



CONSTRUCTION INDUSTRY INNOVATION

By Robert I. Carr

Business Roundtable
1999 National Construction Congress
Ponte Vedra Beach, Florida
November 15, 1999

Written by Robert I. Carr and presented by Robert I. Carr and Roger W. Lane to the 300 registrants at the First General Session of the Business Roundtable 1999 National Construction Congress, Ponte Vedra Beach, Florida, November 15, 1999.

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The Construction Innovation Forum is a grass roots non-profit organization made up of people, companies, companies, and associations from the full breadth of construction.

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CONSTRUCTION INNOVATION FORUM

- Non-profit originated in 1986 in Ann Arbor
- Response to BRT CICE Project
- Sole purpose: Recognize and encourage innovation in construction industry
- NOVA Awards presented in March
- 35 NOVA Awards in 10 years
- Open to all: Check your guns at the door

The CIF is a 501C3 non-profit corporation. It originated in 1986 in Ann Arbor, Michigan by individuals from the different parts of the construction industry. It's supposition is there is a lot of innovation in construction, from that required to solve unique problems on individual projects to solutions to major industry problems. The innovative problem solving is what so many of us in construction enjoy about our work. However, good news never gets told, and we hear little about innovation.

The sole purpose of the CIF is to recognize and encourage innovation in the construction industry. The CIF is really a virtual organization. It has no permanent office or staff. Most of its effort is by volunteers. It exists only because so many people in construction are interested in innovation.

The CIF is most known for the NOVA Awards presented each March at the Innovation Celebration Banquet in the Detroit area. It has no equal in construction. 600 people at \$200 a ticket meet to celebrate the innovation in our industry worldwide. 35 NOVA Awards have been presented in the first 10 years.

All parts of the construction industry participate in the CIF. All are asked to "check your guns at the door" and work together on what we hold in common.

