

McWilliam & Partners Pty. Ltd., Brisbane
 W. L. Meinhardt & Partners Pty. Ltd., Melbourne
 Lane N. Meltzer Real Estate, New Orleans
 Mueser Rutledge Consulting Engineers, New York
 I. A. Naman & Assoc., Houston
 New York Concrete Construction Institute, New York
 O'Brien-Kreitzberg & Associates, Inc., Merchantville
 Ove Arup & Partners, Sydney
 Peddle, Thorp & Walker Arch., Sydney
 John Portman & Associates, Atlanta
 J. Roger Preston & Partners, Hong Kong
 Mahendra Raj Cons. Engrs., New Delhi
 Ranhill Bersekutu, Kuala Lumpur
 Rice & Daubney Architects, Planners, North Sydney
 Robert Rosenwasser Associates, P. C., New York
 Emery Roth & Sons P. C., Architects, New York
 Rowan Williams Davies & Irwin Inc., Guelph
 RTKL Associates Inc., Baltimore
 Sepakat Setia Perunding (Sdn.) Bhd., Kuala Lumpur
 John P. Sheehy/TAC, Cambridge
 Shui On Group, Hong Kong
 Skilling Ward Magnusson Barkshire, Seattle
 South African Institute of Steel Construction, Johannesburg
 Steen Consultants Pty. Ltd., Singapore
 Syska & Hennessy, Inc., New York
 Gary P. TenEyck, Dallas
 TenEyck Merritt Barnett Pitt, Dallas
 Tishman Speyer Properties, New York
 Trade ARBED Inc., New York
 Turner Construction Co., New York
 B. A. Vavaroutas and Associates, Athens
 Werner Voss & Partner, Braunschweig
 Harry Weese & Associates, Chicago
 Weidlinger Associates, New York
 Wiss, Janney, Elstner and Associates, Northbrook
 Wong & Ouyang & Associates, Hong Kong
 Woodward-Clyde Consultants, New York
 Zaldastani Associates, Inc., Boston

Contents

Preface	xix
Contributors	xxiii
Planning and Environmental Criteria	
Introductory Review	1
<i>B. P. Lim</i>	
Philosophy of Tall Buildings	
The Philosophy and the Future of the Skyscraper	3
<i>Alan Ritchie</i>	
History of Tall Buildings	
The Two Centuries of Technical Evolution Underlying the Skyscraper	11
<i>Carl W. Condit</i>	
The Relative Value of Invention and the History of Tall Buildings	25
<i>Tom F. Peters</i>	
Evolution of the Skyscraper: A History of the Tall Building in Chicago	33
<i>C. William Brubaker</i>	
Social Effects of the Environment	
Time's Arrow: Tall Moving Targets and Social Research	53
<i>David Cooperman</i>	
Social and Environmental Factors of High-Rise Living: A Singapore Experience	59
<i>B. P. Lim</i>	
Socio-Political Influences	
The Urban Ecology of Tall Buildings	79
<i>Leonard I. Ruchelman</i>	

Economics

- A Preliminary Model for the Economic Analysis of Tall Buildings** 87
John P. Wenzelberger
Henry Malcolm Steiner

Architecture

- Architecture and Society** 101
Paul Goldberger
- Tall Buildings as Symbols** 117
Bruce J. Graham
- Considerations for Urban Architecture and the Tall Building** 149
William Pedersen
- A Perspective on Architectural Directions** 165
Harry Seidler
- The Architecture of Large Buildings** 183
Fred L. Foote
- Impact of European Technical Culture on the Development of Tall Building Architecture** 189
Giselher Hartung
Tom F. Peters

Interior Design

- Building Design Consultation** 201
M. Arthur Gensler, Jr.
Antony Harbour
- The Inside Story: How Structure and Services Impact Office Design in Tall Buildings** 209
Maira Moser

Urban Planning and Design

- Chicago Update** 229
Elizabeth L. Hollander
- San Francisco Downtown Plan and the Skyscraper** 233
George Williams

- The Chicago Perspective: Response to the San Francisco Plan** 257
David R. Mosena

- The San Francisco Downtown Plan: A Tale of Two Cities** 263
Jeffrey Heller

- Tall Buildings, Tight Streets** 275
Tom Lollini

- Skylobbies as Interconnecting Links Amid the Cluster of Skyscrapers** 287
Valer Mocak

