAL DESIGN OF TALL CONCRETE AND MASONRY BUILDINGS

Com. 23 - STABILITY

1. Development of methods of second-order analysis suitable for design office use.

2. Development of methods for column design in frames that have been analyzed using a second-order analysis.

3. Clarification of the role of the effective length factor in the design of beam columns.

4. Development of practical methods of considering sustained load effects in the design of columns and frames.

5. Analysis of the capacity of slender walls with low tension strength (such as masonry, or lightly reinforced concrete).

6. Procedures for evaluating the effect of foundation deformations on frame stability.

7. Procedures for evaluating the effect of joints in precast construction on the over-all structural stability.

Vol. CB - STRUCTURAL DESIGN OF TALL CONCRETE AND MASONRY BUILDINGS

Com. 24 - STIFFNESS, DEFLECTIONS, AND CRACKING

1. What are realistic drift limits for various types of occupancy and various types of construction?

2. What are the effects of displacements (permanent and recoverable) on the integrity of the structure?

3. Development of stiffnesses (EI values, for example) that reflect cracking, reinforcement ratio, and other factors, and yet are sufficiently simple for use in the analysis of large frameworks.

4. What are realistic crack widths?

5. What mechanisms are available to control cracking?

6. Methods of calculation and limitation of cracking caused by thermal and shrinkage effects.

7. Studies of expansion, construction and control joints in tall building structures.

The Monograph and its Chapters

IMPLEMENTATION COMPONENTS

(A list of possible ways in which the work of the Tall Buildings Council and its findings can find their way into actual practice)

1. High-Rise Committees. Formed in the major cities, usually on an ad hoc basis; representation of engineers, architects, planners, city officials such as building commissioners, material interests; exchange information; stimulate research; promote utilization; evaluation.

2. Specialized Documents. Preparation of abstracts of Monograph and other Proceedings of conferences in own region that will provide material directly oriented to the various decision-maker categories (developers, investors, building officials, city planners).

3. National Tall Building Committees. These can be established by a country to carry out this implementation phase. In many cases there are existing "editorial committees" that can act in this role. Keep contact with the Tall Buildings Council.

4. Identify Data Base. In some cases this has already started with the establishment of "tall building libraries". Can be expanded to interact with regional computerized tape networks.

5. Professional Societies. In their usual role they can arrange lectures and conferences on topics of local and current interest. Stimulate contact and exchanges and interaction with and among the professionals.

6. Organized Citizens Groups. In may regions there are established groups that can exercise considerable influence. Ways should be found to work with them. They are a key "decision-maker". Education. Provide access to information.

7. Visiting Specialists. Groups may want to take advantage of contacts with the Tall Buildings Council by inviting specialists from other parts of the world to visit and lecture. By the same token, a given country can arrange to support its people to attend conferences in other parts of the world.

8. Stimulate Instructional Programs. New or expanded instructional programs are sometimes useful. They can act to arouse student interest.

9. The Media. Ways should be found to work with radio, television, and press to facilitate the reporting of factual information and progress.

10. Promote Development of Urban Plans. Flexibility. Consider high-rise; transportation; urban services. Provides a focus for items 1 and 3. Impact plans.

11. Workshops/Symposia. Identify problems. Organize sessions to feature those problems with preprints. Follow-up actions (see items 1 and 3).

Work Plan for Code and Specification Implementation

A. Identification

1. Review of plans with the Implementation Committee of the Council (Chairman, Dr. Fazlur R. Khan)

2. Identify codes and specifications to be targeted for implementation.

3. Review and refine the "highlights" of the Monograph having in mind the particular model code or specification group which has been targeted.

4. Contact with Highrise Committees.

B. Contact/Information

5. Contact the particular code or specification group(s) identified in the prior steps.

6. Advise the particular code group of what is in the Monograph, of pertinence to their scope.

7. Arrange initial meeting to set the stage for the later work. Participants should include:

    a. Responsible specification officials

    b. Representatives of the appropriate Tall Building Council groups and committees

    c. Headquarters staff representatives

    d. Implementation Committee representatives

    e. Sponsor representatives

8. Compare the Monograph with the selected code/specification. An example of such a comparison is that developed by the Structural Stability Research Council (Yen, B. T. et al., 1969).