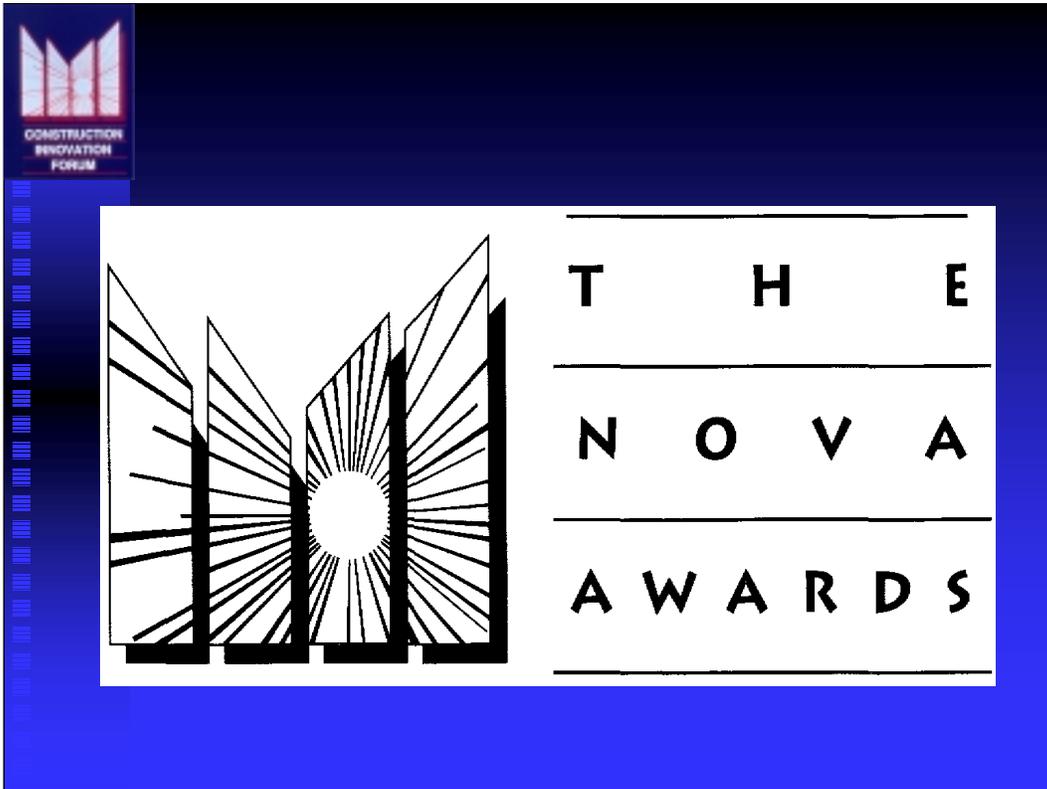


BROAD BASED

- Owners
- Contractors and Contractor Associations
 - ◆ General and Specialty
 - ◆ Union and Open Shop
- Building Trades
- Architects, Engineers, Faculty
- Suppliers of Material, Equipment, Services

The CIF is a grass roots organization, built on broad, unselfish participation by any and all who believe in working together to advance the construction industry.

People and organizations participate as members, sponsors of projects, attendance at the March Innovation Celebration Banquet, nominators of innovations for the NOVA Award, NOVA Award Jurors, or Investigators of NOVA Award Nominations.



The CIF is particularly known for presenting the NOVA Awards each March to innovations from around the world that have proven to save cost and increase quality of construction.

The 10th Annual NOVA Awards were presented in March 1999.



NOVA AWARD CRITERIA

- Innovation judged by effect on construction process
 - ◆ Construction process or project
 - ◆ Material, design, equipment
 - ◆ Contract, labor, management, training
- Proven success on a project
- Significant advance
- Documentable and presentable

Criteria for the NOVA Award are described in the Nomination Form:

- 1. Each nominated innovation is judged on its effect upon the construction process. It can be an innovation in the construction process itself or in materials, design, equipment, detailing, contract administration, labor relations, management, training, procurement, etc. that improve the construction process. A project can be nominated for its innovative concepts or methods.**
- 2. The innovation must be a proven success. It must have had a positive, important effect on construction, to improve quality or reduce cost. Innovation is the implementation of new methods and new technologies. It is not merely an idea that has merit and may be successful in the future. It must promote good, acceptable construction practices.**
- 3. The innovation must be a significant advance, not just a natural evolution of existing methods, common sense, or good practice.**
- 4. The innovation must be documentable and presentable. Innovators and their employers must disclose sufficient information about the innovation to allow documentation for the Jury and an informative presentation at the Construction Innovation Celebration.**



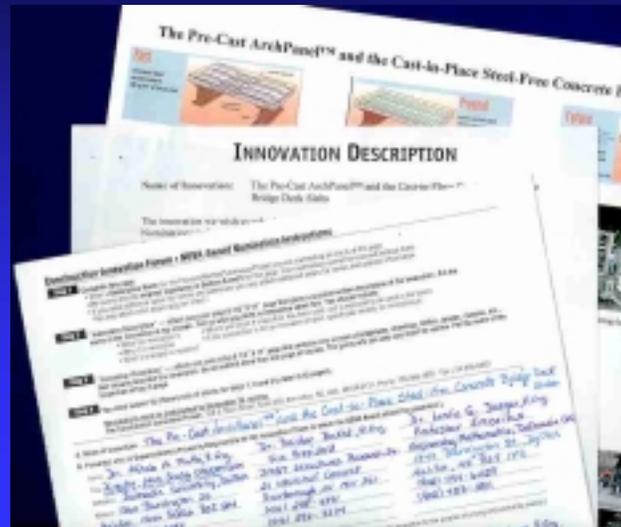
UNIQUE NOVA AWARD PROCESS

- Nomination is simple 3 page format
- From all parts of industry
- Worldwide: from 20 countries and 6 continents
- National Jury selects short-list
- Engineering faculty investigate
- Jury selects winners
- NOVA Awards presented at March Banquet of 600 people: (March 16, 2000)

