2003 NOVA AWARD NOMINATIONS

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October 22, 2002

The Construction Innovation Forum is proud to present the 35 Nominations for the 14th NOVA Awards, the most recognized international award for innovations that have been proven to decrease the cost and improve the quality of constructed facilities. Each year, the NOVA Award Nominations represent the cutting edge of worldwide innovation in the construction industry. By distributing this set of Nominations, we invite the construction world to use these innovations and to build on them their own innovations to advance the art and science of construction. Each Nomination identifies a person to contact for further information on the innovation.

The NOVA Award Jury holds its Nomination Screening Meeting in November to select a short list of Nominations for in-depth investigation by research engineers. The investigators prepare confidential reports on these Nominations, which are be distributed to the Jury in January. The Jury meets early in 2003 to select up to five innovations to receive the 2003 NOVA Award. The 2003 NOVA Awards are presented at the Fifteenth Annual Innovation Celebration on the evening of April 24, 2003 at the new Ford Conference and Event Center (formerly The Spirit of Ford) in Dearborn, Michigan, near Detroit.

Classes, student societies, and other groups of construction related students and professionals are encouraged to act as a NOVA Awards Mock Jury to screen the 35 nominations the same way as the regular NOVA Awards Jury. At its World Wide Web site the CIF furnishes each Mock Jury with a complete Mock Jury Kit, which consists of the information that is furnished to the regular NOVA Awards Jury for its Screening Meeting. In addition to this set of Nominations, the Kit provides instructions and software for the NOVA Award Jury process.

The sole purpose of the CIF is to recognize and encourage innovation in the construction industry, worldwide. The CIF is a grass-roots movement, open to all who wish to work with others to advance innovation in construction. Students and other young construction crafts and professionals are particularly welcome, because the future depends on their dedication to innovation. Therefore, we encourage them to participate in the CIF as NOVA Award Mock Jurors, to learn the state of innovation today, and to dedicate their careers to advancing construction through innovation.

Robert I. Carr, Ph.D., P.E.
Vice-Chairman, Construction Innovation Forum
Chair, NOVA Awards
Professor of Civil Engineering
NOVA AWARD SELECTION CRITERIA

Each nominated innovation is judged by its effect on the construction process and on facility service. It can be an innovation in the construction process itself or in materials, design, equipment, detailing, contract administration, labor relations, management, training, procurement, maintenance, use, etc. that improves the construction process and/or facility service. A project can be nominated for its innovative concepts or methods.

The innovation must be a proven success. It must have had a positive, important effect on construction or service, 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.

The innovation must be a significant advance, not just a natural evolution of existing methods, common sense, or good practice.

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. 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.
2003 NOVA AWARD NOMINATIONS – RECEIVED FALL 2002

1. MORTARLESS MASONRY WALL SYSTEM erects faster concrete block walls
2. PAVEMENT QUALITY INDICATOR measures asphalt pavement density
3. AIR QUALITY MONITORING SYSTEM collects contaminants through diffusion
4. FIBER REINFORCED POLYMER (FRP) REINFORCING BAR is alternative to steel reinforcing
5. ON-LINE BIDDING EXCHANGE facilitates the bidding process between agency and bidder
6. AERIAL CONCRETE WALL SAWING AND DRILLING machine has integrated hydraulics and water
7. GAS MAIN INSPECTION system is based on magnetic flux leakage (MLF)
8. DENSE POLYETHYLENE SLAB BLOCKOUT is left in place, which saves wrecking-out time
9. INTERNET PLAN ROOM INFORMATION NETWORK provides real-time information to clients
10. JOINT OPERATOR & IRONWORKER TRAINING for structural steel erection
11. BEHAVIOR BASED SAFETY augments traditional construction safety programs
12. EMBEDDED GALVANIC ANODE protects concrete reinforcing steel from corrosion
13. PREFABRICATED CLADDING DEFENDS STRUCTURES against air blast explosions
14. MULTI-USE ELEVATED WATER STORAGE TANK provides concessions and indoor office space
15. INTERNET BASED PLAN ROOM is virtual private network for contractor bidding
16. TEAM-BASED BUILDING DESIGN PROGRAM introduces students to construction
17. WORK FLOW MANAGEMENT progressively reduces uncertainty, makes work ready
18. INTERNET TRACKING OF WORKER STATUS accesses training and drug screening database
19. PLASTIC COVERED STEEL GUARDRAILS protect workers, public, and equipment
20. REMOTE DATA ENTRY DAILY TIMESHEET tracks craft worker hours and quantities by cost code
21. LAUNCHED STEEL GIRDER BRIDGE ERECTION technique eliminates in-place steel erection
22. ULTRA-HIGH PERFORMANCE DUCTILE CONCRETE provides long spans without reinforcing
23. HOLISTIC “GREEN” OFFICE BUILDING uses 1/10 energy of comparably sized building
24. CONTRACTOR WEB-BASED TRAINING for employees, owners, AEs, and subcontractors
25. CONTROL NETWORK TECHNOLOGY ON A CHIP is broadly accepted for smart facilities
26. LASER DECONTAMINATION OF METALS with fiber-optic control for surfaces in remote locations
27. INSULATING CONCRETE FORMS remain in place to increase energy efficiency
28. AUTOMATIC REBAR TYING MACHINE replaces manual task of tying rebar
29. CLOSE-RANGE PHOTOGRAMMETRY used for suspension bridge structural analysis
30. PRESTRESSED CFRP REPLACES STEEL reinforcing in pre and post tensioned bridge concrete
31. CONSTRUCTION CAREERS WEB SITE recruits high school and college students
32. RESIDENTIAL UTILITY TRENCHING MACHINE reduces cost of installing underground utilities
33. POLYETHYLENE SHIELD FOR WOOD POSTS/POLES protects underground wood from rot
34. ELECTRIC MINI-EXCAVATOR is quiet and free of carbon monoxide/combustion fumes
35. GROUND PENETRATING RADAR locates underground and concrete embedded utilities/items
MORTARLESS MASONRY WALL SYSTEM  

2003 Nova Award Nomination 1

Flexlock® Mortarless Masonry Wall System

The FlexLock Wall System is a complete load bearing structure designed as a mortarless alternative to standard concrete block construction. The system's multi-patented technology produces significant competitive advantages through the use of an interlocking design, precision bearing surfaces, and post tensioned tendons.

Useful for residential, commercial and industrial application, the FlexLocV system consists of two integrated sub-systems, masonry and hardware. In terms of its application, FlexLocV can be used for load bearing structures such as: big box stores, strip malls, manufacturing facilities, safe rooms, as well as commercial and residential buildings. A wide range of non-load bearing applications exist for both fencing and massive highway sound walls as well. The competitive advantages are:

Mortarless. Except for the first course, the FlexLocV system requires no mortar between the joints or grouting of the horizontal cores.

- Reduced Construction Time. The FlexLock Wall System can be assembled at least three times faster than conventional block construction.
- Work Force/Market Sensitive. According to the World Center for Concrete Technology, the average age of a master mason in the U.S. is 52 years and estimates indicate a shortage of over 50,000 masons. Because FlexLocV uses one master mason (the rest being laborers), it can accommodate this shortage by being uniquely configured to the current labor pool.
- Completely Reusable. The unique interlocking surfaces allow for total disassembly rendering all of the components useful for other construction projects.
- All Season Construction. Since the FlexLocV Wall System does not use mortar, it can be assembled in any temperature zone.
- Lower Overall Construction Costs. A recent independent study indicated that overall masonry cost decreased 38% using the FlexLocV Wall System.
- Super Strong Wall. Variable dynamic resistance is the ability of a structure to "give" slightly under external pressure, radially distribute the force across the whole surface, and then lock-up as a solid interconnected mass. This patented characteristic is exclusive to the FlexLocV Wall System. This feature is expected to make the FlexLocV system applicable to seismic regions.
- Strong Patent Portfolio. Currently, Cercorp has two published utility patents and a third utility patent pending. These cover the functionality of the system and subsequent improvements. Two design patents are about to publish covering the block designs. Cercorp has filed a broad utility patent under the PCT for all of the industrialized nations. For branding purposes, "FlexLock" is a registered trademark and "Cercorp" is now pending as a trademark.

Over the years, the available pool of masons and master masons has declined considerably. Some estimate a shortage of near 50,000 masons in the United States. FlexLocV offers an innovative concrete unit that can replace conventional gray block wall systems, conforming itself to the current labor pool. The system does not eliminate the need for masons, but rather allows the mason to be more productive. As a result, apprentices, working with the mason, may erect a structure four times faster than conventional wall systems, becoming more cost effective in building the structure and allowing the mason to outbid his competition and be more profitable. The FlexLock Wall System will be used to create residential foundations, highway sound walls, residential fencing, tornado safe rooms, big box stores, and other facilities.

