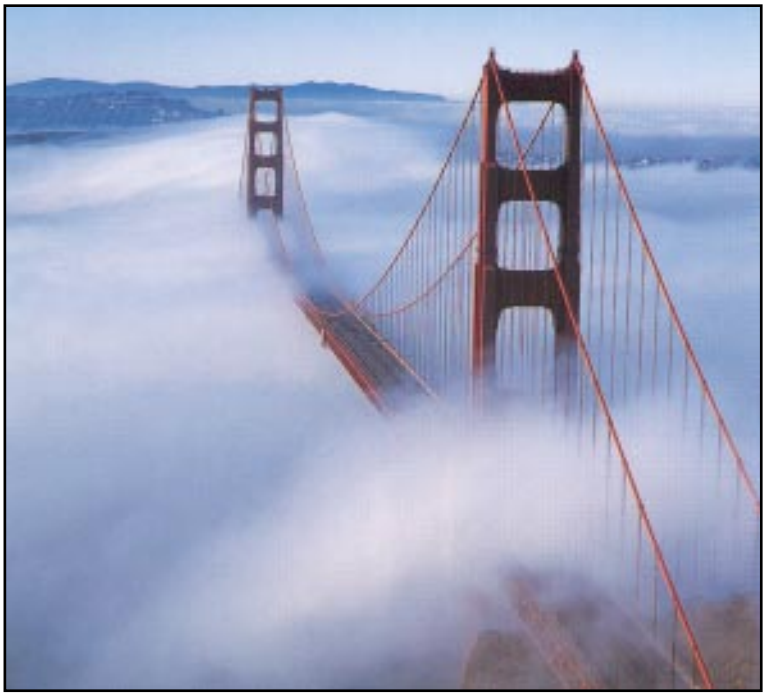
Construction Industry Institute
2001 Annual Conference

Conference Proceedings



2001: A Construction Odyssey — Trends & Perspectives

San Francisco, California

CII Member Companies

3M
Abbott Laboratories
Air Products and Chemicals
Anheuser-Busch Companies
Aramco Services Company
Bayer Corporation
The Boeing Company
BP Amoco Corporation
Cargill
Celanese
Chevron Corporation
CITGO Petroleum Corporation
Conoco
Dofasco
The Dow Chemical Company
DuPont
Eastman Chemical Company
ExxonMobil Corporation
FPL Energy
General Motors Corporation
General Services Administration
GlaxoSmithKline
Huntsman Corporation
Intel Corporation
Eli Lilly and Company
NASA
Naval Facilities Engineering Command
Ontario Power Generation
Phillips Petroleum Company
Praxair
The Procter & Gamble Company
Reliant Energy
Rohm and Haas Company
Shell Oil Company
Solutia
Tennessee Valley Authority
Texaco
U.S. Air Force Research Laboratory
U.S. Army Corps of Engineers
U.S. Department of Commerce/NIST
U.S. Department of Energy
U.S. Department of State
U.S. Steel
The University of Texas System
Weyerhaeuser Company

ABB Lummus Global
ALSTOM Power Inc.
Baker Concrete Construction
BE&K
Bechtel Group
Black & Veatch
BMW Constructors
Burns & McDonnell
Burns and Roe Enterprises
Butler Manufacturing Company
CDI Engineering Group
Chicago Bridge & Iron Company
Day & Zimmermann International
Dick Corporation
Dillingham Construction Holdings
Eichleay Holdings
Fisher Controls International
Fluor Daniel
Foster Wheeler USA Corporation
Graycor
Hilti Corporation
Honeywell International
Integrated Electrical Services
Jacobs
Johnson Controls
Kellogg Brown & Root
Kiewit Construction Group
Kværner
M. A. Mortenson Company
Murphy Company
Parsons Energy & Chemicals Group
Petrofac LLC
Primavera Systems
PSEG Energy Technologies
Rust Constructors
S&B Engineers and Constructors Ltd.
SAP America
SMS Demag
VA TECH
Walbridge Aldinger Company
Washington Group International
H. B. Zachry Company

Conference Proceedings

Construction Industry Institute

2001 Annual Conference

San Francisco, California

August 8–9, 2001

Table of Contents

Foreword

The Construction Industry Institute Annual Conference is recognized for its quality of presentations and timeliness of topics. Our conference theme, “2001: A Construction Odyssey — Trends and Perspectives,” gives us a chance to reflect on the challenges of our industry, past and present, and to report on what we are doing today to improve our industry’s future. Like an odyssey, we have seen significant changes over time, and we will be looking at the effects of those and others facing us now.

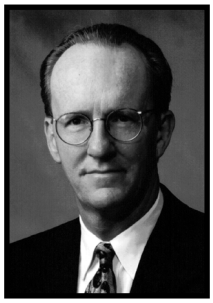
The recent energy crisis in our host state of California has made national headlines and been the subject of numerous media stories and even national debates. We begin the conference with a keynote address to help us understand the background of the current crisis and what is being done to address the issue.

Our conference will also take an in-depth look at today’s construction workforce. How is our industry perceived? How can we assure that the projects of tomorrow will be properly staffed for their safe and successful execution? What are the key issues in our workforce shortage and how are they being addressed? A panel of experts will provide owner, contractor, and researcher perspectives on the workforce and will offer their views on how to improve our industry’s image and appeal. The timeliness of these presentations could not be better as we build a path forward into the 21st Century.

Our research teams, committees, and member companies will report on recent trends. Safety, benchmarking, partnering, and contract strategies have been fertile fields of investigation for CII and are areas where CII has made significant contributions to the industry. These, coupled with our conference reports on electronic simulation, virtual teams, the two-tier workforce, engineering productivity, the fully integrated and automated project process, and the aforementioned trends and perspectives, guarantee that the 2001 CII Annual Conference will truly be a milestone on the voyage we are calling the construction odyssey.

Thanks for your continued support and interest in improving our industry. We hope that you enjoy the conference.

KEN EICKMANN
CII Director



DON SUNDGREN
Conference Chair

The California Energy Crisis: Weathering the Storm, Farming the Future

Keynote Speech: Tom J. Allen

Abstract

Tom Allen will discuss California's electricity crisis or the "perfect storm" as it has been called, and possible solutions on how California can secure its energy future. He will detail how we got to this point, what has been done so far, and what needs to be done for California and the West to frame the future.

Keynote Speaker

Tom Allen is Vice President, External Affairs, for Mirant Americas–West Region. His offices are located in Sacramento and Walnut Creek, California. He directs the firm's legislative and regulatory affairs and public relations activities in the 11 states west of the Rocky Mountains and in Western Canada. Tom works closely with local, state, and federal governments and regulatory bodies on a wide range of energy-related and public policy matters. He has experience in both the regulated and unregulated energy businesses, and has worked with Mirant assets worldwide, which are located on four continents and in 12 different countries. With Georgia Power Company from 1973-1996, he held a variety of positions including manager of economic development for the Atlanta metropolitan region before setting up the economic development organization for Mirant worldwide. Tom holds a bachelor's degree in industrial management from the Georgia Institute of Technology and an EMBA from Georgia State University.

Making Zero Accidents A Reality

Making Zero Accidents A Reality Project Team

Learning Objectives

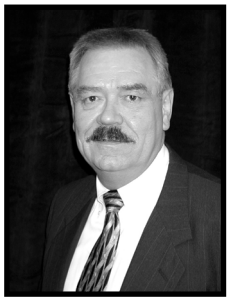
- Find out which 10 recommended safety practices are at the forefront of safety management.
- Identify the key components of current zero accident techniques having a major impact in today's zero accident culture.
- See the impact of zero accident management on overall operational performance.
- Get a preview of the planned education module and Best Practice Data Sheets.

Abstract

Take a safety journey starting with a perspective on safety performance improvements since 1993 to today and learn which best practices have resulted in significant performance improvements. The research data provides quantifiable data that reflects significant performance improvements with companies that are utilizing these techniques. The members of the implementation session panel will review and discuss the application of the updated Zero Accident Techniques and provide an in-depth look into the current key zero accident techniques.

Plenary Session Presenter

John J. Mathis – Vice President and Manager of ESH – North America, Bechtel Group, Inc.



John Mathis has over 25 years of experience in the construction industry. He is currently Manager of Environmental, Safety and Health for Bechtel Group, Inc.'s work in the U.S, Mexico, and the Caribbean. John's ES&H assignments have included managing safety across a broad range of business units that include nuclear and fossil power, petro-chemical, mining and metals, and infrastructure projects. He has held positions as Regional Manager of Safety and Health, Manager of ES&H for Bechtel's BECON Construction Company and ES&H Manager covering all of Bechtel's work in North America. John has been recognized as a leader in Bechtel's drive to achieve and sustain "Zero Accidents" on a worldwide basis and has played a major role in the development of the current ES&H management system tools and processes.

Implementation Session Moderator

John J. Mathis – Vice President and Manager of ESH – North America, Bechtel Group, Inc.

Implementation Session Participants

A. Dennis Cobb, Regional Safety Consultant – E. I. duPont de Nemours & Co., Inc.

T. Paul DeForge, Project Manager, Northeast Plant Group – Ontario Power Generation

Jimmie W. Hinze, Interim Associate Dean – University of Florida

Randal D. Marconnet, Vice President Corporate Services – Watkins Engineers & Constructors, Inc.

Michael F. Schwimmer, Project Management Consultant – Chevron U.S.A., Inc.

Gary L. Wilson, Director – National Center for Construction Engineering Research

Making Zero Accidents A Reality

Making Zero Accidents A Reality Project Team

During the last decade of the 20th Century, the construction industry experienced enlightenment in the area of worker safety. On some projects, clients and contractors seriously adopted the belief that projects could be constructed without worker injuries. This change in philosophy resulted in significant improvements in safety performance, with some projects being constructed injury-free.

While the successes on some projects were impressive, the industry has not experienced the same degree of improvement in safety performance. Part of the failure of the industry to improve at the same rate as enjoyed by some projects is perhaps rooted in a fundamental lack of understanding of what elements of a safety program are most effective. To develop a greater understanding of the merits of the different elements of safety programs, CII sponsored research conducted by its Making Zero Accidents a Reality Project Team.

The team focused its efforts on conducting two separate studies. The first was a study of the construction safety practices being employed by the 400 largest construction firms in the U.S, identified as the *ENR* 400. Perhaps the most significant finding related to the importance that training plays in construction safety. Additionally, it was found that new and innovative approaches were being applied in safety programs with considerable success. The second study focused on obtaining information directly from large projects under construction. These projects were valued between $50 and $600 million. A total of 38 projects participated in this study.

The data were analyzed to determine the OSHA recordable injury rate associated with the implementation of each safety program element. The results led to the identification of nine different categories of safety programs that are effective in helping achieve the zero injury objective. The nine key topic areas to achieve world class safety performance are:

- Demonstrated management commitment
- Staffing for safety
- Staffing planning
- Safety training and education
- Worker participation and involvement
- Recognition and rewards
- Subcontract management
- Accident/incident reporting and investigations
- Drug and alcohol testing

The project team suggests that these initiatives be taken as a consolidated group. By using them, firms can expect significant savings through the reduction of injuries and in making zero

accidents a reality. An effective safety program will include some aspect of all of these categories, which are briefly described below:

Demonstrated management commitment is understandably at the core of an effective safety program. Management must convey to others that safety is a top priority that will not be compromised. This can be demonstrated in many ways. The commitment must be sincere and it must somehow be conveyed to the worker level. Without this clear communication, the underpinning for the safety program is lacking.

Staffing for safety is essential on large projects. It requires full-time safety personnel to ensure that the safety needs of the projects are being satisfied. These safety personnel are a valued resource for the project and provide the day-to-day safety support for the field personnel.

Safety planning continues to play a vital role in jobsite safety. Site-specific safety programs ensure that the projects have a safe start, while pre-task safety plans ensure that daily tasks are performed with safety integrated into the daily work routine.

Safety training and education is a major component of jobsite safety. The education of workers begins with formal jobsite orientation for all workers. The learning process is never completed. As jobsite conditions change, it is necessary to provide additional training to field workers, supervisors, or managers.

Worker participation and involvement is perhaps the area in which the most significant changes have taken place in recent years. This is based on the view that workers are not just a valuable resource to be protected, but are a resource that can contribute to achieving the goal of zero accidents. Such involvement can be achieved through several means, including observations of worker behavior, input from worker safety perception surveys, and through worker service on safety committees.

Recognition and reward programs have shown some success in improving safety performances. While the traditional incentive programs offer no assurance of good safety performance, some techniques were noted to offer guidance. If incentives are offered, for example, they need not be costly, should be given often, and should be based on a specific goal. Personnel should be given overall evaluations that include their performance in the area of safety.

Subcontract management implies that the influence of general contractor's safety program must extend beyond its own employees to the subcontractors.

Accident/incident reporting and investigations must be conducted diligently to identify the root causes. As the incidence of injury/accidents decrease, near misses are now a key focus in accident investigations.

Drug and alcohol testing continues to reveal its importance to the achievement of good safety performance. Perhaps the next step in this area is to develop rehabilitation programs for employees who abuse drugs.

Making Zero Accidents A Reality

Making Zero Accidents A Reality Project Team

Knowledgeable Points of Contact

John J. Mathis
Vice President & Manager of ES&H – North American Operations
Bechtel Group, Inc.
9W163/MS024
3000 Post Oak Blvd.
Houston, TX 77056
P: (713) 235-3702 F: 713-235-8579
jmathis@bechtel.com

A. Dennis Cobb
Regional Safety Consultant
E. I. duPont de Nemours & Co., Inc.
7909 Parkwood Circle Drive
Houston, TX 77036
P: (713) 981-2088 F: 713-272-3910
a-dennis.cobb@usa.dupont.com

T. Paul DeForge
Project Manager, Northeast Plant Group
Ontario Power Generation
Internal TS5
801 Montjoy Street South
P. O. Box 966
Timmins, ON P4N 7H1
CANADA
P: (705) 267-7033, ext. 3602 F: 705-267-5789
pdeforge@opg.com

Jimmie W. Hinze
Professor, School of Building Construction
University of Florida
5040 N.W. 50th Terrace (32606)
P. O. Box 115703
Gainesville, FL 32611-5703
P: (352) 392-4697 F: 352-392-9606
hinze@ufl.edu

Randal D. Marconnet
Vice President Corporate Services
Watkins Engineers & Constructors, Inc.
2101 Maryland Circle (32303)
P. O. Box 2194
Tallahassee, FL 32316
P: (850) 574-7884 F: 850-576-5768
rmarconn@watkins.dillingham.com

Michael F. Schwimmer
Project Management Consultant
Chevron U.S.A. Project Resources
1400 Woodloch Forest Drive
The Woodlands, TX 77380
P: (281) 363-7174 F: 281-363-7244
mfsc@chevron.com

Gary L. Wilson
Director
National Center for Construction Engineering Research
P. O. Box 141104
Gainesville, FL 32614-1104
P: (352) 334-0911 F: 352-334-0932
gary@nccer.org

Making Zero Accidents A Reality

Plenary Slides

CII Education Tools and How to Access Them

Education Committee

Learning Objectives

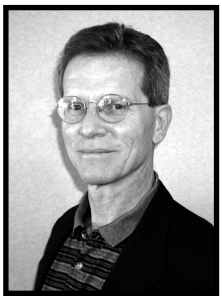
- Gain a better understanding of the current and future CII Education products.
- Determine which education delivery systems will give the best ROI for your organization now and in the future.
- Leverage your training dollars by delivering courses on CII Best Practices and much more for $50 per person per year.
- Find out if you are taking advantage of all of the “learning centers” available within CII.

Abstract

This presentation will summarize the content and the various sources of CII Education material through discussion of the CII Knowledge Structure, outlining Best Practices, tools, supporting products and references available. Other CII learning opportunities will be highlighted, including current and future types of education material delivery systems.

Plenary Session Presenter

Chris W. Hyvonen – Senior Vice President, Kiewit Industrial Company



Chris Hyvonen is Senior Vice President for Kiewit Industrial Company, the Power and Process Division of Kiewit Construction Group, in Omaha, Nebraska. At Kiewit, he is responsible for business development and marketing for engineering and construction projects in the power and process sector. He has more than 27 years experience in the construction industry with assignments in operations, strategic planning, business and finance, and corporate development. Chris is co-chair of the CII Education Committee. He earned BA, BE, and MBA degrees from Dartmouth College in Hanover, New Hampshire.

Implementation Session Moderator

Michael M. Cate – Director, Procurement & Contracts, Industrial/Process Business Unit, Washington Group International, Inc.