- **The 3 Page format of the NOVA Award Nomination makes nominating simple: about 1 person day to prepare nomination**
- **Nominations come from all parts of the industry, as can be seen by searching the Nomination database.**
- **Nominations come from all over the world, from innovators and projects worldwide. At least 20 countries and 6 continents are represented in nominations. Countries represented in NOVA Award Winners include America, Australia, Canada, Egypt, Holland, Japan, Norway, Switzerland, and the United Kingdom.**
- **In addition to several engineering faculty at the University of Michigan, engineering faculty at U of Illinois, U of Wisconsin, Iowa State U, U of Cincinnati, U of California at Berkeley, U of Florida have also investigated nominated innovations.**



3 PAGE NOMINATION



3 Page Nomination:

1. Page that identifies those who are responsible for the innovation and those who can provide information about it.
2. One page of text that describes the innovation
3. One page of illustrations or other information on the innovation.

Nomination is simple, to make it easy to nominate

Preparing a nomination takes about a person-day.

The Jury uses nomination only to select short-list for investigation by CIF.

THE NOVA AWARD STATUE



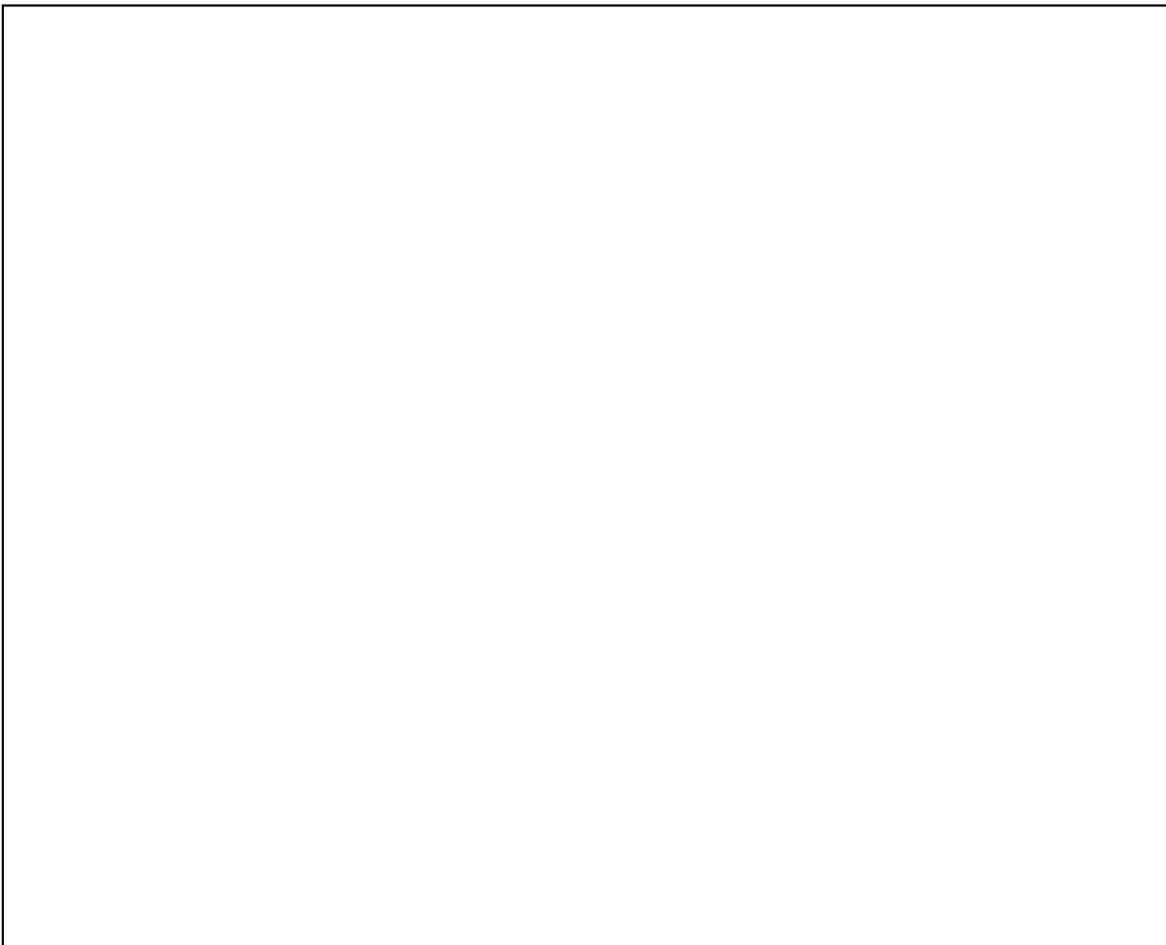
The NOVA Award is a bronze statue, emblematic of a construction worker prying a nova, a growing star, out of the soil from which construction springs.

