Conference Proceedings

Building a Strong Sustainable Future

Construction Industry Institute ®

CII Annual Conference

Vancouver B.C. Canada

July 27-29, 2004

Photos Courtesy Tourism Vancouver

Conference Proceedings

Construction Industry Institute

2004 Annual Conference

Vancouver, British Columbia, Canada

July 27–29, 2004

The University of Texas at Austin.

Printed in the United States of America.

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Foreword

Sustainability – development or growth that provides for today's needs without compromising the ability of future generations to provide for their own needs. What impact does it have on engineering and construction? How do we broaden our understanding of sustainability and increase the value of our projects and facilities?

These questions confronted us many months ago as we began planning for the 2004 Annual Conference. Our theme of "Building A Strong Sustainable Future" gives us an opportunity to answer these questions and provide you with in-depth knowledge about sustainability.

We believe that sustainability involves a triple bottom line: economic success, social well-being, and environmental protection. Our program addresses this triple bottom line head-on. In fact, you'll find that our keynote and featured speakers get right to the point. They will explain the implications of sustainable development and describe the lessons from 9/11. A financial expert will provide a perspective on the economic recovery, and a distinguished military leader will explain the engineers' role in rebuilding Iraq. We'll discuss the leadership that sustainability will require of us in energy and environmental design. You'll also see first-hand the importance of building medical infrastructure for AIDS/HIV patients in Uganda.

CII's unique role in engineering and construction R&D will also be evident with reports on lean construction, attracting and retaining leaders of tomorrow, and radical reduction in project cycle time. Member companies will contribute as well with case studies on knowledge management, global construction, and project management excellence. Finally, a world-class panel of experts will outline how we can capture value from sustainable development.

To top it off, our host city of Vancouver — site of the 2010 Winter Olympics — offers many rich opportunities for us all. It is one of Canada's premier locales, with the Pacific Ocean and the Coast Mountains providing backdrops that are to be treasured. Enjoy the conference, enjoy Vancouver, and celebrate with us at this twentieth annual gathering of engineering and construction's best and brightest.

J. Norman Lockington
Conference Chair

Hans VanWinkle
CII Director

Sustainable Development: Status and Implications

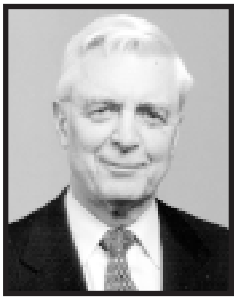
Keynote Speaker: James L. Lammie

Abstract

What is sustainable development? Where did it come from? Is it a new concept? Is it global? Who is pushing sustainable development as a new standard? Is it a generally accepted standard? Will sustainable development have significant impact on the construction industry in the future? What does sustainable development mean to me (a designer) and you (a constructor)? Should we be doing anything now? Is there a specific role or task which CII should be starting now?

Speaker

James L. Lammie – Director Emeritus, Parsons Brinckerhoff Inc.



For six years as CEO of Parsons Brinckerhoff, Jim Lammie had responsibility for corporate operations domestically and internationally. Previously he served for eight years as chief operating officer of the firm's U.S. infrastructure design and project management company. Other experience includes director of the general engineering consultant for design and construction of the Metropolitan Atlanta Rapid Transit Authority (MARTA) transit system and 21 years in the U.S. Army Corps of Engineers. A member of the National Academy of Engineering, Lammie earned an engineering degree at West Point and post-graduate degrees at Purdue University, George Washington University, and the U.S. Army Command and General Staff College.

e-mail: lammie@pbworld.com

The Journey Toward Project Management Excellence

Case Study: Aramco Services Company

Abstract

This case study will demonstrate the improvement of the company project management program over the last ten years, focusing on implementation of lessons learned and other CII Best Practices. The audience will learn how to bypass false starts and non-productive steps on the journey. The benefits of an organized Best Practices Implementation Unit will be quantified, and strategic plans for future improvement will be shown.

The implementation session team will share the benefits of successful project management programs, and show how these tools can improve internal Project Management Programs.

Plenary Session Presenter

Ali A. Al-Ajmi – Vice President, Project Management, Aramco Services Company

With Saudi Aramco for more than 30 years, Ali Al-Ajmi began as an engineer in oil and gas operations. In the 1990s, Al-Ajmi managed numerous oil and gas facilities prior to becoming president and CEO of Petron Corporation, a Saudi Aramco investment. Later on he took assignments as vice president of employee relations and training and a similar position with Saudi Aramco Southern Area Gas Operations. Al-Ajmi earned a bachelor of science degree from the University of Arizona and a master's in engineering management from the University of Missouri–Rolla.

e-mail: ajmiaa@aramco.com.sa

Implementation Session Moderator

Mohammed A. Hammad – Department Manager, Saudi Aramco

Mohammed Hammad's current assignment is managing the planning and execution of the $2 billion Hawiyah Natural Gas Liquids (NGL) Recovery Program. Hammad has more than 20 years of experience, and has worked on major projects in Saudi Arabia, Europe, and North America. Major projects include the East/West Pipeline Expansion, the Shaybah Downstream Facilities, and the Hawiyah Gas Plant project. Hammad holds a bachelor's degree in civil engineering from Cairo University.

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HammaOb@aramco.com.sa

Implementation Session Participants

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Saleh A. Al-Thunaian– Project Engineer, C.A. Project Design & Construction, Saudi Aramco
e-mail: saleh.thunaian@aramco.com

Eric J. Richter– Best Practices Specialist, Project Management Organization, Saudi Aramco
e-mail: eric.richter@aramco.com

The Journey Toward Project Management Excellence

Plenary Slides

Notes

Learning Objectives & Results

- Cost & schedule performance can be dramatically improved with an integrated approach
- CII best practices are one of the key performance enhancers available to all of us.

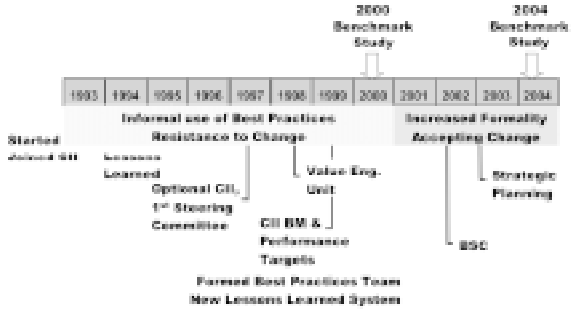
Agenda

- Capital Program Description
- Steps on the Journey
- What worked best?
- Results to date
- Embracing Change

Saudi Aramco Project Management

- Capital Program Size
  - $2.5 to $3 Billion per year expenditures
  - Project Size $2 million - $2 billion
  - 150 active projects – infrastructure to Refinery
- Contractor Information
  - Largest Projects Executed by Major EPC firms
  - Most engineered equipment purchase abroad
  - Smaller Projects - Local engineering & construction
- Corporate PM Functions
  - Quasi-governmental management
  - All funding authorized by Board of Directors

Steps on the Journey

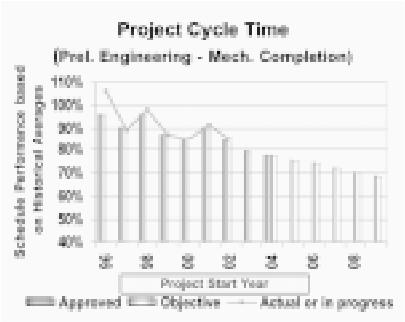


What Worked & Didn't Work

- What did not work?
  - Management resistance to change
  - Voluntary participation by Project Teams
  - Lessons submitted without review
  - Internal Focus
- What did work? An Integrated Approach

Notes

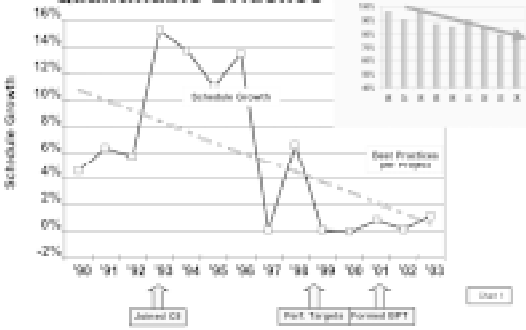
Absolute Performance Improving



Best Practices Portfolio

- Project Execution Planning Workshop (PEPW) – CII
- Project Definition Rating Index (PDRI) – CII
- Schedule Optimization – CII
- Scope Control & Change Management – CII
- Constructability – CII
- Planning for Startup – CII
- Lessons Learned – CII
- Value Engineering – SAVE
- Benchmarking – CII/IPA/Internal

Quantifiable Evidence



Notes

Cost, Quality & Safety Improving

- Cost
  - Cost reliability improved
  - Absolute costs down 10% (per IPA)
- Quality
  - Quality measure established and improving
- Safety
  - Construction Lost Time Incidents down by 50% in 5 years

PM Efficiency Increasing

Embracing Change

- 2004 Strategic Initiatives
- Project Management Technical Competencies
- Capital Program Best in Class

Notes

Notes

Conclusion

Learning Objectives

- Cost & schedule performance can be dramatically improved with an integrated approach
- CII best practices are one of the key performance enhancers available to all of us.

Implementation Session Topics

- Value of Best Practices
- Lessons Learned System

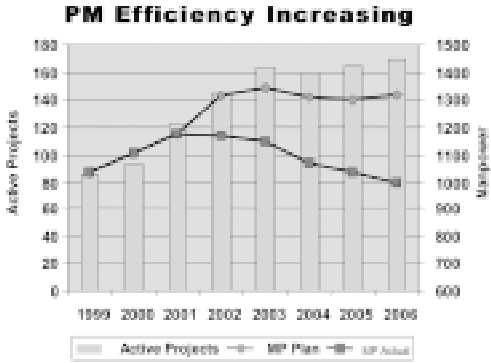
Saudi Aramco
Journey toward Project
Management Excellence

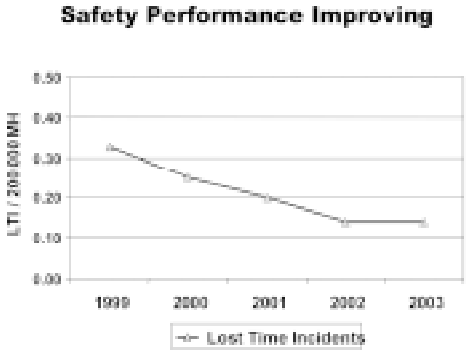
CII Annual Conference

July 28, 2004

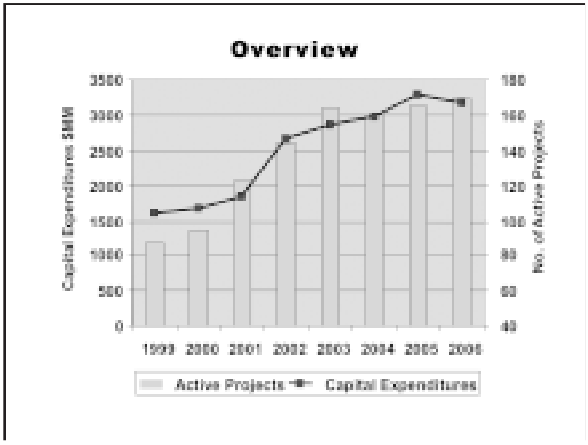
Notes

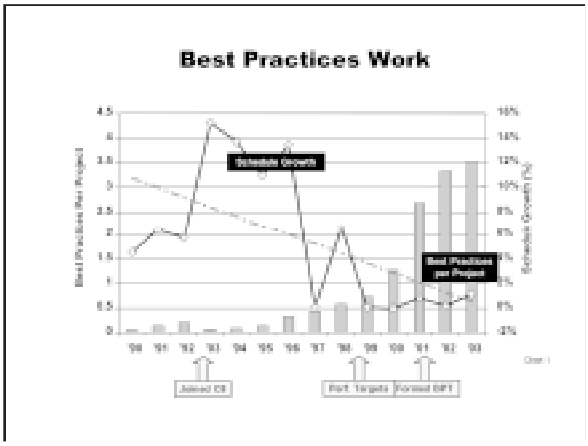

Cost, Schedule & Quality
Predictability Improving
Measure Value
100%
90%
80%
70%
60%
50%
40%
'95 '96 '97 '98 '99 '00 '01 '02 '03
On Time
On Budget
Quality


PM Efficiency Increasing
Active Projects
Manpower
1999 2000 2001 2002 2003 2004 2005 2006
Active Projects
MP Plan


Safety Performance Improving
LTI / 200,000 MH
0.50
0.40
0.30
0.20
0.10
0.00
1999 2000 2001 2002 2003
Lost Time Incidents

Notes





Learning Objectives & Results

- Cost & schedule performance can be dramatically improved with an integrated approach
- CII best practices are one of the key performance enhancers available to all of us.
- Results since 1999
  - Projects schedules - 23% better
  - Cost benchmarks - 10% better
  - Contractor Safety Performance – 50% better

The Journey Toward Project Management Excellence

Implementation Slides

Notes

2004 Annual Conference

Construction Industry Institute Vancouver, Canada

Journey Towards Project Management Excellence

Mohammed A. Hammad - July 28, 2004

Learning Objectives

- Understand how formalized implementation of CII Best Practices adds value
- Find out how to successfully build a Lessons Learned Program

Agenda

- Best Practices
  - Elements of a program
  - Implementation at the project level
  - Benchmarking results
- Lessons Learned
  - Description of process
  - Elements of a system
  - Demonstration of a website

Saudi Aramco Project Management

- Capital program size
  - 150 active projects – infrastructure to refinery
  - 1,000 people in projects and support activities
- Contractor information
  - Largest projects executed by major EPC firms
  - Most engineered equipment purchased abroad
  - Smaller projects – local engineering & construction
- Corporate Project Management functions
  - Quasi-governmental management
  - All funding authorized by Board of Directors

CII Implementation Model

Implementation Approach

Notes

Notes

Best Practices Portfolio

• Project Execution Planning Workshop	CII
• Project Definition Rating Index	CII
• Schedule Optimization	CII
• Scope Control & Change Management	CII
• Constructability	CII
• Planning for Start-Up	CII
• Lessons Learned	CII
• Value Engineering	SAVE
• Benchmarking	CII - IPA - Internal

Implementation Methodology

- Subject Matter Experts (SMEs)
  - 23 SMEs
  - knowledgeable
    recognized
  - dedicated full-time
- Hands-on facilitation with project teams
- Formalized workshops

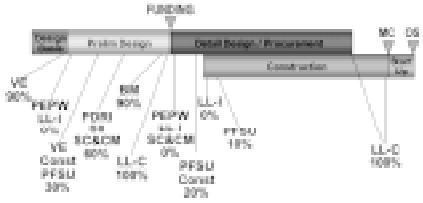
Transferring Knowledge to Engineers

- Course: 2.5 days, 8-10 sessions annually
- Introduces, provides overview of Best Practices
- Taught by Best Practices SMEs
- Attended by projects, facilities operations, business planning, and design contractors
- Trained 1,500 to date

Implementation Planning

- Review capital program yearly to identify project starts
- Work with project teams to select applicable Best Practices and timing
- Monitor project progress and carry out Best Practices implementation sessions

Implementation Timing



BM	Benchmarking	PEPW	Project Execution Planning Workshop
Const	Constructability	PFSU	Planning For Start-Up
LL-I	Implement Lessons Learned	SC&CM	Scope Control & Change Mgt
LL-C	Collect New Lessons Learned	SO	Schedule Optimization
PQRI	Project Definition Rating Index	VE	Value Engineering

Facilitated Best Practices Workshop

- Location: project site office
- Duration: two to four hours
- Participants: Appropriate stakeholders
- Benefits:
  - Best Practice primary benefit
  - Team building
  - Early identification of issues
  - Training

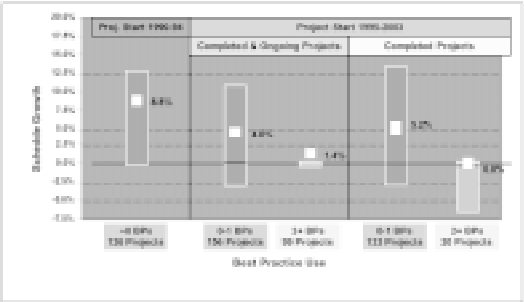
Notes

Best Practices Workshops

Best Practice	2001	2002	2003	Total
Proj. Exec. Plann. Worksh. (PEPW)	1	4	17	22
Proj. Definition Rating Index (PDRI)	23	40	35	98
Schedule Optimization	28	41	19	88
Scope Control & Change Mgt.	1	7	16	24
Constructability	28	51	34	113
Planning for Startup	1	17	20	38
Lessons Learned	1	29	58	88
Value Engineering	32	26	36	94
Benchmarking	20	15	3	38
Total Workshops	135	230	238	603
Training for Personnel	457	637	407	1,501

Schedule Growth vs. Best Practice Use

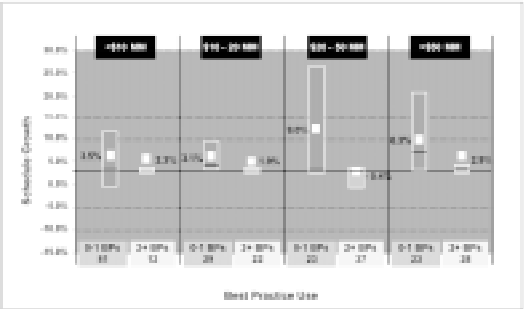
1990-2003



Schedule Growth vs. Best Practice Use

by project size

1995-2003



Notes

Major Project Implementation – Project Description

Hawiyah

Natural Gas Liquids (NGL) Recovery Program

- Objective: Recover NGL and increase NGL supply to downstream industries
  - Construct grassroots NGL recovery facility
  - Expand existing Hawiyah Gas Plant facilities
  - Add fourth fractionation module at Ju'aymah Gas Plant
  - De-bottleneck existing pipeline network
  - Install new upstream and downstream gas pipelines

Major Project Implementation – Best Practices Workshops

- Process facilities (North America)
  - Three SMEs visited during preliminary engineering phase
  - Conducted Best Practices training course onsite
  - Facilitated workshops:
    - Project Execution Planning
    - Lessons learned
- Pipeline facilities and site development (Saudi Arabia)
  - Facilitated full portfolio of Best Practices workshops

Major Project Implementation – Benefits

- Value Engineering savings
- Team alignment through Project Execution Planning Workshop
- Other intangible benefits

Notes

Recap

Formalized
CII Best Practice Implementation

- Use internal and external benchmarking
- Customize CII Best Practices
- Use SMEs to facilitate Best Practices workshops
- Best Practices are foundation for future improvement

Lessons Learned System Implementation

Definition

Lesson Learned:

Knowledge gained from experience
(successful or otherwise)
for the purpose of improving future
performance

Notes

Lessons Learned Objective

- Improve project performance through:
  - repeating successful actions and decisions
  - avoiding repetition of mistakes
  - assisting project execution planning process
  - encouraging improvements in work processes
  - improving safety and quality performance

Lessons Learned Process

COLLECT ⇒ ANALYZE ⇒ IMPLEMENT

- Workshops
- Website
- Close-out reports

- Lessons Learned Review Committee ensures quality

- Facilitated review
- Independent review by project

Lessons Learned
Resources and Roles

- Lessons Learned System Management
  - System coordinator
  - Website designer/administrator
  - Review committee
- Project Stakeholders
  - Project management teams
  - Facility operations
  - Contractors
- Standards & Procedures Custodians

Notes

Lessons Learned Timing

Lessons Learned
Collection Workshop

- Session length: 3 to 4 hours
- Attendees: project team-operations-contractor-inspection
- One facilitator per six people
- Structure
  - Propose lessons learned ideas
  - Prioritize
  - Write detailed lessons for selected ideas:
    - Background
    - Root cause/benefit
    - Recommendation

Lessons Learned
Implementation Workshop

Notes

Lessons Learned…
…about Lessons Learned

- Assign dedicated lessons learned system coordinator
- Implement website to collect and display lessons
- Ensure quality: Lessons Learned Review Committee
- Emphasize quality over quantity
- Use facilitated workshops

ارامكو السعودية
Saudi Aramco

Thought for the Day

Knowledge that's unused is like fuel that's unburned:
It has potential — but no power.

– Mort Crim, radio personality

Thank you!

Notes

Notes

Lessons Learned
Website Demonstration

Best Practices – Lessons Learned Implementation Session

- Agenda
  - Project phases & use of CII Best Practices
  - Project Management view of benefits of these practices
  - Audience question and answer session

Best Practices – Lessons Learned Implementation Session

- Participants
  - Moderator
    - Mohammed Hammad
  - Panelists
    - Salah Shehab
    - Eric Richter
    - Saleh Al-Thunaian
    - John Palmer

Implementation: Once a Dream...Now a Reality

Implementation Strategy Committee

Abstract

Implementation strategy is crucial to the assimilation of CII research. The plenary session will highlight the progress in implementation over the last decade and the strategies and tools that have enabled member organizations to achieve their implementation goals. The Implementation Strategy Committee (ISC) will highlight validation of its Implementation Model as a roadmap to developing successful implementation strategies. Improvements in CII knowledge management and how CII is tapping technology to deploy products online will be discussed along with CII implementation programs and tools.

The implementation session is a must for members wanting to achieve their implementation goals. An experienced panel will discuss strategies, tools, and opportunities for implementation. Details on implementation metrics, the CKII, the Implementation Champion Program, and eRoom will be discussed. Also, three Implementation Resources will be reviewed: RS166-1, IR166-2, and IR166-3.

Plenary Session Presenter

Virgil L. Barton – Manager of Quality Services, Bechtel Power Corporation

Virgil Barton has had both domestic and international project assignments and has over 33 years of experience in power, petrochemical, industrial, shipbuilding, and telecommunication projects. Prior to his current assignment, he held various positions in quality and construction services. An advocate of the Six Sigma program, he is a certified Six Sigma Champion. Barton currently serves as co-chair of the CII Implementation Strategy Committee.

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Implementation Session Moderator

Donald G. Giles – Regional Engineering Manager, Eastern Facilities, U.S. Steel Corporation

Don Giles has over 25 years of experience in the steel industry, with a focus on project management — both new construction and revamps. With U.S. Steel the past 16 years, he has served in various engineering, technical services, and management positions. He currently manages the capital improvements programs in all facets of steel production. At CII, Giles has been involved with research on lessons learned and technology assisted learning. He co-chairs the Implementation Strategy Committee.

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Implementation Session Participants

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Other Knowledgeable Points of Contact

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Cody Bryant – Project Manager, SW&B Construction
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Gregory A. Kanteres – Engineering Fellow, Performance Films Engineering, Solutia Inc.
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Richard F. King – Senior Vice President, Construction Support, Black & Veatch Corporation
e-mail: kingrf@bv.com

Sheryl L. Kolasinski – Director, Project Management, Smithsonian Institution
e-mail: kolas@opp.si.edu

William A. Ryan – Senior Vice President, Project Delivery, CSA Group, Inc.
e-mail: bryan@csagroup.com

David Witt – Construction Group Manager, General Motors
e-mail: david.witt@gm.com

Notes

Implementation:
Once a Dream… Now a Reality

Implementation Strategy
Committee

Once Upon a Time…

Implementation
Was Only a Dream

CII Products

Research Summaries

Research Reports

Implementation

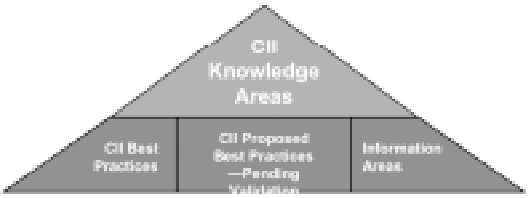
Education

Implementation Resources

CII Implementation Model

CII Knowledge Structure

Overall Body of CII Knowledge
Arranged in Topological Form



Notes

Notes

Barriers to Moving Information Have Been Removed

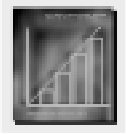
Implementation Champion Program

- Two 1.5-day annual workshops designed to:
  - Inform about new CII products.
  - Provide tools/skills to improve performance.
  - Promote networking with peers.
- Facilitated Web-based e-room collaboration.

Implementation Tools

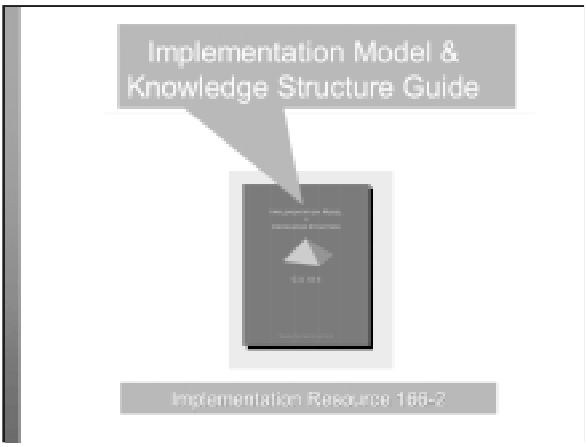
Implementation Resource 166-2

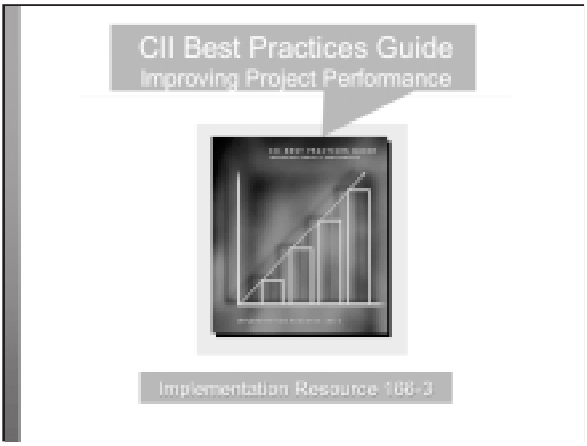
Implementation Model and Knowledge Structure Guide

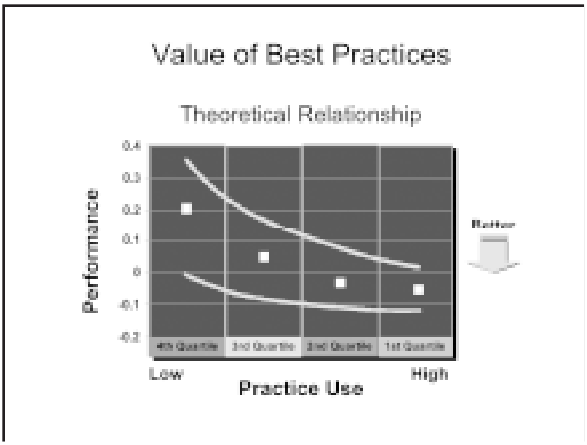


Implementation Resource 166-3

CII Best Practices Guide


Implementation Model &
Knowledge Structure Guide
Implementation Resource 168-2


CII Best Practices Guide
Improving Project Performance
Implementation Resource 168-3


Value of Best Practices
Theoretical Relationship
Performance
0.4
0.3
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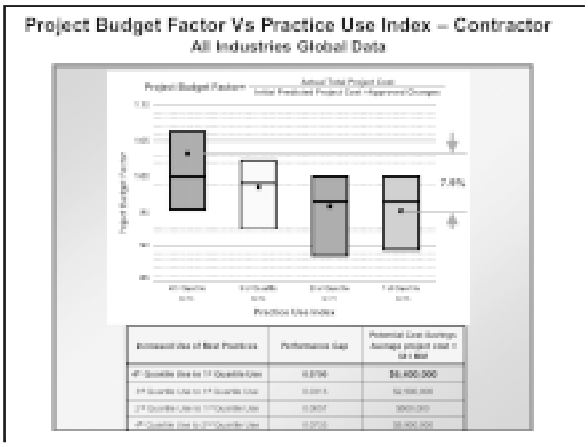
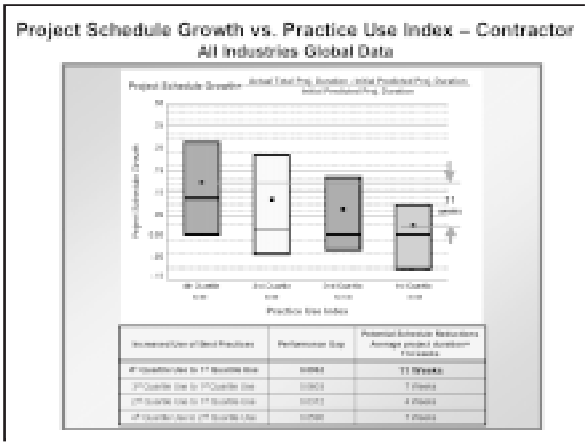
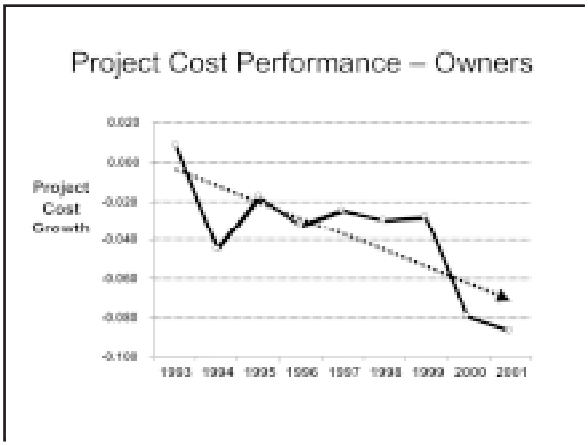
0.1
0
-0.1
-0.2
Better
Low
High
Practice Use

Notes

Notes


Project Budget Factor Vs Practice Use Index – Contractor
All Industries Global Data


Project Schedule Growth vs. Practice Use Index – Contractor
All Industries Global Data


Project Cost Performance – Owners
Project Cost Growth
0.020
0.000
-0.020
-0.040
-0.060
-0.080
-0.100
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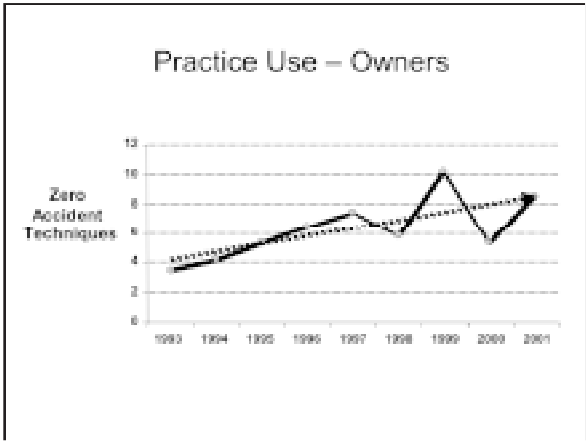
Practice Use – Owners
Zero Accident Techniques
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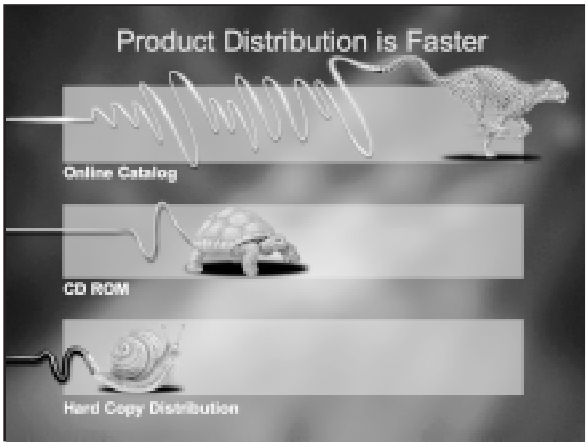
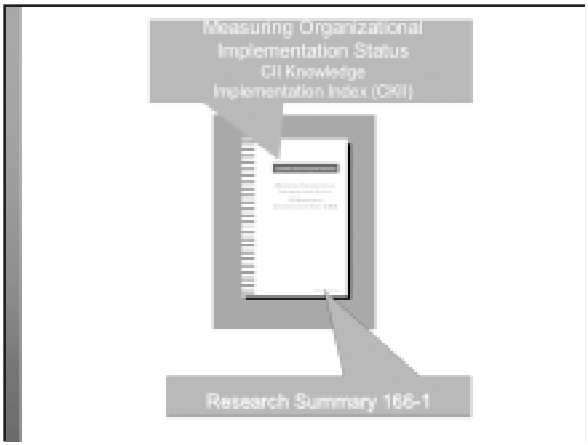
2001

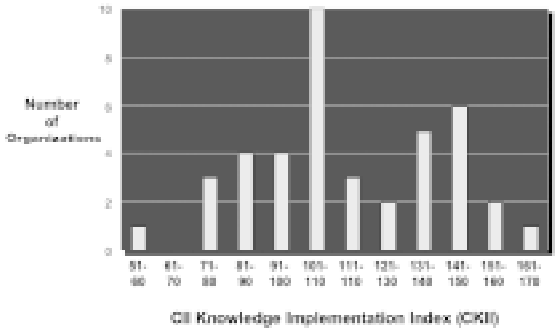

Product Distribution is Faster
Online Catalog
CD ROM
Hard Copy Distribution


Measuring Organizational Implementation Status
CII Knowledge Implementation Index (CKII)
Research Summary 166-1

Notes

Notes

CKII Distribution



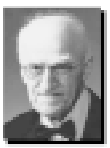
Hope is not a strategy…

Implementation is never an accident. It is the result of high intention, sincere effort, intelligent direction, and skillful execution. It represents the wise choice of many alternatives.

Technology and Culture

- Technology touches the head; but the culture of an organization touches the heart.
- Culture is the shared beliefs, values, attitudes, institutions, and behavior patterns that characterize the members of an organization.

J. M. Juran
"Father of Quality"
(b. 1904)



Implementation Session

A panel of experts will explain these implementation tools and answer any questions about implementation.

- Don Cilea, U.S. Steel
- Billy Miller, Zurich North America
- Bill Beck, Parsons E & C

Come to the Implementation Session

Learn about:

- Implementation Champions Program
- Early Implementation Program
- Implementation Tools
- Implementation Champions e-Room
- Online Catalog

Notes

Implementation: Once a Dream...Now a Reality

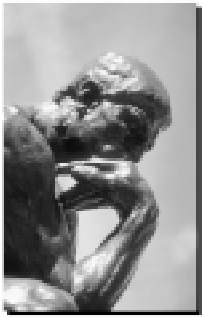
Implementation Slides

Notes

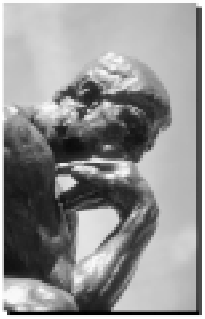
Implementation: Once a Dream…
Now a Reality

Implementation Session

Don Giles, U.S. Steel

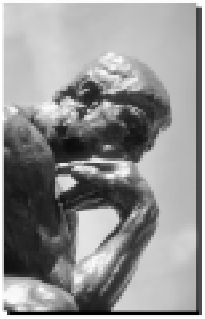


Why did your organization join CII ?



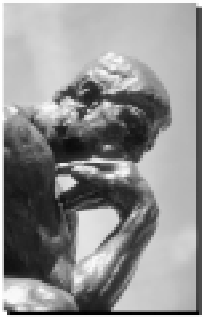
What is the most effective way for your organization to get a Return on Investment in CII ?

Notes



Does your organization have an Implementation Champion ?

Hope is not a strategy…



Implementation is never an accident. It is the result of high intention, sincere effort, intelligent direction, and skillful execution. It represents the wise choice of many alternatives.

Implementation Session

Billy Miller, Zurich North America
- Research Summary 166-1, "Measuring Organizational Implementation Status: CII Knowledge Implementation Index (CKII)"

Don Giles, U.S. Steel
- Implementation Resource 166-2, "Implementation Model + Knowledge Structure Guide"
- Implementation Resource 166-3, "CII Best Practices Guide: Improving Project Performance"

Bill Beck, Parsons E & C
- The Implementation Champions' Toolbox

Notes

Implementation Study

Research Summary RS 166-1

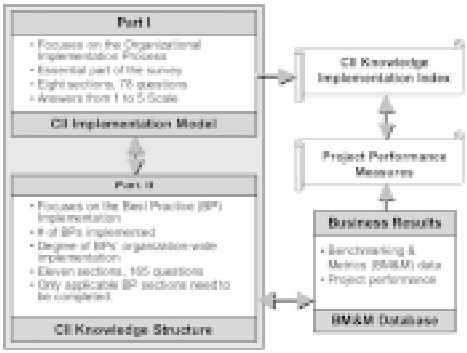
"Measuring Organizational Implementation Status:

CII Knowledge Implementation Index (CKII)"

Billy Miller
Zurich NA

What is CKII?

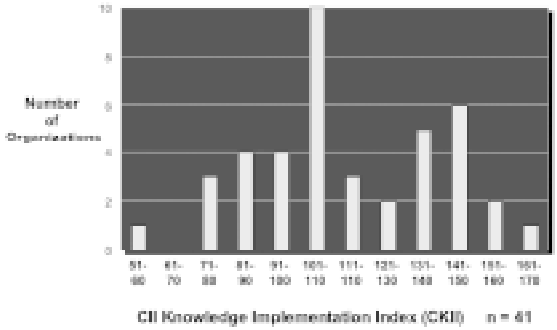
- CII Knowledge Implementation Index
- Evaluates organizational implementation process
- Use of CII Best Practices
- Examines the relationship between organizational implementation and project success
- Initial survey completed Fall 2001



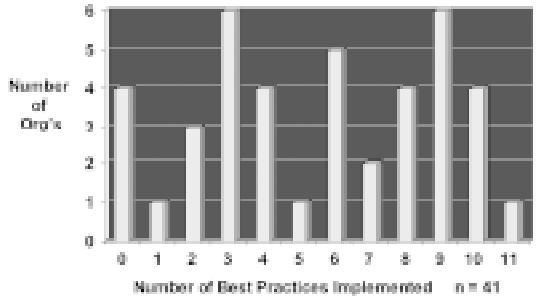
CII Knowledge Implementation Index (CKII)

- Quantifies degree of the organizational implementation status
- Calculated with data from Part I of the CII Implementation Survey
- Normalized score
  - Maximum: 200
  - Minimum: 0
  - Adjusted score by excluding "n/a" questions

CKII Distribution

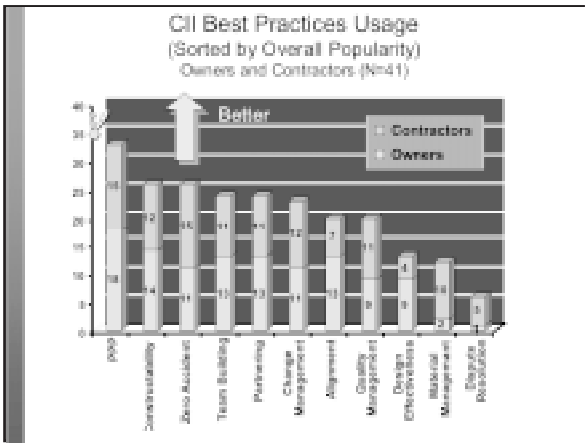


Number of Best Practices Implemented by Participating Organizations



* Participants were implementing an average of 5.5 BPs out of 11

Notes



Summary of Findings

- Wide range of implementation as organization
  - We are making progress
- Room for improvement
- Identify themes and steps to improve

Notes

Conclusions

- CKII is Benchmark Tool for Implementation
  - Plan to use survey tool every two years as an organization for CII (Implementation Strategy & Knowledge Committees)
- Room for improvement
  - Organizational implementation process
  - Best Practice implementation
- Best Practice usage information—good snapshot

Sources of Information

Research Summary
RS 166-1

Research Report
RR 166-11

Implementation Resources

Implementation Resource IR 166-2

"Implementation Model + Knowledge Structure Guide"

Implementation Resource IR 166-3

"CII Best Practices Guide: Improving Project Performance"

Don Giles, US Steel

Notes

Notes

IR 166-2 Contents

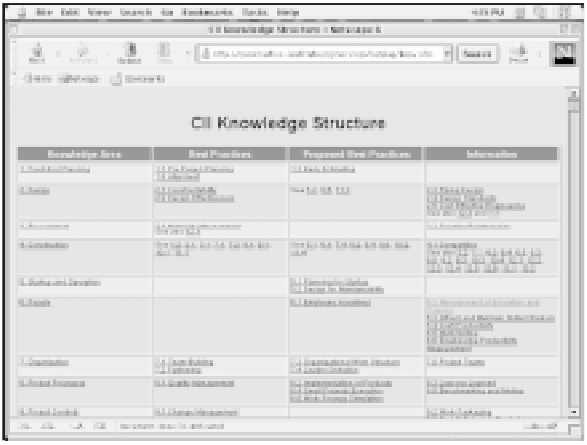
Executive Summary
1. Introduction
2. CII Implementation Model
3. CII Knowledge Structure
4. Conclusions
Appendix 1: Knowledge Structure Terminology
Appendix 2: Knowledge Structure Development Process
Implementation Strategy Committee Members

IR 166-2 Background and Motivation

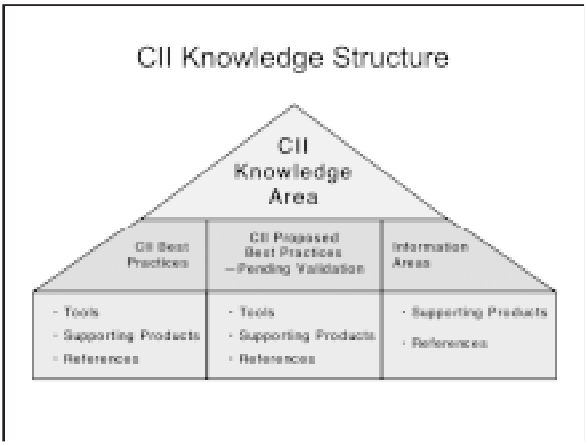
Improve implementation of CII products
_ Many products with great potential have not been utilized by CII member organizations.

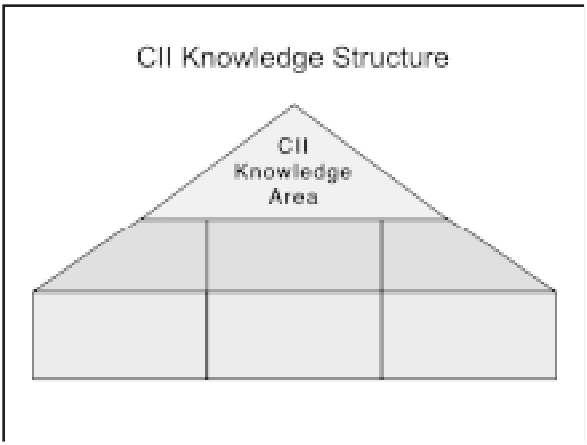
- COMMUNICATE the implementation process.
- Describe WHAT products are available and HOW to implement them.
- Locate the RIGHT products for implementation.
- Increase familiarity with CII best practices.
- Decrease confusion over what is a CII Best Practice.

The Implementation Model

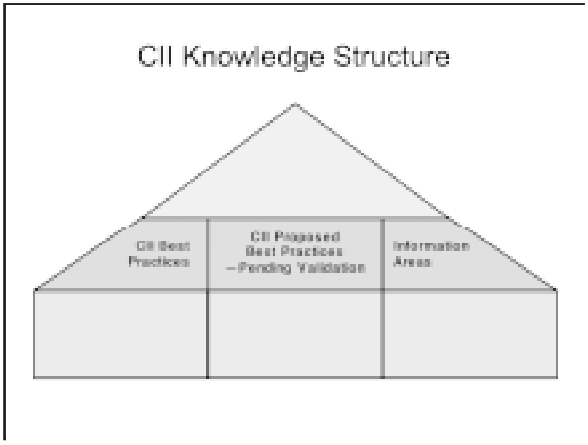

CII Knowledge Structure

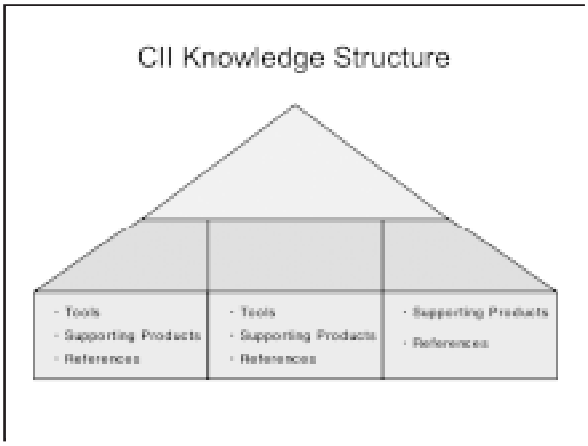
Notes

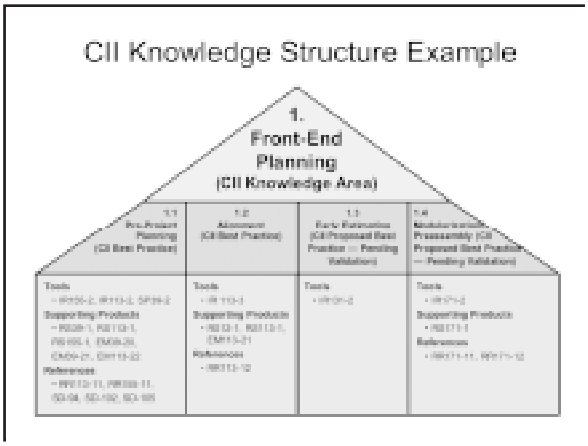

CII Knowledge Structure
CII Knowledge Area
CII Best Practices
CII Proposed Best Practices –Pending Validation
Information Areas
- Tools
- Supporting Products
- References
- Tools
- Supporting Products
- References
- Supporting Products
- References


CII Knowledge Structure
CII Knowledge Area

Notes


CII Knowledge Structure
CII Best Practices
CII Proposed Best Practices – Pending Validation
Information Areas


CII Knowledge Structure
· Tools
· Supporting Products
· References
· Tools
· Supporting Products
· References
· Supporting Products
· References


CII Knowledge Structure Example
1.
Front-End
Planning
(CII Knowledge Area)

Notes

Using IR 166-2
Implementation Model + Knowledge Structure

- Provides a "Jump Start Kit."
- Use CII Implementation Model to drive your implementation program.
- Use the CII Knowledge Structure to identify CII Best Practices to adapt within your organization.

Implementation Resource 166-3
CII Best Practices Guide
Why use it?

- Extension of CKII
- Evaluation tool for CII Best Practices
- Keep it "user friendly"
- Update as new Best Practices are validated

IR 166-3
CII Best Practices Guide

- Description of CII Best Practice
- Essential Elements of Each Best Practice
- Benefits of Using Best Practice
- Checklist for Evaluating Implementation

Notes

CII Best Practices Guide Implementation Tool

- Introduce CII Best Practices.
- Determine which CII Best Practices to implement.
- Guide to Apply the Best Practice — project, corporate, or both.

CII Best Practices Guide Assessment Process

- Compare needs, processes, and procedures.
- Use checklists to assess level of implementation.
- Target areas needing improvement.
- Set priorities to achieve greatest benefit.

Users of the CII Best Practices Guide

- Continuous Improvement managers to improve capital projects process.
- New project management employees in need of orientation and information.
- Experienced construction/project personnel familiar with CII Best Practices.
- Management/project personnel using checklists to evaluate active projects

Notes

CII Best Practices Guide
Scoring Use

- Effectiveness of Implementation Rating (EIR)
- Indicates level of implementation
- Identify opportunities for improvement
- Compare EIR scores among similar projects

Implementation Resources
They are YOUR Tools

A tool is only worth something if it is used!

Implementation Champions' Toolbox

Implementation Champions'

Toolbox Program

Bill Beck, Parsons E & C

Notes

Implementation Champions

- Implementation Champions
- Education
- Products Online
- Website Tool Box

Implementation Strategy Committee – Implementation Champion's Tool Box Program

- Began in 1998
- Purpose
- Benefits
- 11 Workshops
- Implementation Champion Membership 64
- (CII Membership 95)

Topics Presented at Product Implementation Workshops

- Benchmarking
- Education Materials & Tools
- Facilitation Skills
- Front End Loading and the Project Definition Readiness Index
- Implementing Security
- International Risk Assessment
- Knowledge Management
- Plan for Implementation
- Pre Project Planning
- Prefabrication, Preassembly, Modularization, Off Site Fabrication
- Process Industry Practices (PIP)
- Project Success
- Role of Implementation Champion
- RS 166-2 & 166-3
- Safety in the Workplace
- Tactical Implementation Plan
- Team Building
- US Embassy in the 21st Century
- Value Management
- Virtual Teams
- Work Process Simulation
- Zero Accidents Techniques

Notes

Education Tools

- Education Modules (20 available)
- CII Education Courses at:
  - Arizona State University
  - Clemson University
  - The University of Texas at Austin

TAL: Technology Assisted Learning Courses (Web Based Learning)

- Beginning late Summer- early Fall 2004
- Available "Online" on a 24/7 basis
- Complete Learning Management System
- CII succeeds EduNeering as course provider
- Free to CII members during designated access windows
- Access sold to outside organizations
- Full program rollout announcement coming soon
- Visit: http://construction-institute.org/tal.cfm

CII TAL Courses (Available Late Summer- Early Fall 2004)

- Constructability
- Development & Alignment of Project Objectives
- Pre-Project Planning (late 2004 or early 2005)
- Safety
- Scope Control & Change Management

Notes

CII TAL Topics to be Released in 2005-06

- Building the Project Team
- Design For Maintainability
- Developing, Implementing and Managing a Partnering Relationship
- Planning for Start-up
- Pre Fabrication, Preassembly, Modularization & Offsite Fabrication
- Pre-Project Planning
- Tools for Effective Materials Management

Products Online
288 Current CII Publications

- 87 Research Summaries
- 113 Research Reports
- 48 Implementation Resources
- 40 Other Publications
- "Products Online"

As of 20 Feb 04
188 Additional Titles Archived

Products Online

- Publications Online Downloading Statistics
- November 2001 – March 2004
- Total Downloads
  - (All members) **27,374**
  - (Current members only) **21,556**
- Average per Member 244 Downloads
- Owners 37% Contractors 63%

Notes

Products Online

See complete presentation at Products Display

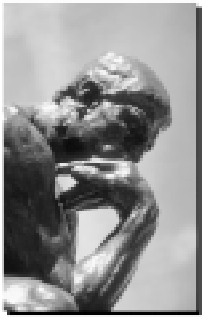
Future Tool Kit

- Web-based "Tool Kit" for all members
- Based on industry Knowledge Management Techniques
- Explicit Knowledge (written)
- Expert Locater (Subject Matter Experts)
- Tacit Knowledge (Non Written)
- Lessons Learned

Implementation Champions Program

- "Implementation Workshop" open to all members
- Excellent presentations at workshops
- Education tools and courses
- All CII products online
- Great collaboration and networking
- Why not participate?
- Next workshop: Sept 22-23, 2004 in Austin, TX

Hope is not a strategy…



Implementation is never an accident. It is the result of high intention, sincere effort, intelligent direction, and skillful execution. It represents the wise choice of many alternatives.

Notes

Project Definition Rating Index (PDRI) Revisited

Special Project

Abstract

The Project Definition Index (PDRI) for Industrial Projects was introduced by CII in 1996 and the PDRI for Building Projects in 1999 as tools to help project teams manage the pre-project planning process. Since that time, these two tools have been widely adopted by both CII members and others and are used around the globe for planning facility projects. This presentation will give a brief overview of the PDRI, the current status of usage among the CII membership, provide data linking its use to project performance improvement, and give guidance concerning successful implementation.

A panel of industry professionals will present their personal PDRI implementation experiences in the implementation session. The remainder of the session will be devoted to audience questions, shared experiences, and feedback on the implementation of the PDRI technique.

Plenary Session Presenter

G. Edward Gibson, Jr. – Professor, Department of Civil Engineering, The University of Texas at Austin

Edd Gibson's research interests include organizational change, pre-project planning, risk management, construction productivity, electronic data management, and automation and robotics. He has been recognized by CII with both its Outstanding Researcher Award and its Outstanding Instructor Award. He is the author of CII's Pre-Project Planning Handbook and Project Definition Rating Index (PDRI). He also was involved in developing CII's International Project Risk Assessment (IPRA) tool. Dr. Gibson, a licensed professional engineer in Texas, received his Ph.D. in Civil Engineering from Auburn University and an MBA from the University of Dallas.

e-mail: egibson@mail.utexas.edu

Implementation Session Moderator

G. Edward Gibson, Jr. – Professor, Department of Civil Engineering, The University of Texas at Austin

Implementation Session Participants

Stephen P. Campbell – Chief, Project Management Office, Center Operations Directorate, NASA
e-mail: stephen.p.campbell@nasa.gov

John R. Fish – Director, Procurement and Quality Assurance, Ford, Bacon & Davis, LLC
e-mail: jrfish@fbd.com

Robert A. Herrington – Manager of Quality, Southern Region, Jacobs
e-mail: bob.herrington@jacobs.com

David Kracht – Technology Manager, 3M Company
e-mail: djkracht1@mmm.com

Javid H. Talib – Senior Project Manager – Gas, Oil & Chemicals Division, Black & Veatch
e-mail: talibjh@bv.com

Project Definition Rating Index (PDRI) Revisited

Special Project

Executive Summary

The Project Definition Rating Index (PDRI) is a weighted checklist of project scope definition elements that facilitates project assessment during pre-project planning. Two versions of the tool exist—one for industrial (process) facilities and one for building facilities. This presentation will explore the current status of PDRI usage among CII members.

Background

PDRI is a risk management tool that can help the pre-project planning team assess and measure project scope definition risk elements and then develop mitigation plans. A risk management analysis is most effective when performed prior to "locking in" facility budgets and committing funds to detailed design and construction. Experience has shown that it provides numerous benefits, including use as a:

- Checklist that a project team can use to determine the necessary steps to follow in defining project scope.
- List of standardized project scope definition terminology throughout the construction industry.
- Standard for rating the completeness of the project scope definition to facilitate risk assessment, prediction of escalation, and evaluation of the potential for disputes.
- Means to monitor progress at various stages during the pre-project planning effort and to focus efforts on high risk areas that need definition.
- Tool that aids in communication between owners and design contractors by highlighting poorly defined areas in a scope definition package.
- Means for project team participants to reconcile differences by providing a common basis for project evaluation.
- An aid to small project scope development.
- Training tool for organizations and individuals throughout the industry.
- Benchmarking tool for organizations to use in evaluating the completion of project scope definition versus the probability of success on future projects.

The PDRI for Building Projects should be used when the primary designer of the new facility is an architect. It consists of 64 elements that are grouped into 11 categories and further grouped into three main sections. A list of the 64 elements is given in Table 1. The 64 elements are arranged in a score sheet format and are supported by 38 pages of detailed descriptions and checklists. An excerpt of the weighted score sheet from the Building PDRI is given in Table 2, along with an example of three PDRI element descriptions making up the equipment category.

The PDRI for Industrial Projects should be used when the primary facility designer is a process or mechanical engineer. The format of the score sheet and descriptions is similar to the buildings projects version of the PDRI. It consists of three sections, 14 categories, and 70 elements. A listing of the 70 elements is given in Table 3.

Table 1. PDRI for Buildings SECTIONS, Categories, and Elements

SECTION I.
BASIS OF PROJECT DECISION

- A. Business Strategy
  - A1. Building Use Requirements
  - A2. Business Justification
  - A3. Business Plan
  - A4. Economic Analysis
  - A5. Facility Requirements
  - A6. Future Expansion/Alteration
  - A7. Site Selection Considerations
  - A8. Project Objectives Statement
- B. Owner Philosophies
  - B1. Reliability Philosophy
  - B2. Maintenance Philosophy
  - B3. Operating Philosophy
  - B4. Design Philosophy
- C. Project Requirements
  - C1. Value-Analysis Process
  - C2. Project Design Criteria
  - C3. Evaluation of Existing Facilities
  - C4. Scope of Work Overview
  - C5. Project Schedule
  - C6. Project Cost Estimate

SECTION II. BASIS OF DESIGN

- D. Site Information
  - D1. Site Layout
  - D2. Site Surveys
  - D3. Civil/Geotechnical Information
  - D4. Governing Regulatory Requirements
  - D5. Environmental Assessment
  - D6. Utility Sources with Supply Conditions
  - D7. Site Life Safety Considerations
  - D8. Special Water and Waste Treatment
- E. Building Programming
  - E1. Program Statement
  - E2. Building Summary Space List
  - E3. Overall Adjacency Diagrams
  - E4. Stacking Diagrams
  - E5. Growth and Phased Development
  - E6. Circulation and Open Space Requirements
  - E7. Functional Relationship Diagrams/Room by Room
  - E8. Loading/Unloading/Storage Facilities
  - E9. Transportation Requirements
  - E10. Building Finishes
  - E11. Room Data Sheets
  - E12. Furnishings, Equipment, & Built-Ins
  - E13. Window Treatment Considerations
- F. Building/Project Design Parameters
  - F1. Civil/Site Design
  - F2. Architectural Design
  - F3. Structural Design
  - F4. Mechanical Design
  - F5. Electrical Design
  - F6. Building Life Safety Requirements
  - F7. Constructability Analysis
  - F8. Technological Sophistication
- G. Equipment
  - G1. Equipment List
  - G2. Equipment Location Drawings
  - G3. Equipment Utility Requirements

SECTION III.
EXECUTION APPROACH

- H. Procurement Strategy
  - H1. Identify Long Lead/Critical Equipment and Materials
  - H2. Procurement Procedures and Plans
- J. Deliverables
  - J1. CADD/Model Requirements
  - J2. Documentation/Deliverables
- K. Project Control
  - K1. Project Quality Assurance and Control
  - K2. Project Cost Control
  - K3. Project Schedule Control Requirements
  - K4. Risk Management
  - K5. Safety Procedures
- L. Project Execution Plan
  - L1. Project Organization
  - L2. Owner Approval Requirements
  - L3. Project Delivery Method
  - L4. Design/Construction Plan & Approach
  - L5. Substantial Completion Requirements

Figure 2. Excerpt from PDRI for Buildings Score Sheet, Category G, Equipment

Note: The score sheet excerpt and the three element descriptions given below comprise one PDRI for Building Projects category and are provided for illustrative purposes. The score sheet and descriptions for the 61 other elements are contained in CII Implementation Resource 155-2 (CII, 1999).

CATEGORY Element	Definition Level						Score
	0	1	2	3	4	5	
G. EQUIPMENT (Maximum Score = 36)							
G1. Equipment List	0	1	5	8	12	15	8
G2. Equipment Location Drawings	0	1	3	5	8	10	3
G3. Equipment Utility Requirements	0	1	4	6	9	11	11
CATEGORY G TOTAL							22

Definition Levels

0 = Not Applicable
1 = Complete Definition
2 = Minor Deficiencies
3 = Some Deficiencies
4 = Major Deficiencies
5 = Incomplete or Poor Definition

G. EQUIPMENT

G1. Equipment List

Project-specific equipment should be defined and listed. (Note: Building systems equipment is addressed in element F4 – Mechanical Design and F5 – Electrical Design). In situations where owners are furnishing equipment, the equipment should be properly defined and purchased. The list should define items such as:

- ❑ Process
- ❑ Medical
- ❑ Food service/vending
- ❑ Trash disposal

- ❑ Distributed control systems
- ❑ Material handling
- ❑ Existing sources and characteristics of equipment
  - ❑ Relative sizes
  - ❑ Weights
  - ❑ Location
  - ❑ Capacities
  - ❑ Materials of construction
  - ❑ Insulation and painting requirements
  - ❑ Equipment related access
  - ❑ Vendor, model, and serial number once identified
  - ❑ Equipment delivery time, if known

G2. Equipment Location Drawings

Equipment location/arrangement drawings identify the specific location of each item of equipment in a project. These drawings should identify items such as:

- ❑ Plan and elevation views of equipment and platforms
- ❑ Location of equipment rooms
- ❑ Physical support requirement (e.g., installation bolt patterns)
- ❑ Coordinates or location of all major equipment

G3. Equipment Utility Requirements

This evaluation should consist of a tabulated list of utility requirements for all major equipment items such as:

- ❑ Power and/or all utility requirements
- ❑ Flow diagrams
- ❑ Design temperature and pressure
- ❑ Diversity of use
- ❑ Gas
- ❑ Water

Table 3. PDRI for Industrial Projects SECTIONS, Categories, and Elements

I. BASIS OF PROJECT DECISION

A. Manufacturing Objectives Criteria
- A1. Reliability Philosophy
- A2. Maintenance Philosophy
- A3. Operating Philosophy

B. Business Objectives
- B1. Products
- B2. Market Strategy
- B3. Project Strategy
- B4. Affordability / Feasibility
- B5. Capacities
- B6. Future Expansion Considerations
- B7. Expected Project Life Cycle
- B8. Social Issues

C. Basic Data Research & Development
- C1. Technology
- C2. Processes

D. Project Scope
- D1. Project Objectives Statement
- D2. Project Design Criteria
- D3. Site Chars. Available vs. Required
- D4. Dismantling & Demolition Req'mts
- D5. Lead / Discipline Scope of Work
- D6. Project Schedule

E. Value Engineering
- E1. Process Simplification
- E2. Design & Material AlternativesConsidered / Rejected
- E3. Design for Constructability Analysis

II. FRONT END DEFINITION

F. Site Information
- F1. Site Location
- F2. Surveys & Soil Tests
- F3. Environmental Assessment
- F4. Permit Requirements
- F5. Utility Sources with Supply Conds.
- F6. Fire Prot. & Safety Considerations

G. Process / Mechanical
- G1. Process Flow Sheets
- G2. Heat & Material Balances
- G3. Piping & Instrmt. Diags. (P&ID's)
- G4. Process Safety Mgmt. (PSM)
- G5. Utility Flow Diagrams
- G6. Specifications
- G7. Piping System Requirements
- G8. Plot Plan
- G9. Mechanical Equipment List
- G10. Line List
- G11. Tie-in List
- G12. Piping Specialty Items List
- G13. Instrument Index

H. Equipment Scope
- H1. Equipment Status
- H2. Equipment Location Drawing
- H3. Equipment Utility Requirements

I. Civil, Structural, & Architectural
- I1. Civil / Structural Requirements
- I2. Architectural Requirements

J. Infrastructure
- J1. Water Treatment Requirements
- J2. Loading / Unloading / Storage Facilities Requirements
- J3. Transportation Requirements

K. Instrument & Electrical
- K1. Control Philosophy
- K2. Logic Diagrams
- K3. Electrical Area Classifications
- K4. Substation Requirements / Power Sources Identified
- K5. Electric Single Line Diagrams
- K6. Instrument & Electrical Specs.