Contact: Dominic Cerrato • Cercorp Initiatives • 201 Luray Dr. • Wintersville, OH 43963
740-346-0960 • Fax 740-346-0961 • www.cercorp.com
Flexlock® Mortarless Masonry Wall System
TransTech Systems’ Pavement Quality Indicator™ (PQI)

Density of hot mix asphalt is the most important construction variable in the durability of asphalt pavement surfaces. All current methods of measuring asphalt pavement density have major limitations. Destructive core samples and laboratory measurement are time consuming and costly. Useful information does not reach the paving crew in time to make any corrections to the paving process. The alternative, nuclear densitometers, currently the "gold standard" in the industry, are cumbersome to use, require strict licensing and usage procedures, take several minutes to get data, and have limitations in their accuracy. Further, the time required by nuclear devices to obtain useful density data limits their in-process, Quality Control (QC) effectiveness during pavement construction.

TransTech Systems' important innovation is the development of an alternative, electrical-impedance based Pavement Quality Indicator (PQI) for use as a QC tool during the paving process. For their efforts, TransTech has recently been issued a second patent on the device. The reason this device is innovative is that through the use of its constant voltage, low frequency, electrical impedance approach, the PQI is able to make instantaneous, in-situ measurements of pavement density. This approach is based on a novel toroidal electrical sensing field that is established in the material to be measured via a flat sensing plate. This density, or compaction level, is measured by the response of the PQI's electrical sensing field to changes in electrical impedance of the material matrix, which in turn is a function of the composite dielectric constant of the paving material and the air trapped in the voids of the material. Since the dielectric constant of air is much lower than that of the paving material, as compaction increases, the combined dielectric constant increases because the percentage of air in the mix decreases. The embedded computer allows the PQI to perform sophisticated calibration and correction functions and enables the device to store a number of readings for later retrieval and analysis.

The importance of this innovation is that relative density measurements can now be taken instantly, allowing necessary changes to the rolling pattern may be made immediately. It also makes it possible to take many more readings per hour on the job site, both of which help ensure the best possible pavement quality. Recent improvements provided the ability to compensate for surface water. The device is light-weight, easy to use and requires no special licensing. Thus, almost any member of the paving crew can operate it successfully.

A highly successful FHWA Five State Pooled Fund Study concluded that the use of the PQI for providing QC during paving is a perfectly acceptable method and provides results at least as good as the nuclear devices in widespread use today. This has positioned the PQI as the ideal rapid measurement, non-destructive device for determining asphalt pavement density on the market today.

TransTech Systems, Inc. began the initial phase of work on the PQI in 1995 at its original Latham, NY facility, under the New York State Energy Research and Development Authority Agreement 4354ERTER-TR96. TransTech achieved outstanding results during the six-year project, and has benefited from support from the FHWA and AASHTO, delivered through the NCHRP under the IDEA Program administered by the TRB, under the auspices of the National Academy of Sciences. In addition, the USACE, through WES, was a key supporter and has provided funding as well as critical technical guidance. The Rensselaer Polytechnic Institute faculty provided substantial technical in areas such as statistics, software development, materials studies and mathematical algorithms.

Currently, the PQI is a commercial product with approximately 400 units sold. It has been accepted internationally as well as domestically, and is now being used in more than 10 countries worldwide.
TransTech Systems’ Pavement Quality Indicator™ (PQI)
Air Monitoring Systems

3M™ Air Monitors are simple and effective devices that collect contaminants through the scientific principle of diffusion. They meet or exceed OSHA accuracy requirements of ±25% at 95% confidence level for many work contaminants.

Features/Benefits
- **Simple and convenient.** There are no batteries, hoses, pumps or equipment to calibrate.
- **Easy to use.** Just clip the monitor to lapel, collar, or pocket.
- **Versatile.** 3M monitors can also be used for area monitoring if sufficient air flow exists.
- **Product support.** 3M provides reference information needed to use the monitors.
- **Analysis options.** All our monitors can be analyzed in your lab or returned for analysis.
- **Confidence.** Our manufacturing operation is ISO 9002 certified.
- **Comfort.** Our monitors are small and lightweight and will not interfere with employee activities.

Organic Vapor Monitor 3500

- **3500** - monitor only.
- **3510** - includes analysis for up to 3 compounds per monitor, selected from a list of more than 80 vapors. 18-month shelf life.

Organic Vapor Monitor 3520 with Back-up Section
Primary and back-up sorbent pads for sampling demanding environments. Especially suited for monitoring compounds like acrylonitrile, butadiene and methylene chloride for which activated carbon shows limited capacity.

- **3520** - monitor only.
- **3530** - includes analysis for up to 3 compounds per monitor. 18-month shelf life.

Ethylene Oxide Monitor 3550
Designed for sampling personnel or work areas in the pharmaceutical, health care and chemical industries. Analysis procedure is available on request.

- **3550** - includes analysis.
- **3551** - monitor only. 18-month shelf life.

Formaldehyde Monitor 3720
Monitors personnel or work areas in health care, laboratories, and in the chemical, pulp/paper, foundry and textile industries. Analysis procedure is available on request. Not acceptable for STEL monitoring.

- **3720** - includes analysis.
- **3721** - monitor only. 18-month shelf life.
AIR QUALITY MONITORING SYSTEM  
3M™ Air Monitoring Systems

3510/3530 Compound List

<table>
<thead>
<tr>
<th>Compound</th>
<th>Source</th>
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<tbody>
<tr>
<td>Acetone (2)</td>
<td>Ethyl Benzene (8)</td>
</tr>
<tr>
<td>Acetoneitrile (2)</td>
<td>Ethylene Chlorohydrin (8)</td>
</tr>
<tr>
<td>Acrylonitrile (8)</td>
<td>Ethylene Dichloride (EDC) (8)</td>
</tr>
<tr>
<td>Allyl Alcohol (8)</td>
<td>Ethyl Ether (4) (c)</td>
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<td>Amyl Acetate (8)</td>
<td>Furfural (8)</td>
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<tr>
<td>n-Amyl Alcohol</td>
<td>Halothane (8)</td>
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<tr>
<td>s-Amyl Alcohol</td>
<td>n-Heptane (8)</td>
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<tr>
<td>Benzene (8)</td>
<td>n-Hexane (8)</td>
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<td>Benzyl Chloride (8)</td>
<td>iso-Amyl Acetate (8)</td>
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<tr>
<td>Bromoform (8)</td>
<td>iso-Butyl Alcohol (8)</td>
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<tr>
<td>1-Bromopropane (m)</td>
<td>Isoplane (Forane)</td>
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<tr>
<td>n-Butyl Acetate (8)</td>
<td>Isopar G</td>
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<tr>
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<td>Isophorone (8)</td>
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<td>t-Butyl Acetate (8)</td>
<td>Isopropyl Acetate (7)</td>
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<tr>
<td>Butyl Acrylate (8)</td>
<td>Isopropyl Alcohol (m) (c)</td>
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<td>n-Butyl Alcohol (8)</td>
<td>Mesitylene (8)</td>
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<tr>
<td>s-Butyl Alcohol (8)</td>
<td>Mesityl Oxide (8)</td>
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<tr>
<td>t-Butyl Alcohol (8)</td>
<td>Methoxy Perfluorobutane (HFE-7100)</td>
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<tr>
<td>Butyl Cellosolve Acetate</td>
<td>MethyIsobutyl Ketone (MBK) (8)</td>
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<tr>
<td>Butyl Cellosolve (8)</td>
<td>MethyIsobutyl Ketone (MBK) (8)</td>
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<tr>
<td>Butyl Glycidyl Ether (8)</td>
<td>MethyIsobutyl Ketone (MBK) (8)</td>
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<td>p-Tert Butyl Toluene (8)</td>
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<td>Camphor (8)</td>
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<td>n-Decane</td>
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<td>Diacetone Alcohol (8)</td>
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<tr>
<td>o-Dichlorobenzene (8)</td>
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<tr>
<td>p-Dichlorobenzene (8)</td>
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</tr>
<tr>
<td>trans-1,2-Dichloroethylene (6)</td>
<td>MethyIsobutyl Ketone (MBK) (8)</td>
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<tr>
<td>Diisobutyl Ketone (DIBK) (8)</td>
<td>MethyIsobutyl Ketone (MBK) (8)</td>
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<tr>
<td>p-Dioxane (8)</td>
<td>MethyIsobutyl Ketone (MBK) (8)</td>
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<tr>
<td>Dipropylene Glycol Methyl Ether Acetate</td>
<td>MethyIsobutyl Ketone (MBK) (8)</td>
</tr>
<tr>
<td>Enflurane (8)</td>
<td>MethyIsobutyl Ketone (MBK) (8)</td>
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<tr>
<td>Epichlorohydrin (8)</td>
<td>MethyIsobutyl Ketone (MBK) (8)</td>
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<tr>
<td>Ethoxy Perfluorobutane (HFE-7200)</td>
<td>MethyIsobutyl Ketone (MBK) (8)</td>
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<tr>
<td>Ethyl Acetate (6)</td>
<td>MethyIsobutyl Ketone (MBK) (8)</td>
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<tr>
<td>Ethyl Acrylate (8)</td>
<td>MethyIsobutyl Ketone (MBK) (8)</td>
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</tbody>
</table>

The number in parenthesis is the recommended sampling period in hours. This time has been estimated using the capacity of the 3510 organic vapor monitor, a relative humidity of <50% and the 1998 ACGIH TLVs. Use of the 3530 allows the sampling time to increase. (c) Because of their high vapor pressures (low boiling points), the (c) compounds are best sampled initially with the 3520 or 3530 monitor (with back-up section). Subsequent sampling may be done with the 3500/3510 monitor if determined, by 3530 results, that contaminant concentrations are within the 3500/3510 capacity limits.