C. Develop Proposed Revisions

9. Further identify specific areas of the code/specification for possible revision.

10. Arrange with code or specification group to form advisory committees of their own personnel to develop changes. Supplement this group with representatives from the appropriate committees of the Tall Building Council and of project personnel, where appropriate.

11. Follow the procedures of the code or specification group in the processing of changes.

D. Implementation

12. Participation in the work of the advisory committee as it presents proposed revisions at the appropriate technical society and professional meetings.

13. Adoption in specifications of the particular jurisdiction.

14. "Announcement" Conferences or other methods to explain the new provisions and to give their background.

E. Feedback

15. As a result of the code review, there will certainly be areas where revisions should be made to the Monograph. These should be identified.

16. Also as a result of the code review, needed research should be identified and incorporated into JC-5.

17. Evaluate the process. Identify those mechanisms that work and those that do not.

CITY THRUST: DETAILS

Objective: Hold workshops leading to the formation of local high-rise committees and other organizational components to implement Tall Buildings Council findings in cities.

1. Selection of Cities

   A. Identification of Cities

   Objective: Develop a list of cities that seem to be most desirable to contact.

   1. Identify characteristics that would serve as criteria in the selection of subject cities.

   2. Make a list of possible cities.

   3. Discussions with sponsor and Advisory Committee 29 of the Tall Buildings Council.

   4. Develop "agenda" for contacts with city people.

   5. Request information from Council contacts in U.S. cities on the existence of potential organizational base in their cities and the suitability of their cities to implementation activity.

   B. Preliminary Contacts with Cities

   An exploration, in part, as to whether the target cities (Step A) were the right choices. It involves contact with the Tall Buildings Council people in the cities.

   6. Develop interview questions for Council contacts in the cities.

   7. Interview these contacts in the cities.

   8. Evaluate preliminary information.

   C. Decision on Selection

   9. Develop recommendations.

   10. Present to Advisory Committee and sponsor.

   11. Final decision on cities to include in the study.

2. Identify Resources

Objective: Identify the key people and organizations who recognize the need for implementation programs and have a potential interest in initiating activity in their communities. Survey them to determine resources and high-rise problem areas.

A. Develop interview questions and an agenda for preliminary meetings.

B. Visit city for the purpose of meeting with Tall Building Council contacts to develop specific approaches to key influentials.

C. Meet with key influentials to explain the need for local high-rise committee and other organizational base. Initiate discussion on workshop plans.

1. Identify key people and organizations.
2. Elicit support and encouragement for their conduct of the workshop.
3. Determine financial support mode.
4. Investigate other sources to develop list of additional participants.

D. Conduct surveys.

5. Develop survey questions.
6. Finalize list of people to be surveyed.
7. Utilize Council contacts and key influentials to open the way to interviewees.
8. Conduct survey interviews for the purpose of learning about the locale and identifying problems and priority of needs for each city on questions of high-rise and urban development.

E. Organize, analyze and evaluate data.

9. Review list of active people.
10. Review and refine list of problems and priorities of the city vis-a-vis tall buildings.
11. Develop preliminary topics for the workshop.

F. Meeting with sponsor and Advisory Committee 29 -- "Is the city 'GO'?"

3. Hold Workshops

Objective: To bring together the people identified in Phase 2 above to discuss the high-rise problems of their city and to develop structure and programs of implementation (getting the information out of the Tall Buildings Council data base). Hopefully, it will lead to formation of a high-rise committee and other organizational components. Workshops are to be locally run, with cooperation from Headquarters.

A. Organization

1. Identify workshop chairman.

2. Supply organizational materials and suggestions.

3. Develop topics.

4. Develop program, schedule, etc.

5. Announcements, program.

6. Identification of Tall Buildings Council participants.

7. Invitations.

B. The Workshop

8. Hold workshop.

9. Recommendations for establishing organizational base.

   a. High-Rise Committee (Proposal Section 4.1a).

   b. Other organizational components (Section 4.1b &c).