III. EXECUTION APPROACH

L. Procurement Strategy
- L1. Identify Long Lead / Critical Equipment & Materials
- L2. Procurement Procedures & Plans
- L3. Procurement Resp. Matrix

M. Deliverables
- M1. CADD / Model Requirements
- M2. Deliverables Defined
- M3. Distribution Matrix

N. Project Control
- N1. Project Control Requirements
- N2. Project Accounting Req'mts
- N3. Risk Analysis

P. Project Execution Plan
- P1. Owner Approval Requirements
- P2. Engr. / Constr. Plan & Approach
- P3. Shut Down/Turn-Around Req'mts
- P4. Pre-Commissioning Turnover Sequence Requirements
- P5. Startup Requirements
- P6. Training Requirements

Extent of Usage

CII conducted a survey in 2004 to determine the extent of PDRI usage, with 70 of 92 CII members responding (76%). Of the 70 respondents, 43 organizations are using the PDRI on capital projects, including 18 of 34 contractor and 25 of 36 owner respondents. The PDRI for industrial projects has been used for an average of 4.3 years, while the PDRI for building projects has been used for an average of 2.7 years. The breakdown of usage by type is given in Figure 4. Details of PDRI usage within these firms is given in Table 4.

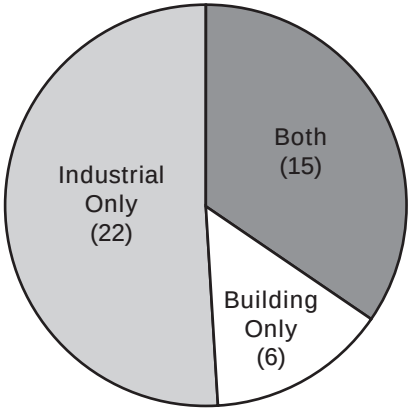


Figure 4. PDRI Usage by Type (N=43)

Table 4. Frequency of Use Among Organizations Using PDRI (N=43)

The PDRI is used:	Frequency
As a checklist in early project development	81%
As a "gate" check before moving to the next project phase	72%
In conjunction with other front end planning measurement methods (i.e., IPA, internal measures)	72%
As a means of measuring or benchmarking front end planning process performance	70%
More than once on most projects	42%
As an audit tool	42%
In a modified form for small or unusual projects	33%
To help capture lessons-learned	28%
With the help of an outside facilitator	29%

Twenty-seven organizations indicated that they do not use the PDRI at this time. Among reasons given for not employing the PDRI were: that it is not applicable to the business model of their organization; that another measurement method or tool is used; or that the respondent had not heard of the PDRI or had time to implement it.

Performance

Table 5 compares project performance for a sample of 92 building projects worth $1.5 billion using a 200-point PDRI score cutoff. These data show the mean performance for the projects versus execution estimate for design and construction and the absolute value of changes as a percentage of total project cost. Projects with a PDRI score under 200 (a lower score is better) statistically outperformed projects with a PDRI score above 200. The PDRI score was determined just prior to the beginning of detailed design and the differences in performance parameters are statistically significant.

Table 5. Comparison of Projects with PDRI-Building Projects Scores Above and Below 200

Performance	PDRI Score	
	< 200	> 200
Cost	1% above budget	10% above budget
Schedule	3% behind schedule	20% behind schedule
Change Orders	7% of budget	11% of budget
	(N=17)	(N=75)

A similar evaluation was performed on a sample of 104 industrial projects representing approximately $5.7 billion. Table 6 summarizes the project performance and PDRI score using the same 200-point PDRI score cutoff. Again, projects with better scope definition (lower PDRI score) significantly outperformed projects with poorly defined scope at the 95 percent confidence level.

The projects used in these samples were voluntarily submitted. The Building PDRI sample includes data from 20 organizations, including office, control building, recreation, institutional, and research facilities. Project sizes ranged from approximately $1.5 million to $200 million with an average cost of approximately $16 million. The Industrial PDRI sample included data from 39 organizations and represents heavy and light

Table 6. Comparison of Projects with PDRI-Industrial Projects Scores Above and Below 200

Performance	PDRI Score	
	< 200	> 200
Cost	3% below budget	4% over budget
Schedule	2% behind schedule	11% behind schedule
Change Orders	5% of budget	8% of budget
	(N=57)	(N=49)

industrial projects including chemical, pharmaceutical, power, pulp and paper, refining, and metals facilities. Project size ranged from $100k to $635 million with an average of approximately $55 million.

It should be noted that the evaluations provided here are valid for the samples as given. These samples may or may not be indicative of projects in your organization and the samples may be biased because of the size and types of projects making up the sample. However, the results are convincing in terms of performance predictability.

Sources of Information

Website: http://construction-institute.org/pdri/

Gibson, G. E. and Pappas, M. (2003). *Starting Smart: Key Practices for Developing Scopes of Work for Facility Projects*, The National Academy Press, Federal Facilities Council Technical Report #146, 87 pp., December.

CII (1999). *PDRI: Project Definition Rating Index, Building Projects*, Construction Industry Institute, The University of Texas at Austin, Implementation Resource 155-2, 80 pp., July.

CII. (1999). *Pre-Project Planning Tool: PDRI for Buildings*, Research Summary 155-1, Construction Industry Institute, The University of Texas at Austin, 28 pp., December.

Cho, C., Furman, J. C., and Gibson, G. E. Jr. (1999). "Development of the Project Definition Rating Index (PDRI) for Building Projects," Construction Industry Institute, The University of Texas at Austin, Research Report 155-11, 296 pp., December.

CII (1997). *Pre-Project Planning Tools: PDRI and Alignment*, Publication 113-1, Construction Industry Institute, The University of Texas at Austin, 33 pp., August.

CII (1996). *PDRI: Project Definition Rating Index, Industrial Projects*, Construction Industry Institute, The University of Texas at Austin, Implementation Resource 113-2, 95 pp., July.

Gibson, G. E. and Dumont, P. R. (1996). "Project Definition Rating Index (PDRI)," Construction Industry Institute, The University of Texas at Austin, Research Report 113-11, 214 pp., June.

Project Definition Rating Index (PDRI) Revisited

Plenary Slides

Notes

Project Definition Rating Index (PDRI)
Revisited

G. Edward Gibson, Jr., Ph.D., P.E.
Professor, Department of Civil Engineering
The University of Texas at Austin

Agenda

- What is PDRI?
- How broadly used by CII members?
- How organizations using PDRI?
- What is the value of using PDRI?
- How to use PDRI?
- Lessons learned since the tool's introduction?

What Is PDRI?

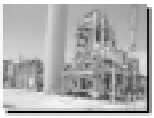
Notes

PDRI – The Definition

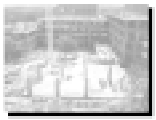
- An Acronym
  - Project Definition Rating Index
- An Index
  - Score along a continuum representing the level of scope definition
- A Risk Management Tool
  - Identifies and measures risks related to project scope definition

PDRI – History

Born on date



PDRI Industrial: 1996

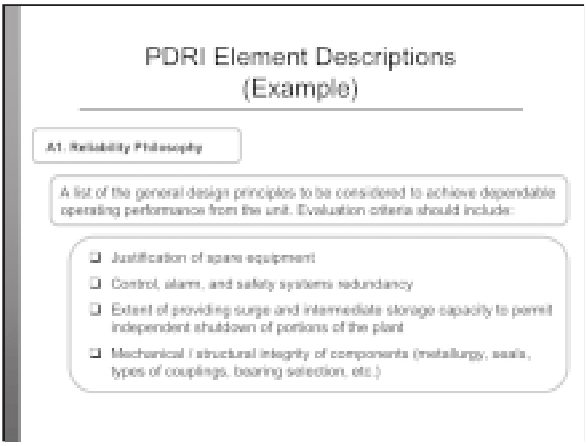


PDRI Buildings: 1999

PDRI – Composition

	Industrial	Buildings
Sections:	3	3
Categories:	15	11
Elements:	70	64
Score:	70-1000	70-1000

Notes

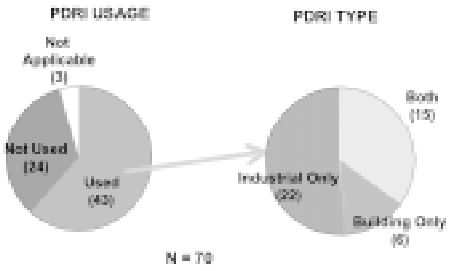

PDRI Element Descriptions
(Example)
A1. Reliability Philosophy
A list of the general design principles to be considered to achieve dependable operating performance from the unit. Evaluation criteria should include:
Justification of spare equipment
Control, alarm, and safety systems redundancy
Extent of providing surge and intermediate storage capacity to permit independent shutdown of portions of the plant
Mechanical / structural integrity of components (metallurgy, seals, types of couplings, bearing selection, etc.)

Notes

How Broadly Used?

PDRI

PDRI Usage Among CII Members



How Being Used?

PDRI

Usage

- As a checklist in early project development (81%)
- As a "gate" check before moving to the next project phase (72%)
- In conjunction with other front end planning measurement methods (72%)
- As a means of measuring or benchmarking front-end planning process performance (70%)
- More than once on most projects (42%)

Usage

(continued)

- Others:
  - As an audit tool (42%)
  - In a modified form for small or unusual projects (33%)
  - To help capture lessons-learned (28%)
  - With the help of an outside facilitator (19%)

The Value

PDRI

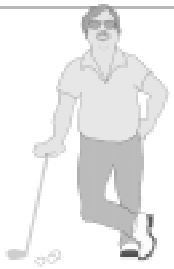
Notes

Notes

Understanding PDRI Scores

1000 Points

0 Points



Lower Is Better!

What does a score mean?

- A continuum
- Relative to timing
- Only as valid as effort/seriousness
- Accuracy (the real score) can be improved with facilitation
- Perhaps is not the most important output of the assessment

Comparison of Projects with PDRI Above and Below 200 — Industrial Projects

	PDRI Score	
Performance	**< 200**	**> 200**
Cost	3% below budget	4% over budget
Schedule	2% behind schedule	11% behind schedule
Change Orders	5% of budget	8% of budget
	(N=57)	(N=49)

PDRI – The Results

Example:

$55 Million Industrial Project, 24-Month Schedule

	< 200	> 200
Cost	$53 million	$57 million
Schedule	24 months	26 months

Comparison of Projects with PDRI Above and Below 200 — Building Projects

	PDRI Score	
Performance	**< 200**	**> 200**
Cost	1% over budget	10% over budget
Schedule	3% behind schedule	20% behind schedule
Change Orders	7% of budget	11% of budget
	(N=17)	(N=75)

How to Use

PDRI

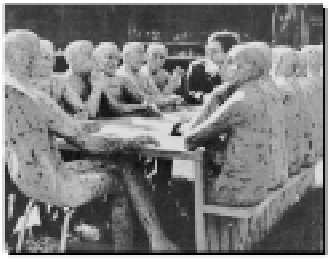
Notes

Notes

Assessing a Project

- What it SHOULDN'T be

Performed in a vacuum



Time Needed for Assessing a Project

- Two-and-a-half to four hours initially
- Less later

Observations

- Official sanctioning of activity
- Part of process
- Small cadre of facilitators
- Training
- Does not plan
- Risk mitigation process

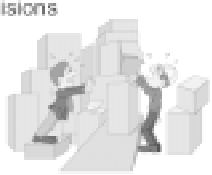
Notes

Summary

PDRI

Benefits of PDRI to Owners

- Well planned projects
- Better team alignment and communication
- Improved risk assessment
- Ability to make "tradeoff" decisions
- Can be used in developing a portfolio



Benefits of PDRI to Designers and Contractors

- Ability to measure scope
- Avenue to communicate
- Reconcile differences
- Standardized scope package
- Monitor progress
- Minimize design rework

Notes

In Summary

- PDRI works!
- PDRI is not as easy as it appears
- "Score" is good, process of getting there is better

PDRI Publications

PDRI Industrial Projects
CII Implementation Resource 113-2

PDRI Building Projects
CII Implementation Resource 155-2

http://construction-institute.org/pdri/

Implementation Session Participants

Steve Campbell	NASA
John Fish	Ford, Bacon, and Davis
Edd Gibson	UT Austin
Bob Herrington	Jacobs
Dave Kracht	3M
Javid Talib	Black & Veatch

Project Definition Rating Index (PDRI) Revisited

Implementation Slides

Notes

Project Definition Rating Index
(PDRI) Revisited

Implementation Session
July 28, 2004

Implementation Session
Participants

Edd Gibson, Moderator
Steve Campbell
John Fish
Bob Herrington
Dave Kracht
Javid Talib

JACOBS
3M
BLACK & VEATCH

PDRI Publications

PDRI Industrial Projects
CII Implementation Resource 113-2

PDRI Building Projects
CII Implementation Resource 155-2

PDRI http://construction-institute.org/pdri/

Notes

Steve Campbell

Chief, Project Management Office
Johnson Space Center

How is the PDRI used at NASA JSC?

- Best Practice on All Capital Projects > $0.5M
- Three (3) years of use
- ~ 45 Capital Projects
- Planning Office Tool -- Pre-Project Planning
- Project Mgmt Tool – Design Phase
- PDRI Score is Requested for Project Approval and Funding

Results at NASA JSC

- ~ 15 Projects in P3 Now
- ~ 15 Project in Design Now
- ~ 15 Project in Construction Now or Done
- Very Good Results – Problem Avoidance
- A Few Project Surprises
  - Unknown Field Conditions, Steel Costs, Limited Competition

Notes

Lessons Learned at NASA JSC:

- We Could Have Used This 10 Years Ago
- Feel High Success Rate
- It's Not a Guarantee
- Teams Can Work Well by Starting Well
- PDRI and P3 Need Updating for New Security and LEED Changes

John Fish

Director Procurement and Quality Assurance

Ford, Bacon & Davis, LLC

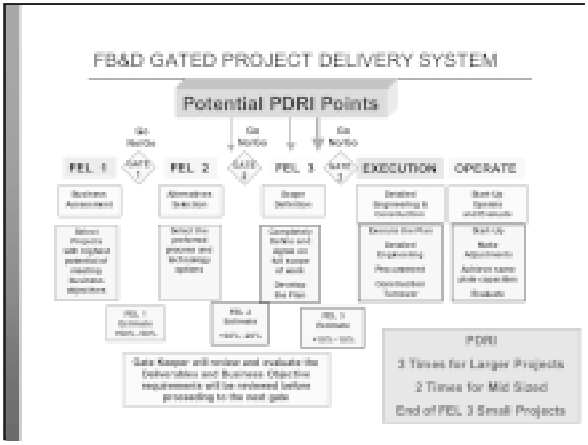
Also representing:

S&B Engineering & Construction, Ltd

Results at S&B/FB&D

- Pre-Project Planning Checklist - ***CONSISTENCY!!!***
- Communication Tool
  - Help Communicate Business Drivers to Team.
  - Ensure Operations has buy-in
- Screen the WRONG project early.
- Provide Owner and Contractor a feedback tool across ALL projects.
- Emphasize the need for Best Practices IN FEL
- Importance of Business Drivers, contracting Strategy, Turnover and Commissioning Planning in FEL.
- Leads Explain WHAT and HOW to satisfaction of Project Manager and Owner Team.

Notes



How is the PDRI used at S&B/FB&D

- Trained NON-Project Facilitators
- Large Projects - 2 or 3 times
  - Guide to Prepare Team for IPA
  - Alignment
  - Focus on Heavy Hitters/At Risk Items
- Multiple Small Projects 1 to 2 times
  - Team Alignment
  - Identify At Risk Items
  - 200 Score Required for Funding by owners
- Lump Sum EPC Bidding - Look for Risk/Weaknesses

Bob Herrington

Manager of Quality, Southern Region

JACOBS

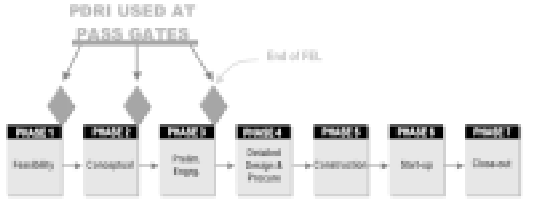
How is PDRI used at Jacobs?

- Implemented in 1995 with draft CII document
- Recognized formally in Jacobs EPC work process as 'Value Enhancing Practice'
- Required use on all CPI capital projects > $2.0MM
- Employed formally at end of Phase 2 and 3 (Within FEL) to measure quality/completeness
- Used for tracking progress during FEL

How is PDRI used at Jacobs?

- Scoring and 'Gap List' reviewed in Pass Gate session, prior to proceeding into next project phase
- Utilized in addition to IPA FEL Assessment
- Used to evaluate 3rd party document quality & completeness

Jacobs Work Process Summary Map



Notes

Notes

Results at Jacobs

- PDRI use has ….
  - attributed to more complete/consistent FEL packages
  - led to more successful project outcomes by driving completion of FEL
  - prevented proceeding to next project phase prematurely (reduced rework)
- PDRI 'Gap List' used by Teams to
  - complete FEL deliverables within schedule
  - assess risks and establish mitigation plans

Lessons Learned at Jacobs

- PDRI sessions should be facilitated by internal 3rd party to obtain objective results
- Owner and multi-discipline participation improves results
- 'Gap List' is more valuable than "raw" score
- Interim use of PDRI provides excellent "Health Check" on project progress
- 3rd party packages improved through use of PDRI

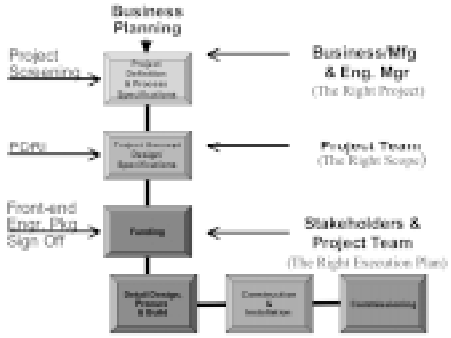
Dave Kracht

Engineering Manager
Medical Markets Division Engineering

3M

Notes

Capital Project Delivery Process at 3M



Evolution of PPP and PDRI at 3M

- 2000-2002: PPP, Alignment, and PDRI Training for Project Engineers (Edd Gibson)
- Requirement effective February 1, 2000, for Funding
- Integration of PDRI into our Project Management Process
  - Project Management Manual and Diagram (2000)
  - Front End Engineering Package (2003)
  - Alignment of Phases 1-3 to the PDRI Elements (2004)
- Project Management Sub-Team (Engineering Council) – 2004

PDRI Analyses

Over 137 PDRI Analyses Completed to Date as Requirement for Funding.

2000	(52) PDRI	(147) Average Score
2001	(27) PDRI	(156) Average Score
2002	(12) PDRI	(177) Average Score
2003	(29) PDRI	(171) Average Score
2004YTD	(16) PDRI	(189) Average Score

Notes

Lessons Learned- Process

- Use Early in Project
  - Review PDRI & Element Descriptions with Key Project Personnel
  - Checklist
- Front-end Engineering Requires Time & Resource Availability
- Process Flow Diagrams & P&ID's should be Prepared Prior to Funding
- Need Measurements to Demonstrate Value of PDRI

"The real benefit of the PDRI will not be realized until the engineering community and (business) management are fully supportive of front-end engineering……"

Lessons Learned- Team

- Core Team Participates in At Least One Evaluation Meeting
  - Alignment of Stakeholders
  - Balanced & Quantitative Assessment of Scope Definition.
  - Excellent Communication Tool
  - Teaching Tool for Non-Engineering Personnel.

Notes

"The PDRI is really comprehensive…. More so than any other single document we use and it is an eye opener for lab, process, even division manufacturing clients……"

Lessons Learned- Facilitation

- Use a Facilitator from Outside the Project Team
- Challenge Project Team to have Element/Deliverable in Writing to Score Each Element as Completely Defined.
- Assemble Action List/Person Responsible

Javid Talib, P.E.

Senior Project Manager
Gas, Oil and Chemicals Division
BLACK & VEATCH

Notes

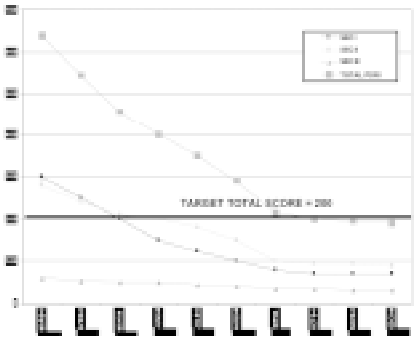
Using PDRI at Black & Veatch

- PDRI (Industrial) – Operations Directive
- Standard Execution Approach – Quality Gate
  - Front End Engineering Design (FEED)
  - EPC
- Benchmarking/Client Gates / IPA
- Lump Sum EPC Bidding

Results at Black & Veatch

- 20+ Projects
  - Achieved 220 or Less for All FEED
- Well Defined FEED
- Great Tool for Alignment
- Good Monitoring Tool
  - Chart to Target Scoring
- Good Correlation with Project Outcome

Charting Target PDRI Score Example



Notes

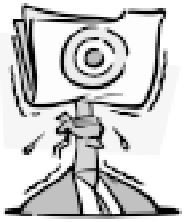
Implementation - How do we do it?

- Trained Facilitator
- Well Balanced Team/Participants
- Short Training Session for All Participants
- Automated Scoring Sheets
- Participant Come Prepared
- Encourage Open Discussions - Consensus
- Patience –Do Not Focus on Just Numbers
- Use Action List
- Maintain Same Participants
- Have Fun

Results at Black & Veatch

- Conformance to CII Expectation
- Checklist in Defining Project Scope
- Improved Execution Approaches,
  - Cost Control, Reduced Rework & Shorter Schedules
- Communication Tool to Avoid/Reconcile Differences – Buy-in
- Highlights Potentially "Poor" Projects Prior to Bidding/Authorization

Questions?



Recruit and Attact Future E&C Leaders

Attract, Recruit, and Retain Future Engineering & Construction Leaders Project Team

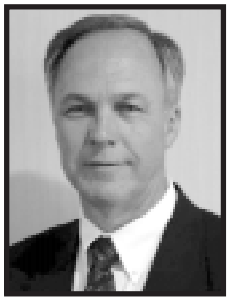
Abstract

Data clearly show that the number of professionals and technical leaders that will be available in the future is diminishing. In addition, younger professionals are motivated by different factors than their counterparts from previous generations. This CII team has developed a company self-assessment tool to help recruit, attract, and retain industry professionals and technical leaders of tomorrow.

The plenary session features "The Construction Zone," a short play on current aspects of attracting and retaining young leaders of tomorrow. The implementation session will include a panel of young professionals who participated in the interview process during the research. The audience will hear directly from the age group in question and will have an opportunity to talk with them.

Plenary Session Presenter

Harold L. Helland – Manager, Project Engineering, Abbott Laboratories



Harold Helland has over 17 years of experience in engineering and construction. In his current role, he is responsible for design, engineering, and construction of new facilities for all divisions of Abbott Laboratories. Prior to joining the firm, Helland was a project engineer for Davy McKee Corporation in the food and pharmaceutical division. He earned a bachelor's degree in civil engineering from the University of Illinois–Urbana and a master's in management from Northwestern University.

e-mail: harold.helland@abbott.com

Cast

Jodi	Xenia C. Guerrero, Abbott Laboratories
Joe-da	Thomas Roosa, Bechtel Group, Inc.
Joey	Vernell McDonald, Jr., Southern Company Generation and Energy Marketing
Rod Serling character	John R. Hewitt, Kværner Songer
Walkie-Talkie Charlie	Kenneth E. Olmstead, Smithsonian Institution

Implementation Session Moderator

Tonya Beesley – Recruiting Coordinator, Baker Concrete Construction Inc.

Since joining Baker in 2000, Tonya Beesley has been working closely with high school and college students to promote opportunities in the construction industry. Beesley serves as an advisory committee member for several area high school construction technology programs, and also serves on the Construction Management Advisory Board at Southern Illinois University. She previously spent 17 years with Dresser Roots, a division of Halliburton. Beesley earned a bachelor's degree in business administration from Indiana Wesleyan University.

e-mail: beesley@bakerconcrete.com

Implementation Session Participants

Xenia C. Guerrero – Pharma Equipment Engineer, Abbott Laboratories
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John R. Hewitt – President, Kværner Songer
e-mail: john.hewitt@akerkvaerner.com

Saundra Lauerman – Divisional Director, Human Resources, The Shaw Group
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Vernell McDonald, Jr. – Project Engineer, Construction Management, Southern Company Generation and Energy Marketing
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Kevin Sadowski – Graduate Research Assistant, Del E. Webb School of Construction, Arizona State University

Adnan A. Siddiqui — Construction Manager, The Dow Chemical Company
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John P. Trottier – Executive Vice President, AZCO Inc.
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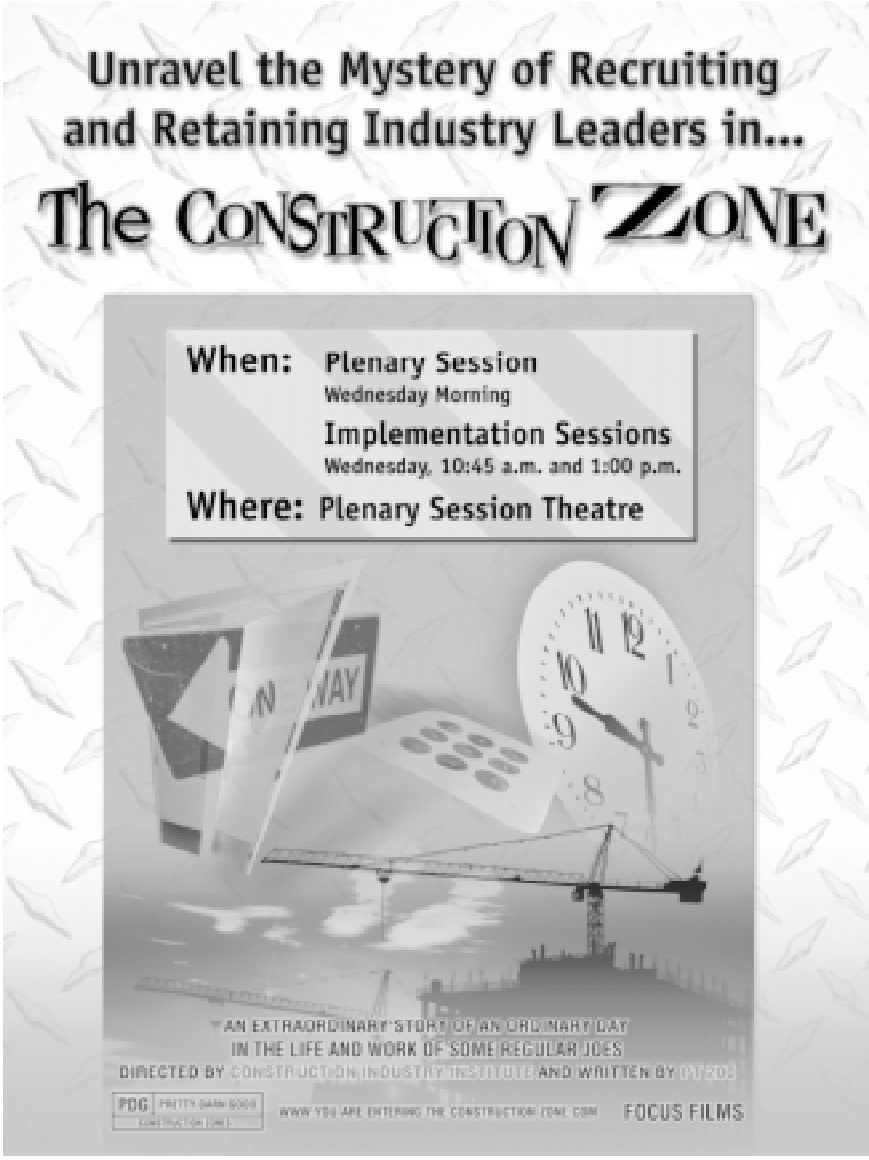
Recruit and Attact Future E&C Leaders

Attract, Recruit, and Retain Future Engineering & Construction Leaders Project Team

Executive Summary

As members of the "Baby Boomer" generation approach their retirement years, the engineering and construction industry faces a growing shortfall of new leaders to replace those that leave. Retaining talent in individual companies will likely prove to be more and more difficult, as well. CII chartered the Attract, Recruit, and Retain Engineering and Construction Leaders Project Team (PT 200) to explore this problem and provide solutions that can be implemented by companies throughout the industry. CII contends that such a program could result in significant gains for the industry by enhancing the real and perceived advantages of careers in engineering or construction management.

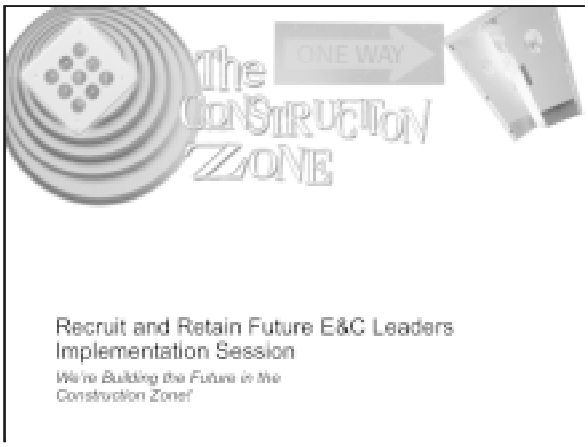
PT 200 concludes that solutions are indeed available. Through its literature search, questionnaires, and personal interviews with prospective, recent, and experienced industry professionals, the project team has identified specific benefits, programs, and other incentives that young people are looking for when choosing a career path and a prospective employer. To succeed in recruiting and retention, companies should consider improved compensation and benefits packages, career path and advancement opportunities, continued education and training, and a host of other ideas that the project team has identified through this in-depth CII study. PT 200 has prepared CII Implementation Resource 200-2 to serve as a checklist for organizations interested in a self-assessment of their recruiting and retaining efforts. This team's report and presentation sessions describe the findings of the research and offer best practice recommendations.

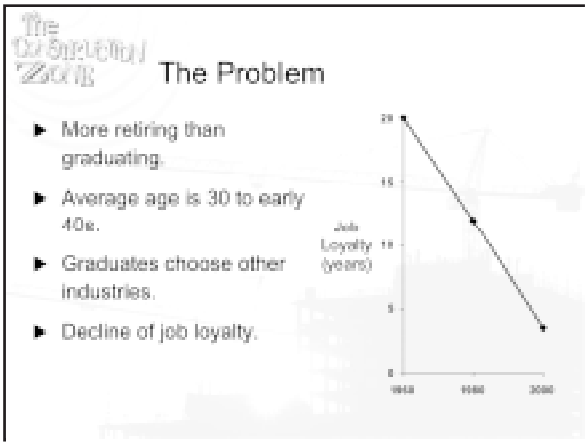

Unravel the Mystery of Recruiting
and Retaining Industry Leaders in...
The CONSTRUCTION ZONE
When: Plenary Session
Wednesday Morning
Implementation Sessions
Wednesday, 10:45 a.m. and 1:00 p.m.
Where: Plenary Session Theatre
"AN EXTRAORDINARY STORY OF AN ORDINARY DAY
IN THE LIFE AND WORK OF SOME REGULAR JOES
DIRECTED BY CONSTRUCTION INDUSTRY INSTITUTE AND WRITTEN BY
PG
WWW.YOU ARE ENTERING THE CONSTRUCTION ZONE.COM
FOCUS FILMS

Recruit and Attact Future E&C Leaders

Implementation Slides

Notes





Research Categories and Questions

Attract, Recruit, and Retain E&C Leaders Project Team (PT 200)

272 interviews—24 E&C firms

Name of Firm	# of People Interviewed	Name of Firm	# of People Interviewed
Turner	5	Gilbane	7
PCL	4	Bechtel	10
AECOM/Tishman	17	Abbott	15
PCL	4	Kiewit	8
Mortenson	14	Kiewit-Sorger	8
Dow Chemical	11	KBR	8
Baker Concrete (Ohio)	19	Parsons	14
Baker (Houston)	23	SAIC	8
BBRC (Alabama)	10	Shell	7
Southern Group	12	Foster Wheeler	8
CAA Group	5	BP/AK (Houston)	4
Smithsonian	13	The Shaw Group	29

Research Categories and Questions

Personal Information and Background

Research Categories and Questions

Current Career

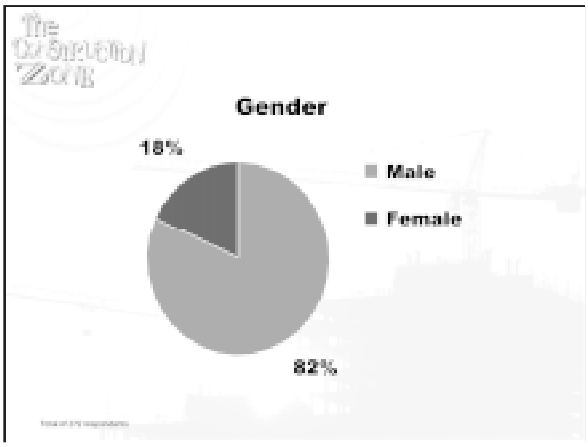
Notes

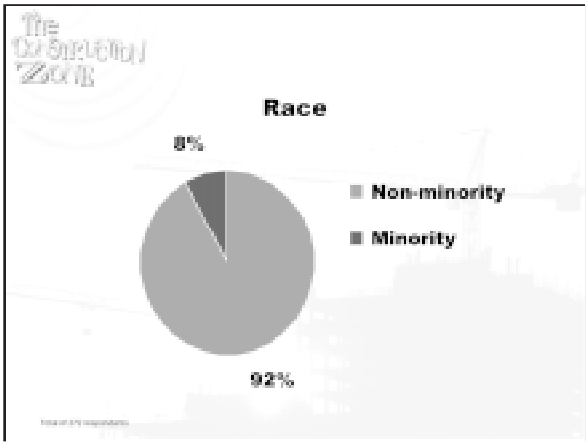
Notes

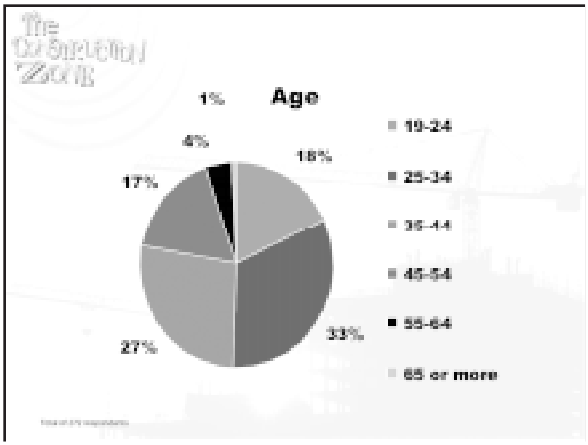

Research Categories
and Questions
Current Employer
and/or Company


Research Categories
and Questions
Benefits

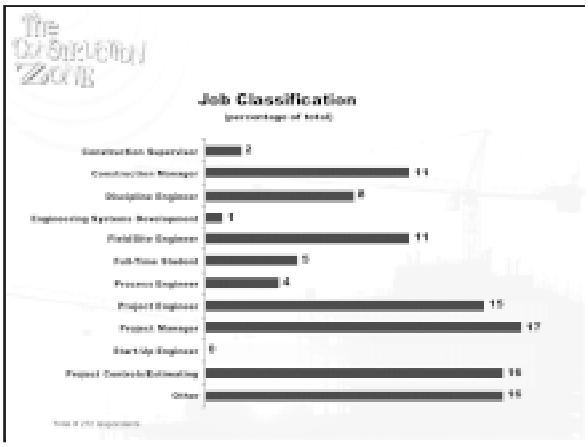

Research Categories
and Questions
Questions Regarding the Engineering
and Construction Industry

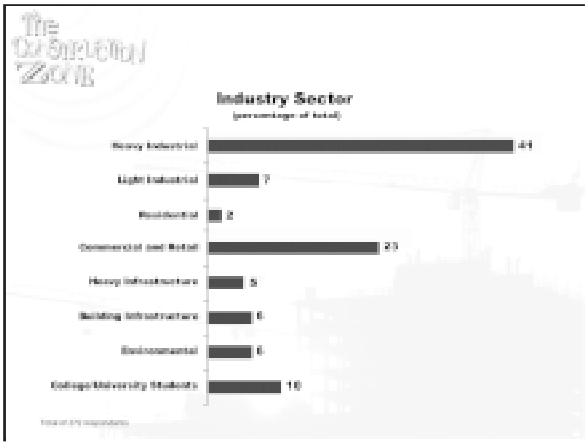

Gender
18%
82%
Male
Female

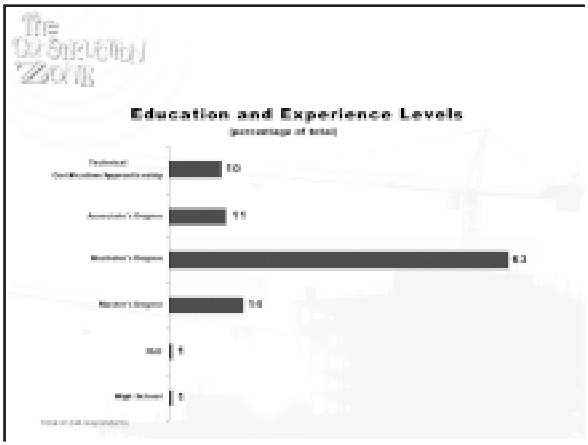

Race
8%
92%
Non-minority
Minority


Age
1%
4%
18%
17%
27%
33%
19-24
25-34
35-44
45-54
55-64
65 or more

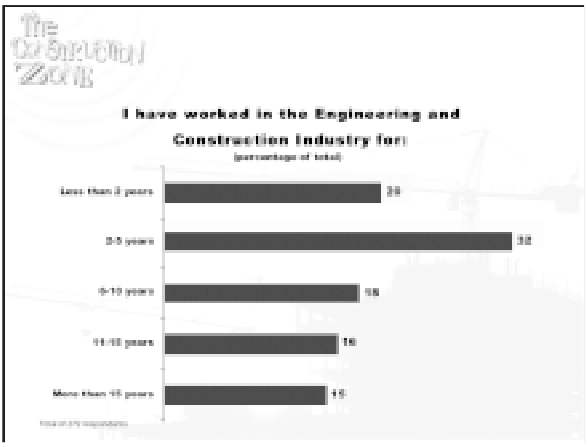
Notes

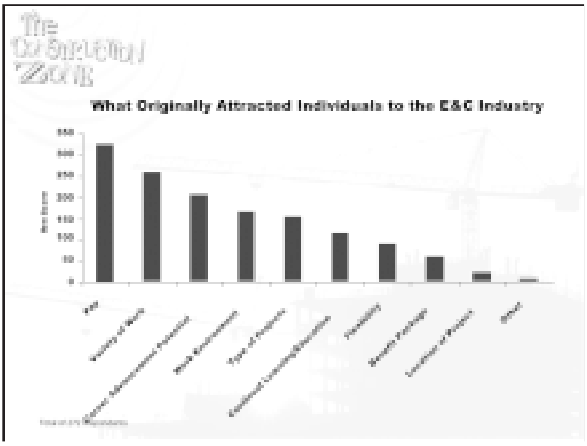

Job Classification
(percentage of total)
Construction Supervisor
2
Construction Manager
11
Discipline Engineer
8
Engineering Systems Development
1
Field Site Engineer
11
Full-Time Student
5
Process Engineer
4
Project Engineer
15
Project Manager
17
Start Up Engineer
5
Project Controls/Estimating
16
Other
15


Industry Sector
(percentage of total)
Heavy Industrial
44
Light Industrial
7
Residential
2
Commercial and Retail
23
Heavy Infrastructure
5
Building Infrastructure
6
Environmental
6
College/University Students
10


Education and Experience Levels
(percentage of total)
Technical
Certification/Apprenticeship
10
Associate's Degree
11
Bachelor's Degree
63
Master's Degree
14
PhD
1
High School
1

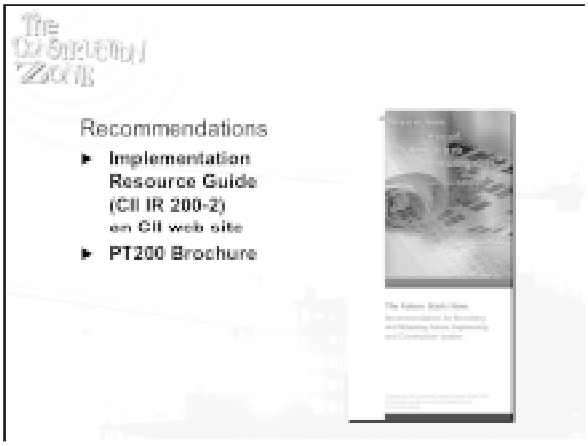
Notes

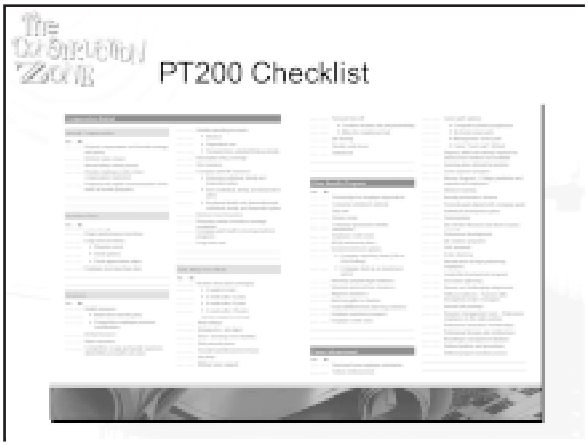

I have worked in the Engineering and Construction Industry for:
(percentage of total)
Less than 2 years
20
2-5 years
32
6-10 years
18
11-15 years
16
More than 15 years
15


What Originally Attracted Individuals to the E&C Industry


Paradigm Challenge

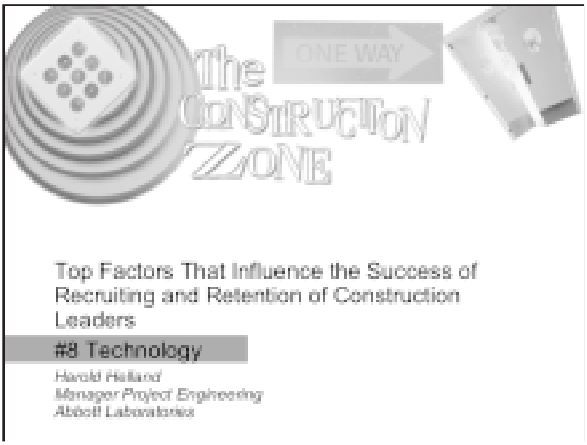
Notes


Recommendations
Implementation Resource Guide (CII IR 200-2) on CII web site
PT200 Brochure


PT200 Checklist

Notes

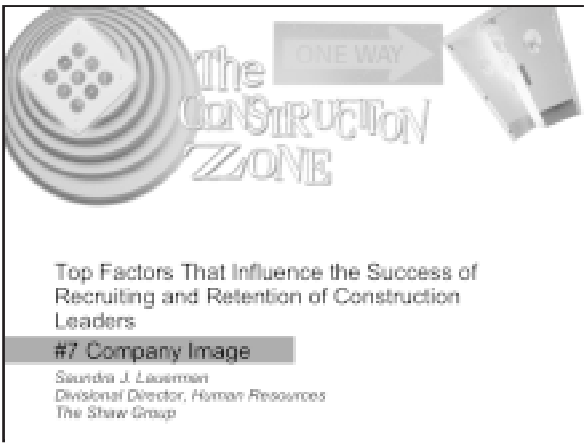

Panel
Harold Helland
Manager Project Engineering
Abbott Laboratories
Saundra Lauerman
Divisional Director, Human Resources
The Shaw Group
Viernell McDonald, Jr.
Project Engineer (Construction Management)
Southern Company Services
Xenia C. Guerrero
Pharma Equipment Engineer
Abbott Laboratories Global
Pharmaceutical Operations
Dr. Samuel Arunatnam
Associate Professor
Del E Webb School of Construction
Arizona State University
PT-200 Research Academic


ONE WAY
Top Factors That Influence the Success of Recruiting and Retention of Construction Leaders
#8 Technology
Harold Helland
Manager Project Engineering
Abbott Laboratories


Techno-Enablers
Cell phones
Palm pilots
Project management software
T1 lines
GPS
Bar coding
Productivity, manpower, and equipment tracking
Videogrammetry

Notes

Notes

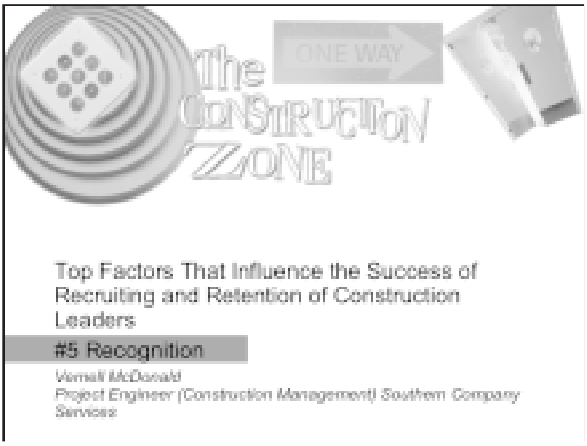

ONE WAY
The Construction Zone
Top Factors That Influence the Success of Recruiting and Retention of Construction Leaders
#7 Company Image
Saundra J. Lauerman
Divisional Director, Human Resources
The Shaw Group


The Construction Zone
#7 Company Image
Reasons to consider their employer a great place to work:
Compensation and company benefits
Career advancement opportunities
Great working environment
Co-workers
Flexible work options
Strong leadership
Job stability

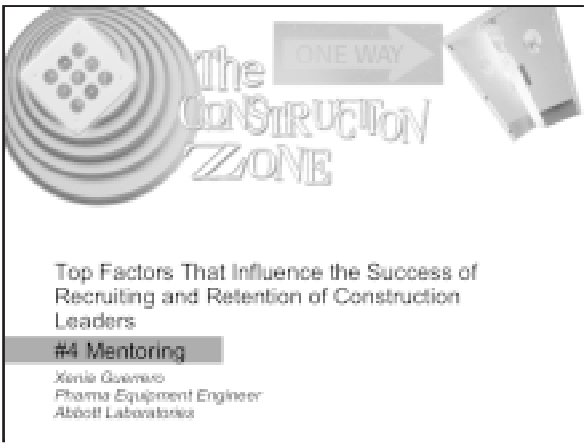

ONE WAY
The Construction Zone
Top Factors That Influence the Success of Recruiting and Retention of Construction Leaders
#6 Quality Leadership
Saundra J. Lauerman

Notes

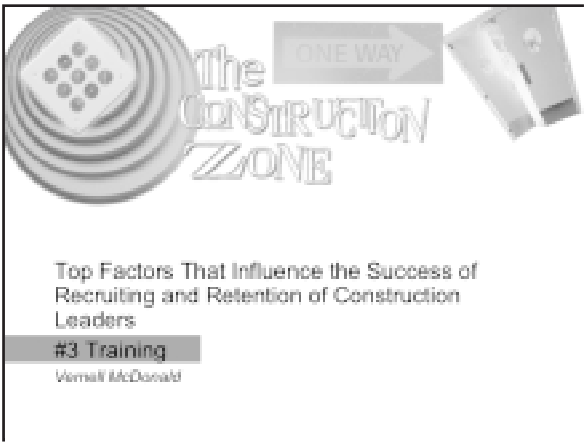

#6 Quality Leadership
Respect
Trust
Inspired to follow


ONE WAY
Top Factors That Influence the Success of Recruiting and Retention of Construction Leaders
#5 Recognition
Vernell McDonald
Project Engineer (Construction Management) Southern Company Services

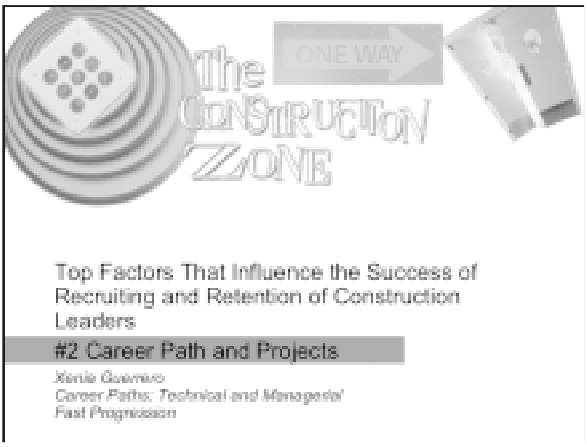

#5 Recognition
Cash
Gifts
Travel
Press
Personalized thank-you


ONE WAY
The Construction Zone
Top Factors That Influence the Success of Recruiting and Retention of Construction Leaders
#4 Mentoring
Xenia Guerrero
Pharma Equipment Engineer
Abbott Laboratories

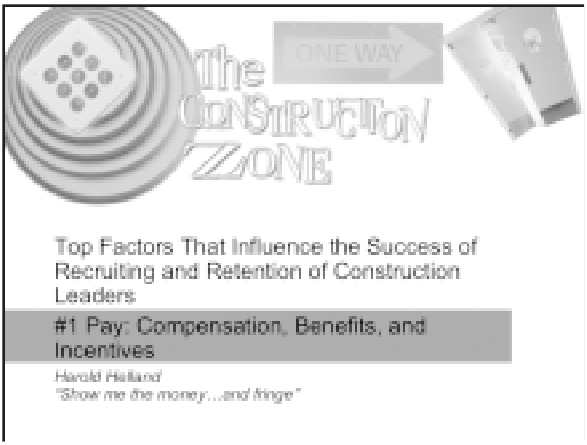

The Construction Zone
#4 Mentoring
30% of respondents are very satisfied with the overall leadership/supervision/career mentoring they receive.


ONE WAY
The Construction Zone
Top Factors That Influence the Success of Recruiting and Retention of Construction Leaders
#3 Training
Vernell McDonald

Notes

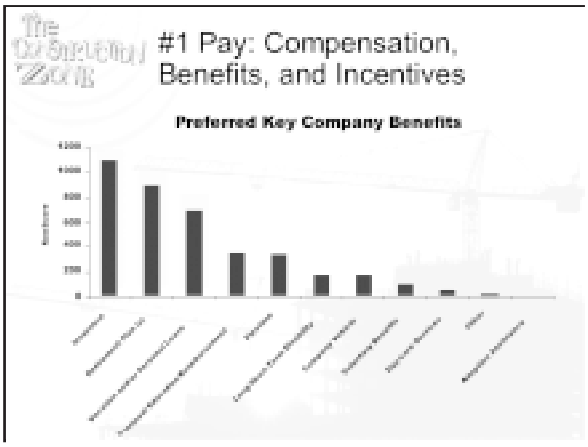

ONE WAY
Top Factors That Influence the Success of Recruiting and Retention of Construction Leaders
#2 Career Path and Projects
Xenia Guerrero
Career Paths: Technical and Managerial
Fast Progression

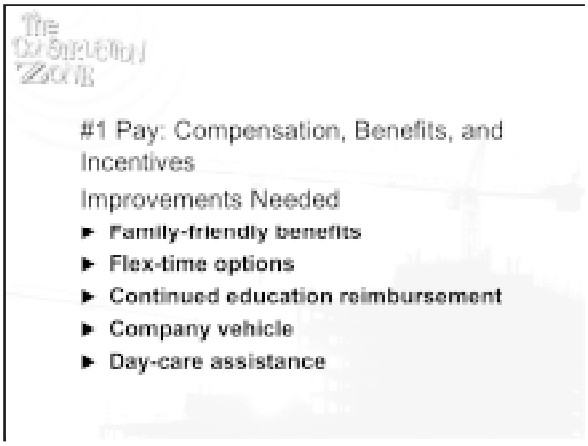

#2 Career Path and Projects
Do I see a future?

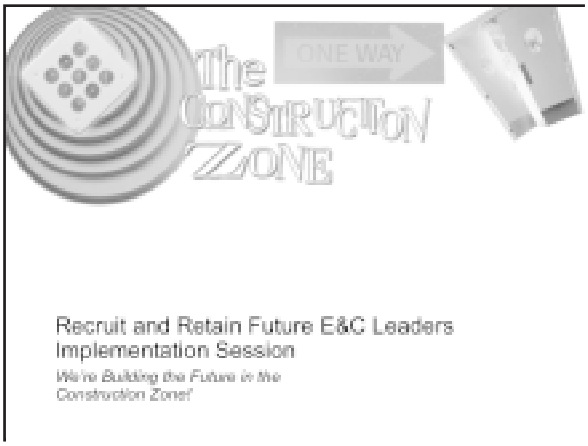

ONE WAY
Top Factors That Influence the Success of Recruiting and Retention of Construction Leaders
#1 Pay: Compensation, Benefits, and Incentives
Harold Helland
"Show me the money…and fringe"

Notes

Notes


#1 Pay: Compensation, Benefits, and Incentives
Preferred Key Company Benefits


#1 Pay: Compensation, Benefits, and Incentives
Improvements Needed
Family-friendly benefits
Flex-time options
Continued education reimbursement
Company vehicle
Day-care assistance


ONE WAY
Recruit and Retain Future E&C Leaders
Implementation Session
We're Building the Future in the Construction Zone!

CII Vision, Achievements, and Opportunities for You

Orientation — Implementation Session Only

Abstract

This session is designed for those who want to know more about CII and how its various efforts to improve the industry are generated and accomplished. A panel of members will provide insight on how CII provides unique research, networking, and professional development opportunities.

Implementation Session Moderator

Hans VanWinkle – Director, Construction Industry Institute

Prior to joining CII in 2003, VanWinkle was Deputy Commanding General of the U.S. Army Corps of Engineers. He oversaw the Corps' military construction and real estate services and water resources program, and the design, construction management, and real estate services for other Defense and Federal agencies. He participated in Operation Desert Shield/Desert Storm in Iraq and Operation Joint Endeavor in Bosnia. VanWinkle is a Registered Professional Engineer (Virginia), a graduate of the U.S. Military Academy at West Point, and holds a Master of Science degree in public policy from the University of California–Berkeley.

e-mail: h.vanwinkle@mail.utexas.edu

Implementation Session Participants

Emerson T. Johns – Chief Financial Officer and Operations Leader, Engineering, Facilities, and Safety, Health, and Environmental Services, DuPont Company
e-mail: *emerson.t.johns-1@usa.dupont.com*

Susan M. Steele – Vice President, Industrial Services, BE&K Construction Company
e-mail: steeles@bek.com

The U.S. Recovery: Gathering Speed

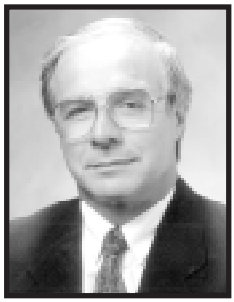
Featured Speaker: David Wyss

Abstract

The U.S. economy is speeding up two years into its recovery, and jobs are finally appearing. The Fed is confident enough in the expansion to begin raising interest rates. Growth is likely to slow, however, because the fiscal stimulus is all in the economy already, the consumer is spent out, and the higher interest rates will slow housing. Business investment is beginning to accelerate, which should carry the expansion, but at 3.5 percent, not the 5.5 percent of the last three quarters. Moreover, oil price spikes or weaker overseas growth threaten the recovery.

Speaker

David Wyss – Chief Economist, Standard & Poor's

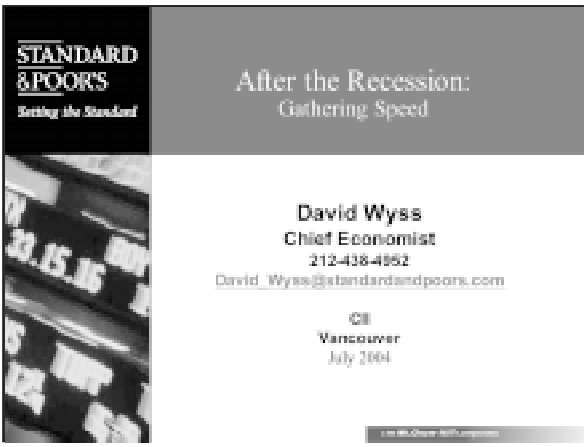


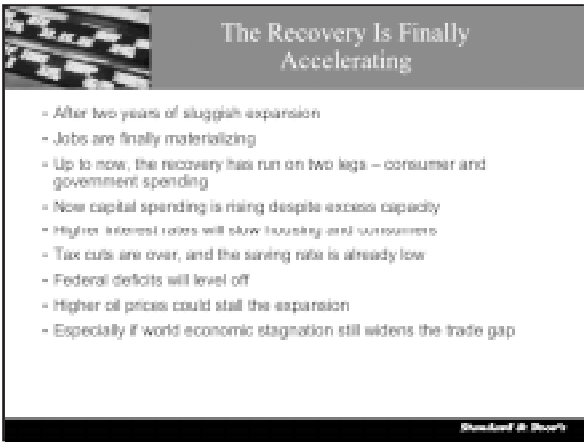
David Wyss is responsible for S&P's economic forecasts and publications, and co-authors the monthly Equity Insight and the weekly Financial Notes. Often quoted in the press, he also manages research projects, especially in financial risk. He formerly was a senior staff economist with the President's Council of Economic Advisers, senior economist at the Federal Reserve Board, and economic advisor to the Bank of England. Wyss holds a bachelor's degree from MIT and a Ph.D. in economics from Harvard University.