Mike Cate is Director, Procurement and Contracts, for the Industrial/Process Business Unit of Washington Group International in Cleveland, Ohio. During his 35 years with Washington Group, he has had both foreign and domestic assignments. Functional responsibilities have included engineering, procurement, project management, and field assignments. He currently manages the procurement and contracts departments for WGI. At CII, he has served on research teams and has been an Annual Conference presenter. He currently serves on the CII Education and Research Committees. Mike holds an electrical engineering degree from the University of Tennessee.

Implementation Session Participants

Carol P. Arnold, Leader, DuPont Engineering University – DuPont Engineering

Chris W. Hyvonen, Senior Vice President – Kiewit Industrial Company

Arnold M. Manaker, Project Manager, Paradise SCR – Tennessee Valley Authority

Benjamin Don Patrick, Director, Training & Employee Development – H. B. Zachry Company

CII Education Tools and How to Access Them

Education Committee

The purpose of this presentation is to assist in developing a broad awareness of the learning opportunities in CII, with emphasis on providing:

a. Knowledge of the descriptions of the CII research documents and related education modules that can be found very easily by using the interactive CII Catalog. This catalog may be accessed through the CII Web site at http://construction-institute.org, then clicking on "catalog" and "Knowledge Structure." Clicking on any topic in the Knowledge Structure matrix will provide the listing of the CII references with supporting detailed information.

b. Knowledge of the resource represented by the 20 Education Modules developed by CII that are available for use by members and by the industry. A list of the 20 CII-developed modules is provided on the following pages.

c. Information on the many opportunities to access the information in the CII Education Modules, including:

   1. Presenting the CII Education Module training within member organizations by industry practitioners or outside trainers.

   2. The presentation of 14 CII Education Modules, by means of two standardized courses, each of one-week duration, by three universities: Arizona State University, Clemson University and The University of Texas at Austin. These three universities have coordinated their continuing education programs to provide the CII courses at differing times throughout the year. The schedule for these courses is available on the CII Web site, http://construction-institute.org under "Short Courses." Links to the individual continuing education programs of the presenting universities is also available from the CII Web site.

   3. The presentation of customized CII courses by any of the three universities noted above on topics and at locations of the clients selection.

   4. The presentation of selected CII Education Modules by local or regional elements of the Construction Users Roundtable (CURT).

d. Information on the newly developed training resource, CII Technology Assisted Learning (TAL) which will provide a number of CII education modules through the Internet. As the content of the existing CII Education Modules is converted to the TAL format, this material will be available to members at minimal cost. Because the education material can be accessed via the Internet, users may access it while at work, at home or on travel; anywhere that Internet service is available. The cost for this service through our supplier, KnowledgeWire, is $50 per person, per year and includes access to over 100 courses in the KnowledgeWire Library as well as the CII courses. The users may take as many courses during the year as they desire for one subscription fee. There will be no additional cost for the CII courses for

member organizations. Non-members will pay a substantial additional fee to access the CII courses. You may access the system at www.knowledgewire.com, and a free 60-day test-drive is available for up to 100 employees. One CII course is now available on the KnowledgeWire system, titled "Construction Safety." The "Constructability" course, consisting of four modules, is the next to be placed on the system. The Constructability course will be followed by "Planning for Startup." The list of CII modules currently planned for conversion to the TAL format is shown on the following pages.

e. Information on other opportunities to learn through active participation on CII teams and committees.

CII Education Modules Currently Available

EM #	*Title*	*Year Published*
EM-1	Optimizing Project Schedules	1992
EM-2	Measuring Productivity	1994
EM-3	Work Packaging for Project Control	1993
EM-4	Quality Performance Management System (QPMS)	1993
EM-5	Construction Safety: Zero Accidents	Revised 2000
EM 7-21	Materials Management (successor to EM-6)	2001
EM-11	Implementing Constructability	Revised 1998
EM-12	Modularization in Industrial Construction ***New research underway***	1993
EM-16	Total Quality Management	1994
EM-25	Design Effectiveness and the Objective Matrix	1998
EM-37	Building the Project Team	1998
EM-39	Pre-Project Planning	1997
EM-48	Environmental Remediation	1997
EM 102-21	Developing, Implementing, and Managing a Partnering Relationship	1999
EM 111-21	Owner/Contractor Work Structure	2001
EM 113-21	Development and Alignment of Project Objectives	1999
EM 113-22	Project Scope Control and Change Management	2000
EM 114-21	Contractor Compensation	1999
EM 121-21	Planning for Startup	2000
EM 125-21	Impacts of Changes in the EPC Process	2001

Technology Assisted Learning (TAL)

Priority Order	CII Education Modules for Conversion to TAL format in 2001	
1	EM-5, *Construction Safety*	**Tier 1 completed**
2	EM-11, *Constructability* (four modules)	**Tier 1 under construction**
3	EM 121-21, *Planning for Startup*	**Tier 1 under construction**
	The following priorities for TAL conversions based on Implementation Session attendee input from the 2000 Annual Conference and Construction Project Improvement Conference. Conversion of these modules will be underway soon.	
4	EM-39, *Pre-Project Planning, including the Project Definition Rating Index (PDRI)*	
5	EM 113-22, *Project Scope Control and Change Management*	
6	EM-2, *Measuring Productivity*	
7	EM-1, *Optimizing Project Schedules*	
8	EM 113-21, *Development and Alignment of Project Objectives*	
9	EM-37, *Building the Project Team*	

Suggested Sources of Information

Find information on the CII Education Modules in the CII Interactive Electronic Catalog. Direct your browser to http://construction-institute.org. That will bring you to the CII Home Page. Click, in turn, on “Catalog” and “Knowledge Structure.” Then click on any topic in the Knowledge Structure format to find the applicable research products and the related education modules.

You may also contact Bob Ryan, CII Associate Director for Implementation and Education at 512-232-3012 or *r.ryan@mail.utexas.edu.*

Knowledgeable Points of Contact

CII Education Committee

Carol P. Arnold, Committee Co-Chair
Leader, DuPont Engineering Univ.
DuPont Engineering
1007 Market Street, B10212
Wilmington, DE 19898-0001
P: 302/773-2740 F: 302-774-1347
carol.p.arnold@usa.dupont.com

William W. Badger
Director, Del E. Webb School of Construction
Arizona State University
P. O. Box 870204
Tempe, AZ 85287-0204
P: 480/965-3615 or 9011 F: 480-965-1769
bill.badger@asu.edu

Michael M. Cate
Director, Procurement & Contracts
Industrial/Process Business Unit
Washington Group International, Inc
Washington Plaza
1500 West 3rd Street
Cleveland, OH 44113-1406
P: 216/523-6579 F: 216-523-8147
mike.cate@wgint.com

Richard A. Danks
Deputy Chief, Facilities & Test
Engineering Division
National Aeronautics & Space Admin.
John H. Glenn Research Center
21000 Brookpark Road, MS 21-2
Cleveland, OH 44135
P: 216/433-8055 F: 216-433-3124
Richard.A.Danks@grc.nasa.gov

W. Frank Eskridge
Director, Construction Industry Cooperative Alliance
Clemson University
Box 340912
200 Lowry Hall
Clemson, SC 29634-0912
P: 864/656-4201 F: 864-656-0124
eskridw@ces.clemson.edu

Chris W. Hyvonen, Committee Co-Chair
Senior Vice President
Kiewit Industrial Company
One Thousand Kiewit Plaza
Omaha, NE 68131
P: 402/271-2836 F: 402-271-2837
chris.hyvonen@kiewit.com

Knowledgeable Points of Contact

CII Education Committee (continued)

Arnold M. Manaker
Project Manager, Paradise SCR
Tennessee Valley Authority
1101 Market Street, MS LP3K-C
Chattanooga, TN 37402-2801
P: 423/751-7438 F: 423-751-7170
ammanaker@tva.gov

Don Patrick
Director, Training & Employee Development
H. B. Zachry Company
P. O. Box 240130
San Antonio, TX 78224-0130
P: 210/475-8025 F: 210-475-8060 or 8784
patrickd@zachry.com

Robert H. Ryan
Associate Director
Construction Industry Institute
3208 Red River Street, Suite 300
Austin, TX 78705-2697
P: 512/232-3012 F: 512-499-8101
r.ryan@mail.utexas.edu

Andre Siegenthaler (Andre)
Vice President, Human Resources
Hilti Corporation
5400 S. 122nd East Avenue
Tulsa, OK 74146
P: 918/252-6433 F: 918-250-3801
siegand@us.hilti.com

Walter Silowka
Director of Process Safety
Air Products & Chemicals, Inc.
7201 Hamilton Blvd.
Allentown, PA 18195-1501
P: 610/481-6808 F: 610-481-5224
silowkw@apci.com

D. Kent Stephenson
IPT Leader
NAVFAC – Atlantic Division
1510 Gilbert St.
Norfolk, VA 23511-2699
P: 757/322-4845 F: 757-322-4956
stephensondk@efdlant.navfac.navy.mil

Freddie P. Wong
Senior Project Engineer, Project Liaison Unit
Aramco Services Company
TS/ASC
P. O. Box 4534, MS-1093
Houston, TX 77210-1093
P: 713/432-4577 F: 713-432-4041
fp.wong@aramcoservices.com

Knowledgeable Points of Contact

CII Continuing Education Short Courses

Gary L. Aller

Director, Alliance for Construction Excellence

Arizona State University

P.O. Box 870204

Tempe, AZ 85287

P: 480/965-9284 F: 480-965-8172

gary.aller@asu.edu

W. Frank Eskridge

Director, Construction Industry Cooperative Alliance

Clemson University

Box 340912

200 Lowry Hall

Clemson, SC 29634-0912

P: 864/656-4201 F: 864-656-0124

eskridw@ces.clemson.edu

Jesse A. Pfeiffer, Jr.

Program Director, Construction Industry Programs

The University of Texas at Austin

Center for Lifelong Engineering Education

Box 300A

Blanco, TX 78608

P: 512/232-5154 F: 512-471-0831

jpfeiffer@mail.utexas.edu

CII Education Tools and How to Access Them

Plenary Slides

Benchmarking: The Journey to Improvement

Benchmarking & Metrics Committee

Learning Objectives

- Learn how Benchmarking can influence project outcomes as a project unfolds.
- Discover how real time Key Reports can provide project level feedback to guide project performance.
- Understand how the Knowledge Team activities are driving the development of metrics and analyses.
- Check out the latest developments of Benchmarking's interactive Web site:
  - Access to benchmarking tools and implementation resources, and
  - The ability to define custom data slices and graphics for performance comparisons.

Abstract

CII's Benchmarking & Metrics program is using Web-based technology to influence project outcomes. Project managers can input data during the project life cycle and compare the planned practice use to actual project experiences in the CII database. From this information you can then determine those critical practices that can improve performance. Two separate implementation sessions will be conducted — one jointly with Implementation to demonstrate advances in CII's online Benchmarking System to include links to Implementation Resources and special interactive features that provide users much flexibility in defining their benchmark comparisons. The other session will present progress in the definition and validation of productivity metrics.

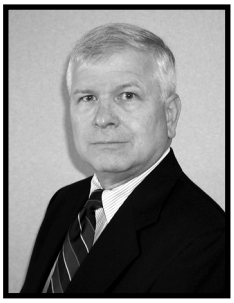
Plenary Session Presenter

David G. Hile – Operations Manager, Watkins Engineers & Constructors

Dave Hile is Operations Manager for Watkins Engineers and Constructors in the Alliance Division in Tallahassee, Florida. He has over 20 years' experience in heavy industry, including assignments in the refining, pulp and paper, chemical, and power sectors. He has served as field engineer, project controls manager, and director of business development prior to his current assignment in operations. Dave is co-chair of the CII Benchmarking and Metrics Committee and currently is helping to guide a CII study on productivity and performance metrics for construction and engineering. He is a graduate of Indiana State University.

Enhanced Project Success Through Continuous Benchmarking
Implementation Session Moderator

John Tato II – Chief, Program Support Branch, Office of Overseas Buildings Operations, U.S. Department of State



John Tato II is Chief of the Program Support Branch of the Office of Overseas Buildings Operations, U.S. Department of State, in Arlington, Virginia. He joined the Department of State in 1990. At State, he is responsible for developing and implementing a comprehensive database and reporting system and for providing financial management support for the department's 200-plus projects valued at more than two billion dollars. He also is responsible for the change management system. John attended the United States Naval Academy and holds bachelor's and master's degree in architecture from Stanford University.

Implementation Session Participants

Virgil L. Barton, Quality Assurance Manager of Projects, Bechtel Inc.

Karen B. Beer, Leader, Benchmarking – E. I. duPont de Nemours & Co., Inc.

Robert A. Herrington, Quality Manager, Central Region – Jacobs

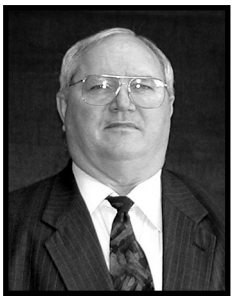
Donald G. Giles, Engineering – Mon Valley Works, U.S. Steel

Robert O. Ogletree, Vice President, Engineering – BE&K Engineering Company

Benchmarking: Productivity Metrics
Implementation Session Moderators

David G. Hile – President, Watkins Engineers & Constructors

James G. Slaughter, Jr. – President, S&B Engineers & Constructors Ltd.



James G. Slaughter, Jr. is President of S&B Engineers and Constructors in Houston, Texas. He joined S&B in 1967. He is past president of the Houston Area Contractors Safety Council and has been recognized many times for his safety efforts. Jimmy is active in CII, serving as research team chair, committee chair, and is currently a member of the Benchmarking Committee. He was recently inducted into the National Academy of Construction. Jimmy received his bachelor's degree in chemical engineering from the University of Houston, and attended the University of Toledo and Harvard Business School.

Benchmarking: The Journey to Improvement

Benchmarking & Metrics Committee

The Plenary and Implementation Presentations

The CII Benchmarking & Metrics Committee will present a progress update during its plenary presentation. The plenary session presentation also will address the use and benefits of continuous benchmarking. Recent accomplishments in the productivity metrics initiative will be featured.

As the CII Benchmarking Program has matured, the need to formalize rules governing participant activities and expectations became increasingly important. Principles of conduct, procedures governing confidentiality, and use of data have been formally addressed through the establishment of a Code of Conduct for benchmarking participants. Highlights of the code will also be addressed during the plenary presentation.

New opportunities developed through Web-based benchmarking will be expanded upon at two implementation sessions. The accomplishments of the past year require two separate sessions to share findings and allow for adequate discussion.

Major Efforts in 2000-2001

Recent committee activity has centered on two major efforts: Web development of benchmarking tools and development of productivity metrics. Web adaptation is essential to the achieving the benchmarking goals that were established two years ago. CII member companies said that they need a benchmarking system that is cost-effective, that allows them to submit data during project execution, and that it be capable of producing timely reports. The system has to be flexible and conform to company needs, and must be expanded to address the broadening membership base.

This past year the committee transitioned to a Web-based benchmarking system, thus meeting these requirements. Data are now collected exclusively via an online questionnaire that improves accuracy, supports data submission by the entire project team throughout project execution, and is adaptable to member company project environments. Project Key Reports — confidential reports depicting performance and practice use comparisons against the CII database — are now available at your PC as the data are entered. Quartile comparisons and graphical depiction versus the database provide meaningful and readily interpretable feedback. User-selectable data slices for comparisons afford added flexibility in customizing project reports. And the addition of new cost, schedule, and practice use metrics allows companies to select the metrics most meaningful for their needs. In addition, the Data Report — CII's broad reference publication for industry benchmarks — is now available online.

In less than a year, the productivity metrics program moved from conceptual planning to pilot data collection and metric calculation leveraging the same Web-based technology developed by the best practice benchmarking effort. Common definitions for seven categories of productivity metrics (concrete, structural steel, piping, insulation, instrumentation, equipment,

and electrical & devices) were developed through member company input following many hours of collaborative questionnaire development. Early results of these achievements are being tallied for presentation at the conference. After refinement of the construction productivity metrics, the productivity metrics group plans to turn its attention to similar engineering metrics.

