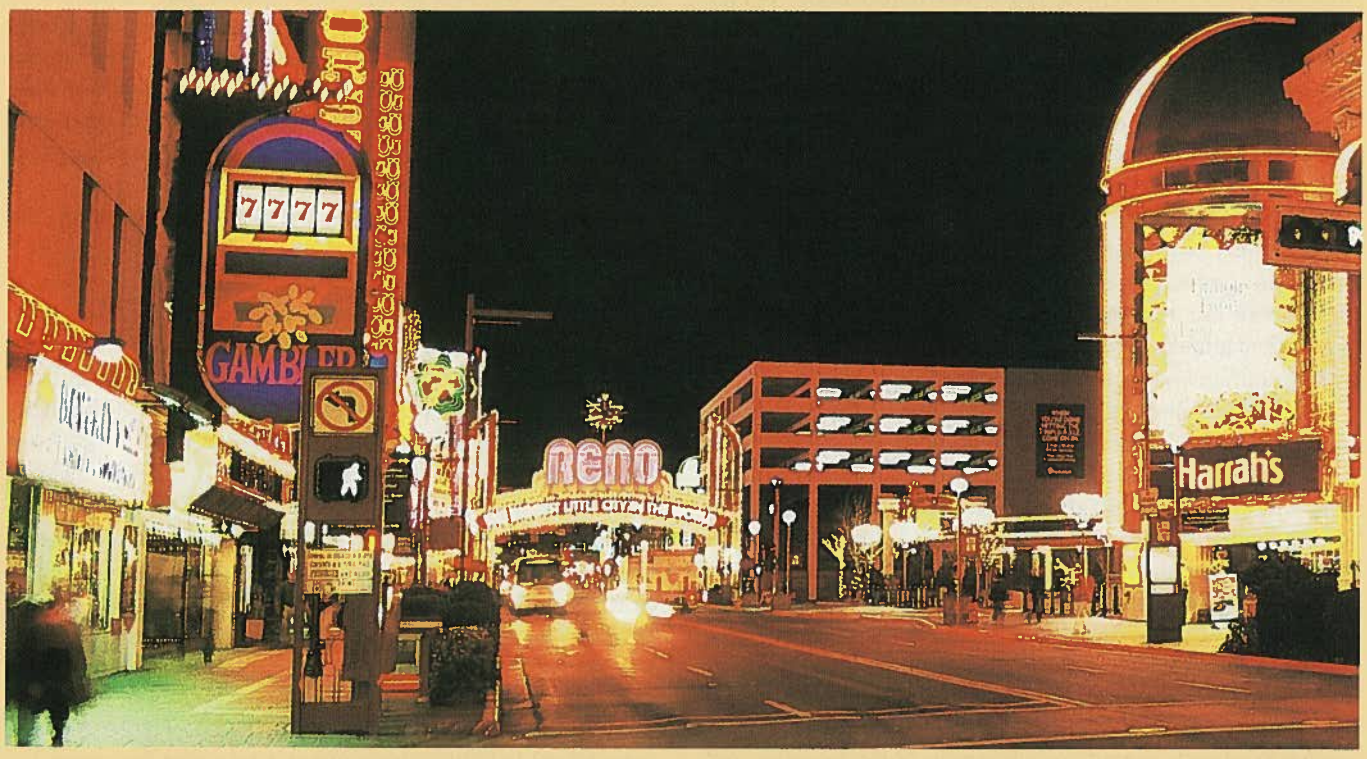
QUALITY — DELIVERING THE PROMISE

HIGHLIGHTS

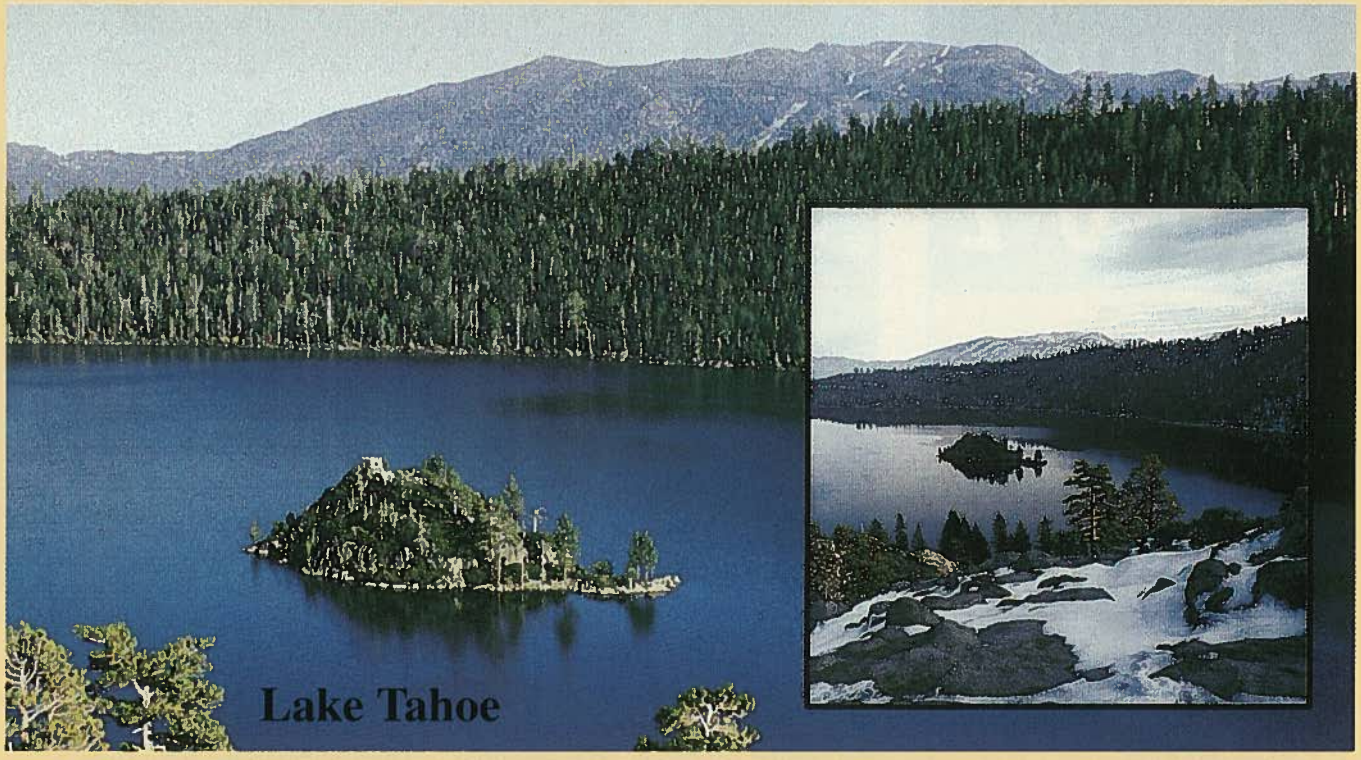
of PCI's 47th Annual Convention & Exhibition Reno, Nevada, October 21 to 24, 2001



Nearly 1300 members and guests attended PCI's 47th Annual Convention & Exhibition in Reno, Nevada, October 21 to 24 – making this meeting one of PCI's most heavily attended conventions in recent years. In addition, 80 exhibitors from North America and other parts of the world displayed their products, machinery and services — the highest number of exhibitors PCI has ever known. These numbers are even more remarkable considering the fact that the convention was held less than six weeks after the September 11 terrorist attack in New York City and Washington, D.C.

The convention was held at John Ascuaga's Nugget Hotel, the same hotel that hosted PCI's convention six years ago. This venue proved to be a convenient point from which to explore the vibrant city of Reno as well as its beautiful surroundings. Foremost among these attractions are the rugged "Gold Rush" mountain trails from a century and a half ago leading to world-renowned Lake Tahoe. Many at the convention took the opportunity to go on the Spouses/Guest Tour and explore these wonderful places with an Old West flavor.

The theme of the convention was "Quality – Delivering the Promise." To fulfill that goal, **Frank Tedesco** of the Juran Institute gave the keynote address at the Monday morning Business Breakfast Meeting and followed up that presentation with the details of



the Breakthrough Improvement Design and Six Sigma Quality Program in an afternoon session.

This year, there were a total of fifteen sessions ranging from architectural precast concrete, bridges, education, research and development, seismic design, plant safety, innovative precast structures, and technical issues facing the industry. Titles of the individual presentations in each session were published in the July-August issue of the PCI JOURNAL.

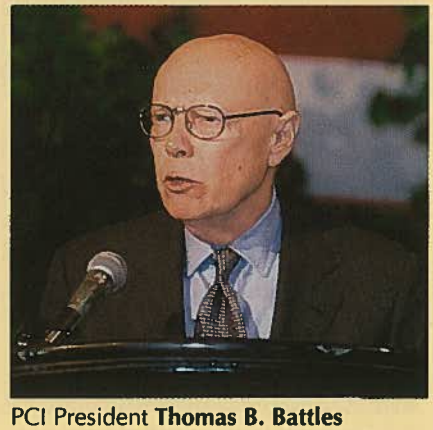
Among the many informative presentations, topics included self-compacting concrete, silica additives for high performance concrete, ultra high strength concrete, and the design-construction of the newly topped out 39-story precast, prestressed concrete apartment building in San Francisco. It is expected that some of the significant papers presented at the convention will be published in future issues of the PCI JOURNAL.

To augment the emphasis on education, a special student education session was organized Tuesday afternoon for civil and architectural college students and professors in the vicinity of Reno. Some 70 students attended this popular PCI-sponsored event.

Those enjoying outdoor recreation participated in the annual golf outing on the Friday preceding the convention. Most of the next two days were devoted to executive, board of directors and technical committee meetings. For the second year in a row, a professional member reception was held Saturday principally to meet new PCI professional members and explain the new initiatives being undertaken by the Professional Member Committee.

The Exhibit Hall was officially

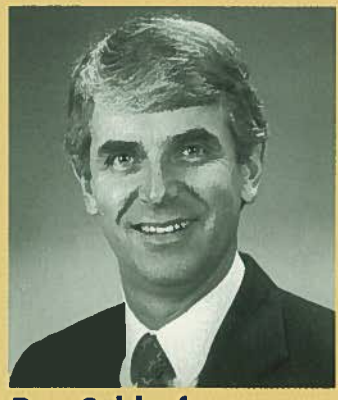
PCI Chairman **Saul Shenkman**, general manager of Unistress Corporation, presided at the Business Breakfast Meeting, Design Awards Banquet, and Membership Luncheon.



PCI President **Thomas B. Battles** welcomed the members and guests to the PCI Convention and summarized the course of events.

Keynote speaker **Frank M. Tedesco**, Senior Vice President, Juran Institute Incorporated, spoke about reducing costs and improving quality.