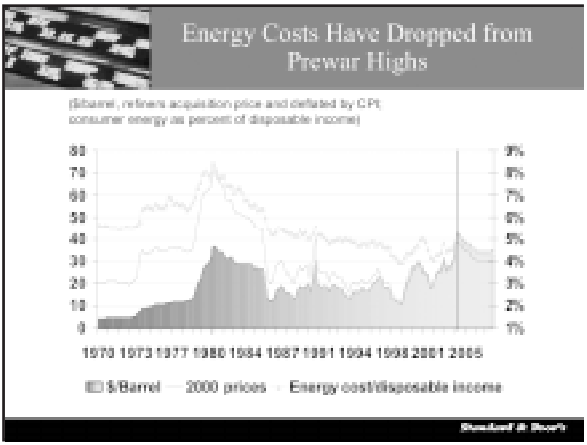
e-mail: david_wyss@standardandpoors.com

The U.S. Recovery: Gathering Speed

Plenary Slides







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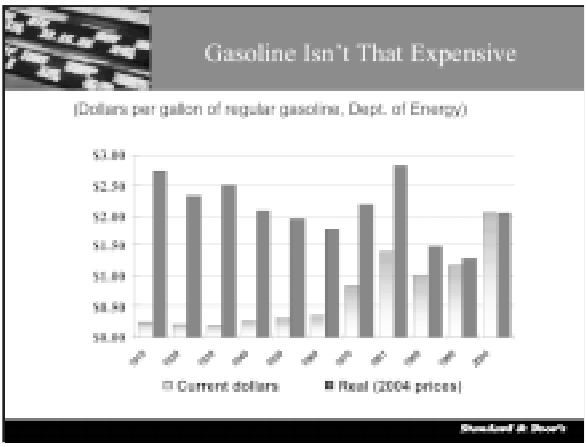
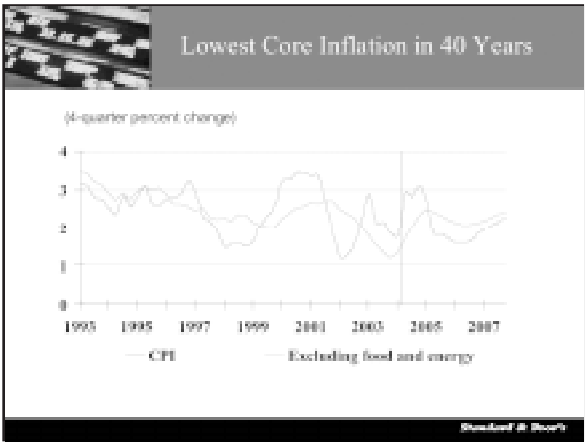
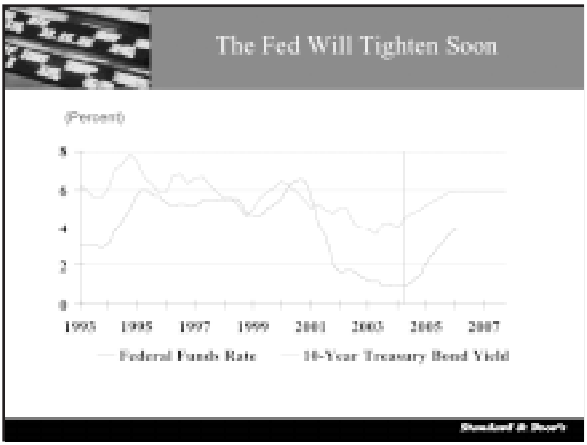
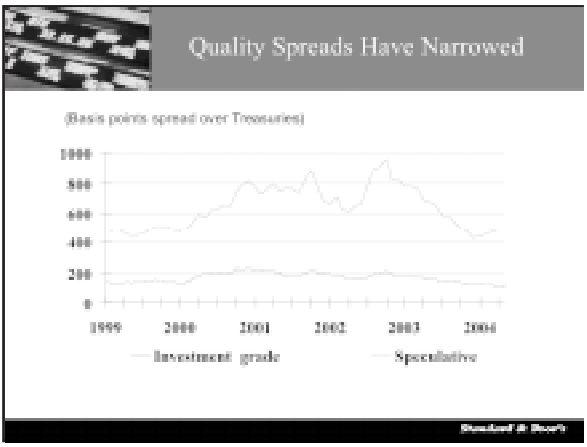
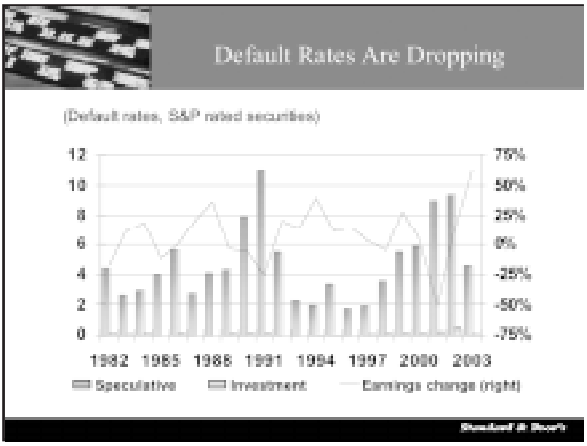

Gasoline Isn't That Expensive
(Dollars per gallon of regular gasoline, Dept. of Energy)
Current dollars
Real (2004 prices)

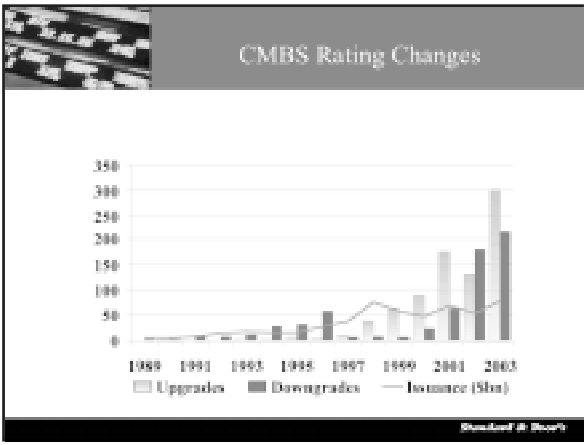

Lowest Core Inflation in 40 Years
(4-quarter percent change)
4
3
2
1
0
1995
1995
1997
1999
2001
2003
2005
2007
CPI
Excluding food and energy


The Fed Will Tighten Soon
(Percent)
8
6
4
2
0
1995
1995
1997
1999
2001
2003
2005
2007
Federal Funds Rate
10-Year Treasury Bond Yield

Notes


Quality Spreads Have Narrowed
(Basis points spread over Treasuries)
1000
800
600
400
200
0
1999
2000
2001
2002
2003
2004
Investment grade
Speculative


Default Rates Are Dropping
(Default rates, S&P rated securities)
12
10
8
6
4
2
0
75%
50%
25%
0%
-25%
-50%
-75%
1982
1985
1988
1991
1994
1997
2000
2003
Speculative
Investment
Earnings change (right)

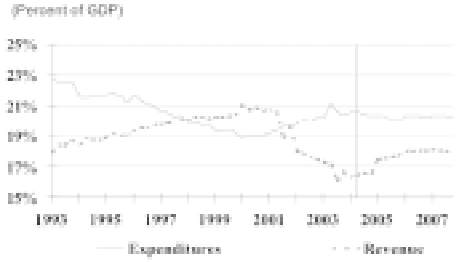

CMBS Rating Changes
350
300
250
200
150
100
50
0
1989
1991
1993
1995
1997
1999
2001
2003
Upgrades
Downgrades
Issuance ($bn)

Notes

The Pork Barrel Polka

- In April 2001 OMB projected a $334 billion surplus for fiscal 2003
- The deficit was $374 billion
- OMB projects $521 billion this year
- The estimate seems a low-ball; it will probably be near $460 billion
- The deficits helped in the short run
- But should be eliminated in the long run.
- Deficits should be kept in proportion
- US will probably have lower deficit as share of GDP than Germany this year
- But outlook worsens dramatically after baby boom retires

Deficits Forever?



State Deficits

- States expanded spending when times were good
- And cut tax rates.
- It's tougher to contract when times get bad.
- Rainy day funds were never very big
- Stock market was more important for revenue than states thought
- Deficits have been brought under control, but with more difficulty than in the past
- State bond yields are very high relative to Treasuries.
- As Treasury yields move up, so will state borrowing costs
- But worst seems over

Notes

State Budgets in Deficit

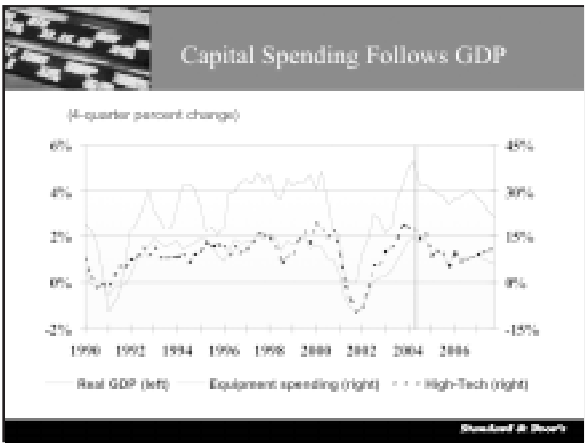
Outlook Has Improved

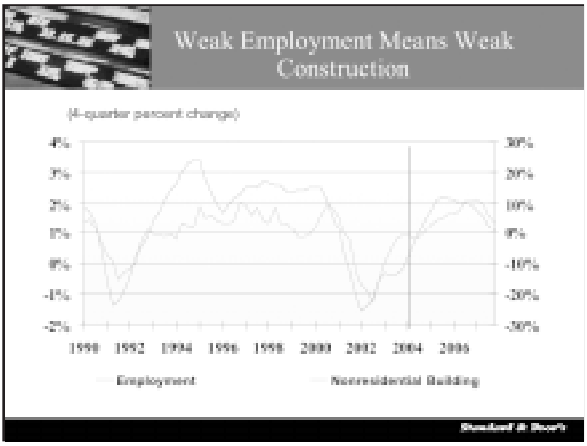
Number of states	Feb 2003	Feb 2004	Apr 2004
Budget gaps	36	18	20
Gap above 5%	15	5	0
Mid-year gap	$25.7 bn	$2.5 bn	$0.7
Budget overruns	37	23	28
Revenue above forecast	6	23	18
Revenue below forecast	30	14	11
Concerned or pessimistic outlook	38	13	

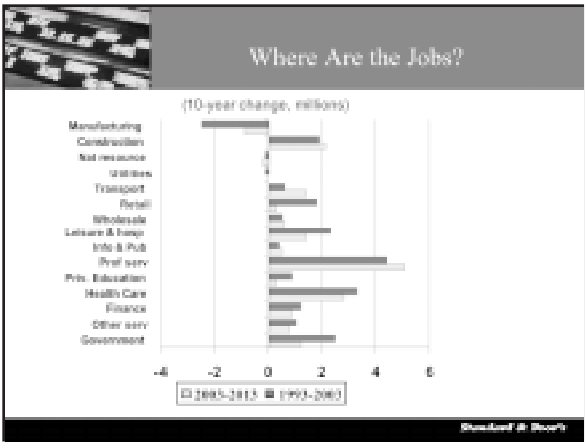
Source: NCSL Survey Apr 2004

State Bond Yields Remain High Relative to Treasuries

Notes


Capital Spending Follows GDP
(4-quarter percent change)
6%
4%
2%
0%
-2%
40%
30%
15%
0%
-15%
1990 1992 1994 1996 1998 2000 2002 2004 2006
Real GDP (left)
Equipment spending (right)
High-Tech (right)


Weak Employment Means Weak Construction
(4-quarter percent change)
4%
3%
2%
1%
0%
-1%
-2%
30%
20%
10%
0%
-10%
-20%
-30%
1990 1992 1994 1996 1998 2000 2002 2004 2006
Employment
Nonresidential Building


Where Are the Jobs?
(10-year change, millions)
Manufacturing
Construction
Natural resource
Utilities
Transport
Retail
Wholesale
Leisure & hosp
Info & Pub
Prof serv
Priv. Education
Health Care
Finance
Other serv
Government
-4
-2
0
2
4
6
2005-2015
1993-2003

Notes

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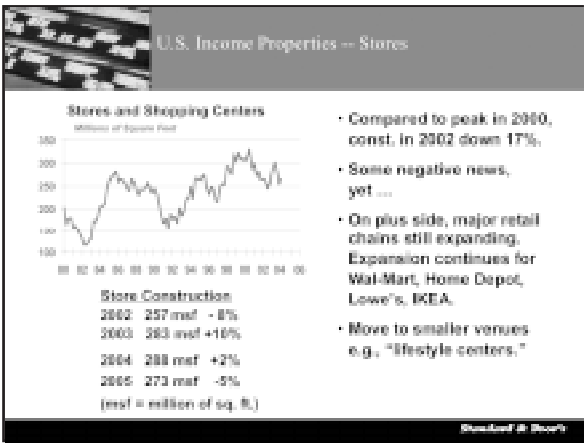
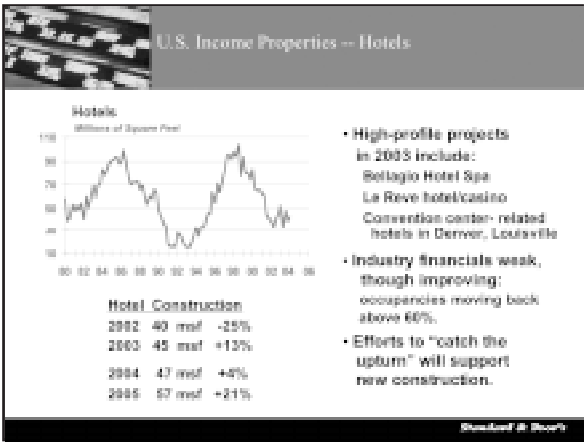
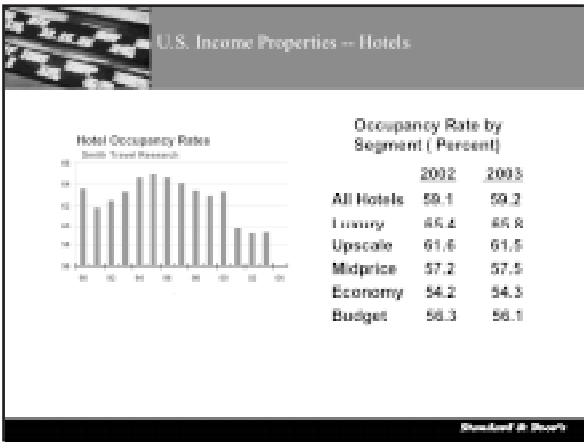
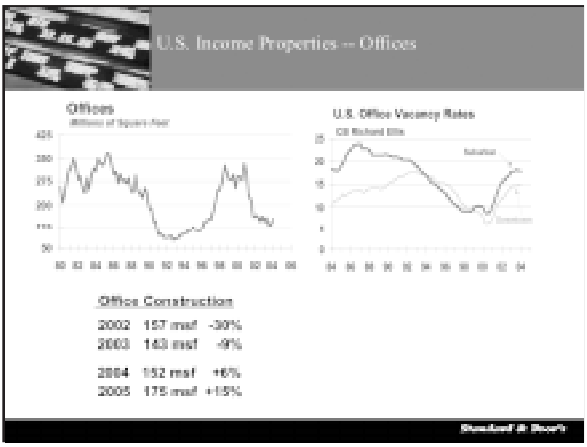
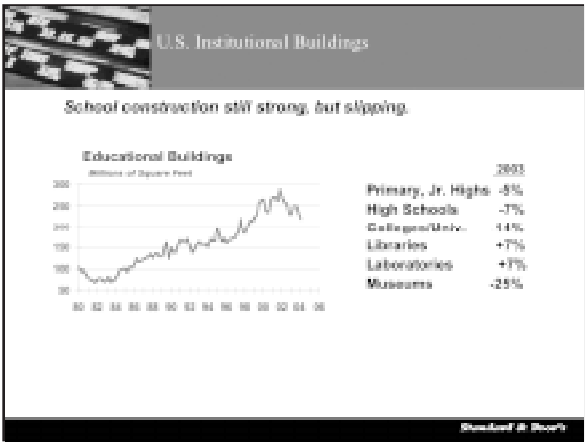
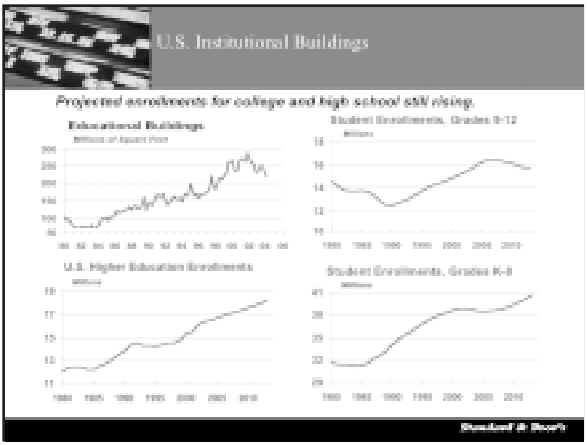

U.S. Income Properties -- Stores
Stores and Shopping Centers
Store Construction
2002: 257 msf - 8%
2003: 283 msf +10%
2004: 288 msf +2%
2005: 273 msf -5%
(msf = million of sq. ft.)
• Compared to peak in 2000, const. in 2002 down 17%.
• Some negative news, yet ...
• On plus side, major retail chains still expanding. Expansion continues for Wal-Mart, Home Depot, Lowe's, IKEA.
• Move to smaller venues e.g., "lifestyle centers."


U.S. Income Properties -- Hotels
Hotels
Hotel Construction
2002: 40 msf -25%
2003: 45 msf +13%
2004: 47 msf +4%
2005: 57 msf +21%
• High-profile projects in 2003 include:
Bellagio Hotel Spa
Le Reve hotel/casino
Convention center- related hotels in Denver, Louisville
• Industry financials weak, though improving:
occupancies moving back above 60%.
• Efforts to "catch the upturn" will support new construction.


U.S. Income Properties -- Hotels
Hotel Occupancy Rates
Occupancy Rate by Segment (Percent)
2002 2003
All Hotels 59.1 59.2
Luxury 65.4 65.8
Upscale 61.6 61.5
Midprice 57.2 57.5
Economy 54.2 54.3
Budget 56.3 56.1


U.S. Income Properties -- Offices
Offices
U.S. Office Vacancy Rates
Office Construction
2002 157 msf -30%
2003 143 msf -9%
2004 152 msf +6%
2005 175 msf +15%


U.S. Institutional Buildings
School construction still strong, but slipping.
Educational Buildings
2003
Primary, Jr. High -5%
High Schools -7%
Libraries +7%
Laboratories +7%
Museums -25%


U.S. Institutional Buildings
Projected enrollments for college and high school still rising.
Educational Buildings
U.S. Higher Education Enrollments

Notes

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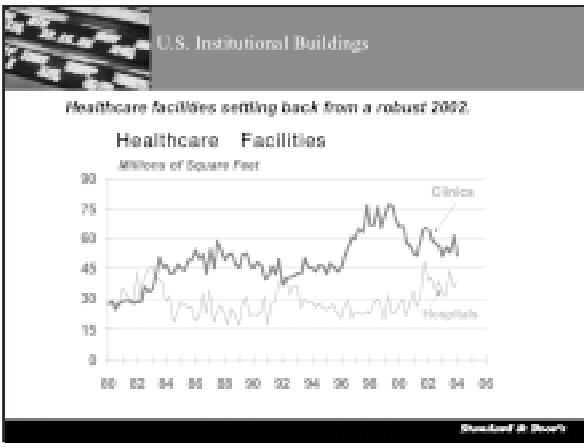
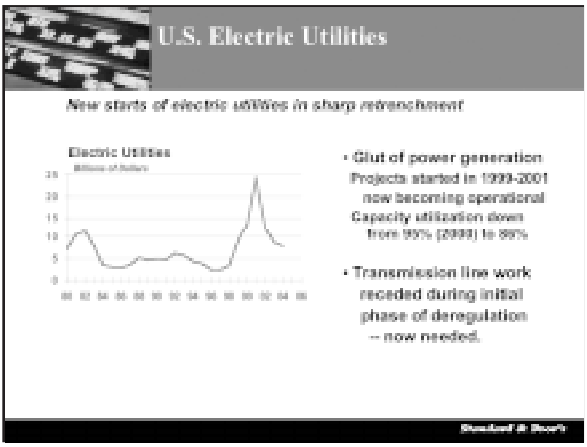
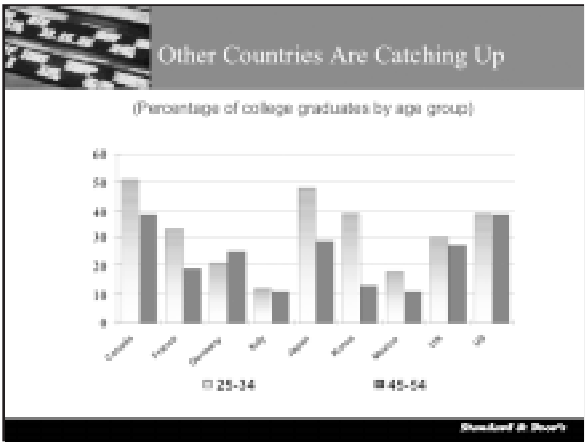
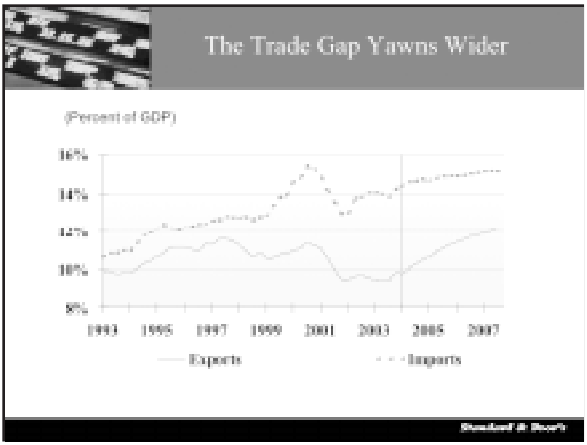


U.S. Public Works

- Fiscal 2004 appropriations, passed in January 2004, were more supportive than expected.
  - Federal-aid highway program up 4% to $33.6 billion.
  - Mass transit up 1% to $7.3 billion. Airport grants flat.
  - EPA water infrastructure up 3%, Corps of Eng. down 3%.
  - Constraints – uncertainty over new transportation bill, steel price hikes, state fiscal stress
- Bush Administration proposals for fiscal 2005.
  - Federal-aid highway program, mass transit unchanged.
  - Airport grants up 4% to $3.5 billion, plus $250 million for airport upgrades under Aviation Security Capital Fund.
  - EPA water infrastructure cut 18%, Corps of Eng. cut 17%.

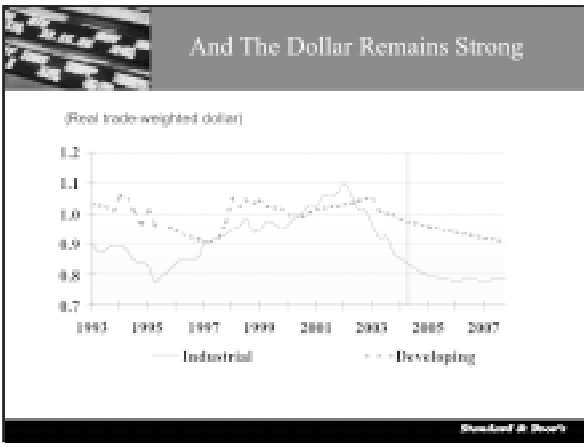

U.S. Electric Utilities
New starts of electric utilities in sharp retrenchment
Electric Utilities
• Glut of power generation
Projects started in 1999-2001
now becoming operational
Capacity utilization down
from 95% (2000) to 88%
• Transmission line work
receded during initial
phase of deregulation
-- now needed.

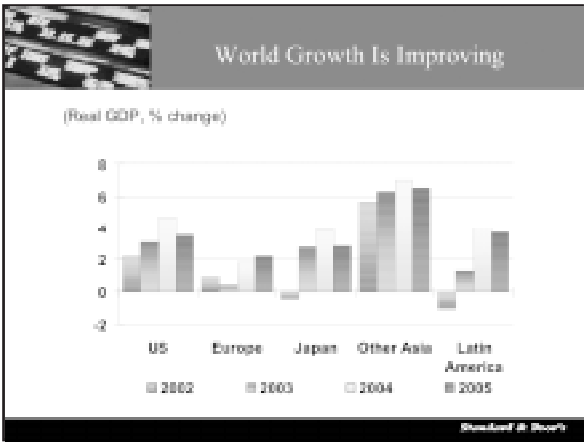

Other Countries Are Catching Up
(Percentage of college graduates by age group)
25-34
45-54

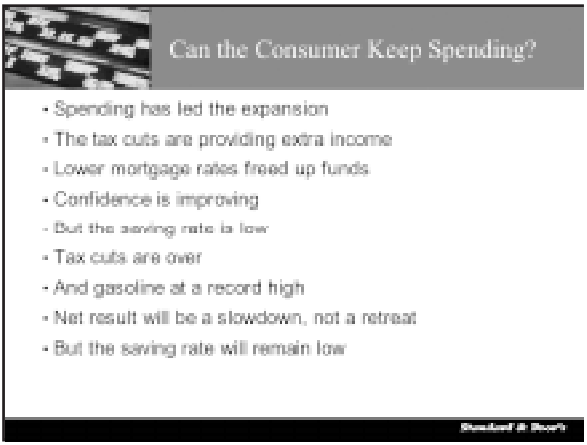

The Trade Gap Yawns Wider
(Percent of GDP)
1993
1995
1997
1999
2001
2003
2005
2007
Exports
Imports

Notes

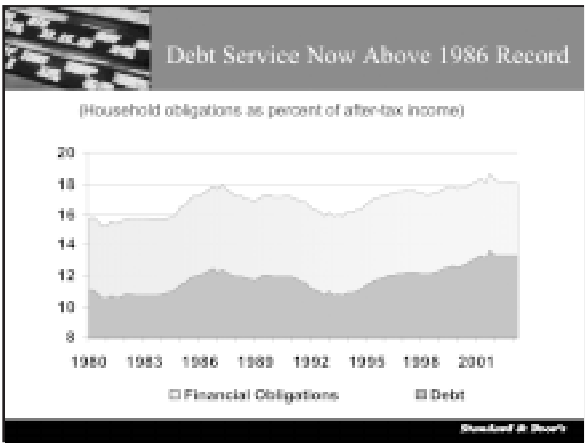
Notes

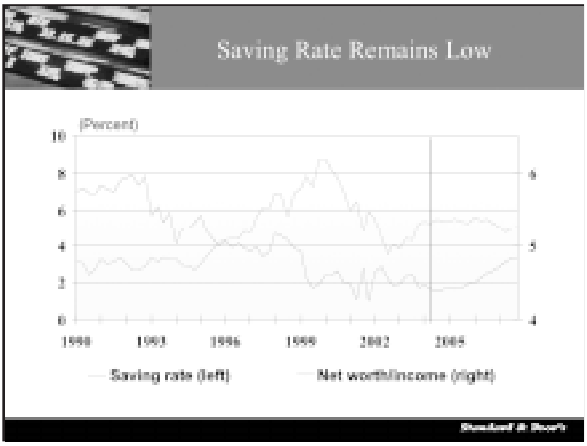

And The Dollar Remains Strong
(Real trade-weighted dollar)
1.2
1.1
1.0
0.9
0.8
0.7
1993
1995
1997
1999
2001
2003
2005
2007
Industrial
Developing

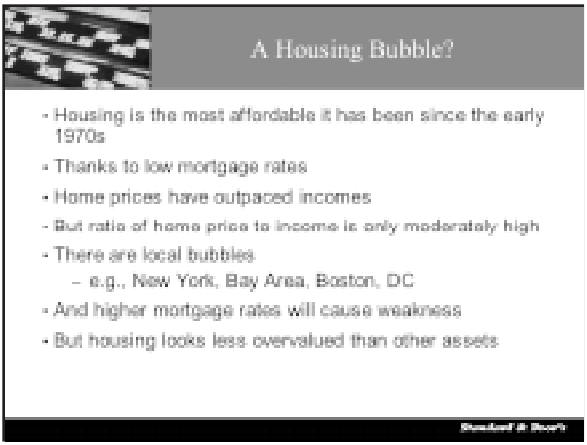

World Growth Is Improving
(Real GDP, % change)
8
6
4
2
0
-2
US
Europe
Japan
Other Asia
Latin America
2002
2003
2004
2005


Can the Consumer Keep Spending?
• Spending has led the expansion
• The tax cuts are providing extra income
• Lower mortgage rates freed up funds
• Confidence is improving
• But the saving rate is low
• Tax cuts are over
• And gasoline at a record high
• Net result will be a slowdown, not a retreat
• But the saving rate will remain low

Notes

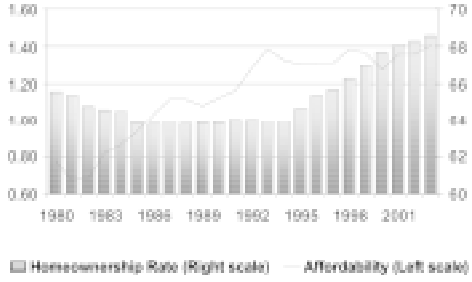

Debt Service Now Above 1986 Record
(Household obligations as percent of after-tax income)
20
18
16
14
12
10
8
1980
1983
1986
1989
1992
1995
1998
2001
Financial Obligations
Debt


Saving Rate Remains Low
(Percent)
10
8
6
4
2
0
6
5
4
1990
1993
1996
1999
2002
2005
Saving rate (left)
Net worth/income (right)

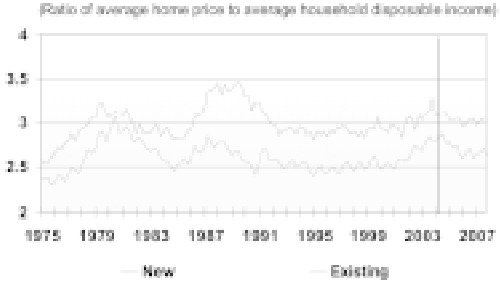

A Housing Bubble?
• Housing is the most affordable it has been since the early 1970s
• Thanks to low mortgage rates
• Home prices have outpaced incomes
• But ratio of home price to income is only moderately high
• There are local bubbles
– e.g., New York, Bay Area, Boston, DC
• And higher mortgage rates will cause weakness
• But housing looks less overvalued than other assets

Notes

More Affordable Housing Allows More Households To Own Their Home

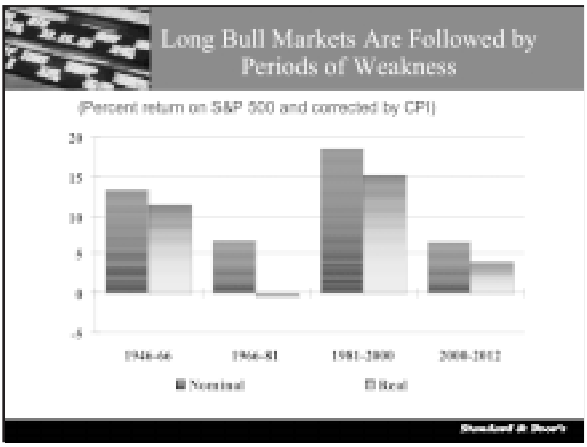


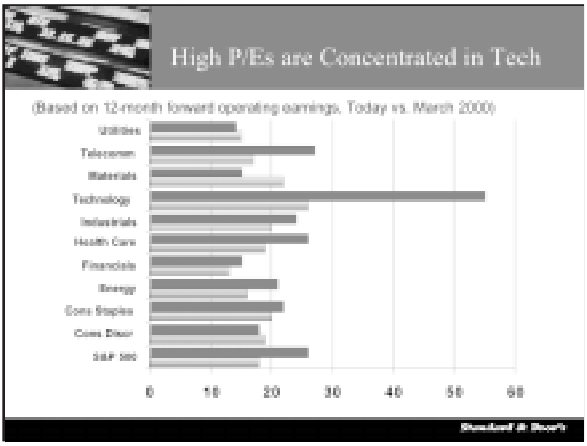
Home Prices Are High Relative to Household Income



The Stock Market Will Recover, But Slowly

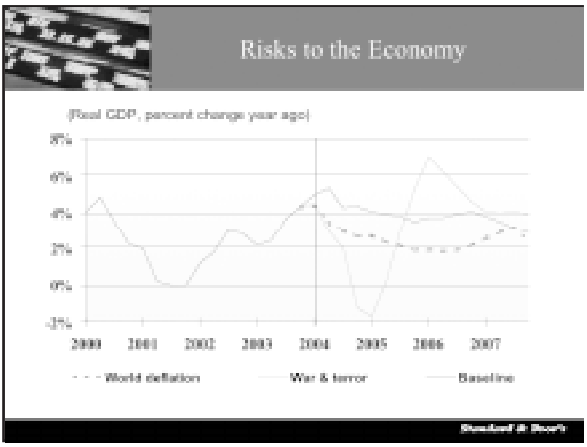
- Market rose over 20%/year from 1995 -99
- But dropped from March 2000 through June 2003
- First three consecutive down years since 1939-41
- Biggest drop since 1929-32
- Profits cannot continue to outpace GDP
- Share prices cannot continue to outpace earnings
- As interest rates rise
- Stocks will thus yield less in the future than in the recent past.
- But a near-term rally is being spurred by earnings recovery and dividend tax change


Long Bull Markets Are Followed by Periods of Weakness
(Percent return on S&P 500 and corrected by CPI)
20
15
10
5
0
-5
1946-66
1966-81
1981-2000
2000-2012
Nominal
Real

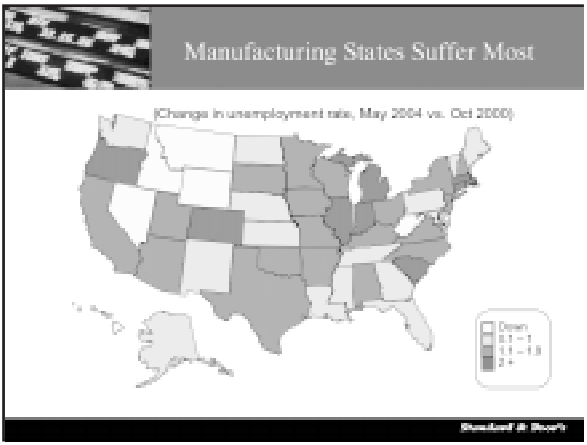

High P/Es are Concentrated in Tech
(Based on 12-month forward operating earnings, Today vs. March 2000)
Utilities
Telecomm
Materials
Technology
Industrials
Health Care
Financials
Energy
Cons Staples
Cons Discr
S&P 500
0
10
20
30
40
50
60


Bottom Line: The Economy Recovers, But Slowly
• Consumers are spending near max
• Businesses will not take over the lead yet
• But strong stimulus from fiscal policy
• Interest rates rise gradually next year
• Housing prices and starts slow
• Weak recovery for stock market
• Risk of recession remains if:
– Further terror attacks damage confidence
– War disrupts oil supplies
– World deflation sucks the US into slower growth

Notes


Risks to the Economy
(Real GDP, percent change year ago)
8%
6%
4%
2%
0%
-2%
2000
2001
2002
2003
2004
2005
2006
2007
World deflation
War & terror
Baseline


Unemployment Rates Are Moderate
(Unemployment rate, May 2004)
Under 4.5
4.0-6.4
5.5-6.9
6.0+


Manufacturing States Suffer Most
(Change in unemployment rate, May 2004 vs. Oct 2000)
Down
0.1 – 1
1 – 1.9
2+

Notes

A Case Study for Knowledge Management

Case Study: DuPont

Abstract

During the stages of developing and implementing a knowledge management (KM) process and culture, it will be clear that the business value in converting data to information and then transforming it into knowledge can increase the personal productivity of technical and project professionals by more than 25 percent. At the same time, a successful KM process enables renewal, innovation, and sustainable business growth. The development framework and implementation approaches will be outlined.

Plenary Session Presenter

Jim Porter – Vice President of Engineering and Operations, DuPont Engineering

Jim Porter served as CII Chairman in 2000 and has a lengthy association with CII in various executive capacities. Porter's career with DuPont began in 1966 as a chemical engineer in Newark, Delaware. After a two-year tour of duty with the U.S. Army, he returned and took an assignment as a field engineer. He was promoted to field manager in 1979, followed by an assignment as Manager of Investment Engineering in 1981. With the restructuring of DuPont Engineering in 1990, Porter became Director of Engineering Operations. In 1992, he was named Director of Operations for the Fluoroproducts business. He has been in his current post since 1999. Porter holds a degree in chemical engineering from the University of Tennessee.

e-mail: james.b.porter-jr-1@usa.dupont.com

Implementation Session Moderator

Emerson T. Johns – Chief Financial Officer and Operations Leader, Engineering, Facilities, and Safety, Health, and Environmental Services, DuPont Company

Emerson Johns has been with DuPont since 1969, when he started his career as an internal auditor. Many of his assignments have involved interfacing with the Federal government, in particular DuPont's activities at its Savannah River Plant. He also has been involved in DuPont operations in Puerto Rico, Germany, and the United Kingdom. Since 1986, Johns has been at the corporate headquarters in Wilmington, Delaware. Actively involved in CII for the past several years, Johns is former chairman of the Research Committee and chaired the CII Annual Conference in 2003.

e-mail: emerson.t.johns-1@usa.dupont.com

Implementation Session Participants

Carol P. Arnold – Knowledge Management Leader, DuPont Engineering
e-mail: carol.p.arnold@usa.dupont.com

Judith W. Passwaters – Engineering Director, E. I. duPont de Nemours & Co., Inc.
e-mail: judith.w.passwaters@usa.dupont.com

James B. Porter, DuPont Engineering
e-mail: james.b.porter-jr-1@usa.dupont.com

A Case Study for Knowledge Management

Plenary Slides

Notes

A Case Study for Knowledge Management

"Creating Sustainable Business Value"

Jim Porter
DuPont

"Knowledge Management"

The Right Information
at the Right Place
at the Right Time
at the Right Price
enables rapid, effective Decision Making
and Problem Solving delivering
Sustainable Business Results

The Goal is Zero

ZERO on-job injuries

ZERO off-job injuries

ZERO environmental incidents

ZERO ethics incidents

ZERO people-treatment incidents

100% Right Behaviors

Notes

Knowledge As Value

Product	Price Per Pound ($)
Pentium processor	42,893.00
Viagra	11,766.00
Gold	4,827.20
Hermes scarf	1,984.29
Palm Pilot	1,726.92
"Saving Private Ryan" DVD	874.75
Bicycle	100.00
Mercedes Benz E-Class sedan	18.98
Chevrolet Cavalier sedan	6.76
Hot-rolled steel	0.19

Source: Fortune, March 20, 2000, p. 68

Compelling Drivers Improved Information Utilization

- Improve productivity.
- Increase customer value.
- Renew and leverage needed competencies.
- "Smart" leverage of expertise:
  - "Safe" self-service
  - "Experts" in optimum role
  - New/unproven resources development
- Drive innovative solutions.

Business Existing Examples: Effective Knowledge Management

- Construction Industry Institute
- Process Industry Practices
- Center for Chemical Process Safety
- Independent Project Analysis

Knowledge Management Vision

Create a strategy and managing process for accelerating knowledge management that will introduce a culture change as well as effective tools and processes to further enable employees as "knowledge workers," improve productivity, and use knowledge intensity to achieve sustainable growth.

Major Opportunity Areas

1. Capability to capture information

   88% of DuPont's top salespeople have over 30 years of experience.

   40% of DuPont engineers will be pension-eligible in the next two to four years.

   38% of a person's time is wasted trying to manage information.

   No central repository of intellectual capital.

Major Opportunity Areas

2. Capability to find right information and people

   20% of a scientist's time is spent searching and accessing information.

   75% of the info people need to effectively work is not in "transaction backbone" data.

   No capability to locate experts/expertise across company.

Notes

Notes

Major Opportunity Areas

3. Ability to collaborate and share info and expertise

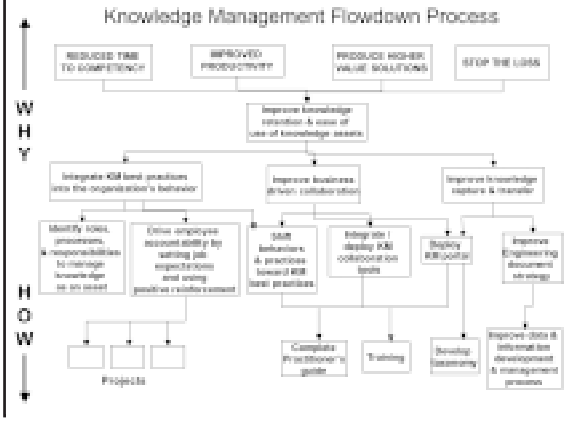
20% of a person's time is spent repeating answers.

25% of info that a company owns is used.

65% of a company's design work is duplicated.

Success and business intelligence depend on readily available knowledge.

Knowledge Management Flowdown Process



Engineering Competency
Knowledge Management — Business Case Summary

- Benefit benchmarks engineering ($MM)

	Leveraged competency	Engineering ($MM)
Increased productivity	8.6	12.9
Reduced problem-solving time	30.0	45.0
Best Practice sharing	34.2	51.3
Packaged solutions/offerings leverage	17.0	25.5
Decreased time to renewal	3.0	4.5

- Cost estimate
  - 5 to 6 million dollars over three years

Key Learnings

- Ease-of-access to knowledge assets is critical.
- Minimize time required to find/reuse knowledge.
- Management support is critical.
- Tacit knowledge capture is much more difficult than explicit.
- Knowledge management is a culture change — not just a toolbox.

At Our Implementation Session

Purpose

- Understand how knowledge management creates sustainable business value.
- Learn how to implement a knowledge management process and culture.

Notes

A Case Study for Knowledge Management

Implementation Slides

Notes

Knowledge Management (KM)

Implementation Session

Emerson Johns
Jim Porter
Carol Arnold
Judy Passwaters

Knowledge Management (KM)

Implementation Session

Purpose

- Understand how KM creates sustainable business value
- Learn how to implement a KM process and culture

Agenda

Introduction	Emerson Johns
Overview	Jim Porter
KM Project	Carol Arnold
Interoperability	Judy Passwaters
Discussion	All

Notes

"The only thing that gives an organization a competitive edge … is what it knows, how it uses what it knows, and how fast it can know something new."

Laurence Prusak
IBM Knowledge Institute

Key Benchmark Companies

1. Johnson & Johnson	Knowledge networking
2. Gateway	KM & IT client services
3. Sprint	Business market research
4. IBM	Institute for KM
5. PriceWaterhouseCoopers	KM
6. World Bank	Knowledge and learning
7. Intel	KM
8. Microsoft	Enterprise KM
9. Accenture	KM
10. Chevron	Information architecture
11. Ford	Best practices
12. Capital One	Knowledge champions
13. Skandia	KM
14. Cisco	KM
15. MIT Sloan School of Management	Academic program
16. British Petroleum	KM
17. Dow	KM
18. Texas Instruments	KM
19. Siemens	KM

Knowledge Management (KM)

Implementation Session

KM Overview

Jim Porter

Notes

Creating Sustainable Business Value from Data

Information	= f (Data)
Knowledge	= f (Information)
Sustainable Business Value	= f (Knowledge)

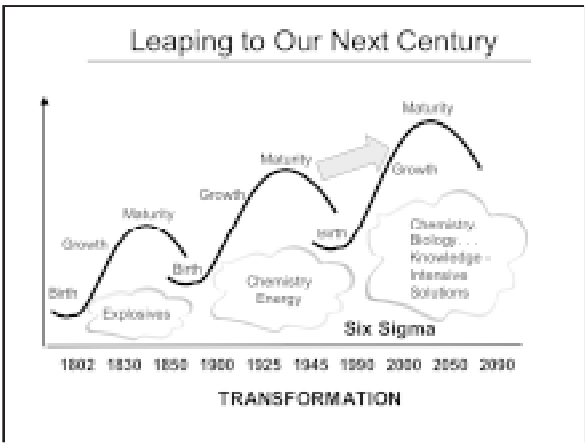
Business Successes

- BP—attributed $260 million added value directly from KM
- Dow—saved $40 million over 10 years by divesting costly, unused patents
- Texas Instruments—saved $1 billion as a result of improved KM
- Chevron—employee productivity up 50 percent thru TQM and KM
- Siemens—its ShareNet tool added $122 million in sales since rollout

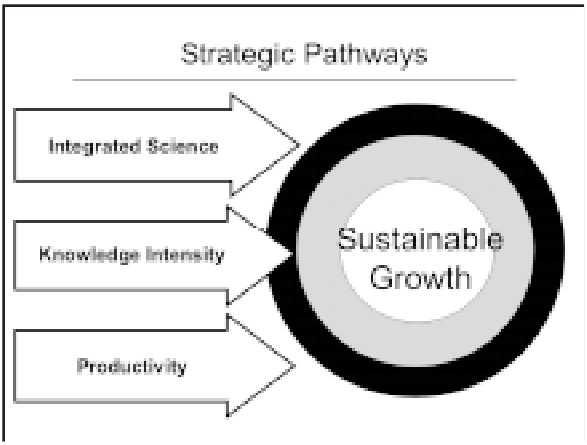
Of all the initiatives we've undertaken at Chevron during the 1990s, few have been as important or as rewarding as our efforts to build a learning organization by sharing and managing knowledge throughout our company. In fact, I believe this priority was one of the keys to reducing our operating costs by more than $2 billion per year.

Kenneth T. Derr
Chairman and CEO
Chevron

Notes


Leaping to Our Next Century
Birth
Growth
Maturity
Birth
Growth
Maturity
Birth
Growth
Maturity
Explosives
Chemistry
Energy
Chemistry
Biology...
Knowledge -
Intensive
Solutions
Six Sigma
1802 1830 1850 1900 1925 1945 1990 2000 2050 2090
TRANSFORMATION


New DuPont Vision
To be the world's most dynamic science company, creating sustainable solutions essential to a better, safer, healthier life for people everywhere.


Strategic Pathways
Integrated Science
Knowledge Intensity
Productivity
Sustainable
Growth

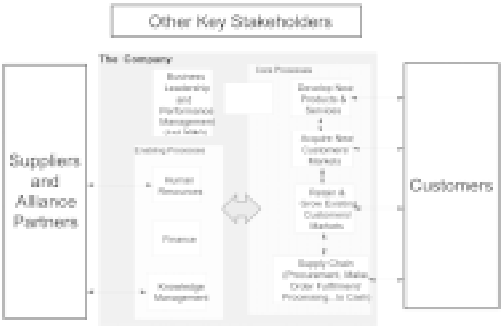
Notes

DuPont Business Goals

Top Line Growth
- World-class marketing capability
- World-class sales capability
- Enhanced innovation
- Knowledge in offer bundles

Productivity
- Employee productivity and effectiveness
- People renewal
- Global supply chain

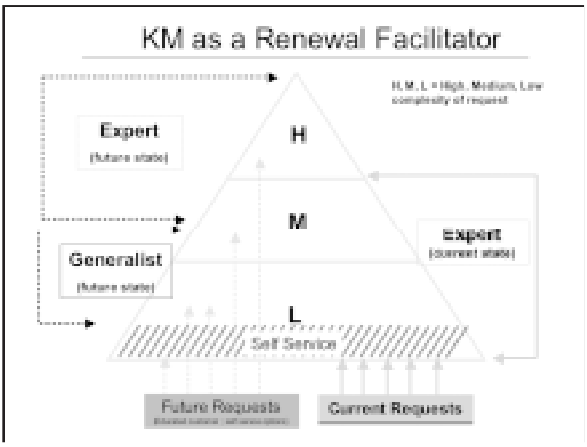
Process View—Typical Enterprise (End-to-End View)



Compelling Drivers Improved Information Utilization

- Improve productivity
- Increase customer value
- Renew and leverage needed competencies
- "Smart" leverage of expertise
  - "Safe" self-service
  - "Experts" in optimum role
  - New/unproven resources development
- Drive innovative solutions

Notes



CII Knowledge Impact Areas

- Safety
- Business Decisions
- Capital Projects
- Plant Startups
- Competency Renewal
- Personnel Development
- Outside Influence

Knowledge Management (KM)

Implementation Session

KM Project

Carol Arnold

Notes

Three Major Opportunity Areas

Major Opportunity Areas

1. Capability to capture information

   88% of DuPont's top salespeople have over 30 years of experience.

   40% of DuPont engineers will be pension-eligible in the next two to four years.

   38% of a person's time is wasted trying to manage information.

   No central repository of intellectual capital.

Major Opportunity Areas

2. Capability to find the right information and people

   20% of a scientist's time is spent searching and accessing information.

   75% of the information people need to effectively work is not in "transaction backbone" data.

   No capability to locate experts/expertise across company.

Notes

Major Opportunity Areas

3. Ability to collaborate and share info and expertise

   20% of a person's time is spent repeating answers.

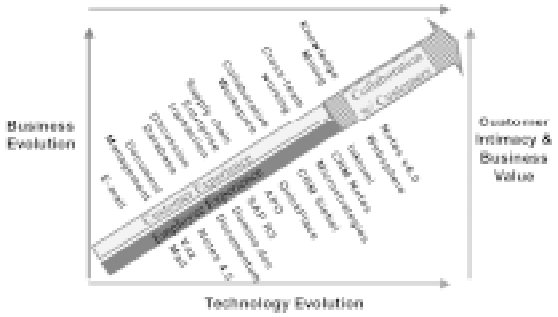
   25% of info that a company owns is used.

   65% of a company's design work is duplicated.

   Success and business intelligence depend on readily available knowledge.

Knowledge Management Continuum

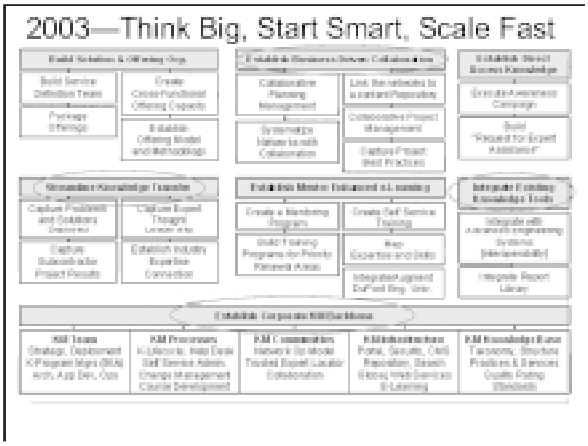
Organizational Readiness & Productivity



DuPont Knowledge Management: Phase 1

	Participants	Initial Focus
Finance—Internal Audit	100	Global capability
CR&D	4200	Research portal
Engineering	300	Renewal
Sourcing	1200	Global rapid workouts
Crop Protection	15	Technology laboratory
Strategic Accounts	140	Global account management
Imaging Technologies	20	Global leadership effectiveness
Six Sigma	>10,000	Business effectiveness

Notes



KM Program Office

...establish a dedicated team to lead the journey...

- Business/program lead
- Change management and education
- KM consulting
- Six Sigma/business analyst
- IT KM Lead
- Project-based resources
  - Project manager
  - Community facilitators
  - Knowledge capture resources
  - IT resources

Notes

KM Roles and Responsibilities

DuET Group Manager	Executive sponsor; actively supportive of the roll out.
Knowledge Stewards	Prime contacts for the KM team and early adopters of KM processes and tools. Champions of KM processes; work with subject matter experts to oversee group intellectual property.
Subject Matter Expert (SME)	Technology specialist, expert. Recognized, well-respected content/competency expert. Helps the Knowledge Steward manage intellectual assets for the rest of the group.
Knowledge Workers	All people in the workgroup (regardless of whether they may also be SMEs, Knowledge Stewards, or OSPs).

Implement Common KM Processes

- Effective global collaboration
- Consistent knowledge sharing
- Build and grow strong teams
- Capture and organize knowledge assets
- Document and publish good/best practices
- Improve search/find and access to information
- Find the right person (or be found!)
- Better mentoring and training opportunities

Example Value Areas to Explore

- Improve information/knowledge sharing
- Capability to capture information/knowledge
- Turning tacit knowledge into explicit knowledge
- Improved innovation process
- Ability to collaborate
- Efficiency and effectiveness of scientists
- Getting products to market faster
- Driving growth: Sales and marketing effectiveness and revenue growth

Notes

KM Roll Out Process

- Manager's Meeting
- Planning Meeting
- Group Launch
- Portal Set Ups
- Tool Trainings
- Learning Modules
- Workshop
- Close Out

Weeks 1-2 are planning, front-end loading, pre-work.

Weeks 3-4 are training, overviews, continued setup

Weeks 5-6 are more training, some project work, feedback sessions, and a closing session

Portal Overview

A brief tour of the portal environment and its concepts/terminology...

KEY FEATURES

- Collaboration
- Engineering Employees
- Engineering Search
- Engineering Page

KM Portal

A brief look of some tools available through the iPortal

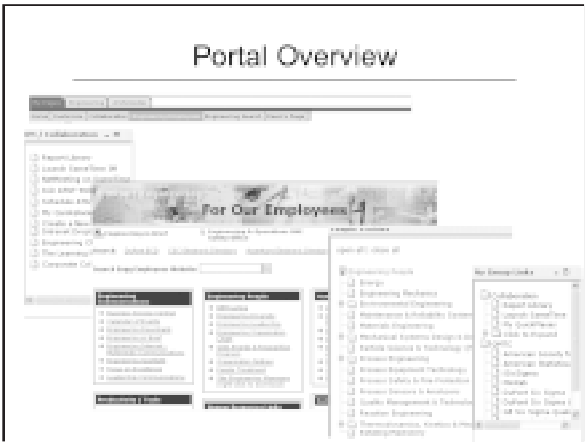
Sametime

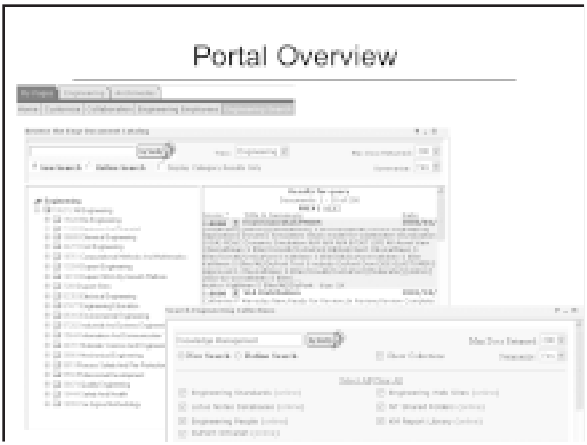
QuickPlace

Taxonomy and Collections Search

Notes


Portal Overview
Sametime Instant Messenger and QuickPlace are located under the Collaboration tab
Lotus.
IBM.


Portal Overview
For Our Employees


Portal Overview

Notes

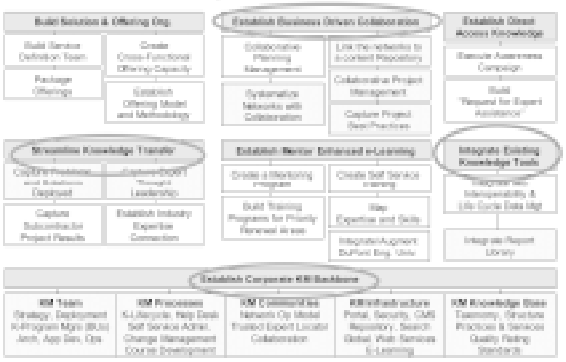
Knowledge Management (KM)

Implementation Session

Engineering Interoperability

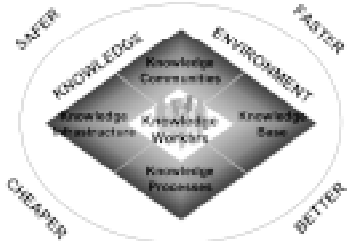
Judy Passwaters

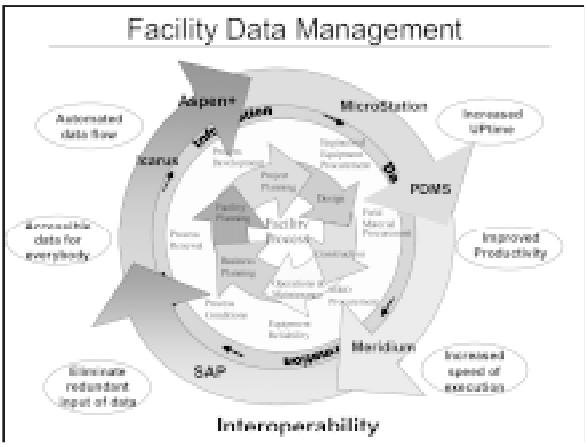
2003—Think Big, Start Smart, Scale Fast

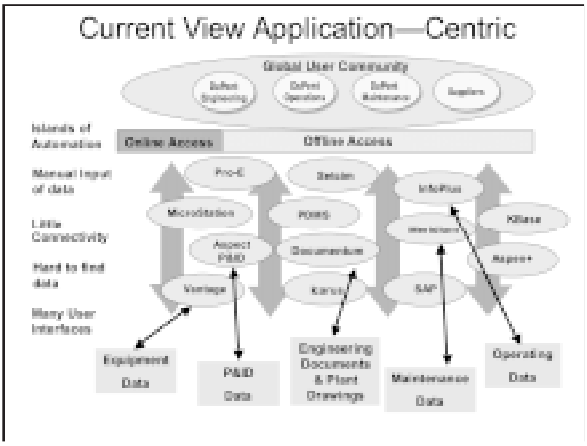


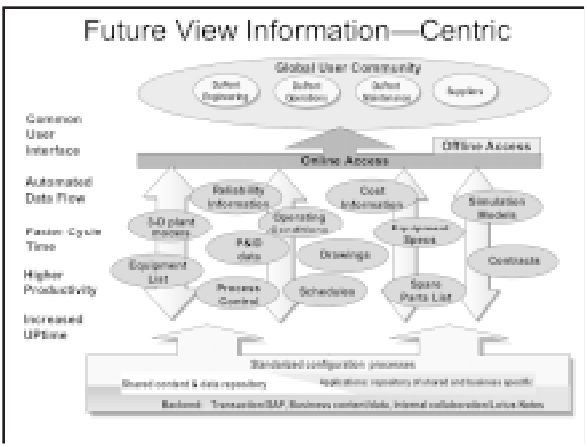
Knowledge Management Vision

Create a strategy and managing process for accelerating knowledge management that will introduce a culture change as well as effective tools and processes to further enable employees as "knowledge workers," improve productivity, and use knowledge intensity to achieve sustainable growth.



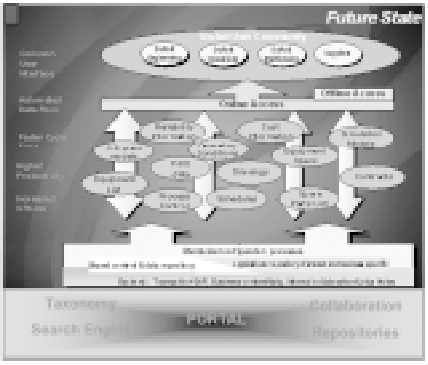

Facility Data Management
Aspen+
MicroStation
Automated data flow
Increased UPtime
Karus
POMS
Accessible data for everybody
Facility Process
Improved Productivity
Meridian
SAP
Increased speed of execution
Eliminate redundant input of data
Interoperability


Current View Application—Centric
Global User Community
Islands of Automation
Online Access
Offline Access
Manual input of data
Little Connectivity
Hard to find data
Many User Interfaces
Pro-E
Belzen
InfoPlus
MicroStation
POMS
Kilana
Aspect P&ID
Documentum
Aspen+
Vantage
Karus
SAP
Equipment Data
P&ID Data
Engineering Documents & Plant Drawings
Maintenance Data
Operating Data


Future View Information—Centric
Global User Community
Common User Interface
Automated Data Flow
Passive Cycle Time
Higher Productivity
Increased UPtime
Online Access
Offline Access
Reliability Information
Cost Information
Simulation Models
3-D plant models
Operating Procedures
P&ID data
Drawings
Contracts
Equipment List
Process Control
Schedules
Spare Parts List
Standardized configuration processes
Shared content & data repository
Backend - Transaction/SAP, Business content/data, internal collaboration/Lotus Notes

Notes

Align KM and Interoperability/ Facility Data Management



Issues and Challenges

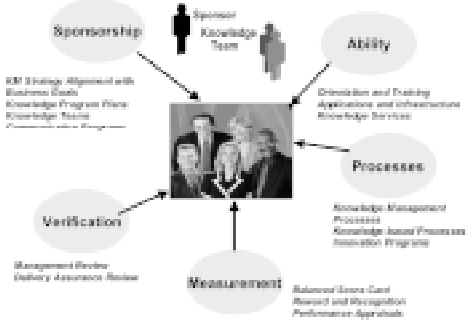
- KM
  - Long-term storage/accessibility of electronic media
  - Enable the Data > Information > Knowledge progression
- Interoperability
  - Open systems
  - Applications integration
  - Legacy Data

DISCUSSION

Notes

Notes

How Do You Knowledge-Enable the Business?



KM Processes

- **Find**
  - **Find the Right Person (or be found!)**
  - **Improve Search and Better Access to Information**
- **Collaborate**
  - Effective Global Collaboration
  - Document and Publish Good/Best Practices
  - Build and Grow Strong Teams
  - Consistent Knowledge Sharing
  - Better Mentoring and Training Opportunities
- **Capture**
  - Capture and Organize Knowledge Assets

Interoperability Issues and Challenges

- **Open systems—No active, coordinated U.S. body working on data standards.**
- **Applications integration—continues to be difficult achieving collaboration between software companies.**
- **The industry needs to reduce barriers to interoperability, enabling benefit realization.**

Lean Manufacturing Tools for Construction

Lean Principles in Construction Project Team

Abstract

The primary drivers for lean adoption are reduced cost and improved schedule. This can be accomplished with no reduction in safety performance or quality. This CII project team will offer some early, but compelling, evidence that lean principles can be used to improve project performance. The team has thoroughly investigated available materials on the subject, analyzed work of early adopters of the principles, and researched the areas in which improvements can be made. Reasons to become lean will be detailed and a roadmap will be presented to lead interested parties in the right direction.