Benchmarking: The Journey to Improvement

Benchmarking & Metrics Committee

Knowledgeable Points of Contact

Virgil L. Barton
Quality Assurance Manager of Projects
Bechtel Inc.
5275 Westview Drive, 1A-6 BP2
Frederick, MD 21703-8306
P: (301) 228-8403 F: 301-682-4790
vbarton@bechtel.com

Karen B. Beer
Leader, Benchmarking
E. I. duPont de Nemours & Co., Inc.
Brandywine 10208
1007 Market Street
Wilmington, DE 19898
P: (302) 774-2530 F: 302-774-2564
karen.b.beer@usa.dupont.com

Donald G. Giles
Manager, Engineering – Mon Valley, Fairless Works
U.S. Steel
Irvin Plant
P. O. Box 878
Dravosburg, PA 15248
P: (412) 675-2571 F: 412-674-7826
dgiles@uss.com

Robert A. Herrington
Quality Manager, Central Region
Jacobs
5995 Rogerdale Road (77072-1601)
P. O. Box 53495
Houston, TX 77052-3495
P: (832) 351-7186 F: 832-351-7701
bob.herrington@jacobs.com

David G. Hile
Operations Manager
Watkins Engineers & Constructors
2101 Maryland Circle
P. O. Box 2194
Tallahassee, FL 32316
P: (850) 574-7899 F: 850-576-1939
dhile@watkins.dillingham.com

Robert O. Ogletree
Vice President, Engineering
BE&K Engineering Company
2000 International Park Drive (35243)
P. O. Box 2332
Birmingham, AL 35201-2332
P: (205) 972-6304 F: 205-972-6884
ogletreeb@bek.com

Knowledgeable Points of Contact (continued)

James G. Slaughter, Jr.
President
S&B Engineers and Constructors Ltd.
7825 Park Place Blvd. (77087)
P. O. Box 266245
Houston, TX 77207-6245
P: (713) 845-4502 F: 713-640-0039
jgsjr@sbec.com

John Tato II
1701 N. Fort Myer Drive (22209)
Chief, Program Support Branch
Office of Foreign Buildings Operations
U.S. Department of State
P. O. Box 12248
Rosslyn Station
Arlington, VA 22219-2248
P: (703) 875-6599 F: 703-875-4130
tato-iij@state.gov

Benchmarking: The Journey to Improvement

Plenary Slides

Electronic Simulation in Construction

Electronic Simulation in Construction Research Team

Learning Objectives

- Find out if electronic simulation is right for your company.
- Discover the current state of practice/technology.
- See the benefits and perceived barriers to using Electronic Simulation in Construction.
- Obtain tools for implementing Electronic Simulation in Construction technologies/ systems.

Team's Research Objectives

The specific objectives of the Electronic Simulation in Construction research team were to:

- Determine and evaluate existing technologies involved in interactive electronic simulation in construction.
- Develop procedures and recommendations on when to use and how and what type of technology to use.

Abstract

This presentation will define Electronic Simulation in Construction and highlight the current usage by CII member companies. The various benefits and perceived barriers to the implementation of electronic simulation in construction will be discussed. Tools will be introduced that can be used to select the best technology available to meet current and future needs.

Plenary Session Presenter

Bryan Sharp – Project Manager, Petrofac LLC

Bryan Sharp is a project manager at Petrofac in Tyler, Texas. His international experience includes projects in Korea, Scotland, Venezuela, and Brazil. He has served in both the Navy Reserve and the Army National Guard. A veteran of Desert Storm, he served as a U.S. Army Engineering officer and platoon leader in that conflict and was promoted to company commander of a combat heavy engineering company after returning. He chairs the CII Electronic Simulation in Construction Research Team. A mechanical engineering graduate from Louisiana Tech University, he currently is working toward his MBA at the University of Texas at Tyler.

Electronic Simulation in Construction

Electronic Simulation in Construction Research Team

Owners, engineers, construction managers, and contractors face numerous problems throughout the life cycle of a project (i.e., planning, design, construction, start-up, operation, and maintenance). These problems include:

- Lack of comprehensive scope visualization and design review
- Constructability, maintainability, and operability issues
- Quality and safety issues
- Cost and schedule control problems

The main purpose of this research was to identify, analyze, and evaluate the current use of interactive electronic simulation in construction. The results highlight the benefits, limitations, and barriers of electronic simulation in heavy industrial construction, and also establishes the state-of-the-art, state-of-practice, and the state-of-R&D for electronic simulation in construction.

The Electronic Simulation in Construction Research Team believes that many areas and practically all types of projects could significantly benefit from the use of electronic simulation. The research team developed a decision aid to assist users in selecting the most appropriate electronic simulation technology for their use. That is described in CII Implementation Resource 154-2.

With 92 percent of survey respondents agreeing that electronic simulation technology adds value to the project management process, it will remain an important field of review, consideration, and implementation facing CII membership.

Definitions

For the purposes of the research the following definitions were used.

- Spatial Visualization (3D-Static), which is the use of 3D CAD systems/tools for spatial visualization and analysis in contrast to simple 2D rendition. Example: 3D-Model Review
- Virtual Interactive Environment (3D-Dynamic), which is the use of visualization systems/tools to present 3D objects or project plans into computer generated interactive virtual project environment for visualization, simulation, and analysis. Example: Animated 3D-Model Construction Sequence
- Construction Process Simulation (mathematical models), which is the use of mathematical models/tools to simulate system interactions with an objective to forecast impacts, and determine activity bottlenecks, resource requirement, and productivity of the system or process. Example: Monte Carlo-based models, MicroCyclone, Stroboscope, and Simphony.
- Integrated Simulation Environment, which is the integration of 3D-Static, 3D-Dynamic, mathematical simulation models (as well as other project management software and databases) into an unified framework. This is done in a way that achieves seamless data transfer between the different systems and databases for the purpose of overall project management.

Additional reference material or handouts

The Electronic Simulation in Construction decision support aid can be found at the Emerging Technologies Web site at *http://www.new-technologies.org/ECT/* .

Electronic Simulation in Construction

Electronic Simulation in Construction Research Team

Knowledgeable Point of Contact

Markarand Hastak
Dept. of Civil & Environmental Engineering
University of Cincinnati
P.O. Box 210071
Cincinnati, OH 45221-0071
P: (513) 556-3689 F: 513-556-2599
mhastak@uceng.uc.edu

Bryan Sharp
1021 ESE Loop 323
Tyler, TX 75701
P: (903) 581-8755 F: (903) 534-5049
bryan.sharp@petrofac.com

Randy Williams
Vice President – Business Development
Suite 300
10700 Richmond Avenue
Houston, TX 77042
r.williams@cadcentre.com

Electronic Simulation in Construction

Plenary Slides

Multiple Partnering Consortium

Case Study: Procter & Gamble, Fru-Con Construction, and Fluor

Learning Objectives

- Learn how early construction involvement in a project's planning process maximizes the utilization of the Owner's capital resources.
- Develop an effective, aligned project team.
- Discover how successful partnering relationships increase quality, innovation and performance.
- Increase revenue while investing in safe work practices, saving lives, preventing lost-time accidents and reducing compensation cases.

Abstract

Hear what to do and what not to do to implement the objectives of constructability, team building, partnering and zero-accident techniques. Multiple cultures and practices on this project formed one cohesive Joint Venture/Consortium team, resulting in enhanced project team performance. Now you can benefit from their proven successes while learning about the obstacles, mistakes and lessons learned.

Plenary Session Presenters

Gregory J. Holthouse – President, Engineering/Senior Vice President, Fru-Con Construction Corporation

Greg Holthouse is President, Fru-Con Engineering in St. Louis, Missouri. He has been at Fru-Con since 1988, serving in a variety of positions including Engineering Manager, Construction Operations Manager, Manager of Middle East operations, and Senior Vice President of industrial business unit. Prior to joining Fru-Con, he held a variety of construction and project management positions with a major consumer products company. He is a past member of the CII Partnering/Strategic Alliance Implementation Feedback Team. Greg holds a degree in construction management and structural design from Purdue University.

Dwayne A. Wilson – Vice President, Executive Director for the Chairman and CEO, Fluor Corporation

Dwayne Wilson is Vice President, Executive Director for the Chairman and CEO, Fluor Corporation. His experience is wide-ranging, with assignments in a variety of industry areas: food & beverage, metals, general manufacturing, automotive, paper and forest products, petroleum and petrochemicals, power generation, and government facilities. His previous position as Vice President of Fluor's manufacturing business line included

worldwide responsibility for project operations as well as sales, finance, construction, human relations, and management of key accounts. In addition to completing graduate courses at the Tuck School of Business Management at Dartmouth and Thunderbird School of International Management, Dwayne earned a bachelor's degree in civil engineering from Loyola Marymount University, Los Angeles, California.

Implementation Session Moderators

Gregory J. Holthouse – President, Engineering/Senior Vice President, Fru-Con Construction Corporation

Dwayne A. Wilson – Vice President, Executive Director for the Chairman and CEO, Fluor Corporation

Implementation Session Participants

William M. Gregerson, NSC Safety Director – Fru-Con Construction Corporation

John E. Moseley, Project Manager – The Procter & Gamble Company

Patrick J. Sanders, Project Manager – Fluor, Inc.

Multiple Partnering Consortium

Case Study: Fru-Con Construction Corporation, Fluor Daniel

The Procter & Gamble tissue and towel plant in Cape Girardeau, Missouri, was designed and constructed from January 1998 to March 2000 by the New Site Consortium (NSC), which consisted of:

- Fru-Con Construction Corporation and Fluor, Inc. (general contractor joint venture)
- Valmet Corporation.

Designed to produce 130,000 tons per year, the plant was constructed as an expansion to P&G's existing diapers manufacturing facility. Project statistics include the following:

- 18 acres of manufacturing space
- 200-plus subcontractors and 1,700 workers at peak, with around-the-clock work
- 80,000 cubic yards of concrete and 7,700 tons of structural steel used
- P&G's largest single capital project.

The project was awarded on a lump sum, or firm price, basis. In the past, P&G typically awarded reimbursable contracts for large-scale projects in the U.S. P&G had previous experience with each of the consortium members, but never had used them as a single contractual entity before.

Use of CII Best Practices

The project used several CII Best Practices. Those practices and the results are listed below.

Partnering

Partners invested their unique strengths to contribute to the project's success:

- Value engineering and other collaborative measures reduced the client's capital costs.
- Integrated start-up plan increased the client's revenues and set a new benchmark for start-up.

Achieved continuous feedback in all directions and focused on continuous quality improvement:

- Feedback incentive program improved cost, safety, quality, and schedules.
- Blending and spelling out JV's work processes resulted in fewer contractual/procedural disputes.

Team Building

Focused, aligned, and motivated team:

- Consultant-led alignment meetings ensured all were working toward common goals.
- Milestone celebrations motivated the team to accomplish its goals.
- 50/50 joint venture by two general contractors ensured common financial objectives.

Removed roadblocks to the project's success:

- The dispute resolution process was streamlined and issues were proactively resolved through regular meetings at the job site and with the joint venture, consortium, and client, as well as internal and joint alignment sessions held at critical times.

Constructability

Integrated construction input into planning, design, and field operations:

- Start-up driven, resource-loaded schedule enabled project milestones to be achieved.
- Limiting changes in scope and change orders permitted project completion below the client's cost goal.

Improved productivity:

- Schedule flexibility enabled early training of personnel and early start of some operations.
- The client's early release for site work permitted project completion ahead of schedule.

Copy scope findings:

- Saved money by reducing engineering, documentation, and capital equipment pricing.
- Saved time, but less than anticipated.
- Reduced risk — most significant benefit.
- Reduced rework in design and construction.
- Changed design process — virtually eliminated engineering and reduced design, reviews, and QA/QC.

Zero Accident Techniques

Provided safe environment for all workers:

- Nearly everyone passed pre-employment and random substance abuse testing and was commended for safe behavior.

Instilled zero-accident mentality:

- Pre-job training, on-site orientation, weekly safety meetings, and supervisor training resulted in zero lost-time accidents in more than four million effort hours worked and a 0.42 OSHA recordable rate.

Pre-project safety plan:

- Developed before subcontractors' arrival, expectations identified in pre-bid conferences, and cost issues for safety "extras" eliminated.

Prequalification of subcontractors:

- Eliminated "bad apples" and identified improvement focus areas.
- Didn't always find subcontractors that met criteria, and prequalifying sub-tier subcontractors was difficult.

Pre-task safety plans:

- High-risk work plans were identified in the contract, and communication increased between supervisors and their crews.
- Difficult to audit content.

New employee orientation:

- Consistent message and orientation allowed evaluation employees' knowledge and subcontractors' safety program.
- Language/education issues resulted in increased cost for projects with high turnover.

Supervisor training:

- Responsibility guidelines were established, and required safety process participation levels were identified, which ensured understanding of site programs and established communication link with the Safety Department.

Safety incentives:

- Increased management participation, and “good” subcontractors worked hard to set example.
- “Bad” subcontractors motivated to hide accidents, a lot of management time is required, and timeliness is difficult on large projects.

Behavior-based safety approach:

- Provided the framework for increased safety communication between supervisors and their crew, differentiated training and enforcement issues, focused on pre-accident issues, and served as OJT for supervisors on hazard identification.

Multiple Partnering Consortium

Case Study: Fru-Con Construction Corporation, Fluor Daniel

Knowledgeable Point of Contact

Greg Holthouse
Fru-Con Construction Corporation
P: 636-391-4574
greg.holthouse@frucon.com

John Moseley
Procter & Gamble
P: 513-634-2360
john.moseley-je/pgi@pgi.com

Dwayne Wilson
Fluor, Inc.
P: 573-326-8661
dwayne.wilson@fluor.com

Pat Sanders
Fluor, Inc.
P: 802-859-2367
pat.sanders@fluor.com

Bill Gregerson
Fru-Con Construction Corporation
P: 573-334-0204
gregerson.wm@pg.com

Sources of Information

The Construction Industry Institute. *Constructability: A Primer*. Publication 3-1. July 1986.

The Construction Industry Institute. *Partnering: Meeting the Challenges of the Future*. CII Partnering Task Force Interim Report. August 1989.

The Construction Industry Institute. *In Search of Partnering Excellence*. Special Publication 17-1. July 1991.

The Construction Industry Institute. *Team Building: Improving Project Performance*. Publication 37-1. July 1993.

The Construction Industry Institute. *Zero Injury Techniques*. Research Summary 32-1. May 1993.

Multiple Partnering Consortium

Plenary Slides

What Can CII Do for You?

First-Time Attendee Orientation — Implementation Session Only

Learning Objectives

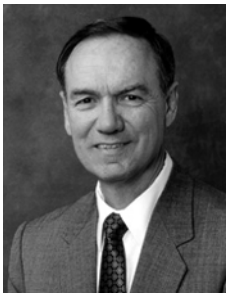
- Obtain an overview of the background origin of CII and its continued evolution.
- Gain a better understanding of CII and the breadth of its current and planned activities.
- Learn specific details of the CII research process, implementation efforts, and educational opportunities.
- Listen to how CII member companies have benefited from the implementation of CII tools and practices.

Abstract

This implementation session is designed for first-time attendees, prospective CII members, and others who would like to gain a broad understanding of CII and its many activities. CII Director Ken Eickmann will lead this special implementation session (no plenary presentation will be provided and the session will be conducted on Wednesday morning only). The session will provide detailed information on how CII is organized and what the primary core processes entail. The session panel includes four current members of the CII Executive Committee who will offer their insights on how their companies have benefited from CII membership.

Implementation Session Moderator

Kenneth E. Eickmann – Director, Construction Industry Institute



Prior to joining CII as Director in September 1998, Ken Eickmann (Lt. Gen., U.S. Air Force, Retired) enjoyed a distinguished and highly decorated 31-year career in the U.S. Air Force. Ken is a Registered Professional Engineer and a Certified Acquisition Professional in acquisition logistics, program management, and systems planning, research, development, and engineering. He is a Senior Lecturer in Civil Engineering at UT Austin. He holds a bachelor's degree in mechanical engineering from UT, a master's degree in systems engineering from the Air Force Institute of Technology, and is a graduate of the University of Michigan School of Business and the John F. Kennedy School of Government, Harvard University.

Implementation Session Panelists

William W. Brubaker, Director of Facilities Engineering and Operations – Smithsonian Institution

Bernard J. Fedak, General Manager – Engineering, U.S. Steel Group

James B. Porter, Jr., Vice President, Engineering & Operations

Dennis A. Schroeder, President, Engineering Division – BE&K Engineering Company

What Can CII Do for You?

Knowledgeable Points of Contact

Ken Eickmann

Director

Construction Industry Institute

3208 Red River Street, Suite 300

Austin, TX 78705-2697

P: (512) 232-3015 F: 512-499-8101

k.eickmann@mail.utexas.edu

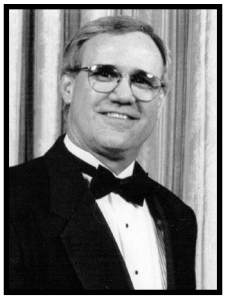
The Owner's Stake in Construction Workforce Training

Keynote Speech: J. Kent Underwood

Abstract

The workforce skill shortage is having a significant impact on owners, and they must become engaged in the solutions. Ken will provide clear recommendations on what owners should do and why it makes business sense. Owners must be committed to the construction workforce training issue and realize that this is not just a contractor problem.