PCI OFFICERS 2002



Ron Schlerf
Chairman

Michael E. Quinlan
Vice Chairman

Fred W. Heldenfels IV
Secretary-Treasurer

Chairman **Saul Shenkman** cut the ribbon on Sunday to officially open the Exhibit Hall.

opened Sunday morning by the PCI Board of Directors in a colorful ribbon-cutting ceremony. This was followed by a cocktail party and delicious luncheon generously provided by the exhibitors.

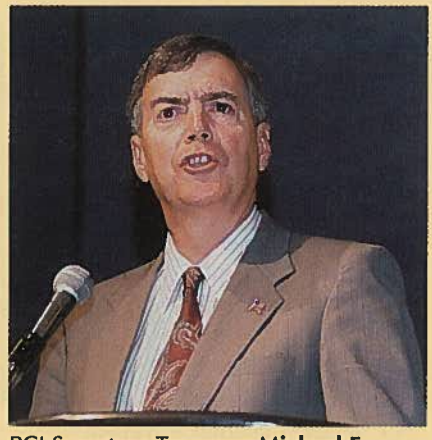
Following tradition, the Business Breakfast Meeting was held Monday morning. PCI Chairman **Saul Shenkman** opened the meeting with a somber moment of silence for the victims of the September 11 terrorist attack as well as remembering the dozen notable PCI members that had died during the past year. This was followed by a spontaneous rendition of "God Bless America," led by **Ed McDougle** of Ross Bryan Associates, Inc.

PCI President **Thomas B. Battles** reported upon the status of PCI activities and the record number of registrants attending the convention.

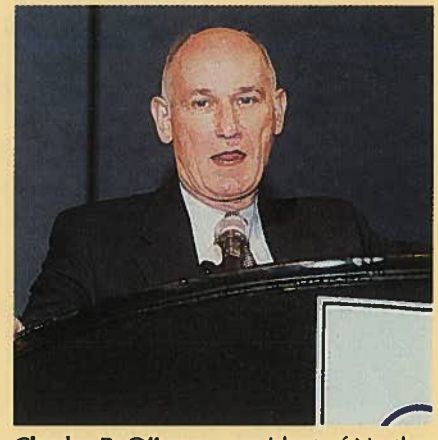
Mr. Shenkman in his address emphasized the importance of quality in all phases of production and erection, and summarized the year's PCI activities. For details of his address, see his Chairman's Message titled "Roundup of Year 2001 Activities."

Secretary-Treasurer **Michael E. Quinlan** gave the PCI financial summation, reporting upon the excellent state-of-health of the Institute. PCI is currently operating on a $7.8 million budget based on a $5 billion sales volume.

Market Plans Chairman **Charles P. O'Leary**, president, Northeast Concrete Products, gave an excellent out-



PCI Secretary-Treasurer **Michael E. Quinlan**, president of Gate Precast Company, reported on the financial health of the Institute and its projected operating budget for 2002.



Charles P. O'Leary, president of Northeast Concrete Products and chairman of the Market Plans Committee, summarized the activities of that committee and outlined its accomplishments of the past year.

THE 2002 PCI BOARD OF DIRECTORS

Bottom row, left to right: **C. Douglas Sutton** (Chairperson, Technical Activities Committee), Purdue University, West Lafayette, Indiana; **William F. Simmons III** (Chairperson, Management Activities Committee), The Shockey Precast Group, Winchester, Virginia; **Charles P. O'Leary** (Chairperson, Market Plans Committee), Northeast Concrete Products LLC, Plainville, Massachusetts; **Michael E. Quinlan** (Vice Chairman), Gate Precast Company, Jacksonville, Florida; **Saul Shenkman** (Immediate Past Chairman), Unistress Corporation, Pittsfield, Massachusetts; **Ron Schlerf** (Chairman) Central Pre-Mix Prestress Co., Spokane, Washington; **Fred W. Heldenfels IV** (Secretary-Treasurer), Heldenfels Enterprises, Inc., San Marcos, Texas; **Thomas B. Battles** (PCI President), Precast/Prestressed Concrete Institute, Chicago, Illinois; **Stanley J. Ruden** (Chairperson, Quality Assurance Committee), Coreslab Structures (ARIZ) Inc., Phoenix, Arizona; **Thomas J. D'Arcy** (Chairperson, Research and Development Committee), The Consulting Engineers Group, Inc., San Antonio, Texas.

Middle row, left to right: **Peter A. Urquhart** (Zone 2), Rocla Concrete Tie, Inc., Denver, Colorado; **William "Adrian" Lovell, Jr.** (Professional Member Director), Precast Technical Assistance Corp., Pensacola, Florida; **Kim A. Sorenson** (Zone 3), Wells Concrete Products Company, Wells, Minnesota; **Bill LeBlanc** (CPCI Chairman), Con-Force Structures Ltd., Calgary, Alberta, Canada; **Michael L. Boykin** (Zone 6), Boykin Brothers, Inc., Baton Rouge, Louisiana; **Gregory B. Gibbons** (Associate Member Director), Gibbons Erectors, Inc., Parker, Colorado; **James R. Clark** (Zone 1), Clark Pacific, West Sacramento, California; **Gregory F. Force** (Zone 5), Tindall Corporation, Petersburg, Virginia.

Top row, left to right: **Tony Mazzeo** (Zone 5), Oldcastle Precast, Inc., South Bethlehem, New York; **Thomas R. Hailey** (Zone 4), Prestress Services, Inc., Lexington, Kentucky; **James A. Sautter** (Zone 3), Rinker Materials Corporation; **Skip Francies** (Associate Member Director), Dayton/Richmond Concrete Accessories, Miamisburg, Ohio; **Millard J. Barney** (Zone 1), Concrete Technology Corporation, Tacoma, Washington; **Douglas M. Mooradian** (Allied Organization), Precast/Prestressed Concrete Manufacturers Association of California, Inc. (PCMAC), Glendale, California; **David J. Hellyer** (Zone 2), Coreslab Structures (OKLA), Inc., Oklahoma City, Oklahoma; **Christian R. Newkirk** (Zone 4), Prestress Engineering Corporation, Prairie Grove, Illinois; **Alvin C. Ericson** (Chairperson, Student Education Committee), Technical Consultant, Bonita Springs, Florida.

Missing from picture: **Mason Hardaway Lampton** (Zone 6), Standard Concrete Products, Inc., Columbus, Georgia; **Todd G. McCoy** (Professional Member Director), H. Wilden & Associates Inc., Allentown, Pennsylvania.

James R. Voss, president of JVI, Inc., elaborated on the PCI Education Foundation, a new non-profit organization that aims to attract talented young professionals to our industry.

Audience applauds the announcement of the award winners at the Monday Business Breakfast Meeting.

line of the initiatives PCI is taking to increase market awareness of precast concrete.

James R. Voss gave a very eloquent talk on the status of the PCI Education Foundation. This not-for-profit foundation will shortly be officially incorporated, with **W. Michael McConochie** serving as its CEO.

CPCI President **Bruce Taylor** reported on the activities of the Canadian precast/prestressed concrete industry. Currently, they are implementing the Pathways Plan, which involves five strategic goals. CPCI has also instituted a National Precast Day, which has been well received by the membership and public.

Special awards were subsequently given for Plant Certification, Safety, Associate Member, Educator of the Year, PCI JOURNAL, PCI Fellows, and Medal of Honor. Details of these awards and the recipients follow later in this article.

The convention officially came to a close at the Membership Luncheon on Wednesday. Here, **Saul Shenkman** ceremoniously handed the gavel to his successor **Ron Schlerf**.

At the conclusion of the Membership Luncheon, the new Medal of Honor inductee, **Robert F. Mast**, gave a very eloquent presentation on the early days of prestressed concrete and especially his association with his former partners Art and Tom Anderson. For details of this presentation, see the article on "My Adventures in Prestressed Concrete" at the end of the convention highlights.

Elected as 2002 PCI Chairman of the Board of Directors is **Ron Schlerf**, President of Central Pre-Mix Prestress Co., Spokane, Washington. In accepting the chairmanship, Mr. Schlerf spoke about the importance of the quality of the precast product and especially in ensuring customer satisfaction.

Mr. Schlerf holds a bachelor's degree in business administration from Boise State University. Active in PCI administrative and technical committee work, he served on the PCI Board of Directors in 1994 and 1995, and 2000 to 2001. He has also been a member of the Sandwich Wall Panel Committee, Parking Marketing/Promotion Committee, and the Media, Public Relations & Publications Committee.

Serving with Ron Schlerf on the 2002 Executive Committee are

Bruce Taylor of RES Precast Inc., chairman of the Canadian Precast/Prestressed Concrete Institute, gave a report on Canadian activities.

Nearly 1300 members and guests attended the PCI Reno Convention.

At the Membership Luncheon on Wednesday, Chairman **Shenkman** passed the chairman's gavel to chairman-elect **Ron Schlerf**, who will assume the chairmanship on January 1, 2002.

Vice Chairman **Ron Schlerf** presented Chairman **Shenkman** and his wife **Suzanne** with special gifts as tokens of gratitude for their dedicated service to PCI.

Michael E. Quinlan, Fred W. Heldenfels IV, Saul Shenkman and **Thomas B. Battles.**

Michael E. Quinlan is president of Gate Precast Company, Jacksonville, Florida. He has previously worked in sales/marketing for Coreslab Structures (Miami) Inc. and Southern Prestressed Concrete, Inc. Mr. Quinlan has a bachelor's degree in civil engineering from Northeastern University and a master's degree in business administration from the University of New Haven. He served on the PCI Board of Directors in 1991 to 1994, 1999 to 2000, and 2000 to 2001. He is past chairman of the PCI Marketing Council (1991 to 1994), Georgia-Carolinas PCI and Florida Precast Concrete Association.

Fred W. Heldenfels IV has been president of Heldenfels Enterprises, Inc., San Marcos, Texas for six years. Mr. Heldenfels earned a bachelor of business degree in marketing from Texas A&M University, College Station, Texas, in 1979. He served on the PCI Board of Directors from 1999 to 2000. He is past chairman of the PCI Transportation Market Team, a current member of the PCI Plant Personnel Training Committee and a past member of the PCI Contracts and Financial Performance Committees. Currently, he is president-elect of the Texas Good Roads/Transportation Association and past president of the Precast Concrete Manufacturers Association of Texas.