A panel of early lean adopters will talk about their experiences in the implementation session. Participants will be able to ask questions of the panel, the project team members, and the principal investigator.

Plenary Session Presenter

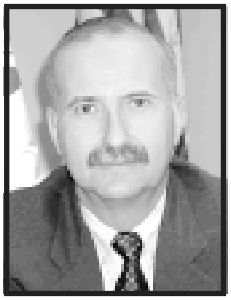
David Tweedie – Regional Manager, Fru-Con Construction Company

David Tweedie has full management responsibility for Fru-Con's engineering and construction services out of its southeastern U.S. office in Tallahassee, Florida. He joined Fru-Con in 2003 after a long and successful career with Watkins Engineers & Constructors, where he had wide-ranging assignments and increasing responsibility. He began as a chief construction engineer and became a vice president and division manager. Involved with CII in various capacities since 1993, he currently chairs CII's Lean Principles in Construction research study. Tweedie holds a bachelor's degree in construction management from Louisiana State University.

e-mail: david.tweedie@frucon.com

Implementation Session Moderator

Louis F. Troendle – Director of Operations, Automotive, Washington Group International



Louis Troendle has 24 years of experience in the industry, including projects ranging from $6 million to over $2 billion in total installed cost. One recent assignment was at the tornado-damaged General Motors plant in Oklahoma City. This $100+ million reconstruction project, which involved a 24/7 schedule, was recognized for its low safety incident rate and excellent turnaround time to full production. Troendle holds a bachelor's degree in civil engineering from the University of New Mexico.

e-mail: louis.troendle@wgint.com

Implementation Session Participants

Michael R. Haller – Executive Vice President, Walbridge Aldinger Company
e-mail: mhaller@walbridge.com

John Hallman – Director, Manufacturing Construction Management Group, Worldwide Facilities Group – Capital Projects, General Motors Corporation
e-mail: john.hallman@gm.com

Dan M. Kumm – Manager, Field Operations, Butler Manufacturing Company
e-mail: dank@bucon.com

Paul Reiser – Vice President, Production & Process Innovation, The Boldt Company
e-mail: paul.reiser@boldt.com

Other Knowledgeable Points of Contact

Joshua Balonick — Graduate Research Assistant, University of Colorado–Boulder
e-mail: joshua.balonick@colorado.edu

Brian W. Barker — Operations/Labor Relations Manager, Parsons G-UB-MK Constructors
e-mail: bwbarke5@tva.gov

Brian L. Becker — Senior Project Manager, General Motors Corporation
e-mail: brian.becker@gm.com

Anthony Buzzeo — Project Engineering & North America Construction Manager, Praxair, Inc.
e-mail: tony_buzzeo@praxair.com

Gregory D. Clum — Manager, BVCI Labor Relations, Black & Veatch Corporation
e-mail: clumgd@bv.com

Eric Delaney — Project Engineer, BMW Constructors, Inc.
e-mail: delaney@bmwc.biz

James E. Diekmann — K. Stanton Lewis Professor, University of Colorado–Boulder
e-mail: james.diekmann@colorado.edu

Sant Harit — Manufacturing Consulting Services Manager, Washington Group International Inc.
e-mail: sant.harit@wgint.com

James A. Hengel — Vice President, Project Management, Black & Veatch
e-mail: hengelja@bv.com

Eric Janovsky — Senior Project Manager, U.S. General Services Administration
e-mail: eric.janovsky@gsa.gov

Jeff Millikan — Project Manager, ALSTOM Power, Inc.
e-mail: jeff.millikan@power.alstom.com

Louis L. Prudhomme — Associate Director, Construction Industry Institute
e-mail: lprudhomme@mail.utexas.edu

Mag A. Risk — Project Management Consultant, Johnson Controls, Inc.
e-mail: mag.risk@jci.com

Brian Saller — Graduate Research Assistant , University of Colorado–Boulder
e-mail: brian.saller@colorado.edu

Robert C. Schulz — Global Construction Technology Manager, The Dow Chemical Company
e-mail: rschulz@dow.com

Craig Wright — Vice President Construction, Black & Veatch
e-mail: wrightcg@bv.com

Lean Manufacturing Tools for Construction

Lean Principles in Construction Project Team

Change to Workplace Organization — How Walbridge Aldinger is effecting lean cultural change

Leader Involvement

- First and foremost — absolutely essential in setting pace and direction
- Leadership forums that emphasize the importance of lean performance
- Lean recognition program and accountability reinforced through employee performance appraisal

Education

- "Lean Fundamentals" instructor led eight-hour course required for all salaried positions
- Field training — Tradesmen and Foreman Training Program
- Trade apprentice schools
- Architects/Engineers
- Subcontractors
- Project specific (i.e., Corner House Lofts, Ann Arbor, Michigan)
- Development and implementation of Lean Toolbox Talks

Lean Construction Steering Team

Cross-functional members and executive sponsor whose mission includes:

- Define and achieve annual lean goals
- Articulate lean best practices
- Review lean savings ideas and lean achievement recognition
- Define implementation strategies and continuously evaluate

Full-Time Lean Manager

- Assist and advise teams in the field; provide project leaders with After Action Reviews
- Manage lean programs; lead the Lean Construction Steering Team
- Communicate (contributing editor for "Lean Focus" Newsletter and Lean Toolbox Talks)
- Subject matter expert who teaches

Process Improvement Work Groups — "Lean Teams"

Value-stream mapping to improve specific processes (Kaizen)

Lean Olympics

Measures the implementation of lean best practices

Friendly competition, team recognition

- Bronze
- Silver
- Gold
- Extra Credit Laurels

1% Savings Drive

- Motivates everyone to think of ways to eliminate waste and add value — lean is a state of mind
- Pledged goals / reinforces fiscal responsibility
- Tangible, measurable, and achievable (though not easy)
- Aligned with other continual improvement tools — Walbridge Aldinger Quality Management & Value Management
- Focus on capturing/sharing ideas (documented in value management database)
- Linked to "Lean Achievement Recognition" (individual and team levels)

Detailed Logistics Planning

- Site layout, staging areas, environmental impacts, security, field sanitation, 5S, traffic control, flow, etc.
- Capitalizes on visual management

Pre-Task Planning for Lean (modeled on safety pre-task planning)

Consultants / Academic Liaison / Lean Construction Institute membership

Marketing & Communication

Website, "Lean Focus" newsletter, posters and slogans, Lean Toolbox Talks

Patience

- Eat the elephant one bite at a time.
- Improve 1000 things 1% instead of 1 thing 1000% (Toyota) — ref: 1% Savings Drive.
- Takes years to realize — must become part of everything and everybody.
- Reinforced through our core values.

Notes

Project Team 191:
Lean Principles in Construction

Lean Principles in Construction Project Team

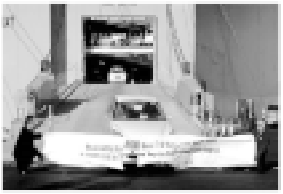
Josh Balonick	University of Colorado
Brian Barker	GUB-MK Constructors / Parsons E&C
Brian Becker	General Motors
Tony Buzzeo	Praxair
Jim Diekmann	University of Colorado
Eric DeLaney	BMW Constructors
Sant Hant	Washington Group International
Mark Krewedl	University of Colorado
Dan Kumm	Butler Construction
Mag Risk	Johnson Controls
Bob Schulz	Dow Chemical
Lou Troendle	Washington Group International
David Tweedie	Fru-Con, Chair
Craig Wright	Black & Veatch

Project Team 191 Mission

To examine the potential for the use of Lean Principles that were developed in the manufacturing industry for adaptation and use in the engineer-procure-construct (EPC) industry.

Notes

The Power of Lean



"Catch up with America in three years. Otherwise the automobile industry of Japan will not survive."

_ Kiichiro Toyoda
Founder, Toyota Motor Co.
1894-1952

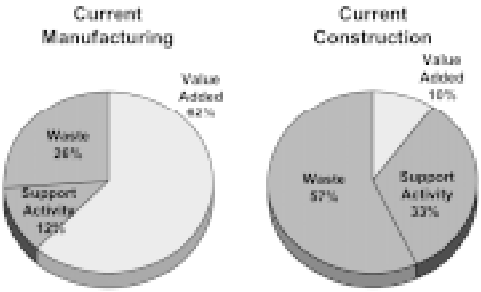
Lean in Manufacturing

Five Principles of Lean Manufacturing:

1. Precisely specify value by specific product.
2. Identify the value stream for each product.
3. Make value flow without interruptions.
4. Let the customer pull value from the producer.
5. Pursue perfection.

_ James P. Womack
Founder, Lean Enterprise Institute

Opportunity for Improvement in Construction Today



Notes

Lean Construction Defined

The continuous process of:

- eliminating waste.
- meeting or exceeding all customer requirements.
- focusing on entire value stream.
- pursuing perfection in execution of constructed project.

Drivers of Lean Manufacturing

- Mass production practices
- Limited space
- Reduced inventory
- Limited natural resources
- Lower demand
- Quality improvement

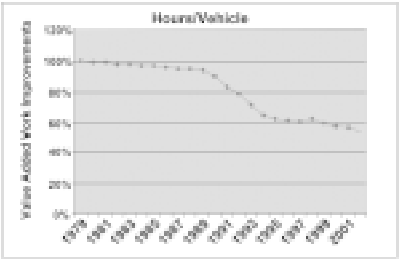
Drivers of Lean Construction

- Waste
- Non-standardized workplace
- Individual contract structure
- Fragmented relationships
- Supply chain integration
- Available work force
- Produce one-off projects

Notes

Progress with Lean Manufacturing

Value Added Work Improvements



Use of lean manufacturing principles resulted in better optimization of resources.

Accomplishments of Lean Manufacturing

- Half the human effort in the factory
- Half the manufacturing space needed
- Half the investment in tools
- Half the engineering hours to develop a new product in half the time
- Less than half the needed inventory on site
- Fewer defects
- Produces greater and ever growing variety of products

Lean Construction Principles

- Eliminate waste
- Customer focus
- Workplace standardization
- Culture/people
- Continuous improvement, built-in quality

Waste in Construction Processes

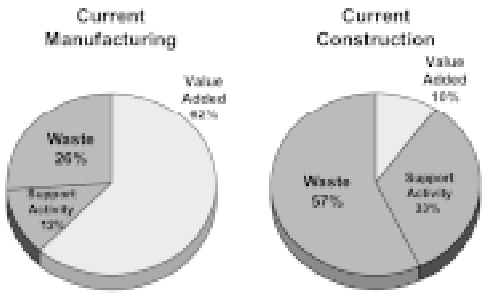
- Excessive material handling
- Rework
- Design errors
- Conflicts between trades
- Conflicts between other contractors
- Ineffective supply chains

Rewards to "GO LEAN"

- Reduce waste / improve efficiency
- Improve safety
- Lower cost
- Better quality
- Fewer defects / less rework

You have the opportunity to be the construction industry leader.

Waste Reduction = Sustainability



Notes

Notes

The Journey to Lean

- Literature research
- Global interviews with early adopters
- Meetings with prominent lean researchers
- Activity case studies
- Questionnaires

Lean Works!!

Implementation Session

Introduction – Lou Troendle, Washington Group Int.

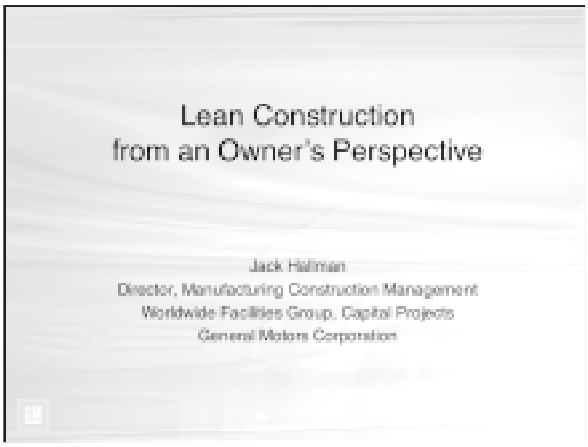
- Change of culture
- Path forward
- Self-assessment tool

Panelists

- Jack Hallman, GM: Owner's Perspective
- Mike Haller, Walbridge Aldinger: Visual Management
- Paul Reiser, Boldt: Production Planning/Culture Change
- Dan Kumm, Butler: Eliminate Waste
- Jim Diekmann, CU Boulder: Principal Investigator

Q&A

Notes

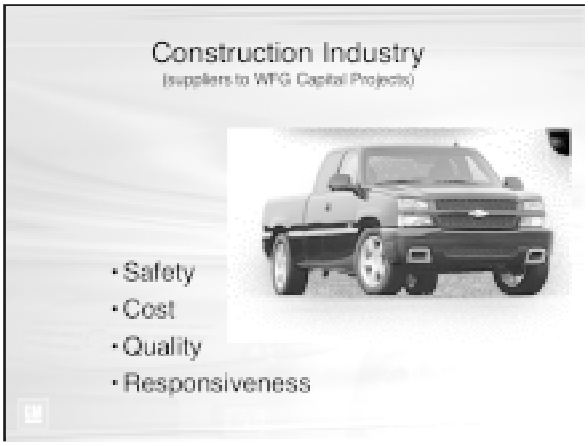

Lean Construction
from an Owner's Perspective
Jack Hallman
Director, Manufacturing Construction Management
Worldwide Facilities Group, Capital Projects
General Motors Corporation

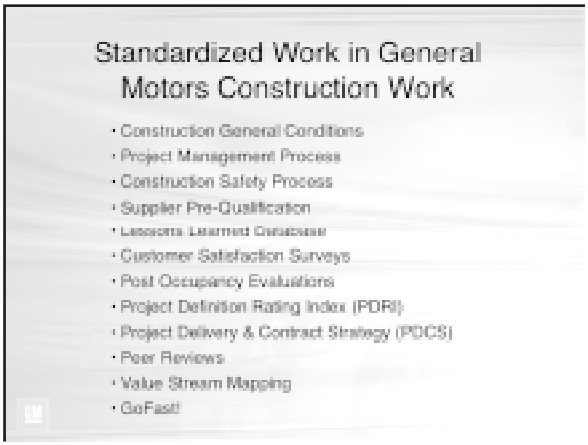

Products
• Safety
• Cost
• Quality
• Responsiveness


Manufacturing Operations
(suppliers to the product community)
• Safety
• Cost
• Quality
• Responsiveness

Notes

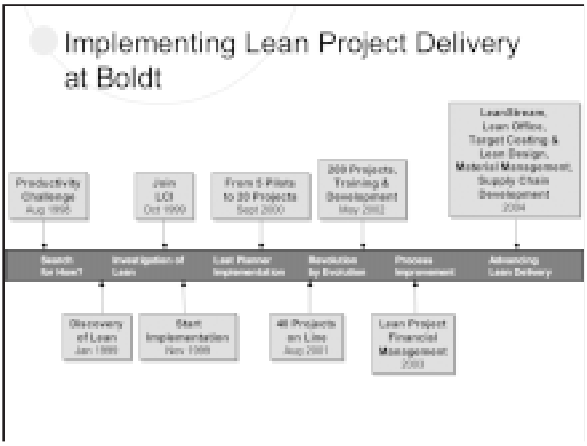

Capital Projects
(suppliers to the manufacturing operations)
• Safety
• Cost
• Quality
• Responsiveness

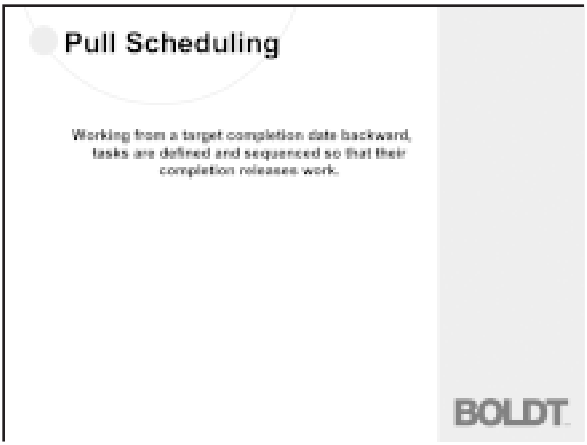

Construction Industry
(suppliers to WFG Capital Projects)
• Safety
• Cost
• Quality
• Responsiveness


Standardized Work in General Motors Construction Work
• Construction General Conditions
• Project Management Process
• Construction Safety Process
• Supplier Pre-Qualification
• Lessons Learned Database
• Customer Satisfaction Surveys
• Post Occupancy Evaluations
• Project Definition Rating Index (PDRI)
• Project Delivery & Contract Strategy (PDCS)
• Peer Reviews
• Value Stream Mapping
• GoFast!


BOLDT
2004 CII Annual Conference
Lean Manufacturing Tools for Construction
Paul Reiser, The Boldt Company

Notes


Implementing Lean Project Delivery at Boldt
Productivity Challenge
Join LCI
From 5 Pilots to 20 Projects
200 Projects, Training & Development
Leanstream, Lean Office, Target Costing & Lean Design, Material Management, Supply Chain Development
Search for How?
Investigation of Lean
Lean Planner Implementation
Revolution by Evolution
Process Improvement
Advancing Lean Delivery
Discovery of Lean
Start Implementation
48 Projects on Line
Lean Project Financial Management


Pull Scheduling
Working from a target completion date backward, tasks are defined and sequenced so that their completion releases work.
BOLDT

Notes

Pull Scheduling Overview

- Work tasks, information flow, and material deliveries are planned based on the request (or "pull") of downstream customers.
- Traditional concepts of how work, information, and material are processed need to change.
- Pull scheduling will often expose the need for smaller batches, just in time delivery, improved leveling of resources, and reduced lead times.
- Workflow becomes more reliable and efficient as the waste of waiting, redundancy, and over-processing are eliminated.

BOLDT

Pull Planning & Scheduling

Strategic — Tactical

Planning

Master CPM Schedule | Phase/Pull CPM Schedule | Lean Work Stream (Pull Planning)

Re-planning

Measurement

Float (Pull Intensity)

Percent Planned Complete (Planning Reliability)

BOLDT

Lean Production Mgt.

Master, Phase & Look Ahead Schedule

Make-Ready Process

Work Plan & Execution

Learning & Improvement

- Decentralized Planning
- Explicit Quality Assignments
- Clear Definition of Handoff
- Clear Path for Work Flow
- Work Based on Request not Command
- Collaborative Team Commitment

BOLDT

Notes

LeanStream
Managing work streams

- Decentralized planning and control at the crew level
- Start with a work stream milestone from the Master or Phase schedule
- Do a backward pass "pull" plan based on the release of work
- Plan and control the "hand off" of work
- Review daily
  - Did we do what we said we would
  - What did we learn
  - Will we accomplish tomorrow's plan
  - What do we need to make tomorrow's plan succeed

BOLDT

The Four Rules of a Lean Production System

- All work shall be explicit as to content, sequence, timing and outcome.
- Every connection (hand off of work) in the work stream must be direct, and there must be a clear way to request action and receive a response.
- The pathway for production must be simple and direct.
- Improvements are made according to a method, under guidance, and at the lowest possible level in the organization.

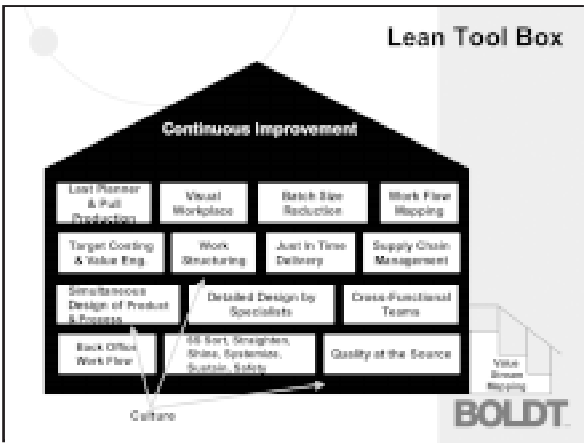
BOLDT

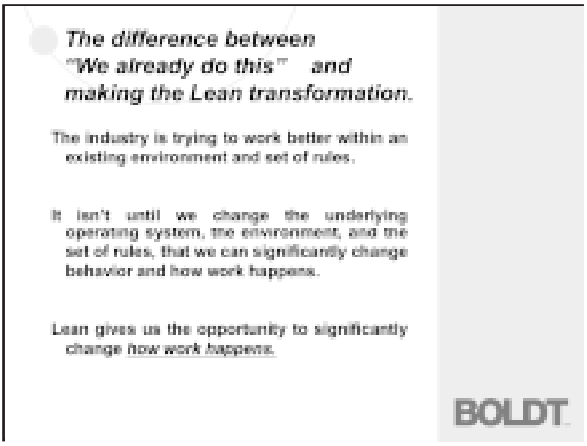
Lean Design Process

- **Co-located, Multidisciplinary Target Cost Teams**
  Designers, Facility Users, Estimators, Specialty Contractors and Suppliers, Project Manager, Superintendent
- **Sharing small batches of incomplete information**
  Evaluating design and budget more often.
- **Value Tools**
  Value Stream Mapping during Project Definition, Value Engineering Function and Worth
- **Set Based Design**
  Advancing sets of solutions to the last responsible moment
- **Simultaneous design of Product and Process**
  Digital prototyping and operations design
- **Detailed design by specialty contractors and vendors**
  Eliminating the waste of redundant detail design

BOLDT

Notes


Lean Tool Box
Continuous Improvement
Last Planner & Pull Production
Visual Workplace
Batch Size Reduction
Work Flow Mapping
Target Costing & Value Eng
Work Structuring
Just In Time Delivery
Supply Chain Management
Simultaneous Design of Product & Process
Detailed Design by Specialists
Cross-Functional Teams
Back Office Work Flow
5S Sort, Straighten, Shine, Systemize, Sustain, Safety
Quality at the Source
Value Stream Mapping
Culture
BOLDT


The difference between
"We already do this" and
making the Lean transformation.
The industry is trying to work better within an existing environment and set of rules.
It isn't until we change the underlying operating system, the environment, and the set of rules, that we can significantly change behavior and how work happens.
Lean gives us the opportunity to significantly change how work happens.
BOLDT


Leading an intense implementation of Lean principles and techniques
Business not as usual.
Moving from activity centered contract management to collaborative work stream management.
Implementation / R&D
Advance Work Flow Management/Last Planner
Material Management
Operations Design & Standard Work Processes
Digital Prototyping
Lean Design
Target Costing
Supply Chain Development
BOLDT

Buildings for a Livable Future

Case Study: Johnson Controls

Abstract

This presentation will answer the questions: "What is sustainability?" and "What is the triple bottom line impact on early engagement in the design phase?" You will learn what it means to be a company or organization that takes full advantage of triple bottom line benefits offered by a commitment to sustainability:

- Environmental quality
- Social equity
- Economic success

Case studies of Leadership in Energy and Environmental Design (LEED) certified facilities will be reviewed in the implementation session. Hear how green design can lower your construction costs, reduce operating costs, make a more productive environment, produce a higher valuation of building and visibility/marketability, and reduce insurance and risk of liability. A panel of experts will be available for questions and discussion.

Plenary Session Presenter

Paul von Paumgartten – Director of Energy and Environmental Affairs, Johnson Controls

Paul von Paumgartten manages Johnson Controls' high performance green buildings business. Von Paumgartten, a well-known expert on energy and the environment, also is on the Board of Directors of the U.S. Green Building Council and serves on the council's LEED steering committee. Before joining Johnson Controls, he ran his own consulting firm, Productive Environments. An invited speaker at numerous conferences, he also has taught lighting design courses and has conducted seminars for a variety of professional societies. Von Paumgartten earned a degree in finance and marketing from the University of Wisconsin–Milwaukee.

e-mail: paul.vonpaumgartten@jci.com

Implementation Session Moderator

Paul von Paumgartten – Director of Energy and Environmental Affairs, Johnson Controls

Implementation Session Participant

Michael Arny – President, Leonardo Academy
e-mail: michaelarny@leonardoacdemy.org

Notes


Buildings for a Sustainable Future
Paul von Paumgartten
Director
Energy & Environmental Affairs
Johnson Controls, Inc.


Classic Definition of Sustainability
New Organizational Metric
Economy
Ecology
Equity
Triple Bottom Line


Sustainable Business Practices
Why Sustainability is Here to Stay
Top and Bottom Line Impact
Government Environmental Mandates
Transparent Corporate Governance

Notes

Environmental Impact of Buildings

Americans spend as much as 90% of time indoors.

Buildings:

- Consume almost 40% of all energy.
- Add 40% to atmospheric emissions.
- Use 68% of all electricity.
- Use 12% freshwater, 88% potable water.
- Take up to 40% municipal solid waste stream.
- Exploit significant amounts of land.

Notes

Energy Savings Actions

1990-2000

- Energy Cost Savings – $16.7 billion
- Electric Energy Savings – 166 million MWh
- Electric Demand Reductions – 2,500 MW
- Carbon Dioxide Emissions Reduction 217 Million Tons

Total Energy Savings Actions

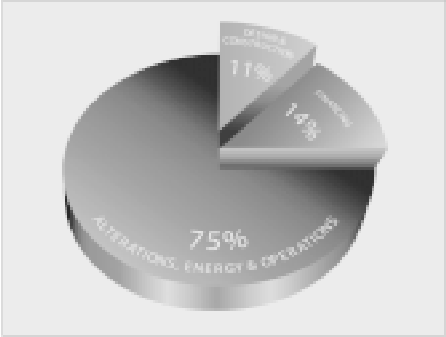
1990-2010

- $95 billion in energy savings
- 981 MWh in electric energy savings
- 6,000 MW in electric demand reduction (15 new 400 MW power plants)
- 5.3 billion MMBTU reduction in direct fuel use
- Total savings power all California households for 13 years, and 4% of of Kyoto Goals

Characteristics of Green Buildings

- Optimal environmental and economic performance
- Increased efficiencies, saving energy and resources
- Satisfying, productive, quality indoor spaces
- Whole-building design, construction, and operation over entire life cycle
- Fully integrated approach – teams, processes, systems

Life Cycle Cost of Buildings



Economic Benefits of Green Design

Lower Construction Costs

- Reduced site preparation and landscaping
- Lower waste disposal costs by 50 to 98 percent

Reduced Operating Costs

- Lower utility costs by 20 to 50 percent
- Reduced maintenance costs

Higher Valuation of Building

- Rule of Thumb: divide reduction in annual operating costs by 10 percent to get increased value of building.
- Up to $4 increased valuation for every $1 spent.

Economic Benefits of Green Design

More Productive Environment

- Better tenant and worker attraction/retention
- Less absenteeism by 45 percent
- Higher productivity up to 16 percent

Reduced Insurance and Risk of Liability

- Healthy occupants, greater occupant satisfaction
- Lower environmental impacts
- Streamlined regulatory approvals

Higher Visibility and Marketability

Notes

U.S. Green Building Council

- National coalition representing all sectors of the building industry.
- Promotes design, construction, operation of environmentally responsible, profitable, healthy places to live and work.
- Launched Leadership in Energy and Environmental Design (LEED) in 2000.
  - Rating system to guide sustainable project development

LEED

LEED Point Categories

- Sustainable Sites
- Materials & Resources
- Water Efficiency
- Energy & Atmosphere
- Indoor Environmental Quality
- Innovation

LEED

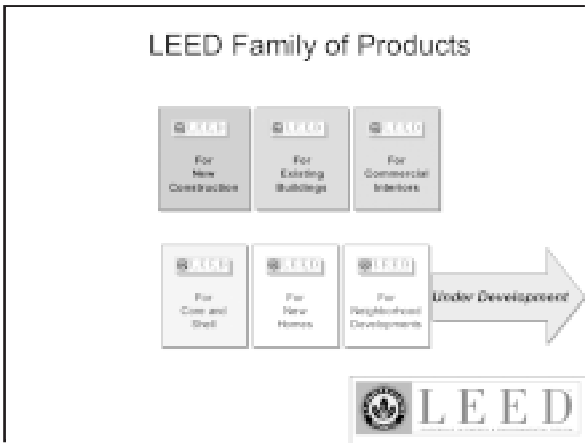
LEED Programs

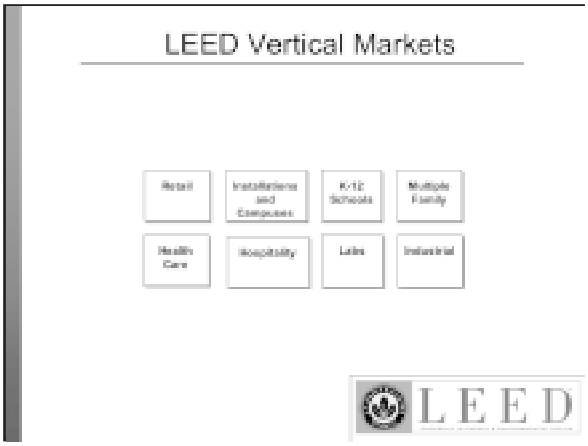
- Building Certification
  - Green, Silver, Gold, Platinum
- Professional accreditation
- Training workshops
- Educational resources
- Website – www.usgbc.org

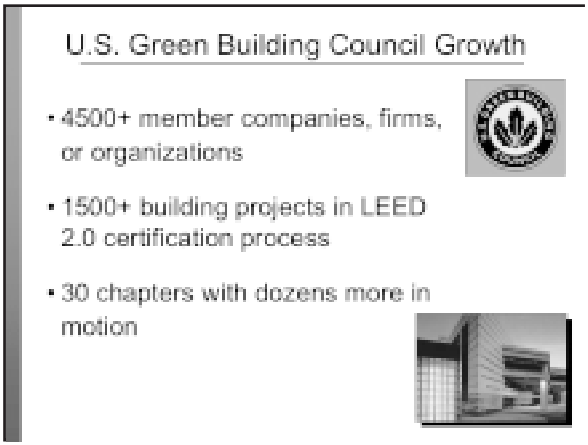
LEED

Notes

Notes


LEED Family of Products
For New Construction
For Existing Buildings
For Commercial Interiors
For Core and Shell
For New Homes
For Neighborhood Developments
Under Development
LEED

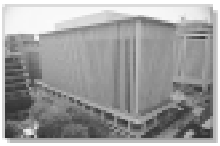

LEED Vertical Markets
Retail
Installations and Computers
K-12 Schools
Multiple Family
Health Care
Hospitality
Labs
Industrial
LEED


U.S. Green Building Council Growth
• 4500+ member companies, firms, or organizations
• 1500+ building projects in LEED 2.0 certification process
• 30 chapters with dozens more in motion

LEED EB Pilot Participants

- National Geographic Society
- Pentagon
- U.S. GSA
- State of Maryland
- City of Chicago
- Furman University
- Duke University
- JohnsonDiversey
- Microsoft
- Johnson & Johnson
- Liberty Property Trust
- Russellville School District
- Buffalo Public Schools
- Cambridge Memorial Hospital
- Hewlett Packard
- Milliken Carpets

Case Studies



Buildings for a Sustainable Future

Paul von Paumgartten
Director
Energy & Environmental Affairs
Johnson Controls, Inc.

Notes

Notes

Sustainable Development Can Create a Competitive Advantage

- Paul von Paumgarten – Johnson Controls
- Michael Amy – National Geographic Society
- Greg Bell – JohnsonDiversey, Inc.

Overview

- Green Buildings
- Brengel Center Description
  - Sustainable Aspects
  - Results

U.S. Green Building Council

- National coalition representing all sectors of the building industry.
- Launched Leadership in Energy and Environmental Design (LEED) in 2000.
  - Rating system to guide sustainable project development

LEED

Notes

LEED Point Categories

- Sustainable Sites
- Materials & Resources
- Water Efficiency
- Energy & Atmosphere
- Indoor Environmental Quality
- Innovation

LEED

LEED Family of Products

For New Construction (NC)

For Existing Buildings (EB)

For Commercial Interiors (CI)

LEED

Brengel Technology Center

LEED-Certified Building

Milwaukee, Wisconsin

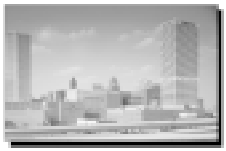
LEED

JOHNSON CONTROLS

Notes

Brengel Technology Center

- Built in 2000
- $16 million technology & customer center
- 130,000 square feet on 7 floors
- Complements 100-year-old building next door
- Minimized footprint by building on existing site in city's center



Outstanding example of urban redevelopment

Brengel Sustainable Features

- Open green-area courtyard in city center

- Personal environments for desktop control by employees

- Abundant use of natural daylight with advanced lighting technology

Brengel Sustainable Features

- Accommodates busing and bike to work
- Roof-mounted weather system for accurate energy applications

Notes

Building Automation System

- Optimal energy efficiency and performance with Metasys® Building Automation System
- Remote Access
- Easy to identify energy savings opportunities
  - Energy sub-metering
  - Load profiling
  - Cost report generation

LEED Silver to Gold

- Modified housekeeping specifications
- Improved exterior landscaping and snow removal procedures
- Replaced compact fluorescent with low-mercury
- Reduced water consumption on existing fixtures
- Upgraded copying machines for better indoor environmental quality
- Additional parking for environmental preferably transportation

- More points
  - Expanded measurement & verification
  - Ongoing recycling
  - Daylighting strategies

Brengel Benefits

- Integrated control system saved $225,000 during construction
- Lighting system consumes only .86 watts per sq. ft.
- 130,000 sq. ft. added – with no additional maintenance personnel
- 35% reduction in operating costs
- $76,000 in annual energy savings

$4.2 Million Savings Over the Next 10 Years!

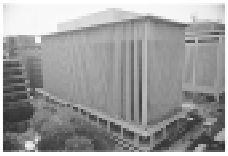
Notes

Sustainable Development Can Create a Competitive Advantage

- Paul von Paumgarten – Johnson Controls
- Michael Arny – National Geographic Society
- Greg Bell – JohnsonDiversey, Inc.

National Geographic Society

LEED Certification Case Study



Michael Arny

President

Leonardo Academy

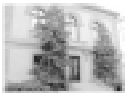
Case Study Overview

- Introduction to National Geographic
- Vision for Creating Green Buildings
- LEED Certification Program
- NGS's Performance Contract
- Cost/Benefit Analysis

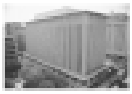
Notes

National Geographic

- One of the world's largest scientific and educational non-profit organizations
- Existing headquarter complex has four buildings



Hubbard Hall 100 years old



17th Street 40 years old

16th Street 60 years old

M Street 20 years old

Green Buildings Vision

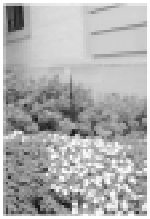
- *Engineering Department* challenge
- NGS vision for the new millennium
- 2000 *Corporate Service* goal
- Introduction to pilot program for LEED EB
- Johnson Controls selected as business partner

NGS Campus Green Building Adopted Operating Policies

- **Site**
  - Erosion control during site improvements
  - Hybrid vehicle parking and telecommuting
  - Green landscaping, [illegible] management
- **Energy**
  - Measurement & Verification plan
- **Materials & Resources**
  - Construction waste management
  - Resource reuse and recycled content policy
  - Certified wood
  - Green housekeeping management
  - Contractor materials management and reporting policy
- **Indoor Environmental Quality**
  - Construction IAQ management plan

Notes

LEED Certification Program



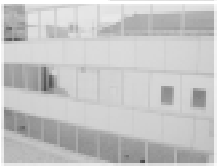
Water Sensor

Roof Replacement

LEED Certification Program

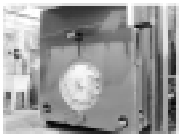
Bamboo Flooring

Lighting Controls

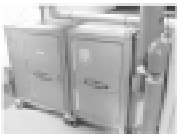


Window film

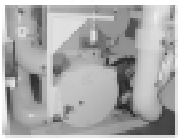
LEED Certification Program



Boiler



Air Handling Units



Evergreen Chiller

Variable Frequency Speed Drives

Notes

NGS Performance Contract

- Modified RFP based on LEED requirements
- Partnered with Johnson Controls
- Performance Contract Highlights
  - Core processes - energy & water consumption
  - Established metrics for specific savings performance
  - Guarantees become responsibility of NGS in future
- Quarterly Review with Business Partner

Cost/Benefit Analysis

- Results align with NGS mission
- Tremendous savings
  - 10% savings in energy costs
  - $300,000 annual savings in operational costs
  - Lower water consumption
  - Lower waste disposal expenses
- Increased Market Value
  - $7 million investment increased real estate value by $24 million
  - Improved equity, credit rating, debt borrowing capacity

Steelcase Wood Products Plant

Grand Rapids, Michigan

- World's First LEED-Certified Manufacturing Plant
- 600,000-square-foot facility, 700 workers
- 1.5 M gallons in annual water savings
- 70% reduction in VOC emissions

The Pentagon

Arlington, Virginia

- 6.5 million sq ft, 34 acre government facility
- Major renovation to integrate sustainable and secure operations
- Four projects registered with USGBC for LEED Certification

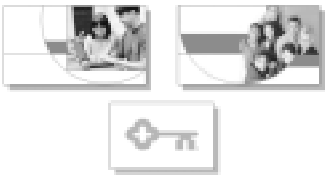
Boulder Community Hospital

Boulder, Colorado

- 265-bed acute care facility
- First LEED-Certified hospital
- Use of recycled materials in all possible areas
- Alternative vehicle transportation encouraged and supported

Key Bank

Cleveland, Ohio



- One of the nation's largest bank based financial services company
- Locations throughout the country
- Organizational sustainable upgrades and operations

Notes

Bren School, UC
Santa Barbara, California

- School of Environmental Science and Man-
- Agreement provides training for environmental problem solving
- LEED Platinum Certified Building
- Greenest laboratory in America
- Variety of excellence in sustainability awards

City of Chicago
Chicago, Illinois

- Industrial sustainability citywide rebuild program
- Green rooftop garden on top of City Hall
- DOE – Engine Company 46 and GSA – Area 1 are part of the LEED EB Pilot Program

Earning LEED for Existing Buildings Certification

JohnsonDiversey
Global Headquarters

LEED

Notes

Notes

Why go for LEED Certification?

- Why a sustainable building?
  - Drives down operational costs
  - Increases occupant satisfaction
  - Increases asset values of facilities
- LEED provides the roadmap and the recognition

LEED's Significance for JohnsonDiversey

- **Environmental Leadership** is 1 of 5 corporate business drivers.
- Regardless of design and construction, LEED-EB is the platform for **operating buildings, sustainably**.
- LEED-EB includes standards for **green-housekeeping** practices, chemical use and IAQ that can provide up to 26% of the certification points.
- Because of LEED's wide recognition, customers call on us to help them **understand and facilitate LEED certification**.
- JohnsonDiversey has pioneered **Healthy, High-Performance Cleaning**, which includes LEED-EB criteria.

Company's Sustainability Heritage

- The SC Johnson family of companies has a long history of commitment to sustainability.
- Practices embodied in company values called 'This We Believe':
  - Concern for environment
  - Concern for the community
  - Concern for employees

Notes

Environmental Leadership

- Mid-1970s, SCJ voluntarily **eliminated use of all CFCs** in aerosol products.
- Developed new technology and shifted market that **lead to Congressional ban of CFCs** in the late 70s.

JohnsonDiversey Global HQ

- **Integrated design** and construction process
- **Commissioned** to high environmental standards
- Contributed to **development of national standards for environmentally** responsible construction.
- **Completed before LEED-NC** standards were launched.
- Mandated to be **built at or below market costs** for a similar building with traditional construction.

LEED-EB Gold Certification

- Indoor Environmental Quality
  - Healthy, High-Performance Cleaning processes
  - Personal environmental controls at all workstations
  - CO2 monitoring
  - Use of natural daylight in more than 90% of occupied spaces
  - Line of site to outdoors from more than 80% of workspace
  - Innovative glare control

LEED

Notes

LEED-EB Gold Certification

- Sustainable site
  - 12 acres of restored wetlands and stormwater detention on 57-acre site
  - 30 acres of native prairie plants
  - Ongoing environmental site management

LEED-EB Gold Certification

- Energy use
  - Efficiency measures save $90,000 annually
  - Integrated building-automation, measurement & controls
  - Mixed-use facility (office and R&D labs) first to use ENERGY STAR® modeling

LEED-EB Gold Certification

- Materials and Resources
  - Rapidly renewable materials such as maplewood
  - More than 50% of site-generated waste is recycled
  - Use of very low VOCs

LEED-EB Gold Certification

- Water Use
  - Stormwater collected in detention ponds used for irrigation saving 2 to 4 million gallons
  - Low-use fixtures throughout building

Commitment to Sustainability

- **Live out** heritage and corporate strategy for **Environmental Leadership**
  - Engaged with the USGBC and other environmental organizations
  - Contributions to developing standards
  - Continuous improvement
- Respond to customer needs and an **emerging demand for safe, healthy high-performing buildings** with products, services and solutions
- Offer our **building as a 'living laboratory'** and model for managing facilities in environmentally preferable ways
- Align with world-class suppliers and other partners in a **constant delivery of environmental performance** to the market

Notes

FIATECH Smart Chips Project — Collaborating for the Future

Special Topic: FIATECH

Abstract

In early 2004, Fluor Corporation implemented a chip and sensor based concrete maturity technology as a global standard practice in less than six months. Fluor's corporate technology group learned about and piloted this technology in the FIATECH Smart Chips Project. The Smart Chips Project helps facility owners and EPCs leverage resources to implement commercial-ready or near-ready technology.

Since June 2003, the FIATECH Smart Chips Project has planned and conducted five realistic, in-field technology pilot studies and presented over a dozen online workshops with top academics, developers, and industry users. Smart Chips Project participants have used this collaborative learning and experience to accelerate implementation of valuable technologies.

In the implementation session, a panel of Smart Chips Project participants will share their experiences and discuss some promising new technology with construction industry application.

Plenary Session Presenter

Art Stout – Director, Capital Development Group, Intel Corporation

Art Stout joined Intel in 1979 and now manages both the design and construction process of Intel's largest semiconductor wafer fab expansions in the U.S. and overseas. He also manages the strategies for design and delivery of new facility capital projects worldwide and examines best in class activity within both the research community and the marketplace. He is the author of the *Project Triangle Principle*, which explores the challenge of balancing continuous changes in scope, schedule, and budget. Stout, a registered engineer (California and Arizona), earned a degree in mechanical engineering from Arizona State University.

e-mail: art.a.stout@intel.com

Implementation Session Moderator

Charles R. Wood – Smart Chips Project Manager, FIATECH

Charles Wood has over 20 years of experience in capital project development planning and execution for both owner and contractor organizations, including more than 15 years in senior level management positions. Wood has led and supported professional teams in planning and executing large ($300 million) capital facility development projects. He earned a bachelor's degree in construction technology from the University of Houston, an MBA and a master's in accounting from Rice University, and a master's in science and technology commercialization from UT Austin.

e-mail: cwood@fiatech.org

Implementation Session Participants

Ignatius Chan – Senior Scientist, ChevronTexaco Corporation
e-mail: ichan@chevrontexaco.com

Gary P. Chanko – Group Director, Fluor Corporation
e-mail: gary.chanko@fluor.com

Steven Glaser – Assistant Professor, University of California at Berkeley
e-mail: glaser@ce.berkeley.edu

FIATECH Smart Chips Project — Collaborating for the Future

Special Topic: FIATECH

The FIATECH Smart Chips Project, seed-funded by CII's Breakthrough Strategy Committee in 2003, helps facility owners and EPCs leverage resources to learn about, plan for, adapt, and implement commercial ready or near-ready technology. In early 2004, Fluor Corporation implemented a chip and sensor based concrete maturity technology as a global standard practice. The corporate implementation, from beginning of pilot testing to global deployment, took less than six months. Fluor's corporate technology group first learned about this technology and pilot tested it within the FIATECH Smart Chips Project.

Since its start in 2003, the FIATECH Smart Chips Project has planned and conducted five realistic in-field technology pilot studies of commercial ready technologies adapted to field construction and operations applications. Besides the concrete maturity technology, these pilots included: 1) commercial ready GPS technology to locate specific materials in laydown, 2) a RFID system to automate offshore materials and supply tracking, and 3) testing the capability of RFID technology to automate shipping and receiving of fabricated pipe and other highly metallic materials.

The FIATECH Smart Chips Project participants also collaborate on relevant construction technology developments through monthly online workshops with top academics, developers, and industry users. More than 50 Smart Chips workshop presentations have included: 1) extensive education in RFID technology and standards, 2) wireless networking technology and standards, 3) Global Positioning Systems (GPS) in civil construction application, 4) military logistics tracking systems, 5) concrete maturity monitoring systems, 6) micro-sensors in structural monitoring, 7) laser imaging, and much more.

By working as an industry group, the FIATECH Smart Chips Project participants have been able to leverage common resources, technology developer cooperation, and field experience to accelerate learning and implementation of valuable technologies.

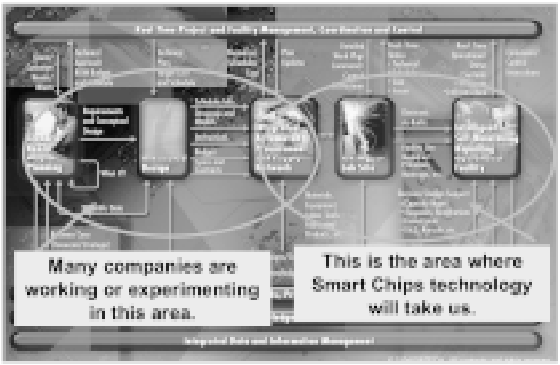
Notes

FIATECH

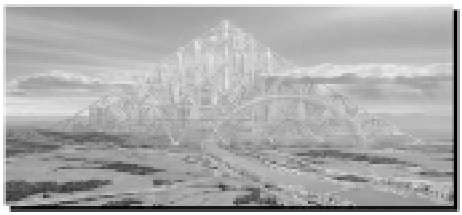
The Smart Chips Project:

Collaborating for the Future

FIATECH Vision of an
Integrated and Automated Capital Projects Industry



The Intelligent Jobsite
and Operating Facility



The Smart Chips Project

- Seed-funded by CII in 2002
- Technology pilots and education

Notes

What Are Smart Chips?

- **RFID** – Radio frequency identification
- **MEMS** – Micro electro-mechanical systems
- **Motes** – tiny networked sensor platforms

"Mote"

and more _ Global Positioning System (GPS), wireless networks, satellite communications

A way to radically improve productivity

FIATECH Smart Chips Sponsors

- Aramco Services
- ChevronTexaco
- DuPont
- Intel
- Procter & Gamble
- Bechtel
- Fluor
- Jacobs
- KBR
- Zachry

Collaborators:

NIST _ Carnegie Mellon _ UT Austin _ University of Kentucky
Tulane _ MIT Auto ID Center _ AIM Global

A Remarkable Success

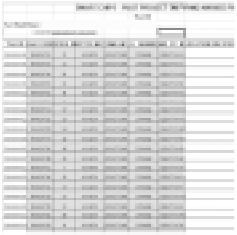
In early 2004, Fluor implemented a chip and sensor based concrete maturity technology as a global standard practice.

The implementation took less than six months from beginning of pilot testing to global deployment.

Notes

Tracking Fabricated Pipe with RFID

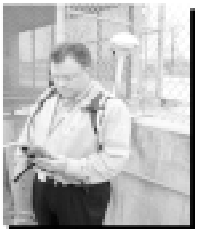
- Error-free, real time pipe supply visibility.
- Automatically documents shipping/receipt.



- Hosted by Fluor and Shaw Fabricators
- Observation and report by UT Austin and Carnegie Mellon

Locating Tagged Material with GPS

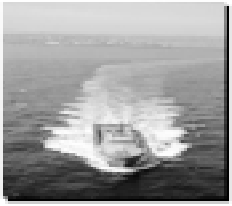
- Rapid positive location of items in laydown.
- Increase craft productivity, prevent critical item loss.



- Handheld gives location, bearing, distance.
- Hosted by KBR on a BP project site.

Offshore Material Logistics with RFID

- Reduce lost crew time, critical item loss.
- Real-time visibility of a remote and complex chain.



Hosted by ChevronTexaco

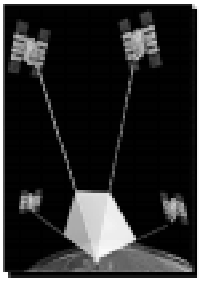
Notes

Sponsor Value: Collaboration Costs Less

- Address high value construction industry problems together.
  - Good supplier cooperation
  - Low cost pilot technology
- Present large common market for technology developers.
  - Lower cost technology
  - Better support (standards)

Smart chips project membership costs less than one independent in-house pilot.

Sponsor Value: Collaboration Produces More



Smart Chips Online Workshops
Industry focus audience attracts:
- Technologists
- Construction academics
- User and pilot case studies

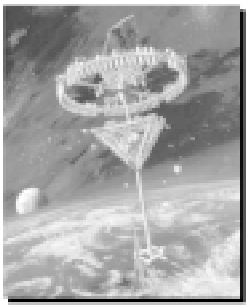
Relevant current topics:
- RFID-construction issues
- Industry-sponsored research
- In-depth pilot updates

Smart chips project costs less than sending two people to one conference.

What's Next?

Valuable opportunities are out there…

…What will you do with them?

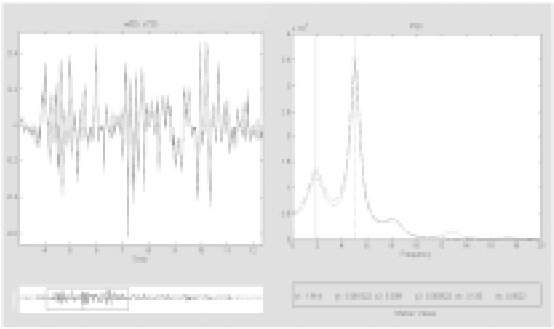


Notes

Mote (ADXL202) Accelerometer

Time Domain Comparison

Frequency Domain Comparison

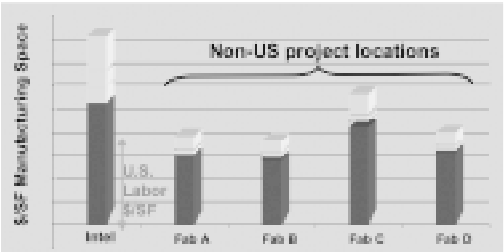


Why should you care…

…about successful collaboration in construction technology with FIATECH?

Intel Benchmark Study

Global Cost Comparison



If we can't compete in the U.S. on labor costs, then we need to find another way!


The Smart Chips Project:
Collaborating for the Future
Implementation Session
Gary Chanko Fluor
Ignatius Chan ChevronTexaco
Steven Glaser UC Berkeley
Charles Wood FIATECH

Notes


The Smart Chips Project:
Collaborating for the Future
Visit the Conference Display
for a hands-on demonstration
of smart chip applications.

Notes

The FIATECH Smart Chips Project:
Collaborating for the Future

Implementation Session:

Gary Chanko, Fluor

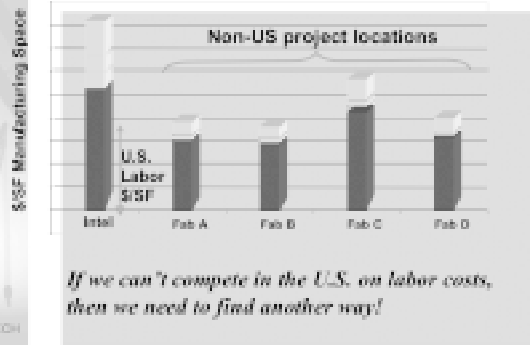
Ignatius Chan, ChevronTexaco

Steven Glaser, UC Berkeley

Charles Wood, FIATECH

FIATECH

Intel Benchmark Study
Global Cost Comparison



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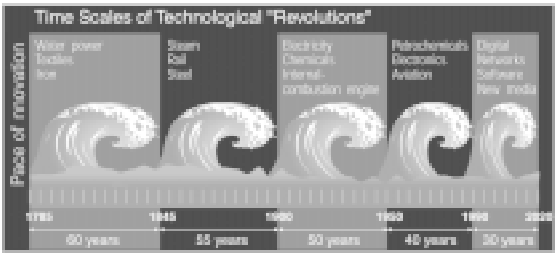
Productivity Growth
Growth in Real Output per Worker 1960-95

Country	Change
Japan	346%
Spain	303%
Italy	232%
Finland	201%
France	179%
Norway	168%
German	128%
Netherlands	123%
Denmark	119%
Sweden	116%
United Kingdom	108%
Australia	87%
Canada	68%
United States	57%
New Zealand	39%

FIATECH

Waves of Technological Change



We need to invest in technology, innovation, and commercialization…and we need to invest wisely.

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FIATECH Smart Chips Sponsors

- Aramco Services
- ChevronTexaco
- DuPont
- Intel
- Procter & Gamble
- Bechtel
- Fluor
- Jacobs
- KBR
- Zachry

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The FIATECH Smart Chips Project:

Collaborating for the Future

Implementation Session:

Gary Chanko, Fluor

Ignatius Chan, ChevronTexaco

Steven Glaser, UC Berkeley

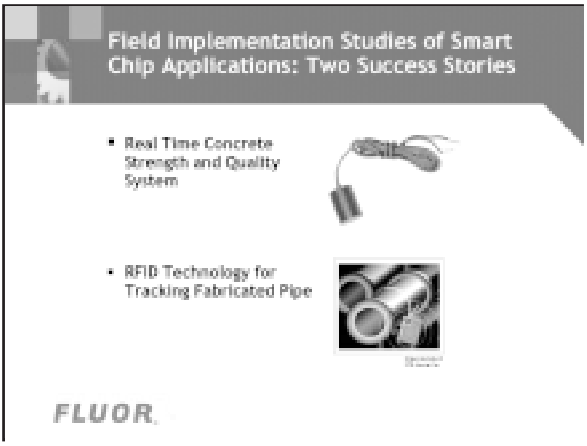
Charles Wood, FIATECH

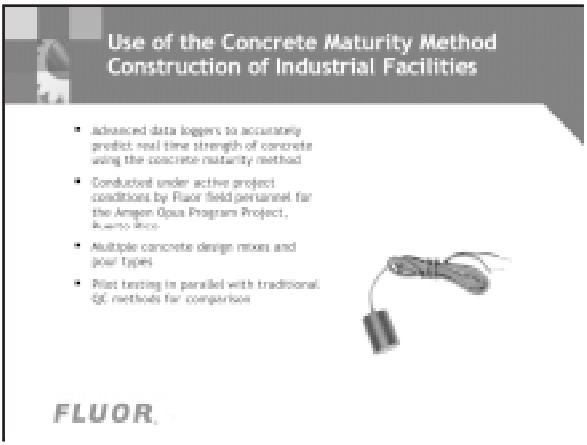
FIATECH

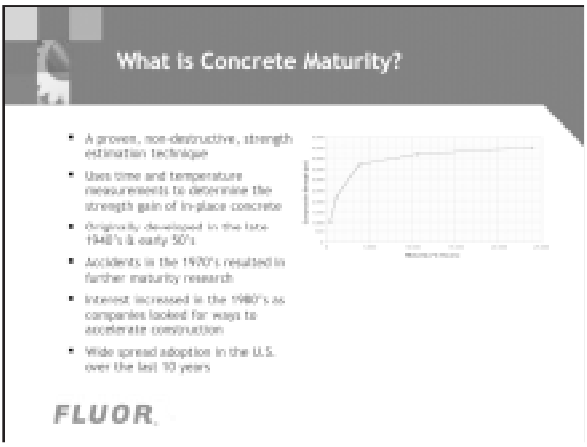
Notes

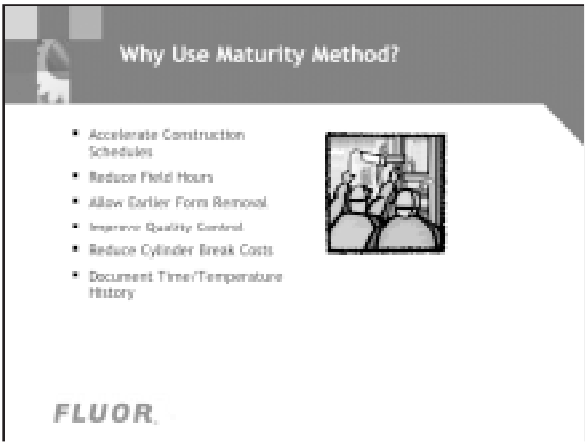
Notes

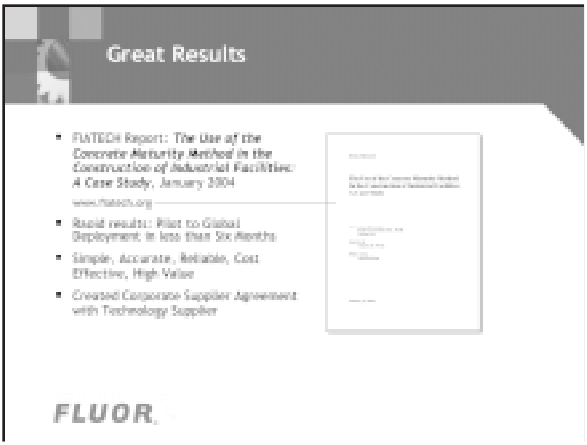

Field Implementation Studies
of Smart Chip Applications:
Two Success Stories
Smart Chips: How Smart Are They?
FIATECH 2004 Spring Meeting
Gary R. Clarke
Director, Construction Technology
FLUOR


Field Implementation Studies of Smart
Chip Applications: Two Success Stories
Real Time Concrete
Strength and Quality
System
RFID Technology for
Tracking Fabricated Pipe
FLUOR


Use of the Concrete Maturity Method
Construction of Industrial Facilities
Advanced data loggers to accurately
predict real time strength of concrete
using the concrete maturity method
Conducted under active project
conditions by Fluor field personnel for
the Amgen Opus Program Project,
Multiple concrete design mixes and
pour types
Pilot testing in parallel with traditional
QC methods for comparison
FLUOR


What is Concrete Maturity?
A proven, non-destructive, strength estimation technique
Uses time and temperature measurements to determine the strength gain of in-place concrete
Originally developed in the late 1940's & early 50's
Accidents in the 1970's resulted in further maturity research
Interest increased in the 1980's as companies looked for ways to accelerate construction
Wide spread adoption in the U.S. over the last 10 years
FLUOR


Why Use Maturity Method?
Accelerate Construction Schedules
Reduce Field Hours
Allow Earlier Form Removal
Improve Quality Control
Reduce Cylinder Break Costs
Document Time/Temperature History
FLUOR


Great Results
FIATECH Report: The Use of the Concrete Maturity Method in the Construction of Industrial Facilities: A Case Study, January 2004
www.fiatech.org
Rapid results: Pilot to Global Deployment in less than Six Months
Simple, Accurate, Reliable, Cost Effective, High Value
Created Corporate Supplier Agreement with Technology Supplier
FLUOR

Notes

Notes

RFID Technology for Tracking Fabricated Pipe

- Two Phase Field Trials
- Phase One: test RFID read capability in static controlled field environment
- Phase Two: conduct trials of RFID technology in realistic dynamic application

FLUOR

Phase One Results

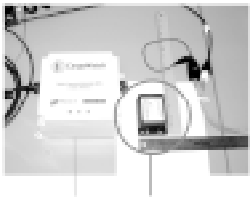
- Current active RFID technology works very effectively in a congested, metal intense construction field environment
- One reader sufficient to read all tags, when placed in a central location.
- Proved RFID tags work around metal pipe for identification of spool pieces.