Keynote Speaker



Kent Underwood is manager of project management for Solutia Inc. in St. Louis, Missouri. He has over 33 years of experience in the engineering, construction, and facilities management industries, 25 with Monsanto and Solutia. He has been recognized twice with the *ENR* Award of Excellence for his work with The Business Roundtable. He began his association with CII in 1986. Currently, Kent serves on the CII Executive Committee and is vice chairman of the St. Louis Regional Convention and Sports Complex Authority. A U.S. Air Force captain (retired), he holds a degree from Virginia Military Institute.

Executing Small Capital Projects

Executing Small Projects Research Team

Learning Objectives

- See how organizations with core teams complete their small projects 17% faster.
- Learn why companies who use standard small project processes significantly increase their schedule and budget performance.
- Obtain checklists for design, and responsibility matrices for procurement that improve your small project program.
- Maintain a consistent workforce by performing small capital projects and maintenance work.

Abstract

A large portion of all current industry capital budgets involve “small projects.” They typically focus on increased production, improved quality, and general maintenance of facilities. Because of that significant expense and the inherent opportunities for substantial savings, the CII Small Projects Research Team learning objectives were developed to identify the differentiating success factors available for improved small projects execution. The survey research data collected from over 40 CII owner and contractor member organizations provides confirmation and substantiation of the *Small Projects Toolkit*, which is organized using the CII knowledge structure. The implementation session will provide attendees with a sampling of the many specific learnings contained in the new *Toolkit* publication.

Plenary Session Presenter

Gareth V. Williams – Project Manager, Bechtel Corporation

Gareth Williams is a project manager for Bechtel Corporation in Houston, Texas. In his 20-year career he has worked on a variety of domestic projects for the firm. Initially a construction field engineer in the nuclear sector, Gareth had assignments in procurement and engineering before moving into project management. Besides experience on large power, petrochemical, and telecommunications projects, he has managed a number of small project programs including engineering and multi-site construction organization alliances. Gareth has a civil engineering degree from Cornell University, Ithaca, New York, and an MS degree from Rice University, Houston, Texas.

Implementation Session Moderator

Matthew J. Nissen – Marketing Manager, Watkins Engineers & Constructors

Matthew Nissen is Marketing Manager for Watkins Engineers and Constructors in Tallahassee, Florida. With Watkins for the past five years, he manages the company's marketing and business development efforts. His background also includes experience in project management and construction operations. Matthew currently is a member of CII Research Team 161, Executing Small Projects, and is actively involved in publishing the research results of the CII funded study. He joined the research team when it was formed in 1999. Matthew earned a bachelor's degree in construction from the University of Florida.

Implementation Session Participants

Gertraud F. Breitkopf, Senior Program Manager – General Services Administration

Jon R. Dutcher, Manager, Project Engineering, Corporate Engineering Division – Abbott Laboratories

Eric Johnson, Project Manager – Solutia Inc.

Gary R. Smith, Professor & Director, Construction Management & Engineering – North Dakota State University

Gareth V. Williams – Project Manager, Bechtel Corporation

Executing Small Capital Projects

Executing Small Projects Research Team

By improving the effectiveness and consistency of the small project delivery process, all industrial sectors can benefit. Current practices often yield less than satisfactory results in terms of project cost, quality, and schedule. The research process was designed to capture both qualitative and quantitative data on small project execution. The practical knowledge of the research team was captured in the form of a "toolkit" of ideas about processes and procedures that have proven effective for small project execution.

Scope and Purpose

The focus of the research was on small capital projects whose characteristics, as defined by a combination of complexity, organization, work volume, and staffing requirements, require the use of modified project management and execution processes or procedures. For simplicity, the scope was assigned capital project monetary limits between $100,000 and $2,000,000. However, many other factors contribute to a project being defined as small, and management practices and procedures are highly variable within the industry.

Objectives

The research addressed the following objectives:

- Identify the problems in the small project execution process.
- Identify approaches and modified procedures, processes, and resources for small projects.
- Identify the best practices and key factors for successful small project execution.
- Identify leading edge technology applications for small projects.
- Identify opportunities and development of personnel for multi-skilled design and construction assignments.

Lessons Learned from the Research Activity

Once the research team began the research process, it quickly learned that:

- The general body of literature has only a few instances that report on successes where project management considerations are specifically designed to improve the effectiveness of small project delivery.
- Circumstances, factors, processes, tools, organizations, and practices vary widely.
- Many large project processes do not readily adapt to small projects.
- Small project program manuals are used only occasionally (more commonly, the manuals are used as parts of overall programs that are not tailored to small projects).
- The research findings support and/or dispute many of the relationships and factors influencing small project management and project execution.

No generally accepted procedure exists to organize, manage, and execute small projects. Each instance observed was unique in some measure.

Research Findings

The following represent a few of the findings summarized by the research:

- The top three logistics challenges presented by small projects are:
- Shortened or compressed time frame for executing projects.
- Reduced front-end planning and faster turnaround for concept and scope.
- Information flow and communication needs - a small group of people must communicate with a wider range of customers throughout existing facilities.
- Approximately 30 percent more time is required for supervision on small projects.
- Fifty-five percent of the organizations evaluated have separate entities for small projects, and those usually include independent, core management groups.

Key Conclusions

- Checklists used in front-end planning are beneficial to both schedule and budget performance.
- Constructability has been adopted by most organizations for small projects.
- Concurrent maintenance work is beneficial to performance effectiveness, which results from improved continuity and planning.
- Written, standard processes have a beneficial influence on small project performance.
- Alliances and preferred contractor arrangements are common and effective for small projects.

Benefits of Best Practices

Implementation of best practices by the leading performance organizations in the study is calculated to have at least a five percent cost savings. Within one organization, savings were demonstrated up to 15 percent.

Suggestions for Implementation Efforts

1. Improve the overall effectiveness of the business case definition and front-end planning process.
2. Ensure that career path opportunities for small project personnel are similar to those for personnel on large projects.
3. Establish the small project organization as a viable, independent business service unit that is to be responsible for demonstrating the benefits to owners and contractors.
4. Use CII Implementation Resource 161-2, *Small Projects Toolkit.*

Executing Small Capital Projects

Executing Small Projects Research Team

Knowledgeable Points of Contact

Gertraud F. Breitkopf
Senior Program Manager
General Services Administration
1800 F Street, N.W.
Washington, D.C. 20405
P: (202) 501-0182 F: 202-501-2258
gertraud.breitkopf@gsa.gov

Jon R. Dutcher
Manager, Project Engineering
Corporate Engineering Division
Abbott Laboratories
Dept. 56Z, Bldg. AP52-S
200 Abbott Park Road
Abbott Park, IL 60064-6212
P: (847) 937-1411 F: 847-937-5617
jondutcher@abbott.com

Eric Johnson
Project Manager
Solutia Inc.
Bldg. 451, Room 6
P. O. Box 97
Gonzalez, FL 32560-0097
P: (850) 968-7742 F: 850-968-7224
epjohn2@solutia.com

Matthew J. Nissen
Marketing Manager
Watkins Engineers & Constructors
2101 Maryland Circle (32303)
P. O. Box 2166
Tallahassee, FL 32303
P: (850) 574-7817 F: 850-574-1909
mnissen@watkins.dillingham.com

Gary R. Smith
Professor & Director, Construction Management & Engineering
North Dakota State University
Department of Civil Engineering & Construction
CME Bldg., Room 120
Fargo, ND 58105
P: (701) 231-7880 F: 701-231-7431
gary_smith@ndsu.nodak.edu

Gareth V. Williams
Project Manager
Bechtel Corporation
3000 Post Oak Blvd. (77056)
MS-033
Houston, TX 77210-2166
P: (713) 235-2125 F: 713-235-4494
gvwillia@bechtel.com

Executing Small Capital Projects

Plenary Slides

Virtual Teams – A Guide to Successful Implementation

Making Virtual Teams Work Project Team

Learning Objectives

- Find out the concepts, implementation issues, and requirements for a successful virtual team.
- Learn why cultural issues dominate, not technology.
- Discover why technology is not a barrier to successful virtual teaming.
- Understand how to gain project execution efficiency by removing boundaries, and integrating and optimizing competencies.

Abstract

The successful initiation and execution of a virtual team is gaining increasing attention in the design and construction community. This presentation will highlight the opportunities that are available from the successful implementation of these teams. In the implementation session, the demonstration of a virtual team will provide an understanding of the management requirements that are essential to the success of virtual teaming. Discover the opportunities and barriers while observing a virtual team demonstration with the latest in virtual team technology.

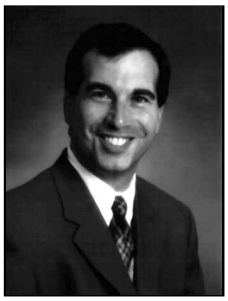
Plenary Session Presenter

Christopher L. Parker – Vice President of Engineering, Houston Operations, Parsons Energy & Chemicals

Chris Parker is Vice President of Engineering for Parsons Energy & Chemicals, where he has been given increasingly responsible assignments since joining the firm in 1981. He is responsible for implementing new technologies in the engineering department and for the continuous improvement programs of the department. He also has responsibility for establishing and implementing standard engineering procedures and specifications for use on all company projects. Chris currently chairs a PIP steering team and the CII Virtual Teams Project Team. A Licensed Professional Engineer, Chris earned a bachelor's degree in mechanical engineering from the University of Houston.

Implementation Session Moderator

Paul S. Chinowsky – Associate Professor, Georgia Institute of Technology



Paul Chinowsky is an Associate Professor in the School of Civil and Environmental Engineering at the Georgia Institute of Technology and the President of AECStrategies, a management consulting firm. Dr. Chinowsky is currently conducting research in the management of organizations in the architecture-engineering-construction industry and in the role of virtual teams in engineering collaboration. In the management area, Dr. Chinowsky has published Strategic Corporate Management in Engineering, an introduction to the concepts of strategic management. He received his undergraduate and Masters degree in architecture from Cal Poly San Luis Obispo and his doctorate in civil engineering from Stanford University.

Implementation Session Participants

Paula J. Hansen, Senior Research Scientist – Texaco Group, Inc.

Margaret A. Holly, Manager, Lean Engineering Military Aircraft & Missile Systems Group – The Boeing Company

William F. Johnston, Information Technology Director – Day & Zimmermann International Inc.

Stephen S. Pao, Vice President, Product Management – Latitude Communications

Robert L. Pinson, Vice President & General Manager – BE&K Engineering Company

Eddy M. Rojas, Assistant Professor, Department of Civil, Structural, and Environmental Engineering, State University of New York at Buffalo

Virtual Teams – A Guide to Successful Implementation

Making Virtual Teams Work Project Team

As companies and projects utilize multi-national and multi-organizational partnerships, the need for more efficient communication alternatives is increasing. However, little guidance currently exists to assist an organization in the successful implementation and management of these teams. In an effort to fill this information gap, CII formed a team in April 2000 to study virtual teams. The scope included the examination of current research, practices within the industry, cases outside the EPC industry, and the development of recommendations for successfully implementing virtual teams in the EPC industry.

Organizations and researchers have various definitions for the concept of virtual teaming. Therefore, to assist CII members in pursuing this topic, the CII team developed the following definition:

> **A virtual team is a group of people with complementary competencies executing simultaneous, collaborative work processes through electronic media without regard to geographic location.**

The important concept is that virtual teams do not refer to traditional work sharing, electronic communications, or other forms of dividing projects that require individuals or groups to work independently. Rather, virtual teams allow individuals or groups to collaborate on a project in real time through electronic media. In this manner, a virtual team operates as an integrated team whose members may happen to be located in different parts of the country or world. The potential advantages of this type of collaboration include:

- Efficiency of project execution
- Removal of physical boundaries
- The integration and optimization of competencies
- The ability to form new partnerships.

The majority of CII members believe that virtual teams will be a primary mode of project execution within five years. The construction industry in general and CII companies specifically, however, have not studied the full spectrum of issues associated with implementing virtual teams. Reinforcing a “team” feeling, establishing trust, and selecting team leaders have received little attention, while technology issues such as security, compatibility, and training remain as perceived barriers to implementing virtual team technology.

Conclusions

Rather than focusing on best practices as a starting point for lessons learned, the team transferred its focus to providing a set of guidelines and recommendations for industry

organizations embarking on the road to virtual team implementation. The conclusions can best be summarized in the following statement:

> **Technology is not the barrier to successfully implementing virtual teams. Although technology can lead to virtual teaming failures, sufficient technology is available to successfully implement virtual teams. Rather, revising traditional management practices is the key to successfully initiating and implementing virtual teams.**

This focus on management as the principal issue in virtual teaming is reinforced continually within both the literature and anecdotal evidence. Researchers in the computing and management disciplines, companies such as Boeing and NASA that incorporate virtual teaming as a primary design and coordination tool, and companies within the EPC industry that have taken initial steps to implement virtual teams all emphasize the importance of resolving management issues prior to implementing virtual teams.

Recommendations

Management practices are a primary element in the successful implementation of virtual teams. Organizations should consider the following.

Management Issues

1. Virtual teaming requires initial face-to-face meetings to develop a sense of “team.”
2. The project objectives must be restated and reinforced frequently.
3. Managers must visit remote participants during the course of the project.
4. Conflicts must be addressed quickly to avoid unresolved issues.
5. Expectations of each team member must be stated clearly.
6. Virtual team leaders should be selected with an acknowledgment of the unique demands placed on distributed teams
7. Team member workloads should be monitored to ensure increases do not occur.
8. Regular training must occur equally for all members of the virtual team.

Technology Issues

1. Select tools that allow simultaneous sharing of data and multi-person collaboration.
2. Determine security requirements and acquire appropriate (and existing) encryption and authentication software.
3. Purchase systems that have the ability to communicate with all necessary computing platforms.
4. Purchase a system that incorporates industry and company standards for data sharing and communication.

Virtual Teams – A Guide to Successful Implementation

Making Virtual Teams Work Project Team

Knowledgeable Points of Contact

Paul S. Chinowsky

Associate Professor

School of Civil and Environmental Engineering

Georgia Institute of Technology

Atlanta, GA 30332-0355

P: 404-894-8269 F: 404-894-5418

pchinow@ce.gatech.edu

Paula Hansen

Senior Research Scientist

Texaco Group, Inc.

3901 Briarpark

Houston, TX 77042-5301

P: 713-954-6319 F: 713-954-6016

hansepj@texaco.com

Margaret A. Holly

Manager Lean Engineering Military Aircraft & Missile Systems Group

The Boeing Company

P. O. Box 516 MC S064-2809

St. Louis, MO 63166

P: 314-234-3513 F: 314-234-5010

margaret.a.holly@boeing.com

Steve Pao

Vice President of Product Management

Latitude Communications

185 Berry St., Suite 160

San Francisco, CA 94107

P: 408-654-1320 F: 415-644-1344

spao@latitude.com

Eddy Rojas

Assistant Professor

SUNY Buffalo

Dept. of Civil, Structural and Environmental Engineering

226 Ketter Hall

Buffalo, NY 14260

P: 716-645-2114 F: 716-645-3733

rojase@acsu.buffalo.edu

Virtual Teams – A Guide to Successful Implementation

Plenary Slides

Breakthrough 2001

Special Implementation Session

Learning Objectives

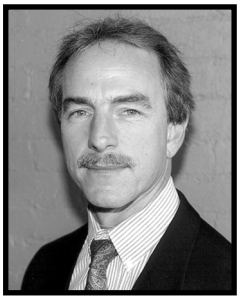
- See what breakthrough activities are currently under way.
- Learn about the breakthrough process for generating new topics.
- Find out how you can contribute to the process with your ideas.

Abstract

This special implementation session will provide a forum to review the CII Breakthrough process with members of the Breakthrough Strategy Committee. The committee continues to pursue new innovative ideas for the engineering and construction industry. An update on the top five ideas that have been identified/assessed and now moving into the nurture phase of the breakthrough process will also be provided. The committee will also solicit input to evaluate the next 10-15 ideas that are progressing through the assess phase along with soliciting new ideas to enter the process.

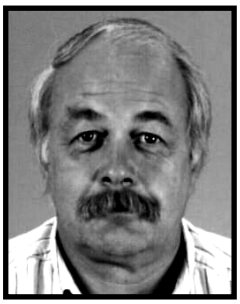
Implementation Session Moderators

C. Chatt Smith – Manager, Best Practices, Jacobs Engineering



Chatt Smith is Manager, Best Practices, in the Quality Department of Jacobs in Houston, Texas. He has over 25 years of experience in the petrochemical and E&C industries, where he has worked in both the owner and contractor communities. His assignments have included a variety of engineering and management positions in operations, maintenance, economics, supply and logistics, and construction. He is a member of the CII Breakthrough Strategy Committee and was a presenter at the 2000 CII Annual Conference in Nashville, Tennessee. Chatt is a chemical engineering graduate of Louisiana State University.