Project Management

- Project Management for Tall Buildings and Urban Habitat** 297
James J. O'Brien

- Scheduling Tall Buildings** 309
Denis W. Boyd

Tall Buildings in Developing Countries

- High-Rise Development in India** 317
Jashwant B. Mehta

Development and Investment

- Developing Tall Buildings to Meet Future Needs: Transco Tower Case History** 327
Gerald D. Hines

Systems and Concepts

- Introductory Review** 337
John Rankine

Structural Systems

- The Composite High-Rise Building—An Interaction of Planning, Structure, Speed, and Economy** 339
John G. Nutt

A Tall Building of Stacked Steel and Concrete Structures	353
<i>R. Shankar Nair</i>	
A Tall Building Core-Hanger Interaction System	361
<i>Marek W. Kwieciński</i>	
<i>Adam Z. Pawłowski</i>	
Transfer Structures	367
<i>Jack Zunz</i>	
<i>Chris Wise</i>	
Investigation and Prevention of Failures	383
<i>Lev Zetlin</i>	
Cladding	
Design of Glass Against Breakage	397
<i>Joseph E. Minor</i>	
Construction Systems	
Innovations in High-Rise Construction	409
<i>John Norris</i>	
Times Square Office Center: The Story of a High-Rise Complex	427
<i>L. V. Shüte</i>	
<i>H. R. Corry</i>	
Foundation Design	
Recent Improvements in Foundations	433
<i>Edmund M. Burke</i>	
High-Rise Housing	
High-Rise Public Housing Development in Singapore	443
<i>Khee Poh Lam</i>	
Demand for High-Rise Housing in the United States	465
<i>Richard Kateley</i>	
A Comparison of High-Rise Housing in India with Industrialized Countries	473
<i>Jashwant B. Mehta</i>	

Prefabricated Tall Buildings	
Prefabricated Concrete Systems	483
<i>Bohdan Lewicki</i>	
INTEGRO: Open-Element Prefabricated Construction System	493
<i>Pavel Cizek</i>	
Robots and Tall Buildings	
Construction Robotics in Japan	507
<i>Seishi Suzuki</i>	
<i>Tetsuji Yoshida</i>	
<i>Takatoshi Ueno</i>	
Application of Systems Methodology	
Computer Integrated Facilities Management	553
<i>Jeffrey E. Harkness</i>	
Reduce Operating Expenses by Computerizing Facilities Management	557
<i>Grant S. Farquhar</i>	
Perceptions of the Computer in Design	563
<i>Peter Hoyt</i>	
<i>Bob Stockdale</i>	
Role of Expert Systems in High-Rise Building Design	571
<i>M. L. Maher</i>	
<i>S. J. Fenves</i>	
Knowledge-Based Systems for Tall Buildings	591
<i>V. Tuncer Akiner</i>	
Building Service Systems	
Introductory Review	605
<i>Gordon Rigg</i>	
Heating, Ventilating, and Air Conditioning (HVAC)	
High-Rise Office Buildings: Changes Anticipated by the Year 2000	607
<i>I. A. Naman</i>	

Vertical and Horizontal Transportation

- Energy Consumption and Power Requirements of Elevators** 621
Joris Schroeder

- Space-Saving Elevators for the Very Tall Building** 629
Joris Schroeder

High-Tech Tall Buildings

- Current and Future Trends: The New Age of Buildings** 635
Joseph H. Newman

Criteria and Loading

- Introductory Review** 645
Alan G. Davenport

Earthquake Loading and Response

- Behavior of Structures Retrofitted with Diagonal Steel Bracings During the 1985 Mexico City Earthquake** 649
Enrique del Valle Calderón

- Damage Statistics of the September 19, 1985 Earthquake in Mexico City** 657
Gilberto Borja Navarrete
Manuel Díaz Canales
Alejandro Vázquez Vera
Arturo A. Bello Maldonado
Luis B. Rodríguez González
Sergio Escamilla Aguilar
Gerardo Muñoz González
Enrique del Valle Calderón

- Effects of the September 19, 1985 Earthquake on the Buildings of Mexico City** 667
Roberto Meli

- Lessons of the Mexico City Earthquake** 679
Ignacio Martín

Wind Loading and Wind Effects

- Definition of Wind Pressure on Tall Buildings** 681
W. H. Melbourne

- Air Infiltration and Internal Pressures in Tall Buildings** 689
W. Alan Dalglish

- Effects of Higher Modes on Response of Wind-Excited Tall Buildings** 697
B. Samali

- The Response of Supertall Buildings to Wind** 705
Alan G. Davenport

Fire

- Fire Safety Design for Tall Buildings: Recent Developments** 727
Margaret Law

Structural Safety and Quality Assurance

- Safety, Quality Assurance, and Performance** 735
Carl J. Turkstra

- Structural Safety: Some Problems of Achievement and Control** 741
Graham S. T. Armer