Identic Solutions RFID tag

FLUOR

Phase Two: Testing Through A Portal

- Is it possible to record tags on spool pieces loaded on a truck as the truck is driven through a portal?
- Technology and equipment furnished from Phase IV Engineering

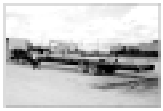


Reader RFID Tag

FLUOR

Tagging the Spool Pieces

Truck and trailer loaded with spool pieces



Spool pieces with tags attached to the flange ends

FLUOR

Trailer Passing Through the Portal

Antenna locations circled in red

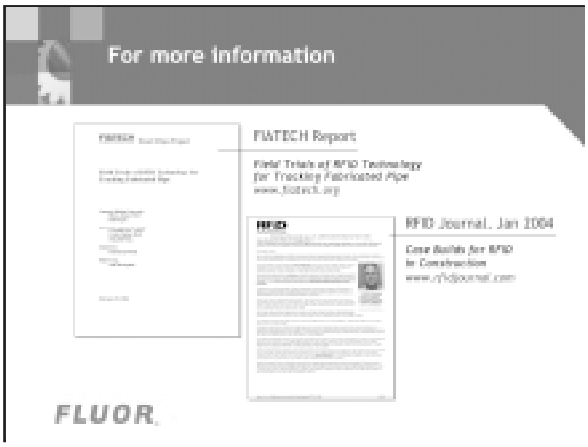
FLUOR

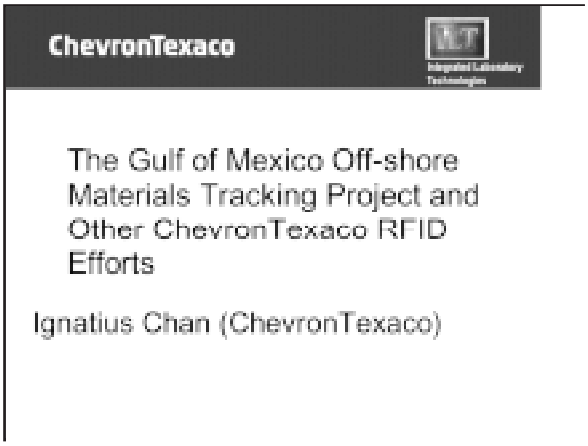
Phase Two Results

- Able write and read data on a tag.
- One reader sufficient to read all tags, when placed in a central location.
- Able to pass load of tagged spool pieces through a portal and read all tags.
- Able to vary the load structure and tag placement and still read all tags.
- Developed a repeatable procedure for 100% read.

FLUOR

Notes


For more information
FIATECH Report
RFID Journal, Jan 2004
FLUOR


ChevronTexaco
The Gulf of Mexico Off-shore Materials Tracking Project and Other ChevronTexaco RFID Efforts
Ignatius Chan (ChevronTexaco)


Off-shore Materials Tracking Project
ChevronTexaco

Notes

Notes

ChevronTexaco Gulf of Mexico Offshore Material Tracking Using RFID Tags

Project Team:

- ChevronTexaco
  - Opportunity for technology usage
- Fiatech
  - Technology consortium
  - Supplier contacts for technology
- Phase IV Engineering
  - Providing RFID hardware
  - Programming for ChevronTexaco specific process
- Tulane University
  - Reporting – academic rigor and objective view

ChevronTexaco Gulf of Mexico Offshore Material Tracking Using RFID Tags

PROJECT OBJECTIVE:

Understand the factors and feasibilities of using RFID technology in tracking the movement of materials from the Venice shore base to the Main Pass 41 field.

Problems Identified:

- Items unaccounted for at the base
- Items not delivered to the platform
- Items not loaded on the boat
- Items misplaced in yard/warehouse
- Items disappeared on route
- Items unaccounted for (no confirmation of receipt offshore)
- Items delivered to the wrong platform

ChevronTexaco Gulf of Mexico Offshore Material Tracking Using RFID Tags

Scope:

- Tracking of material shipments to and from the Venice shore base terminal to the Main Pass 41DLM facility using RFID technology.
- Hardware: 60 RFID tags, 2 handheld readers
- 1 month study; parallel to existing process
- Checkpoints in the process
- Observations at each location

Notes

Learnings about the RFID technology

The fundamental RFID technology performed well. Both the hardware and software were easy to use. They operated with no problem in the marine weather/environment.

The RFID technology appears to suit our needs better than bar codes if we want to automate the shipping and receiving process

Most of the people involved were able to visualize the eventual benefits relating to their own specific jobs

Learnings about the Work Process

Need to closely couple the work process and the technology in order to successfully realize benefits

More initial training was required before starting the pilot

The technology forced a more stringent process

The work process design must include steps to resolve exceptions and determine whether there is an error in shipping or an instrumental failure

Other Learnings

The best case is to have the vendor tags the items and send us the electronic manifests. The benefit is the greatest when the technology is incorporated furthest upstream in the supply chain.

RFID makes it easy to provide accountability (fast, accurate). Manual process of accountability is tedious and they skip it.

Notes

Future Applications of RFID and Related Technologies in ChevronTexaco

Inventory Management and Tracking

- Warehouse for internal operations
- Supply Chain operations for Marketing

Safety

- Tracking of hazardous materials
- Monitoring in hazardous environments

Maintenance / Reliability

- Monitor equipment performance and usage
- Manage service schedules and prevent incidents

Key Issues for ChevronTexaco Technology Implementation

Acceptance from business units: Operating units need to see clearly value drivers and benefits

Infrastructure Development: Information needs to be interfaced with legacy IT systems

Relevant Sensors: Applications depend on parallel sensor technology advances

Wireless networks: Future of industrial automation

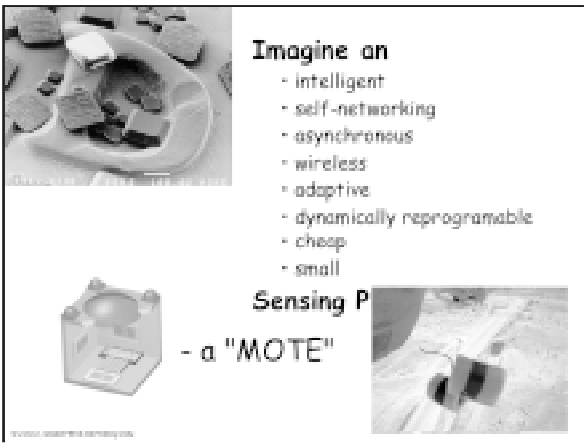
New Sensor Technologies for Monitoring the Civil Systems

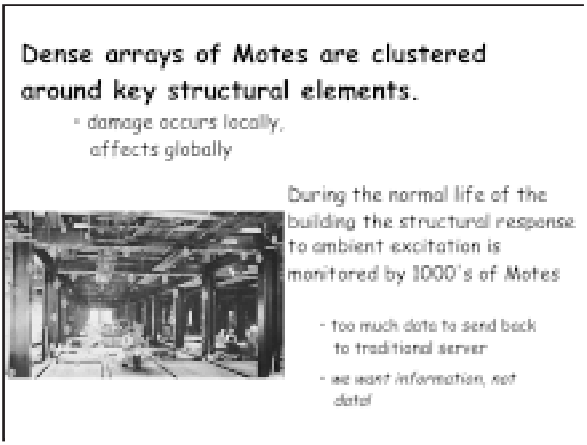
Application

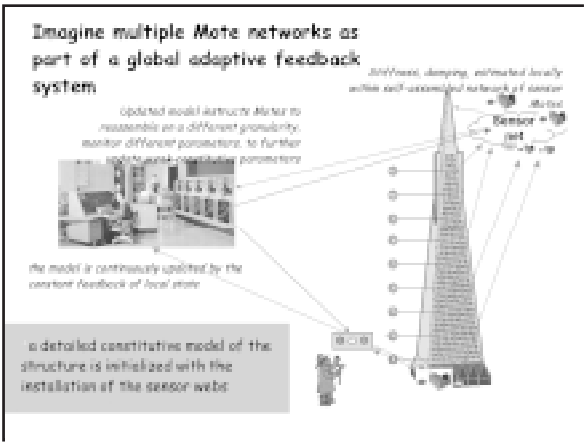
Science

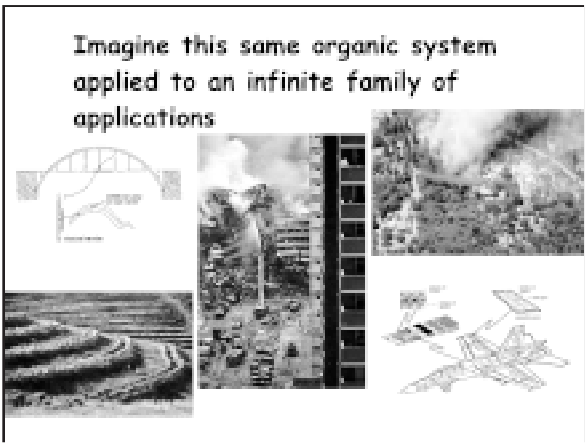
Prof. Steven Glaser (glaser@ce.berkeley.edu)

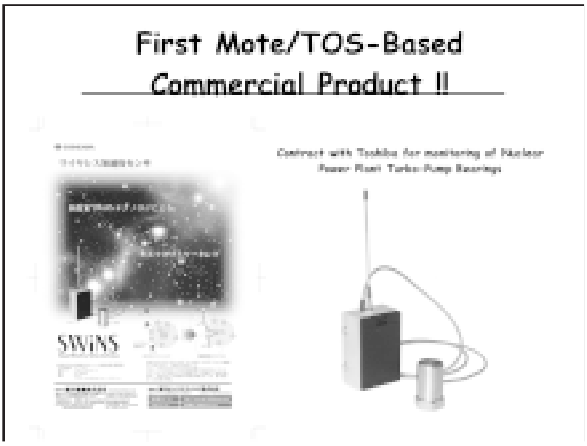
Notes

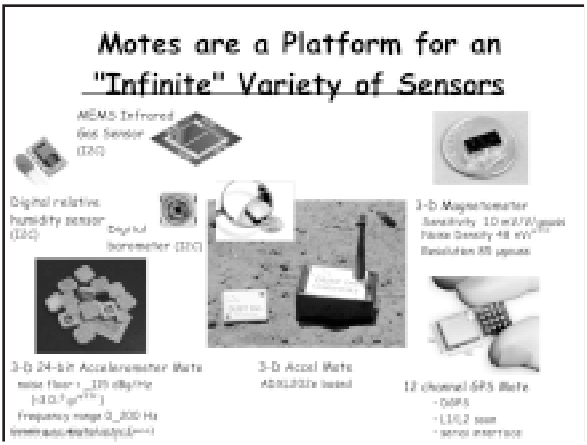

Imagine an
- intelligent
- self-networking
- asynchronous
- wireless
- adaptive
- dynamically reprogramable
- cheap
- small
Sensing P
- a "MOTE"


Dense arrays of Motes are clustered around key structural elements.
- damage occurs locally, affects globally
During the normal life of the building the structural response to ambient excitation is monitored by 1000's of Motes
- too much data to send back to traditional server
- we want information, not data!


Imagine multiple Mote networks as part of a global adaptive feedback system
updated model instructs Motes to reassemble on a different granularity, monitor different parameters, to further
the model is continuously updated by the constant feedback of local state
a detailed constitutive model of the structure is initialized with the installation of the sensor webs


Imagine this same organic system applied to an infinite family of applications


First Mote/TOS-Based Commercial Product !!
Contract with Toshiba for monitoring of Nuclear Power Plant Turbo-Pump Bearings
SWiNS


Motes are a Platform for an "Infinite" Variety of Sensors
MEMS Infrared Gas Sensor (I2C)
Digital relative humidity sensor (I2C)
Digital barometer (I2C)
3-D Magnetometer
3-D 24-bit Accelerometer Mote
3-D Accel Mote
12 channel GPS Mote

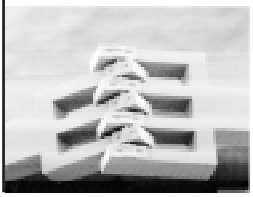
Notes

Notes

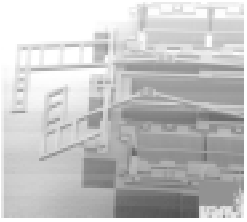
What is MEMS?

- MEMS is Micro ElectroMechanical Systems
  - Integrated circuit processing + micromachining
  - Sensors, Motors, Structures, Electronics Systems, on a micron (mm?) to centimeter scale

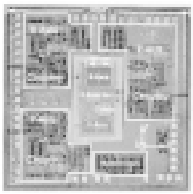
e.g. Synthetic Insects
(Smart Dust with Legs)



Goal: Make silicon walk.

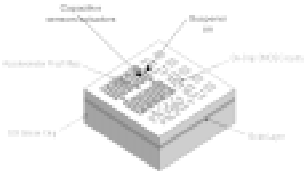


MEMS Inertial Sensor



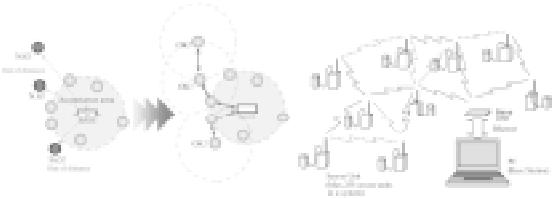
- MicroElectro Mechanical Systems
- 3-D accelerometers
- 3-D Rate Gyros
- 16- bit digitization

SOI-MEMS process

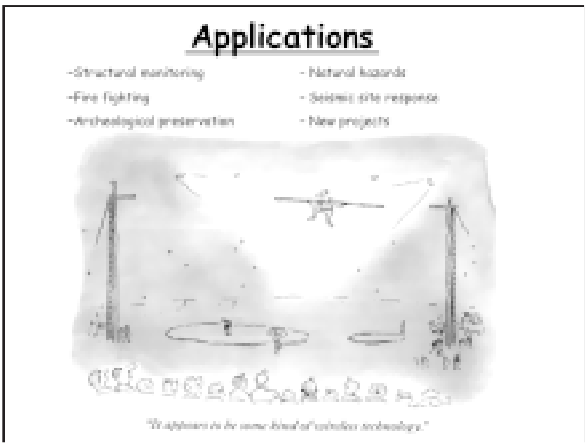


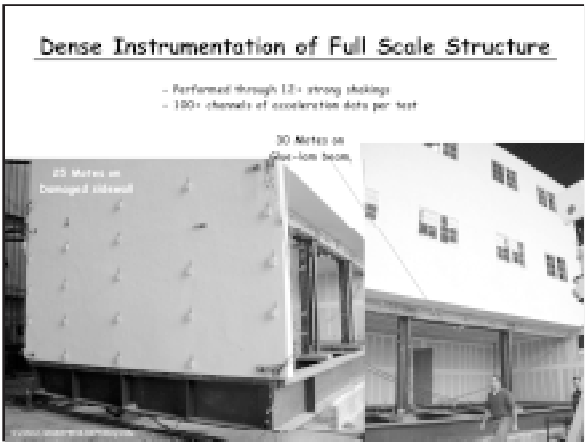
- Force-Balance accelerometer

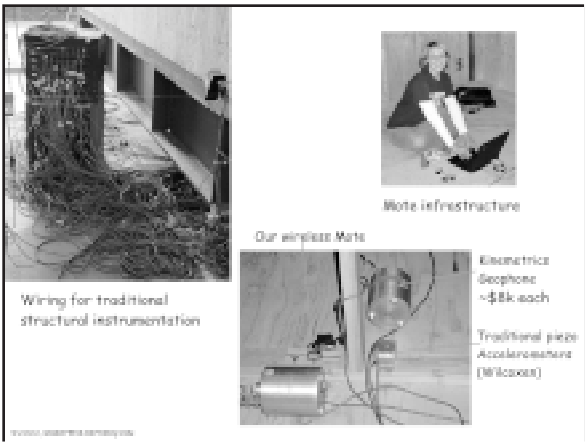
Self-Assembling, Redundant Networking



- Active Dynamic Route Determination
- Radio cell structure very unpredictable
- Builds and maintains good breadth-first forest
- Each node only records own state and parent(s)

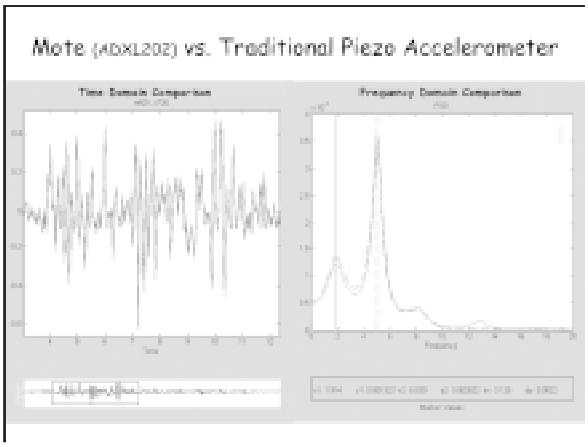

Applications
-Structural monitoring
-Fire fighting
-Archeological preservation
- Natural hazards
- Seismic site response
- New projects

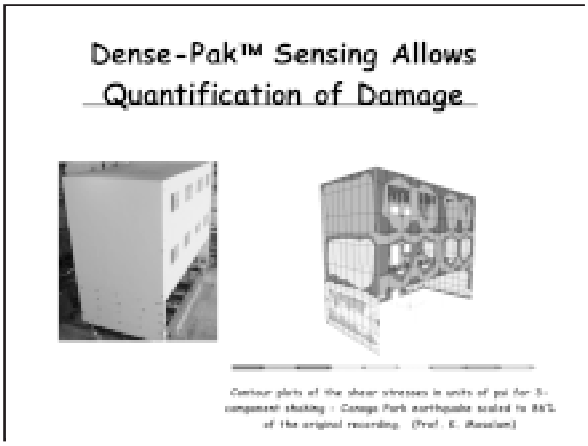

Dense Instrumentation of Full Scale Structure
- Performed through 12+ strong shakings
- 180+ channels of acceleration data per test
30 Motes on
Our-line beam
40 Motes on
Damaged sidewall

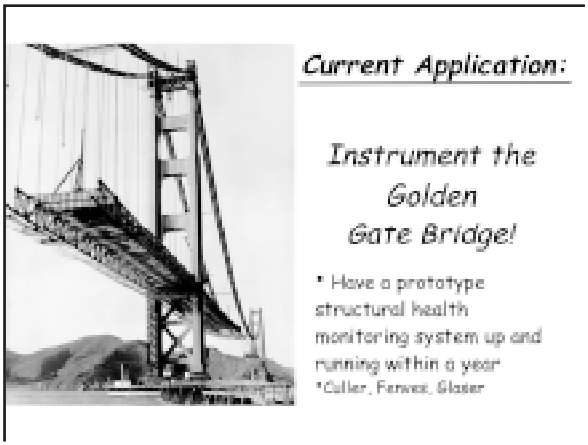

Wiring for traditional
structural instrumentation
Mote infrastructure
Our wireless Mote
Kinemetrics
Geophone
~$8k each
Traditional piezo
Accelerometers
(Wilcoxon)

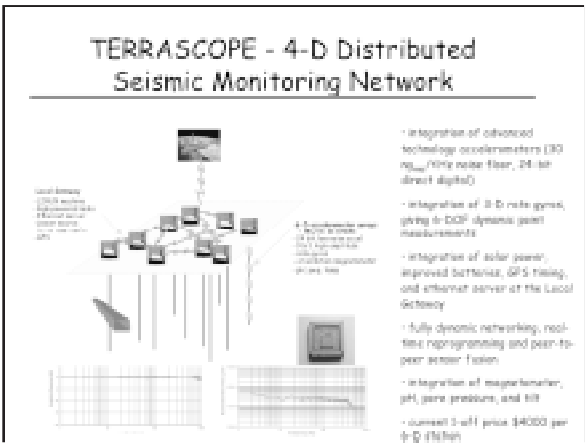
Notes

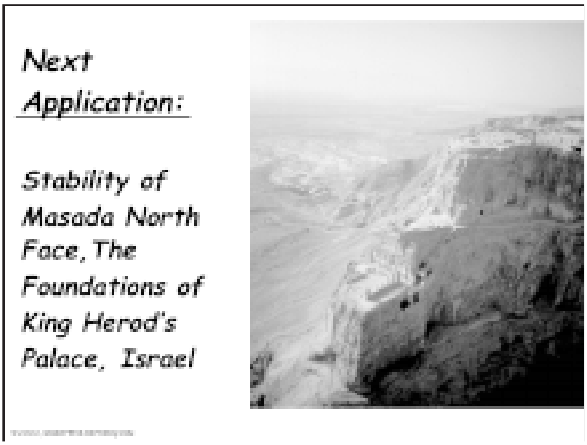
Notes

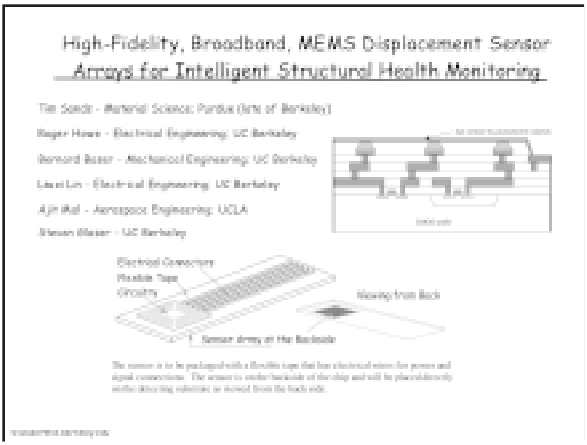

Mote (ADXL202) vs. Traditional Piezo Accelerometer
Time Domain Comparison
Frequency Domain Comparison


Dense-Pak™ Sensing Allows
Quantification of Damage


Current Application:
Instrument the
Golden
Gate Bridge!
* Have a prototype
structural health
monitoring system up and
running within a year
*Culler, Fenves, Glaser

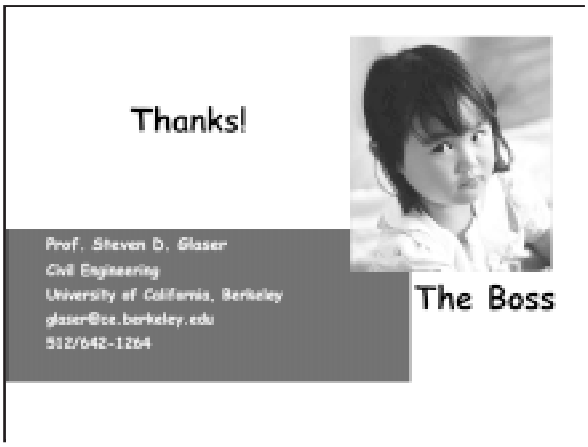

TERRASCOPE - 4-D Distributed
Seismic Monitoring Network

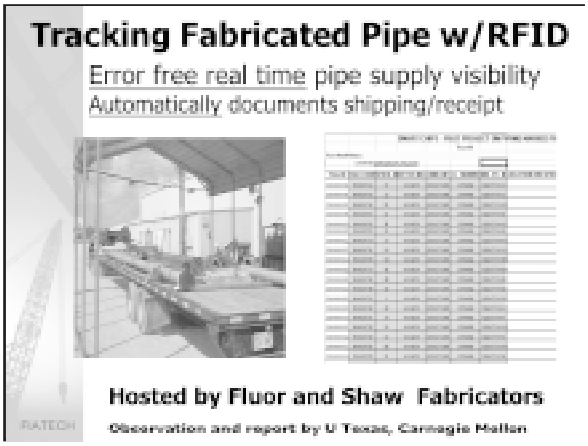

Next
Application:
Stability of
Masada North
Face, The
Foundations of
King Herod's
Palace, Israel


High-Fidelity, Broadband, MEMS Displacement Sensor
Arrays for Intelligent Structural Health Monitoring

Notes

Notes


Thanks!
Prof. Steven D. Glaser
Civil Engineering
University of California, Berkeley
glaser@ce.berkeley.edu
512/642-1264
The Boss


Tracking Fabricated Pipe w/RFID
Error free real time pipe supply visibility
Automatically documents shipping/receipt
Hosted by Fluor and Shaw Fabricators
Observation and report by U Texas, Carnagie Mellon
FIATECH


Locating Tagged Material w/GPS
Rapid positive location of items in laydown
Increase craft productivity, prevent critical item loss
Handheld gives location, bearing, distance
Hosted by KBR on a BP project site
FIATECH

Notes

Offshore Material Logistics w/ RFID

Reduce lost crew time, critical item loss

- Real-time visibility of a remote and complex chain

Hosted by ChevronTexaco

FIATECH

FIATECH Smart Chips Project Leverage Shared Experience

Address high value construction industry problems together

- Good supplier cooperation
- Low cost pilot technology

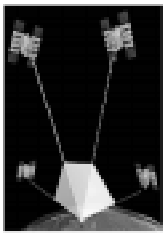
Present large common market for technology developers

- Lower cost technology
- Better support (standards)

SMART CHIPS PROJECT MEMBERSHIP COSTS LESS THAN ONE INDEPENDENT IN-HOUSE PILOT

FIATECH

FIATECH Smart Chips Project Leverage Shared Learning



Smart Chips Online Workshops

Industry focus audience attracts:

- Technologists
- Construction academics
- User and pilot case studies

Relevant Current Topics

- RFID- construction issues
- Industry sponsored research
- In-depth pilot updates

THE SMART CHIPS PROJECT COSTS LESS THAN SENDING TWO PEOPLE TO ONE CONFERENCE

FIATECH

Notes

The FIATECH Smart Chips Project:

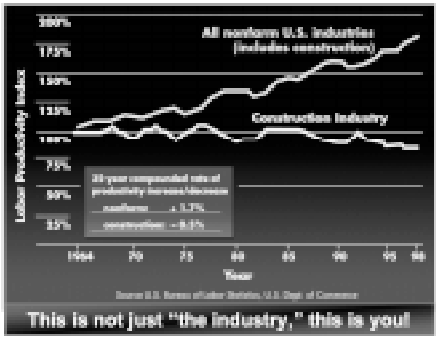
Collaborating for the Future

Implementation Session:

Gary Chanko, Fluor
Ignatius Chan, ChevronTexaco
Steven Glaser, UC Berkeley
Charles Wood, FIATECH

Productivity Gap

Construction lags behind the economy



Benchmarking as a Best Practice

Benchmarking & Metrics Committee

Abstract

Benchmarking has matured to CII Best Practice status – a documented and structured process with quantifiable benefits. Attendees will learn about the value member organizations are gaining through using the CII online Benchmarking Toolkit.

The Toolkit will be demonstrated online in the implementation session. Also, a panel will discuss both the challenges of implementation and the value obtained from the benchmarking process.

Plenary Session Presenter

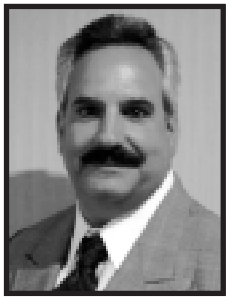
Robert A. Herrington – Manager of Quality, Southern Region, Jacobs Engineering Group

Bob Herrington has more than 37 years of experience in the chemical and petroleum refining industries, with 30 years in managerial positions with Union Carbide and Jacobs. At Union Carbide, he managed numerous multi-site and multi-functional manufacturing and engineering programs. At Jacobs, he has made significant contributions in benchmarking as well as work process improvement, customer satisfaction, and "virtual office" implementation–all focused on client value. At CII, he has been active with the CII Benchmarking & Metrics program since 1996 and is co-chair of the committee for 2004. Herrington earned a mechanical engineering degree from the University of Arkansas.

e-mail: bob.herrington@jacobs.com

Implementation Session Moderator

Frank K. Suhan – Project Management Consultant and Manager of Project Controls, Johnson Controls, Inc.



Frank Suhan has 22 years of experience involving many aspects of engineering and construction management, estimating, quality assurance, code compliance, facility commissioning services, and government facilities operations and management. He also has extensive experience in strategic planning, program development, and conceptual estimating in all types of project delivery systems. A Six Sigma Black Belt, Suhan has led diverse teams on business improvement projects applying Six Sigma methodologies. He holds a bachelor's degree in civil engineering, construction management, and structural engineering from Michigan Technological University.

e-mail: frank.k.suhan@jci.com

Implementation Session Participants

Dean Ergenbright – Program Analyst, U.S. Department of State
e-mail: ergenbrightde@state.gov

Harold L. Helland – Manager, Project Engineering, Abbott Laboratories
e-mail: harold.helland@abbott.com

Robert A. Herrington – Manager of Quality, Southern Region, Jacobs
e-mail: bob.herrington@jacobs.com

James H. Jones – Project Manager, 3M
e-mail: jhjones@mmm.com

Grant G. Landry – Manager, Business Development, Jacobs
e-mail: grant.landry@jacobs.com

Stephen R. Thomas – Associate Director, CII
e-mail: sthomas@mail.sthomas@mail.utexas.edu

Other Knowledgeable Points of Contact

Ron Beechey Scheduling Specialist, Dofasco, Inc.
e-mail: ron_beechey@dofasco.ca

Gertraud F. Breitkopf – Senior Program Manager, U.S. General Services, Administration
e-mail: gertraud.breitkopf@gsa.gov

Tom Butts – Manager, Southwest Operations, Lockwood Greene
e-mail: tbutts@lg.com

Robert E. Chapman – Economist, Office of Applied Economics, National Institute of Standards & Technology
e-mail: robert.chapman@nist.gov

Jean Childers – Accounts Operations Manager, AMEC, Inc.
e-mail: jean.childers@amec.com

Gregory D. Clum – Manager of Project Controls, Black & Veatch Corporation
e-mail: clumgd@bv.com

William G. Cooley, Sr. – Senior PMP Capital Effectiveness Engineer, U.S. Steel
e-mail: wgcooley@uss.com

Deborah L. DeGezelle – Systems Analyst, Construction Industry Institute
e-mail: debdeg@mail.utexas.edu

Dean Ergenbright – Program Analyst, U.S. Department of State
e-mail: ergenbrightde@state.gov

Donald A. Gaddy – Construction Safety & Health Manager, Engineering & Construction Services, Southern Company Generation & Energy Marketing
e-mail: dagaddy@southernco.com

James B. Gibson – Vice President, Projects, ALSTOM Power Inc.
e-mail: james.b.gibson@power.alstom.com

Kevin J. Gierc – Director, Project Controls, Dick Corporation
e-mail: kjgierc@dickcorp.com

Charles M. Green – Engineering Specialist , Aramco Services Company
e-mail: charlie.green@aramcoservices.com

Carl Gretzinger – Facilities Project Planner, Project Planning Department, General Motors Corporation
e-mail: carl.gretzinger@gm.com

David G. Hile – Operations Manager, Fru-Con Construction Corporation
e-mail: david.hile@frucon.com

Howard Kass – Senior Facilities Engineer Program Manager, National Aeronautics & Space Administration
e-mail: howard.kass@nasa.gov

John E. Kurth – President, Aker Kværner Pharmaceuticals
e-mail: john.kurth@akerkvaerner.com

John M. Mellin – Manager, Business Planning & Performance, GlaxoSmithKline
e-mail: john.m.mellin@gsk.com

Michael S. Mitchell – Director, Project Management Office, Refining & Chemical Industry Center, Emerson Process Management
e-mail: mike.mitchell@emersonprocess.com

Wladimir Norko – Senior Engineer, Technical Policy Branch, U.S. Army Corps of Engineers
e-mail: walt.norko@usace.army.mil

Mark T. Owens – Director, Global Facilities Delivery, Eli Lilly and Company
e-mail: mto@lilly.com

David M. Perkins – Project Manager, Rohm and Haas Company
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Derek C. Ross – Associate Director, Construction, Office of Facilities Engineering & Operations, Smithsonian Institution
e-mail: rossde@opp.si.edu

Michael J. Scholz – Engineer/Estimator, Kiewit Industrial Company
e-mail: michael.scholz@kic.kiewit.com

Danny Scott – Supervisor, Engineering Project Controls, BE&K, Inc.
e-mail: scottd@bek.com

James G. Slaughter – President , S&B Engineers and Constructors Ltd.
e-mail: jgsjr@sbec.com

John H. Stuart – Leader, Enterprise Project Management Office, NOVA Chemicals Corporation
e-mail: stuartj@novachem.com

John Tato II – Director, Project Evaluation & Analysis Division, U.S. Department of State
e-mail: tato-iij@state.gov

Stephen D. Warnock – Project Manager, Washington Group International, Inc.
e-mail: steven.warnock@wgint.com

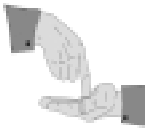
Notes

Benchmarking as a Best Practice

CII Annual Conference
Vancouver, British Columbia

My Objectives

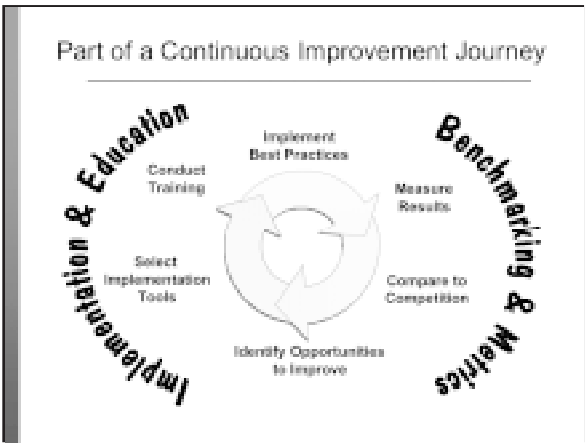
- Discuss Value of Benchmarking
- Establish Ease of Use
- Gain Your Participation

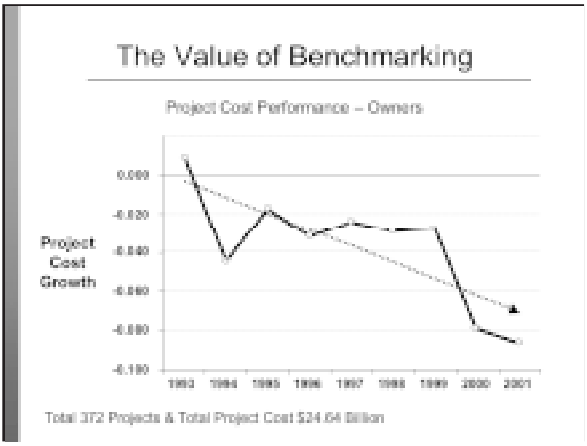


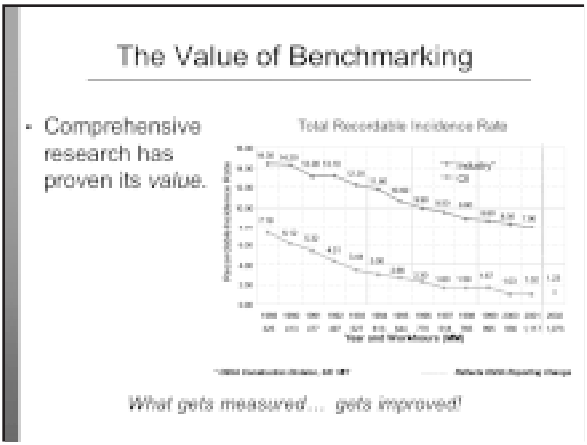
Benchmarking Is…

- measuring yourself against the best relative to:
  - Performance Metrics
    - Cost
    - Schedule
    - Safety
    - Rework
    - Changes
  - Best Practice Use
  - Productivity
- planning and executing your improvement journey to "best in class."

Notes


Part of a Continuous Improvement Journey
Implementation & Education
Benchmarking & Metrics
Implement Best Practices
Measure Results
Compare to Competition
Identify Opportunities to Improve
Select Implementation Tools
Conduct Training


The Value of Benchmarking
Project Cost Performance – Owners
Project Cost Growth
0.000
-0.020
-0.040
-0.060
-0.080
-0.100
1993
1994
1995
1996
1997
1998
1999
2000
2001
Total 372 Projects & Total Project Cost $24.64 Billion


The Value of Benchmarking
Comprehensive research has proven its value.
Total Recordable Incidence Rate
Industry
Year and Workforce (MM)
What gets measured… gets improved!

Notes

The Value of Benchmarking

- **Improves** project & company **performance** when used as an ongoing measure
- **Establishes** improvement goals based on external/**competitive benchmarks**
- **Enables** your company to understand & achieve "**best in class**" **performance**

Thought Break

Please ask yourself the following .....

- Have we planned an effective continuous improvement journey?
- Are we benchmarking?
- With CII?

CII Benchmarking Participation

- CII Benchmarking & Metrics participation
  - 1,200+ projects input in 8 years
  - Worth approximately $60 billion
  - Over 70 owners and contractors have participated
- New / re-energized companies benchmarking:

3M	General Motors Corp.
Anvil Corp.	General Services Admin.
BE&K	GlaxoSmithKline
CDI Engineering Group	Johnson Controls
Eli Lilly & Co.	Procter & Gamble
Foster Wheeler USA Corp.	Rohm & Haas

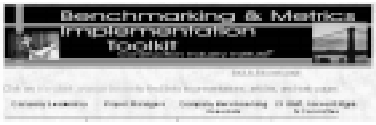
Benchmarking Is Easy at CII

Online

- Large Project questionnaire
- New Small Project questionnaire
- Implementation Toolkit

Implementation Toolkit

- Online http://cii-benchmarking.org/toolkit/main.cfm



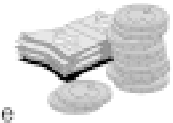
- Assists in the implementation of Benchmarking
  - Training slides
  - Project selection criteria
  - Printable questionnaires
  - Executive level and project level presentations demonstrating the value of benchmarking

Presentations Show the Value of Benchmarking

Notes

Notes

Summary



- Benchmarking .....
  - best practice
  - value to your bottom line
  - guide to "best in class" performance
  - easy at CII
  - requires your participation
- *What gets Measured Gets Improved !!!!*

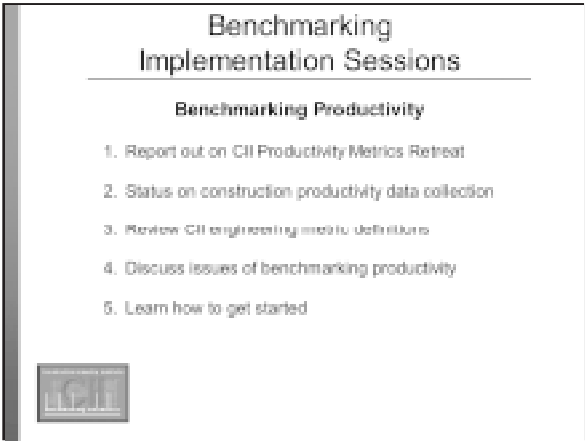
Learn More

- Visit the Conference Display Area
- Join our implementation sessions
- Get involved!

Benchmarking Implementation Sessions

Benchmarking as a Best Practice

1. Learn how to incorporate benchmarking into your project processes
2. See how member companies are gaining value through benchmarking
3. Review CII's Benchmarking Toolkit – the implementation resource for CII benchmarking
4. Hear testimonials from companies using CII benchmarking
5. Get an update on the status of CII benchmarking


Benchmarking
Implementation Sessions
Benchmarking Productivity
1. Report out on CII Productivity Metrics Retreat
2. Status on construction productivity data collection
4. Discuss issues of benchmarking productivity
5. Learn how to get started

Notes

Notes

Benchmarking As A Best Practice

CII Annual Conference Workshop
Vancouver, British Columbia

Objectives

- Define Benchmarking
- Benefits of Benchmarking
- Incorporating Benchmarking in Your Organization
- Tools & Training
- Closing Remarks
- Questions and Discussion

Panel Members

- Frank Suhan – Johnson Controls Inc.
- Grant Landry – Jacobs
- Dean Ergenbright – U.S. Dept. of State
- Harold Helland – Abbott Laboratories
- James Jones – 3M

Notes

What is Benchmarking

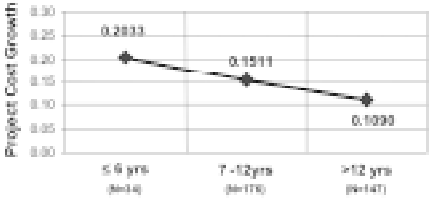
- Performance Metrics
- Best Practice Use
- Productivity Metrics
- Process Improvement

The Value of Benchmarking

Project Cost Performance - Owners

The Value of Benchmarking

Contractor Cost Performance
(Project Cost Growth)



Notes

Benefits

- System for Measuring Project Performance
- Enables Process and Performance Improvement
- Guide to Best in Class Performance

Incorporating Benchmarking

How do you incorporate Benchmarking into your corporate culture?

3M Journey

Johnson Controls Journey

BENCHMARKING AT JCI

Measure, Assess, & Improve

June 01, 2004

JOHNSON CONTROLS

Johnson Controls Vision

- Measure and improve our performance and increase customer satisfaction on high profile projects
- Quantify performance across the project lifecycle
- Gain recognition as a company that delivers projects with world class performance as compared to our peer group

Value

- Benchmarking can prevent poor performance when used as an ongoing measure
- Allows our corporate culture to learn what is possible outside of our current belief system
- Enables JCI to achieve breakthroughs in performance

JCI Maturity Model

Notes

Notes

How Information is Compiled

- JCI input (Area and PMO participation)
- CII (Construction Industry Institute) member company input
- Analysis by CII in conjunction with the University of Texas

Sampling of CII Company Members (Owners)

- General Motors
- Eli Lilly
- Proctor & Gamble
- GlaxoSmithKline
- DuPont
- The Dow Chemical Company
- U.S. Army Corps. of Engineers

Sampling of CII Company Members (Contractors)

- Johnson Controls Inc.
- Honeywell International
- Walbridge Aldinger Company
- Fluor Daniels
- Washington Group International
- Black & Veatch
- M.A. Mortenson Company
- Turner Construction Company

The Process

- Area project teams possess all of the project information that is required to benchmark
- JCI Project Management Office (PMO) will input all data into the system through an interview process with Project Managers
- Projects teams receive reports on performance
- Summary of project and corporate performance will be published by CII
- All information gathered is confidential

Levels of Use

Purpose for Using CII's Benchmarking Capabilities

Project System Improvement	Feedback on more than one project	Feedback on a single project	Productivity Eng. Or Con.

Why Should a Project Manager Care?

- Understand your own performance across your portfolio
- Objective measurement of performance
- Identify areas for personal improvement
- Provide project performance information to management
- Gain management recognition on high profile projects

Notes

Notes

We need your HELP!!!!!

- The quality of the reports are directly related to the quality of the information input
- The more projects that we input with quality data will yield a statistically significant report

Benchmarking Will Allow JCI to…

- Accurately analyze, improve, and DOMINATE our business!

Status of JCI Benchmarking

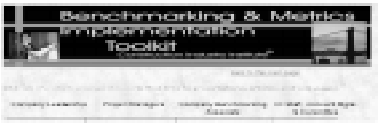
- In testing phase
- Have selected a sampling of completed projects
- Six projects submitted to date
- Benchmarking is EASY, 2-1/2 hours per project

Path Forward

- Identify projects for benchmarking early in the sales phase
- Continue to input completed projects
- CII small projects database available to member companies October 2003

Toolkit

- Online http://cii-benchmarking.org/toolkit/main.cfm



- Assists in the implementation of Benchmarking
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  - Printable questionnaires
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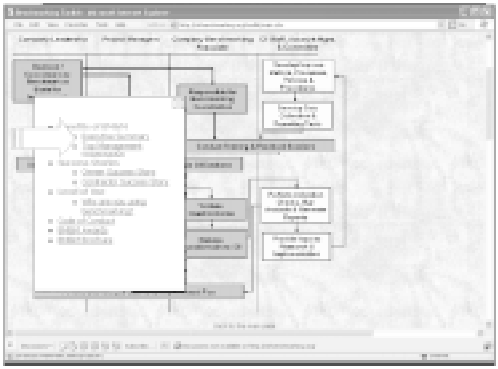
http://cii-benchmarking.org/toolkit/main.cfm



Notes

Notes

Training

- Held 3 times per year around the U.S.
  - Online training in development
- Participants gain an understanding of the metrics and their definitions
- Assures data is collected consistently and accurately
- Instruction on use of the online system
- Review of the small and large project questionnaires
- Demonstrate project and industry reports and their use in the improvement process
- Discussion on how Benchmarking is part of the Continuous Improvement Process

Summary

- Benchmarking is a Best Practice
- Benchmarking adds value to your organization and your bottom line
- Benchmarking is a guide to best in class performance
- Benchmarking requires your participation
- What gets Measured Gets Improved !!!!

Questions & Discussion

Building HIV/AIDS Infrastructure in Uganda

Case Study: Pfizer

Abstract

A critical element of a large-scale HIV/AIDS program is creating infrastructure for program delivery in the developing world. The recently constructed Infectious Diseases Institute (IDI) in Kampala, Uganda, is an example.

The plenary presentation will demonstrate that a comprehensive pre-project planning process was critical. In the implementation session, CII's *Pre-Project Planning Handbook* will be the focus. Key members of the IDI owner-contractor project team will share experiences, lessons learned, and data exchange.

Plenary Session Presenter

Donna J. Ryan-Rose – Senior Manager, Project Support Team, Pfizer Global Engineering

Donna Ryan-Rose helps develop, promote, and maintain project management tools that are consistent, efficient, and cost effective across the company. Her previous experience at Pfizer includes project management for commercial and pharmaceutical research capital facilities and facilities maintenance. She holds a bachelor's degree in mechanical engineering from The Catholic University of America, an MBA from the University of Rhode Island, and a master's in civil engineering from UT Austin.

e-mail: rose@pfizer.com

Implementation Session Moderators

Barbara Lawson – Project Director for Global Programs, Pangaea Global AIDS Foundation

Barbara Lawson joined Pangaea in 2001 and is currently responsible for the foundation's role as fiscal administrator of the Infectionous Diseases Institute at Makerere University, Uganda. She previously served in administration and finance posts at California State University-Monterey Bay and at Marin Community Foundation. She also is the former chief financial officer at the Pacific Stock Exchange, San Francisco. Lawson earned a bachelor's degree in English from UC Santa Barbara and an MBA from UC Berkeley.

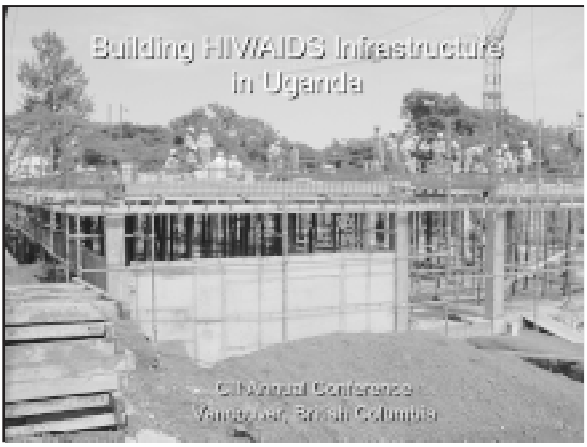
e-mail: blawson@sfaf.org

Donna J. Ryan-Rose – Senior Manager, Project Support Team, Pfizer Global Engineering

e-mail: rose@pfizer.com

Building HIV/AIDS Infrastructure in Uganda

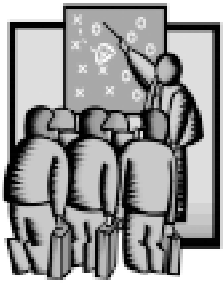
Plenary Slides



Notes

Building HIV/AIDS Infrastructure in Uganda

- Donna Ryan-Rose, Pfizer Inc.
- Barbara Lawson, Pangaea Global AIDS Foundation



Application of the
Pre-Project Planning Process
to the Construction of an HIV/AIDS Clinic
in Kampala, Uganda

Pre-Project Planning Handbook
CII Implementation Resource 39-2

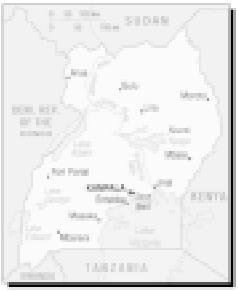
Notes

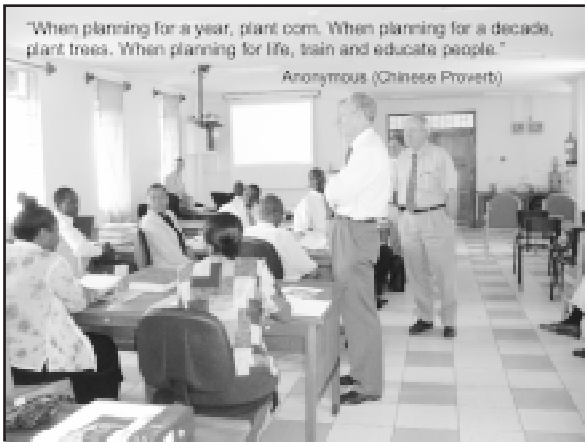
HIV/AIDS in Africa

- Worldwide, 40 million people live with HIV.
- Two-thirds live in Sub-Sahara Africa.
  - (20.6 million in 2003)
- In 2003, new HIV cases in Sub-Sahara Africa: 3 - 3.4 million
- Prevalence rates: 40 percent

Uganda

- About the size of Oregon
- 25.8 million people (2003 UN)
- 1890 - 1962: British Colony
- 1962 - 1986: unrest
- Avg. annual income: U.S. $260 (World Bank, 2001)
- 82%: agriculture, 13%: services, 5%: industry
- Adult prevalence rates: 1992: 30 percent, 2000: 8 percent
- Life expectancy: 42 years





Notes

Major Stakeholders

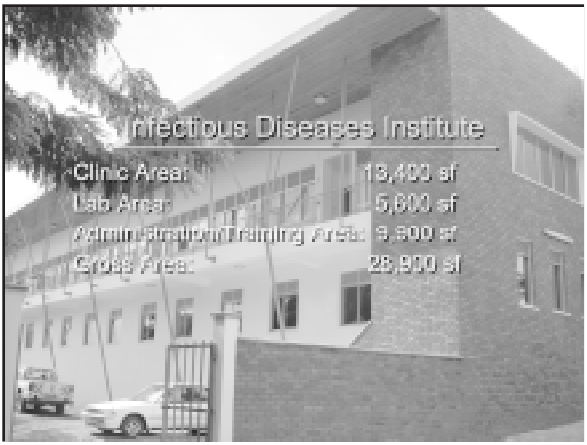
- Pfizer Foundation
- Pfizer Inc.

$11 million grant

- San Francisco AIDS Foundation (SFAF)
  Pangaea Global AIDS Foundation
- Makerere University/Faculty of Medicine
- Academic Alliance for AIDS Care in Africa

Project Goals

- Increase access to medical care
  - Expand the existing clinic
  - Construct state-of-the-art clinical care facility
- Train healthcare professionals
- Support prevention counseling
- Capacity Building
  - Infrastructure
  - Administrative
  - Operational



Notes

Project Challenges

Infrastructure

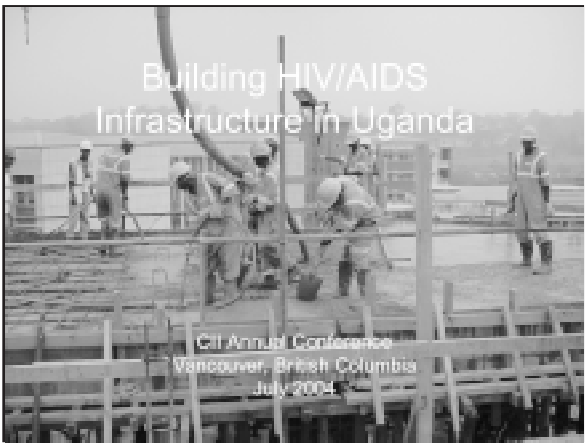
- Commercial
- Legal
- Technical
- Utilities

Project Challenges

- Economic risk
- Political stability
- Means & methods

Building HIV/AIDS Infrastructure in Uganda

Implementation Slides



Notes

Building HIV/AIDS Infrastructure in Uganda

- Donna Ryan-Rose, Pfizer Global Engineering, Pfizer Inc.
- Barbara Lawson, Pangaea Global AIDS Foundation

Application of the Pre-Project Planning Process to the Construction of an HIV/AIDS Clinic in Kampala, Uganda

Pre-Project Planning Handbook
CII Special Publication 39-2

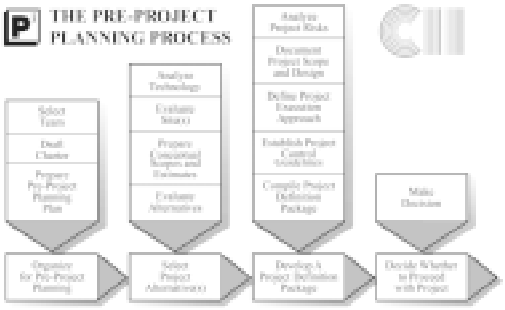
Notes

Presentation Outline

1. Introductory Comments
2. Pre-Project Planning Process
   - Application
   - Challenges
   - Lessons Learned
3. Q & A

"Proper prior planning prevents poor performance"

Anonymous



Notes

Organize for Pre-Project Planning

- Select Team
- Draft Charter
- Prepare Pre-Project Planning Plan

Organize for Pre-Project Planning
Select a Team

Membership on the team is fundamentally a function of organizational participation, and required attributes of individuals so that the team may accomplish its charter.

Notes

Organize for Pre-Project Planning
Draft Charter

Defining team mission,
authority,
responsibilities and
accountability.

Organize for Pre-Project Planning
Project Goals

- Increase Access to Medical Care
  - Expand the existing clinic
  - Construct State-of-Art Clinical Care Facility
- Training of Healthcare Professionals
- Support Prevention Counseling
- Capacity Building
  - Infrastructure
  - Administrative
  - Operational

Organize for Pre-Project Planning
Prepare the P^3 Plan

The pre-project plan is a
formulation and documentation of
the methods and resources
available .

Notes

Organize for Pre-Project Planning Challenges

- Simultaneous execution of:
  - Prepare the P^3 Plan
  - Select the Project Alternatives
- Phased development of the project team
  - Stakeholder alignment
  - Managing team dynamics
  - Definition of roles & responsibilities

Organize for Pre-Project Planning Lessons Learned

- Alignment of multiple stakeholders
- Managing organizational diversity
  - Defining roles and responsibilities
- Managing the geographic diversity
- Dedicate time and resources to communication

Select Project Alternatives

- Analyze Technology
- Evaluate Site(s)
- Prepare Conceptual Scopes and Estimates
- Evaluate Alternatives

Notes

Select Project Alternatives
Analyze Technology

Asses available technologies in relation to company needs and constraints .

Select Project Alternatives
Analyze Technology

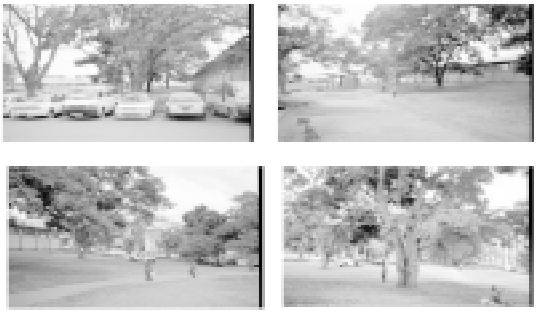
- Lab Design
  - Functional Requirements
  - Equipment Requirements
  - Lab Layout
  - Building Infrastructure Requirements
- Information Technology
  - Hardware Requirements
  - Software Requirements
- Utilities/Building Infrastructure

Select Project Alternatives
Evaluate Sites

Assessment of relative strengths and weaknesses of alternative locations to meet the teams requirements.

Notes

Select Project Alternatives
Evaluate Sites



Select Project Alternatives
Evaluate Site

- Existing Technical Infrastructure
  - Land ownership
  - Geotechnical Conditions
  - Utilities Infrastructure
    - Availability
    - Reliability
  - Professional Services
    - Availability
    - Level of Development
  - Construction Means & Methods
    - Skill level
    - Level of Development

Select Project Alternative

Prepare Conceptual Scopes & Estimates

Provide a reasonable order-of-magnitude estimate of capital costs, using preliminary scope information and early estimating methods.

Evaluate Alternatives

Develop a complete picture (cost benefits, economics etc.) of each alternative so a valid comparison can be made

Notes

Select Project Alternatives

Prepare Conceptual Scopes & Estimates
Evaluate Alternatives

- Identify Operational & Functional Program Requirements
- Comply with Local Codes
- Incorporated Industry Best Practices
- Balance Capital Cost with Life Cycle costs
- Positive impact on Local Economy
- Capacity building
- Culturally appropriate
- Develop project budget

Select Project Alternatives

Prepare Conceptual Scopes & Estimates
Evaluate Alternatives

- Facility Functional Summary
  - Clinic: 15 Exam Rooms=200 outpatients per day.
  - Training: 100 health care workers per year
  - Lab: Lab testing support for 30% - 50% of outpatients (100 patients/day)
- Basis of Design
- Project Budget

Select Project Alternatives Challenges

- Managing Stakeholder Expectations
  - Cost
  - Schedule
- Availability of reliable cost data
- Local knowledge of means & methods

Notes

Select Project Alternatives
Lessons Learned

- Project Planning Due Diligence
- Managing Stakeholder Expectations
  - Process Education
  - Project Cost
  - Project Schedule
- Communication
- Local Representation

Develop A Project Definition Package

- Analyze Project Risks
- Document Project Scope and Design
- Define Project Execution Approach
- Establish Project Control Guidelines
- Compile Project Definition Package

Develop a Project Definition Package
Analyze Project Risks

- Technical Infrastructure
  - Professional Services
    - Availability
    - Level of Development
  - Construction Means & Methods
    - Skill level
    - Level of Development
  - Utilities Infrastructure
    - Availability
    - Reliability
  - Facility Sustainability

Notes

Develop a Project Definition Package
Analyze Project Risks

- Project Execution
  - Local experience, International systems
  - Multiple Stakeholder
  - Organizational Diversity
  - Geographic Diversity: 3 continents, 11 time zones
  - Procurement Logistics

Develop a Project Definition Package
Analyze Project Risks

- Commercial Infrastructure
  - Banking System
  - Manufacturing Base
  - Shipping/Storage/Warehousing
- Legal Infrastructure
  - Contract Law
  - Legislative Environment

Develop a Project Definition Package
Analyze Project Risks

- Economic Risk
  - Exchange rate
  - Import/Customs/VAT
  - "Deep Pocket" Syndrome
  - Non-value Added Fees
- Political Risk
  - Individual vs. systemic

Notes

Infrastructure Development Challenges

- Sociological Issues
  - Economics of Scarcity
  - Explorer vs. Settler Syndrome
  - "Do Gooder" Syndrome
  - "Local" Connection
  - Now vs." Now-Now" vs. "Now-Now-Now"
  - Regional Diversity

Develop a Project Definition Package

- Document Project Scope & Design
  - Clearly define and communicate the basic requirements and objectives of the project
- Define Project Execution Approach
  - Clearly define the key elements of "how" a project will be executed along with the procedures, methods and resources required to the project execution.
- Establish Project Control Guidelines
  - Clearly define the processes for monitoring, evaluating, and adjusting the project execution as the project performance is compared to the project plan.
- Compile Project Definition Package
  - Summary of the project information

Develop a Project Definition Package

- Document Project Scope & Design
  - Revised Basis of Design & OME Budget
- Define Project Execution Approach
  - "GMP Design-Build" process executed in 2 phases
  - Steering Committee: contract T&C, strategic planning
  - Project Committee: tactical project management
  - Pangaea Site Presence with Technical Consultants
- Establish Project Control Guidelines
  - International Federation of Consulting Engineers (FIDIC) Contract template
- Compile Project Definition Package
  - Library of documents

Notes

Develop a Project Definition Package
Challenges

- Identifying "next phase" resources
- Managing Stakeholder Expectations
- Communications

The Pre-Project Planning Process

- Organize for Pre-Project Planning
- Select Project Alternatives
- Develop a Project Definition Package
- Decide Whether to Proceed with Project

Notes

Project Goals

- Increase Access to Medical Care
  - Expand the existing clinic
  - Construct State-of-Art Clinical Care Facility
- Training of Healthcare Professionals
- Support Prevention Counseling
- Capacity Building
  - Infrastructure
  - Administrative
  - Operational

Project Goals

- Increase Access to Medical Care
  - Expand the existing clinic
  - Training of Healthcare Professionals

Project Goals

- Increase Access to Medical Care
  - Expand the existing clinic
    - 3,800 patients registered by 12/03
    - 1,700 patient visits per month
    - 300 new patients per month
  - Training of Healthcare Professionals
    - 48 physicians trained

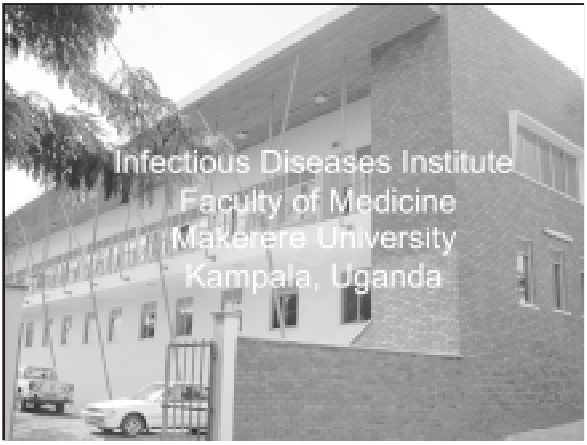
Notes

Project Lessons Learned

- Implementation of the Vision of the End User
- Flexible Funding
- Dedicate time & resources to communication
- Create & follow detailed business plan
- Commitment to build local capacity & sustainability

Project Lessons Learned

- Build a transparent financial & management plan
- Project controls process
- Project resourcing
- Rigorous pre-project planning & project management plan
- Clarification of roles & responsibilities
- Adjust timeframes & expectations to fit resource limited environment


Infectious Diseases Institute
Faculty of Medicine
Makerere University
Kampala, Uganda

Notes

Lessons from 9/11: Prepare, Plan, and Practice

Keynote Speaker: Joe M. Allbaugh

Abstract

How quickly companies can get back to "business as usual" after a flood, a fire, a tornado, or a terrorist attack depends on an investment in planning today. Planned business continuity, including training and exercises, reassures the staff, customers, and suppliers that the firm will be open for business after a major disaster. In so doing, companies will be planning effectively for sustainable development, which supports the community, the employees, and the nation.