Robert C. Jacobs – Director, Facilities Engineering, Real Estate and International Engineering Services, 3M Company



Bob Jacobs is Director, Facilities Engineering, Real Estate and International Engineering Services, for the 3M Company in St. Paul, Minnesota. He has been with 3M for over 34 years, and has extensive experience in engineering, manufacturing, and research and development. His background includes assignments in process and product development research, plant and site management, and division and markets engineering. He also has served as project manager on major engineering and construction projects in Europe and the U.S. He holds an agricultural engineering degree from the University of Wisconsin-River Falls.

Breakthrough 2001

Knowledgeable Points of Contact

Robert C. Jacobs

Director, Facilities Engineering & Real Estate & International Engineering

3M Company

900 Bush Ave., Bldg. 42-2W-02

St. Paul, MN 55133-3331

P: (651) 778-4585 F: 651-778-6180

rcjacobs1@mmm.com

C. Chatt Smith

Manager, Best Practices

Jacobs

5995 Rogerdale Road

Houston, TX 77072-1601

P: (832) 351-7187 F: 832-351-7701

chatt.smith@jacobs.com

The Image of the Construction Industry

Keynote Speech: Daniel J. Bennet

Abstract

Today's construction industry is facing the difficult challenge of recruiting, training, and retaining an adequate workforce. Projections from various sources estimate a workforce shortfall of 240,000 employees every year for the next decade. Reasons for this shortfall include the high volume of construction projects and competition from other industries for employees. Probably the most significant, however, is the poor image with which our industry has been labeled.

In many instances, that image is deserved. Our industry must seriously analyze compensation and benefits programs, safety issues, and the availability of quality training programs that provide lifelong learning opportunities and lead to career advancement. *ENR* magazine reported that the construction industry ranks dead last in training when compared to all other industries. In September 2000, the National Construction Image Summit was held in Atlanta to address all of these issues. More than 150 industry leaders attended the conference from construction companies, owners, labor, associations, manufacturers, and academia. Conference topics include a study of the demographics facing our industry, the changing attitudes of our workforce, competition with other industries for a workforce, and case studies of best practices from companies that are consistently ranked as *Fortune 500*'s Best Places to Work in America.

The strategic plan developed by the conference attendees led to the formation of the Image Steering Committee, which is comprised of 31 individuals. The committee has been charged with developing a path forward that can be used by the entire construction industry. The composition of the organization includes seven subcommittees in addition to a governing body. The seven subcommittees will be tackling issues such as workforce diversity, wages and benefits, employee relations, awards criteria, media and public relations, education/school-to-career, and an industry Web site. The vision of the effort is to make construction the career of choice. Research and programs will be developed around core messages that include:

Construction Builds a World of Opportunity

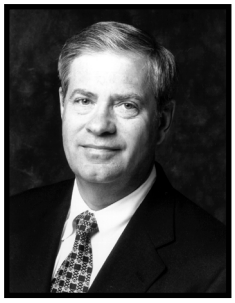
Construction is the Engine that Drives the Economy

Construction is Honorable and Rewarding

Construction Demands Excellence

This organization represents an industry-wide opportunity to positively affect the future of our industry's image.

Keynote Speaker



Dan Bennet is president of the National Center for Construction Education and Research (NCCER), which is based at the University of Florida. He was Executive Vice President of the Associated Builders and Contractors from 1983 to 1997. He also was a member of the Construction Industry Cost Effectiveness Project, a five-year study of the industry by The Business Roundtable that led to the creation of CII. Widely recognized as a leader in the construction industry, Dan has been honored many times. He received CII's highest honor, the Carroll H. Dunn Award of Excellence, in 1995.

Project Delivery & Contract Strategy Tool

Project Delivery & Contract Strategy Research Team

Learning Objectives

- Relate project delivery and contract strategy (PDCS) to project objectives and success parameters.
- Provide a decision support tool that will facilitate achievement of project objectives through selection of the most suitable PDCS.
- Evaluate the knowledge base of practitioners with an expanded, well-defined and documented set of PDCS alternatives.
- Provide defensible rationale for selecting PDCS, based on quantification of alternatives.
- Support the CII objective of developing Best Practices.

Abstract

Project delivery and contract strategies (PDCS) define the roles and responsibilities of the parties involved in a project and how the owner will pay for services. In place of the current practice of informal assessments, a structured procedure has been developed for owners in making this important project management decision. This procedure focuses on the owner's project objectives and the project execution environment, and incorporates a quantitative assessment of 12 PDCS alternatives in a decision support tool. This newly developed owner's tool produces reliable results, enhances insight into the problem of selecting a PDCS, harmonizes delivery systems with contract strategies, relates these to the owner's project objectives, and provides a defensible rationale for PDCS selection.

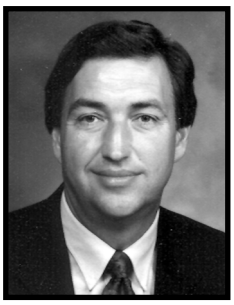
Plenary Session Presenter

Gary W. Vandiver – Manager, Performance Films Engineering, Solutia Inc.

Gary Vandiver is Manager, Performance Films Engineering, at Solutia in St. Louis, Missouri. He joined Monsanto in 1974 as a process design engineer in the St. Louis offices, and from 1978-85 served in several capacities for the firm in Pensacola, Florida. Gary has extensive experience in environmental remediation and remediation management as well as project management and process engineering. He also has international experience as leader of engineering teams exploring potential joint ventures with French and Dutch counterparts. He currently serves on the CII Project Delivery and Contract Strategy Research Team. Gary holds a chemical engineering degree from the University of Missouri-Rolla.

Implementation Session Moderator

G. Wayne Burchette – Director, Project and Process Engineering, Worldwide Engineering and Construction, Eastman Chemical Company



Wayne Burchette is Director, Project and Process Engineering, Worldwide Engineering and Construction for Eastman Chemical Company, Kingsport, Tennessee. He has served in numerous project and engineering management positions over his 32 years with Eastman. His international assignments include work as a project manager in both Singapore and Malaysia in 1996-97. Wayne is a member of the American Institute of Chemical Engineers and the National Society of Professional Engineers. He currently chairs the CII Project Delivery and Contract Strategy Research Team. He holds a bachelor's degree in chemical engineering and a master's in engineering administration from the University of Tennessee.

Implementation Session Participants

Stuart D. Anderson, Associate Professor, Department of Civil Engineering – Texas A&M University

Stanley F. Berger, Senior Principal Engineer – 3M Company

Lawrence G. Kruse, Senior Vice President – Murphy Company

Adetokunbo Oyetunji, Graduate Research Assistant – Texas A&M University

Paul D. Wicker, Project Manager, Capital Projects – General Motors Corporation

Project Delivery & Contract Strategy Tool

Project Delivery & Contract Strategy Research Team

Project delivery and contract strategies (PDCS) define the roles and responsibilities of the parties that are involved in a project, and how the owner pays for services. From the owner's perspective, project delivery and contract strategy together provide the framework for organizing for project execution. An efficient framework will facilitate project success and such an efficient framework can be achieved when the most suitable combination of delivery system and contract strategy is selected.

Within the industry, there is no standardized, broad-based set of documented project delivery systems, applicable to a wide range of project types. CII sought to improve upon this situation by commissioning a research study. This study focused on identifying an array of project delivery systems and contract strategies, and developing a decision process and tool for selecting a combined approach from this array, for each particular project.

A structured procedure has been developed that focuses on the owner's project objectives and the project execution environment, and incorporates a quantitative assessment of 12 integrated PDCS alternatives in a decision support tool.

Responses obtained during testing and validation of this procedure and tool have already shown that it:

- Expands the list of PDCS alternatives that are available to owners in the decision-making process.
- Is an improvement over current practices.
- Produces reliable results.
- Enhances insight into the problem of selecting a delivery and contract strategy for a capital project.
- Harmonizes delivery systems with contract strategies and relates these to the owner's project objectives.
- Constitutes a useful decision support system.
- Provides a defensible rationale for PDCS selection.

The procedure includes a decision support tool in the form of a simple Excel™ workbook for performing the PDCS selection analysis. This analysis involves identifying the selection factors that are relevant to the project under consideration (the factors that are related to the owners project objectives and other success parameters for the particular project), assigning preference weights to those factors to reflect their priority on that project, and obtaining aggregate scores from the spreadsheet. The aggregate scores are computed as sum-product functions of the user defined preference weights, and the pre-determined relative effectiveness values. The higher the aggregate score, the more suitable the PDCS alternative is, in theory, for the subject project. The results from the decision support tool are reviewed in a final decision-making step.

Methodology

The development of the PDCS selection procedure and decision support tool was based on research conducted with the involvement of CII member companies and several non-member companies. Private and public sector agencies in the industrial and general building sectors participated in the research. Similarly, input was received from both owners and contractors.

The first objective was to develop and document comprehensive sets of PDCS alternatives and selection factors for industry-wide application. The second objective was to develop a procedure that incorporates an analysis tool to aid in PDCS selection. The final objective was to develop a procedure that would facilitate achieving the owner's project objectives, and by doing so, increase the likelihood of project success.

An initial set of PDCS options and selection factors were defined by the research team. In the first of two phases of data collection, responses to a questionnaire on the initial set of PDCS options and selection factors were received on 90 projects. These projects included industrial and building projects, but no infrastructure projects. Analysis of the Phase I data confirmed that the initial sets of PDCS alternatives and selection factors are used in practice and are relevant to an owner's selection procedure. During Phase I, the research team evaluated different analysis approaches and selected an approach for the selection procedure. A second phase of data collection and analysis was then used to establish the relative effectiveness values for each selection factor. This Phase II data collection exercise was performed via a set of workshops involving 32 project managers. Based on the Phase I data collection and subsequent analysis, the research team identified 12 PDCS alternatives and 20 selection factors. The selection procedure developed is based on these alternatives and selection factors.

During the research work for developing this tool, data for infrastructure projects was not obtained. Thus, this PDCS tool may not be applicable to infrastructure projects. However, by applying the same research methodology, a similar tool could be developed for such projects.

Project Delivery & Contract Strategy Tool

Project Delivery & Contract Strategy Research Team

Knowledgeable Point of Contact

Stuart D. Anderson
Associate Professor
Department of Civil Engineering
Texas A&M University
College Station, TX 77843-3136
P: 979-845-2407 F: 979-845-6554
s-anderson5@tamu.edu

Stanley F. Berger
Senior Principal Engineer
3M Company
Bldg. 42-5E-02
900 Bush Avenue
St. Paul, MN 55144
P: 651-778-5004 F: 425-732-0710
sfberger@mmm.com

G. Wayne Burchette
Director, Project & Process Engineering
Worldwide Engineering & Construction
Eastman Chemical Company
P. O. Box 511
Kingsport, TN 37662-5399
P: 423-229-2153 F: 423-224-0453
waynebur@eastman.com

Robert P. Kehoe
Construction Program Manager
NASA Johnson Space Center
Mail Code JA16
Houston, Texas 77058
P: 281-483-3149 F: 281-483-6763
Robert.p.kehoel@jsc.nasa.gov

Larry Kruse
Senior Vice President
Murphy Company
1233 North Price Road
St. Louis, MO 63132
P: 314-692-1542 F: 314-692-1520
lkruse@murphy-stl.com

Tim Thury
Project Manager
General Services Administration
819 Taylor Street, Rm 12A29
Fort Worth, TX 76102
P: 817-978-4315 F: 817-978-6155
tim.thury@gsa.gov

Gary Vandiver
Manager, Process Engineering
Solutia Inc.
575 Maryville Center Dr, MS 5N (63141)
P. O. Box 66760 (MS 5N)
St. Louis, MO 63166-6760
P: 314-674-6768 F: 314-674-6595
gwvand@solutia.com

Paul D. Wicker
Project Manager
General Motors Corporation
GMC-WFG, MC 482-303-003
485 W. Milwaukee Ave.
Detroit, MI 48202-3220
P: 313-304-9648 F: 248-685-5038
paul.wicker@gm.com

Project Delivery & Contract Strategy Tool

Plenary Slides

Fully Integrated & Automated Project Processes – The Vision

FIAPP Steering Team

Learning Objectives

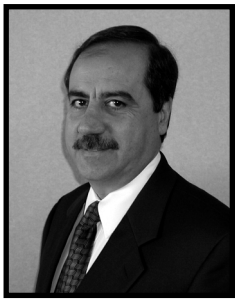
- Provide an overview of the FIAPP concept.
- Summarize the relationship between the CII FIAPP Steering Team and FIATECH.
- Provide an overview of the CII FIAPP Steering Team and its activities.
- Provide some examples of FIAPP today and its possible future initiatives.
- Request feedback and participation.

Abstract

For many years, owners, contractors, and suppliers have envisioned integrating technologies to bring about significant improvement in the effectiveness of construction and operation of large capital facilities. The integration of state-of-the-art technologies is often referred to as fully integrated and automated project processes, or FIAPP. The success of FIAPP could provide facilities that are a more strategic element of the owners' business model.

Plenary Session Presenter

Reginald S. Gagliardo – Vice President of Engineering, Burns and Roe Enterprises, Inc.



Reg Gagliardo is Vice President of Engineering for Burns and Roe Enterprises in Oradell, New Jersey. A 27-year veteran of the firm, he is responsible for directing and coordinating engineering and design services. His previous assignments have involved engineering and project management responsibilities for a wide variety of industrial facilities. Reg is Chair of the CII FIAPP Steering Team as well as a member of the CII Academic Council. He is a licensed Professional Engineer in New York and New Jersey, and has a bachelor's degree in electrical engineering from Newark College of Engineering.

Fully Integrated & Automated Project Processes – The Vision

FIAPP Steering Team

Introduction

For years, owners, contractors, and suppliers have envisioned integrating technologies to bring about significant improvement in the effectiveness of construction and operation of large capital facilities. The integration of state-of-the-art technologies is often referred to as fully integrated and automated project processes, or FIAPP. The success of FIAPP could provide facilities that are a more strategic element of the owner's business model.

The presentation seeks to: 1) clear up confusion that may exist concerning FIAPP, the CII FIAPP Steering Team and FIATECH, and their interrelationships; and 2) build an understanding of the value of FIAPP and what it may be able to do for our respective businesses.

What is FIAPP?

FIAPP is the acronym for Fully Integrated and Automated Project Processes. FIAPP is a concept, a vision, or an ideal (or idealized) end state, where individual project processes/ activities are automated and then integrated with the remainder of the process and activities. It is not a product that can be bought, nor is it an organization. FIAPP is currently focused on information management and transfer. In its fuller sense, however, it includes software, hardware, equipment, and the underlying work processes. It is important to note that FIAPP is not the same as the CII FIAPP Steering Team, which in turn is not the same as FIATECH.

FIAPP is an idea that means something different to each of us in CII. This is because CII is comprised of a number of different types of organizations, namely owner/operators, engineers, constructors, suppliers and academics. These organizations have different primary functions, and therefore different focuses; and, ultimately, different needs and wants from FIAPP. For example, key potions of owner resources and a large part of the engineer/contractor/supplier community are focused in the capital project creation process. At the same time, a major portion of owner resources and another portion of the engineer/contractor/supplier community are focused in the operation and maintenance of these capital facilities. The priorities and information needs of these subgroups are all related, but different. A key issue that needs to be addressed is - How can FIAPP benefit all of us?

FIAPP Players

Major groups and organizations that are involved in developing or investigating FIAPP include:

- CII's FIAPP Steering Team, which focuses on developing the FIAPP vision for CII member companies and communicating news and developments in the FIAPP arena.
- FIATECH, which focuses on developing and delivering products and technologies that enable FIAPP.
- The Owner Operator Forum, which currently focuses on the operations and maintenance phases of capital facilities.
- CII Research Teams, which are primarily involved in documenting best practices.
- CII New Technologies Web Site, which researches and lists a number of FIAPP-related developments.
- Sloan CCIS Program, which conducts FIAPP-related research and issues reports on its findings.
- Academia, which presents conferences, maintains Web sites, prints material, and conducts research.
- The software and hardware industry, which conducts research and provides products, technologies, conferences, Web sites, and printed material.

Relationship of CII FIAPP Steering Team and FIATECH

The CII FIAPP Steering Team and the recently launched FIATECH consortium are both involved in developing the FIAPP state-of-the art. Their individual areas of concentration are different, but complementary, as summarized in the following table. Both organizations are working to develop and achieve the FIAPP vision.