10. Recommendations for activities.

C. Post-Workshop Follow-Up

11. Follow-up meeting of workshop steering committee with project staff and Advisory Committee 29.

12. Evaluation of workshop.

4. Establish Organizational Base

Objective: To reinforce and extend interest in and support for implementation activities, particularly with regard to the formation of local high-rise committees.

A. Meeting with sponsor and Advisory Committee 29.

B. Identify key people.

C. Meet with key people.

D. Supply sample materials from other high-rise committees.

E. Encourage broad representation.

F. Encourage development of specific local action plans to facilitate implementation of Tall Buildings Council findings.

G. Evaluation.

5. Activities: Documentation, Research, Communication

Objective: Stimulate interest among concerned locals in carrying out long-range activities that will draw material from Tall Buildings Council documentation and expertise.

A. Documentation and Application

1. Use the specific action plan developed by the local high-rise committee (Phase 4 F) as a basis for initiating activity for putting Council findings into practice. In particular:

a. Encourage the use of the MONOGRAPH on Tall Buildings in updating urban plans (developing them where they do not already exist) and revising codes (building, zoning, planning, municipal services and impact review procedures).

b. Encourage the establishment of local tall building libraries.

c. Promote research pertinent to the special needs of the cities.

2. Meet with sponsor and Advisory Committee 29 to review.

B. Information Delivery

3. Internal: Distribute information through the tall building libraries, regional computerized tape networks, newsletters and audio-visual aids. (It is expected that much of the Tall Buildings Council data will be available through the National Technical Information Service.)

4. External: Regularly contact the news media to facilitate the reporting of information and progress. Supply information to institutional libraries. Groups may want to take advantage of contacts with the Council by inviting specialists from other parts of the world to lecture at public-interest seminars or professional gatherings. By the same token, a particular city or professional group could arrange to support their specialists who want to attend conferences elsewhere.

5. Review/evaluation.

6. Assessment of Implementation Programs

Objective: Evaluate the total program and develop recommended procedure for future similar action in other cities. As an on-going activity throughout the duration of the program, this phase should provide corrective feedback for the refinement of the implementation program, while monitoring the chain of activities.

A. Develop plans for making assessment.

B. Meet with Sponsor and Advisory Committee 29.

C. Identify the flow of information between the point of disbursement and the point of reception.

D. Identify the extent to which information is transferred.

E. Identify successes and difficulties.

F. Recommend changes in the work plan; develop detailed implementation procedure for the "City Thrust".

G. Meet with Sponsor and Advisory Committee 29.

H. Make final evaluation.

REFERENCES/SELECTED BIBLIOGRAPHY

Beedle, Lynn S., 1977
TALL BUILDINGS: A LOOK TO THE FUTURE, IABSE Surveys S-3/77, August, p 1-20.

Council on Tall Buildings, Headquarters Staff, 1976.
BIBLIOGRAPHY OF COUNCIL REPORTS
Fritz Laboratory Report 369.180 (2nd Ed. in preparation).

Council on Tall Buildings, D. Sfintesco, Ed., 1978.
2001: URBAN SPACE FOR LIFE AND WORK, Proceedings of Conference held in Paris, France, November 1977 (4 volumes), CTICM, Paris (in English and French).

Council on Tall Buildings, Sharon L. Siegler, Ed., 1978.
TALL BUILDING DISASTERS (Bibliography with abstracts generated from COMPENDEX and NTIS) Fritz Laboratory Report 441.4.

Council on Tall Buildings, Standing Committee 29, 1976.
STATEMENT ON THE IMPLEMENTATION OF JOINT COMMITTEE DOCUMENTATION, Fritz Laboratory Report 369.189, Lehigh University, May.