Terms of office for the new board members begin January 1, 2002. Other incoming members are:

Producer Member Zone Directors

- **Millard J. Barney** (Zone 1), Concrete Technology Corporation, Tacoma, Washington
- **Peter A. Urquhart** (Zone 2), Rocla Concrete Tie, Inc., Denver, Colorado

PCI Chairman Shenkman introduced PCI staffers who attended the convention. From left to right are **George Nasser, Leah Noparstak, Gary Munstermann, Liz Martino, Brian Goodmiller, Brian Stejskal, Paul Johal, Phil Iverson, John Dick, Sidney Freedman, Frank Kurtz,** and **Jason Krohn.**

MEMORIES OF PCI'S 47TH ANNUAL

CONVENTION & EXHIBITION ...

The University of Cincinnati won the first-ever PCI Big Beam Competition. **Richard Miller** (left) accepted the award from **Paul Campion** of Sika Corporation, the sponsor of the event.

Southern Illinois University formed the first-ever PCI Student Chapter under the direction of Professor **Norm Lach**. Student Chapter President **David M. Helfrich** (left photo) and Vice President **Peter F. Sherrill** received certificates commemorating this achievement from PCI Chairman **Saul Shenkman**.

- **Kim A. Sorenson** (Zone 3), Wells Concrete Products Company, Wells, Minnesota
- **Christian R. Newkirk** (Zone 4), Prestress Engineering Corporation, Prairie Grove, Illinois
- **Gregory F. Force** (Zone 5), Tindall Corporation, Petersburg, Virginia
- **Mason Hardaway Lampton** (Zone 6), Standard Concrete Products, Inc., Columbus, Georgia

Associate Member Director

Gregory B. Gibbons
Gibbons Erectors, Inc.
Parker, Colorado

Professional Member Director

Todd G. McCoy
H. Wilden & Associates, Inc.
Allentown, Pennsylvania

Chairperson, Management Activities Committee

William F. Simmons III
The Shockey Precast Group
Winchester, Virginia

Chairperson, Research and Development Committee

Thomas J. D'Arcy
The Consulting Engineers Group, Inc.
San Antonio, Texas

A moment of humor during the Business Breakfast Meeting.

AWARDS PRESENTATIONS

Awards presentations for plant certification participation, plant safety, associate member recognition, outstanding PCI JOURNAL papers, distinguished educator honors, Medal of Honor, and special recognitions were made at the Business Breakfast Meeting on Monday, October 22.

At this meeting, it was announced that the first-ever PCI Student Chapter has been formed at Southern Illinois University in Carbondale, Illinois. This was accomplished principally due to the efforts of Professor **Norm Lach**. PCI Chairman **Saul Shenkman** presented certificates commemorating this event to Student Chapter President **David M. Helfrich** and Vice President **Peter F. Sherrill**.

At the same meeting, an award was presented to Professor **Richard Miller** representing the University of Cincinnati for winning first prize in the PCI Big Beam Competition. This contest is sponsored by Sika Corporation and was presented by **Paul Campion**, representing the donor.

PCI PLANT CERTIFICATION ANNIVERSARY RECOGNITIONS

Each year, the Institute recognizes those plants in the PCI Plant Certification program that have reached anniversary milestones. This year, PCI recognizes the plants that have achieved 25 and 30 years of plant certification. They are:

25 YEARS

- High Concrete Structures, Inc.
  Denver, Pennsylvania
- Northeast Concrete Products, LLC
  Plainville, Massachusetts
- Rinker Materials Corporation
  Kansas City, Kansas

30 YEARS

- PBM Concrete, Inc.
  Rochelle, Illinois
- Rocky Mountain Prestress, Inc.
  Structural Plant
  Denver, Colorado
- Tindall Corporation – Jonesboro Division
  Jonesboro, Georgia
- TPAC
  A Division of Kiewit Western Company
  Phoenix, Arizona
- TPAC
  A Division of Kiewit Western Company
  Tuscon, Arizona

PLANT SAFETY AWARDS

Each year, PCI's Safety Committee collects and analyzes the Producer Members' accident data from the previous year (2000). All of the winners this year had "0" rating for incident, frequency and severity. The Safety Awards are given in categories based on the number of employees in the company.

100+ EMPLOYEES

- Prestressed Concrete, Inc.
  Newton, Kansas

1-49 EMPLOYEES

- Modern Mosaic Ltd.
  Niagara Falls, Ontario
  Canada
- Conrad Constructors, Inc.
  Rialto, California

The Associate Member Award was presented to Splice Sleeve North America, Inc. Accepting the award was **Stanley S. Kunoki**, general manager.

Dr. Neil M. Hawkins, professor emeritus and interim head of the Civil Engineering Department at the University of Illinois at Urbana-Champaign, was presented with the PCI Distinguished Educator Award.

ASSOCIATE MEMBER AWARD

Splice Sleeve North America, Inc.

The original NMB Splice-Sleeve® was invented by **Dr. Alfred A. Yee** and first used in 1970 as the primary connection for "column trees" in the 38-story Ala Moana Hotel in Honolulu, Hawaii. The total precast concept for this hotel allowed it to be selected in 9 months. During these years, Dr. Yee worked with the local representative of Master Builders, **Hisao Miyamoto**, who saw the potential for the coupler in the highly seismic Japanese market.

Mr. Miyamoto convinced the Japanese division, Nisso Master Builders, to buy the patent rights and embark on an extensive multi-million dollar research program. Splice Sleeve Japan, Ltd. was formed in 1977 as an independent company by Mr. Miyamoto and a group of investors, and they gained acceptance by the Japanese Ministry of Construction in 1984 to prove its efficacy in any location in the world. Thus, the letters NMB for Nisso Master Builders was added in front of Splice Sleeve and remains today as one of the most recognized brands of grout-filled rebar coupler in the world.

In 1980, the NMB was formally introduced to the U.S. market through the efforts of a California engineer, **C. E. Joe Warnes**. Splice Sleeve North America was incorporated in 1988, and subsequently moved from Sacramento to Los Angeles to the current location in Ontario, California. The NMB is now in its third generation and just received formal recognition as a Type 2 coupler by both ICBO and the National Evaluation Service.

Splice Sleeve North America joined PCI as an Associate Member immediately upon being incorporated in the United States. Its engineering and technical consultants have worked on many PCI committees and donated countless hours in lecturing at PCI sponsored events. The company recognized from the beginning that its success depended on the success of the precast concrete industry.

In 1988, **Alvin C. Ericson** was hired as an independent technical consultant to cover the eastern United States. Splice Sleeve North America has had two general managers: **Stanley S. Kunoki** from 1987 through 1994 and **Ichiro (Mike) Kanoh** from 1995 to present. Mr. Kanoh returned to Japan this fall and Mr. Kunoki was at the convention again to accept this award.

DISTINGUISHED EDUCATOR AWARD

Neil M. Hawkins, professor emeritus and interim head of the Civil Engineering Department at the University of Illinois at Urbana-Champaign was conferred with the PCI Distinguished Educator Award for 2001. The award, developed by the Student Education Committee, recognizes distinguished educators in the fields of engineering, architecture, and construction technol-

Martin P. Korn Award winners (clockwise from top left): **Panya Noppakunwijai**, **Maher K. Tadros**, **Zhongguo (John) Ma**, and **Robert F. Mast**.

ogy who have made significant contributions to the precast, prestressed concrete industry.

Dr. Hawkins is former Head of the Civil Engineering Department at the University of Illinois and Associate Dean of Engineering at the University of Washington, Seattle. A fellow of ACI and ASCE, and a member of many prestigious organizations, Dr. Hawkins has authored over 100 technical papers and reports, many of which have been published in the PCI JOURNAL. He is a member of several technical committees including ACI Committee 318 and the Building Seismic Safety Council (BSSC). Over the years, he has won numerous honors and awards from various organizations. A frequent speaker at PCI meetings and conventions, he is currently a member of PCI's ATLSS & PRESSS and Seismic committees.

PCI JOURNAL AWARDS

Each year, PCI bestows three awards to authors for outstanding papers published in the PCI JOURNAL during the previous 12 months (September-October through July-August). The award-winning papers are selected by the JOURNAL Awards Committee (**Leslie D. Martin**, chairman).

MARTIN P. KORN AWARD

The Martin P. Korn Award, recognizing the paper that offers the greatest contribution to the advancement of precast and prestressed concrete in the area of design and research, was presented to **Panya Noppakunwijai**, **Maher K. Tadros**, **Zhongguo (John) Ma** and **Robert F. Mast** for their paper "Strength Design of Pretensioned Flexural Concrete Members at Prestress Transfer," which appeared in the January-February 2001 PCI JOURNAL. This paper proposes a rational method for the design of pretensioned flexural concrete members due to the effects of prestress transfer.

Panya Noppakunwijai is a graduate research assistant in the Civil Engineering Department at the University of Nebraska working towards his Ph.D. He obtained a B.Eng. degree from Kasetsart University, Bangkok, Thailand, and subsequently an MS degree in Engineering Science from the University of Mississippi. In 1999, he was awarded a Daniel P. Jenny Research Fellowship for Reassessing Allowable Compressive Stress Limits.

Zhongguo (John) Ma is assistant professor, Civil and Environmental Engineering Department, University of Alaska-Fairbanks, Alaska. He obtained his Ph.D. from the University of Nebraska in 2000 where he previously held positions as research assistant and research assistant professor. A registered professional engineer, Dr. Ma is the author of numerous technical papers, several of which have been published in the PCI JOURNAL.

Maher K. Tadros is Cheryl Prewett Professor, Departments of Civil Engineering and Construction Systems, University of Nebraska-Lincoln, Omaha, Nebraska. He received his BS and MS degrees from Assyut University (1967, 1971) and his Ph.D. from the University of Calgary (1975). He has been a structural engineer, researcher and teacher of precast/prestressed concrete for the past 30 years. He is the author of more than 200 papers, many of which have appeared in the PCI JOURNAL. During his career, he has received numerous awards including the Distinguished Educator (1995), Martin P. Korn (1996), and T.Y. Lin (1997) awards. Currently, he is a member of the Bridges, JOURNAL Advisory, Research & Development, and Education committees. Also, he is the principal author of the PCI Bridge Manual.

Robert F. Mast is co-founder, senior principal, and director of engineering development of BERGER/ABAM Engineers, Inc., Federal Way, Washington. Mr. Mast has devoted the past 42 years of his professional career

SPECIAL THANKS TO OUR PCI CONVENTION EXHIBITORS

The Institute gratefully acknowledges the support and sponsorships provided by the convention exhibitors.

We hope to see you all at the 2002 PCI Annual Convention & Exhibition in Nashville, Tennessee, October 6 through 9, 2002.

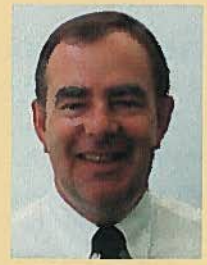


Robert J. Lyman Award winners (from left to right): **Vijay Chandra**, **Jennifer Hill**, and **Elie H. Homsi**. Awardees not in attendence are shown below.