Speaker

Joe M. Allbaugh – President & CEO, The Allbaugh Company

Joe Allbaugh formulates corporate strategies to expand competitive advantage for private sector clients. As the former Director of the Federal Emergency Management Agency (FEMA) during 2001-2003, he managed 2,500 employees and an annual budget of $3 billion. After the September 11, 2001, terrorist attacks, Allbaugh coordinated the Federal government's $8.8 billion response and recovery effort. He was also a founding member of the Homeland Security Advisory Council. Prior to his presidential appointment at FEMA, he was the national campaign manager for Bush–Cheney. Before that, he served as chief of staff to then-Governor Bush. Allbaugh holds a bachelor's degree in political science from Oklahoma State University.

e-mail: joe.allbaugh@theallbaughcompany.com

The Corps of Engineers' Role in Rebuilding Iraq

Keynote Speaker: Gen. Robert L. Davis, U.S. Army

Abstract

General Davis will discuss the role of the Corps of Engineers in supporting the Coalition Provisional Authority and the new government of Iraq. Having spent six months in Iraq from June through December 2003, he assisted in setting up the Project Management Office. Today the Corps of Engineers continues to oversee military construction for multi-national forces in Iraq as well as providing construction services to the Project Management Office for restoring essential services and facilities as part of international efforts to rebuild Iraq.

Speaker

Brigadier General Robert L. Davis – Commander and Division Engineer of the Pacific Ocean Division, U.S. Army Corps of Engineers

Brigadier General Robert L. Davis is responsible for engineering design, construction, and real estate management for the Army and Air Force in Hawaii and Alaska and for all Department of Defense agencies in Japan, Korea, and Kwajalein Atoll, Marshall Islands. His division administers the Corps' federal water resource development and regulatory programs in Alaska, Hawaii, American Samoa, Guam, and the Northern Mariana Islands. He deployed to Iraq for six months during Operation Iraqi Freedom and served as Commander, Iraq Provisional Command, Baghdad. He has been with the Corps of Engineers since 1974, and has been awarded the Legion of Merit (five times), the Bronze Star Medal (twice), and the Parachutist and Air Assault badges. General Davis earned a degree in industrial engineering from Auburn University, a master's in operations research from Georgia Tech, and also is a graduate of the Army Command and General Staff College and the Air War College.

e-mail: larry.davis.bg@pod01.usace.army.mil

Working Safely in Global Construction

Case Study: Rohm and Haas and Jacobs

Abstract

This presentation will use a recently completed project near Mumbai, India, as a case study to show how any project in any location can be done safely. Tools, techniques, cultures, and management involvement will be discussed as the success factors.

The implementation session will describe what made this project successful and the steps that can be taken to have a successful safety program anywhere in the world. Informational and motivating, it will show what can be done with the correct focus and management support.

Plenary Session Presenter

Tom E. Will – Director of Capital, Engineering, and Process Development – Coatings, Rohm and Haas Company

With extensive and wide-ranging experience in the power, utility, and chemical business for Rohm and Haas, Tom Will now has responsibility worldwide for major capital projects at the company. At CII, he chaired the Owner/Contractor Work Structure Research Team in the late 1990s, and has been active on the Globalization Committee and other CII efforts for several years. Will addressed the CII Annual Conference in Minneapolis, Minnesota, in 1998. He holds a bachelor's degree in mechanical engineering from the University of Virginia.

e-mail: twill@rohmhaas.com

Implementation Session Moderators

Randy Arrington – Alliance Manager, Jacobs Engineering

Randy Arrington has been involved in managing alliances at Jacobs for the last eight years. His focus is on alliances and creating value with long-term owner/contractor relationships.

e-mail: randy.arrington@jacobs.com

Tom E. Will – Director of Capital Deployment – Coatings, Rohm and Haas Company

Implementation Session Participants

Geoff Bell – Project Manager, Rohm and Haas Company
e-mail: gbell@rohmhaas.com

Lazar (Benny) Arimbrue – Construction Manager, Jacobs H&G
e-mail: mumbai.construction@jacobs.com

Working Safely in Global Construction

Case Study: Rohm and Haas and Jacobs

Executive Summary

It is possible to have a construction project with no recordable injuries. Furthermore, it is possible to achieve this goal anywhere in the world. Rohm and Haas in conjunction with Alliance Partner, Jacobs H&G (Jacobs), constructed a grassroots Adhesives & Sealants and Emulsions plant in Taloja, India (near Mumbai). The project was successful on many fronts: cost, schedule, quality, attainment of business goals, and safety.

The safety statistics for the project speak for themselves: 3.6 million work-hours, four recordable injuries, and an RIR of 0.2.

This project is an example of how the application of CII Best Practices can significantly improve the safety performance of any job site. In this case study we will discuss what the challenges were, how we addressed them, what the safety program consisted of, why we believe it worked, and how you can achieve similar results.

The mission of this project was to provide an operational grassroots chemical plant in Taloja, Navi Mumbai, India (operation began in July 2003). This facility produces both water-based emulsions and packaging/ laminating adhesives.

This location was chosen due to its proximity to nearly 40-50 percent of the overall Indian market for both emulsions and adhesives, as well as to a major Indian port for handling raw materials. Mumbai is the hub of all industrial activity in India, thus offering best opportunities for hiring/ retaining technical and management staff, and commercial support services, banks, hotels, and an international airport.

The project consists of five main areas: Bulk Raw Material Storage, Process Buildings, Product Storage, Utilities and Miscellaneous OBLs. The process equipment will be housed in a three- and four-level building of steel construction with concrete floors and metal siding. The primary process equipment is a single emulsion reactor along with polyester and polyurethane reactors. The utilities for the plant consists of: steam, cooling tower water, hot oil system, thermal oxidizer, scrubber, chiller, DI water, process/potable water, process/instrument air, firewater, electrical power, nitrogen and waste treatment. The OBL portion of the project will consist of a raw material warehouse, administrative offices, flammable warehouse for adhesives, QC lab, tech service lab for adhesives, bathrooms, showers, and canteen facilities. Other items included are guardhouse, perimeter fencing, paving, and landscaping.

Safety Challenges

Maintaining world-class safety programs in India has its own challenges.

- There is very minimal legislation in India on safety issues and the enforcement is even worse. Hence there is no real pressure on owners/contractors for maintaining high safety standards.
- Contractors are inclined to utilize work force labor instead of mechanical equipment as manual labor is the most cost-effective option.
- The majority of construction labor is poorly educated. Most of the work force wears no footwear. There was much reluctance by the workers to wear safety shoes.
- The work force is migratory. Some of the labor goes back for farming during certain times of the year. Contractors also tend to employ large numbers of subcontractors for specific portions of the job. This involves large numbers of labor turnover at the construction site. On this project about 5300 new workers were inducted at the site with total construction work-hours of about 3,600,000. The average labor strength was 800 at the site (a peak of 1,350).
- Civil construction activities commenced in April 2002. Monsoon in this area starts in June and it rains heavily in July/August. The site was partly open and undeveloped during this time. The heavy rain brings out poisonous snakes, which caused two lost-time incidents.
- The project schedule required compressing many construction activities in a short duration. This involved simultaneous operation of multidisciplinary work in a small area, which increased hazards and the possibility of accidents.

Elements of Program:

a) Management had shown commitment for the safety program from the beginning of the project. This uncompromising commitment for safety was first emphasized to Jacobs H&G with the specific requirement of “zero accidents” for the project site. In all subsequent project reviews with Jacobs H & G senior management, safety was always the first issue to be discussed.

   Rohm and Haas senior management closely observed safety issues and safety performance on this project. The Rohm and Haas local

management was dedicated to implementation of the safety program. All safety issues were extensively reviewed and discussed during weekly teleconferences with Rohm and Haas senior management. A dedicated health, safety, and environment (HSE) manager was employed at an early stage of the project and the Rohm and Haas project manager was accountable for the safety program and reported to the highest corporate level as required.

b) Rohm and Haas required Jacobs H&G to set up a world-class HSE program covering planning, organizing, controlling, monitoring, and reviewing the job so that HSE aspects were taken into account from the beginning of the job through its completion.

   In line with this requirement, a "Set of Site Rules" was prepared and was to be observed by all while on the project site. The Set of Site Rules explained the substance abuse policy as well.

c) Orientation for all new employees before they are allowed to work was made mandatory from the beginning. The program covered Rohm and Haas HSE Policy, Site Safety Organization, Security & Gate Pass requirement, Smoking & Drug Policy, Drinking Water & Sanitation facility, First Aid facility, Individual Responsibility, Vehicular Traffic, Housekeeping, Work in High Risk Areas, and Emergency procedures. For foremen and supervisors, special training sessions were conducted that detailed supervisor training.

d) Safety meetings with safety personnel and supervisors of all contractors were held on a weekly basis and typically addressed non-compliance issues, weekly inspections, training requirements, and likely challenges.

e) Disciplinary actions included Warning, Re-induction, and Temporary/Permanent Suspension from the job site for repeat violations by individuals, including foremen and supervisors.

f) Recognition for outstanding performance was achieved through instituting award ceremonies for achieving 250,000 safe work-hours. During the ceremonies, all workers were given small gifts and a few (5–10) were rewarded with special gifts for exemplifying "safe workers." Foremen and supervisors were given certificates and contractors were given trophies for their contributions toward achieving safety at the site.

g) All work was strictly carried out under a "permit system." Special permits were used for high-risk activities such as working at heights and confined spaces. Electrical work was carried out with proper permits covering a lockout / tagout system.

h) Standard format was developed with guidelines for investigation that helped in analyzing and identifying root causes of incidents. All investigation findings were shared with supervisors and management and actions were taken to avoid recurrence.

i) Monitoring of the safety program was achieved through safety observation reports and safety evaluations carried out during the construction phase. Corrective actions were taken to improve compliance on work activities that showed inconsistency in safety compliance.

j) Formal audits were conducted by the corporate safety manager to assess the effectiveness of the procedures and systems. This improved understanding of safety among all supervisors.

k) An emergency response plan was developed on the basis of guidelines prepared at the initial phase of the project.

l) All new workers were identified with a red band on hard hats and were accompanied by experienced co-workers for the first month. This "buddy system" helped new entrants to understand project safety culture.

m) The site prepared a list of "Top Ten" hazards associated with ongoing works. This list identified hazardous activities and risks associated with the work, was kept dynamic, and was revised at intervals depending on work situations at the site.

n) Power was supplied to a labor camp for electrical lighting. A health care program also was set up with local doctor visits to the village several times per week.

o) Historically in India, safety has not been a focal point, nor has recordkeeping. However, the safety performance of all contractors was a major selection criteria in awarding contracts, and safety bonuses were made part of contracts.

Industry "Best Practices" Utilized

1. Project Execution Planning
2. HSE Reporting & Metrics
3. Contractor Pre-Qualification
4. Site Orientation
5. Pre-Task Planning
6. Incident Reporting & Investigations
7. HSE Staffing
8. Training & Orientations
9. Audits & Inspections
10. Recognition & Rewards

Safety Statistics

Total installed cost	$50,000,000 (Gulf Coast Equivalent)
Total work-hours	3,600,000
Total lost work day cases	2
Total recordable incidents	4

Conclusions and Recommendation

With proper management involvement and commitment by all parties, it is possible to implement a world-class safety program in adverse conditions such as Taloja, India. To achieve this, a full understanding of the local culture and work practices is of extreme importance. Utilizing industry best practices and following through with the plan will deliver results.

Notes

Working Safely
in Global Construction

Tom Will

Rohm and Haas Company

ROHM HAAS
ALLIANCE
JACOBS

No one person or single party can create a safe jobsite. It requires a collaborative effort with the owner and contractors working together from the top of their respective organizations down to, and most importantly with, the hourly workers.

Case Study: Taloja, India

- Adhesives, sealants, emulsions plant
- 3.6 million work-hours
- Two lost time incidents, two recordable injuries
- Construction Users Roundtable (CURT) Award

- President's Health-Safety-Environmental Award (Jacobs)
- Joseph J. Jacobs Master Builder Award
- On time, on budget project that met business goals with outstanding safety results

Project Execution Strategy

Joint partnership by:

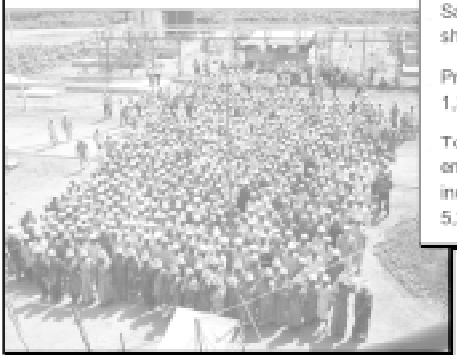
- Owner:
  - Rohm and Haas
- EPCM Contractor/Alliance Partner:
  - Jacobs H&G
- Numerous subcontractors

Safety Goals

- Zero injuries
- Everyone goes home in the same condition they went to work
- World-class safety program
- Proactive safety tools
- Support worker needs (on and off the job)

Work Force

Taloja, India



Safe workers shown: 600

Project peak: 1,300

Total employees indoctrinated: 5,200

Notes

Safety Beliefs

- You can work safely anywhere _ all of the time.
- Owner, contractor, and subcontractors working together make it happen.
- It all starts at the top.
- Safety management culture and systems drive results.
- Each and every individual must contribute.
- Injuries are produced by "at-risk behavior" that can be changed.
- Changing behaviors requires systems, resources, commitment, and hard work.

What Were the Keys to Safety Performance?

- Application of Industry (CII) Best Safety Practices
- "Owner's Role in Safety" research (CII Project Team 190)
- Rohm and Haas/ Jacobs Alliance 18 Best Safety Practices

Details in Implementation Session

Tie-off / Fall Protection

Do Not Worry; If I Lose Balance, My Harness Would Save Me!

Use Protective Equipment Properly. Safety Harness Lanyard To Be Hooked On Strong And Rigid Objects

Notes

Safety Statistics

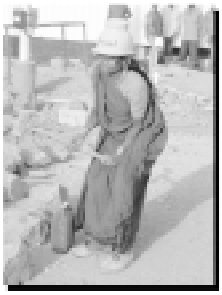
Category	U.S.	India
Construction workers	9 Million	100 Million
Injuries per day	1,800	50,000
Construction deaths per day	5	150
Construction deaths per year	1,250	40,000

Comparison to Similar Gulf Coast Project

Category	Gulf Coast Typical CII Equivalent	Taloja, India
Total Installed Cost (TIC)	$50MM	$50MM
Work Hours	800,000	3,600,000
Total Recordable Injuries	4	4
Lost Time Incidents (LTI)	1	2
Recordable Incident Rate (RIR)	1.0	0.2
CII Industrial RIR	1.0 – 1.1	
U.S. Industrial RIR	5.0 – 7.0	

Challenges & Risks: Taloja, India

- No real safety culture or legislation.
- Many owners and contractors don't support safety.
- High manual labor content and worker density.
- Work force: poor, unskilled, migrant.
- Civil work during monsoon season.
- Several distinct languages.
- Minimal use of construction equipment.



Notes

Notes

Key Program Elements

- Management commitment, involvement, accountability
- World-class health-safety-environmental program
- One common safety team
- New employee orientation and training
- Medical facilities — on and off site
- Pre-project planning
- Safety observations system and audits
- Recognition/reward and disciplinary system
- Incident investigation and feedback/learnings

Professional Safety Staffing

Rohm and Haas	2
Jacobs	4
Safety specialty sub	5
Contractors	12
Total	23

Additional support and auditing from management at Rohm and Haas and Jacobs.

Why It Worked

- Management support and corporate alignment.
- The core project team and Jacobs' local presence.
- Corporate alignment (Rohm and Haas/Jacobs).
- "Walked the talk."
- Organized, staffed project with safety as key success factor.
- Made local practices safe, didn't impose the unfamiliar.
- Supervisors were key and we won their hearts and minds.
- Work force felt that management cared about safety.

Notes

Summary of Injuries

Three million, six hundred thousand work-hours:

- ONE industrial injury
- Four recordable injuries
  - Two lost time incidents
  - Two recordables
    - One was "slip and fall" resulting in laceration (only true industrial accident)
- Forty-four first-aid cases

Frequently Asked Questions

How did you deal with poor contractor safety culture?

Selection process, training, zero tolerance.

Frequently Asked Questions

Only one industrial injury?
Do people not report injuries at the site?

Not normal in India.
Site nurse improved reporting.
Site procedures mandated reporting.

Notes

Frequently Asked Questions

Why 660 percent turnover?

Migrant farm workers, contract agency workers, paid daily with no retention incentive, zero tolerance to at-risk safety behavior.

Safety Management Beliefs and Principles

- All safety incidents are preventable.
- All safety incidents are caused by at-risk behavior.
- All behaviors can be changed.
- "If you're not confronting at-risk behavior, you're reinforcing it."

- Leadership is required to institute change and improve safety.
- Attainment of zero injuries is possible.

Rigging

For "Long" Loads
Use Double Slings!

Conclusions

Success Factors

- True and highly visible management commitment.
- Local jobsite commitment (walk the talk).
- Key contractor culture and commitment.
- Implementation of a solid, detailed safety plan utilizing CII Best Practices.
- Follow-through with elements of the plan.
- Winning hearts and minds of supervisors, making believers out of them.
- Above all, uncompromising intolerance to "at-risk behaviors."

The Bottom Line

"You will achieve the level of safety that you demonstrate you want to achieve."

Implementation Session

Working Safely in Global Construction

Moderator:

- Randy Arrington, Jacobs

Panelists:

- A. L. Benny, Construction Manager (Jacobs)
- Geoff Bell, Project Manager (Rohm and Haas)
- Tom Will, Capital Manager (Rohm and Haas)

Notes

Notes

ROHM HAAS ALLIANCE JACOBS

Working Safely in Global Construction

Randy Arrington
Jacobs
Moderator

Implementation Session

Working Safely in Global Construction

Moderator:

Randy Arrington, Jacobs

Panelists:

A. L. Benny	Construction Manager, Jacobs
Geoff Bell	Project Manager, Rohm and Haas
Tom Will	Capital Manager, Rohm and Haas

Session Format

- Presentation, Case Study
- Words from the Project Manager & Construction Manager
- Open Discussion and Q&A Period

Notes

Alliance Mantra

We will never, ever, ever
compromise safety
for any reason.

Safety Statistics per Million Workers

	US	India
# Injuries / day	200	500 * * Estimated
# Construction Deaths / day	.56	1.5
# Construction Deaths / Year	139	400

The Ratio of Serious Injuries and Deaths per Capita for India as compared to the US is 3:1

Project Description

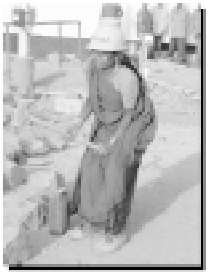
- Grassroots chemical plant
- Adhesives and emulsions:
  - Bulk raw material area
  - Process buildings
  - Product storage
  - Utilities
  - Administration building
  - Laboratory
  - Canteen
  - Misc. outside battery limits (OBL) and iInfrastructure

- 70,000 square meter site: 7 hectors (~ 16 acres)
- Gulf Coast equivalent – $ 50 million total installed cost

Notes

Summary of Injuries

- **3.6 Million Work Hours: ONE, Industrial Injury**
- **4 Recordable Injuries**
  - 2 LTI's
    - Snake Bites
  - 2 Recordables
    - 1 Slip and Fall
    - 1 Assault
- **44 First Aid Cases**
    - 17 were blisters



An Average US Project

- **If the Project had…..**
  - 3,600,000 Work Hours
    RIR of 1.0
- **There would have been…..**
  - 18 Recordable Injuries
  - 2 Lost Time Injuries

Challenges/Risks

- No real safety culture or Legislation
- Indian Owners see safety as added cost
- Indian Contractors see safety as added cost
- High Manual Labor Content, minimal use of equipment/technology
- Workforce is poor, Unskilled, no belief in Personal Protective Equipment (PPE)
- Migrant Work Force (Travelers)
- Civil work during monsoon season

Notes

Challenges/Risks

- Tight schedule & manual labor = high worker density
- Living conditions are poor, labor camps
- Several distinct Languages
- Low skill levels
- Only use construction equipment when manual labor cannot accomplish the task SAFELY

What Were Keys to Safety Performance?

- Application of CII Best Practices
- Owner's Role in Safety - CII Project Team 190
- Rohm and Haas-Jacobs Alliance: 18 Best Safety Practices

CII Safety Best Practices

- Demonstrated management commitment
- Staffing for safety
- Planning: pre-project and pre-task
- Safety education: orientation/training
- Worker involvement
- Evaluation and recognition/reward
- Subcontract management
- Accident/incident investigations
- Drug and alcohol testing

Not Done

CII Study: Owners Role In Safety

CII Project Team 190 ; 2003 CII Annual Conference, Orlando

- Contractor selection
- Contractor safety requirements
- Safety communication and involvement
- Monitor safety performance
- Participate in orientations
- Participate in incident investigations
- Conduct inspections and audits
- Owner Sponsored Recognition
- Near Miss Reporting

Not Done

Alliance Best Health, Safety & Environmental (HSE) Practices

- Project HSE Plan
- Engineering Safe Plans of Action (SPA's)
- Safety Observations (SOR's)
- House Keeping
- Personal Protective Equipment (PPE) Requirements
- Permitting

Program Elements

- Management Commitment, Involvement and Accountability *
- Set Up world class EHS program
- New Employee Orientation *
- Disciplinary System
- Recognition/Reward System *
- Enforced Permit System

* Denotes CII Best Practice

Notes

Notes

Program Elements

- Full-time medical staff on site
- Weekly doctor visit to worker's camp to tend to family illnesses
- Arrangements made at local hospital
- Permanent availability of emergency transport vehicle at Site & Camp
- Safety Observations, Safety Evaluations, Surveys & Audits *

* Denotes CII Best Practice

Program Elements

- Emergency Response (drills conducted)
- One common safety team - all contractors
- Meaningful Safety Meetings
- Buddy System
- Incident Investigations *
- Accurate Records & Reporting
- Actions taken on learnings, Safety Observation Reports, etc. *

* Denotes CII Best Practice

Why It worked

- Management Support and Commitment.
- Core Project Team & Jacobs Local presence
- Corporate Alignment (Rohm and Haas/Jacobs)
- Walked the Talk.
- Proactive and truly caring about workforce safety and well being.

Notes

Why It worked

- Supervisors are the key
- Chose to work safely before schedule
- Spent more effort on Safety than typical U.S. Project
- Weekly doctor visit to worker's camp
- The work force felt that Management cared about safety

Why It worked

- Brought attention to working safe
- Drove ownership to the masses.
- Management visibly and consistently reinforced Safety beliefs
- Organized and Staffed the project with Safety as a key Success Factor.
- Made the local construction practices safe, rather than impose unfamiliar practices.

Monthly Safety Summary Report

1. Summary
2. Injury Report
3. Precautionary Measures
4. High Risk Jobs
5. High Risk Conditions
6. Risk Management Actions
7. Safety Meetings
8. Safety Training
9. Procedures
10. Safety Observations
11. Inspection Log

Safety Observation Summary Report

Sample

SAFETY OBSERVATION REPORT (SOR) AS ON 30 APRIL 2003

ITEM	DETAILS	NOS	ACTION TAKEN
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Safety Observation Report (SOR)

Summary

SOR Category	Number
Fall Protection	971
House Keeping	664
PPE	461
Hot Work	317
Miscellaneous	242
Permits	225
Electrical	177
Lighting	104
Excavation	99

SOR Category	Number
Mechanical Material Handling	77
Materials Storage	67
Manual Material Handling	62
Hand & Power Tools	50
Positive Observations	48
Total	3,554

Sample Safety Training Log

JACOBS H&G

BC 2701 : ROHM AND HAAS - TALOJA.

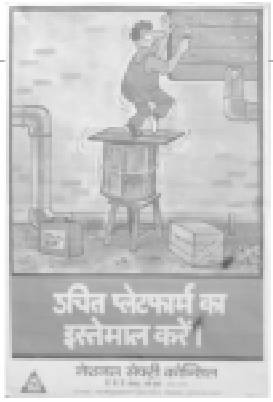
SAFETY TRAINING STATUS AS ON 30 APRIL 2003

SR. NO.	DATE	TOPICS	SITE STAFF	SAFETY STAFF	WORKERS	TOTAL
1	[illegible]	Excavation and Working Platforms	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	Fire Prevention & Fighting and Mock drill	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	Emergency Action Plan	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	General Construction Safety	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	Scaffolding, Slugging Work and Material Handling	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	Working at Height	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	Safe Plant at Nature	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	Temporary Platform Permit System	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	Safety in grinding, welding and drilling operations	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	Scaffolding, Slugging Work and Material Handling	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	Housekeeping	[illegible]	[illegible]	[illegible]	[illegible]

Notes

Sample Inspection Log

Safety Posters from the Site



Notes

Notes

EXCAVATION

IF YOU ARE NOT CAUTIOUS, YOU MAY EXCAVATE YOUR OWN GRAVE.

PROTECT FROM EARTH COLLAPSE, DURING EXCAVATION

EMERGENCY READINESS

BE PREPARED FOR EMERGENCY

KNOW ABOUT ....

FIRE EXIT

SAFETY SHOWER

BREATHING APPARATUS

FIRST-AID BOX

GAS LEAK

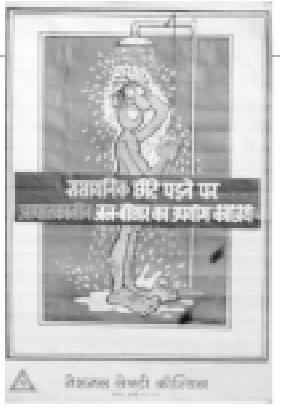
I DO NOT NEED ANY OF IT.. I AM WORKING HERE FOR FIFTEEN YEARS. I CAN FIX THIS ORDINARY LEAK WITHOUT BREATHING EQUIPMENT.

TO WORK AROUND TOXIC GAS LEAKAGE, BREATHING PROTECTION IS MUST!

Notes

SAFETY SHOWER

IN CASE OF "CHEMICAL SPLASH" USE EMERGENCY SAFETY SHOWER.



EYE PROTECTION

THANK YOU.....

YOU SAVED MY EYE

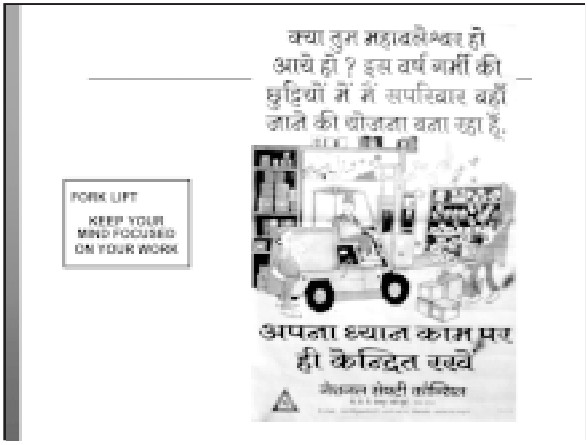
SAFETY SHOES

YOU SHOULD WEAR SAFETY SHOES...

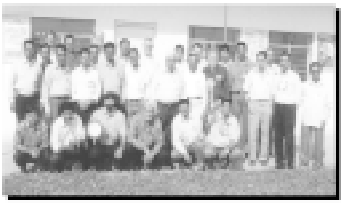
THERE ARE MANY INJURED FEET AND THOSE WHO DO NOT.

ACCIDENTS CAUSE PRODUCTION LOSS

Notes



Site Management Team Recognition



Site-Wide Safety Awards

Tiffin boxes to all workers

Notes

Award Presentations

Safety Award Presentations

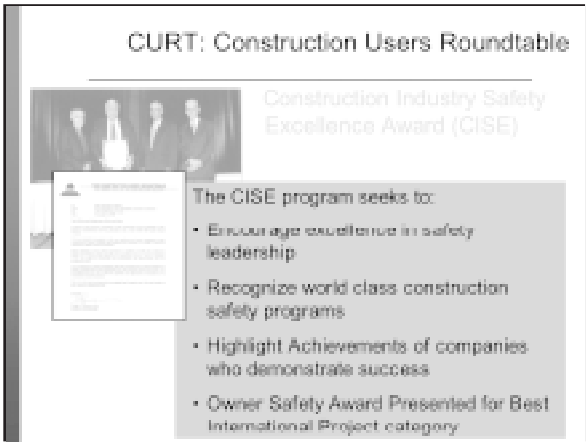
Dish and bowls
distributed to all workers

Rohm & Haas Photographs

Project Manager presented
award by Jacobs executive


ROHM HAAS
Rohm and Haas India Pvt. Ltd
Certificate of Appreciation
is granted to
V. Soundarajan
for outstanding contribution in achieving 2.0 Million Safe Workhours
Adhesives & Water Based Polymers Plant
Granted: April 15, 2003

Notes


CURT: Construction Users Roundtable
Construction Industry Safety Excellence Award (CISE)
The CISE program seeks to:
• Encourage excellence in safety leadership
• Recognize world class construction safety programs
• Highlight Achievements of companies who demonstrate success
• Owner Safety Award Presented for Best International Project catagory


Factors to Create a Safe Job Site
• Visible Management Commitment
• Walk the Talk
• Contractor Culture and Commitment
• Implement a safety plan utilizing CII Best Practices
• Follow through with the elements of the plan
• Win hearts and minds of supervisors, make believers out of them.
• ABOVE ALL, UNCOMPROMISING INTOLERANCE TO "AT RISK BEHAVIORS"

Notes

Management Involvement & Commitment

- Includes Senior and Middle Management
  - Owner and Contractors
- Direct and visible involvement
- Actively Participate in Events
  - Audits
  - Site Meetings, Job Walks
  - Awards Presentations
- Hold Project Team Accountable
- Celebrate Success

Management Involvement & Commitment

- Rohm and Haas
  - Plant Manager
  - Business EHS Director
  - Country / Business Manager
  - Capital Manager
  - COO
- Jacobs
  - Local Operations Manager
  - Regional EHS Manager
  - Regional Vice President
  - Executive Vice President
  - CEO
- Contractors – Owners Direct Involvement

Construction Manager's Perspective

A. L. Benny

Jacobs H&G

Notes

Project Manager's Perspective

Geoff Bell
Rohm and Haas

Wrap Up

- Questions for the Panel?
- Comments ?

Working Safely in Global Construction

Thank You……

The Globalization Challenge for EPCs

Globalization Committee

Abstract

The Globalization Challenge to EPCs Forum, co-sponsored by CII, the Globalization Committee, FIATECH, and CURT, was held on February 11 in Houston, Texas. Under the leadership of the facilitator, Wayne Burkan, the participants provided a list of ideas for the construction industry to pursue in making quantum changes. A white paper was published from the workshop, as well as a video and a CII news story.

The Globalization Committee will move forward with the work done during the Forum and solicit input from Annual Conference attendees to further pursue changes to be made to our industry. The implementation sessions will be roundtable discussions using the work product of the Forum as a starting point.

Plenary Session Presenter

Robert F. Pascuzzi – Vice President and General Manager – Pittsburgh, Kværner E&C

Rob Pascuzzi has over 33 years of experience in the performance of a wide variety of turnkey projects, both domestic and international, including environmental, manufacturing,metals, and power projects. His past assignments have included operations management, project management, construction management, and commissioning management. His international responsibilities have included Australia, Brazil, Canada, Guatemala, India, Indonesia, Mexico, and Saudi Arabia. A registered professional engineer (Pennsylvania), Pascuzzi holds a civil engineering degree from the University of Pittsburgh and a mathematics degree from Bethany College.

e-mail: rob.pascuzzi@akerkvaerner.com

Implementation Session Moderator

Freddie P. Wong – Senior Project Engineer, Project Liaison Unit, Aramco Services Company

Freddie Wong, born in Shanghai and raised in Hong Kong, is a Senior Project Engineer for Aramco Services Company in Houston, Texas. He currently is responsible for the training program for all Aramco technical services personnel. With Aramco since the mid-1970s, Wong has served as engineering specialist, project engineer, project design manager, and administrator. For the past several years, he has been active with the CII Education Committee. Wong holds a bachelor's degree in electrical engineering from Texas A&M University as well as a law degree.

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Makarand Hastak — Assistant Professor, Div. of Construction Engrg. & Mgmt. , Purdue University
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Robert A. Predmore — Manager of Projects, Corporate Services Construction, Intel Corporation
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James A. Schmidt — Senior Vice President, Project Management, Fluor Daniel, Inc.
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Tom E. Will — Director of Capital Deployment – Coatings , Rohm and Haas Company
e-mail: twill@rohmhaas.com

Notes

The Globalization Challenge for EPCs

Globalization Committee

CII Member Companies:
Focus on Safety
Priceless

CII Member Companies:
Best Practices
Priceless

Notes

CII Member Companies:
Breakthrough Strategies

Priceless

CII Member Companies:
Global EPC Value

? ? ? ?

Globalization Challenge to the EPC Industry

Owners/Contractors/Suppliers

- CII's Strategic Plan identified Globalization as a major trend eight years ago.
- Does competing in the global marketplace appear as part of your "Strategic Plan?"
- What tactical plans are you implementing to win the competition?

Notes

Globalization Challenge to the EPC Industry

Owners

- How many of your facilities are being built/modified outside of your home country?
- How many of your facilities are being built/modified by CII contractors/suppliers outside of your home country?
- Are you satisfied with the value provided by your non-CII contractors/suppliers?

Globalization Challenge to the EPC Industry

Contractors/Suppliers

- How much of your work is on facilities outside of your home country
- What are owners telling you about the value you bring on facilities outside your home country (maybe in your home country as well)?
- What do you need to do to compete effectively and provide value in the global marketplace?

Globalization Challenge to the EPC Industry

Owners/Contractors/Suppliers

Value = Benefit – Cost

Notes

Globalization Challenge to the EPC Industry

Contractors'/Suppliers' Perspectives of the Value to Owner

Value = Benefit – Cost

Is "cost" really a small influence in the owners' evaluation?

Globalization Challenge to the EPC Industry

Owners' Perspective of Contractors'/Suppliers' Value

Value = Benefit – Cost

Is "benefit" compromised in the owners' evaluation?

Globalization Challenge to the EPC Industry

Question:

What is the only commonality of these two diametrically opposed equations?

Value = Benefit – Cost

Value = Benefit – Cost

Notes

Globalization Challenge to the EPC Industry

The Answer:

In order to compete successfully, both must have the ability to provide

RELEVANT VALUE

in a global marketplace.

Globalization Challenge to the EPC Industry

- Workshop February 11, 2004, at Aramco's Houston facilities sponsored by:
  - CII
  - FIATECH
  - CURT
- Approximately 75 attendees

Globalization Challenge to the EPC Industry

Question Posed at Workshop:

What step changes do we (Owners/Contractors/Suppliers) need to recognize or implement to remain or to become SUSTAINABLE?

Notes

Globalization Challenge to the EPC Industry

Typical Reactions to Change

- Incremental Change (GOOD!)
  - Readily accepted and constantly sought after
- Step Change (OUCH!)
  - Jettisons the old rules and renders the old investment worthless

Globalization Challenge to the EPC Industry

Incremental Change:

- How many of our organizations attempt to apply the same operational mentality globally?
- How many have "comfortable" and "conservative" risk and execution methodologies that are applied worldwide?
- Why do we think "one size fits all"?

THE COMPETITION HAS MOVED IN!

Globalization Challenge to the EPC Industry

Step Change:

- The standard or paradigm has shifted.
- We Must Have the Guts to Go Back to Zero.
- When a standard shifts, everyone goes back to zero.
- Success in the old standard, without a step change, marks us for failure.

Notes

Globalization Challenge to the EPC Industry

Critical Success Factors

- Meet customers' objectives relating to VALUE (cost, quality, schedule).
- Attain understanding of business cultures including reassessing human resources model, training, retention, skill levels and nationality mix.

Globalization Challenge to the EPC Industry

Where we have made the least progress:

- Recognition of value
- Security for employees and families
- Right employees & workforce issues
- Productivity gains due to technology quickly becomes the norm, but masks itself as step change
- Integration/compensation for business cultural differences

Globalization Challenge to the EPC Industry

Where should we look for new solutions?

Notes

Globalization Challenge to the EPC Industry

It is probable that someone is either working on or has already solved one of your "impossibilities."

How do you find that person?

Globalization Challenge to the EPC Industry

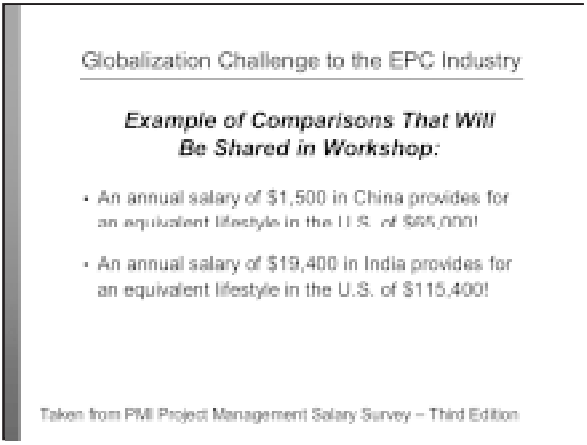
Implementation Session

- Summary of Houston findings
- Additional "opportunities" will be identified.
- Methodology using "generic definition" will be employed.
- Specific "Path Forward" activities will be identified and actions assigned.

Globalization Challenge to the EPC Industry

Example of Solution Methodology to Be Discussed In Implementation Session:

- Identification of your "impossibilities."
- Restate using generic language.
- Determine who outside your field has already solved or would be interested in solving this kind of problem (in generic language)?
- Seek them out!


Globalization Challenge to the EPC Industry
Example of Comparisons That Will Be Shared in Workshop:
• An annual salary of $1,500 in China provides for an equivalent lifestyle in the U.S. of $65,000!
• An annual salary of $19,400 in India provides for an equivalent lifestyle in the U.S. of $115,400!
Taken from PMI Project Management Salary Survey – Third Edition

Notes

The Globalization Challenge for EPCs

Implementation Slides

Notes

CII Annual Conference 2004
Vancouver, British Columbia

Globalization Committee:
Implementation Session

Globalization Challenge to the EPC Industry

Houston 2004 EPC Workshop

- EPC is a commodity.
- Research is not rewarded.
- Creativity is not rewarded.
- EPC is not "patent-able."
- Failure is not an option.
- Decisions are not timely.

Globalization Challenge to the EPC Industry

Paradigm Shifts

- "Best Buggy Whips Made."
- Japan – "Get it right; then, go fast."
- World – Use all opportunities.
  - Better Ways?!
  - More than "CII Best Practices"
  - "Best Practices" from all sources

Notes

Globalization Challenge to the EPC Industry

Been there! – Done that!

- Automotive industry (Detroit vs. Japan)
- Assembly (U.S. vs. China, Mexico, others)
- U.S. – Service provider only
- U.S. – Knowledge provider?
- How to capitalize on U.S. strategic advantages

Globalization Challenge to the EPC Industry

EPC's Biggest Problems/Opportunities

- Low-cost service providers
- "Good" quality of services
- Employees with low standard of living

Globalization Challenge to the EPC Industry

What are your greatest global challenges?


Globalization Challenge to the EPC Industry
• Meet owner's objectives.
• Deliver business benefits to owners.
• Understand how owner delivers value.
• Need significant "total" cost reduction.
• Eliminate waste and defects (Lean six sigma).
• Evaluate human resource model:
_ Recruiting
_ Retention
_ Training

Notes

Radical Reduction in Project Cycle Time

Radical Reduction in Project Cycle Time Project Team

Abstract

Four key drivers must be present to radically reduce project cycle time: (1) a compelling business need; (2) owner commitment; (3) a high performing team; and (4) detailed project planning and execution. The key drivers will not be broadly applicable to a portfolio of projects at one time, but rather to projects that meet specific criteria. In addition, CII research identified five prioritized CII Best Practices that are key components of radical reduction. Research case studies delivered radical reductions in cycle time without sacrificing safety, quality or cost.

Learn about the Game Planner tool that will help determine which CII Best Practices and management techniques to use to achieve radical reduction in project cycle time. A secondary tool, the Playbook, covers project management fundamentals to support the Game Planner and will be discussed in the implementation session.

Plenary Session Presenter

David DeBruine – Associate Director, Health Care Engineering, The Procter & Gamble Company

David DeBruine has been with P&G for 27 years. At CII, he chairs the research effort on radical reduction in project cycle time. His experience at P&G covers engineering design, project management, construction management, technical operations management, and capital management, and he has worked at corporate as well as plant locations. Having been involved in many of the company's global business units, his most recent assignments are in P&G's growing health care business. DeBruine, a licensed professional engineer, holds a civil engineering degree from the University of Wisconsin–Platteville.

e-mail: debruine.dj@pg.com

Implementation Session Moderator

Clark W. (Skip) Stuart – Senior Manager, Materials Management, Black & Veatch

Skip Stuart is currently responsible for the deployment and implementation of material and supply chain management techniques and work processes on all domestic EPC projects. He also is responsible for directing corporate material management, logistics, transportation, and expediting functions and managing the construction equipment fleet services group. Prior to joining Black & Veatch, he was responsible for international material management activities for Stone & Webster Engineering. Stuart's previous CII research participation includes projects on radio frequency identification tagging and supply chain management.

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Radical Reduction in Project Cycle Time

Radical Reduction in Project Cycle Time Project Team

Executive Summary

Today's businesses rely on just-in-time capacity enhancements and first-to-market product strategies to gain competitive advantage and increase profit margins. This has created an increased demand for a high performance project delivery system that can achieve a dramatic reduction in project delivery time.

Radical reduction is defined as a reduction of 25 percent or more in overall project cycle time when compared to the current industry standard for projects of similar size and scope. CII chartered the Radical Reduction in Project Cycle Time Project Team (PT 193) to investigate the reality, requirements, and barriers to such radical reduction in project cycle time.

The research findings emphasize that owner involvement is the key factor in determining the potential success of radical reduction. In order to achieve radical reduction in project cycle time, the four drivers were consistent and overriding. The first two define the need or the "why" and are completely under the control of the owner:

- A compelling business need
- Owner commitment

The second two define the execution or "how" and are the joint responsibility of the owner and contractor:

- High-performance team
- Detailed project planning and execution

The research also investigated the impact of radical reduction on certain key project objectives, specifically the following:

- Consistent schedule reduction of 25% to 50%
- Improved safety in over 85% of the cases
- Savings in cost up to 20% in all but one case study
- Equal or improved quality

Any project can utilize the findings from the PT 193 research to improve project performance, providing the key drivers are in place. Two CII Implementation Resources, The Project Manager's Playbook and the Project Manager's Game Planner, were developed to facilitate the choice, use, and optimal deployment of the techniques and CII Best Practices.

Approach

The hypothesis of this research was that a study of high performing projects would lead to the discovery of delivery practices or techniques, which, if applied broadly and routinely, would improve delivery time across the industry. The research methodology needed to define and test this hypothesis included the following:

- Literature review
- Questionnaire surveys targeting the CII membership and case study respondents
- Case studies of selected projects
- "Priority Matrix" based on the case study responses

The literature review helped in identifying the various schedule reduction techniques (SRTs), CII Best Practices currently used in the construction industry, and the reduction techniques applied in other industries (categorized as management techniques). Those most relevant to construction were studied in detail. The findings were distilled into a "Priority Matrix" for each of the commonly identified phases of a project (pre-project planning, design, materials management, construction, and start-up).

Twenty-nine domestic projects were identified that achieved radical reduction in project cycle time. Of these, seven were deemed useful for in-depth study for a better understanding of the decision-making process used by owners and the construction industry to radically reduce project cycle time. The major objective was to verify the known practices and techniques utilized as well as to identify additional reduction techniques.

The research covered a cross-section of the industry. Respondents included owners, architect/engineers, construction managers, contractors, and suppliers. The majority of the responses were from contractors. The size and variety of projects varied. Project types included general building, transportation, manufacturing, industrial process, petroleum, power, environmental, telecom, and others.

Generally, PT193 believes that almost all projects can benefit from cycle time reduction but, specifically, the following types of projects were identified as prime candidates for radical reduction techniques:

- Projects with strong business drivers.
- Projects that are complex.

- Projects requiring a high degree of integration with outside stakeholders.
- Projects that have a high degree of upper management support.
- Large projects with a high level of purchasing activities/multiple packages.

The research also identified the most significant barriers to achieving radical reduction in project cycle time. Although generally within the responsibility of the owner, they may be influenced by the owner/contractor project team. These include:

- Scope changes
- Lack of decision making
- Lack of clear project objectives

Radical reduction is not for every project. It takes a huge commitment, a strong team, and outstanding execution, which are difficult to achieve and justify for every project in a routine fashion.

List of References

Back, W. E., K. Moreau, and J. Toon. (1998). "Determining the Impact of Information Management on Project Schedule and Cost." RR 125-11, Construction Industry Institute, The University of Texas at Austin.

Cause and Effects of Fieldwork Research Team. (2001). "The Field Rework Index: Early Warning for Field Rework and Cost Growth." RS 153 -1, Construction Industry Institute, The University of Texas at Austin.

Choi, K. and W. Ibbs. (1989). "Cost Effectiveness of Computerization in Design and Construction." SD-50, Construction Industry Institute, The University of Texas at Austin.

Construction Implementation Task Force. (1993). *Preview of Constructability Implementation*. RS 34-1, Construction Industry Institute, The University of Texas at Austin.

Cost / Schedules Control Task Force. (1988). *Concepts and Methods of Schedule Compression*. RS 6-7, Construction Industry Institute, The University of Texas at Austin.

Gibson, G. E. Jr., J. Kaczmarowski, and H. E. Lore, Jr. (1993). "Modeling Pre-Project Planning for Construction of Capital Facilities." SD - 94, Construction Industry Institute, The University of Texas at Austin.

Pre-Project Planning Research Team. (1994). *Pre-Project Planning: Beginning a Project: The Right Way*. RS 39-1, Construction Industry Institute, The University of Texas at Austin.

Project Team Building Task Force. (1993). *Team Building: Improving Project Performance*. RS 37-1, Construction Industry Institute, The University of Texas at Austin

Songer, A. D. and J. Diekmann. (2000). "Re-Engineering the EPC Process." RR 124-11, Construction Industry Institute, The University of Texas at Austin.

Zero Accidents Task Force. (1993). *Zero Injury Techniques*. RS 32-1, Construction Industry Institute, The University of Texas at Austin.

Radical Reduction in Project Cycle Time

Plenary Slides

Notes

Radical Reduction
in Project Cycle Time

Radical Reduction in Project Cycle Time

Project Team 193

PT 193 Team Members

David Campbell	Air Products & Chemicals
David DeBruine	Procter & Gamble, Chair
Sanjiv Gokhale	Vanderbilt
David Halvorson	3M
Mark Hastak	Purdue
John Olliott	ConocoPhillips
Tim Pike	ConocoPhillips
Brian Schmidt	Black & Veatch
Don Schreyer	ALSTOM Power
Roy Sensenig	Parsons E&C
Sam Scucci	Shaw Group
Clark Stuart	Black & Veatch
George Sullivan	Dow
Tom Wilber	Rust

Past Members

Tim Carpenter	U.S. Steel
Christy Kolitz	Solutia
Don Kumm	Butler Mfg

Grad Students

Kartik Goyani	Purdue
TaeHoon Hong	Purdue
Shavin Safi	Purdue

Definition

Radical Reduction in Project Cycle Time

Reduction greater than 25 percent as compared to industry average cycle time (target: 25-50 percent).

Project Cycle Time

Starts during planning phase, when owner's engineering organization becomes involved, and continues through start-up.

Objectives

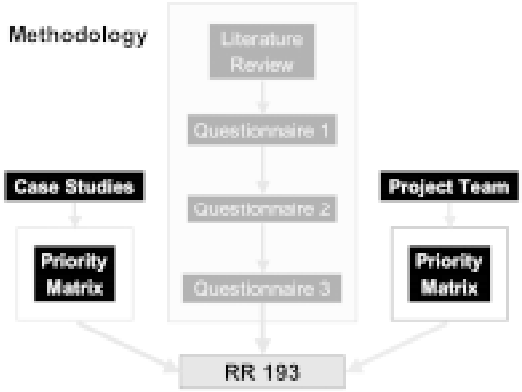
1. Identify approaches or practices that can radically reduce project cycle time.
2. Identify barriers to radical reduction in cycle time.
3. Prioritize the radical reduction techniques (RRTs) based on their potential for cycle time reduction.

Principal Beneficiaries

- Owners and contractors in:
  - Industrial
  - Building and
  - Infrastructure sectors

  including both private and public operations.

Methodology



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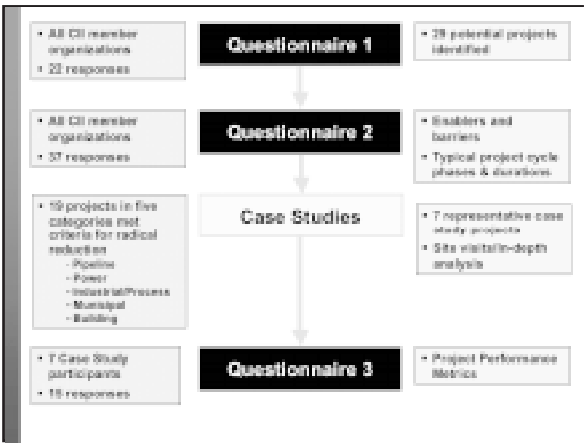
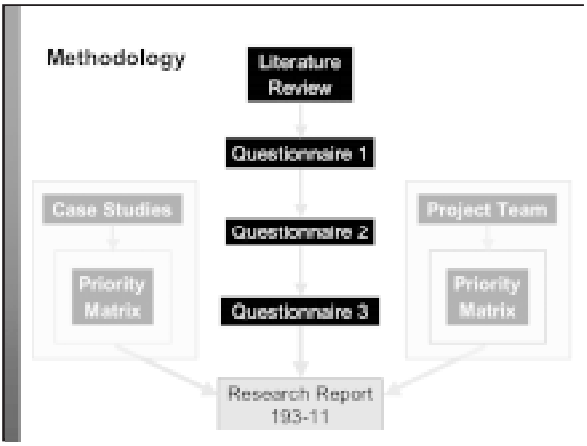




Case Study Projects

Project	Capital Cost ($MM)	Typical Duration (mo)	Actual Duration (mo)	Project Cycle Reduction (%)
Industrial	9	12	9	25
Industrial	45	21	10	50
Power	335	28	20	30
Process	16	12	6	50
Pipeline	13	18	9	50
Municipal	94	60	36	40
Bldg (Const)	35	4	2	50

Notes

Key Findings

- Key drivers WHY projects achieve radical schedule reduction:
  - Compelling business need
  - Owner commitment

Compelling business need | Owner commitment

Key Findings (cont.)

- Key drivers HOW projects achieve radical reduction:
  - High performance team
  - Detailed project planning and execution

Compelling business need | Owner commitment | High performance team | Detailed planning & execution

Key Findings (cont.)

- These CII Best Practices are key components of radical schedule reduction over project phases:
  - Materials Management
  - Alignment
  - Pre-Project Planning
  - Constructability
  - Design Effectiveness

Compelling business need | Owner commitment | High performance team | Detailed planning & execution

Notes

Key Findings (cont.)

- In conjunction with CII Best Practices, management and schedule reduction techniques from other industries are required to achieve radical reduction.

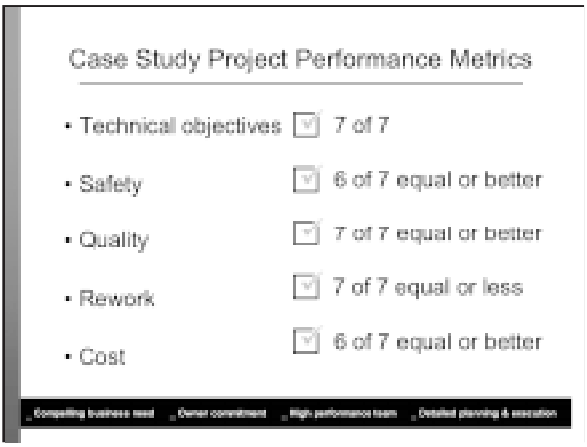
Schedule Reduction and Management Techniques

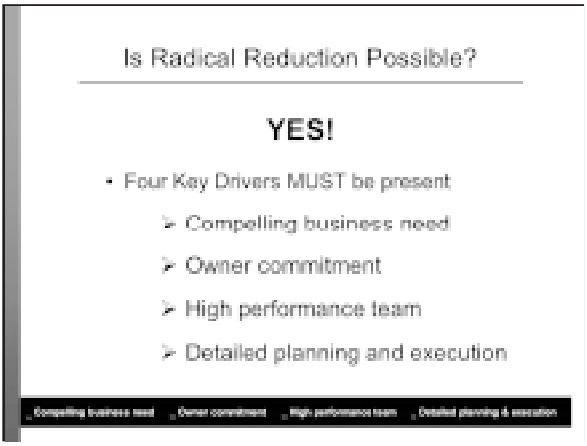
- Start-up driven scheduling
- Use of electronic media
- Participative management
- Construction driven scheduling
- Employee involvement

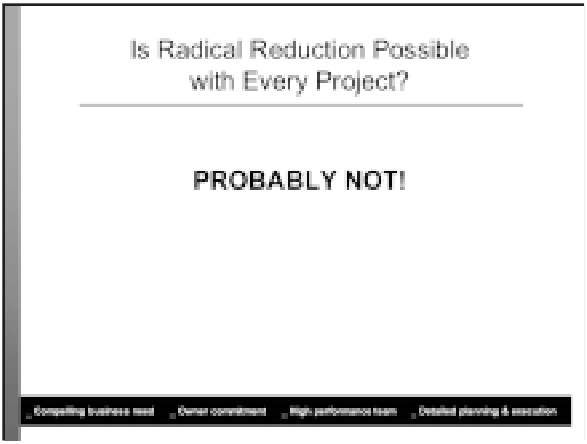
Barriers to Radical Reduction

- Top three barriers:
  - Scope changes
  - Lack of decision making
  - Lack of clear project objectives

Notes


Case Study Project Performance Metrics
• Technical objectives
7 of 7
• Safety
6 of 7 equal or better
• Quality
7 of 7 equal or better
• Rework
7 of 7 equal or less
• Cost
6 of 7 equal or better


Is Radical Reduction Possible?
YES!
• Four Key Drivers MUST be present
➢ Compelling business need
➢ Owner commitment
➢ High performance team
➢ Detailed planning and execution


Is Radical Reduction Possible
with Every Project?
PROBABLY NOT!

Notes

Notes

The research did not discover any
"silver bullets,"
but there are
tried and true approaches
that, used together, can deliver results!

Compelling business need | Owner commitment | High performance team | Detailed planning & execution

What if someone came to you
and asked how to
radically reduce
their project cycle time?