Council on Tall Buildings and Urban Habitat, 1978-79.
MONOGRAPH ON THE PLANNING AND DESIGN OF TALL BUILDINGS, 5 Volumes, American Society of Civil Engineers, New York (to be published, 1978)

Volume PC: PLANNING AND ENVIRONMENTAL CRITERIA, Kavanagh et al.
SC: SYSTEMS AND CONCEPTS FOR TALL BUILDINGS, Khan et al.
CL: TALL BUILDING CRITERIA AND LOADING, Robertson et al.
SB: STRUCTURAL DESIGN OF TALL STEEL BUILDINGS, Higgins et al.
CB: STRUCTURAL DESIGN OF TALL CONCRETE AND MASONRY BUILDINGS, Reese et al.

Driscoll, George C., Jr. et al, 1976.
SURVEY OF TALL BUILDING CHARACTERISTICS, Fritz Engineering Laboratory Report No. 369.173, Lehigh University, Bethlehem, PA, June.

Joint Committee on Tall Buildings, Lynn S. Beedle, Ed., 1973.
PLANNING AND DESIGN OF TALL BUILDINGS, Proceedings of 1972 ASCE-IABSE Conference, ASCE, June 1973 (5 volumes).

Jonssen, J. Erick, 1969.
TECHNOLOGY IN URBAN AFFAIRS, The Engineer and the City, National Academy of Engineering, Washington, DC, October.

Lu, L. W. and Beedle, L. S., Eds., 1972.
CURRENT QUESTIONS, PROBLEMS, AND RESEARCH NEEDS, Fritz Laboratory Report 369.17, Lehigh University, August.

Lu, L. W., and Beedle, L. S., 1973.
TALL BUILDING PROTECTION FROM PHYSICAL DISASTERS, Fritz Laboratory Report 369.86, Lehigh University, October.

Moser, M., 1978.
TALL BUILDING DECISION-MAKING PARAMETERS, Fritz Laboratory Report 444.3, July.

Reizenstein, Janet E., 1975.
LINKING SOCIAL RESEARCH AND DESIGN, The Journal of Architectural Research, Vol. 4, No. 3, December 1975, p. 26.

Rentschler, G. P., Driscoll, G. C., and Chen, W. F., 1978.
TESTS OF BEAM-TO-COLUMN WEB MOMENT CONNECTIONS, ASCE Spring Convention, April 24-28, Preprint No. 3202.

Whyte, William H., 1970.
THE LAST LANDSCAPE, Anchor Books.

Yuceoglu, U., and Tall, L., Eds., 1975.
BIBLIOGRAPHY ON TALL BUILDINGS - SUPPLEMENT 1, Fritz Laboratory Report 369.165 (NTIS #PB-248 243).

BIBLIOGRAPHIC DATA SHEET	1. Report No. LEHIGH/FL/369--251	2.	3. Recipient's Accession No. PB 80 178874
4. Title and Subtitle ON HAZARDS OF THE HIGH-RISE			5. Report Date February, 1979
			6.
7. Author(s) Lynn S. Beedle			8. Performing Organization Rept. No. LEHIGH/FL/369--251
9. Performing Organization Name and Address Lehigh University Fritz Engineering Laboratory - #13 Bethlehem, PA 18015			10. Project/Task/Work Unit No.
			11. Contract/Grant No. ENV 77-01578
12. Sponsoring Organization Name and Address National Science Foundation 1800 G Street Washington, DC 20550			13. Type of Report & Period Covered
			14.

15. Supplementary Notes

16. Abstracts

The potential for hazards in tall buildings is presented from the standpoint of hazards due to loading, and in construction as well as those associated with potential failures in design, planning, decision-making, and concept. Sample topics of needed research, gleaned from the Monograph on Tall Buildings, are presented. Utilization of currently available information is of highest priority. Consideration of the total urban system is essential in high-rise projects of major magnitude.

17. Key Words and Document Analysis. 17a. Descriptors

Design Failures
Hazards
Implementation
Loading
Research Needs
Tall Buildings
Urban Design

17b. Identifiers/Open-Ended Terms

17c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
No restriction on distribution. Available from National Technical Information Service, Springfield, VA 22151 approved by NSF M. P. Gaus	UNCLASSIFIED	
	20. Security Class (This Page) UNCLASSIFIED	22. Price