CII FIAPP Steering Team	FIATECH
Strategic – Overarching	Tactical – Targeted
Theory – Vision	Practice – Reality
Articulate the Vision	Implement the Vision
Identify industry needs	Fulfill industry needs
Investigate FIAPP apps in use in industry	Roll out FIAPP products for industry
Report It! – What's Happening	Do It! – Research, Develop & Deploy
For CII Members – 15-20 reps on Steering Team; $25K/yr	For FIATECH Members – 50+ members; multi-$100k/yr
= FIAPP info, ideas & best practices	= "Projects" with Products

CII FIAPP Steering Team Mission and Goals

It is important to note that the CII FIAPP Steering Team is not a research team, and therefore its activities and organization are different than those of traditional CII research teams.

The major goals of the CII FIAPP Steering Team are to:

- Develop the FIAPP vision and keep it in front of CII.
- Communicate FIAPP benefits and issues.
- Contribute FIAPP ideas to the CII Research Committee.
- Communicate CII FIAPP needs to suppliers of FIAPP products and services.
- Provide a clearinghouse for FIAPP developments.
- And, overall, to enable the understanding and use of FIAPP.

The CII FIAPP Steering Team communicates with CII and industry primarily through:

- A Web site at http://www.construction-institute.org/fiapp/fiapp-homepage.jpg (currently under construction).
- Recommendations for new research to the CII Research Committee and others.
- Reports on its activities and findings, such as best practices.

The CII FIAPP Steering Team has arrived at the following top-level objectives for the FIAPP vision:

- Support one-time entry of data, with multiple use of that data throughout the life-cycle.
- Permit the free flow and flexible use of information.
- Simplify and automate activities/processes and information flow.
- Enable collaboration between owners, operators, designers, specialists, contractors and suppliers.
- Support all phases of a facility's life-cycle (engineer, procure, construct, operate, and maintain (EPCOM)).
- Integrate EPCOM processes, functions & activities.
- Improve execution & financial performance through:
  - Improved efficiency and productivity.
  - Higher quality and accuracy.
  - Reduced schedule and cycle times.
  - Improved supply chain management.
  - Enhanced communications.

The purpose of the CII FIAPP Steering Team is not to develop these areas and objectives, but to provide the overall vision and requirements so that they can be developed by other organizations.

Examples of Current FIAPP Initiatives

Some examples of tools and processes resulting from current FIAPP activities include:

- "Smart" software tools for analysis and design (e.g., process modelers, intelligent process and instrument diagrams, instrumentation design software)
- Integrated databases
- Expanded use of electronic plant models for:
  - Integrated and collaborative design
  - Construction sequencing and scheduling
  - Construction and procurement status
  - Maintenance and operations planning and training
  - Visualization and Simulation of Material and Process Flows
- Project Web sites (project management and e-commerce)
- Direct submittal of design information for procurement, manufacturing and fabrication

The Future of FIAPP

The future direction of FIAPP is heavily dependent on the input provided by industry, just as the success of its initiatives and products are dependent on the degree of adoption and use by industry. Issues that need to be addressed to bring about the alignment of the vision and the suitability and effectiveness of the products include:

- Are we on the right track? (e.g., Are fully automated and integrated project processes and their associated hardware and software tools vital to industry?)
- What other major objectives need to be added to the FIAPP vision?
- What existing objectives and elements of the FIAPP vision need to be changed or improved?
- What are the highest priorities and where should the most attention be focused? Which project phases? Which key activities?

Today, there are more questions than answers with respect to the vision and reality of fully automated and integrated project processes. The questions will be resolved through concerted efforts of the construction industry and the organizations that supply products and services to it. To be successful, these efforts will require your active support and participation through the CII FIAPP activities, FIATECH projects, and other FIAPP-related initiatives.

Fully Integrated & Automated Project Processes – The Vision

FIAPP Steering Team

Knowledgeable Point of Contact

James V. Bartlett, Jr.
Assistant, Director, Engineer Ops Center And Head, Client Liaison
NAVFACENGCOM HQ
1322 Patterson Ave., SE
Washington, DC 20374-5065
P: 202-685-9209 F: 202-685-1592
BarlettJV@navfac.navy.mil

Reginald S. Gagliardo
Vice President, Engineering
Burns and Roe Enterprises, Inc.
800 Kinderkamack Road
Oradell, NJ 07649
P: (201) 986-4325 F: 201-986-4483
rgagliardo@roe.com

Deborah Grubbe
Corporate Director – Safety and Health
DuPont Safety, Health & Envir. Ctr.
E. I. du Pont de Nemours & Co., Inc.
1007 Market St., DuPont 6064
Wilmington, DE 19898
P: (302) 773-0299 F: (302) 774-1361
deborah.l.grubbe@usa.dupont.com

Richard Jackson
Managing Director
FIATECH
3208 Red River St., Suite 300
Austin, TX 78705-2697
P: (512) 232-3036 F: (512) 476-6319
rjackson@fiatech.org

Kent Reed
Leader, Computer Integrated Construction Group
National Institute of Standards & Technology
Building 226, Stop 8630
100 Bureau Dr.
Gaithersburg, MD 20899-8630
P: (301) 975-5852 F: 301-975-5433
kreed@nist.gov

Anthony Songer
Associate Professor
Dept. of Civil & Environmental Eng.
113B Patton Hall
Virginia Tech
Blacksburg, VA 24061
P: 540-231-7255
Adsonger@vt.edu

Fully Integrated & Automated Project Processes – The Vision

Plenary Slides

FIATECH: Delivering on the Vision of FIAPP

FIATECH

Learning Objectives

- Hear about FIATECH's progress and organizational status since last year's unveiling.
- Be introduced to FIATECH's completed and ongoing research findings.
- Gain knowledge on specific project team results.
- Find out how FIATECH is working to bring FIAPP to member organizations.
- Learn how to get involved in FIATECH and its projects.

Abstract

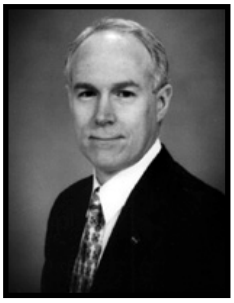
Since its unveiling at the 2000 CII Annual Conference, FIATECH has implemented a number of project initiatives focused on delivering fully integrated and automated project processes (FIAPP) to the capital facilities industry. In this session, FIATECH will present findings from completed research, progress on current projects, and an outline of future initiatives.

The implementation session panelists have all been active members in FIATECH projects and will provide more in-depth information on activities and outcomes. Initiatives that are in progress (in alphabetical order) are as follows:

- Capital Facilities Technology Roadmapping Initiative – Strategic Focus Area
- eBusiness for Capital Facilities – Strategic Focus Area
- Economic Impact of Imperfect Interoperability
- In Your Face Computing for Construction, Maintenance, and Operations Project
- Owner Operator Forum – Strategic Focus Area
  - Life Cycle Data Management Project
- Public-Private Technology Partnership – Strategic Focus Area
  - Smart Chips Project
  - 3D Laser Scanning Project
  - Digital As-built Documentation Project

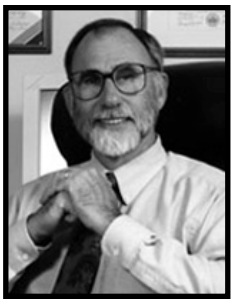
Plenary Session Presenters

William W. Brubaker – Director of Facilities Engineering and Operations, Smithsonian Institution



William W. Brubaker is Director of Facilities Engineering and Operations at the Smithsonian Institution in Washington, D.C. He formerly was Director of Facilities Engineering for the National Aeronautics and Space Administration. Bru has extensive experience in public works construction. Prior to his 1992 appointment at NASA, he served in several capacities with the U.S. Army Corps of Engineers, including Chief, Department of the Army Construction Programming Division at the Pentagon. Bru holds a bachelor's degree in civil engineering from the University of Virginia, a master's of civil engineering from Georgia Tech, and an MBA from Boston University.

Richard H. F. Jackson – Managing Director, FIATECH



Ric Jackson is the Managing Director of FIATECH in Austin, Texas. The FIATECH consortium was formed to bring about fully integrated and automated technologies to the project process. He was the Director of the Manufacturing Engineering Laboratory at the National Institute of Standards and Technology. At FIATECH, he has been overseeing the merger with the Owner Operator Forum and launching the first FIATECH projects. He is a recognized expert in the fields of mathematical modeling, nonlinear optimization automated manufacturing, and technology transfer. Ric holds a bachelor's degree from Johns Hopkins University, a master's degree from Southern Methodist University, and a doctorate from George Washington University.

Implementation Session Moderator

Richard H. F. Jackson – Managing Director, FIATECH

Implementation Session Participants

Robert K. Kwok, GAIP Project Manager – Dow Chemical Company

Mark E. Palmer, Project Manager & Research Engineer – National Institute of Standards and Technology

C. Chatt Smith, Manager, Best Practices – Jacobs

Judith W. Passwaters, Manager, IT Integration – DuPont

FIATECH: Delivering on the Vision of FIAPP

FIATECH

Knowledgeable Point of Contact

William W. Brubaker
Director of Facilities Engineering & Operations
Smithsonian Institution
Arts & Industries Bldg., Room 2269
900 Jefferson Drive S.W., MRC428
Washington, D.C. 20560
P: (202) 357-1873 F: 202-786-2330
brubakerw@ofs.si.edu

Richard H. F. Jackson
Managing Director
FIATECH Consortium
3208 Red River Street, Suite 300
Austin, TX 78705
P: (512) 232-3036 F: 512-499-8101
rjackson@fiatech.org

Robert K. Kwok
GAIP Project Manager
Dow Chemical Company
400 W. Sam Houston Pkwy. South
Houston, TX 77042-1299
P: (713) 978-2535 F: 713-978-2111
rkwok@dow.com

Mark E. Palmer
Project Manager & Research Engineer
National Institute of Standards & Technology
Bldg. 226, Room B306
100 Bureau Drive, MS 8630
Gaithersburg, MD 20899-8630
P: (301) 975-5858 F: 301-975-5433
mark.palmer@nist.gov

C. Chatt Smith
Manager, Best Practices
Jacobs
5995 Rogerdale Road
Houston, TX 77072-1601
P: (832) 351-7187 F: 832-351-7701
chatt.smith@jacobs.com

FIATECH: Delivering on the Vision of FIAPP

Plenary Slides

100% Improvement in Capital Productivity

Case Study: DuPont and Day & Zimmermann

Learning Objectives

- Learn about the advantages of integrating central engineering into the business.
- See why it is beneficial to integrate the contractor into engineering.
- Discover the advantages of centralized technology and global standardization.
- Develop relationships that will maintain global competitiveness.

Abstract

This presentation will identify the step-by-step process used to improve capital productivity, resulting in a reduction in capital investment. An overview of a successful capital program will be used to demonstrate the value of integrated teams, standardization, global thinking, and the use of Information Technology tools, while maintaining a competitive advantage in the market place. The owner and contractor will describe the growth that was necessary in both organizations to achieve the long-term relationships necessary to maintain competitiveness.

Plenary Session Presenter

Bill R. Bolton – Engineering Manager, Lycra/Terathane, DuPont

Bill Bolton is Engineering Manager, Lycra/Terathane, at DuPont. He is a 40-year veteran with the company, having started there in 1962 as a mechanical engineer in the Plant Design Group at DuPont's Martinsville, Virginia, location. From 1962-76, he had numerous plant engineering assignments in the maintenance, power, process, and manufacturing areas. His roles increased in responsibility upon being transferred to DuPont's Wilmington, Delaware, offices in 1976. For the past four years, he has served as the Engineering Manager for the DuPont's Lycra/Terathane group. He is a mechanical engineering graduate of Christian Brothers University, Memphis, Tennessee.

Implementation Session Moderator

Nicholas W. Maliszewski – Global Program Director, DuPont Lycra Projects, Day & Zimmermann, Inc.

Nick Maliszewski is the Global Program Director for Day & Zimmermann, Inc. in Newark, Delaware. He joined D&Z in 1992 after a 20-year career with DuPont. His assignments included a variety of design and project positions in the textile fibers business. During his nine years with D&Z he has served in various levels of project management and office leadership positions. He is currently serving as the D&Z Global Program Director for the DuPont Lycra business. His responsibilities include the coordination and execution of all Lycra project work performed by D&Z.

Implementation Session Participants

Bill R. Bolton – Engineering Manager, Lycra/Terathane, E. I. du Pont de Nemours & Co., Inc.

Randy S. Swartz, President and Chief Executive Officer – Day & Zimmermann International, Inc.

100% Improvement in Capital Productivity

Case Study: DuPont and Day & Zimmermann

DuPont has been aggressively expanding its Lycra® business since 1997 using a concept called "The Plant of the Future (X-Plants)." The initial concept was to engineer, design, and construct a generic plant that could be duplicated, based on market demands, anywhere in the world. The idea was to improve capital productivity.

To accomplish this, engineering felt that it had to get closer to the customer. DuPont Engineering thus began to integrate itself into the Lycra® business. This allowed the business/engineering team to speak with one voice, which reduced the opportunity for unwanted change.

DuPont, along with its full service design contractor, Day & Zimmermann, applied a number of CII Best Practices to reduce the capital investment cost per pound by 100 percent. The partnering and teambuilding approach proved to be extremely successful. DuPont also was able to integrate the owner and contractor engineering organizations to create an efficient and collaborative team.

Using some best practices such as pre-project planning, constructability, and the effective use of design tools reduced the engineering and home office costs significantly. Competitive bidding, leveraged buyout, and successful negotiations reduced the overall program procurement costs. Having six plants in five different countries, a standard package approach was taken for construction. Improving construction bid packages, lump sum contracting strategies, and a rigorous change management process drove down construction costs.

Currently DuPont has three X-Plants operating, two under construction, and one entering the production design phase. The alliance (partnering) between DuPont and Day & Zimmermann has achieved the business goal of 100 percent improvement in capital productivity.

100% Improvement in Capital Productivity

Case Study: DuPont and Day & Zimmermann

Knowledgeable Points of Contact

Bill R. Bolton
Engineering Manager, Lycra/Terathane
E. I. duPont de Nemours & Co., Inc.
Beech Street Engineering Center
101 Beech Street
Wilmington, DE 19805

Nicholas W. Maliszewski
Global Program Director, DuPont
Lycra Projects
Day & Zimmermann, Inc.
240 Continental Drive
Newark, DE 19713
P: (302) 453-3313 F: 302-453-3336
nick.maliszewski@dayzim.com

Randy S. Swartz
President & Chief Executive Officer
Day & Zimmermann International, Inc.
77 Center Drive, Bldg. 5200
Charlotte, NC 28217-0707
P: (704) 943-5444 F: 704-943-5112
randy.swartz@dayzim.com

100% Improvement in Capital Productivity

Plenary Slides

More Than Just An Airplane

Special Presentation

Abstract

In 1988, when Boeing began to consider updating its venerable 767 product line, no one knew the final product would be all-new with requirements defined by the customer, new processes for design and construction of the aircraft and, most importantly, a totally new way for people to accomplish this incredible task by working together.

The Boeing Company took a multi-billion dollar gamble to produce a two-engine jumbo jet that could compete not only with aircraft from Airbus Industrie and McDonnell-Douglas, but also with Boeing's own 747. The bet was on Boeing's ability to deliver an entirely new plane on schedule and on budget.

This airplane would incorporate technologies and features defined by the customer, each of which had to "buy their way" on the airplane. This meant that each item individually and collectively would have to enhance the performance, reliability, or operating economics of the aircraft before it could be incorporated. The results: new-generation, high-bypass engines, an advanced wing design, fly-by-wire wings, flaps, and ailerons operated by electronic impulses, rather than hydraulics, and — for the first time — the use of advanced composite materials in primary structure. Each of these technologies would present a unique challenge. Even though each was developmental in nature, once installed and delivered each had to perform as mature. A truly service-ready aircraft!

The longest-range twin-engine aircraft, the 777-300ER and 777-200LR, are currently on the "drawing boards" and will be capable of flying 10,000 statute miles. These will create challenges all their own: airplanes that will be in the air for over 18 hours and fly routes previously unheard of; passenger galley requirements for up to three meals; and flying with two full fight crews. These are the opportunities of tomorrow.

Presenter

John A. Monroe – Director, 777 Program Management, Boeing Commercial Airplane Group

John Monroe is director of the Boeing 777 Program Management in Seattle, Washington. Since 1998, he has managed the 777 program's planning and customer commitment processes, including production and delivery commitments. He also oversees the authorization, implementation, and integration of customer requirements. A 36-year Boeing veteran, John has progressed through a number of engineering assignments, including management positions in New Airplane Development, Product Development, and Customer Support. He is active with the Boeing Employees Guard and Reserve Network and is president of the Boeing Management Association, Everett chapter. A graduate of the University of Puget Sound, John holds bachelor's degrees in Business Administration and Finance.