At the March Innovation Celebration Banquet, the CIF presents a program on each NOVA Award winning innovation. People responsible for the innovation are introduced. The statue is presented to each NOVA Award winner.



NOVA AWARD WINNING INNOVATIONS INCLUDE

- Paving
- On-site child care
- Modular design
- Foundations
- Concrete technology
- Site positioning
- Labor/management
- Concrete formwork
- Structural steel
- Soil remediation
- Safety and training
- Connectors
- Underground
- Fiber reinforcement
- Innovative projects
- Automation



www.cif.org



The CIF website at www.cif.org is heavily visited from all over the world.

It has won an award for the value it provides visitors.

We are constantly adding information and links to provide the world with information on innovations.



www.cif.org

- NOVA Award winners and finalists
- Keyword searchable database of nominations
- Descriptions and summaries of nominations
- NOVA Award mock jury kit
- New *Journal of Construction Innovation*
- NOVA Award nomination form/instructions
- Membership and banquet ticket forms

The CIF website includes these items.

NOVA AWARD WINNERS & FINALISTS



The screenshot shows the CIE 1999 NOVA Award Winners & Finalists webpage. The page features a navigation bar with links: HOME / HOME / UPDATING AVAILABLE / NOVA AWARDS-WINNERS AND FINALISTS / WHO IS CIE / HOW TO USE THIS SOURCE. The main content is organized into three sections: 1999 NOVA Award Winners, 1999 NOVA Award Finalists, and NOVA AWARD WINNER. The winners section lists: Humboldt Stiffness Gauge, Continuous Belt Asphalt Roller, Special Moment Resisting Truss, and Direct Drive Elevators. The finalists section lists: Composite Column Reinforcement, Dynamic Lateral Load Test, Pultruded All-Composite Bridge Deck, and Three-Dimensional Machine Control. The winner section highlights the Humboldt Stiffness Gauge (HSG) as the NOVA AWARD WINNER, describing it as a field instrument that nondestructively measures soil stiffness and soil modulus. A thumbnail image of the HSG device is shown next to the text. Small starburst icons are placed to the right of the winners and finalists lists.

This web page describes the 4 NOVA Award Winner innovations and the 4 other NOVA Award Finalist innovations for 1999.

Thumbnail illustrations produce enlarged illustrations when clicked.

Other Winners are shown for each of the 9 prior years.

DATABASE SEARCH

CIE
NOVA AWARD NOMINEES

HOME / ABOUT / AWARDING AWARD / NOVA AWARD NOMINEES AND NOMINEES / NEW A CITY / AWARD AND RESOURCE

Please enter one or more of the following criteria for the nomination you would like to locate. If you do not get a match, reduce the number of search criteria and try again.