Compelling business need | Owner commitment | High performance team | Detailed planning & execution

Implementation Session

Moderator

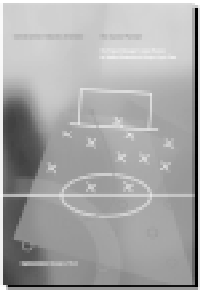
Clark Stuart Black & Veatch

Panelists

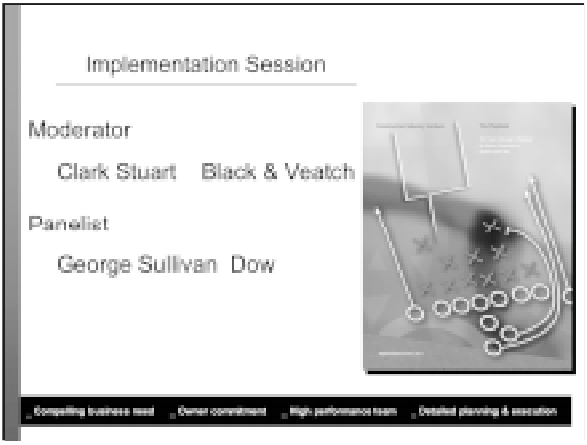
Sanjiv Gokhale Vanderbilt

Sam Scucci Shaw Group

Roy Sensenig Parsons E&C



Compelling business need | Owner commitment | High performance team | Detailed planning & execution


Implementation Session
Moderator
Clark Stuart Black & Veatch
Panelist
George Sullivan Dow

Notes

Radical Reduction in Project Cycle Time

Implementation Slides

Notes

Radical Reduction in Project Cycle Time

Implementation Session

Project Manager's Game Planner and Playbook

Radical Reduction in Project Cycle Time Project Team

Agenda

- Welcome
- CII Project Team 193 Membership
- "Project Manager's Game Planner"
- "Project Manager's Playbook"
- Questions and Answers

PT 193 Team Members

David Campbell	Air Products & Chemicals
David DeBruine	Procter & Gamble, Chair
Sanjiv Gokhale	Vanderbilt
David Halvorson	3M
Mark Hastak	Purdue
John Offutt	ConocoPhillips
Jim Pike	ConocoPhillips
Brian Schmidt	Black & Veatch
Don Schreyer	ALSTOM Power
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Sam Scucci	Shaw Group
Clark Stuart	Black & Veatch
George Sullivan	Dow
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Dan Kumm	Butler Mfg

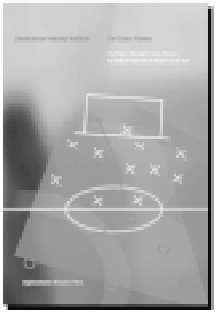
Grad Students

Kartik Goyani	Purdue
TaeHoon Hong	Purdue
Shawn Saft	Purdue

Panel Discussion

Moderator
Clark Stuart — Black & Veatch

Panelists
Sanjiv Gokhale — Vanderbilt
Sam Scucci — Shaw Group
Roy Sensenig — Parsons E&C



Panel Discussion

Moderator
Clark Stuart — Black & Veatch

Panelist
George Sullivan — Dow

Notes

Development of "The Game Planner"

- CII Project Phases
  - CII Research Report 125-11:
  "Determining the Impact of Information Management on Project Schedule and Cost"
- Case Studies
  - CII Best Practices
  - Schedule Reduction Techniques
  - Management Techniques

Key Findings

- Key drivers WHY projects achieve radical schedule reduction:
  - Compelling business need
  - Owner commitment
- Key drivers HOW projects achieve radical reduction:
  - High performance team
  - Detailed project planning and execution

_ Compelling business need _ Owner commitment _ High performance team _ Detailed planning & execution

Organization of "The Game Planner"

- List of 25 Radical Reduction Techniques (RRTs)
  - page 2
- Top 10 RRTs by project phase
  - pages 6 and 7
- Relative impact of RRTs by project phase
  - pages 8 and 9
- Definitions for RRTs and their project applications
  - pages 10 through 13
- Radical Reduction Playcard
  - pages 14 and 15

Notes

The 25 Radical Reduction Techniques

Alignment
Constructability
Design effectiveness
Materials management
Pre-project planning
Zero accident techniques

CII Best Practice | Management Technique | Schedule Reduction Technique

The 25 Radical Reduction Techniques

Alignment
Constructability
Design effectiveness
Employee involvement
Materials management
Pre-project planning
Safety in workspace
Zero accident techniques

CII Best Practice | Management Technique | Schedule Reduction Technique

The 25 Radical Reduction Techniques

Alignment
Constructability
Construction driven schedule
Design effectiveness
Efficient packaging/transportation
Employee involvement
Freezing of project scope
Lump sum contract
Materials coordination
Materials ID on purchase documents
Materials management
Non-traditional drawing releases
Pareto's Law
Participative management
Pre-project planning
Prioritize procurement of material
Realistic scheduling
Safety in workspace
Start-up driven schedule
Supplier/engineer early interaction
Supplier submittal control
Temporary start-up systems
Use of electronic media
Well-defined organization structure
Zero accident techniques

CII Best Practice | Management Technique | Schedule Reduction Technique

Notes

Notes

Project Phases

- Pre-Project Planning
- Design
- Materials Management
- Construction
- Start-Up

Pre-Project Planning

- Start-up driven scheduling
- Participative management
- Pre-project planning
- Alignment
- Use of electronic media
- Well-defined organizational structure
- Pareto's Law
- Employee involvement
- Realistic scheduling
- Construction driven scheduling

Design

- Constructability
- Use of electronic media
- Alignment
- Freezing project scope
- Design effectiveness
- Start-up driven scheduling
- Employee involvement
- Non-traditional drawing release
- Participative management
- Supplier/engineer early interaction

Pre-Project Planning

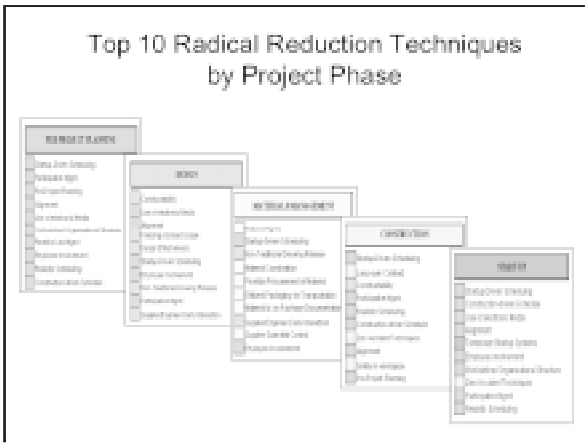
Notes

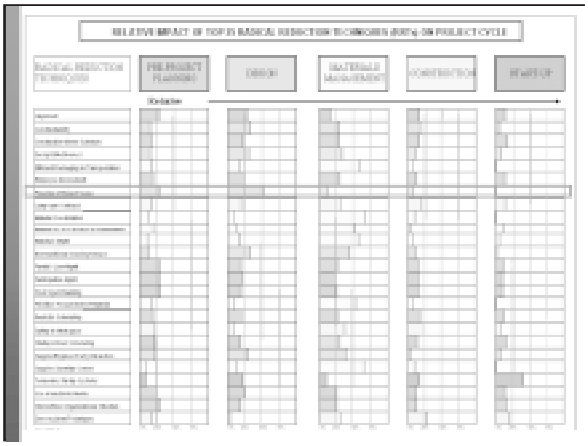

Materials Management
Materials management
Start-up driven schedule
Non-traditional drawing release
Materials coordination
Priorities procurement of materials
Efficient packaging for transportation
Material ID on purchase documentation
Supplier/engineer early interaction
Supplier submittal control
Employee involvement
Pre-Project Planning
Design

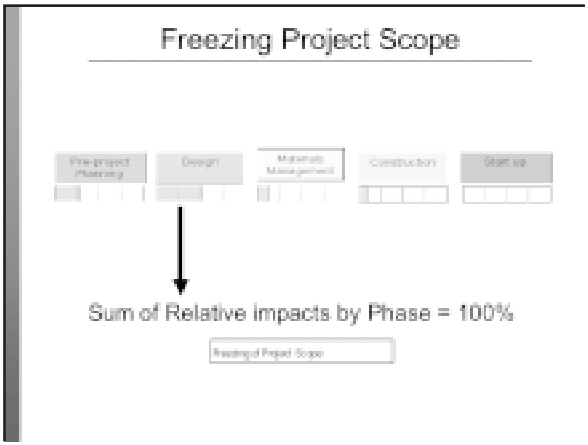

Construction
Start-up driven schedule
Lump sum contract
Constructability
Participative management
Realistic scheduling
Construction driven schedule
Zero accident techniques
Alignment
Safety in workspace
Pre-project planning
Pre-Project Planning
Design
Materials Management

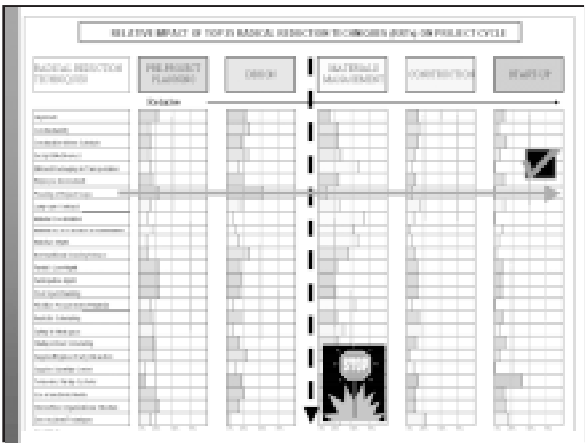

Start-Up
Start-up driven schedule
Construction driven schedule
Use of electronic media
Alignment
Temporary start-up systems
Employee involvement
Well-defined organizational structure
Zero accidents techniques
Participative management
Realistic scheduling
Pre-Project Planning
Design
Materials Management
Construction

Notes


Top 10 Radical Reduction Techniques
by Project Phase




Freezing Project Scope
Sum of Relative impacts by Phase = 100%



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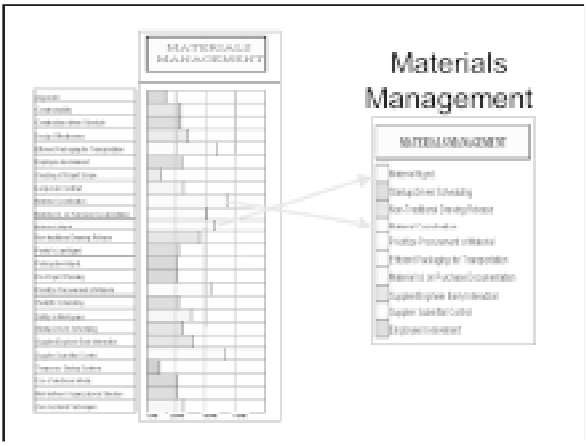
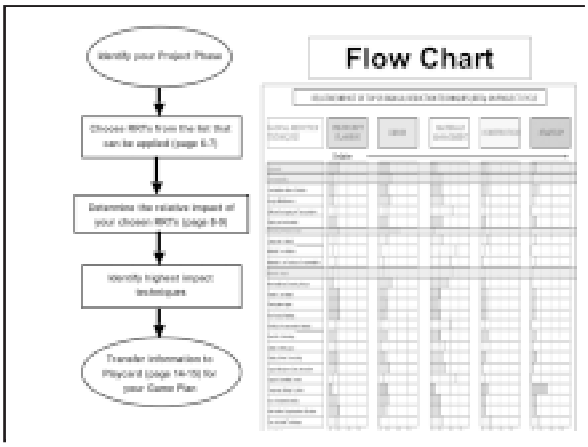
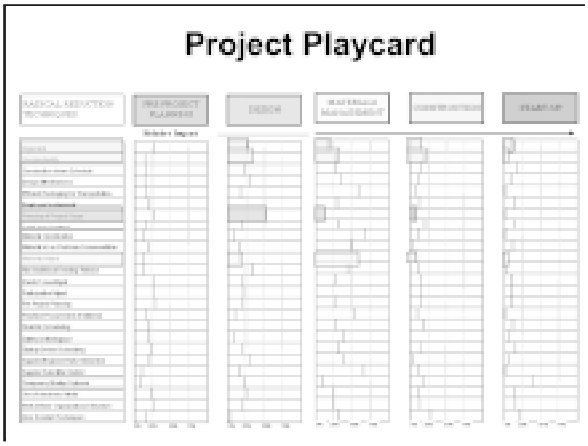
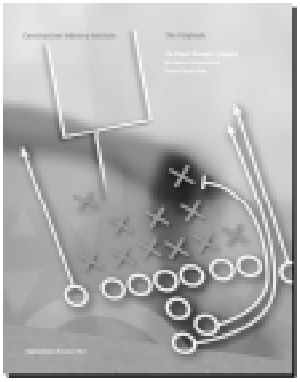


"Radical Reduction Playcard"

- A tool for developing strategies for a given project by assigning ranks (if necessary) and color-coding appropriate boxes
- A tool to track reduction during project phases when implementing different RRTs.
- Serves as a reference for future projects.


Flow Chart
Identify your Project Phase
Determine the relative impact of your chosen RRTs (page 6-9)
Identify highest impact techniques
Transfer information to PlayCard (page 14-15) for your Game Plan


Project Playcard

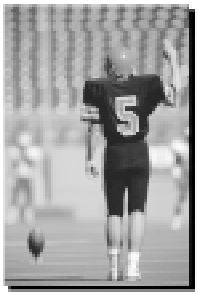


Notes

Notes

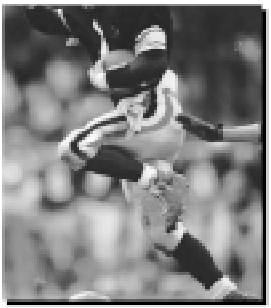
"The Playbook"

- Fundamentals
- The Team
- The Plays
- The Game
- After the Game



Fundamentals

- Early Recognition
- Compelling Business Need
- Goals and Objectives
- Commitment



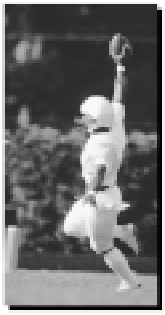
The Team

- The Draft
- Formations
- Team Spirit
- Team Effectiveness

Notes

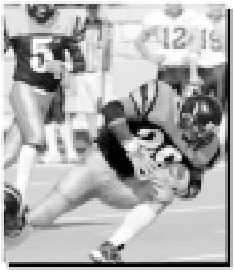
The Plays

- Pre-Project Planning
- Design
- Material Management
- Construction
- Start-Up



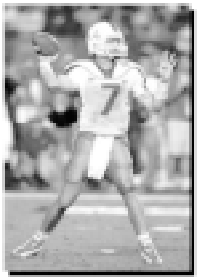
The Game

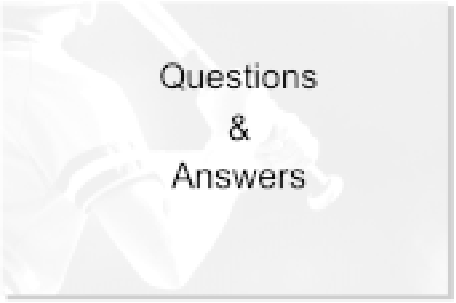
- Plan the Work/Work the Plan
- Project Work Processes
- Information Technology
- Project Controls
- Change Management
- Quality Management
- Risk Management
- Issue Resolution



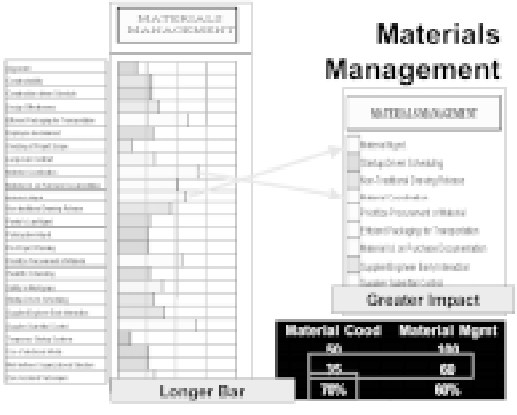
After The Game

- Scores and Stats
  Metrics
- Post-Game Analysis
  _ Lessons Learned




Questions
&
Answers

Notes


MATERIALS MANAGEMENT
Materials Management
Greater Impact
Material Coord
Material Mgmt
50
100
35
60
70%
60%
Longer Bar

CII Chairman's Perspective of Sustainability

Les Sturgeon, CII Chairman for 2004

Abstract

The pressure to perform in the area of sustainability requires a complex balancing act between creating shareholder value and increasing economic, social, and environmental value. The CII Chairman will provide a perspective on sustainability and the business approaches that are necessary to bring about sustainable successes. How well corporations perform in the area of sustainability requires competence in several areas: strategy, customer and product, stakeholder, finance, human resources, and knowledge management.

Speaker

Les Sturgeon – Division Vice-President of Global Facilities Engineering , Abbott Laboratories

Les Sturgeon is responsible for the planning, design, and implementation of major capital projects worldwide. With Abbott since 1973, he has held a series of positions in operations technical support and manufacturing management, and was previously manager of engineering. He has both domestic and international project experience and served as Abbott's director of engineering for the diagnostics division from 1990-1995. Sturgeon earned a bachelor's degree in chemical engineering from the University of Louisville. At CII, he is chairman for 2004.

e-mail: les.sturgeon@abbott.com

Capturing Value from Sustainable Development

CII Forum

Abstract

The construction business moves fast and furious and needs to stay low cost, on time, on schedule and on budget. Do we have the time to handle another issue like "sustainable development?"

The answer is that we need to *make* the time if we want to stay in business for the long term. Sustainable businesses pay attention to the "triple bottom line" — economic results, long- and short-term; protecting the environment; and respecting the communities around us.

This panel will review the Suncor Energy oil sands mega project in Northern Alberta, where sustainability challenges were met head on and handled with excellence. We will also look at the Hatch approach to sustainable plant design and the relationship between sustainability and risk management. Finally we will look at what the Chief Architect thinks it takes to design a sustainable building from the ground up.

Moderator

J. Norman Lockington – Vice President, Technology, Dofasco, Inc.

Norm Lockington joined Dofasco in 1973 as an occupational hygienist. His roles expanded to include safety, environment, energy, and utilities. In 1993, he was appointed to his current assignment and has responsibility for 1,150 people and 15 departments. Lockington is chair of the International Iron and Steel Institute (IISI) Committee on Technology, past chair of the IISI Committee on Environment, and past president of the Association of Iron and Steel Engineers. He earned a bachelor's degree in chemical engineering from the University of Waterloo and an MBA from McMaster University. Lockington is the CII Annual Conference Chairman for 2004.

e-mail: norm_lockington@dofasco.ca

Panelists

Ed Feiner – Chief Architect, U.S. General Services Administration

Ed Feiner provides national leadership for design and construction activities of the GSA and serves as senior advisor on design and construction policy and innovation. At GSA since 1981, Feiner previously managed master planning for the Naval Facilities Engineering Command. Besides teaching at Northern Virginia Community College, he lectures at Harvard University and to architectural program participants at numerous other colleges and universities. A Fellow of the American Institute of Architects, Feiner holds architectural degrees from The Cooper Union and the Catholic University of America.

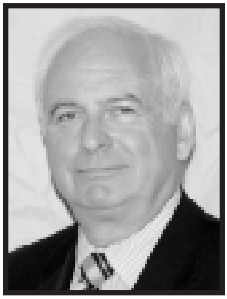
e-mail: edward.feiner@gsa.gov

Ron Genereux – Vice President, Major Projects, Suncor Energy

Ron Genereux has been with Suncor Energy since 1988, and has participated at key engineering and managerial levels for a wide variety of projects, particularly ones involving oil sands and desulphurization. He recently was responsible for the construction of nearly $1 billion dollars worth of bitumen production facilities. As a senior member of Suncor's Major Projects team, Genereux is also accountable for ensuring that all company growth projects are designed and constructed in a manner that supports the company's vision of sustainability. He is co-chair of the Construction Owner's of Alberta Association Productivity Measurement and Benchmarking Committee. Genereux earned a bachelor's degree in mechanical engineering from the University of Saskatchewan.

e-mail: rgenereux@suncor.com

David Rodier – Leader, Sustainable Development Practice, Hatch



David Rodier leads the Sustainable Development Practice, which seeks to find innovative ways to help clients make breakthroughs in business and capital projects. Current areas of activity include integrating sustainable development into integrated risk management, initiation of a sustainable development community of practice for the company, establishment of a social risk network of consultants, and development of a sustainable plant design initiative. Rodier chairs the Executive Working Group of the International Council for Mining and Metals. Prior to joining Hatch, he was with Noranda Inc. for 36 years, holding a broad variety of operational and executive roles.

Productivity Metrics Breakthrough

Special Topic: Benchmarking & Metrics Committee – Implementation Session Only

Abstract

This implementation session will report on the Engineering Productivity Metrics Retreat, which was held June 2–4, 2004, in Woodville, Texas. All CII member organizations active in developing engineering productivity metrics were invited to the retreat to review the alternative approaches of measuring engineering productivity that have been developed at CII in recent years. The retreat involved 28 representatives from 20 different organizations.

The goals of the retreat were simple:

1. To allow organizations to discuss the advantages and disadvantages of the alternatives.
2. To build a consensus on common metric definitions.
3. To develop a data collection strategy that will be supported by participating organizations.

The retreat was successful on all accounts. Now, with agreed-upon definitions, the path forward has been established. First, specific commitments have been made by participants for data submission in the fall. Second, a Benchmarking Committee report on this topic will be issued in March 2005.

During the implementation session, the metric definitions will be discussed and attendees will be extended the opportunity to participate in the data collection initiative. Those submitting data can expect to receive the March 2005 report.

Implementation Session Moderator

David G. Hile – Operations Manager, Fru-Con Construction Corporation

Dave Hile has over 20 years of 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. Hile is currently helping to guide a CII study on productivity and performance metrics for construction and engineering. He is a graduate of Indiana State University.

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Implementation Session Participants

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James G. Slaughter – President , S&B Engineers and Constructors Ltd.
e-mail: jgsjr@sbec.com

Stephen R. Thomas – Associate Director, Construction Industry Institute
e-mail: sthomas@mail.utexas.edu

Paul N. Woldy – Staff Engineer, ChevronTexaco Corporation
e-mail: pwoldy@chevrontexaco.com

Other Knowledgeable Points of Contact

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e-mail: ron_beechey@dofasco.ca

Gertraud F. Breitkopf – Senior Program Manager, U.S. General Services, Administration
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Tom Butts – Manager, Southwest Operations, Lockwood Greene
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Robert E. Chapman – Economist, Office of Applied Economics, National Institute of Standards & Technology
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Jean Childers – Accounts Operations Manager, AMEC, Inc.
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Gregory D. Clum – Manager of Project Controls, Black & Veatch Corporation
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William G. Cooley, Sr. – Senior PMP Capital Effectiveness Engineer, U.S. Steel
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Dean Ergenbright – Program Analyst, U.S. Department of State
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Donald A. Gaddy – Construction Safety & Health Manager, Engineering & Construction Services, Southern Company Generation & Energy Marketing
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James B. Gibson – Vice President, Projects, ALSTOM Power Inc.
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Carl Gretzinger – Facilities Project Planner, Project Planning Department, General Motors Corporation
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Howard Kass – Senior Facilities Engineer Program Manager, National Aeronautics & Space Administration
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John E. Kurth – President, Aker Kværner Pharmaceuticals
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John M. Mellin – Manager, Business Planning & Performance, GlaxoSmithKline
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Michael S. Mitchell – Director, Project Management Office, Refining & Chemical Industry Center, Emerson Process Management
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Wladimir Norko – Senior Engineer, Technical Policy Branch, U.S. Army Corps of Engineers
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Mark T. Owens – Director, Global Facilities Delivery, Eli Lilly and Company
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David M. Perkins – Project Manager, Rohm and Haas Company
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Derek C. Ross – Associate Director of Construction, Office of Facilities Engineering & Operations, Smithsonian Institution
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Michael J. Scholz – Engineer/Estimator, Kiewit Industrial Company
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Danny Scott – Supervisor, Engineering Project Controls, BE&K, Inc.
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John H. Stuart – Leader, Enterprise Project Management Office, NOVA Chemicals Corporation
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Frank K. Suhan – Manager, Project Controls, Johnson Controls, Inc.
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John Tato II – Director, Project Evaluation & Analysis Division, U.S. Department of State
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Stephen D. Warnock – Project Manager, Washington Group International, Inc.
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Notes

CII

Productivity Metrics Breakthrough

July 29th, 2004
Vancouver, BC

BMM Productivity Committee Members

Dave Hile, Chair	Fru-Con Construction Corporation
Danny Scott	BE&K Engineering
David Perkins	Rohm and Haas Company
Jim Gibson	ALSTOM Power Inc.
John Kurth	Aker Kvaerner Pharmaceuticals
Jimmy Slaughter	S&B Engineers and Constructors Ltd.
Steve Thomas	Construction Industry Institute
Inho Kim	CII / The University of Texas at Austin

Purpose of Implementation Session

- Review & discuss engineering productivity metric definitions agreed at Woodville Retreat.
- Extend to all CII member companies the opportunity to participate and receive reports.

Notes

CII

Productivity Metrics Retreat

June 2-4 , 2004
Woodville, TX

Summary of Retreat Participation

- 27 representatives from 20 companies

Productivity Metrics Retreat Participation

Owners
Jim Johns – 3M
John Jondle – BP North America
Paul Woldy – ChevronTexaco
David Teague – Dow
David Butler – GlaxoSmithKline
David Perkins – Rohm and Haas Company
Richard Shunnarah – Southern Company Services, Inc.

Academia
Steve Thomas – CII (Facilitator)
Inho Kim – The University of Texas at Austin
Hans VanWinkle – CII, Director

Productivity Metrics Retreat Participation cont.

Contractors

Richard Hensley – ABB Lummus Global
Larry Stevens – ALSTOM Powers
Rick Oegema – ALSTOM Powers
John Ward – Bibb & Associates
Danny Scott – BE&K, Inc.
Daryle Barnhart – CDI
Rick Campbell – Flint Energy
Peter Moore – Fluor Corporation
Dave Hile – Fru-Con (Facilitator)
Jack Yarbrough– Jacobs
Tony Smith – Mustang Engineering

Jimmy Slaughter – S&B (Host)
David Anders – S&B
Bob McKinley – S&B
Charles Reid – S&B
Marvin Black – S&B
Scott Bentivegna– Washington Group International, Inc.

Purpose of The Retreat

- Purpose:
  - Gain an understanding of engineering metric definitions (PT 192 & Benchmarking)
  - Develop a consensus on metrics definitions
  - Develop a data collection strategy
  - Have a relaxed setting to pull people together

Why Productivity Metrics?

- CII has provided leadership in project improvement for 20 years and member companies have vastly improved.
- CII research generally targets project processes and we have established many metrics that drive improvement at that level.
- Our continued success in the global environment however, requires improvement at the discipline level.
- Productivity metrics for both engineering & construction are essential to drive improvement at the discipline level.

Notes

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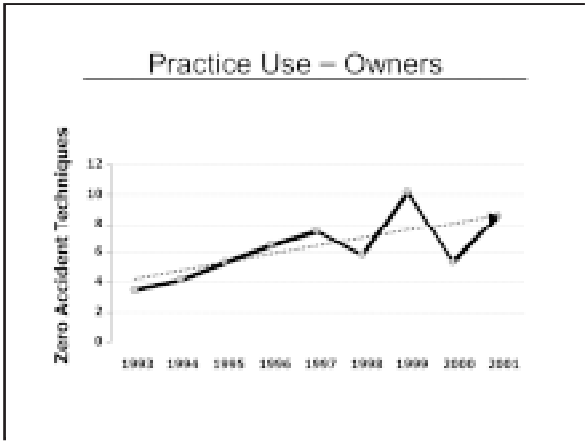
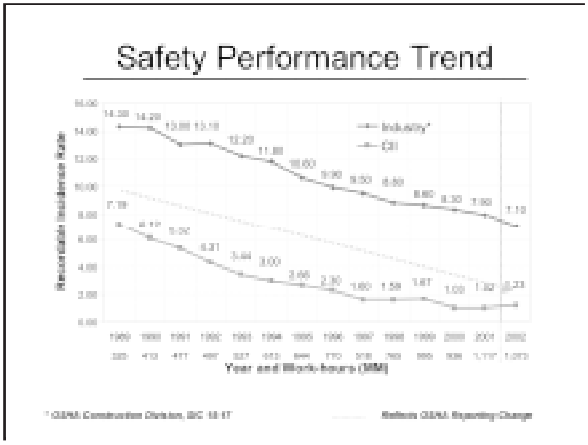
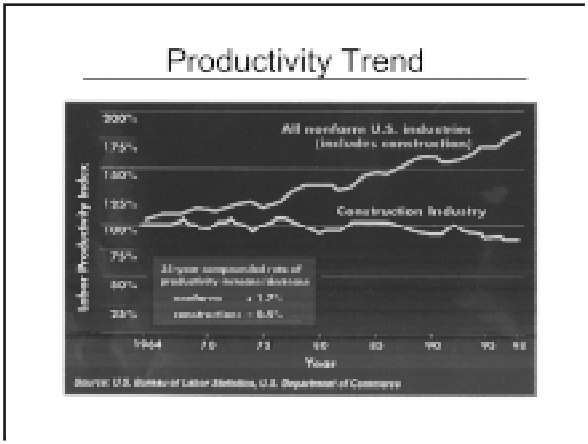
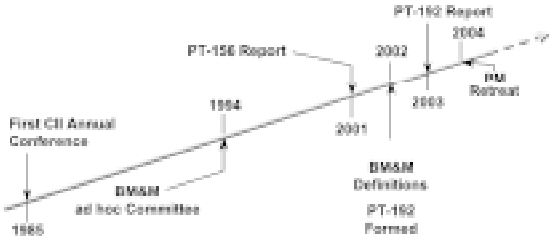

Practice Use – Owners
Zero Accident Techniques
12
10
8
6
4
2
0
1993 1994 1995 1996 1997 1998 1999 2000 2001


Safety Performance Trend
Recordable Incidence Rate
Industry*
CII
Year and Work-hours (MM)


Productivity Trend
All nonfarm U.S. industries (includes construction)
Construction Industry
Labor Productivity Index
Year

Notes

Productivity Measurement History



Present Practices

Most companies:

- Track production of drawings and specifications versus budget
- Use % TIC as target engineering budget
- Use earned value concept in some form
- Have no uniform system of measurement

Source: RT 156 2001 Annual Conference Slide

Problems with Present Practices

- Lack of standard format and content
- Difficulty in tracking actual effort dedicated to each deliverable
- No correlation between number of deliverables and installed quantities or effectiveness
- Computer-based tools:
  - Schematics and specs from database
  - Physical drawings replaced by models

Source: RT 156 2001 Annual Conference Slide

Notes

PT-192

- Followed PT-156 approach for metrics based on installed quantities
- Concluded that companies can not report work-hours below discipline level
- Developed predictive models (basis hours) at the discipline level based on selected quantities.
- Developed Productivity Index:

$$\text{Productivity Index} = \frac{\text{Actual Hours}}{\text{Productivity Basis Hours}}$$

PT-192 Issues/Concerns

- Relative vs. absolute measurement
- Based on predictive models:
  - Accuracy
  - Ability to update/reproduce
- Feasibility of Custom Tailored Approach
- Easier to collect data (Off-the-Shelf Approach)
- Use of tool

BM&M Approach

- Followed PT-156 approach for qty based metrics
- Developed common definitions for Direct/Indirect Accounts
- Developed Construction Prod. Metrics for 7 Categories (wk-hr/Installed Qty)
- Developed Engineering Prod. Metrics for 6 Categories (Wk-hrs/IFC Qty)

$$\text{Raw Productivity} = \frac{\text{Actual Hours}}{\text{IFC Quantity}}$$

Notes

BM&M Issues/Concerns

- Absolute vs. Relative Measurement
- Based on direct measurement for IFC quantities
- Ability to feed data
- Use of metrics

Decision Point

- Are Productivity Metrics for CII?
  Unanimously – Yes!
- What Approach?
  - Direct Measurement
  - Predicted Model

Direct Measurement

Direct Measurement

$$\text{Raw Productivity} = \frac{\text{Actual Hours}^{*}}{\text{IFC Quantity}}$$

* Per Design Component

Notes

Highlights of the Retreat

- 27 attendees from 20 companies
- Reviewed current practice, Research, and Benchmarking approaches
- Discussed pros and cons of both approaches
- Built a consensus for CII productivity metrics
- Majority of attendees favored BM&M approach
- Modified the BM&M engineering productivity questionnaire
- Discussed a direct/indirect ratio for new metrics
- Developed data collection strategy
- Established path forward

Data Collection Strategy

- Goal:
  - Commitment for 50 projects by the end of 2004
  - PT-192: Obtain 118 projects by asking companies that participated
- How do we get more companies involved?
  - Owners contact "CII member" contractors
  - Contractors contact "CII member" owners
  - Annual Conference

What was Accomplished

- Developed a consensus that engineering productivity metrics are doable and will provide meaningful data to the industry
- Gained an understandings of engineering metric definitions (PT-192 & BM&M)
- Reviewed and modified engineering productivity metrics definitions
- Agreed on providing greater flexibility for data collection
- Agreed on measuring IFC quantity vs. Actual Installed quantity
- Added "Rework Hours" per each major category if data available

Notes

Path Forward

- Extend opportunity to participate to all CII member companies.
- New data collection through December 2004
- Meet at BOA in November to discuss progress in data collection
- Productivity Metrics report out by next March
- Meet in March or April 2005 to update and share each company's experience

Special Training Available

- Benchmarking will hold a special productivity metrics training on August 24-25th – Austin, TX

Contact Frances DeCoux
f.decoux@mail.utexas.edu
512-232-3000 to register

Productivity Metrics

Construction Productivity	Engineering Productivity
• Concrete	• Concrete
• Structural Steel	• Structural Steel
• Piping	• Piping
• Instrumentation	• Instrumentation
• Equipment	• Equipment
• Electrical	• Electrical
• Insulation	
Examples	
Work-hours / Qty Installed	Design Hours / IFC Qty

Notes

Directs & Indirects - Engineering

	Direct	Indirect
Accrued	Discipline Engineer	Document Control
	Designer	Reproduction Graphics
	Technician	Project Management
		Project Controls (cost/schedule/estimating)
		Project Engineer
		Scanning/clerk
		Procurement (supply management)
		Construction Support (field, punchlist, inspect, commissioning, etc.)
		Quality Assurance
		Accounting
		Legal

Engineering Productivity Metrics

Concrete (Hrs/CY)	Structural Steel (Hrs/Ton)
Slabs • Ground & Supported Slabs • Area Paving Foundations • Piling (each) • Foundations (< 5CY) • Foundations (> 5CY) • Total Foundations (CY) excluding piling Concrete Structures Total Concrete	Structural steel Pipe Racks & Utility Bridges Miscellaneous Steel Total Steel

Engineering Productivity Metrics *Cont.*

Electrical	Piping (Hrs/LF)
Total Electrical Equipment (Hrs/EA) Electrical Equipment 600V & Below Electrical Equipment over 600V Conduit (Hrs/LF) (Hrs/ No. of Runs) Cable Tray (Hrs/LF) Wire and Cable (Hrs/LF) (Hrs/ No. of Terminations) Other Electric Metrics Lighting (Hrs/EA) Total Electrical (Hrs/LF)	Small Bore (2-1/2" & smaller) Large Bore (3" and Larger) Hangers and Supports (Hrs/EA) Total Piping

Notes

Engineering Productivity Metrics *Cont.*

Equipment (Hrs/EA)	
Pressure Vessels	Pulp & Paper Equipment
Atmospheric Tanks	Woodyard Equipment
Heat Transfer Equipment	Pulp Mill Equipment
Boiler & Fire Heaters	Bleach Plant Equipment
Rotating Equipment	Stock Preparation Equipment
Material Handling Equipment	Wet End Equipment (through the Presses)
Power Generation Equipment	Dryer Sections
	Dry End Equipment including Roll Wrap/Converter Equipment
	Other Process Equipment
	Vendor-Designed Modules & Pre- Assembled Skids
	Total Equipment

Engineering Productivity Metrics *Cont.*

Instrumentation (Hrs/Count)	
Loops (count)	
Tagged Devices (count)	
I/O (count)	
DCS/PLC Configuration & Programming (I/O count)	

CII

Productivity Metrics Breakthrough

July 29th, 2004
Vancouver, BC

Small Project Execution Education Module

Special Topic: CII Continuing Education Short Courses — Implementation Session Only

Abstract

Since the release of its *Manual for Small (Special) Project Management* in 1991, CII has had a leadership position in defining small project management practices. While many project management methods are the same for large and small projects, they are often not properly executed for small projects. Some techniques and practices, however, are beneficial to implement. Time will be provided to ask questions and discuss various approaches to small project execution.

Implementation Session Moderator

Gary R. Smith – Professor, Department of Civil Engineering and Construction, North Dakota State University

Gary Smith is the Director of the NDSU Construction Management and Engineering division. His research interests include methods to improve management systems with an emphasis in quality and safety. His research includes projects in the highway, heavy, industrial, and manufacturing construction sectors. Smith has 17 years as an active researcher and teacher. He also has experience as a design engineer, project engineer, and estimator. A licensed professional engineer, he holds a doctorate in civil engineering from Purdue University.

e-mail: gary.smith@ndsu.nocak.edu

A Toolkit for Construction Project Management

Case Study: Kværner Songer — Implementation Session Only

Abstract

This presentation will highlight key components and steps required to develop and implement an operations handbook. Although this endeavor is challenging, it is certainly not an insurmountable task. The paybacks are tremendous and far outweigh the contribution of company resources with significant benefits realized in all aspects of operations and business ventures.

Implementation Session Moderator

James Ross – General Manager, Quality Department, Kværner Songer

James Ross is responsible for QA/QC technical services and development, maintenance, and education of the company's quality processes and systems. He also is the primary writer of Kværner Songer's Operations Handbook. Previous assignments with the company include controller and vice president—administration. Ross has been active in CII for the past six years, and is currently involved in the Achieving Learning Organizations in the EPC Industry research effort. He holds degrees from Washington & Jefferson College (English) and Robert Morris University (accounting).

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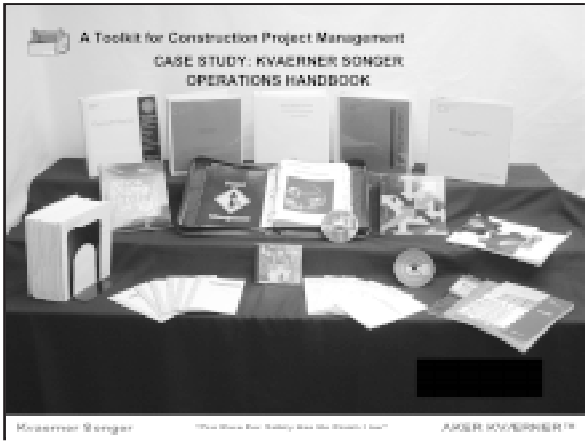
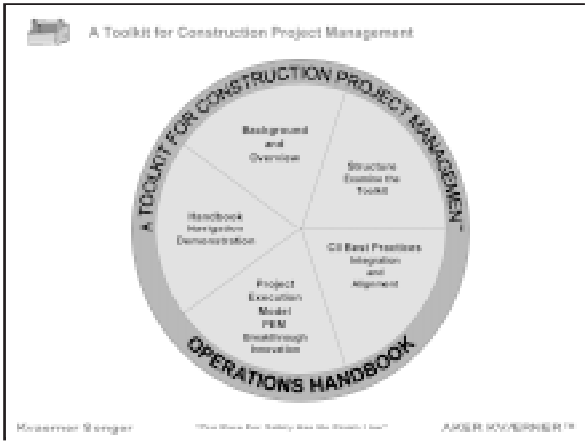
John R. Hewitt – President, Kværner Songer
e-mail: john.hewitt@akerkvaerner.com

Sam Steinmiller – Project Controls Manager, Quality Department, Kværner Songer
e-mail: sam.steinmiller@akerkvaerner.com

A Toolkit for Construction Project Management

Implementation Slides





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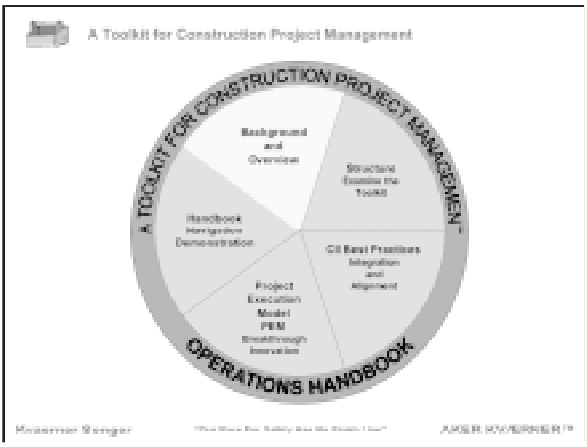
A Toolkit for Construction Project Management
A TOOLKIT FOR CONSTRUCTION PROJECT MANAGEMENT
OPERATIONS HANDBOOK
Background and Overview
Structure Explore the Toolkit
CII Best Practices Integration and Alignment
Project Execution Model PEM Breakthrough Innovation
Handbook Navigation Demonstration
Kvaerner Songer
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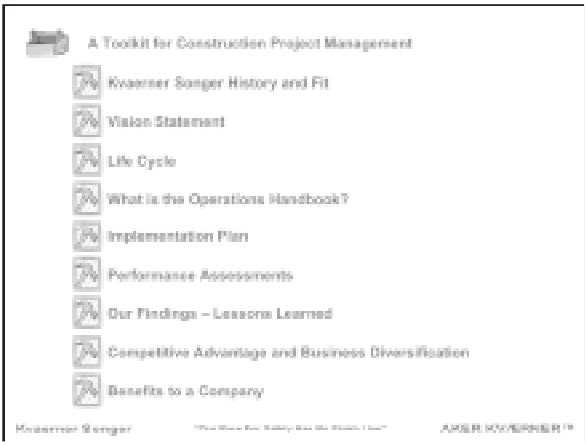
A Toolkit for Construction Project Management
Kvaerner Songer History and Fit
Vision Statement
Life Cycle
What is the Operations Handbook?
Implementation Plan
Performance Assessments
Our Findings – Lessons Learned
Competitive Advantage and Business Diversification
Benefits to a Company
Kvaerner Songer
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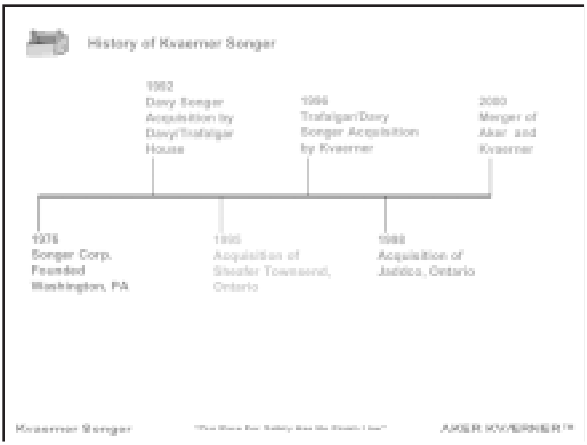
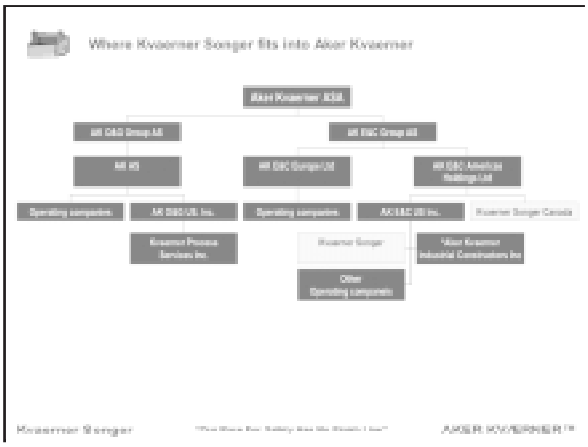
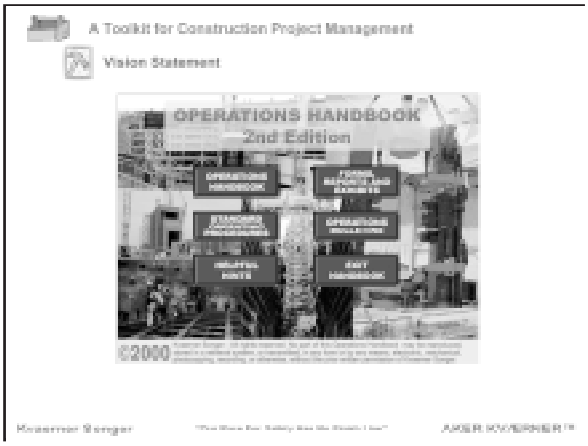

History of Kvaerner Songer
1982
Davy Songer Acquisition by Davy/Trafalgar House
1994
Trafalgar/Davy Songer Acquisition by Kvaerner
2000
Merger of Akar and Kvaerner
1978
Songer Corp. Founded Washington, PA
1995
Acquisition of Sheafer Townsend, Ontario
1998
Acquisition of Jubilee, Ontario
Kvaerner Songer
AKER KVAERNER


Where Kvaerner Songer fits into Aker Kvaerner
Kvaerner Songer
AKER KVÆRNER


A Toolkit for Construction Project Management
Vision Statement
OPERATIONS HANDBOOK
2nd Edition
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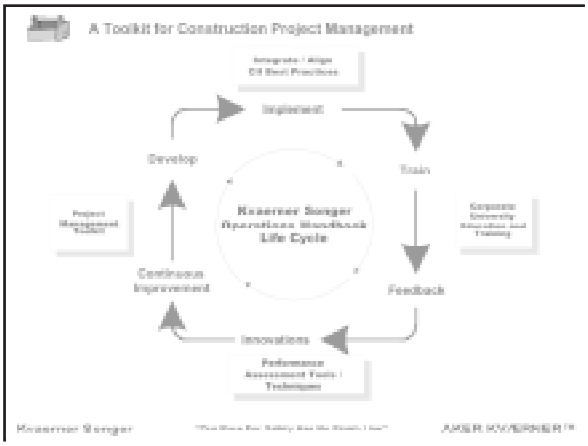
A Toolkit for Construction Project Management
Implement
Train
Feedback
Innovations
Continuous Improvement
Develop
Kvaerner Songer
Operations Handbook
Life Cycle
Kvaerner Songer
AKER KVÆRNER

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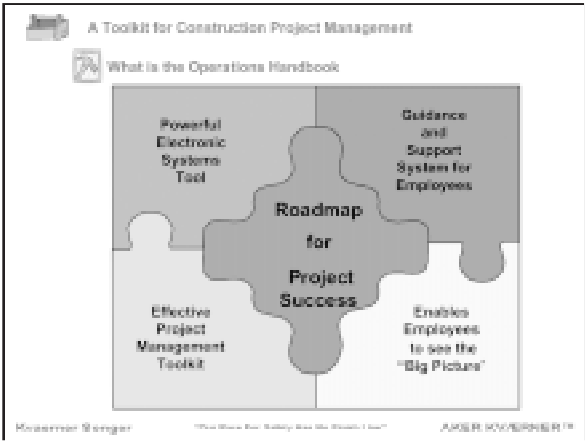
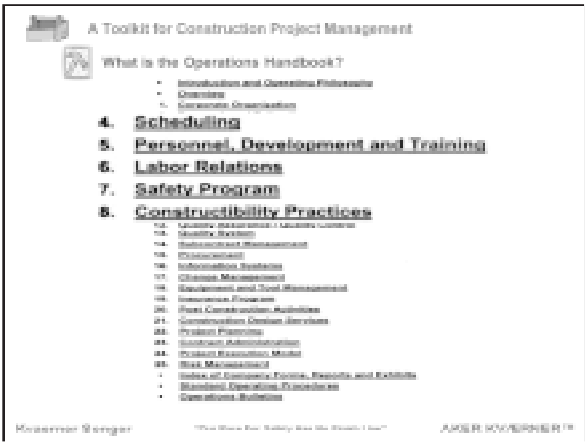
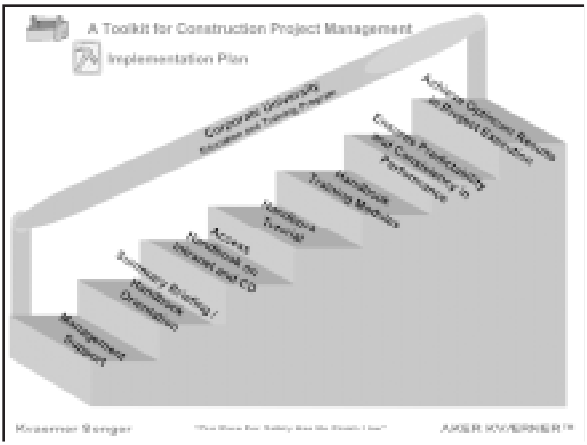
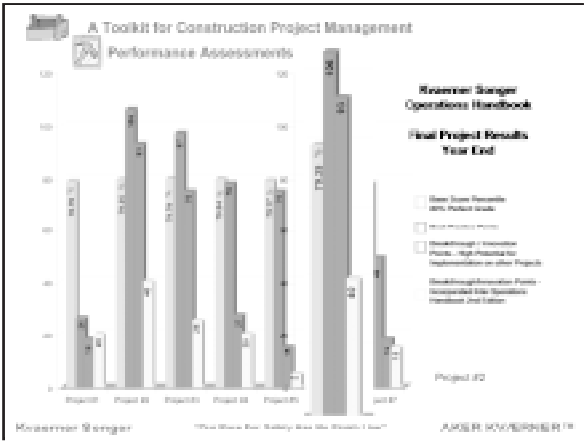

A Toolkit for Construction Project Management
What is the Operations Handbook
Powerful Electronic Systems Tool
Guidance and Support System for Employees
Roadmap for Project Success
Effective Project Management Toolkit
Enables Employees to see the "Big Picture"

Notes


A Toolkit for Construction Project Management
What is the Operations Handbook?
4. Scheduling
5. Personnel, Development and Training
6. Labor Relations
7. Safety Program
8. Constructibility Practices


A Toolkit for Construction Project Management
Implementation Plan

Notes



A Toolkit for Construction Project Management

Our Findings – Lessons Learned

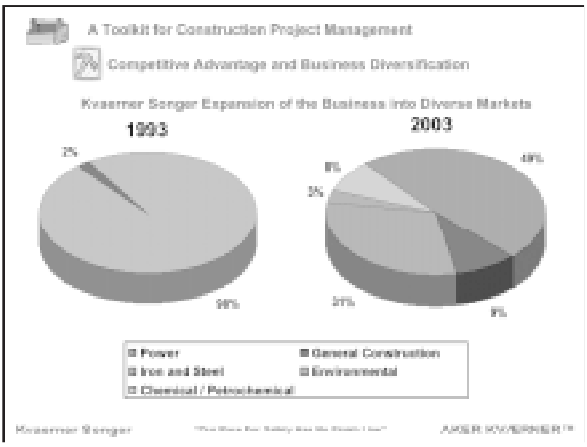
KEY AREAS FOR IMPROVEMENT	CORRECTIVE ACTION & REMEDY
Management did not support delivery of Handbook Training Modules	Management support for roll out of Handbook 2nd Edition Training Modules
Sufficient resources were not allocated for training	Additional staff added to the Quality Department – adequate budget provided
Only 6 of 17 Handbook Modules delivered	Handbook 2nd Edition Training Modules are completed – delivery with training started
Weak Subcontract Management and Administrative Tools	Checklists and Subcontractor Administrative Manual included in Handbook 2nd Edition
Inadequate Project Administration – Feedback from major Canadian client	Handbook 2nd Edition modified for Canadian Operations

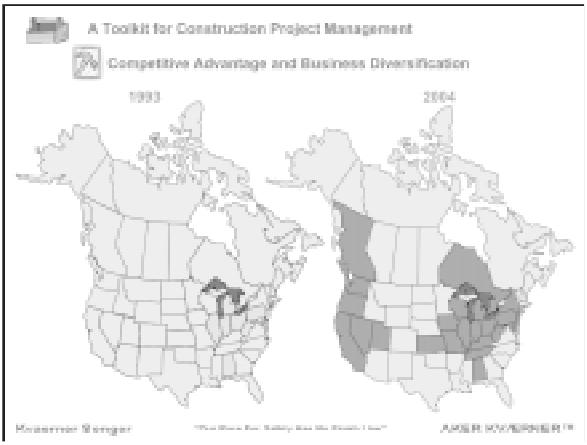
A Toolkit for Construction Project Management

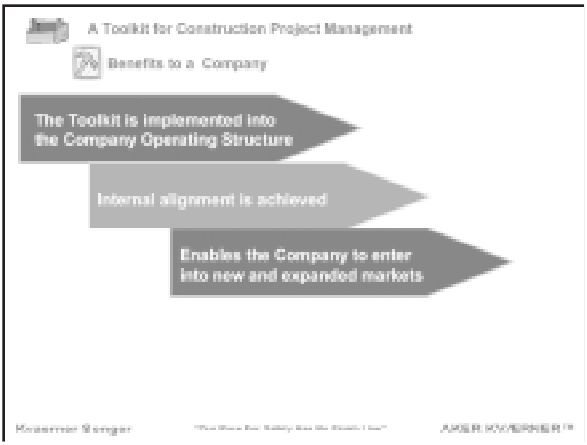
Our Findings – Lessons Learned

KEY AREAS OF EXCELLENCE	BENEFITS TO COMPANY
Accelerated orientation – new employees "get up to speed quickly" and optimize their performance	Improved project execution results
Demonstrated accuracy and reliability of management reporting tools	Ensures predictable results
Employee primary project duties and function matrix – an indispensable tool for a systematic approach	One team concept with everyone on "same page" – optimum project execution results
Handbook Performance Assessments performed on projects	Identified areas of weakness and excellence – drives the process of continuous improvement
Seamless and uniform project execution strategy – one system	Delivery of quality products and services recognized and valued by our customers with high degree of satisfaction

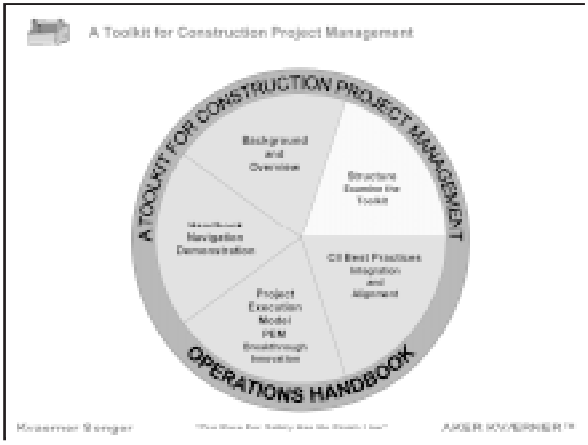
Notes

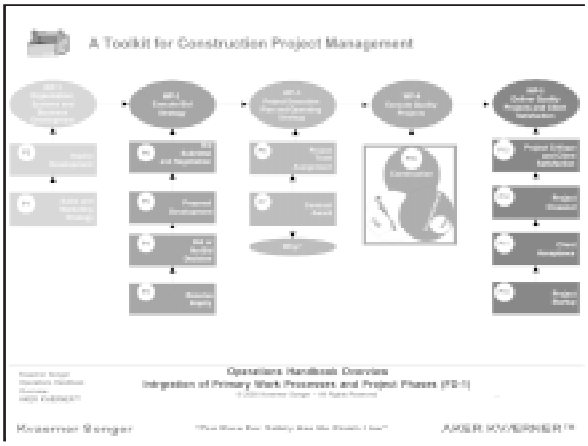

A Toolkit for Construction Project Management
Competitive Advantage and Business Diversification
Kvaerner Songer Expansion of the Business into Diverse Markets
1993
2003
2%
98%
8%
3%
48%
37%
8%
Power
General Construction
Iron and Steel
Environmental
Chemical / Petrochemical
Kvaerner Songer
AKER KVÆRNER

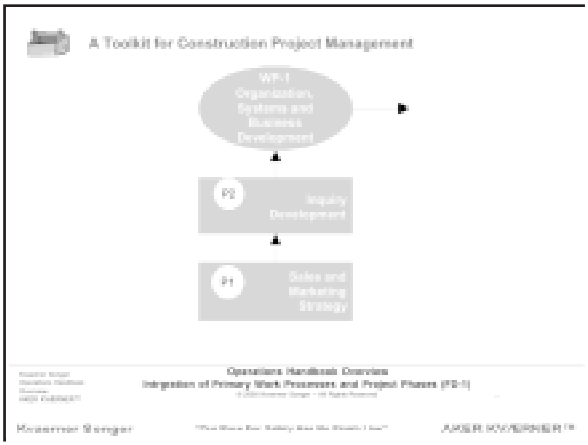

A Toolkit for Construction Project Management
Competitive Advantage and Business Diversification
1993
2004
Kvaerner Songer
AKER KVÆRNER

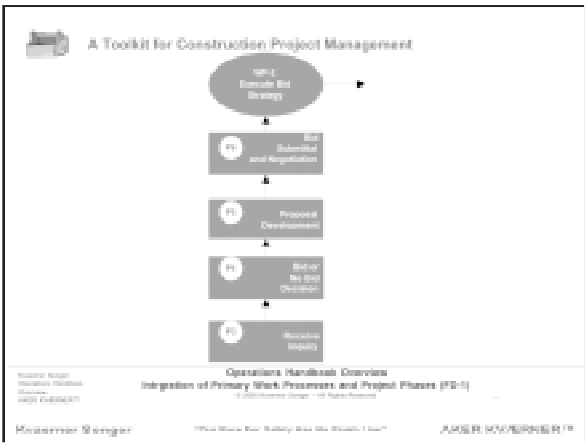

A Toolkit for Construction Project Management
Benefits to a Company
The Toolkit is implemented into the Company Operating Structure
Internal alignment is achieved
Enables the Company to enter into new and expanded markets
Kvaerner Songer
AKER KVÆRNER

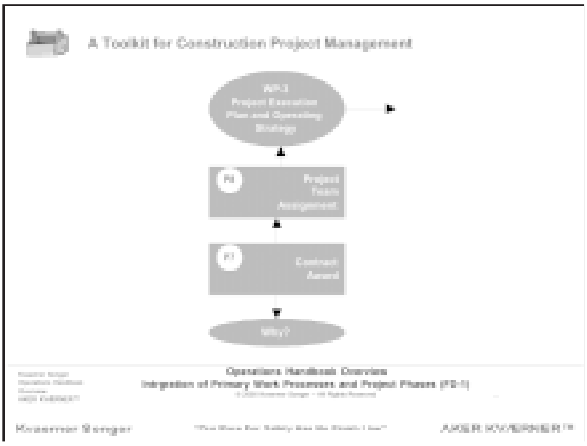
Notes


A Toolkit for Construction Project Management
A TOOLKIT FOR CONSTRUCTION PROJECT MANAGEMENT
Background and Overview
Structure
Navigation Demonstration
CII Best Practices Integration and Alignment
Project Execution Model PEM
OPERATIONS HANDBOOK


A Toolkit for Construction Project Management
Operations Handbook Overview
Integration of Primary Work Processes and Project Phases (PD-1)


A Toolkit for Construction Project Management
WP-1 Organization, Systems and Business Development
P2 Inquiry Development
P1 Sales and Marketing Strategy
Operations Handbook Overview
Integration of Primary Work Processes and Project Phases (PD-1)


A Toolkit for Construction Project Management
Operations Handbook Overview
Integration of Primary Work Processes and Project Phases (PD-1)


A Toolkit for Construction Project Management
Operations Handbook Overview
Integration of Primary Work Processes and Project Phases (PD-1)


A Toolkit for Construction Project Management
WP-4
Execute Quality
Projects
PMC
Construction
Operations Handbook Overview
Integration of Primary Work Processes and Project Phases (PD-1)

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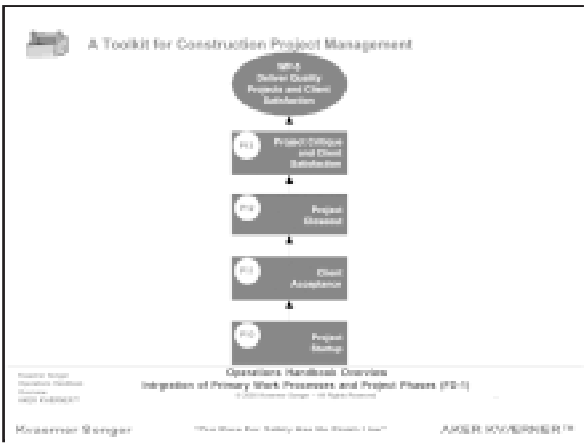
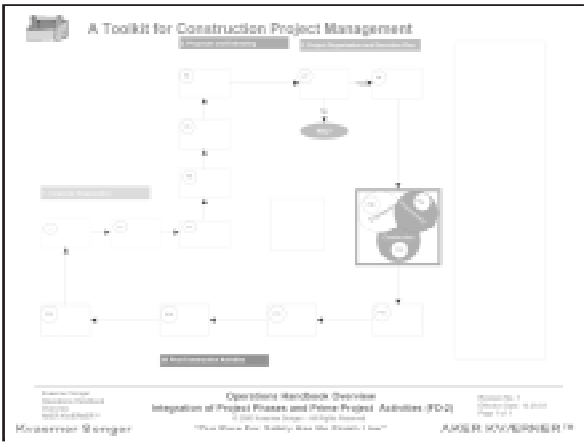
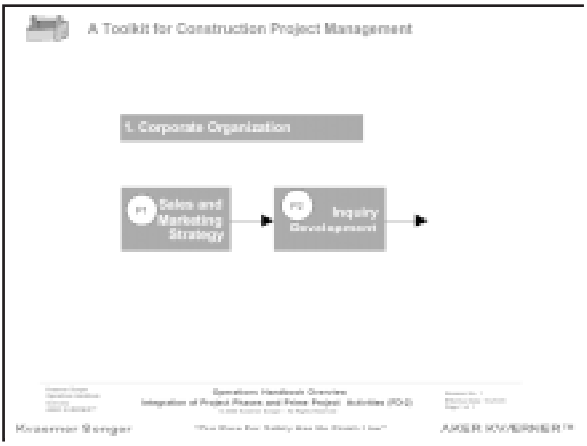
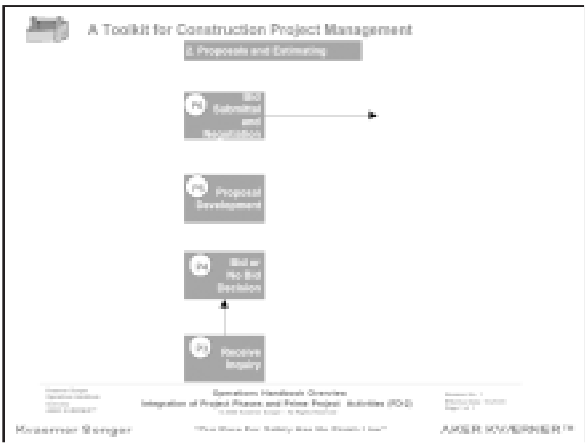
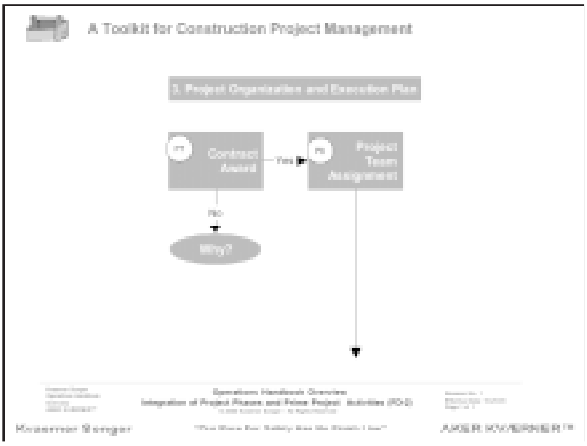

A Toolkit for Construction Project Management
Operations Handbook Overview
Integration of Primary Work Processes and Project Phases (PD-1)

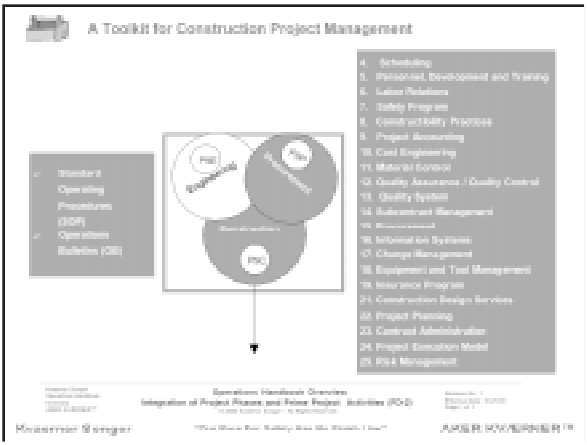

A Toolkit for Construction Project Management
Operations Handbook Overview
Integration of Project Phases and Prime Project Activities (PD-2)


A Toolkit for Construction Project Management
1. Corporate Organization
Sales and Marketing Strategy
Inquiry Development

Notes


A Toolkit for Construction Project Management
2. Proposals and Estimating
Bid Submittal and Negotiation
Proposal Development
Bid or No Bid Decision
Receive Inquiry
Operations Handbook Overview
Integration of Project Phases and Prime Project Activities (PDA)
Moisseron Stenger
AKER KVERNER


A Toolkit for Construction Project Management
3. Project Organization and Execution Plan
Contract Award
Yes
Project Team Assignment
No
Why?
Operations Handbook Overview
Integration of Project Phases and Prime Project Activities (PDA)
Moisseron Stenger
AKER KVERNER