Engineering Productivity Measurement

Engineering Productivity Measures Research Team

Learning Objectives

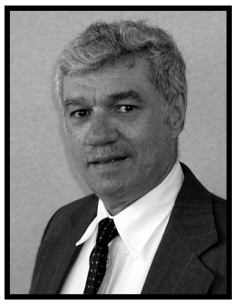
- Gain an understanding of present engineering measurement practices and why they do not work well.
- See how another industry improved productivity and what we can learn from them.
- Discover why a radically new Productivity Model will address present state shortcomings and drive improvement that goes beyond engineering cost.
- Contribute to the development and refinement of a quantity based measurement system that will deliver the savings that technology promises.

Abstract

Conclusions from this research will show why present practice fails to drive the improvement that latest technology allows. A totally new productivity model based on installed quantities will be presented with preliminary data that supports the model hypothesis along with a plan for implementation on active projects. CII member companies will be presented with several options to help advance this research into an Engineering Productivity standard that will drive internal improvement and allow uniform external benchmarking.

Plenary Session Presenter

Robert J. Shoemaker – Vice President & Engineering Manager, BE&K Engineering Company



Robert J. Shoemaker is Vice President & Engineering Manager for BE&K in Newark, Delaware. He has 35 years of wide-ranging experience in both construction and engineering, and has had numerous international and domestic assignments. Bob joined BE&K as a Department Manager in the BE&K Delaware office when it was established in 1992. His engineering responsibilities have ranged from Design to Project Management. Bob currently chairs the CII Engineering Productivity Measures Research Team. A licensed Professional Engineer, he holds engineering degrees from Pennsylvania State University and the University of Delaware.

Implementation Session Moderator

Deborah J. McNeil – Global Project Best Practices/Front End Loading Leader, Dow Chemical Company

Debbie McNeil is the Global Project Best Practices/Front End Loading Leader for the Dow Chemical Company. After 23 years with Union Carbide, she joined Dow as a part of the 2001 Dow–Union Carbide merger. In her career with Carbide, Debbie's assignments included Plant Engineering Field Office Group Leader, Business Engineering Manager, Plant Engineering Manager, and Work Process Transition Team Leader. She also was Engineering Business Team Leader for Carbide's SAP Project and Associate Director for Engineering Automation. Debbie has a BS degree in chemistry and BS and MS degrees in chemical engineering from Clarkson University, Potsdam, New York.

Implementation Session Participants

John K. Atwell, Jr., Project Manager, Steam Generator Replacement – Bechtel Power Corporation

Kenneth D. Walsh, Associate Professor, Del E. Webb School of Construction, College of Engineering & Applied Sciences – Arizona State University

Thomas L. Zenge, Global Capital System Manager, Beauty Care – The Procter & Gamble Company

Engineering Productivity Measurement

Engineering Productivity Measures Research Team

Background

The continual rise in engineering costs in the face of the promise of reductions that advanced design tools offer is of paramount interest to both owners and contractors.

Present productivity methods focus on design deliverables such as drawings and specifications. Lack of standard formats and content requirements for these deliverables, difficulty of tracking effort dedicated to each deliverable, and lack of correlation of the numbers to installed quantities and overall project effectiveness have rendered present methods much less than ideal.

The increased use of computer-based engineering tools has further invalidated present methods. These same tools, however, present untapped opportunities to track engineering progress much the same as construction progress is presently tracked. When this potential is realized, the earned value systems in common use today can be applied to “resource loaded” schedules and will put engineering and construction resources on an equivalent basis - a significant advance in integrated project controls.

Purpose and Objectives of the Research

Surprisingly little effort has been expended in the arena of Engineering Productivity at the very time that design tools, work processes, and project cost and schedule constraints have been continuously changing. The general purpose of the research was to address this fact.

Specifically, the objectives were to:

- Determine present practices and their shortcomings.
- Find Productivity Improvement success stories in other industries and apply learnings.
- Develop a new productivity model that addresses the shortcomings of present practices.
- Test model hypotheses with a pilot study.
- Develop plans for carrying results into actual project practice.

Findings & Conclusions

The software industries approach to improvement provided applicable learnings for consideration. The traditional lines of code/hr. presented many of the same difficulties as drawings/hr. does for engineering. The lines of code/hr. measure was adjusted to account for number of defects, level of complexity, and a well defined starting point (functional specification) and applied within a standardized scoring system.

These learnings provided a proven platform to build on in the areas applicable to engineering productivity. A productivity model that addresses identified shortcomings of present methods was developed and validated with project data in the piping discipline. This model is

applicable to all disciplines whose responsibilities were defined by the research team to allow uniform data collection.

The model is to be applied in the detail design phase of projects at the discipline level. It employs hrs./installed quantity as the productivity measure for each discipline adjusted by three influence factors: Input Quality, Scope/Complexity, and Design Effectiveness.

Engineering Productivity Model =

Input Quality Factor	X	Scope & Complexity Factor	X	Raw Productivity	X	Effectiveness Factor
Product Definition Rating Index		Project Characteristics		Hours / Installed Quantity		% Field Rework

When using this model for budget preparation, total hours can only be reduced by genuine improvements in one or more of the model elements, e.g.:

- Improve the quality of the Production Design Basis.
- Improve work processes and design tool utilization to reduce complexity.
- Execute the scope more efficiently to reduce installed quantities.
- Improve design effectiveness by assuming and delivering lower field rework.

Each element provides a driver for bottom line improvement totally missed by counting drawings and specs. There is also little opportunity to reduce engineering hours by transferring effort elsewhere in a costly, non-visible way.

Also, designer proprietorship of the installed quantities will drive improvement directly to the owners bottom line. Companies that track estimated quantities during detailed design have noted significant reductions of unintentional scope growth during the design process.

The model is applicable to all industries. The influence factors will account for differences in industry and project type. It is also applicable to large and small projects, down to single discipline projects.

Implementation Phase

The research team has recommended to CII an implementation phase that will develop the detailed models for all disciplines and apply them to projects starting in the front end phase of projects. An implementation guide and an education model will also be produced. Support of this implementation phase by CII member companies is critical and must move quickly to discourage the establishment of rival standard systems that would only dilute the industry's opportunity for significant improvement.

Engineering Productivity Measurement

Engineering Productivity Measures Research Team

Knowledgeable Points of Contact

John K. Atwell, Jr.
Project Manager
Bechtel Power Corporation
5275 Westview Drive
Frederick, MD 21703
P: (301) 228-6037 F: 301-696-0673
jkatwell@bechtel.com

Kenneth D. Walsh
Associate Professor
Arizona State University
Del E. Webb School of Construction
Tempe, AZ 85287-0207
P: (480) 965-0306 F: 480-965-1769
ken.walsh@asu.edu

Deborah J. McNeil
Global Project Best Practices/Front End Loading Leader
The Dow Chemical Company
400 W. Sam Houston Parkway South
Houston, TX 77042
P: (713) 978-3855 F: 713-978-2795
mcneildj@dow.com

Thomas L. Zenge
Associate Director, Beauty Care Engineering
The Procter & Gamble Company
11511 Reed Hartman Highway
Cincinnati, OH 45241
P: (513) 626-3460 F: 513-626-1500
zenge.tl@pg.com

Robert J. Shoemaker
Vice President & Engineering Manager
BE&K Engineering Company
242 Chapman Road
Newark, DE 19702
P: (302) 452-9024 F: 302-452-9008
shoemakerb@bek.com

Sources of Information

Chalabi, A. F., Beaudin, B. J. and Salazar, G. F. (1987) "Input Variables Impacting Design Effectiveness," SD-26, a report to the Construction Industry Institute, Austin, Texas, April 1987.

Chalabi, A. F. (1989) "Variables Impacting Design Effectiveness Key to Project Quality," Proceedings for Construction Congress I, ASCE, New York, NY, 540–545.

CII (1997) *Determining the Impact of Process Change on the EPC Process*, IR125-2, Construction Industry Institute, Austin, Texas, July 1997.

Diekmann, J. and Thrush, K. B. (1986) "Project Control in Design Engineering," SD-12, a report to the Construction Industry Institute, Austin, Texas, May 1986

Eldin, N. N. (1991). "Management of Engineering/Design Phase," Journal of Construction Engineering and Management, ASCE, 117(1), 163–175.

George, M., and Chang, Luh M., "Engineering Productivity Measurement," RR156-11, a report to the Construction Industry Institute, Austin, Texas, September 2001.

Georgy, M.E., Chang, L.M., and Walsh, K. (2000) "Engineering Performance in Industrial Construction," Proceedings for Construction Congress VI, ASCE, Orlando, FL

Gibson, G. Edward, Jr. and Peter R. Dumont. (1996) "Project Definition Rating Index (PDRI) for Industrial Projects." RR113-11, a report to the Construction Industry Institute, Austin, Texas, June 1996.

McConnell, D. R. (1984) "Earned Value Technique for Performance Measurement," Journal of Management in Engineering, ASCE, 1 (2), 79–94.

McGeorge, J. F. (1988) "Design Productivity: a quality problem," Journal of Management in Engineering, ASCE, 4(4), 350–362.

McFarland, T. D. (1994) "Managing Performance of Engineers," Journal of Management in Engineering, ASCE, 10(5), 28–33.

Stull J. O. and Tucker, R. (1986) "Objective Matrix Values for Evaluation of Design Effectiveness," SD-22, a report to the Construction Industry Institute, Austin, Texas, November 1986.

Tucker, R. L. and Scarlett, B. R. (1986). "Evaluation of Design Effectiveness," SD-16, a report to the Construction Industry Institute, Austin, Texas, July 1986.

Engineering Productivity Measurement

Plenary Slides

Foundation for Their Future: Building A Better Early Education System for America

Special Presentation

Abstract

What can America's construction industry do to set a stronger foundation under the nation's education system? First, recognize that child care is more than just a strategy to recruit and retain employees and an amenity to attract and please customers. Instead, look at it as the cornerstone of the education of a whole generation of our children. Builders, owners and managers can play a number of key roles in improving the child care infrastructure to meet the needs of both stakeholders and stockholders.

In this presentation, the president of a national child care advocacy group will draw on her experience in the private and public sectors, at DuPont and the U.S. General Services Administration respectively, to make the case for child care as a vehicle for education reform, as well as a critical determinant of the quality and productivity of the workplace-today and in the future.

Presenter

Faith Wohl is president of the Child Care Action Campaign. She formally was Director of the Office of Workplace Initiatives at the General Services Administration. She came to the GSA after 20 years with DuPont, where she was a director of human resources, pioneering the company's initiative to help employees balance their family lives and careers. Wohl also took responsibility for many of DuPont's efforts to improve its workplaces for women and minorities. She has been recognized for her accomplishments in family and workplace issues by a number of national and community organizations. Faith received her degree in economics from Adelphi University in Garden City, New York.

About Child Care Action Campaign

Child Care Action Campaign is a leading voice and national resource advocating quality affordable child care for all families. Growing numbers of children start their earliest form of education in child care. Yet, as a nation, we still do not set standards for quality care, or provide an effective mechanism for making quality care available. Through advocacy and action, CCAC informs business leaders, policymakers, advocates, activists, parents, child care professionals, and educators on how to ensure stimulating, safe child care for all children.

Child Care READS!

Child Care READS!, a project of CCAC, is a national action campaign intent upon involving children in language-rich activities to set the foundation for their later reading and school success. Child Care READS! has brought together a national network of literacy organizations, publishers of early childhood books, and educators to stress the benefits of

creating stimulating learning environments for children from birth to 5 in child care settings. This network provides books and materials to child care providers through community-based resource and referral agencies. CCAC's message to caregivers and parents alike is simple: talk, reach, read!

Universal Pre-K

CCAC is working to build momentum for universal pre-kindergarten. Universal Pre-K is becoming increasingly important as the country tries to move towards the first National Education Goal — "that all children enter school ready to learn." Access to pre-kindergarten is one key element in resolving the nation's readiness gap, while re-framing the concept of school reform to include early care and education. CCAC has taken the lead in developing forums that promote systemic change at the state wide level, working to advance collaborations among child care, Head Start, and the public schools.

The Finance CIRCLE (Communities Increasing Resources for Children's Learning Experiences)

CCAC is one of the national Managing Partners in The Finance CIRCLE, a new way to meet the need for a financing system that makes high-quality early care and education more available and affordable. The Finance CIRCLE will bridge the cost-quality gap by: expanding and maximizing sources of public and private investment; enhancing quality through direct support to programs that meet and adhere to standards of excellence; determining families' ability to pay using a uniform methodology; and distributing tuition aid based on need. The Finance CIRCLE uses models and tools based upon specific elements of the higher education financing system that are adaptable to early care and education.

CCAC shapes and generates public dialogue on child care. Because child care is linked to so many other areas of public interest — school readiness, corporate productivity, community economic development, crime prevention, welfare reform, equal opportunity, and family stability — we all have a stake in creating a climate for policy change. Please join us as we work to make children and families a top national priority. For additional information about becoming a member of CCAC, contact Regine Vincent at 212-239-0138 ext. 208 or *rvincent@childcareaction.org*.

A Two-Tier Workforce Strategy

Special Presentation

Learning Objectives

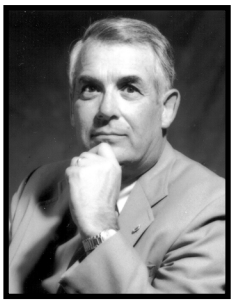
- Familiarize attendees with the concept of Two-Tier Workforce Strategy, its benefits, and its potential for addressing worker shortage.
- Explain the transition strategy for Tier II Implementation.
- Introduce necessary elements for a Tier II project.
- Introduce and explain metrics for measuring Tier II implementation.

Abstract

This research study will introduce a second tier of workers who will be paid more, but produce more through higher skills (including computer), stay on the job longer (through multi-skilling), and have higher job results such as lower total costs, better schedules, better quality, and better safety. This will help address the worker shortage issue through better retention and help simplify recruitment.

Plenary Session Presenter

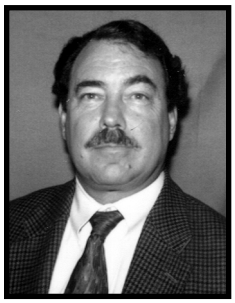
Richard L. Tucker – Director, Center for Construction Industry Studies



Richard Tucker is Director, Center for Construction Industry Studies (CCIS), and a tenured professor at UT Austin. He was largely responsible for the creation of CII and served as its Director from its inception in 1983 until 1998. He has been recognized and honored by numerous industry groups from around the world, and is a distinguished graduate of the College of Engineering at UT Austin. In 1997, he was recognized by CII with its highest honor, the Carroll H. Dunn Award of Excellence. He earned bachelor's, master's, and doctorate degrees from The University of Texas at Austin.

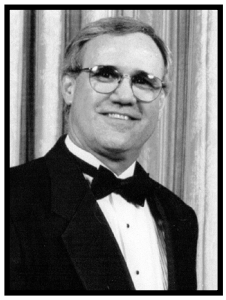
Implementation Session Moderators, First Session

D. Keith Byrom, General Manager, Employee Relations – H. B. Zachry Company



Keith Byrom is General Manager of Employee Relations for Zachry Construction Corporation in San Antonio, Texas. He has been with Zachry for 28 years and has served the company in a number of positions in the employee relations area. Among the many titles he has held for Zachry are Manager of Continuous Improvement and Director of Training and Employment. Keith holds a bachelor's degree in secondary education from Texas A&I University, a master's degree in personnel and guidance from St. Mary's University (San Antonio), and a doctoral degree in human resource development from Texas A&M University.

J. Kent Underwood, Manager – Project Management Enterprise Engineering, Solutia Inc.



Kent Underwood is manager of project management for Solutia Inc. in St. Louis, Missouri. He has over 33 years of experience in the engineering, construction, and facilities management industries, 25 with Monsanto and Solutia. He has been recognized twice with the *ENR* Award of Excellence for his work with The Business Roundtable. He began his association with CII in 1986. Currently, Kent serves on the CII Executive Committee and is vice chairman of the St. Louis Regional Convention and Sports Complex Authority. A U.S. Air Force captain (retired), he holds a degree from Virginia Military Institute.

Implementation Session Moderators, Repeated Session

Randall Evans – Vice President of Construction Operations, BE&K, Inc.

Randy Evans is Vice President of Construction Operations for BE&K. He has 30 years of experience in the construction industry and has been with BE&K for over 25 years. Randy is responsible for construction management, the boiler department, field personnel, craft training, and QA/QC. He assigns and evaluates field personnel and monitors their performance in regard to safety, quality, cost, and schedule. He received his craft technical training in Camden, South Carolina, and is a graduate of the Construction Executive Program at Texas A&M, and the Goizueta Business School of Emory University in Atlanta, Georgia.