NOTE: certain compounds (e.g. acetone, methyl ethyl ketone, vinyl acetate, etc.) may show a decreased recovery when sampled in high relative humidity. Refrigerate and/or expel for analysis to ensure accurate results.

(m) See technical bulletin.

For more information:

In the U.S., contact:
Technical Assistance
1-800-243-4630
Sales Assistance/Local Distributor
1-800-328-1687
Fax On Demand
1-800-646-1655
Internet
www.3M.com/occsafety
E-mail
occsafety@mmm.com
For other 3M products
1-800-3M HELP$ (1-800-3M-HELP$)

In Canada, contact:
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P.O. Box 5757
London, Ontario N6A 4T1
Technical Assistance (Canada only)
1-800-267-4414
Sales Assistance
1-800-265-1840, ext. 6137
Internet
www.3M.com/CA/occsafety
3M Canada E-mail
ches@ca.3m.com
Technical Assistance In Mexico
01-800-712-0646
Technical Assistance In Brazil
0800-550705
For all other OUS locations:
1-651-732-6530
Fiber Reinforced Polymer (FRP) Reinforcing Bar

What is FRP Reinforcing Bar? A structural reinforcing bar made from filaments or fibers held in a polymeric resin matrix binder. The FRP Bar can be made from various types of fibers such as Glass (GFRP) or Carbon (CFRP). FRP bars have a surface treatment that facilitates a bond between the finished bar and the structural element into which they are placed.

FRP Bars are intended for use as concrete reinforcing in areas where steel reinforcing has a limited life span due to the effects of corrosion. They are also used in situations where electrical or magnetic transparency is needed. In addition to reinforcing for new concrete construction, FRP bars are used to structurally strengthen existing masonry, concrete or wood members.

Why is it innovative? FRP bars are a new type of structural material for the civil engineering community. The basic constituent materials for reinforced concrete design have changed very little in the past 100 years. Traditionally, composite materials have been used extensively in aerospace and consumer sporting goods where their high strength to weight characteristics were first exploited.

Corrosion of steel reinforcement in concrete structures causes deterioration of concrete resulting in costly maintenance, repairs and shortening of the service life of structures. Government agencies throughout the world have recognized the potential benefits to society if our infrastructure can last longer and are thus funding significant amounts of research in the field of FRP's.

What does FRP Change or replace? FRP bars are an alternative to steel rebar in many applications and to steel plate-bonding techniques for structural strengthening.

Where and when did FRP bars originate, has it been used and is expect to be used? The concept of FRP bars has been around since the 1960's, but advances in the field of polymers, advancements in production techniques and implementation of authoritative design guidelines have resulted in a rapid increase in usage of FRP bars in the last 5 years. FRP bars have been used in a number of FHWA funded Innovative Bridge Research projects as rebar in bridge decks (photo) and in a number of seawall and marine structure projects including the rehabilitation of Dry Dock #4 at Pearl Harbor Hawaii (photo). Other uses include slurry wall construction (photo) as "soft-eye" openings for tunnel boring machines, and reinforcing for ornamental and architectural concrete of all types. A great deal of research is being performed utilizing FRP bars as structural strengthening of existing concrete and masonry members to increase flexural and shear capacity. Examples of this technique have been used to remove the posted rating of a bridge in Missouri (photo) and seismic strengthening of un-reinforced masonry walls (photo).
On-Line Bid Exchange Service

Bid Express™ (www.bidx.com) is an Internet service owned by BidX.com, a subsidiary of Info Tech, Inc. It was created as a complement to the American Association of State Highway and Transportation Officials' (AASHTO) Expedite TM, which is a software program used by 36 state departments of transportation (DOTS) and their contracting communities to manage, prepare, and submit bid data electronically.

- Bid Express is the web site and back-end database that provides a reliable, secure Internet connection between an agency and its bidders and an effective sealed depository for bids that is not accessible to any parties prior to the public bid opening.
- Bid Express can be implemented in a “one-way” format where the site is configured to allow the agency to post notices to contractors, plan holders lists, bid documents, addenda, and other bid-related information. It will also allow contractors to access bid documents online and perform searches on items, bid tabs, and vendors.
- Bid Express can also be implemented in a “two-way” format to allow for secure Internet bid submission and bid bond validation back to the agency using digital signature technology and a public-private key infrastructure for security. Agency staff interacts directly with Bid Express using an administrative interface accessible via a standard web browser.

Why is Bid Express innovative?
Bid Express is the first fully electronic, internet-based bidding service to be accepted as reliable and secure enough to replace or complement the traditional sealed bid letting process used by transportation agencies. Bid Express represents a significant advance in how DOTS do business with contractors.

What did Bid Express change or replace?
Bid Express replaces paper bid documents and eliminates the need for contractors to travel to letting locations to submit their sealed bids in person, saving significant cost in travel time and expenses. Contractors can also achieve greater geographical reach on jobs they wish to bid, and agencies have access to a potentially larger group of bidders. In addition, contractors can make last minute changes to their bid, for example if they are waiting for sub-quotes, and still submit their bids on time if they use Bid Express. Because Bid Express has a direct interface to most DOTS' award systems, they can automatically download bids and post `As-Read' results immediately.

Together Bid Express and Expedite have also eliminated many points where manual error checking was necessary by the agency and the bidder during the process. For example, Expedite performs automatic checks of arithmetic and administrative errors. Bid Express ensures that the proposal document is properly signed, that all amendments are applied, that the contractor is an eligible bidder, that cut-off times for submission are enforced, and that the proper vendor ID is used.

Bid Express also allows contractors to submit, withdraw, and resubmit their bids up until bid closing time in a safe, secure environment with encrypted printed and electronic receipts of activity. Under the traditional paper-based, sealed bid process, it was extremely difficult, if not impossible, for contractors to withdraw and resubmit bids.

Where and when it originated, has been used, and is expected to be used in the future?
Bid Express was first launched in 1997 with the Wisconsin DOT. It is now in operation with DOTs in the following states: Georgia, Iowa, Michigan, Minnesota, North Carolina, South Carolina, Virginia, and Wisconsin. Bid Express successfully handled over $4 billion in contracts in 2001. Arizona DOT is in the final stages of testing and expected to start full production use of Bid Express by October 2002. Other DOTs that are expected to complete implementation and begin full production use of Bid Express by late 2002 or early-mid 2003 include Indiana, Louisiana, Maine, New Mexico, Vermont, and Oklahoma. States that are expected to begin implementation of Bid Express in 2003 include Florida, Ohio, and West Virginia.

Contact: Thomas P. Rothrock, Ph.D. • Info Tech, Inc. • 5700 SW 34th St., Suite 1235 • Gainesville, FL 32608-5371 352-381-4400 • Fax 352-381-4444 • tom.rothrock@infotechfl.com • www.infotechfl.com
On-Line Bid Exchange Service
SkySAW™

Pre-cast and tilt-up concrete remain a popular method of new building construction. A common requirement in this type of construction is to cut doorways and windows into the concrete walls after the building has been assembled. Traditionally this requirement is satisfied by utilizing a hydraulically powered concrete saw tethered to an external power pack and a water supply. The process of cutting a hole begins with the operator attaching a steel track to the wall, which the saw will traverse during the cutting process. The saw is attached to the track, the hydraulic hoses and water hoses are connected, and the blade is attached to the saw. The saw and track must be repositioned for each cut around a given opening. After the opening has been cut, the wall must be washed to prevent slurry build-up. If the required opening is at a height beyond the operator’s reach, a ladder or aerial work platform is used to elevate both the operator and the saw.

The SkySAW machine provides an aerial work platform with an integrated wall sawing and drilling system. Self-contained hydraulics and water tanks eliminate stand-alone power packs and water trucks. A hydraulic powered saw positioner reduces operator fatigue by allowing the operator to position the saw and the track on the wall. Plus, an onboard pressure washer reduces costly back-charges by enabling on-the-spot pressure washing. The SkySAW offers concrete cutting companies four distinct advantages: improved productivity, lower maintenance and fuel costs, reduced operator fatigue, and lower clean-up charges.

Concrete cutting crews are paid by the number of linear feet they cut per day. A two-man crew using traditional methods can cut up to 150ft. per day. The SkySAW product doubles the linear feet to 300 while only utilizing one operator. Self contained hydraulic power and water tanks greatly reduce the required time to move from one location to another and remove the need for the second operator. By integrating a water supply and by using the aerial work platform’s hydraulic supply to operate the concrete saw, the number of pieces of equipment on the jobsite is also reduced. By utilizing fewer pieces of equipment, the concrete sawing company can reduce its maintenance and fuel costs and focus on its core business.