Anthony L. Ricci


Paul J. Towell


Peter A. Mainville


Keith Donington


Ted Wisniewski


Ru-Chu Hsu

as a structural engineer specializing in precast, prestressed concrete design and construction. He is the author of numerous technical publications, many of which have been published in the PCI JOURNAL. This is the second time he has won the Martin P. Korn Award. He has also won the T. Y. Lin Award twice. He is the recipient of numerous other awards including the Boase, OPAL, CECW awards and most recently the PCI Medal of Honor. Currently, he is a member of the Industry Handbook, ATLSS & PRESSS, and Seismic committees.

ROBERT J. LYMAN AWARD

The Robert J. Lyman Award recognizes the one paper that offers the greatest contribution in the area of plant production, site erection, or general construction using precast and prestressed concrete. This year's award was bestowed on **Vijay Chandra**, **Anthony L. Ricci**, **Paul J. Towell**, **Peter A. Mainville**, **Elie H. Homsi**, **Keith Donington**, **Ted Wisniewski**, **Jennifer Hill** and **Ru-Chu Hsu** for the series of papers they authored on the Central Artery Tunnel Project in Boston, Massachusetts.

Vijay Chandra is senior vice president, Parsons Brinckerhoff Quade & Douglas, Inc., New York, New York. Mr. Chandra received his Bachelor of Engineering from the University of Mysore, India, and his Master of Science (Advanced Structures) from the University of London, England. He has been in the forefront of developing new products and more efficient methods of construction. He has promoted the use of 0.6 in. diameter strand for both piles and beams, spliced girders, and the expanded use of precast and prestressed concrete for MARTA in Atlanta and the Central Artery/Tunnel Project in Boston. He is the author of many technical papers in engineering journals. In recognition of his many achievements, he has received numerous national awards. Currently, he is a member of the Bridge Committee and chairman of the Integral Bridges Subcommittee.

Anthony L. Ricci is chief bridge engineer for the Central Artery/Tunnel Project, Massachusetts Turnpike Authority, Boston, Massachusetts. Mr. Ricci received a BS degree in civil engineering and an MS degree in structural engineering from Northeastern University, Boston. He has designed several precast, prestressed and post-tensioned bridge structures and published articles on cable-stayed bridges. Mr. Ricci is the co-author of two portions of the Central Artery Project – "A Precast Bonanza" and "Boston's Engineering Marvel – Where We Are Now."

Paul J. Towell is senior bridge engineer with Bechtel-Parsons Brinckerhoff in New York City, New York. He co-authored the portions of the Central Artery Project on "Innovative Use of Precast Segmental Technology" and "Precast/Prestressed Structures Span the Big Dig."

Peter A. Mainville is assistant resident engineer with Bechtel-Parsons Brinckerhoff Quade and Douglas, Inc., New York City, New York. He co-authored the portion of the Central Artery Project on "Innovative Use of Precast Segmental Technology."

Elie H. Homsi is president and CEO of Rizzani de Eccher, Aventura, Florida. Mr. Homsi obtained a BS degree in applied science from the University of Beirut, Lebanon, and a BS degree in civil engineering from the University of Texas at Austin. Previously, he worked for Prescon and Perini Corporation. He has contributed as an author to the PCI JOURNAL including the portion of the Central Artery Project on "Innovative Use of

Charles C. Zollman Award winner **Sidney Freedman**.

Precast Segmental Technology." Currently, he is a member of the ASBI Grouting Committee.

Keith Donington is senior bridge engineer with Parsons Brinckerhoff Quade & Douglas, Inc., Boston, Massachusetts. He co-authored the portions of the project on "Precast/Prestressed Structures Span the Big Dig" and "Standard Temporary Bridges."

Ted Wisniewski is a structural engineer with Parsons Brinckerhoff Quade & Douglas, Inc., Tampa, Florida. He co-authored the portion of the Central Artery Project on "Standard Temporary Bridges."

Jennifer Hill is a bridge engineer with Parsons Brinckerhoff Quade & Douglas, Inc., Boston, Massachusetts. She received a BS degree in civil engineering from Rensselaer Polytechnic Institute and a MS degree in business administration from the University of Massachusetts. A registered professional engineer, she co-authored the portion of the Central Artery Project on "Standardized Precast, Prestressed Transition Structures."

Ru-Chu Hsu is a design engineer with Parsons Brinckerhoff Quade & Douglas, Inc., New York City. Mr. Hsu obtained a BS in civil engineering from Chung-Kang University in Taiwan and a MS degree in structures from Polytechnic University in New York. He has designed precast/prestressed concrete beams for live load and precast deck panels for the William Nather cable-stayed bridge. On the Central Artery Project he co-authored the portion on "Standardized Precast, Prestressed Transition Structures."

CHARLES C. ZOLLMAN AWARD

The Charles C. Zollman Award recognizes a special meritorious paper that advances the general understanding and knowledge of precast and prestressed concrete by bringing together available information in a single state-of-the-art report. The 2001 award was presented to **Sidney Freedman** for his paper on "Stone Veneer-Faced Precast Concrete Panels," which was published in the July-August 2000 PCI JOURNAL. This article provides state-of-the-art information on stone properties, design considerations, anchorage of stone facing, panel watertightness, veneer jointing, handling, storage and hauling of panels, as well as repair procedures when needed.

Sidney Freedman is architectural director for the Precast/Prestressed Concrete Institute, Chicago, Illinois. His responsibilities are to implement marketing, technical and educational programs that respond to the needs and interests of the architectural precast producer. Prior to joining PCI in 1973, Mr. Freedman worked 7 years for the Portland Cement Association and for 5 years was manager of its Concrete Technology Section. Sid chaired the committee that prepared PCI's Architectural Precast Concrete, and served as that publication's co-editor. In addition, he is the principal author of the Third Edition of the Manual for Quality Control for Plants and Production of Architectural Precast Concrete, published in 1998. Sid was instrumental in establishing the PCI Erectors Committee in 1974 and has served as staff liaison since that time. He was actively involved in the PCI Erection Safety Manual for Precast and Prestressed Concrete, published in 1995, and the Erectors' Manual, published in 1999. In addition, he serves as staff liaison to the Financial Performance/Contracts, Plant Personnel Training, and Productivity Committees, and he represents PCI on the Environmental Council of Concrete Organizations. Sid obtained his BS in civil engineering from Northeastern University, Boston, in 1957 and his MBA in marketing from Loyola University of Chicago in 1969.

ON TO NASHVILLE 2002

Preparations are underway to organize sessions and programs for the 2002 PCI Convention & Exhibition to be held at the Opryland Hotel, Nashville, Tennessee, October 6 to 9, 2002. Mark these dates on your calendar now and be on the lookout for more details from PCI in the next few months.

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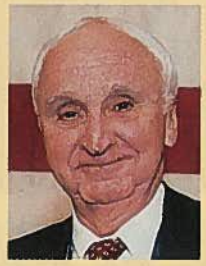
FELLOWS OF THE PRECAST/PRESTRESSED CONCRETE INSTITUTE

For recognition of members of the PCI for their distinguished contributions to the precast, prestressed concrete industry and to the PCI, within the areas of education, research, design, production, quality, erection, marketing and management.

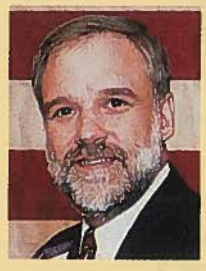
On Monday, October 22, 2001, ten new PCI members were honored as PCI Fellows.

ROBERT N. BRUCE, JR.



Robert N. Bruce, Jr. is the Catherine and Henry Boh Chair in Civil Engineering at Tulane University, New Orleans, Louisiana. He received his BS and MS degrees in civil engineering from Tulane University (1951 and 1953), and his Ph.D. from the University of Illinois (1962). Dr. Bruce has served as a Fulbright Research Scholar at the Magnel Laboratory at the University of Ghent, Belgium in 1954; as a Fulbright Lecturer at the Rangoon Institute of Technology in Burma in 1979; and as a senior Fulbright Fellow at the Technical University of Budapest, Hungary in 2000. Starting from the early 1950s, Dr. Bruce has been involved in the research of prestressed cylinder piles, splicing of piles, blast resistance of prestressed girders, fatigue and debonding tests, and, most recently, testing of high performance bulb tee girders. He is the author of numerous papers, several of which have appeared in the PCI JOURNAL. His paper on "Fatigue Tests of Pretensioned Girders with Blanketed and Draped Strands" won for him the Martin P. Korn Award. He has taught both undergraduate and graduate courses in prestressed concrete at Tulane for the past 40 years including field trips to precast, prestressed fabrication plants. From 1979 to 1983, he served on the Quality Control Criteria Committee. He has also served as a PCI JOURNAL reviewer for more than 30 years. Currently, he is a member of the Prestressed Concrete Piles Committee (1968-2001). In September 2001, he was selected to deliver the Seventh Catherine and Henry Boh Lecture Series in Civil Engineering on "Tulane University – Pioneer in Prestressed Concrete."

REID W. CASTRODALE



Reid W. Castrodale is project manager/senior engineer with Ralph Whitehead Associates, Inc., in Charlotte, North Carolina. He is also a part-time professor at the University of North Carolina-Charlotte, where he teaches a course on prestressed concrete design. He obtained his BS degree in civil engineering from Georgia Institute of Technology (1979), and MS degree in structural engineering (1983) and Ph.D. (1988) both from the University of Texas at Austin. After graduation, he worked for six years as a design engineer for Ralph Whitehead Associates before joining the Portland Cement Association in Skokie, Illinois, in 1993. After working at PCA for four years, he went back to his former consulting firm in 1997. Dr. Castrodale has specialized in all types of prestressed concrete bridge issues including the AASHTO LRFD Design Provisions, continuity, high strength concrete, and bulb-tee girders. He is the author of numerous papers (including the PCI JOURNAL) and special reports as well as a reviewer/contributor to chapters in the PCI Bridge Design Manual. Currently, he is a member of the PCI Bridge Committee and Bridge Producers Committee.

NED M. CLELAND

Ned M. Cleland is a structural engineering consultant and president of Blue Ridge Design, Winchester, Virginia. He obtained his bachelor's and master's degrees in civil engineering from Rensselaer Polytechnic Institute, and his Ph.D. in civil engineering from the University of Virginia. His professional experience spans more than 25 years in structural analysis, design, research, and engineering management, specializing in precast/prestressed concrete parking structures. In 1986, he was honored as "Young Engineer of the Year" by the National Society of Professional Engineers. Dr. Cleland's numerous contributions to PCI include being past chairman of the Technical Activities Committee, member of the Board of Directors (1997-98), and past chairman of both the Computer Software Committee and the Specially Funded Research & Development Program Steering Committee No. 5 on Design of Spandrel Beams. He is currently the chairman of the Seismic Committee, as well as a member of the TMRD Executive, Industry Handbook, Building Code, and Professional Member committees. A long-time contributor and reviewer for the PCI JOURNAL, he was the winner of the Martin P. Korn Award in 1998 for his paper, "Design for Lateral Force Resistance With Precast Concrete Shear Walls."

