



CONSTRUCTION INDUSTRY INSTITUTE

2% ENGINEERING- CAN IT WORK FOR YOU?



Documents

Document Sharing Hub

Research Summary 112-1

Construction Industry Institute

Air Force Center for Environmental Excellence	ABB Lummus Global Inc.
Aluminum Company of America	BE&K, Inc.
Amoco Corporation	Bechtel Group, Inc.
Anheuser-Busch Companies, Inc.	Belcan Engineering Group, Inc.
Aramco Services Company	Black & Veatch
Atlantic Richfield Company	BMW Constructors, Inc.
Bayer Corporation	Brown & Root, Inc.
Champion International Corporation	Bufete Industrial
Chevron Corporation	Burns and Roe Enterprises, Inc.
CITGO Petroleum Corporation	Cianbro Corporation
Commonwealth Edison Company	Day & Zimmermann International, Inc.
Consolidated Edison Company of New York, Inc.	Dillingham Construction Holdings Inc.
DuPont	Eichleay Holdings Inc.
Eastman Chemical Company	Fluor Daniel, Inc.
Enron Corporation	Foster Wheeler USA Corporation
Exxon Research & Engineering Company	Fru-Con Corporation
General Electric Corporation	James N. Gray Construction Company, Inc.
General Motors Corporation	Graycor, Inc.
Hoechst Celanese Corporation	Hilti Corporation
Houston Lighting & Power Company	Honeywell, Inc.
Intel Corporation	International Technology Corporation
James River Corporation	Jacobs Engineering Group, Inc.
Eli Lilly and Company	J. A. Jones Inc.
Merck & Co., Inc.	The M. W. Kellogg Company
Mobil Technology Corporation	Kiewit Construction Group, Inc.
Monsanto Company	Kvaerner-John Brown
NASA	Marshall Contractors, Inc.
Naval Facilities Engineering Command	Morrison Knudsen Corporation
Ontario Hydro	M. A. Mortenson Company
Phillips Petroleum Company	Murphy Company
The Procter & Gamble Company	North Bros. Company
Rohm and Haas Company	The Parsons Corporation
Shell Oil Company	Rust International Corporation
Sun Company, Inc.	S&B Engineers and Constructors Ltd.
Tennessee Valley Authority	Stone & Webster Engineering Corporation
Texaco	Sverdrup Corporation
U.S. Army Corps of Engineers	Technology Design & Construction Company
U.S. Department of Commerce	TPA, Inc.
U.S. Department of State	Woodward-Clyde Consultants
U.S. Generating Company	H. B. Zachry Company
U.S. Steel	
Union Carbide Corporation	
Weyerhaeuser Paper Company	

2% Engineering– Can It Work For You?

**Prepared by
The Construction Industry Institute
Cost Effective Engineering Research Team**

**Research Summary 112-1
March 1997**

Reviewed by CII 23Jun04

© 1997 Construction Industry Institute™.

The University of Texas at Austin.

CII members may reproduce and distribute this work internally in any medium at no cost to internal recipients. CII members are permitted to revise and adapt this work for the internal use provided an informational copy is furnished to CII.

Available to non-members by purchase; however, no copies may be made or distributed and no modifications made without prior written permission from CII. Contact CII at <http://construction-institute.org/catalog.htm> to purchase copies. Volume discounts may be available.

All CII members, current students, and faculty at a college or university are eligible to purchase CII products at member prices. Faculty and students at a college or university may reproduce and distribute this work without modification for educational use.

Printed in the United States of America.

Contents

<i>Chapter</i>	<i>Page</i>
Executive Summary	v
1. Introduction	1
2. General Findings	3
3. Selected Practices – The NUCOR Way	5
4. Conclusions and Recommendations	19
Companies Interviewed	21

Executive Summary

Owners are continuously seeking new ways to improve engineering practices in the execution of capital projects, particularly to make capital projects more cost effective. Thus, when a company such as NUCOR reports that it can achieve overall business objectives at much lower engineering and capital costs, and with faster schedules than normally experienced in the construction industry, it creates a great deal of interest in how a company achieves such results.

As a response to this interest, CII established Research Team 112, Cost Effective Engineering. The objectives of the research team were to compile, assess, and report on the innovative or non-traditional practices used by NUCOR. The research team expanded this original scope by additionally studying other organizations that are perceived to be “pioneers” in innovative practices that have led to low engineering costs. This report summarizes the principal findings of the research team’s investigation.

The research identified 20 innovative or non-traditional practices that can be grouped into three categories: organizational culture, contracting strategies, and design philosophies. What makes NUCOR unique is that within its capital project delivery process, it has been able to eliminate everything that is not needed, while at the same time streamlining and optimizing what is needed and selecting those best qualified to do the job. NUCOR also has been effective in using its unique organizational culture in applying non-traditional contracting strategies and design philosophies. The 10 practices that synthesize this approach are described in this report, along with the benefits and risks that may accompany them. Some of these practices also were found in different forms within some of the other organizations investigated.

Introduction

The CII Cost Effective Engineering Research Team

A perception within the construction industry, which is reinforced by limited data, holds that current engineering practices are not cost effective. In contrast, some companies such as NUCOR have reported using innovative or non-traditional practices that result in achieving overall business objectives at much lower engineering and capital costs, and with faster schedules, than are normally experienced in the construction industry. CII Research Team 112 was formed to compile, assess, and provide information that has the potential to improve competitiveness.

Objectives of the Investigation

This research was performed with the following specific objectives:

- Identify innovative or non-traditional practices that have contributed to successful projects in NUCOR and other selected organizations.
- Evaluate qualitatively each practice and the various potential implications of its use (e.g., risk, schedule, costs, value, content of engineering deliverables, rework, appropriate projects, company culture, and contractual issues).
- Determine various drivers that play a role in determining the use of these practices within an organization.
- Develop an organizational scheme to associate, qualify, and assess these practices, their implications, and their drivers.

Research Methodology

The methodology used to achieve the research objectives included the following tasks:

- Identify and select a group of owner organizations (including NUCOR, a selected sample of its design, equipment and construction contractors, and other companies), perceived to be pioneering innovative or non-traditional project implementation practices that have led to successful projects relative to their individual business objectives, particularly those with apparent low engineering costs.
- Identify and describe specific practices (ranging from global approaches, strategies, and mechanisms to competition, partnering/alliances, and contracts) within the selected organizations, to specific project management practices within the different phases of a capital project, at both the corporate and capital project levels.
- Document and analyze, to the extent allowed by each organization studied, the specific context, potential benefits and risks, and implementation requirements on the project or the organization, of each practice identified.
- Report the findings.

Note: *The nature of the data collected for this investigation in direct interviews was primarily qualitative; most quantitative data was treated with the appropriate level of confidentiality established by the organization being studied.*