The hydraulic-powered saw positioner reduces operator fatigue caused by placing a saw that weighs in excess of 120 lbs on and off the track. This not only improves the efficiency of the saw crews, but also reduces lost time accidents and turnover. By retaining experienced workers, the concrete cutting company also lowers its hiring and training costs. An integrated pressure washer allows operators to clean up after each cut, which eliminates the need to rent an additional piece of equipment.

The SkySAW is rapidly becoming the new standard in the concrete sawing business. It has not only been adopted by industry associations such as the Concrete Sawing and Drilling Association, but has also been welcomed by the leaders in the industry such as the Fabcon Corporation.
SkySAW™

Raising Productivity to a Higher Level
Cut more in a day’s time with the first integrated wall sawing and drilling system. Self-contained hydraulics and water tanks eliminate stand-alone power packs and water trucks. The hydraulic powered saw positioner reduces operator fatigue. Plus, an onboard pressure washer reduces costly back-charges by enabling on-the-spot pressure washing. (Saw and blade not included.)

Traditional (current) Method
- Billable Cost Per Linear Foot: $22
- Linear foot Per Day: 100-150
- Revenue Per Day: $2,200-$3,300
Note: This is a two-man operation (see SkySaw package operation below)

SkySaw™ Package Method (estimates)
- Billable Cost Per Linear Foot: $22
- Linear foot Per Day: 200-300
- Revenue Per Day with SkySaw™ Package: $4,400-$6,600
Note: This is a one-man operation freeing the second man to saw, doubling the above output if a second SkySaw unit is utilized.

Per Unit: Incremental Daily Revenue: >$2,200; Incremental Monthly Revenue: >$44,000

Eliminate Costly Power Packs  •  Reduced Worker Fatigue
On-Board Pressure Wash System Eliminates Costly Back-Charges
Eliminate the Need for Dedicated Water Truck and Driver
Reduce Turnover and Lost Time Expense

Summary: Quantified Savings Per Month
- Fuel savings $225
- Rental of Powerpack $500
- Pressure Wash Rental $600
- Delivery Charges $200
- Monthly Savings $1,525

Savings per month are in addition to the productivity gains outlined above.
Magnetic Flux Leakage (MFL) Inspection System for Gas Distribution Mains: Smart Pig

The gas industry operates and maintains approximately one million miles of pipes consisting of steel, cast iron and plastic pipes to deliver natural gas to customers in the United States. The steel gas mains are prone to time dependent defects such as corrosion, which can reduce safety, security of service and threaten the environment if failure occurs.

The gas industry has recognized the need to inspect these mains to ensure that affected location are repaired or replaced before the failure occurs. Presently, to inspect mains for corrosion requires excavation and visual inspection of the pipe at cost ranging from $1000 to $3000.

Innovation:

In order to reduce the excavation at each affected area of the pipe, an innovative and patented system (see attached Figure) was developed based on the well-known Magnetic Flux Leakage (MFL) technique.

• The MFL sensor --Smart Pig was attached to a mechanically driven push-rod for traveling the sensor through the mains while the gas was flowing through the pipe.

• By making one excavation and using the pioneering MFL inspection technology operators can inspect live gas mains, lower operating costs, minimize service disruptions, and increase safety and reliability.

The current inspection system is suitable for low pressure (less than 60 psi), in service, flinch diameter gas mains. Note that the commercial MFL inspection services are performed on high-pressure transmission lines. The pressure in these lines is 500 psi or more and allows the inspection tool to be propelled through the line by the product by forming a hydraulic seal between the inspection tool and the pipe wall using compliant polyurethane seals. The low operating pressures of gas distribution mains prevent this form of movement. This challenge was addressed with development of an external delivery means (tubing or rod) to move the inspection device through the mains.

The second challenge required miniaturization of the MFL sensor. The commercial MFL inspection pigs are quite long relative to their diameter and use stiff steel brushes to contact the pipe wall in order to assure good magnetic coupling. In gas distribution main applications, the MFL probe must be made much smaller in dimension and operate with an air gap between the magnets and the pipe wall. The MFL sensor with 32 hall sensors was designed and tested. The sensor with the air gap was manufactured to allow uninterrupted gas flow, minimize drag, and reduce the potential of introducing particles into the gas stream that could otherwise occur from the scraping action of the brushes.

The third challenge - access into the gas mains - was addressed through a novel launching and receiving mechanism mounted on the gas main. The entry fitting and the procedures used to launch and retrieve the MFL inspection device was easy to install, had a high level of safety, and had minimum left-in-place hardware.

The complete system was evaluated in several operating gas mains in US and Europe. The test results were provided to participating utilities on the real time basis and then documented in the report. The test results documented corrosion detection capability for both internal and external to pipes, accuracy of defect locations, and entering gas mains from one location and propelling to the distance of 1000 ft with gas flowing through the main and without interrupting gas flow to the customers. The system is currently available for inspecting the low-pressure gas distribution pipes.
Magnetic Flux Leakage (MFL) Inspection System for Gas Distribution Mains: Smart Pig
Pocket Form Isolator™ - PFI™

Pocket Form Isolator is a ‘leave-in-the-slab’ isolation pocket, or diamond block-out engineered of high-density polyethylene (HDPE).

Wood, Styrofoam, and other materials currently used to create block-outs all have a common flaw – they must be ‘wrecked-out’ after the slab in place! Using PFI does away with wrecking-out diamonds, eliminates unsupported and or chipped slab edges, as well as debris-filled pockets that could prevent the proper placement of the column base grout bed. Because HDPE does not fill bond to concrete and because PFI sits as finished floor elevation, it becomes the optimum separation and expansion joint between the inner and outer concrete pours, eliminating the need for grout lines, fiberboard, or other separation methods in use today.

- PFI is easily penetrated with hand tools to accept conduit or PVC doglegs so frequently seen in modern retail and commercial structures.
- POCKET FORM ISOLATOR may also be used to create state of the art utility and refrigeration line pull boxes.
- PFI comes boxed in four sections with everything included to assemble, then anchor PFI to the footing-stainless steel hardware, illustrated English/Spanish instructions, stackable EPDM shims, clips and concrete nails.
- On conventional steel frame structures PFI can be assembled around pre-set columns, making monolithic pours possible because you don’t wreck out PFI.
- PFI is available in 24” and 28” square sizes, in heights up to 48” and beyond.
- One, two, or three PFI sections may be used to create interior corner pockets, “along the wall” or perimeter pockets, and exterior corner pockets, and custom shaped pockets can be constructed to meet the needs of almost any project you are working on.

A companion flush fitting, orange, REUSABLE safety top is available that exceeds OSHA requirements for open holes on jobsites, supporting in excess of 2300 lbs. in dynamic tests. Workers may still be protected AFTER columns are set by utilizing dimensional lumber pieces cut to fit across the interior safety top ledge that is 1 ½” below finished floor elevation. Contractors can power trowel and laser screed directly over PFI when safety tops are in place. PFI is engineered in part with recyclables, and since it is not wrecking out, eliminates the disposal of used formwork and waste lumber. Slab edges no longer require thickening, and saw cut joints are made quick and easy with PFI.

Safety tops also function as a cover for diamond block-outs when casting tilt-up panels. Used in conjunction with our clear polyethylene (POLYTAPE) that sticks aggressively to both PFI and the freshly-poured slab, or with sheet rock mud, PFI can virtually eliminate “grind and patch” from the tilt-up jobsite vocabulary! **And the price is right – a contractor-performed TIME/COST STUDY showed he saved 30+ man-days labor and over $4,000 in direct cost on a 100 block-out job!**

PFI has been successfully used in the slabs of Super Target, Target, Wal-Mart, Super Wal-Marts, Sam’s Clubs, Home Depot Stores, public schools, supermarkets, the new Georgia International Convention Center and a variety of other commercial and industrial structures.

PFI was patented in 1993, and has been marketed since July 2001.
IPIN (Internet Planroom Information Network)

IPIN is a computer program that allows construction reporting agencies, like Builders Exchanges, to completely change the way they have done business for the past 100 years.

Innovation - Before IPIN was created in 1997, every reporting company mailed construction reports to their members/subscribers. The information was late, limited and expensive to deliver. IPIN has allowed companies to completely eliminate hard copy reports in favor of the internet, providing more information in more innovative ways.

Changes: Prior to the internet, construction reporting had not changed in 50 years. Constant phone calling between reporters and architects, typing a minimum of information which was then copied and mailed out, often on a weekly basis. Addenda were often missed due to the painfully slow distribution of information.

IPIN has changed everything about our business by removing the constraints of the printed reports being sent via US Mail. We now provide real-time information to our members, which is vital due to the reduced bidding time allowed by the owners. Also, we include much more information such as complete plans, specs and addenda, expanded bidders lists, estimate break-downs, e-mail links, website links, etc., plus our members can retrieve the information in a variety of ways.

Information gathering has also changed, although the telephone is still very important, IPIN uses a program that constantly checks websites for new bidders, new projects, apparent low bidders, etc. Automation has been the key to the success of IPIN. It allows the gathering and dissemination of a phenomenal amount of information with a minimum amount of people. Prior to the IPIN system, the Cleveland Builders Exchange reported on approximately 2,000 projects per year. We are now on target to exceed 9,000 projects for 2002.