THEODORE W. COONS

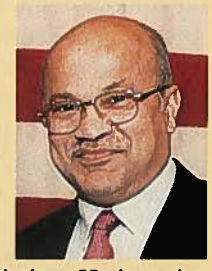
Theodore W. Coons is president of Spillman Company, Columbus, Ohio, and has spent his entire 30-year career with that firm. Spillman Company, a long-time exhibitor at PCI conventions, is a diversified manufacturer of custom steel forms and accessories for the pre-

cast, prestressed concrete industry. Because of Spillman's long-ranging contributions to the industry, it was recognized with PCI's Associate Member Award in 1985. Mr. Coons is a past member of the PCI Board of Directors and Prestressed Poles Committee and is a current member of the Plant Certification and Productivity committees. Through PCI committee work, he helped develop PCI's Policies and Procedures Manual and has been very active in PC-21 activities. In addition, he is past chairman of ASTM Committee C 27 on precast concrete and a co-author of ACI 550's state-of-the-art report on utility vaults. Mr. Coons has a BS in civil engineering (1972) from the University of Pennsylvania and an MBA (1975) from Capital University.

LARRY FISCHER

Larry Fischer (who retired January 1, 2000) was vice president of Concrete Industries, Lincoln, Nebraska. He devoted 38 years of his professional career to the same company. Mr. Fischer obtained both his BS and MS degrees in civil engineering from the University of Nebraska, Lincoln. For more than 20 years, he was responsible for heading up the engineering and business development functions of the company. He collaborated in the development of the Nebraska I-girder, which is now a standard in bridge construction. Two of his many achievements were the Bryan Memorial Medical Office Plaza and the parking structure for the University of Nebraska in Lincoln. He is the author of several papers that have appeared in the PCI JOURNAL, including the paper "Behavior and Design of Double Tees With Openings," which won him the Martin P. Korn Award and subsequently the T. Y. Lin Award. Most of his work in PCI has revolved around codes and plant certification. He was a member of the Building Code Committee in the 1970s, once chairing the committee. Later, as chairman of the Plant Certification Committee, he was influential in the requirement that all PCI producer member companies must operate PCI certified plants as a condition of membership, a stipulation that became a reality in 1992.

S. K. GHOSH



S. K. Ghosh is president of S. K. Ghosh Associates, Inc., of Northbrook, Illinois and Laguna Niguel, California. His firm offers structural, seismic, and code related consulting services. Previously, Dr. Ghosh had served as director of Engineering Services/Codes and Standards for the Portland Cement Association. He is an international authority on the structural design of concrete and on seismic design. The author of numerous technical articles and books, Dr. Ghosh is currently PCI's code representative. In 1998, he won the Charles C. Zollman Award for co-authoring the paper "Precast Structures in Regions of High Seismicity: 1997 UBC Design Provisions" (September-October 1997 PCI JOURNAL). He serves on a number of PCI committees, including the Technical Activities, the Research and Development, the TMRD Executive, the ATLSS & PRESSS, the Building Code and the Seismic committees. He is a member of ACI Committee 318, Structural Concrete Building Code, and he serves on the Board of Direction of the Building Seismic Safety Council. Dr. Ghosh is a regular featured author in the PCI JOURNAL on code and seismic design issues.

2001 PCI Fellows: Sitting, from left to right, **Stanley J. Ruden**, **S. K. Ghosh**, **Larry Fischer**, and **Ned M. Cleland**. Standing, left to right, **Reid W. Castrodale**, **William E. Whitcher**, **Robert N. Bruce, Jr.**, **Walter Podolny, Jr.**, and **Theodore W. Coons**.

William F. Simmons III (right) of The Precast Shockey Group accepted the PCI Fellow plaque for **Dino J. Scalia**, who was recognized post-humously.

2001 PCI FELLOWS

WALTER PODOLNY, JR.

Walter Podolny, Jr., recently retired after a 30-year career of distinguished service with the Federal Highway Administration. With the FHWA, he was extensively involved in the design of a number of unique prestressed concrete bridges, both in the United States and abroad. Perhaps his most noteworthy achievement was his involvement with the Sunshine Skyway Bridge in Tampa, Florida, the first cable-stayed bridge in the United States with single-plane, parallel seven-wire prestressing stays. Among his many accomplishments and numerous awards are more than 85 technical papers, reports, and articles, many of which were published in the PCI JOURNAL. His 1985 JOURNAL paper, "The Cause of Cracking in Post-Tensioned Concrete Box Girder Bridges and Retrofit Procedures," won him both the Charles C. Zollman Award and ASCE's T.Y. Lin Award. He received his second Charles C. Zollman honor in 1993 for a paper on "Corrosion of Prestressing Steels and its Mitigation." He is also the author of two major works published by John Wiley & Sons – *Construction and Design of Cable-Stayed Bridges* and *Construction and Design of Prestressed Concrete Segmental Bridges*. His PCI industry involvement has included chairing the Joint PCI-PTI committee on segmental bridges. He also served on various committees within ASCE, ACI, the Transportation Research Board, PTI, FIP, AASHTO, and many related professional organizations.

STANLEY J. RUDEN

Stanley J. Ruden is executive vice president/general manager with Coreslab Structures (Ariz.) Inc., Phoenix, Arizona. He has been with Coreslab for more than 20 years. He obtained his BS degree in civil engineering from the University of Nebraska (1963). For a short time after college (1964-1969), Mr. Ruden was a bridge designer for Ken R. White Company. His early experience in the precast industry was gained at Stanley Structures in Denver while working as a project engineer, quality control manager, chief engineer and sales manager (1969-1980). Then, for the next seven years, he was general manager for Stanley Structures (Arizona), where he established the plant and its operations from the very beginning. Active in PCI committee work, Mr. Ruden has been heavily involved in improving the quality of the precast product. He was co-chairman of the Field Certification Committee from initiation to 1998. Since 1998, he has been chairman of the Quality Assurance Committee. Currently, he is a member of the PCI Board of Directors, Strategic Planning Committee, Budget Planning and Review Team, and Plant Certification Committee. In 1998, he received a Testimonial Award from PCI for "displaying leadership through a most important period (development and implementation) in the Plant Certification Committee's work on the Field Certification Program."

DINO J. SCALIA

Until his untimely death September 23, 2001, Dino Scalia was projects manager for The Shockey Precast Group, Winchester, Virginia. He had worked for Shockey for nearly 25 years, serving with distinction in engineering, quality control and project management. Mr. Scalia obtained his BS degree in civil engineering from Cornell University in 1970. He gained his early experience in precast concrete while working as a plant engineer with Rocky Mountain Prestress in Denver, Colorado (1971-1977). Mr. Scalia was actively involved in PCI committee work. He had been a member of the Plant Certification Committee since 1982, serving as chairman from 1995-1999. He played a major role in the development of the Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products (MNL 117-96) and the Manual for Quality Control for Plants and Production of Structural Precast Concrete Products (MNL 116-99), for which he received a Certificate of Merit. He also contributed to writing the "Guidelines for the Preparation of a Structural Plant" (QSM-1). As a member of the Quality Performance Criteria Committee, Mr. Scalia contributed significantly to the reports "Fabrication and Shipment Cracks in Prestressed Hollow-Core Slabs and Double Tees" (January-February 1983 PCI JOURNAL) and "Fabrication and Shipment Cracks in Precast or Prestressed Beams and Columns" (May-June 1985 PCI JOURNAL), for which he again received a Certificate of Merit. Earlier, he co-authored the article "Deck Widening and Replacement of the Woodrow Wilson Memorial Bridge," which was published in the May-June 1984 PCI JOURNAL. He also served on the Technical Activities Committee (1989-1992), Bridge Producers Committee, Personnel Training and Certification Committee, and Quality Assurance Committee. At the PCI Convention in Reno, October 22, he was recognized post-humously as a PCI Fellow.

WILLIAM E. WHITCHER

William E. Whitcher is executive vice president and general manager of Coreslab Structures (Miami), Inc., Medley, Florida. Mr. Whitcher has been with Coreslab for the past 14 years. He obtained his BS and MBA degrees from the University of Southern California. Earlier, he worked for Arizona Sand & Rock (1970-1973), Spancrete of California (1973-1980), and Stanley Structures, Inc. (1980-1988). In the last several years, Mr. Whitcher has been heavily involved in PCI administrative and committee work. He has been on the Board of Directors and Executive Committee since 1995, serving as PCI Chairman in 2000. He also serves on the PCI Policies and Procedures Manual, Marketing, Membership and Awards committees. His motivating forces have been to educate and reach out to the next generation.

MEDAL OF HONOR — ROBERT F. MAST

For recognition of individuals who have made a highly significant contribution to the precast, prestressed concrete industry and shall have demonstrated a sincere continuing interest in the Institute.

Robert F. Mast was conferred with PCI's highest honor – the Medal of Honor – for his many years of service to PCI and the precast/prestressed concrete industry. Since its founding in 1954, PCI has only given this award to 15 persons.

Robert F. Mast is co-founder, senior principal, and director of engineering development of BERGER/ABAM Engineers, Inc., Federal Way, Washington. After obtaining a BS degree in architectural engineering from the University of Illinois at Urbana-Champaign in 1957, he served two years in the U.S. Army. Throughout his professional career, Mr. Mast has had an enormous impact on engineering design and construction practice as applied to the seismic design of high rise buildings, bridges, stability of long span prestressed members, prestressed piles, marine piers, curved girders and other complex structures. He has the unique ability to extract an idea from research and apply it to engineering practice. More than 30 years ago, he formulated the shear-friction principle which today is widely used in the design of precast connections. He has taught prestressed concrete design at the University of Washington. Active in PCI technical committee work, he is a member of the Building Code and Industry Design Handbook committees. As a 30-year member of the ACI Building Code Committee, he has brought major contributions to precast and prestressed concrete practice. In 1995, he served as president of the American Concrete Institute. He has also been elected a member of the prestigious National Academy of Engineering.

The author of numerous technical papers (including many in the PCI JOURNAL), he won the Martin P. Korn Award in 1993 and the T.Y. Lin Award in 1969 and 1973. Earlier this year, he received ASCE's 2001 OPAL (Outstanding Projects and Leaders) Award in Design, among only five individuals in the world that have been so honored. Later in the year, he was selected by CECW (Consulting Engineers Council of Washington) as "Engineer of the Year" for 2000. At this convention, he was honored for the second time with the Martin P. Korn Award.