Motion Perception and Tolerance

- Motion in Tall Buildings** 759
Andy W. Irwin

- Damping in Tall Buildings** 779
Alan P. Jeary

- The Role of Damping Systems** 789
Kenneth B. Wiesner

Structural Design of Tall Steel Buildings

- Introductory Review** 803
Leo Finzi

Commentary on Structural Standards	
Structural Standards	807
<i>Geerhard Haaijer</i>	
Methods of Analysis and Design	
Seismic Design of Tall Steel Buildings	815
<i>Egor P. Popov</i>	
Stability	
Design for Strength (Stability)	837
<i>Giulio Ballio</i>	
Design Methods Based on Stiffness	
Adaptive Expert System for Preliminary Design of Wind Bracings in Steel Skeleton Structures	847
<i>Tomasz Arciszewski</i>	
<i>Wojciech Ziarko</i>	
Connections	
Connection Flexibility in Steel Frames	857
<i>W. F. Chen</i>	
Load and Resistance Factor Design (Limit States Design)	
Serviceability Limits for Tall Buildings	885
<i>Gerhard Sedlacek</i>	
<i>Stefan Bild</i>	
Structural Design of Tall Concrete and Masonry Buildings	
Introductory Review	897
<i>Ignacio Martin</i>	
Commentary on Structural Standards	
Building Codes	899
<i>James G. MacGregor</i>	
Selection of Structural Systems	
Concrete Buildings—A Mile High	905
<i>Joseph P. Colaco</i>	

Elastic Analysis	
Methods of Analysis in the Design of Tall Concrete and Masonry Buildings	921
<i>Alex Coull</i>	
Precast Panel Structures	
Precast and Prestressed Concrete Directions in Australia and Southeast Asia	945
<i>W. L. Meinhardt</i>	
Creep, Shrinkage, and Temperature Effects	
Deterioration of Concrete	959
<i>James R. Clifton</i>	
Masonry Structures	
U. S. Coordinated Program for Masonry Building Research	965
<i>James L. Noland</i>	
Project Descriptions	
Superstructure of OUB Centre, Singapore	975
<i>S. Sasaki</i>	
<i>M. Suko</i>	
<i>Y. Atsukawa</i>	
The Skyscraper's Base: Architecture, Landscape and Use in the Dallas Arts District	989
<i>Stuart O. Dawson</i>	
Appendix	
High-Rise Building Data Base	1003
Nomenclature	
Glossary	1007
Symbols	1032
Abbreviations	1033
Units	1034

References/Bibliography	1037
Building Index	1079
Name Index	1085
Subject Index	1095

Preface

On the occasion of the one hundredth anniversary of the tall building, the natural question emerges: What will the second century hold?

When one looks at the past, the most telling thing is how quickly we've adjusted to the high-rise life and work habitat. Up until about one hundred years ago, we could not live much higher than we could climb. But all of that has changed. In one hundred years mankind has abandoned the habits learned over hundreds of millions of years. Although some well-publicized problems have developed, it is remarkable that we have adapted as well as we have.

In all likelihood, then, we will continue to adjust to the new environmental conditions that present themselves, if not physically, then sociologically.

So much for preamble. Since the papers in this book were prepared by leaders in the field, one finds a practical flavor in their projections. Although breakthroughs can occur, by and large new schemes are incremental. (The new "world's tallest" is seldom more than 10% taller than the previous world's tallest). Even the most visionary projections in this book have an air of practicality about them, which augurs well for their applicability to professional practice.

A few overriding considerations seem worthy of comment at this point:

We learned in the "first century" that we could not ignore the cultural and social effects of the built environment. So we will see more research on how to build better and more pressure to consider social and cultural factors in planning and design.

As happened in Western Europe, the United States is reaching an urbanization plateau or will reach it in not too many years. Since the correlation is fairly direct, so also will come a plateau in tall building construction. Less and less will tall buildings be designed to meet new needs, and more and more will they be instruments for renewal and the inevitable recycling of the city.

Quality will be strongly emphasized, because of more experience, greater sophistication of the client, and the availability of information in readily accessible form to explain the "how." The computer will become ever more significant, and greater attention will be paid to using it correctly.

The way the users of tall buildings relate to their habitat will also change. People have an opinion about tall buildings and they are expressing it. Tenants are becoming more sophisticated. For office buildings, the one major