However, the most dramatic change for the construction industry is that on-line programs have allowed contractors and suppliers to bid dramatically more projects which in turn has driven down the cost of construction to the end user.

Our PRIVATE PROJECTS program is beginning to change the way general contractors issue their Invitations To Bid to the industry. They may now, with a single click of the mouse, set up their own project website, complete with plans, specs and addenda. Visitors are logged upon entry to the site and their actions tracked while using the site so that the general contractors have more knowledge regarding their bidders.

Finally, IPIN has opened the industry to information that has never before been available to anyone. Users can instantly retrieve data on companies that would have taken days to gather prior to IPIN. Bidding patterns, company activity, most active companies, mailing lists, etc. can all be accessed at will.
IPIN (Internet Planroom Information Network)

Origination: A group of eight Builders Exchange executives met in Cleveland, Ohio, in the summer of 1996 to begin the process of laying out the IPIN system. Six months later IPIN went on-line in Cleveland, Ohio. IPIN has been continually updated since its inception with ground breaking features and faces a limitless future.

Users: IPIN is the most popular internet reporting software used today. Over thirty-five reporting agencies use IPIN both in the United States and Canada including The Cleveland Builders Exchange, the Builders Exchange of Texas, the Pittsburgh Builders Exchange, the Construction Notebook in Las Vegas, and many others.

We are currently in discussions with nine plan centers in Washington State, the Construction Association of Michigan in Detroit and several Florida Builders Exchanges.

Another benefit from the Exchanges using the IPIN software is that many of them have greatly expanded their reporting territory. In Cleveland and San Antonio, for example, local Exchanges now cover their entire states, respectively, increasing their number of projects from 1,500 to over 7,500 each.

Although it is difficult to extract exact numbers, we estimate that over 10,000 construction companies are actually using the system on a regular basis covering approximately 60% of the United States and a large part of Canada.

Conclusion: Although IPIN is extremely powerful, it's features exciting and it's future limitless, the most remarkable aspect of the system is it's ability to be implemented on a small local application. The smallest reporting agency may now walk stride for stride with the mightiest of competition walking far ahead of them.
The Raising Gang
A Training Program Teaming Together Two Skilled Construction Trade Unions

What the innovation is.
The Raising Gang project is a cooperative training program developed by a partnership among the Great Lakes Fabricators & Erectors Association; Local 25 of the International Association of Bridge, Structural, Ornamental & Reinforcing Iron Workers; and Local 324 of the International Union of Operating Engineers, to enhance the joint training of structural iron workers and operating engineers to work as a team in steel frame construction. The unique program may well be the first time ironworkers and operators have cooperated in joint training in structural steel erection, at least at this scale. Its centerpiece is a massive and complex training frame weighing approximately 150 tons, that can be erected in several different configurations. Following eight hours of classroom instruction, third year apprentices from both unions are trained by journeymen on steel erection techniques that are safe and productive. "On site" training occupies a full, 40 hour week, starting from the initial shakeout of the steel to its final topping out. The frame is then disassembled for the next class. As part of this effort a printed collection of best practices has been prepared for use in conjunction with apprenticeship training manuals.

Where and when it originated.
Planning of the Raising Gang project began in 2000 by the Labor-Management Committee of the GLFEA and Iron Workers Local 25. Operating Engineers Local 324 was approached in 2001 and volunteered the use of a portion of its Journeyman & Apprenticeship Training Fund (JATF) Education Center in Howell for erection of the training frame. Classroom space in the JATF is also provided to allow training to continue in inclement weather. The first column was erected for the very first time on May 6, 2002.

Where it has been used, and is expected to be used in the future.
While expectations are that the Raising Gang program will continue at the JATF for the foreseeable future, the frame could be moved to another location. More important, the entire program could be duplicated. In addition, the frame can be modified to provide training for a project owner's specialized steel erection needs. Planning is underway as well to adapt the training to a variety of other groups, including steel erection foremen, and in combination with several universities for architectural and engineering students.

Why it is innovative.
Here is a rare example where two skilled construction trade unions are working together to improve worker skill levels in a setting that emphasizes real project site conditions. Crane operators learn about the job responsibilities of iron workers and how they can harmonize with them, to enhance safety and productivity. Iron workers learn about the capabilities and limitations of cranes and the operators, in handling the challenges of setting structural steel. Both are given ample opportunities to perfect their skills under the guidance of seasoned instructors.

What it changed or replaced.
Prior to the Raising Gang program, crane operators and iron workers were trained separately. Iron Workers Local 25 had used a much smaller, 1-1/2 story frame made up of lightweight steel members about the size of a one car garage. The old frame is now being used as the framing of a penthouse that can be lifted onto a small portion of the new frame. Operating engineers had used cranes to lift and place some structural steel but they could not erect it into any kind of structure. Instead, they had to learn how to work together as a team while on actual project sites, under production conditions and deadlines that often were not conducive to comprehensive education. Nothing can replace on the job experience, but crane operators and iron workers who successfully complete the Raising Gang program will be far more qualified to safety and productively erect steel than those who do not.
The Raising Gang
A Training Program Teaming Together Two Skilled Construction Trade Unions

The Raising Gang Training Program
A product of cooperation and partnership between the Great Lakes Fabricators & Erectors Association, Local 25 of the International Association of Bridge, Structural, Ornamental, and Reinforcing Iron Workers, and Local 324 of the International Union of Operating Engineers.

Training with experienced journeymen

Simulates project site conditions

Topping out the training frame

Old training frame (left) used as penthouse on new training frame

Joint training of iron workers and crane operators
THE BEHAVIORAL ADVANCED PERFORMANCE PROCESS® (BAPP®)  
IN THE CONSTRUCTION INDUSTRY

What the Innovation Is:
BAPP technology is a leading-edge process approach to reducing exposure to injury by helping organizations to identify safety-related behaviors, gather data, provide ongoing, two-way feedback, and remove barriers to improvement.

BAPP technology provides an effective method of measuring and managing exposure upstream (before injuries occur) and engages workers in safety improvement.

Why is it Innovative?
In the construction industry, barriers to safe behavior include a changing, temporary workforce. In construction, typically, workers can work 3 days or up to a few years on a project. Usually, there are many different contractors employed on a construction project, and they all must work together. These contractors have different rules they must follow and different values for safety. Some contractors are union, some non-union; and contractors are often represented by a number of different unions.

BAPP technology is a revolutionary methodology that improves the working interface between the worker and the systems and conditions. A BAPP performance implementation integrates expertise drawn from organization development, safety, industrial hygiene, human factors, total quality management, engineering, and behavioral science.

What it Changed or Replaced?
BAPP does not replace existing safety processes, but works in tandem with them to enhance safety by improving behavior, attitude, and culture.

Where and when it originated.
BAPP was first pioneered in the late 1970s by Behavioral Science Technology, Inc. Since that time, the technology has been implemented at over 1450 sites located in 39 countries. Employees at over half the sites enjoy union representation. New developments have improved the effectiveness, integration, and sustainability of this approach. BAPP was first introduced in the construction industry during the 1990’s.

How has it been used?
First applied in the manufacturing and petro/chemical fields, BAPP technology expanded into every industry. The question lately is not “does BAPP technology work, but rather “will BAPP safety work in a non-manufacturing setting?” In the construction industry, clients include MW Kellogg, and Cianbro, along with construction projects for companies including Weyerhaeuser.

How is it expected to be used in the future?
BAPP technology not only helps organizations reduce injuries, but also builds employee engagement, and changes the systems that influence at-risk behavior. The flexibility and adaptability of the BAPP approach has been proven again and again in different industries, different countries and cultures, and in applications in addition to safety. Some of these applications include quality efforts and supervisor effectiveness training.
The chart above shows results from two simultaneous construction projects facing very high turnover. This study compared safety performance for two construction projects. Except for the safety initiative (one project used BAPP technology while the other did not), the projects were nearly identical; each project pulled approximately 300 workers from the same labor pool over various phases of the work, had attrition rates of over 300%, lasted approximately 18 months, and involved the same type of construction.
Galvashield® XP Embedded Galvanic Anode

Galvashield XP is a patented sacrificial embedded galvanic anode that provides localized galvanic corrosion protection in reinforced concrete structures. The anode consists of a zinc core surrounded by an active cementitious matrix. The 63mm diameter x 28mm high embedded anode is quickly and easily fastened to reinforcing steel. Once installed, the zinc core corrodes preferentially to the surrounding rebar, thereby providing galvanic corrosion protection to the reinforcing steel.

In the mid 1990s, Vector Corrosion Technologies, through research and development and in partnership with Fosroc International Limited, a UK company, developed the Galvashield XP embedded anode as a breakthrough in the corrosion protection of concrete structures. The design philosophy behind the Galvashield XP embedded anode was to create a simple product that could be incorporated within a patch repair to minimize ongoing corrosion and extend the life of concrete repairs. Without protection, corrosion continues in the reinforcing steel immediately adjacent to the repair and results in premature failure. The anode has been designed to focus protection in the narrow zone directly adjacent to the repair.