My Adventures in Prestressed Concrete

Robert F. Mast
Senior Principal and
Director of Engineering Development
BERGER/ABAM Engineers, Inc.
Federal Way, Washington

At the PCI Membership Luncheon on Wednesday, October 24, newly conferred Medal of Honor winner Bob Mast shared his insight into many of the major developments in the prestressed concrete industry in which he was a part and his association with long-time partners Art and Tom Anderson, two brothers who in 1951 helped found what are now BERGER/ABAM Engineers, Inc., and Concrete Technology Corporation. The following is an abridgement of that presentation.

Most people in the general public may not think of concrete as an especially exciting topic; in fact, they might even think of "adventures in concrete" as a sort of oxymoron: "Concrete, you mix it up, dump it on the ground, smooth it off, and let it set. What else is there to it?" Of course, we all know there's a great deal more to it than that. Concrete is, in fact, one of the construction industry's most innovative products.

Concrete is made from raw materials that are widely available throughout the world; it can be molded into almost any shape; it looks like stone; it is very durable; and, when combined with steel reinforcement, it becomes a very versatile building material. The principle of prestressing is considered by some to be the single most important concept in the history of engineering, and its application to prestressed concrete is one of the greatest achievements in the last 70 years. In combination with the technique of precasting, it has created a multi-billion dollar industry.

My personal adventure in concrete began with Art and Tom Anderson, who themselves had a wonderful adventure in prestressed concrete and enabled me to be a part of it. When I graduated from college in 1957, I

heard of two brothers out in Tacoma, Washington, who were doing some wonderful things with prestressed concrete. I thought it would be exciting to work with those people.

After completing my military duty in early 1959, I came out to Tacoma seeking a job. I planned to stay there about two years and learn all I could about prestressed concrete. But, since I never stopped learning, I never left. And here I am almost 43 years later.

Those of you who knew Art would be surprised to learn that he was not always an advocate of concrete. In fact, before World War II, Art was very interested in welded steel bridges. In the late 1940s, he was involved in consulting in the use of a new invention called the electric strain gauge; and in 1949 he got the job to instrument a 150 ft (46 m) test girder for the Walnut Lane Bridge (see Fig. 1). And that's how Art became interested in concrete and particularly prestressed concrete.

After that experience, Art and his brother Tom, a contractor in Tacoma, went to Europe, looked at what was going on there, returned home, and founded the firms that are now Concrete Technology Corporation and ABAM Engineers in 1951 (see Fig. 2). Fig. 3 shows Art (on the right) and Tom, about 1970. Most of you who knew Art probably did not know Tom that well. Tom was also an engineer, but he was mostly involved in running the business. So, Tom was active in organizations like the American Management Association rather than on the technical side. The two brothers made a wonderful team.

One of their early adventures in bridges was in the form of bridges for logging roads. In the old days, loggers in Washington state would build a bridge by taking about three 5 ft (1.5 m) diameter Douglas fir logs, putting them side by side across the stream, adding a little dirt on top, and then driving across them. Well, those timbers don't last forever, and, furthermore, a 5 ft (1.5 m) diameter Douglas fir log today is worth a lot more than a prestressed concrete beam! So their earliest bridges were for logging companies, often for much heavier loads than highway loads.

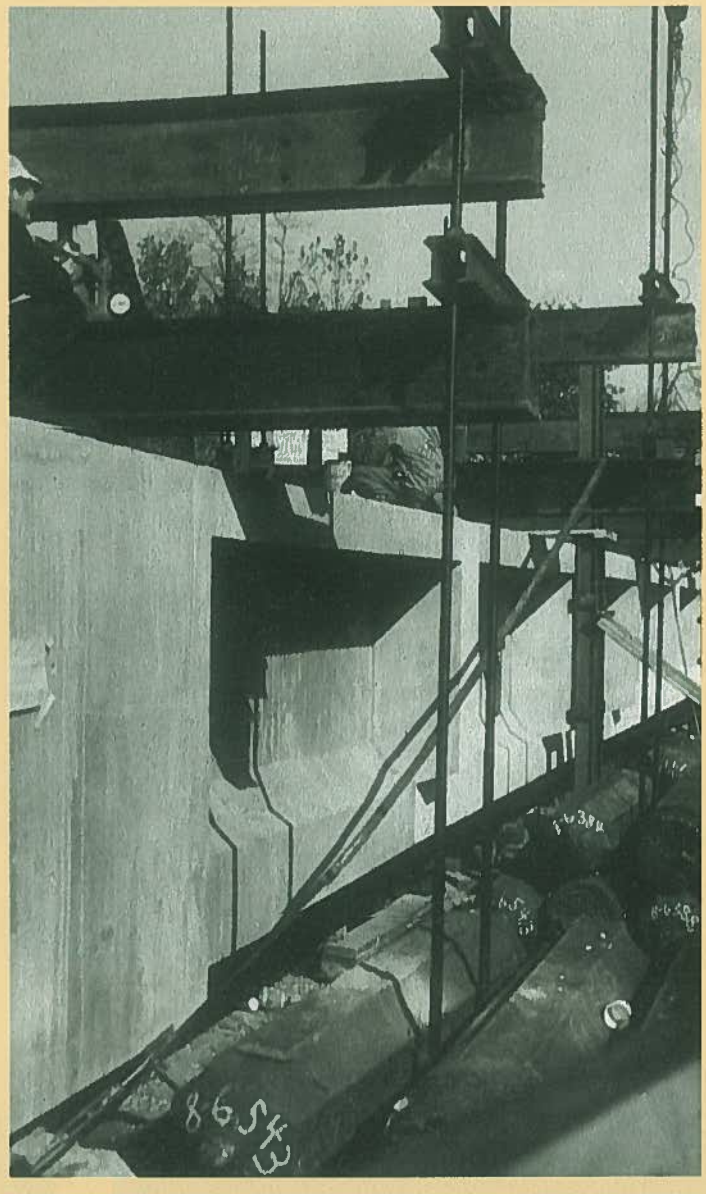


Fig. 1. Testing a 150 ft (46 m) test girder for the Walnut Lane Bridge, circa 1949.

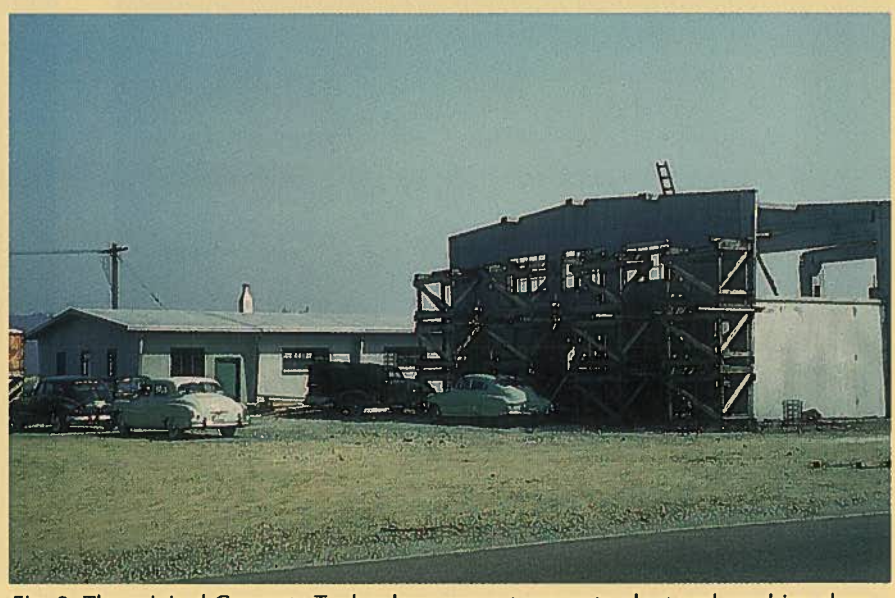


Fig. 2. The original Concrete Technology precast concrete plant and machine shop, circa 1952.

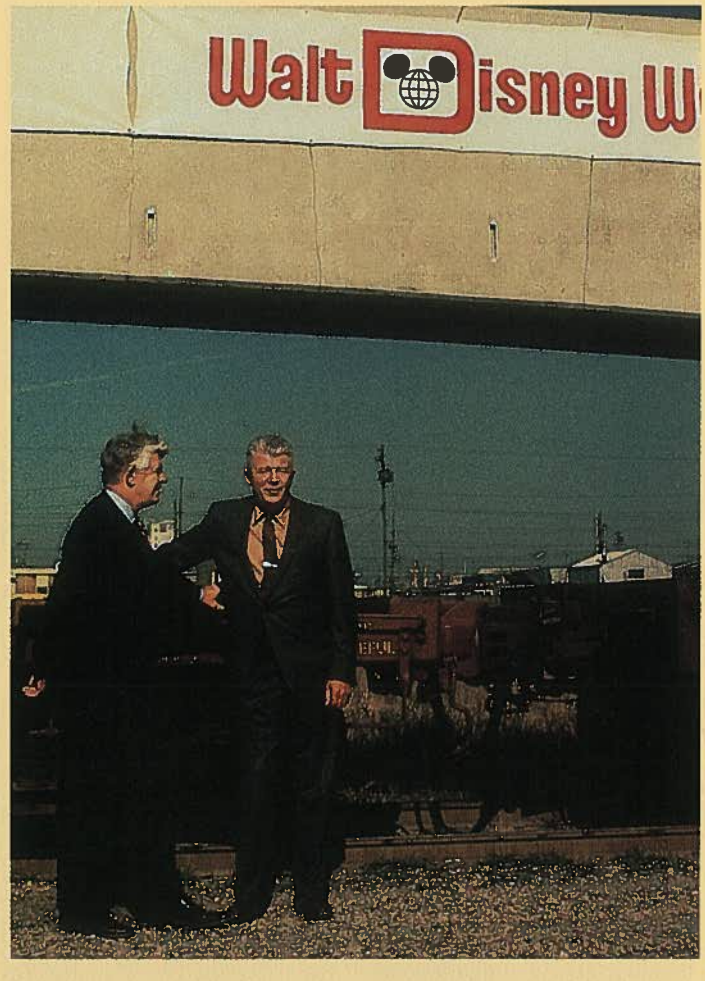


Fig. 3. Tom and Art Anderson, circa 1970.

Fig. 4 shows a relatively small bridge (circa 1955), a deck bulb tee. It is almost completely prefabricated. Fig. 5 is a spliced girder bridge (circa 1957), also on a logging road. In this case, the span was not overly long, but it can be difficult to ship even moderately long girders on some logging roads that wind through the mountains. This particular bridge was erected over the existing bridge, a timber truss, which fortunately was strong enough to support the weight of the two halves, which are spliced at the midspan diaphragm. The old truss was dropped out from underneath the new bridge, which probably raised the roadway in the process and actually improved the roadway profile.