A Toolkit for Construction Project Management
Standard Operating Procedures (SOP)
Operations Bulletin (OB)
PMO
Operations
PDC
4. Scheduling
5. Personnel, Development and Training
6. Labor Relations
7. Safety Program
8. Constructibility Practices
9. Project Accounting
10. Cost Engineering
11. Material Control
12. Quality Assurance / Quality Control
13. Quality System
14. Subcontract Management
15. Procurement
16. Information Systems
17. Change Management
18. Equipment and Tool Management
19. Insurance Program
21. Construction Design Services
22. Project Planning
23. Contract Administration
24. Project Execution Model
25. Risk Management
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Integration of Project Phases and Prime Project Activities (PDA)
Moisseron Stenger
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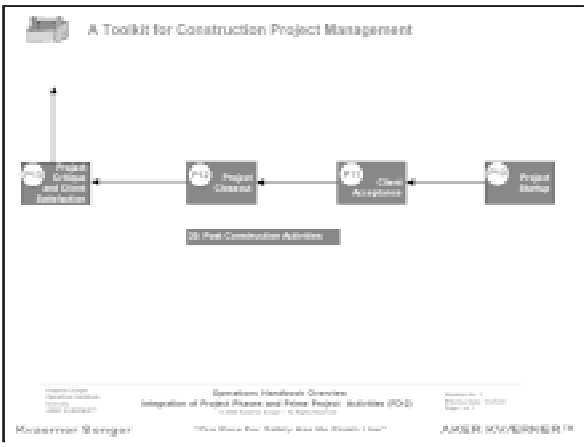
A Toolkit for Construction Project Management
Project Closeout
Client Acceptance
Project Startup
20 Post Construction Activities
Operations Handbook Overview
Integration of Project Phases and Prime Project Activities (PO-2)
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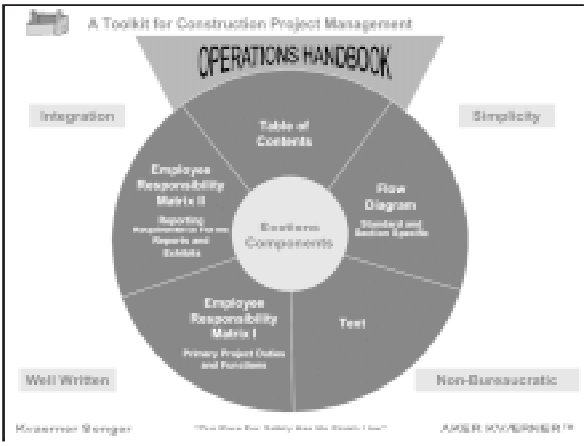
A Toolkit for Construction Project Management
OPERATIONS HANDBOOK
Integration
Simplicity
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Reports and Exhibits
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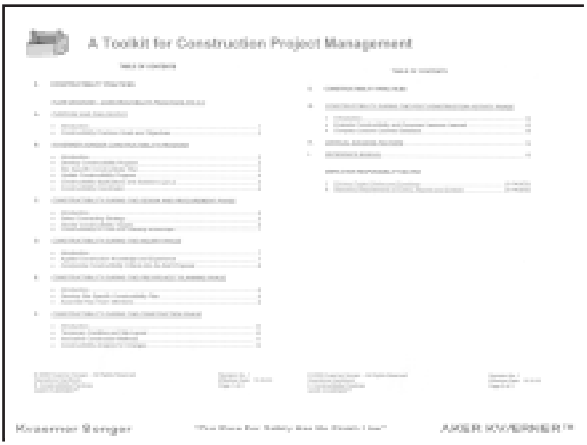
Standard and Section Specific
Functional Components
Employee Responsibility Matrix I
Primary Project Duties and Functions
Text
Well Written
Non-Bureaucratic
Moserrier Stenger
AKER RYVERNER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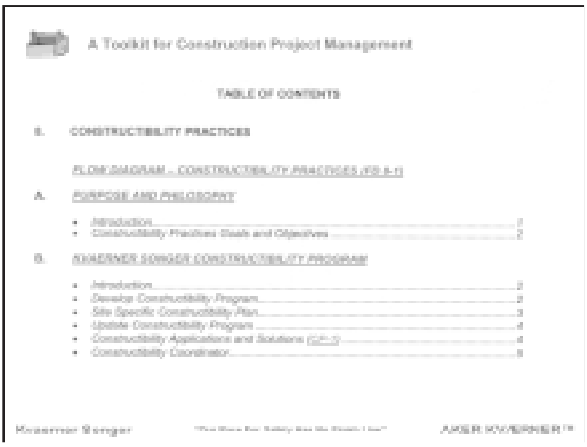
A Toolkit for Construction Project Management
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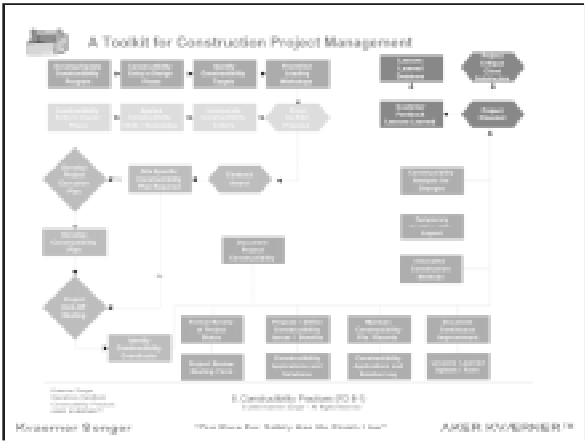
Constructibility Practices Goals and Objectives
B. KHARTNER SONGER CONSTRUCTIBILITY PROGRAM
Introduction
Develop Constructibility Program
Site Specific Constructibility Plan
Update Constructibility Program
Constructibility Applications and Solutions (CP-1)
Constructibility Coordinator
Khartner Songer
AKER KVERNER


A Toolkit for Construction Project Management
Khartner Songer
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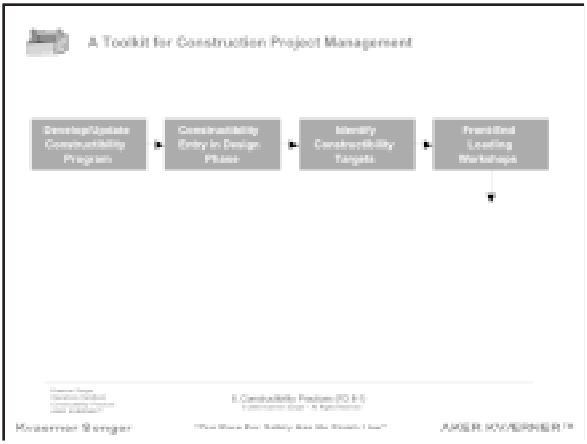
A Toolkit for Construction Project Management
Develop/Update Constructibility Program
Constructibility Entry in Design Phase
Identify Constructibility Targets
Prioritized Leading Workshops
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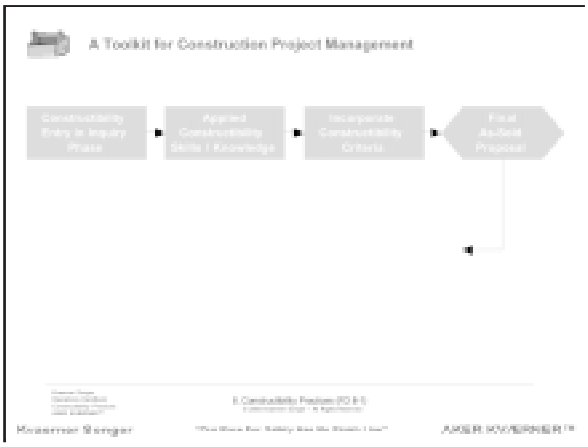
A Toolkit for Construction Project Management
Constructability Entry in Inquiry Phase
Applied Constructability Skills / Knowledge
Incorporate Constructability Criteria
Final Bid/Sold Proposal
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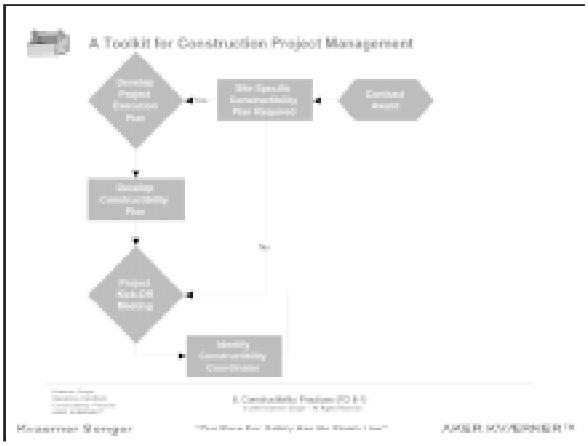
A Toolkit for Construction Project Management
Develop Project Execution Plan
Site Specific Constructability Plan Required
Contract Award
Develop Constructability Plan
Project Kick-Off Meeting
Identify Constructability Coordinator
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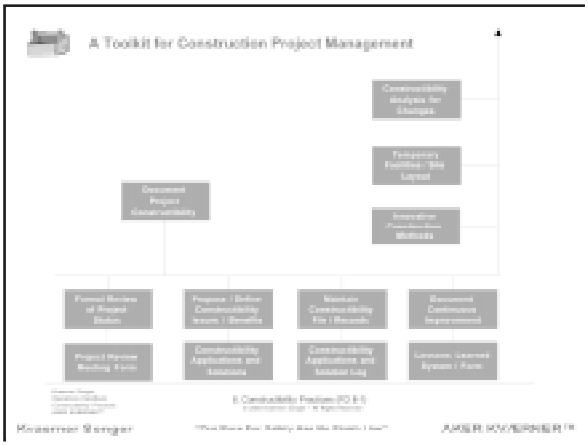
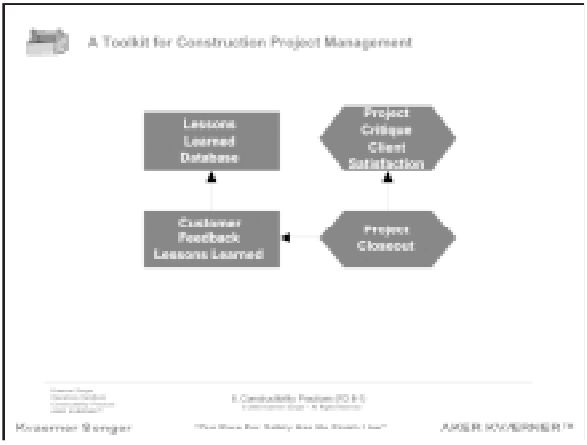
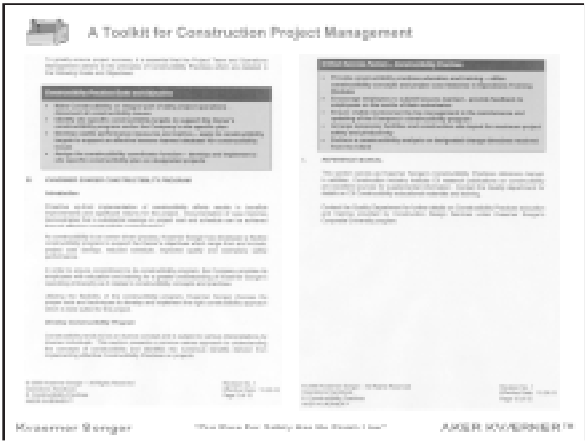
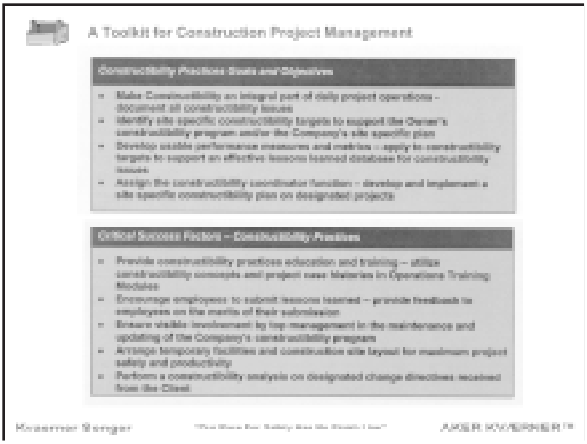
AKER KVERNER


A Toolkit for Construction Project Management
Constructability analysis for changes
Temporary Facilities / Site Layout
Innovative Construction Methods
Document Project Constructability
Formal Review of Project Status
Propose / Define Constructability Issues / Benefits
Maintain Constructability File / Records
Document Continuous Improvement
Project Review Meeting Forms
Constructability Applications and Solutions
Constructability Applications and Solution Log
Lessons Learned System / Form
Mosserrer Stenger
AKER KVERNER

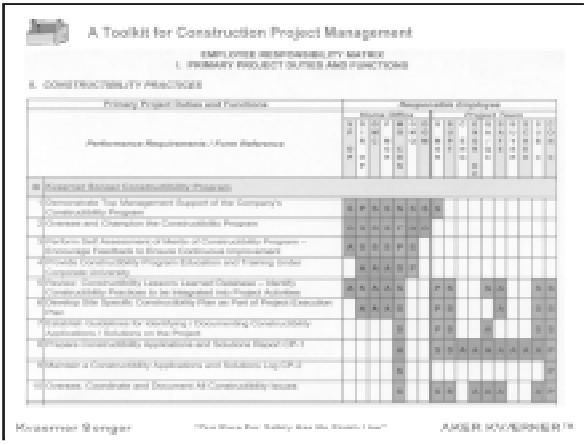
Notes

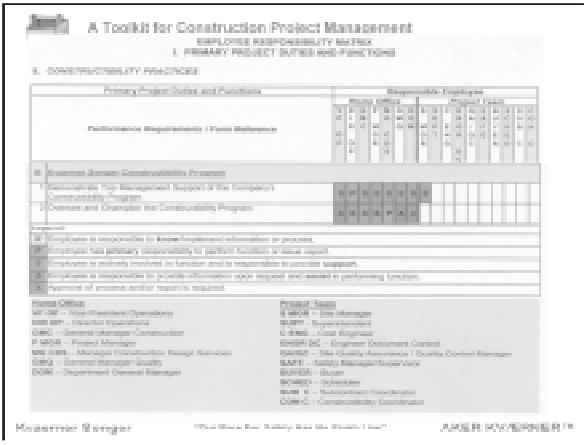

A Toolkit for Construction Project Management
Lessons Learned Database
Project Critique Client Satisfaction
Customer Feedback Lessons Learned
Project Closeout

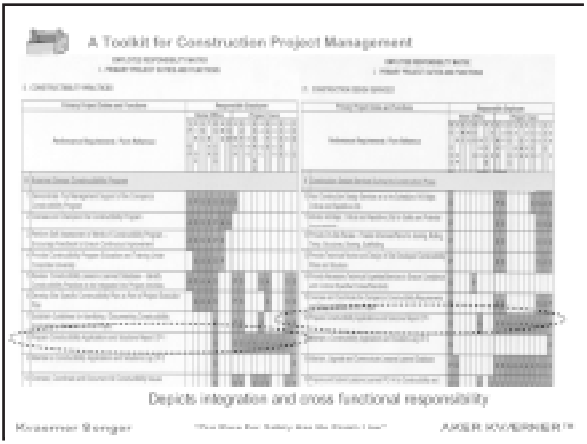

A Toolkit for Construction Project Management


A Toolkit for Construction Project Management
Constructibility Practices Goals and Objectives
Make Constructibility an integral part of daily project operations – document all constructibility issues
Identify site specific constructibility targets to support the Owner's constructibility program and/or the Company's site specific plan
Develop usable performance measures and metrics – apply to constructibility targets to support an effective lessons learned database for constructibility issues
Assign the constructibility coordinator function – develop and implement a site specific constructibility plan on designated projects
Critical Success Factors – Constructibility Practices
Provide constructibility practices education and training – utilize constructibility concepts and project case histories in Operations Training Modules
Encourage employees to submit lessons learned – provide feedback to employees on the merits of their submission
Ensure visible involvement by top management in the maintenance and updating of the Company's constructibility program
Arrange temporary facilities and construction site layout for maximum project safety and productivity
Perform a constructibility analysis on designated change directives received from the Client

Notes


A Toolkit for Construction Project Management


A Toolkit for Construction Project Management


A Toolkit for Construction Project Management
Depicts integration and cross functional responsibility

Notes

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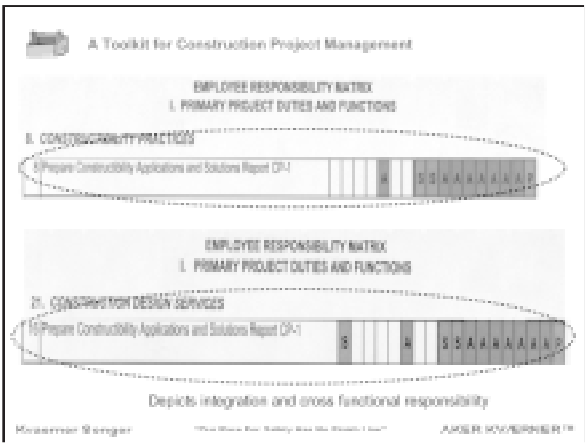
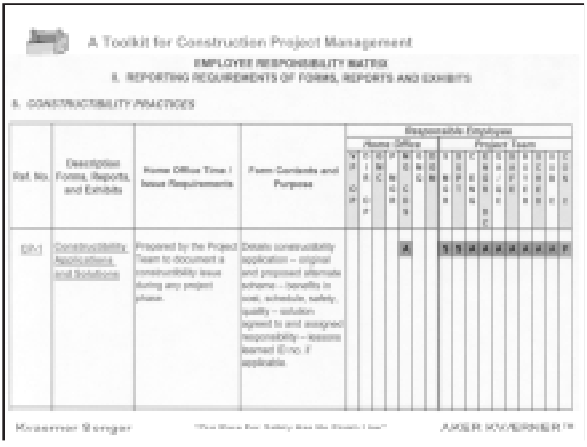
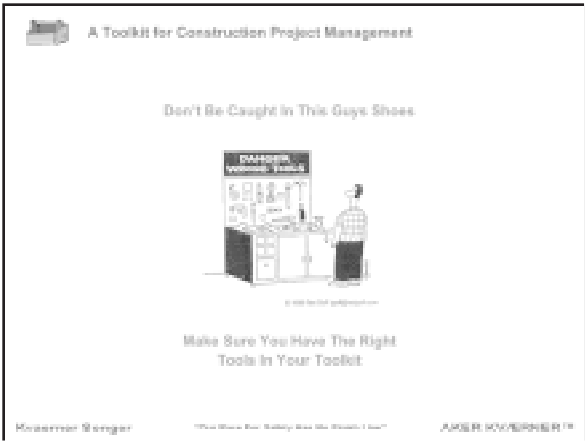
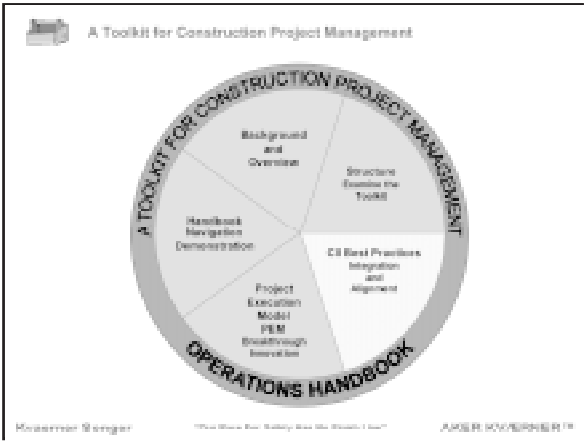
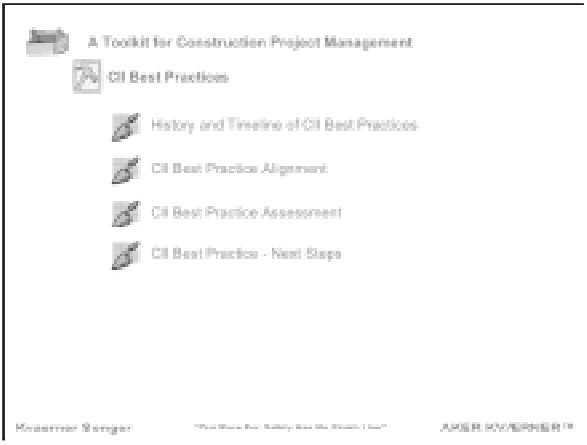

A Toolkit for Construction Project Management
EMPLOYEE RESPONSIBILITY MATRIX
I. PRIMARY PROJECT DUTIES AND FUNCTIONS
II. CONSTRUCTABILITY PRACTICES
EMPLOYEE RESPONSIBILITY MATRIX
I. PRIMARY PROJECT DUTIES AND FUNCTIONS
II. CONSTRUCTABILITY PRACTICES
Depicts integration and cross functional responsibility


A Toolkit for Construction Project Management
EMPLOYEE RESPONSIBILITY MATRIX
II. REPORTING REQUIREMENTS OF FORMS, REPORTS AND EXHIBITS
II. CONSTRUCTABILITY PRACTICES


A Toolkit for Construction Project Management
Don't Be Caught In This Guys Shoes
Make Sure You Have The Right
Tools In Your Toolkit


A Toolkit for Construction Project Management
A TOOLKIT FOR CONSTRUCTION PROJECT MANAGEMENT
OPERATIONS HANDBOOK
Background and Overview
Structure Examine the Toolkit
CII Best Practices Integration and Alignment
Project Execution Model PEM Breakthrough Innovation
Handbook Navigation Demonstration


A Toolkit for Construction Project Management
CII Best Practices
History and Timeline of CII Best Practices
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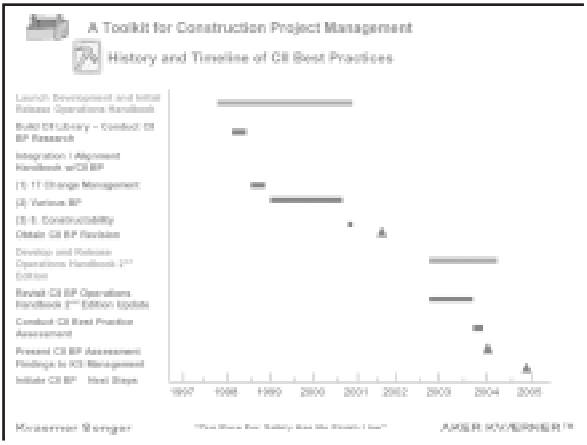
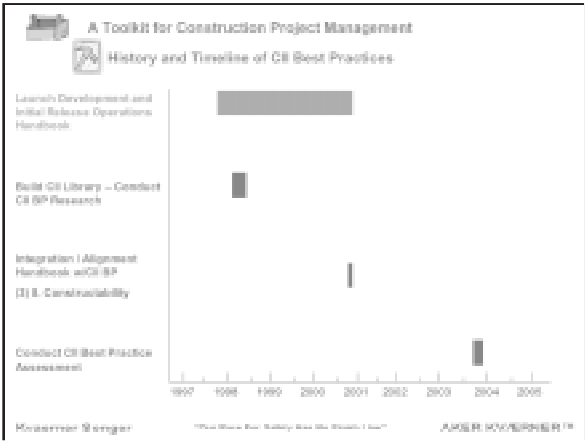
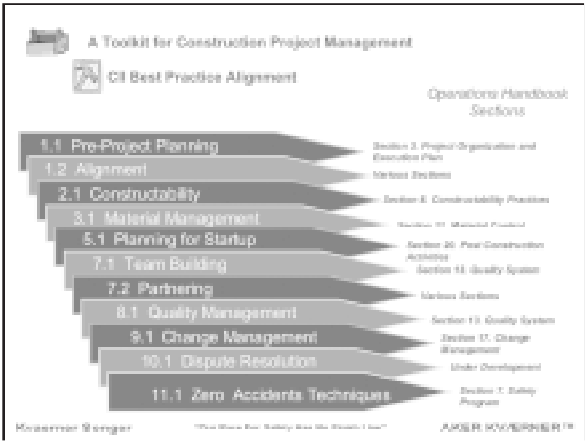
CII Best Practice Assessment
CII Best Practice - Next Steps


A Toolkit for Construction Project Management
History and Timeline of CII Best Practices
1997
1998
1999
2000
2001
2002
2003
2004
2005

Notes


A Toolkit for Construction Project Management
History and Timeline of CII Best Practices
Launch Development and Initial Release Operations Handbook
Build CII Library – Conduct CII BP Research
Integration / Alignment Handbook w/CII BP
(3) 8. Constructability
Conduct CII Best Practice Assessment
1997
1998
1999
2000
2001
2002
2003
2004
2005
Moderator Manager
AKER KVÆRNER


A Toolkit for Construction Project Management
CII Best Practice Alignment
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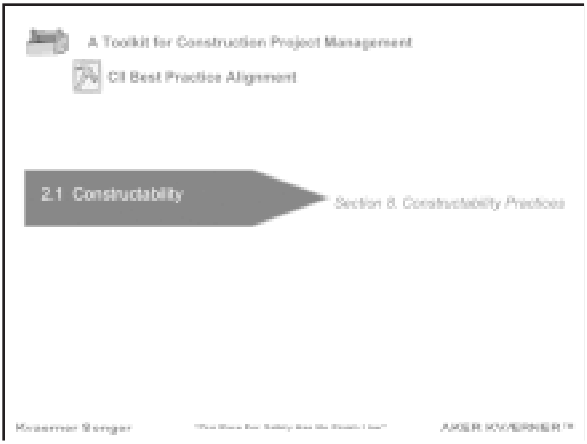
1.2 Alignment
2.1 Constructability
3.1 Material Management
5.1 Planning for Startup
7.1 Team Building
7.2 Partnering
8.1 Quality Management
9.1 Change Management
10.1 Dispute Resolution
11.1 Zero Accidents Techniques
Section 8. Constructability Practices
Section 14. Quality System
Section 17. Change Management
Under Development
Moderator Manager
AKER KVÆRNER


A Toolkit for Construction Project Management
CII Best Practice Alignment
2.1 Constructability
Section 8. Constructability Practices
Moderator Manager
AKER KVÆRNER

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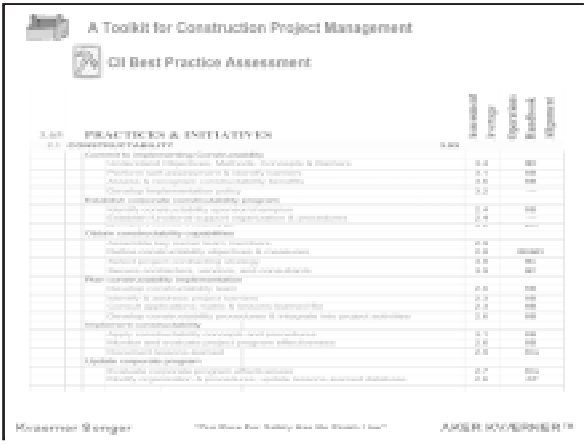
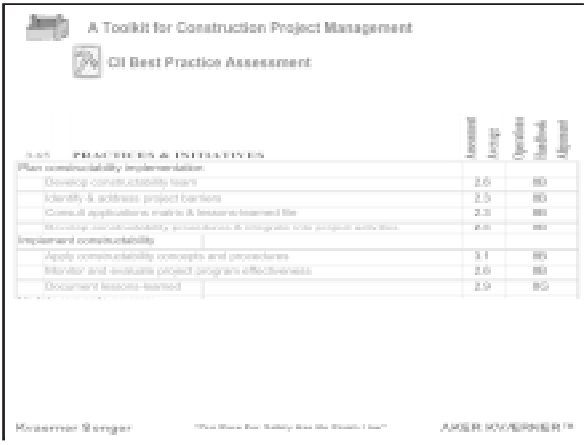
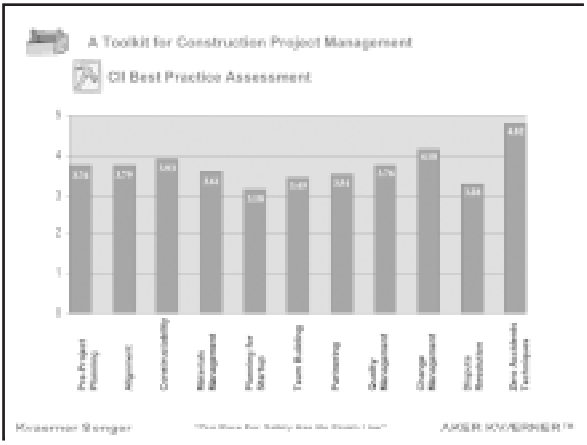
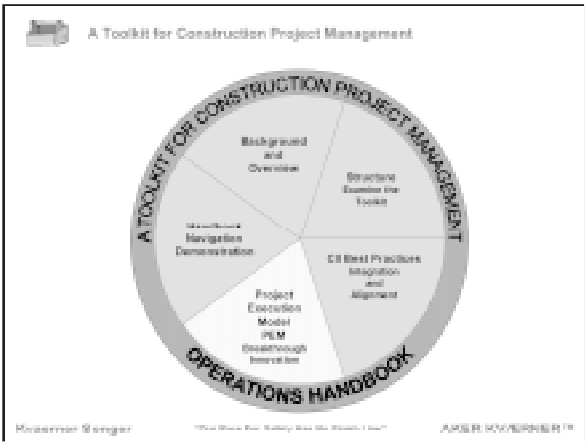

A Toolkit for Construction Project Management
CII Best Practice Assessment
PRACTICES & INITIATIVES

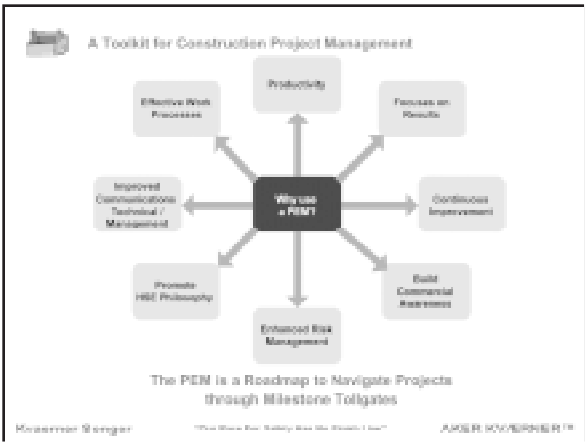

A Toolkit for Construction Project Management
CII Best Practice Assessment
PRACTICES & INITIATIVES
Plan constructability implementation
Develop constructability team
Identify & address project barriers
Consult applications matrix & lessons learned file
Implement constructability
Apply constructability concepts and procedures
Monitor and evaluate project program effectiveness
Document lessons-learned


A Toolkit for Construction Project Management
CII Best Practice Assessment

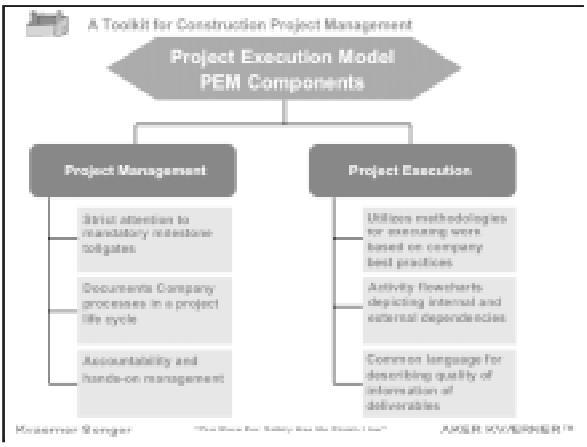
Notes

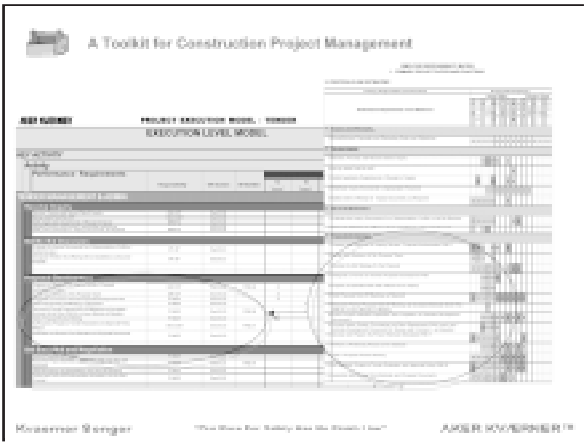

A Toolkit for Construction Project Management
CII Best Practice – Next Steps

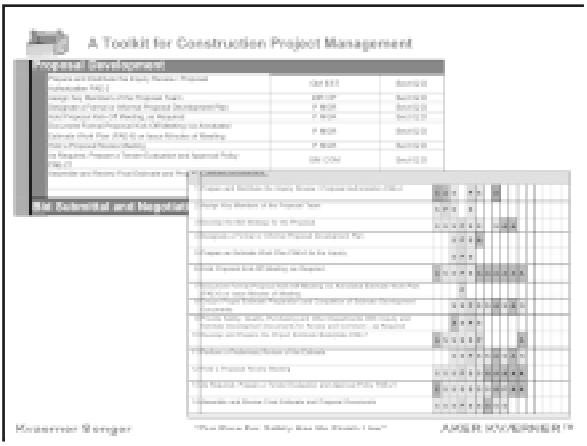

A Toolkit for Construction Project Management
A TOOLKIT FOR CONSTRUCTION PROJECT MANAGEMENT
OPERATIONS HANDBOOK
Background and Overview
Structure
Navigation Demonstration
CII Best Practices Integration and Alignment
Project Execution Model PEM Breakthrough Innovation


A Toolkit for Construction Project Management
Productivity
Focuses on Results
Continuous Improvement
Build Commercial Awareness
Enhanced Risk Management
Promote HSE Philosophy
Improved Communications Technical / Management
Effective Work Processes
Why use a PEM?
The PEM is a Roadmap to Navigate Projects through Milestone Tollgates

Notes


A Toolkit for Construction Project Management
Project Execution Model
PEM Components
Project Management
Project Execution
Strict attention to mandatory milestone-gates
Documents Company processes in a project life cycle
Accountability and hands-on management
Utilizes methodologies for managing work based on company best practices
Activity flowcharts depicting internal and external dependencies
Common language for describing quality of information of deliverables


A Toolkit for Construction Project Management
EXECUTION LEVEL MODEL


A Toolkit for Construction Project Management
Proposal Development

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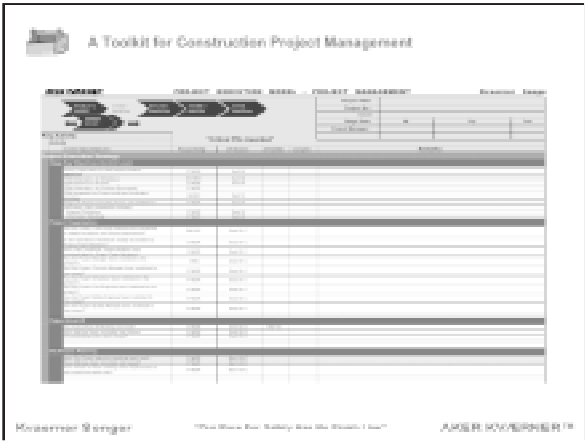
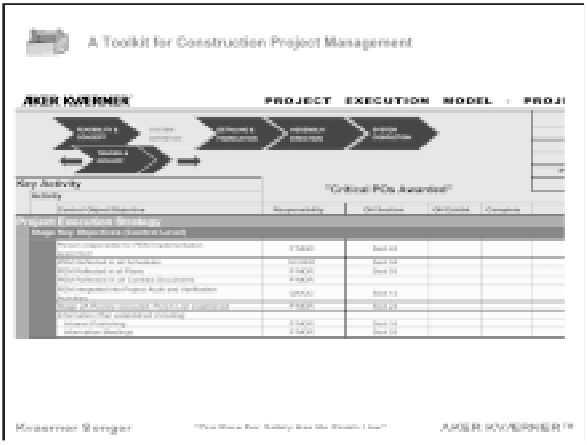
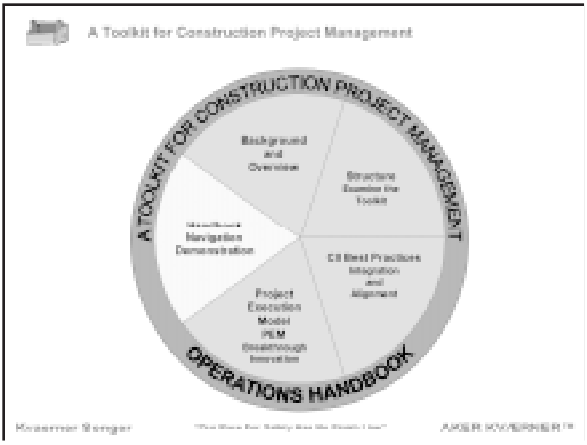

A Toolkit for Construction Project Management
AKER KVÆRNER


A Toolkit for Construction Project Management
AKER KVÆRNER
PROJECT EXECUTION MODEL
"Critical POs Awarded"
AKER KVÆRNER


A TOOLKIT FOR CONSTRUCTION PROJECT MANAGEMENT
Background and Overview
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Project Execution Model PEM
OPERATIONS HANDBOOK
AKER KVÆRNER

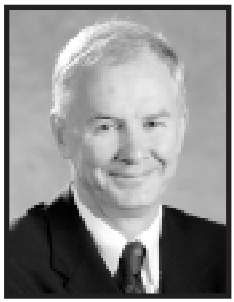
Notes

Banquet Presentation

Banquet Speaker: John Furlong

Speaker

John Furlong – Chief Executive Officer, Vancouver Organizing Committee, 2010 Olympic and Paralympic Winter Games



John Furlong, a longtime member of the Canadian Olympic Committee, Furlong served as co-chair of the British Columbia (BC) Summer Games, the BC Winter Games, and Sport BC. He founded the Northern BC Winter Games Society and served BC at seven Canada Games and two Western Canada Games. An international competitor in three sports and a coach as well, he is a former Canadian Squash Champion. He has been recognized with numerous community awards for his service to sport, including the Darrel Thompson Award and the Kaizan Award for services to sport in BC over a lifetime. Furlong was inducted into the BC Sports Hall of Fame this year.

Outstanding Researcher for 2004

G. Edward Gibson, Jr.

Dr. G. Edward Gibson, Jr., has been selected as the recipient of the Outstanding Researcher Award for 2004. This marks the second time Gibson has been selected as the outstanding researcher, having been selected in 1996 as well. The two researcher awards coupled with his other recognition from CII as the outstanding instructor (1998) make him unique in the history of the Institute.

Gibson is a professor of civil engineering and the Austin Industries Endowed Faculty Fellow in the Construction Engineering and Project Management program at The University of Texas at Austin. He received his Ph.D. in civil engineering from Auburn University and an M.B.A. from the University of Dallas. He currently serves as a member of the Board of Governors for the Architectural Institute within the American Society of Civil Engineering.

He is an author or co-author of numerous articles and reports on pre-project planning. Among these documents are CII's P*re-Project Planning Handbook*, *Project Definition Rating Index (PDRI), Industrial Projects*, and *PDRI, Building Projects*.

Most recently he has been involved in developing the CII International Project Risk Assessment tool and method. It is this research that has helped Gibson garner the outstanding researcher award for the second time. In a letter nominating him for the award, one CII member notes that, "In undertaking the research of this very complex subject, Dr. Gibson has shown leadership and provided direction which resulted in an easy-to-use work product. The research is founded on data that represents billions of dollars of capital investment. The work is unique to our industry and will become a standard for assessing risk for international projects."

CII takes great pride in recognizing Dr. Gibson for his outstanding research contributions. He is a stellar researcher in one of the world's largest industries. Congratulations to Dr. G. Edward Gibson, Jr., on his selection as the Outstanding Researcher for 2004.

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

2001 – Ed Jaselskis, Iowa State University

2002 – Carl Haas, The University of Texas at Austin

2003 – Jimmie Hinze, University of Florida

Outstanding Researcher Award Panel of Judges

W. Edward Back	Associate Professor, Clemson University
Melissa B. Herkt	Vice President, Global Project Management, GlaxoSmithKline
William L. Johnsmeyer	President, Butler Construction, Butler Manufacturing Company
Jerry R. Koogler	General Manager, Graycor Industrial Contractors
Louis L. Prudhomme	Associate Director for Research, Construction Industry Institute

Outstanding Instructor for 2004

Michael R. Peters

Michael R. Peters has been selected as the recipient of the Outstanding Instructor Award for 2004. The award recognizes outstanding performance in using CII material to enhance the learning process.

Peters, corporate training manager for Washington Group International, helped to create and deploy the highly successful Project Team Training Program at his company. The Project Team Training Program covers 26 topics totaling 184 classroom hours. The training is done in two phases: first, a Web-based course or courses to be completed online as a prerequisite to a second phase of facilitated classroom training with case studies and team exercises. He and the Washington Group developmental team integrated all CII Best Practices and Proposed Best Practices into standard company work processes to improve project team performance. He also coordinated the efforts of Clemson University professors and subject matter experts in developing the program's training modules.

During 2003, the Project Team Training Program involved 55,000 hours of training with 7,000 employee and client participants. Peters alone did 20,000 participant hours of training in team building, partnering, and owner/contractor work structure, all based on CII research and recommendations. This personal effort on his part totaled approximately 800 classroom hours — roughly 40 percent of his annual work time.

Peters has been involved in CII activities for several years. He moderated the Washington Group case study on the Project Team Training Program at the 2002 CII Annual Conference as well as the 2002 Construction Project Improvement (CPI) Conference, which is sponsored by CII. He is currently a member of the CII Education Committee.

Consistently rated as an exceptionally effective instructor by the written critiques submitted at the end of each training session, Peters has created high demand for his services among Washington Group offices and projects worldwide. By virtue of this involvement, he has contributed significantly to improved project performance, transferring knowledge about CII research findings and recommendations to project teams for implementation. CII salutes Mike Peters and is pleased to recognize him with its Outstanding Instructor Award for 2004.

Award Criteria

- The nominee is an exceptionally effective instructor whose contributions, talent, and efforts have been recognized for outstanding performance by the participants in learning activities involving CII education material.
- The nominee has presented CII material in ways that have significantly enhanced the learning process.
- Consideration will also be given to the degree to which the nominee has contributed to the development of CII education material.

Previous Recipients of the Outstanding Instructor Award

1995 – Jorge Vanegas, Georgia Institute of Technology

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

2001 – Ed Back, Clemson University

2002 – Ed Ruane, J. A. Jones Construction Company

2003 – James M. Neil, Morrison Knudsen (deceased)
Emmitt J. Nelson, Shell Oil Company (retired)

Outstanding Instructor Award Panel of Judges

Manuel A. Garcia	Associate Director for Education, Implementation, Knowledge Management, Construction Industry Institute
Arnold M. Manaker	Project Manager, Paradise SCR, Tennessee Valley Authority
Leo McKnight	Director, Training & Development, Hilti Corporation
Gary R. Smith	Professor, Department of Civil Engineering and Construction, North Dakota State University

Outstanding Implementer for 2004

Melissa Herkt

Melissa Herkt is the 2004 recipient of the Outstanding Implementer Award from the Construction Industry Institute. The award recognizes outstanding achievement in enhancing implementation of CII Best Practices within one or more CII member organizations.

Herkt is vice president of global project management at GlaxoSmithKline (GSK). She recently sponsored a team within the company to establish common and consistent ways of managing capital projects. She and the team developed a comprehensive project management standard with specific emphasis on the CII Knowledge Areas and corresponding Best Practices and Proposed Best Practices. The resulting GSK standard has more than 100 implementation tools, several of which come directly from CII research.

Herkt's active role and participation has brought a significant amount of experience and credibility to the standard within her company. More than 350 people from over 60 company sites have been trained in the use of the project management standard in 25 different countries. This includes 50 global manufacturing and supply sites, seven R&D sites, consumer healthcare and nutritional sites, and the company's biological group that supports its U.S. commercial operations. GSK personnel have consistently rated the training course as excellent. In addition, the standard has been used as a case study in a prestigious UK academic-industry research project. The company's R&D organizations in Europe and North America will soon adopt the standard as well.

Herkt has been a leader in promoting the concepts of implementation, knowledge management, and in creating a global project management community for her company. Also active in other CII efforts, she has assigned several GSK representatives to a variety of CII projects. Her leadership, commitment, and innovative ideas make her a valuable asset to all. CII is proud to recognize Melissa Herkt as the Outstanding Implementer for 2004.

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 demonstrates 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.

Previous Recipient of the Outstanding Implementer Award

2001 – Richard J. Jessop, Ontario Power Generation

2002 – Mohammad S. Al-Subhi, Saudi Aramco

2003 – Bernard J. Fedak, United States Steel Corporation

Outstanding Implementer Award Panel of Judges

Manuel A. Garcia	Associate Director for Education, Implementation, Knowledge Management, Construction Industry Institute
Donald G. Giles	Manager, Engineering, Mon Valley/Clairton, U.S. Steel Corp.
Robert F. Jortberg	RADM U. S. Navy (Retired) and former Associate Director, Construction Industry Institute
Richard F. Kibben	President, Kibben Consulting
Jack E. Turner	Consultant, Construction Management Services

Benchmarking User Awards for 2004

The Benchmarking User Awards, given to both an owner organization and a contractor organization, recognize exceptional use of and contributions to benchmarking.

Owner: GlaxoSmithKline

GlaxoSmithKline (GSK) actively demonstrates continued and outstanding support of the benchmarking program. GSK helped launch Benchmarking's pharmaceutical study as well as the small projects initiative. The company supports the Benchmarking Committee, has submitted significant amounts of project information to the Benchmarking database, and has sent many GSK representatives to the benchmarking training workshops.

Contractor: Aker Kværner

Aker Kværner has steadfastly supported and been involved with CII Benchmarking since the program's inception. A supporter of the recent productivity measures initiative, it also has representation on the Benchmarking Committee. Aker Kværner is the only CII member organization to have submitted data to all seven versions of the benchmarking questionnaire. The company shared its experiences in benchmarking at last year's Benchmarking Users Forum.

Award Criteria

- Best application of benchmarking for project system improvement.
- Contributions to benchmarking through active participation (forum, training, project submittal, committee).
- Willingness to share ideas.

Previous Recipients of the Benchmarking User Awards

2000 –	Owner:	Champion International
	Contractor:	Jacobs Engineering
2001 –	Owner:	General Motors Corporation
	Contractor:	BE&K
2002 –	Owner:	Aramco Services Company
	Contractor:	Dillingham Construction Holdings
		S&B Engineers and Constructors Ltd.
2003 –	Owner:	Rohm and Haas Company
	Contractor:	CDI Engineering Group Inc.

Benchmarking User Awards Panel of Judges

The Benchmarking & Metrics Committee selects the recipients of the award each year. The committee includes the following individuals:

Ron Beechey	Scheduling Specialist, Dofasco, Inc.
Gertraud F. Breitkopf	Senior Program Manager, U.S. General Services Administration
Tom Butts	Manager, Southwest Operations, Lockwood Greene
Robert E. Chapman	Economist, Office of Applied Economics, National Institute of Standards & Technology
Jean Childers	Accounts Operations Manager, AMEC, Inc.
Gregory D. Clum	Manager of Project Controls, Black & Veatch Corporation
William G. Cooley, Sr.	Senior PMP Capital Effectiveness Engineer, U.S. Steel
Deborah L. DeGezelle	Systems Analyst, Construction Industry Institute
Dean Ergenbright	Program Analyst, U.S. Department of State
Donald A. Gaddy	Construction Safety & Health Manager, Engineering & Construction Services, Southern Company Generation & Energy Marketing
James B. Gibson	Vice President, Projects, ALSTOM Power Inc.
Kevin J. Gierc	Director, Project Controls, Dick Corporation
Charles M. Green	Engineering Specialist, Aramco Services Company
Carl Gretzinger	Facilities Project Planner, Project Planning Department, General Motors Corporation
Harold L. Helland	Manager, Project Engineering, Abbott Laboratories

Robert A. Herrington	Manager of Quality, Southern Region, Jacobs
David G. Hile	Operations Manager, Fru-Con Construction Corporation
Howard Kass	Senior Facilities Engineer Program Manager, National Aeronautics & Space Administration
John E. Kurth	President, Aker Kværner Pharmaceuticals
Grant G. Landry	Manager, Business Development, Jacobs
John M. Mellin	Manager, Business Planning & Performance, GlaxoSmithKline
Michael S. Mitchell	Director, Project Management Office, Refining & Chemical Industry Center, Emerson Process Management
Wladimir Norko	Senior Engineer, Technical Policy Branch, U.S. Army Corps of Engineers
Mark T. Owens	Director, Global Facilities Delivery, Eli Lilly and Company
David M. Perkins	Project Manager, Rohm and Haas Company
Derek C. Ross	Associate Director, Construction, Office of Facilities Engineering & Operations, Smithsonian Institution
Michael J. Scholz	Engineer/Estimator, Kiewit Industrial Company
Danny Scott	Supervisor, Engineering Project Controls, BE&K, Inc.
James G. Slaughter	President , S&B Engineers and Constructors Ltd.
John H. Stuart	Leader, Enterprise Project Management Office, NOVA Chemicals Corporation
Frank K. Suhan	Manager, Project Controls, Johnson Controls, Inc.

John Tato II	Director, Project Evaluation & Analysis Division, U.S. Department of State
Stephen R. Thomas	Associate Director, Construction Industry Institute
Stephen D. Warnock	Project Manager, Washington Group International, Inc.

Richard L. Tucker Leadership & Service Award

Kent Underwood

CII is pleased to announce the creation of a new award, the Richard L. Tucker Leadership and Service Award. The award recognizes an individual who has contributed significantly to the advancement of the CII mission and to the success of CII as an organization. It is named in honor of Dr. Richard L. Tucker, who personally led the effort to create the Construction Industry Institute in 1983 and who served as the first CII Director from its inception until his retirement as Director in 1998.

The CII Executive Committee selects the award recipient. The award may be presented to a CII volunteer participant in CII programs, to an individual not affiliated with a member organization who otherwise meets the criteria for the award, or to a CII staff member. The award is to be presented not more than once per year, and is to be presented only when a worthy candidate has been identified and selected.

The recipient must have been active in CII programs or have provided significant and exceptional service to further the accomplishment of the CII mission; demonstrated a strong and lasting commitment and support for the mission and the objectives of CII; and served as a role model for other CII participants. The recipient also must have been active in CII efforts for at least three years.

J. Kent Underwood

J. Kent Underwood is the first recipient of the Richard L. Tucker Leadership and Service Award. Because of his long association with CII and the extensive industry experience he has brought to bear in the pursuit of the CII mission, he makes an excellent choice as the initial recipient.

Kent Underwood retired in 2002, after more than 33 years of service to the engineering and construction industry. Prior to his retirement, he was 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 *Engineering News-Record* Magazine Award of Excellence for his work with The Business Roundtable. He also has been active in civic and community affairs, serving as vice chairman of the St. Louis Regional Convention and Sports Complex Authority. He served in the U.S. Air Force, achieving the rank of captain.

He began his association with CII in 1986. In the ensuing 15 years, he served in numerous capacities. Among his efforts, he served on the Board of Advisors as both an alternate and an advisor. He also served on the original Implementation Committee as well as the Membership Committee and The Business Roundtable/AIChE Engineering and Construction Contracting (ECC) Advisory Council. He also was an influential member of the CII Executive Committee from 1999 to 2001. In addition, Underwood played an important role in the CII Annual Conferences through his participation as a CII Forum panelist in both 1997 in St. Louis and in 2002 at Keystone, Colorado.

Kent Underwood has steadfastly supported CII from its formative days and has provided leadership, service, and a seasoned point of view to help CII accomplish its mission to improve the engineering and construction industry. It seems only fitting that he should be selected as the initial recipient of this newly created award since his leadership, service, and support of CII and its initiatives are exemplary in every way. He will now serve as the prototype for the Richard L. Tucker Leadership and Service Award. CII is proud to honor Kent Underwood as the first recipient of this new and singular honor.

Carroll H. Dunn Award of Excellence

The Construction Industry Institute established the Carroll H. Dunn Award of Excellence in 1985 to honor an individual for significant achievements in improving the engineering and construction industry. The award is CII's highest honor and is recognized as one of the most prestigious awards of its kind in the construction industry. A recipient for 2004 has been selected by the CII Executive Committee and will be recognized at the CII Banquet.

Carroll H. Dunn

Carroll H. Dunn was the Project Director of the Construction Industry Cost Effectiveness (CICE) by The Business Roundtable that led to the creation of the Construction Industry Institute. He was instrumental in the establishment of CII. Dunn had a highly decorated career in the United States Army Corps of Engineers. He retired as a Lt. General. During his military career, Dunn served in World War II and later served as Director of the Titan II Missile Program and Division Engineer of the Corps' Southwestern Division.

In 1980, Dunn began work as the full-time Project Director of the CICE Project. The CICE study led to the creation of CII. Dunn's service to CII was considered so valuable that he was appointed an ex-officio member of all the original committees and research task forces.

Criteria of the Dunn Award

Criteria for the Dunn Award include the following:

- Significant contributions to the construction industry.
- Demonstration of the highest degree of personal dedication to improving costs, schedule, quality, and/or safety of the capital facilities delivery process.
- A level of knowledge and breadth of experience that distinguish the recipient as an eminent authority.
- A leadership position in the construction industry from which others can be influenced by example and direction.
- A record of accomplishment that brings added distinction to the recipient, the organizations with which he or she has been associated, and to the industry at large.

Recipients of the Dunn Award of Excellence

Carroll H. Dunn (1985) – inspiring leader and project manager of the CICE Project who guided the establishment of CII as a principal national forum for construction research

Charles D. Brown (1987) – early application of cost-effectiveness principles led to stellar engineering career; DuPont representative to CICE study; energetic advocate of CICE findings

Ted C. Kennedy (1988) – a founder of BE&K; influential member of original CII Board of Advisors; recognized industry leader in education, training, and employee development

Robert H. Miller (1989) – intense DuPont participant during CICE who later chaired CII, oversaw its first published research, and helped to establish its educational program

Louis Garbrecht, Jr. (1990) – pioneered “engineering” of the construction process and proved that constructability is cost-effective; early advocate of project management research; original chairman of CII

Clarkson H. Oglesby (1991) – research pioneer and author of classic construction engineering textbooks who established the first graduate studies in construction at Stanford University

James M. Braus (1992) – Shell Oil and CICE leader and diplomat who bridged diverse opinions within CII to keep the Institute unified and authored the original CII Strategic Plan

Gary D. Jones (1993) – hard-working, determined 1987 CII chairman whose “implementation challenge” that year led to a dramatic change in how CII viewed implementation

Jack E. Turner (1994) – originated idea that led to establishment of The Business Roundtable, and later suggested a study of owner-contractor issues that became the CICE Project

Daniel J. Bennet (1995) – aspiring association executive, CICE participant, and author of CII by-laws who led establishment of the National Center Construction Education and Research

John W. Morris II (1996) – led effort to unite Corps of Engineers, Federal government, and environmentalists in shaping national water resources policy during turbulent transition era

Richard L. Tucker (1997) – professor, productivity research pioneer, CICE participant, and renowned industry speaker who personally led efforts to establish CII at UT Austin; served as first Director from 1983-1998

Edward W. Merrow (1998) – researcher who developed the Project Evaluation System, an analytical tool to benchmark project data, and founded Independent Project Analysis (IPA)

Donald J. Gunther (1999) – hard-driving Bechtel executive whose leadership, dedication, and teamwork influenced others personally and professionally as well as changed Bechtel's approach to worldwide business

Arthur J. Fox, Jr. (2000) – long-time editor of *Engineering News-Record;* traveled around the world to report on more than four decades of industry progress, created *ENR*'s Engineer of the Year award

H. B. Zachry, Jr. (2001) – born constructor who led a road contracting firm founded by his father to a worldwide leadership role through dedication to his employees and principles of quality, safety, and client satisfaction

Joseph J. Jacobs (2002) – Jacobs Engineering founder who led his company to the top echelons of the engineering world and whose entrepreneurial spirit and ethical beliefs inspire those who work for him

Appendices

Glossary of Acronyms — 2004 Annual Conference

ABC-SIM	Activity-Based Costing Simulation
ABT	Advanced Building Technology [Matrix]
AC	Annual Conference
ACTS	Advanced Construction Technology System
ADR	Alternative Dispute Resolution
AIA	American Institute of Architects
AIChE	American Institute of Chemical Engineers
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASTD	American Society for Training and Development
BA	Benchmarking Associate
BOA	Board of Advisors
BP	Best Practice
BM&M	Benchmarking and Metrics
BMC	Benchmarking and Metrics Committee
BRT	The Business Roundtable
BTSC	Breakthrough Strategy Committee
CCIS	Center for Construction Industry Studies
CEC	Continuing Education Course
CEN	European Committee for Standardization
CEPM	Civil Engineering Project Management
CEU	Continuing Education Unit
CI	Construction Institute [ASCE]
CIAG	Construction Industry Action Group
CIB	International Council for Research and Innovation in Building and Construction
CICE	Construction Industry Cost Effectiveness
CII	Construction Industry Institute
CIMIS	Common Industry Material Identification Standards [Organization]
CIP	Continuous Improvement Process
CKII	CII Knowledge Implementation Index

CPI	Construction Project Improvement [Conference]
CPI	Consumer Price Index
Compass	Communications Project Assessment [Tool]
CURT	Construction Users Roundtable
D/IT	Design/Information Technology
DART	Days Away, Restricted, or Transferred
DB	Design-Build
DBB	Design-Bid-Build
DL	Data Liaison
DPI	Disputes Potential Index
DRB	Dispute Review Board
E&C or E/C	Engineering and Construction
EC	European Community
EC	Education Committee
ECC	Engineering Contracting & Construction [Conference]
ECI	European Construction Institute
EEC	European Economic Community
EIP	Employee Incentive Program
EIP	Employee Incentives Plan
EM	Education Module
EMR	Experience Modification Rate
ENR	*Engineering News-Record*
EPC	Engineer-Procure-Construct
ERC	Engineering Research Center
ExCom	Executive Committee
EU	European Union
FEL	Front-End Loading
FIAPP	Fully Integrated and Automated Project Processes
FIATECH	Fully Integrated and Automated Technologies
FRI	Field Rework Index
GC	Globalization Committee
GDP	Gross Domestic Product

GPM	General Performance Model
GPS	Global Positioning System
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
IC	Implementation Champion
IDS	Industry Data & Statistics
IPA	Independent Project Analysis, Inc.
IPRA	Instructional Project Risk Assessment
IR	Implementation Resource
ISC	Implementation Strategy Committee
ISO	International Organization for Standardization
JSA	Job Safety Analysis
KA	Knowledge Area
KM	Knowledge Management
KMC	Knowledge Management Committee
KPI	Key Performance Indicators
KSFG	Knowledge Structure Focus Group
LEED	Leadership in Energy and Environmental Design
LL	Lessons Learned
LWCIR	Lost Workday Case Incidence Rate
MC	Membership Committee
MEMS	Micro Electro-Mechanical Systems
NGL	Natural Gas Liquids
NIST	National Institute of Standards and Technology
NSPE	National Society of Professional Engineers
OCWS	Owner Contractor Work Structure
OLA	Online Administrator
OMB	Office of Management and Budget
OSHA	Occupational Safety and Health Administration
P&ID	Piping and Instrumentation Diagram
PBP	Proposed Best Practice
PDCS	Project Delivery and Contract Strategies

PDH	Professional Development Hour
PDRI	Product Definition Rating Index
PE	Professional Engineer
PEpC	Procurement, Engineering, procurement, Construction
PEPW	Project Executive Planning Workshop
PIP	Process Industry Practices
PM	Project Manager
PO	Purchase Order
POL	Products Online
PPMOF	Prefabrication, Preassembly, Modularization & Offsite Fabrication
PPP or P^3	Pre-Project Planning
PRB	Product Review Board
PT	Project Team
QEC	Quality Evolution Chart
QM	Quality Management
QPMS	Quality Performance Management System; archived
R&D	Research and Development
RC	Research Committee
RD&D	Research, Development, and Deployment
RFID	Radio Frequency Identification
RFP	Request for Proposal
RIR	Recordable Incidence Rate
RR	Research Report
RRT	Radical Reduction Technique
RS	Research Summary
RT	Research Team
SAME	Society of American Military Engineers
SAVE	[term]
SHE	Safety, Health, and Environmental
SME	Subject Matter Expert
SPC	Strategic Planning Committee

SRI	Security Rating Index
TAL	Technology Assisted Learning
TED	Training, Education, and Development
TISP	The Infrastructure Security Partnership
TQM	Total Quality Management
TRIR	Total Recordable Injury Rate
USGBC	U.S. Green Building Council
VE	Value Engineering
VM	Value Management
XC	Executive Committee

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3M
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