The size and discrete nature of the anode makes it convenient to install in a wide variety of repairs, and provides the specifier with complete control when targeting the areas that should receive protection. The anode is suitable for large or small repairs; a large repair will simply require the incorporation of multiple anodes. The convenience of the anode makes it a cost effective method of extending galvanic protection to repair scenarios that were not practical just a few years ago.

The Galvashield XP embedded anode is a non-hazardous product. Manufactured of common construction materials it is installed simply without complex equipment or processes. Depending upon a project’s design parameters the anode will normally operate for a period of 10 to 20 years. Once installed its zinc is converted into a stable, non-hazardous zinc corrosion product. After its service life is complete, the anode remains are dormant and concealed within the concrete, having no maintenance or special disposal requirements.

The Galvashield XP embedded anode has been in use in North America since 1998 in a wide variety of applications: deck repairs, joint replacements, pre-stressed and post-tensioned repairs and interface applications between new concrete and existing chloride-contaminated concrete where accelerated corrosion can occur. The anode reduces on-going corrosion activity and also reduces the effect of ring-anode corrosion commonly associated with concrete patch repairs in reinforced concrete.

In order to verify the performance of the Galvashield XP embedded anode, periodic evaluation by various research and education foundations is conducted to provide an unbiased opinion of the effectiveness of this innovative technology. In July 2001, following evaluation of the anode, The Concrete Innovations Appraisal Service issued CIAS Report 01-1 Galvashield Embedded Galvanic Anodes for Repair of Concrete. The principal use of this report is as neutral documentation to help technical committees of the American Concrete Institute (ACI) and users of the anode to better understand the technology. As stated in the report “The technology offers an easy-to-understand concept, which gives the client confidence in the capability of the repaired structure to perform its intended use.” In July 2002, the ASCE/CERF Highway Innovative Technology Evaluation Center (HITEC) commenced evaluation of the Galvashield technology.

For many contractors and engineers perhaps the greatest benefit of the Galvashield XP embedded anode is the fact that installation requires little or no change from existing concrete repair practices, and only a minimal addition in cost. Normal patching procedures simply shift the corrosion reaction to adjacent concrete areas, thus creating a continual battle in which repair crews chase the corrosion problem around the structure. The Galvashield XP embedded anode prevents this from occurring by mitigating the corrosion problem using a maintenance-free, cost-effective strategy.
Galvashield® XP Embedded Galvanic Anode

**Cut-Away of Galvashield® XP Anode**

**Concrete Girder Repair – Anodes tied to steel inside girder repair**

**Bridge Widening Project – Anodes tied to reinforcing steel at joint between new and old concrete**

**Concrete Patch Repair – Anodes tied around perimeter of repair**

**Galvashield® XP Reduces “Ring Anode” Corrosion**

**“Ring Anode” Corrosion (without Galvashield® XP)**
**FIREXX FORTIFICATION**

FIREXX FORTIFICATION is a prefabricated construction cladding material that uniquely defends structures against the catastrophic effects of air blast explosions of all kinds ...whether accidental or otherwise.

Typically just a few inches in thickness, FIREXX FORTIFICATION is a substitute or enhancement for conventional blast protection approaches, such using as reinforced concrete or metal ...or siting structures at extraordinary offset distances.

The core technology involved in FIREXX FORTIFICATION is FIREXX®, an ultra-light (3.3 lb/cu ft) and ultra thin (<2 mm) expanded alloy mesh material. As incorporated in FIREXX FORTIFICATION, bird's-egg-sized FIREXX, mesh ellipsoids are nestled within special expanded metal cages. Rather than 'hardening' structures to reflect the blast waves, FIREXX FORTIFICATION different principals of physics to essentially 'soften' the structure, attenuating overpressures through a compound process of thermal and kinetic energy absorption diffusion of the otherwise coherent blast waveforms.

FIREXX FORTIFICATION is a break-through in several practical respects that, unfortunately, are becoming increasing relevant in the post-"9/11" era when there is urgent need for affordable passive protection of structures and peoples from explosions.

**FIREXX FORTIFICATION Advancements**

- Is typically hundreds of times lighter than blast protection grade reinforced concrete
- Is typically 30%-50% lower in Installed price than blast protection grade reinforced concrete
- Is typically installable a fraction of the time, with semi-skilled labor
- Is detachable, re-locatable and reusable
- Is lifetime-durable, non-corrosive, non-electrostatic, non-degradable.
- Is scalable to almost any assumed blast threat level - from a few pounds to thousands of pounds.
- Is configurable to almost any shape
- Is easily and Inexpensively transported - panels typically are no more than a few inches in thickness

FIREXX FORTIFICATION often leap-frogs conventional techniques especially in civilian or governmental projects where i) there is a compressed timeline for project completion; ii) the project is a security upgrade to an existing structure -- thus, conventional hardening may not be engineered practically or affordably because of weight and dimension factors, or because the structure is in a restrictive urban setting; iii) protection is needed only temporarily; iv) design requirements are unusually complicated, such as for doors, arches, bunkers, protrusions, parking garages, load bearing beams, conduits, tunnels, bridges, embankments, or; v) materials or skills are not locally available for conventional hardening. When desired, aesthetically appropriate breakaway facade materials can be applied to exterior surfaces of the cladding.

FIREXX and FIREXX FORTIFICATION are the inventions of Ghaleb Al-Hamad, a chemist and scientist and former prominent civil construction company owner in Saudi Arabia. FIREXX originally was invented for use as a flame arrester, for which it remains “best in class” among metal mesh materials. However, unlike similar-appearing “mesh” materials, FIREXX FORTIFICATION is the first material proven to be effective, practical, and affordable for mitigating extremely high overpressures. There are currently 26 US Patents and 111 total patents issued by governments worldwide protecting FIREXX and FIREXX FORTIFICATION material, production equipment and processes and various practical applications of the materials and processes. US Patent No's. 5,500,037 (1996), 5,540,285 (1996), 5,563,364 (1996), 5,576,511 (1996) and 6,216,791 (2001) all relate specifically to FIREXX FORTIFICATION.

FIREXX FORTIFICATION has been extensively tested over the years and, for example, was demonstrated in an experiment at the Army's Aberdeen Proving Ground test facility, to mitigate up to 94% of 'flow through' overpressures resulting from the test explosion of 45 lbs TNT equivalency. There are many important practical advancements as a result of this innovation.

In the past three years since FIREXX FORTIFICATION began selling its products actively, 1 million cu ft of FIREXX FORTIFICATION has been installed for such projects in the Middle East as bomb traps, protection of governmental buildings, guardhouses and protection of strategic material storage sites. As reference for this Nomination, the CIF Jury is provided a 1999 testament letter from ABV Rock, KB, a multi-billion dollar international heavy construction company, which already has completed installation of more than $100 million of FIREXX FORTIFICATION. The company has forward construction contracts signed for multiples of this production and is actively marketing in other regions.

FIREXX FORTIFICATION currently is manufactured in Riyadh, in the Kingdom of Saudi Arabia. However, material production and prefabrication is easily located anywhere in the industrialized world.

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Multi-Use Elevated Water Storage Tank
Niceville, Florida

Chicago Bridge & Iron Company recently completed the design and construction of a unique and innovative multi-use elevated water tank for the City of Niceville in June of 2001. The tank is located in the center of four baseball diamonds at the city’s municipal sports complex.

Not only does this tank provide 500,000 gallons of elevated potable water storage, it has four floors in the support structure providing 3,900 square feet of indoor office space. The ground floor includes concessions, public restrooms and entrances to the tank. The second floor has city park administration offices and access to future bleachers that will surround the tank. The third floor includes air conditioned announcer’s booths, a 360 degree cantilevered press box and observation deck for unobstructed viewing for all four baseball fields. The fourth floor contains mechanical equipment and storage space.

CB&I has done similar projects utilizing the base of water towers for fire stations, pump station and auditoriums, but never a multiuse ball park facility. Lannie Corbin, Niceville’s City Manager came up with the original idea back in 1997. Working closely with the City and Polyengineering, Inc. of Dothan, Alabama, CB&I helped develop and price a number of options prior to contracting and building this unique and innovative multi-use structure.

The Niceville Elevated Water Tank is a functional, visually appealing structure that serves the needs of the community by providing elevated water storage for pressurizing their water system, providing municipal office space for the parks department, concession stands and restrooms for public access and an air conditioned, completely enclosed, tinted glass press box that provides comfortable, unobstructed viewing of all four baseball fields.

It is truly a multi-use structure that not only serves the needs of the City’s parks and recreation department and its water department as well as being a source of pride for the entire community. It is an excellent example of teamwork between the owner, engineer, and contractor.

By utilizing one structure, the City avoided the extra expense of additional property for the tank and also the extra expense of an additional building at the ballpark. It will serve the City of Niceville for many generations.
Multi-Use Elevated Water Storage Tank
Niceville, Florida
Unique Solution
The iSqFt system was built to emulate the flow of information in the “bricks and mortar” world, but takes advantage of the speed and scalability of the Internet to create an online “virtual private network” for each user.

Savings for all
The system consists of two primary components:

1. The Internet Plan Room (IPR)

   This solution is accessible by any paying subscriber on a regional (typically statewide) basis any time of the day or night. Users can scroll through hundreds of currently bidding construction projects which typically also reside in their local Associated General Contractors of America (physical) Plan Room.