Fig. 6 shows a 105 ft (32 m) girder, no great feat now, but this is 1956. In 1959, Art developed what would become the forerunner of the bulb tee. In Fig. 7 is a beam that has a thin top flange. The web has a small end block, so the web looks a little thicker than it really is, and then a cast-in-place deck. Art had hoped not only to save material in the beams with the bulb tee, but also to save in the quantity of deck

Fig. 4. A bulb-tee bridge for a logging road, circa 1955.

Fig. 5. Basket Flat Bridge, Clark County, Washington, circa 1957.

steel by designing the deck as a haunch slab, taking advantage of the greater depth for negative moment over the web of the beam. This concept does not seem to have caught on.

At the time of this particular test, in 1959, the AASHTO load factors were 1.5 for dead load and 2.5 for live load. The weight blocks are just applying the extra 0.5 dead load. The big loads are applied through jacks to simulate an HS20 truck near midspan.

Fig. 8 shows another logging bridge. We did about four of these sloping strut bridges where there is a strut that has a steel pin at each end. The strut is raised vertically. The girder is set down on the steel pin, and then it is launched out over the canyon with the strut eventually lining up into position. This particular bridge (circa 1963) had an integral abutment. There is piling under the main foundation and some prestressed piles that go back to the abutment, which is then secured to the end of the beam, so that the bridge becomes an independent floating element. The bridge actually retains the soil at the top of the slope instead of the other way around.

Fig. 9 shows another use of cables, in this case for the field house at Central Washington University. Here, the elements of interest are the concrete pylons that support the cables. They were made in two halves with a removable inner form. The inner forms were removed, and then the two halves were post-tensioned together. The final strut is a compression member, so the post-tensioning is just enough to hold it together for shipping. The post-tensioning anchors are at the small end, and the post-tensioning is slightly eccentric to offset the dead weight bending component of the sloping pylon.

For a large shopping center project in Hawaii in 1956, there were acres of parking in which there is one level of structural concrete above the main ground level. The Dillingham Company, which built this project, called Art in to do some value engineering, and Art converted much of the traditional construction to precast/prestressed concrete. When the Dillingham vice president asked Art what he wanted for a fee, Art said, "How about

Fig. 6. A 105 ft (32 m) roof girder for Woodrow Wilson High School in Tacoma, circa 1956.

Fig. 7. A thin-flange prestressed concrete girder, circa 1959.

Fig. 8. A sloping-strut logging bridge, circa 1963.

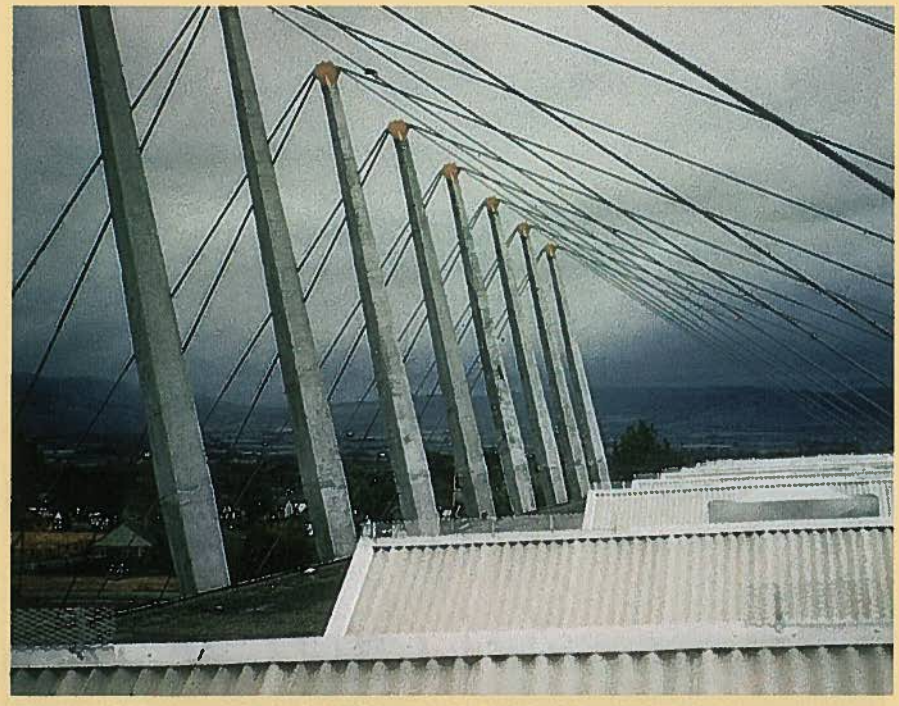


Fig. 9. Field house at Central Washington University, circa 1958.

Fig. 10. Prestressed concrete piling used as a freestanding column for the Ala Moana Shopping Center, Hawaii, circa 1956.

half the savings?" The Dillingham vice president said, "Your fee is too high; it's going to save a million dollars," which was a lot of money in 1956.

A key element in the project's design was the use of prestressed concrete piling as a freestanding column. The original design was a traditional scheme of three or four piles and a pile cap, and then a column cast above that. In this case, however, the prestressed piling was used as a freestanding column. Lateral load tests were done to verify the load capacity, but, when a pile is used as a freestanding column, it has to be positioned very accurately. So Art designed an adjustable frame to serve as a template, which also could be moved a little bit one way or another by adjusting rods to keep the pile right on center while it is being driven.

In Hawaii, piles are typically driven down to a coral reef ledge. The elevation of that ledge varies considerably, so the piles were purposely made short and designed to have an extension cast on them (see Fig. 10). As can be seen in the figure, the form for the extension also has brackets to hold the prestressed beams, although that would later be integrated with the column.

Prestressed concrete piles have other applications. In Fig. 11, for example, is a fender pile for a marine pier. The prestressing is designed so that steel will not yield when ship impact occurs. This same principle is used in the PRESSS program, where the prestressing steel is designed not to yield. A pile like this absorbs the impact of the ship and springs back into position once the load is removed – a very unique application of prestressed concrete.

Fig. 12 is a bird's eye view of the Concrete Technology plant in Tacoma. The main plant buildings were built around 1960. In the left center of the figure, a dry dock can be seen in which production is just beginning on a large floating vessel.

The roof structure is a series of shell elements. Shell structures were in vogue in the 1960s and we did several of them, only we did them using precast concrete rather than cast-in-place concrete, saving considerable formwork (see Fig. 13). The shell elements

were cast in 8 ft (2.4 m) wide sections, pretensioned in the long direction, and reinforced with mild reinforcing steel in the transverse direction. They were handled by steel truss strongbacks, which were also used for the erection of the shells.

We had a total of six strongbacks, enough for two bays. They were erected with walled window frames, or structural channels, that could temporarily take the dead weight. Reinforcing bars were spliced in the joints along a 70 ft (21 m) span. The shear stresses are actually rather small at the joints, so the next day we were able to remove and reuse the trusses. At that time, that's how precast/prestressed barrel shells were built.

Fig. 14 shows a more ambitious project (circa 1963). It is a 150 ft (46 m) span barrel-shell transit shed for the Port of Seattle. In those days, they were still handling cargo inside a big building like the one shown in the figure – in some cases by containers, but in other cases piece by piece.

My interest in the stability of long prestressed beams began when we did a 150 ft (46 m) span barrel shell roof. In the barrel shells for the roof of the Concrete Technology plant, we did not need a separate valley beam down below because with only a 70 ft (21 m) span, the bending moments are not that large. But with a 150 ft (46 m) span, in addition to the shell, a flange is needed in the bottom to resist the tensile forces. So the member shown in Fig. 15 is not a conventional beam in the ordinary sense; it is actually a tension flange of a barrel shell 149 ft (45 m) long.

We were quite concerned about the stability of this beam, so we checked it by Timoshenko and any other classical method we could find. The analysis indicated that it was fine with a high safety factor. Nevertheless, I was quite worried when we lifted out the first two beams. And I was alongside when it was done.

The first beam came out straight as an arrow. The second beam tipped and bent sideways about a foot the instant it cleared the form. Then I had them move the beam out into the center aisle of the plant and set it down. I was not sure if it was going to tip over

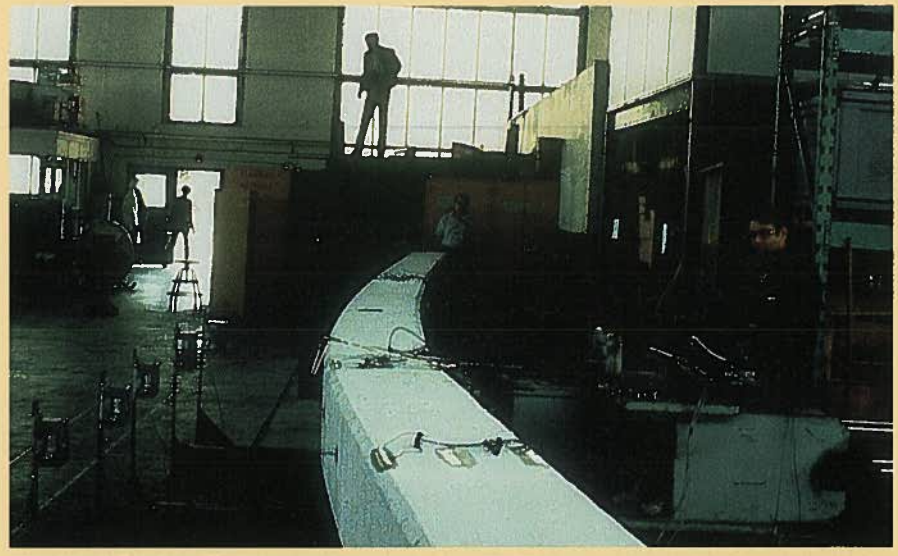


Fig. 11. A fender pile for a marine pier, circa 1985.