Title:

Keywords: precast concrete

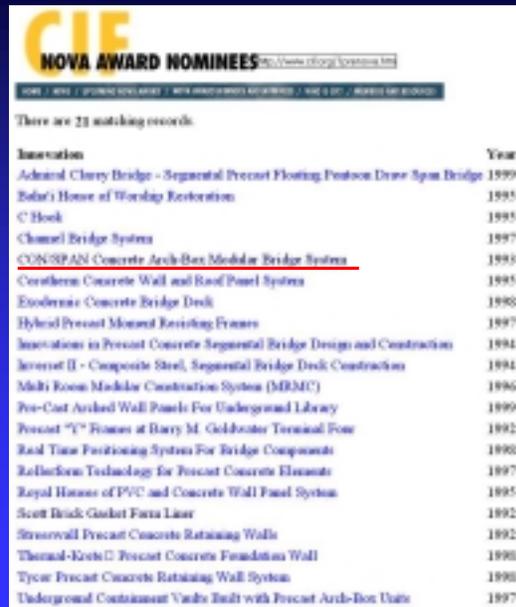
Year:

This is the input page for the searchable database of innovations nominated for the NOVA Award.

The keywords “precast concrete” have been input for this example search. They are shown underlined in red here, for emphasis.

Click on the “Find” button and receive the next page in the browser that shows all of the nominated innovations that relate to precast concrete.

21 PRECAST CONCRETE NOMINATIONS



The screenshot shows a web page titled "CIE NOVA AWARD NOMINEES" with a search bar and a list of 21 nominations. The nomination "CON/SPAN Concrete Arch-Box Modular Bridge System" is highlighted with a red underline.

| Innovation | Year |
|--|------|
| Adriatic Clerry Bridge - Segmental Precast Floating Post-tension Drive Span Bridge | 1999 |
| Baba's House of Worship Restoration | 1995 |
| C Hook | 1995 |
| Channel Bridge System | 1997 |
| <u>CON/SPAN Concrete Arch-Box Modular Bridge System</u> | 1993 |
| Corotherm Concrete Wall and Roof Panel System | 1995 |
| Erodormix Concrete Bridge Deck | 1998 |
| Hybrid Precast Moment Resisting Frames | 1997 |
| Innovations in Precast Concrete Segmental Bridge Design and Construction | 1994 |
| Invercort II - Composite Steel, Segmental Bridge Deck Construction | 1994 |
| Multi Room Modular Construction System (MRMC) | 1996 |
| Pre-Cast Arched Wall Panels For Underground Library | 1999 |
| Precast "T" Frames at Barry M. Goldwater Terminal Four | 1992 |
| Real Time Positioning System For Bridge Components | 1998 |
| ReReform Technology for Precast Concrete Elements | 1997 |
| Royal House of PVC and Concrete Wall Panel System | 1995 |
| Scott Brick Gasket Form Liner | 1992 |
| Stresswall Precast Concrete Retaining Walls | 1992 |
| Thermal-Krete-C Precast Concrete Foundation Wall | 1998 |
| Typar Precast Concrete Retaining Wall System | 1998 |
| Underground Containment Vaults Built with Precast Arch-Box Units | 1997 |

- This shows the 21 innovations in the database that relate to the keywords “precast concrete.”
- We can click on the title of any of them to receive its description.
- For example, we can click on “CON/SPAN Concrete Arch-Box,” here shown underlined in red for emphasis, to receive its description in our browser, as shown in the next slide.

CON/SPAN CONCRETE ARCH-BOX



NOVA AWARD NOMINEES

HOME / NEWS / UPDATING YOUR LIST / NOVA AWARD WINNERS AND NOMINEES / WHO IS CIE? / NUMBER ONE EDUCATION

| | |
|-----------------|---|
| Innovation: | <u>CON/SPAN Concrete Arch-Box Modular Bridge System</u> |
| Year: | 1999 |
| Description: | The CON/SPAN Bridge system is a versatile precast concrete arch-box modular system that provides complete set-in-place construction of bridges with spans up to 36 feet. Each bridge is custom engineered, manufactured for specific site configurations, delivered, and installed in hours. The system is serviced by an established national network. The system utilizes the precast concrete arch-box shape to develop high strengths through a combination of soil-structure interaction and the inherent load carrying capacity of an arch. Vertical sidewalls are maintained to provide a large waterway opening with minimum headroom and a compact shape. CON/SPAN modular units accommodate a wide range of cover and live load conditions and allow backfill to be placed easily and quickly with heavy equipment. This precast modular bridge system is an alternative to conventional small bridge construction. |
| Contact Person: | Mr. William R. Foster |
| Organization: | Butler County |
| Address: | 1921 Fairgrove Avenue |
| City: | Hamilton |
| State/Province: | OH |
| Postal Code: | 45011 |
| Country: | USA |
| Phone No.: | 513-867-5744 |
| FAX: | 513-867-5849 |
| URL: | http://www.bcon.org |