   The online view of these projects includes basic project information as well as copies of the plans and specifications in a highly compressed format. These plans can then be downloaded quickly (even over a dial up connection) and printed to scale on a small printer or large plotter, measured onscreen using the special software provided, or marked up and printed or copied to the Windows clipboard.

   Users, typically subcontractors or suppliers, can quickly do a keyword search and locate projects in their area that include a specific word or phrase anywhere in the specification documents. Easy access to more potential projects is a simple recipe for more successful subcontractors and suppliers.

2. Private Construction Office (CO)

   This tool is geared towards the General Contractor (GC) and allows it to post projects it is currently bidding on or for. Each project includes the plans, specifications, bid forms, site photos and any other relevant documents. Each project is kept “private” unless and until the GC issues invitations to bid, also done online, to any vendor in its online directory. Each invitation contains a unique 8 digit code which may be used by the vendor for free access to the entire project. The vendor can then accept or decline the invitation, also done online, and the GC then can track and organize its invitations to bid, also using the special tools inside its CO.

   Each vendor, sub, and supplier can also expect a phone call from the iSqFt staff informing it of the recently sent invitation, and helping it to log in and view the plans/specs right on its own computers. This added benefit has been proven to drive online adoption in a dramatic fashion.

   The GC user can search the online, “public” directory for additional firms to invite and once selected, they are automatically added to the GC's directory for future use. Vendors who are already using the network can also search for GCs or others who may have their own CO online and request that they be added to the directory for future projects. This solution provides significant savings over traditional methods to both the general contractor and the building owner in reduced paper printing and distribution costs. The savings for the subcontractor and supplier are also substantial in terms of saving time, travel, plan deposits, etc.

Rapid Adoption
This solution has at its core the documents most important to all parties in the construction process, the plans and specifications. That single difference has helped iSqFt to gain adoption by the subcontractor and supplier community at a very rapid rate. As of this writing, it’s been only 16 months since the iSqFt launch, and on average, more than 5,000 visitors per day use the iSqFt network to download plans, specifications, job site photos and other pertinent documents. The typical user spends more than 17 minutes on site in each visit and typically views, prints or downloads 11 different document pages. More than 200 Gigabytes of plans and specifications were downloaded in the month of August 2002, alone.
Internet Based Private Construction Office/Internet Plan Room Network

Conceptual Diagram of the iSqFt Construction Information Network

Understanding the Invitation to Bid Process
Building Design Program (BDP)

The Building Design Program (BDP) was created in 1997 and is structured to introduce construction in a positive and fun manner, while presenting challenges in math, communication and design. Most uniquely, through an estimating exercise, the students use applied math skills. (Applied math skills are a major obstacle in passing apprenticeship exams.)

The BDP is a team-based program introducing students to the imaginative world of construction through these objectives:

- Enhance awareness of construction industry careers and professions;
- Enhance relationships between math, science, technology and communication as they relate to the construction industry;
- Foster critical thinking, problem solving and creativity.

Upon completion of the Building Design Program students will have been introduced to the following concepts:

**Math Concepts**

Students will:

- **Scale** - Develop an understanding of the concept of “scale” as it relates to the construction industry. Scale is the proportion used to determine the relationship of a representation to that which it represents. Example 1/4 inch is equal to 1 foot. This is quarter scale.
- **Estimating** – Learn the process of judging or calculating the quantity of materials, labor and equipment required for a given piece of work; make judgments as to the best use and costs of materials, labor and equipment.
- **Conversion** – Learn the process of changing from one form into another, such as the skills used to make a drawing to scale.
- **Measurement** - Demonstrate the ability to measure to 1/4 inch to be able to work with their sketches and floor plan drawings.

**Science Concepts**

Students will:

- **Brainstorming** - Use brainstorming techniques to explore a variety of floor plans and design options. No judgment is made as to the value of one option over the other until the process is complete.
- **Problem Solving** - Analyze the development of a possible solution and then implement the proposed solution. The solution is then evaluated to determine its appropriateness in relationship to the problem. Generally, problem solving model is:
  
  **Input - Process - Output - Feedback**

**Communication Concepts**

Students will:

- **Listening** - Develop skills in listening to others and following directions.
- **Writing** – Create written reports and present the project for evaluation.
- **Oral Speaking** – Present their project to a larger group, and discuss their reasoning and point of view.
- **Researching and Reading** – Research and read materials necessary to develop decisions, create the project and communicate their ideas effectively.

Under the guidance of an instructor the teams of students will complete the design of a 1,000 square foot house for a family of four keeping the cost under $25,000. The program follows a ten-lesson plan layout including keeping a journal (job log), floor plan sketches, site plan layout, job costs worksheets, a report on five construction industry careers, a scaled model and a final report.

Contact: Carol Kueker • NAWIC Education Foundation • 1864 B Norwood Dr. • Hurst, TX 76054-3066
817-282-8321 • Fax 817-282-8430 • nef@airmail.net
Building Design Program (BDP)
The Last Planner System™

The Last Planner System™ (LPS) is a lean production–based project planning and management system. Application of the LPS to projects has shown that simultaneous improvement in all four dimensions—cost, schedule, quality, and safety—is possible:

• Reduced project cost—workers spend less time waiting for work or working around problems;
• Reduced project duration—available work does not sit idle waiting for workers;
• Improved quality—work is done in its natural sequence and is released from one participant to the next only when it meets established criteria; and
• Improved safety—the work environment is more stable so fewer ad-hoc efforts are required.

With LPS, all parties benefit from improved project performance.

The Last Planner System™, the new “operating system” for project management, maximizes value and minimizes waste. Planning takes place in a series of conversations. Each conversation confirms and expands project value - that which helps the clients achieve their purposes. Value flows to the client because the planning system links milestones to crew level assignments. Making workflow predictable reduces waste. Current project management practice lacks a mechanism to manage workflow; it cannot reduce the combined effects of dependence and uncertainty. As a result, each craft tries to optimize its own productivity and speed with little concern for predictable release to the next activity. “Partnering” and “Design/Build” try to solve the problem by applying organizational or contractual fixes, but these have limited impact because they rest on incomplete models of work and the way they are managed.

There are two kinds of work in projects: the physical work of putting materials in place, and the organizational work of making and keeping commitments at every level. The LPS is a distributed planning system that manages work by progressively reducing uncertainty and making work ready. Responsible Individuals (RIs) prepare phase Pull Schedules. Working backward from project milestones, RIs establish the best sequence of activities and their durations, and allocate float to maximize plan stability. Six weeks before action, activities drop from the Phase Schedule to the Lookahead Plan and are made ready. Activities do not advance from week to week on the Lookahead Plan if the RI loses confidence that the work will be ready when required. This gives the team and management the maximum time to remove the constraint. Assignments are prepared by the Last Planners (foremen, lead hands, design squad leaders, etc.) and must meet criteria or be rejected. Planning system performance itself is measured and improved by identifying and acting on reasons for incompletions. Typical actions include redesign of the planning and logistics systems or training for Last Planners and their supervisors.

Preparation of assignments links work to client value through milestones, and coordinates action to deliver it. The team prepares to be in action together as work advances through the system. Assignments are promises to one another and to those downstream. When planning system and the people who work within it create reliable workflow, the result is simultaneous improvement in all key criteria—time, cost, quality, and safety.
The Last Planner System™

Elevating Project Performance

The time/cost/quality tradeoff is the consequence of a basic law of production physics. This rule relates productivity and duration. As a system with two components approaches full productivity (utilization) of one, the delivery time of the other increases. This may seem counterintuitive at first, but think of rush hour. It takes longer to get home as the utilization of the highways’ capacity increases.

Consider the time/cost tradeoff on a project at Point “A” in Figure 1. Keeping the crews well separated will increase productivity but lengthen the project. Conversely, crowding the project will shorten the duration but reduce productivity. And variation in flow does matter—just one erratic driver can bring the highway system to a standstill, causing that cascade of brake lights.

In fact, the shape of the curve is determined by the amount of variation in the system. In Figure 2, the lower line is the result of more predictable workflow. Delays on that curve still mount as productivity increases, but at higher levels of productivity. The gains in performance from reduced variation can be invested in improved productivity (1), or reduced duration (2), or both (3). Quality improves as well because work is completed to hand-off criteria rather than to earn progress, and fewer accidents occur in the more stable environment.

![Figure 1](image1.png)

![Figure 2](image2.png)
Safe2Work
Tracking of Employee Safety Awareness Training and Drug Screening Status

What the innovation is:
Safe2Work is the proven Internet solution that delivers, reports, documents and tracks the basic safety awareness training and drug screening status of Michigan's unionized construction population. It provides verification of individual worker's drug test status and safety training status - all in one, centralized, online database location. Safe2WorkTM simplifies record keeping for safety professionals and company administrators at all levels. It accurately and reliably reports the workforce readiness of a very mobile employee population from wherever there is Internet access, 24 hours a day. Currently, Safe2WorkTM documents and tracks 30,000 drug tests annually and records the 50,000 mastered, online, safety-training tests of 10,800 workers. (This increases each month.)