James S. Jeffress – Construction Manager, DuPont

Jim Jeffress is Construction Manager for DuPont in Richmond, Virginia. He leads the company's worldwide construction network, and has direct responsibility for DuPont construction activities in the Eastern U.S., South America, and Asia. His entire 36-year career as been with the company, where he has served in numerous design and construction positions. Active in CII since its inception, Jim currently is a member of the CII Skilled Craft Worker Shortage Project Team. He also is a member of the advisory panel for the Sloan Work Force Thrust at UT Austin. Jim is an electrical engineering graduate of Virginia Tech University.

A Two-Tier Workforce Strategy

Special Presentation

The shortage of skilled construction workers has been considered a major industry challenge for decades. The shortage has become more acute in recent years due to declining wages, changing work force demographics, and the changing economic and educational climate in the world's industrialized nations. Many initiatives and new organizations have been created, some with limited success, but the challenges of work force related issues still remain. A "step-change" approach is needed to address the worker related issues in a substantive fashion. Such an approach is proposed as a Two-Tier Work Force Strategy which, if successful, should provide a structure for long-term evolution of an improved work force.

The basic concept of the Two-Tier Strategy is simple. A Tier I project will be built by a relatively less skilled construction work force than for a Tier II project. The workers on the Tier I projects will be paid less, on average, than will workers on Tier II projects, consistent with their lower skill levels. Tier I workers will, on average, not only have limited technical skills and experience, but will also have limited management skills. Tier I projects will require a high level of task training and a detailed management system appropriate to the lower skills of most workers. Even so, it should be possible to realize highly successful Tier I projects, and the Tier I worker category provides a convenient entry level for construction. The Tier I strategy will be developed by CII Research Team 182 over the next several months and is not included as part of this presentation.

A Tier II project will be the other extreme. It will contain fewer, but better, workers who are expected to produce improved safety, quality, schedule and cost results than through the current system. Although a Tier II project will have a variety of worker skills, it will have a high percentage of certified "Tier II Workers", who will have both superior technical skills and some lower level management skills. A Tier II project will be organized and executed to exploit those advanced worker skills through use of information technology, worker utilization and a high performance work structure. The current attention, and focus of this presentation, is on the Tier II strategy.

A critical success factor in the Tier II strategy is the development of metrics. Two metrics are needed, one to measure construction success and one to measure the level of Tier II implementation. The metric to measure construction phase success is being developed through the CII Benchmarking and Metrics program and will be utilized for both the Tier I and Tier II strategies. This presentation will focus on the metric to measure the level of implementation of the Tier II strategy. That metric, called a Tier II Project Index, and measured on a scale of 0-10, will provide not only a measurement system but also criteria for Tier II strategy implementation.

The Tier II Project Index contains five components, composed of sixteen separate elements. Two of the five components, Craft Technical Skills and Craft Management Skills, relate to the quality of the workers available to a project. Those two components comprise 40% of the Tier II Project Index score, and contain nine of the sixteen elements for measurement. Thus, to have a Tier II Project, it is necessary to first have an adequate number of Tier II workers.

The remaining three components of the Tier II Project Index relate to the use of the highly skilled workers in executing the project. The third component, Information Technology Utilization, assumes that Tier II workers are computer literate and relates to the ease of their utilization of appropriate information through electronic media. It contains two elements and represents 20% of the Tier II Project Index. The fourth component, Worker Utilization, also represents 20% of the Index. It contains three elements associated with crew mix, multi-skilling, and worker turnover. The last component, Organization, is also worth 20% of the Index and addresses the important issues of communications and creation of a high performance work place.

The Tier II strategy has evolved through considerable effort and input over the past several months, and captures much of the earlier work performed by CII and other organizations. It is now considered to be developed adequately for pilot project implementation. An objective of this conference presentation is to obtain volunteer projects for pilot implementation. As data are gathered from initial project implementation, the strategy can be refined and developed for widespread use.

A Two-Tier Workforce Strategy

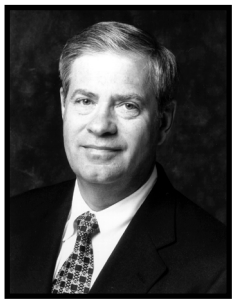
Plenary Slides

Workforce Panel

Special Presentation

Moderator

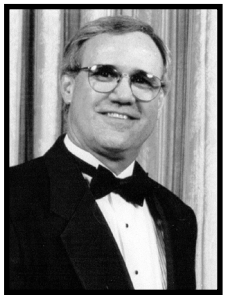
Daniel J. Bennet – President, National Center for Construction Education & Research



Dan Bennet is president of the National Center for Construction Education and Research (NCCER) at the University of Florida. He was Executive Vice President of the Associated Builders and Contractors from 1983 to 1997. Widely recognized as a leader in the construction industry, Dan has been honored many times for his efforts to improve the industry. He received CII's highest honor, the Carroll H. Dunn Award of Excellence, in 1995.

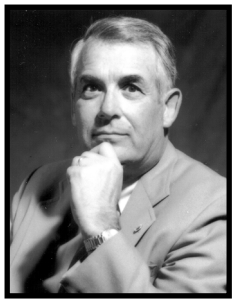
Panelists

J. Kent Underwood – Manager of Project Management, Solutia Inc.



Kent Underwood is manager of project management for Solutia Inc. in St. Louis, Missouri. He has over 33 years of experience in the engineering, construction, and facilities management industries, 25 with Monsanto and Solutia. He has been recognized twice with the *ENR* Award of Excellence for his work with The Business Roundtable. Currently, Kent serves on the CII Executive Committee and is vice chairman of the St. Louis Regional Convention and Sports Complex Authority. A U.S. Air Force captain (retired), he holds a degree from Virginia Military Institute.

Richard L. Tucker – Director, Center for Construction Industry Studies



Richard Tucker is Director, Center for Construction Industry Studies (CCIS), and a tenured professor at UT Austin. He served as CII Director from its inception in 1983 until 1998. He has been recognized by numerous industry groups, and is a distinguished graduate of the College of Engineering at UT Austin. In 1997, he was recognized by CII with its highest honor, the Carroll H. Dunn Award of Excellence. He earned bachelor's, master's, and doctorate degrees from The University of Texas at Austin.

Franklin Joel Yancey – Consultant

Frank Yancey recently retired as Senior Vice President of Kellogg Brown & Root in Houston, Texas. His 45-year career included assignments in Venezuela, Panama, Nigeria, South Africa, Singapore, the Virgin Islands, and many more. He is experienced in the full range of construction services and in such industry segments as petroleum, chemical and refining, forest products, minerals and mining, and infrastructure. A member of various industry boards such as the National Center for Construction Education and Research, Frank is now a consultant for KBR, Houston.

Outstanding CII Researcher for 2001

Ed Jaselskis

Dr. Ed Jaselskis has been selected to receive the CII Outstanding Researcher Award for 2001. He is an Associate Professor, Civil and Construction Engineering, at Iowa State University in Ames, Iowa. The panel of judges for the award selected Dr. Jaselskis because he exceeds all criteria for the award and brings added distinction to this highly respected honor.

He first became involved with CII in 1993 as an academic member of the research team studying predictive tools. In 1998, Dr. Jaselskis was selected to be the principal investigator for the CII research project on radio frequency identification tagging. He brought a great deal of knowledge and enthusiasm to the research team. The quality of the research material produced by him and his research assistant, Tarek Elmisalami, was judged to be excellent. In addition, Dr. Jaselskis was selected by his research team to help present the team's findings. He was a speaker for the research team at both the 2000 CII Annual Conference in Nashville, Tennessee, and at the Construction Project Improvement Conference in Austin, Texas. His ratings by conference participants at both venues were excellent. CII is proud to honor Dr. Jaselskis as the Outstanding Researcher for 2001.

A Registered Professional Engineer, Dr. Jaselskis teaches courses at Iowa State in project management, contract documents, construction materials and methods, estimating, and pre-project planning. His areas of research expertise include innovative construction technologies and construction project success. He has experience as an Exxon cost/schedule engineer and field engineer and has worked as a Bechtel office and civil field engineer. Dr. Jaselskis holds degrees from the University of Illinois at Champaign-Urbana, the Massachusetts Institute of Technology, and The University of Texas at Austin.

Award Criteria

- The research significantly contributed to the improvement of the construction industry.
- The research is completed and products delivered.
- The researcher's excellence is recognized by his or her CII team members, the staff, and the membership.
- The researcher's report to CII is innovative, well written, and timely.

Previous Recipients of the Outstanding CII Researcher of the Year Award

1995 – Mike Vorster, Virginia Polytechnic University

1996 – Edd Gibson, The University of Texas at Austin

1997 – Stu Anderson, Texas A&M University

1998 – Gary Oberlender, Oklahoma State University

1999 – Ed Back, Texas A&M University

2000 – Jeff Russell, University of Wisconsin-Madison

Outstanding CII Researcher Award Panel of Judges

Emerson T. Johns	Global Financial Manager, DuPont, CII Research Committee Chairman
Peter H. Bopp	Regional Engineering Manager, Mexico, DuPont, CII Academic Council Chairman
James T. O'Connor	C. T. Wells Professor of Project Management, UT Austin, CII Research Committee
Gerald D. Oberlender	Professor of Engineering, Oklahoma State University, CII Academic Council
Louis L. Prudhomme	CII Associate Director

Outstanding CESC Instructor for 2001

Ed Back

Dr. W. Edward Back has been selected to receive the CII Outstanding Instructor Award for 2001. In the opinion of the panel of judges, he exceeds all criteria for the award and brings a level of innovation in teaching to the forefront of the CII Education Program.

Dr. Back is a member of the Construction Engineering and Management faculty of the Department of Civil Engineering at Clemson University in Clemson, South Carolina. He teaches courses in project management, project controls, probabilistic estimating and scheduling, and optimization of construction operations and engineering processes. At the CII regional university teaching center at Clemson, administered by the Construction Industry Cooperative Alliance, Dr. Back has been an instructor for each of the education modules presented in the CII-Clemson program. His results have been outstanding. He consistently receives “excellent” ratings from the participants in both his effectiveness of delivery and in his knowledge of the subject.

Dr. Back also incorporates the CII best practices and other reference material from CII into his college curriculum. In addition, he has been active in helping CII member The Washington Group adapt CII concepts throughout its project management team development program. Thus, regardless of the setting, he has shown a superb ability to communicate his understanding of the CII best practices topics and to influence others with his teaching. CII salutes Dr. Ed Back as the Outstanding CII Instructor for 2001.

CII honored Dr. Back with the Outstanding Researcher Award in 1999. His current research for CII involves evaluating the industry’s use of on-site design practices. A licensed professional, he holds graduate degrees in civil engineering and architecture from the University of Illinois at Urbana-Champaign and a doctorate in civil engineering from Clemson University.

Award Criteria

- The individual is an effective instructor whose contributions, talent, and efforts have been recognized by the participants in the CESC courses. This includes the ability to present the information in interesting and innovative ways.
- Individuals receiving the award shall have earned it for contributions to CESC modules on two or more occasions.
- The individual has not previously received this award.

Previous Recipients of the Outstanding CESC Instructor Award

1995 – Jorge Vanegas, Georgia Tech

1996 – Stan Nethery, Dow Chemical

1997 – Steve Sanders, Clemson University

1998 – Edd Gibson, The University of Texas at Austin

1999 – Don Shaw, Ontario Hydro

2000 – Gary Aller, Arizona State University

Outstanding CESC Instructor Award Panel of Judges

Gary L. Aller	Director, Alliance for Construction Excellence, Arizona State University, CII Education Short Course Program
W. Frank Eskridge	Director, Construction Industry Cooperative Alliance, Clemson University, CII Education Short Course Program
Jesse A. Pfeiffer	Program Director, Construction Industry Programs, UT Austin Center for Lifelong Engineering Education, CII Education Short Course Program
Robert H. Ryan	CII Associate Director
Andre Siegenthaler	Vice President, Human Resources, Hilti Corporation; CII Education Committee
D. Kent Stephenson	Head, Mid-Atlantic Integrated Team, NAVFAC; CII Education Committee
Michael C. Vorster	Professor, Department of Civil & Environmental Engineering, Virginia Polytechnic Institute; CII Academic Council

Outstanding CII Implementer for 2001

Dick Jessop

Dick Jessop is the first recipient of the Outstanding CII Implementer Award. The award recognizes outstanding achievement in enhancing the implementation of CII best practices within one or more CII member companies. In the opinion of the panel of judges for this new award, Dick has met and surpassed all criteria and establishes a benchmark against which future recipients will be measured.

Dick is Director of Project Management for the fossil and electricity businesses within Ontario Power Generation. He is also the Chair of the OPG Project Management Advisory Council. The objective of the council is to achieve the benefits of project management excellence in OPG by continuously improving the initiation, planning, execution, and closeout of projects through increasing awareness of recognized project management best practices at all levels of the corporation.

Within his company, Dick has championed the use of CII best practices. He personally established the goal of OPG being in the upper quartile for project delivery as defined by CII Benchmarking. The company met the mark, which translated to a gain of at least 4 percent in savings by the company in 1999 compared with the previous year. He also initiated the implementation of a best practice plan designed along the lines of the CII Implementation Model, and in so doing incorporated such CII best practices as partnering, team building, and the Project Definition Rating Index.

Dick's energy and innovative approaches will come as no surprise to those within CII who have known of his enthusiasm and passion for excellence. He is a former CII research team chairman, the past chair of the Construction Project Improvement Conference from 1996-1999, a former member of the Implementation Strategy Committee, and a past participant on the Board of Advisors. His influence in OPG has helped company personnel in their career development through their involvement in CII project teams and committees. It gives the Institute great pride in selecting Dick Jessop as the initial recipient of the Outstanding CII Implementer Award.

Born in Wellingborough, England, Dick emigrated to Canada in 1975. He joined Ontario Hydro in 1981. Since then, he has held various positions including Construction Superintendent, Senior Project Engineer, Manager of Fossil Services Division, and Manager of Fossil Business Programming and Development. Dick has a Bachelor of Science (Honors) degree from the University of Manchester and a MBA from York University.

Award Criteria

- The nominee has made a significant contribution to enhancing the implementation of CII Best Practices and/or CII Proposed Best Practices within one or more member organizations.
- Objective and specific data are available from the nominating organization that demonstrate the improvements attained through the enhanced implementation of CII Best Practices or CII Proposed Best Practices. The categories of improvements should include: cost, schedule, safety, quality and process improvement.
- The nominee has demonstrated a commitment to the implementation of CII Best Practices or Proposed Best Practices.
- The nominee has developed and/or employed creative and innovative means to enhance the implementation of CII Best Practices or CII Proposed Best Practices. The nominee has also willingly informed others of these means and has shared the details of their use with those interested in implementation.

Outstanding CESC Implementor Award Panel of Judges

James M. Braus	Shell (retired) National Academy of Construction
Doy F. Cole	Consultant, Kellogg Brown & Root National Academy of Construction
C. Jerome Eyink, Sr.	Manager, Project Management, Group Contracts & Procurement, Anheuser-Busch Companies, CII Implementation Strategy Committee
Robert H. Ryan	Associate Director for Education and Implementation, Construction Industry Institute
James G. Slaughter	President, S&B Engineers and Constructors Ltd. National Academy of Construction

The Change-Go-’Round

Banquet Speech: Edward J. Mechenbier

Abstract

Welcome to the year 2001. We live in a world of techno gadgets. Certainly there is nothing yet to be invented and what we think we might like to have, surely the government already has a third generation version in operation somewhere and it’s just a matter of time before we mere mortals have one of our own. Yep, life is great and the rate of change in our life styles is absolutely revolutionary...not just evolutionary, but truly revolutionary. Run and Gun offenses, Shoot and Scoot Warfare...we live in a fast paced, mind boggling world of wizardry. But what’s truly behind all this stuff? How and why does it work? Ed Mechenbier knows the answer.

Presenter

Edward J. Mechenbier is Corporate Vice President, Development, with Science Applications International Corporation. While serving as a U.S. Air Force pilot in Vietnam, he was shot down and captured and spent nearly six years as a prisoner of war. He later was awarded the Silver Star with the first Oak Leaf Cluster for his resistance to the North Vietnamese. As co-host for the United States Air and Trade Show, Ed has flown aircraft ranging from a 1908 Wright B Flyer to a Soviet MiG-29 jet fighter. Associated with a television production company, he travels over North America narrating live air show TV coverage. He is a graduate of the U.S. Air Force Academy, Colorado Springs, Colorado.

Annual Conference
San Francisco, California
August 8–9, 2001
www.construction-institute.org