This is description of the CON/SPAN Arch-Box Modular Bridge System, as shown in a browser window.

The name and address of the person to contact for further information on the innovations is also shown.

The database has descriptions and contacts for all 357 innovations nominated, all searchable by keyword.

This is a unique resource of construction innovations.



INNOVATIONS IN NOMINATIONS

| | | | |
|-------------|----|-----------------|----|
| ■ Safety | 52 | ■ Soil | 37 |
| ■ Quality | 46 | ■ Plastic | 26 |
| ■ Cost | 77 | ■ Seismic | 12 |
| ■ Structure | 92 | ■ Specification | 13 |
| ■ Composite | 55 | ■ Human | 14 |
| ■ Concrete | 98 | ■ Crane | 17 |
| ■ Steel | 78 | ■ Contractor | 58 |
| ■ Computer | 48 | ■ Owner | 31 |

Innovations in Nominations

These are the number of nominations that are retrieved from the 360 Nominations in our searchable database when they are searched for the keyword shown.

For example

- 52 Nominations describe themselves as safety related.
- 46 Nominations are described as quality related
- 77 Nominations are described as cost related.
- 48 Nominations are described as computer related.



An innovation created by the CIF is the NOVA Award Mock Jury.

This shows the Mock Jury web page at www.cif.org.

People on a Mock Jury read the descriptions of the innovations nominated for the NOVA Award. Then they meet and select the innovations they feel should be investigated, just like the real National Jury.

A complete Mock Jury Kit can be downloaded free from the CIF website for any Mock Jury.

Mock Juries have been held at the University of Michigan for several years. Others have been held at the University of California at Berkeley, Purdue University, University of Florida, and University of Texas, that we know of.



JOURNAL OF CONSTRUCTION INNOVATION



JOURNAL OF
CONSTRUCTION INNOVATION

NOMINATIONS FOR THE 2000 NOVA AWARDS

By Robert I. Carr¹

Abstract: This paper presents summaries of the 27 NOVA Award Nominations received between September 15, 1998 and September 1999 for the 2000 NOVA Awards to be presented March 16, 2000 at the annual Innovation Celebration. Nominations include innovations in concrete, asphalt, foundation, retaining wall, insulation, highway, rehabilitation, light framing, pipe, scaffold, and bridge construction. Nominations also include innovations in architectural and engineering design, monitoring and testing, and worker recruiting, training, and safety.

INTRODUCTION

This paper presents summaries of the 27 NOVA Award Nominations received between September 15, 1998 and September 1999 for the 2000 NOVA Awards to be presented March 16, 2000 at the annual Innovation Celebration. Nominations include innovations in concrete, asphalt, foundation, retaining wall, insulation, highway, rehabilitation, light framing, pipe, scaffold, and bridge construction. Nominations also include innovations in architectural and engineering design, monitoring and testing, and worker recruiting, training, and safety.

Nominations are numbered in the order of the dates they were postmarked. Titles are hyperlinked links to the individual nominations, from which readers can obtain more detailed information. Nomination descriptions were edited by Robert I. Carr from original drafts of students in CIE 433 - Construction Professional Practice Seminar at the University of Michi-

The CIF is launching an electronic Journal of Construction Innovation, freely accessible at the CIF website by anyone in the world. The CIF freely permits and encourages copying and distribution of papers in the Journal.

This shows the first Journal paper, which is a short description and the name and address of a contact for each of the innovations nominated for the 2000 NOVA Awards.