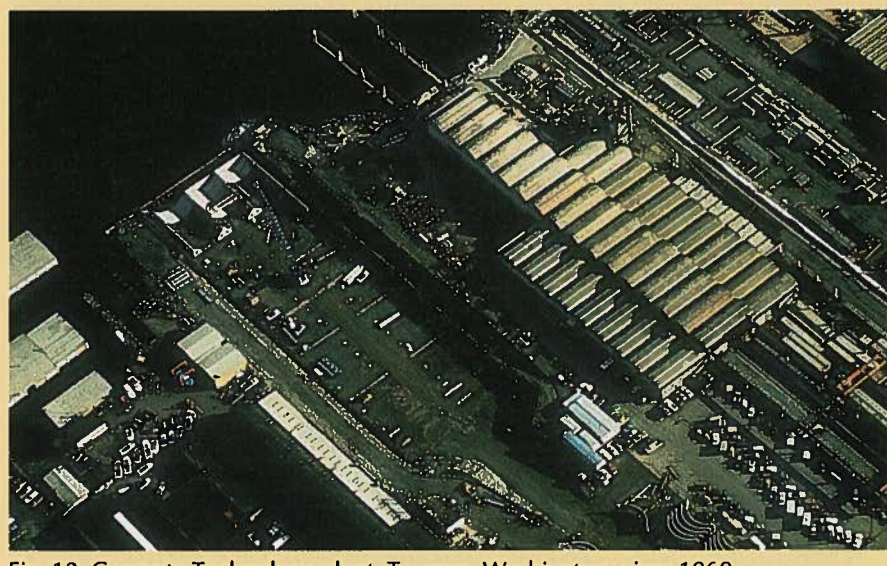


Fig. 12. Concrete Technology plant, Tacoma, Washington, circa 1960.

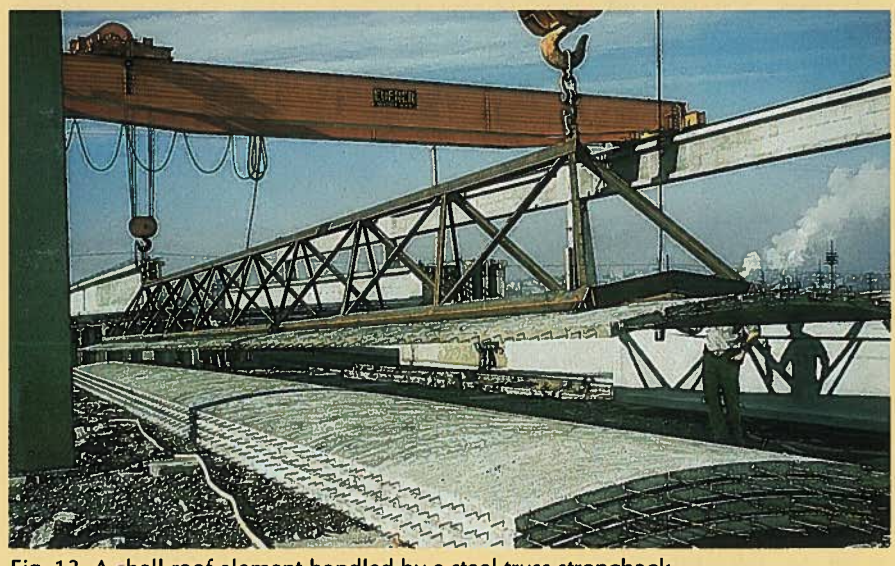


Fig. 13. A shell roof element handled by a steel truss strongback.

Fig. 14. Barrel-shell transit shed, Port of Seattle, circa 1963.

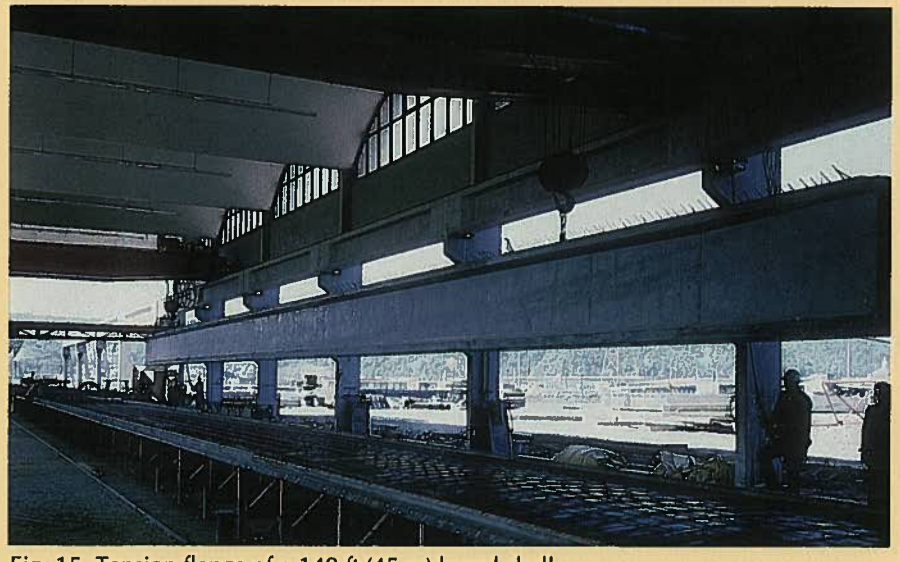


Fig. 15. Tension flange of a 149 ft (45 m) barrel shell.

Fig. 16. An underwater sewer interceptor, Lake Washington, circa 1963.

or come back to vertical, but I knew it was not going to get any better hanging there the way it was.

When we set the beam down, it did come back to vertical and, when it did, it straightened out and we could hardly tell anything had happened. So figuring out the cause and the solution is where my interest in long beams began. And in this case, the solution is quite simple, which is to move the pick points in further from the end. Usually in a long, deep beam there is some excessive compression in the top flange that is not needed.

Another unique application of prestressed concrete is shown in Fig. 16, namely, an underwater sewer interceptor that was put in Lake Washington. The bottom of the lake along the sewer line varied from glacial till (almost as hard as concrete) to peat. So rather than put a pipe in a trench, as is commonly done, we moved the line far enough offshore so we would be above the bottom, built pile caps in the water, and then lowered these pipes down onto the caps. This is a 120 ft (37 m) span, 4 ft (1.2 m) inside-diameter pipe. Prestressing, of course, resisted the self-weight bending moment of the pipe.

Fig. 17 shows the Seattle Monorail (circa 1961). The challenge in designing a monorail is basically the curved beams. Unlike a toy train track, virtually each of the curved beams is different because of the transition spirals and superelevation. Also, the wheels of the train roll directly against the top and sides of the prestressed concrete beam, so the beam has to be manufactured precisely to the required geometry.

To overcome the challenge of the different curved shapes, we developed a universal form that could be bent to the various curvatures required for the different beams. The straight beams had a combination of pre- and post-tensioning, but the curved beams had to be completely post-tensioned.

Eight years later, the Disney Monorail in Orlando was built (see Fig. 18). In this case, the beams were made continuous, whereas the Seattle Monorail was simple span construction. The continuity leads to a much lighter, more elegant structure. The curved

Fig. 17. The Seattle Monorail, circa 1961.

beams had a first stage post-tensioning that just compensated for the dead weight, so that the beam came out flat, not cambered. Second-stage post-tensioning was done after the joints were cast over the columns to make the beams continuous in the five- or six-span units.

Again, the key was in the formwork because there are so many different shapes to make. There is even an S-curve shape. In the first stage of that project, the beams were made in Tacoma and shipped by rail across the country to Orlando. In the second phase that went out to Epcot, the beams were fabricated in Florida on site, but using the same tooling that was originally used to make the first set of forms.

Fig. 19 shows the manufacture of a shell element for a large concrete barge that would displace about 65,000 tons of water. The barge is located in the Java Sea, and it is used to reclaim, liquefy, and store gas from the oil fields there until a steel tanker comes by to take the product to market.

The cross section was governed to a large extent by the fact that there are

Fig. 18. The Disney Monorail, Orlando, Florida, circa 1972.

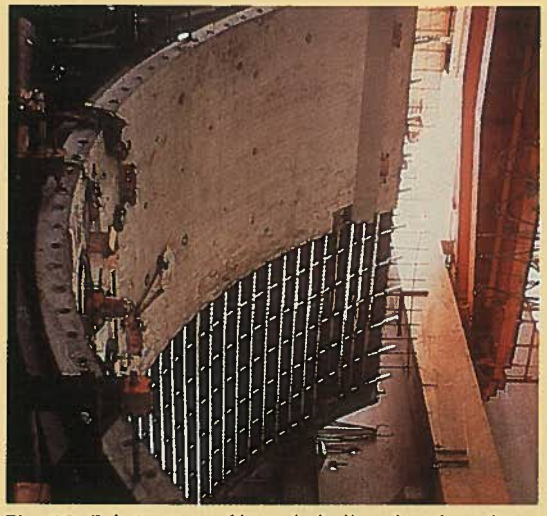


Fig. 19. Fabrication of barrel-shell arches for a large precast, prestressed concrete vessel, circa 1974.

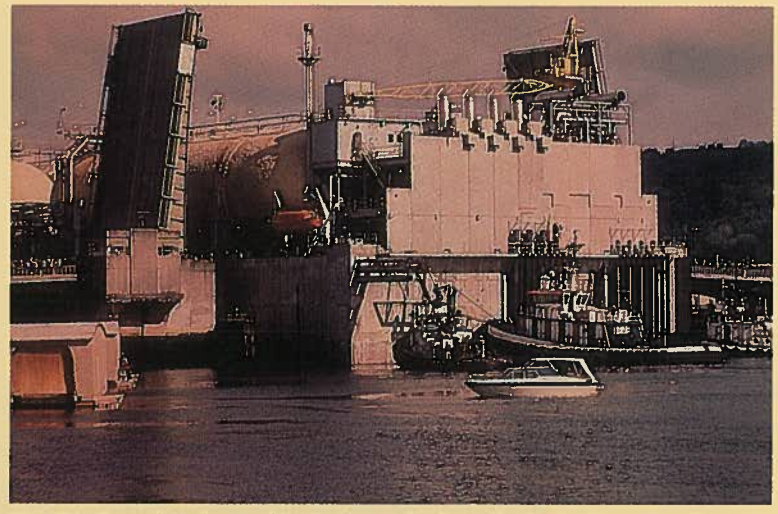


Fig. 20. Completed vessel in Tacoma dock ready for its 10,000 mile voyage to the Java Sea in Indonesia.

large tanks inside the hull as well as above the deck. So the hull bottom was composed of three barrel-shell arches, each spanning about 45 ft (14 m) in the short direction and 200 ft (61 m) in the long direction. The pressure on these shells, from the hydrostatic loading, is about 100 times as great as the load applied on a roof.

Fig. 20 shows the completed vessel ready for delivery 10,000 miles (16000 km) across the Pacific Ocean to Indonesia. It is very difficult to get a sense of scale in this picture, but a close look will reveal people standing on the bridge, which gives some idea of the size of this vessel.

Fig. 21 is another floating project done in the 1980s, with Tom and Art standing beside it. I think this is about the last good picture we have of Art when he was still in good health.

So, in conclusion, one might now ask, "Is the adventure over? We have done all these pioneering things; what is there left to do?"

As is evident from the many ideas, products, and innovations displayed at this convention, the precast/prestressed concrete industry will continue to grow and prosper. We all know that there is much left to be done and that the adventure lives on!

Fig. 21. Tom and Art with display of floating dock project, circa 1984.