BENEFITS OF INNOVATION

- Improve quality & decrease cost of your projects
- Owner core business benefits from cost and quality improvements of suppliers and customers
- Improves our construction industry
 - ◆ Makes us look better
 - ◆ Makes our work more fun
 - ◆ Attracts good people





AN EXAMPLE

1990 NOVA AWARD WINNERS

- F-Number System
 - ◆ Specify & measure concrete slab flatness
- U.S. Post Office Kit of Parts
 - ◆ Flexible modular design of post offices
- Mt. MacDonald Tunnel Ventilation
 - ◆ Fans / gates ventilate diesel locomotive heat and exhaust

These are the NOVA Award Winners of 1990, the first NOVA Awards, which are an example of benefits of innovation in construction.

- **F-Number System specifies and measures concrete slab flatness**
 - Has upgraded concrete slab quality, which benefits all owners who build concrete slabs.
 - Better equipment has been developed to meet the specification, the Somero Laser Screed in particular.
 - Benefits contractors, concrete suppliers, architects, engineers
- **U.S. Post Office Kit of Parts provides flexible, modular design for post offices.**
 - U.S. Postal Service benefits as owner
 - Everyone benefits from better, less expensive, quickly constructed post offices.
- **Mt. MacDonald Tunnel Ventilation: Fans and gates ventilate diesel locomotive heat and exhaust in a 9 mile uphill tunnel through the Canadian Rocky Mountains.**
 - Ventilation system increased Canadian transcontinental capacity 30 %
 - Broke the bottleneck of transcontinental rail travel in Canada.
 - Benefits the Canadian Pacific Railroad as owner, and everyone else.
 - Interesting project for Parson Brinkerhoff engineers and others.



OWNER'S ROLE IN INNOVATION

- Construction innovation primarily benefits owners
- If owners don't demand innovation, little will occur
- All too little occurs now
 - ◆ 8-12% of U.S. GNP is construction
 - ◆ Construction invests 0.5% of gross in R&D (vs 2-15% in other industries)

•Construction innovation primarily benefits owners

- Contractors, labor, architects, engineers feel they benefit very little from innovation

•If owners don't demand innovation, little will occur

•All too little occurs now

- Construction is 8-12% of U.S. GNP
- Construction invests 0.5% of gross in R&D (vs 2-15% in other industries).
- Most of the 0.5% is in construction materials, not construction processes.



DTE ENERGY - CONSTRUCTION INNOVATION PROGRAM

- Built around CIF
- Involves DTE top management
- Evaluates contractor innovation
- Overhaul of procurement
- Partnerships with major contractors
- \$320,000 DTE 12 year investment in CIF saved \$200,000,000 on a single project

DTE Energy's construction innovation program is an example for owners.

**Inspired by and largely built around DTE Energy involvement in CIF
It involves DTE top management, including managers of power plants
and DTE Energy President and CEO**

**DTE Energy evaluates contractor innovation program as part of
contractor selection process. It requires its major contractors to have
an innovation program.**

**DTE Energy has implemented an extensive supply side management
program for all procurement, including construction. Construction
procurement includes a computerized contractor evaluation system.**

**DTE Energy has developed partnering with major contractors as part
of its supply side management program.**

**DTE Energy estimates it has invested \$320,000 in CIF, including
volunteer's time (particularly CIF Chair Roger Lane).**

**DTE Energy savings and quality from its Construction Innovation
program have been substantial. It saved \$200,000,000 on just one
recent large project.**



YOUR INNOVATION PROGRAM

- Find, develop, and use innovations
 - ◆ Steal with pride
- Require contractor/vendor innovation
 - ◆ Like safety and quality programs
- Recognize innovations on your projects
 - ◆ Create an award or nominate for NOVA Award
- Support Construction Innovation Forum
 - ◆ CIF member / sponsor & attend Banquet





The Construction Innovation Forum is a grass roots non-profit organization made up of people, companies, companies, and associations from the full breadth of construction.