Where and when it originated:

Where it has been used, and is expected to be used in the future:
Poised to expand nationwide, Safe2WorkTM currently serves the unionized construction population throughout the state of Michigan. First endorsed by Detroit Edison, the CDROM basic safety foundational awareness training of Safe2WorkTM is (to date) part of the mandated bid package requirements for General Motors, Detroit Edison, Ford Motor Company and Daimler Chrysler.

Why it is innovative:
Safe2WorkTM has successfully brought modern technology to the construction industry. Importantly, Safe2WorkTM has provided the training consistency that has standardized basic foundational awareness training for 48,000+ craft persons (50,000 mastered online tests) across all trades. Because a worker's status follows him/her in Safe2WorkTM, the redundancy of training that has long plagued this mobile workforce is being eliminated. Safe2WorkTM is putting all unionized construction trades together on "the same page." As a result, it is elevating the bar of safety on all jobsites and positively impacting the goal of achieving "zero-injury careers."

What it changed or replaced:
Safe2WorkTM has changed, replaced and eliminated multiple training programs of varying content, done by multiple Contractors, General Contractors and Owners. Safety records, once kept exclusively in file drawers in individual offices, are now maintained and tracked online on Safe2WorkTM. The once massive faxing of worker status information from jobsite to jobsite has become obsolete. Most importantly, Safe2WorkTM has provided this unique employee population with an enhanced feeling of professionalism. Workers who are drug free and who have passed all 14 courses of Safe2WorkTM are designated "Safe2WorkTMCertified." The result? More confident and better-trained workers who are safe to go to work and who also return home safely at night!
Safe2Work
Tracking of Employee Safety Awareness Training and Drug Screening Status

The Safe2Work Report Card is an individual, online resume of workforce readiness. It is the foundation of Safe2Work. It displays the 'real time' status information of both drug and alcohol screening and safety training for every Employee registered in Safe2Work. In sum, it is the sole indicator that shows an Employee/General Contractor/Owner/Union whether or not an Employee is ready and safe to go to work.

### Report Card

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Pre-Test Taken</th>
<th>Test Date</th>
<th>Test Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos Awareness</td>
<td>Yes</td>
<td>3/25/2001</td>
<td>Current</td>
</tr>
<tr>
<td>Cadmium Safety</td>
<td>Yes</td>
<td>9/1/2001</td>
<td>Current</td>
</tr>
<tr>
<td>Confined Space Entry</td>
<td>Yes</td>
<td>3/19/2001</td>
<td>Current</td>
</tr>
<tr>
<td>Electrical Safety</td>
<td>Yes</td>
<td>3/13/2001</td>
<td>Current</td>
</tr>
<tr>
<td>Fire Safety</td>
<td>Yes</td>
<td>9/11/2000</td>
<td>Current</td>
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<td>HAZCOM - Identifying the Dangers</td>
<td>Yes</td>
<td>3/19/2001</td>
<td>Current</td>
</tr>
<tr>
<td>Ladder Safety</td>
<td>Yes</td>
<td>9/1/2001</td>
<td>Current</td>
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<tr>
<td>Lead 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaking</td>
<td>Yes</td>
<td>2/19/2001</td>
<td>Current</td>
</tr>
<tr>
<td>Fat Pipe</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Personal Protective Equipment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scaffolding</td>
<td>Yes</td>
<td>3/19/2001</td>
<td>Current</td>
</tr>
<tr>
<td>Silica E</td>
<td>No</td>
<td>5/10/2002</td>
<td>Current</td>
</tr>
<tr>
<td>Trenching and Shoring</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>MCTSD/CRI/AED/First Aid</td>
<td></td>
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</tr>
</tbody>
</table>

The Reporting Options of the Report Manager offer the ease of feature rich reporting, specifically as they pertain to the individual Employee’s work readiness. At-a-glance Drug and alcohol screening status is available, per Employee. Safety training status information is available in both detail and summary reports for every Employee in the Contractor’s employ. Accessibility is 24/7, from anywhere there is Internet access.
The Ideal Shield® Protective Guardrail System

The Ideal Shield Protective Guardrail System, the industry leader in protective railing, is transforming the way warehouses, stadiums and industrial facilities are built and/or updated. For over ten years, The Ideal Shield Protective Guardrail has greatly reduced maintenance/material costs, lowered up-keep/labor and has been proven to protect employees and expensive equipment from injury from injury and damage. With the introduction of this Guardrail System, the previously disposable, easily damaged and often replaced rail of the past is now obsolete in comparison. Ideal Shield is the manufacturer, patent holder and distributor of this sleek design, which is easily installed with its unique core-in or plate installation. Ideal Shield offers its users several options in colors, sizes and configurations to suit even the most complex floor plans.

Ideal Shield recognizes the ever-changing safety/quality regulations companies are being held accountable for by OSHA and other organizations. In today’s economy Ideal Shield continues to react positively by manufacturing a product that not only adapts to this changing environment, but also is cost effective, customer friendly and #1 in protection.

Ideal Shield Protective Guardrail is fabricated using a unique combination of Schedule 40 and Schedule 80 steel pipe encased in a high-density polyethylene thermoplastic tube. This steel and plastic assembly creates a system that can withstand the force of multiple 12,000-lb forklift impacts while maintaining its structural integrity and does not crack when faced with such intense force. The system is built to last by distributing extreme force evenly throughout the unit.

The patented HDPE plastic tube allows for a smooth rounded finish that will not snag clothing or injure employees with sharp rusty edges. Thanks to the HDPE tube this guardrail system virtually eliminates painting. The HDPE tube maintains color density and keeps the system highly visible and looking like new! No need to shut down production lines due to environmental issues related to painting and welding like in standard guardrail. It can be cleaned with environmentally safe detergent and water solutions. Ideal Shield Guardrail products provide a safe nonconductive barrier, making it the guardrail of choice near electrical equipment. For electrical equipment installations, the guardrail can be installed as close as 6” from the object in which it is protecting.

Ideal Shield invented this system to cost effectively meet its clients’ barrier requirements for years to come. One cost saving Ideal Shield design feature is that the guardrail can be easily removed and reinstalled to meet changing plant floor configurations. One customer recently removed its guardrail and reinstalled it at a new facility…no added costs for new guardrail! Ideal Shield offers core-in installation which is as simple as core, drop, and install. Our clients find it to be the quickest – simplest installation in the industry. Recognized four times over as a Plant Engineering Product of the Year finalist, The Ideal Shield Protective Guardrail is available in one or two line designs and is delivered fully assembled to our clients.

Founder, Frank Venegas, Jr. invented the first Ideal Shield Guardrail product in 1991 to meet the Chrysler Jefferson North plant construction specifications. Chrysler challenged Ideal Steel to make the new facility’s guardrail removable and an environmentally friendly paint-free yellow finish. Mission accomplished! Ideal Steel provided miles of guardrail to the Chrysler Jefferson North plant and the Ideal Shield product line was launched. In 1996, the Ideal Shield manufacturing operation moved to Detroit and Ideal Shield manufacturing operation moved to Detroit and Ideal Shield, LLC was set up as its own separate corporation.

Today Ideal Shield protects some of our nation’s best such as Ford Motor Company, General Motors, Daimler-Chrysler and most recently the Detroit Lions new Ford Field Stadium. Keeping abreast of the newest industry trends and demands has kept Ideal Shield a step ahead of our competitors, and allowed for rapid business advancement. The latest project in our Guardrail line is affectionately known as The Defender Rail. Built in response to the need for added Homeland Security, Ideal Shield has developed a new rail that will stop a high-speed truck yet blend in with its surrounding landscape. Just another example of the world-class customer service and swift ability to solve specialized protection issues Ideal Shield clients has grown to expect. These traits and a high quality product have made Ideal Shield a trustworthy guardrail manufacturing name.
The Ideal Shield® Protective Guardrail System

**GUARDRAIL SPECIFICATIONS**

- **BOLT-IN APPLICATION**
- **CORE-IN APPLICATION**
  - Both 1 & 2 Line are available in Core and Bolt-In applications
  - Custom units available

**STANDARD MATERIALS:**
- 250 Nominal Wall Thickness Base Plate: 5/8" x 10" x 10" with (4) 15/16" anchor bolt holes. Anchors not included.

**STOCK UNIT SIZES:**
- Lengths: 48", 72", 96", 120" and 144" Overall.

**EASY CORE-IN INSTALLATION**
- Core & Drop Installation
- No Grit Needed
- Removable
- Painted Guardrail Available

**OUTDOOR MACHINE GUARDRAIL**

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2525 Clark Street, Detroit, MI 48209 (888) 308-7290 Visit us online at [www.idealshield.com](http://www.idealshield.com)
REALabor

REALabor is a real time labor cost and productivity tool designed for the daily interactive tracking of performance on the job site.

REALabor is an electronic daily timesheet that shows all employees and all cost codes for a project on one sheet.

The five cost windows (Daily Cost, Week to Date, Month to Date, Job to Date, and Any Date) show cost information for specific periods of time. These windows are particularly valuable for evaluating cost data before and after a milestone event or undermining event.

The Job Worksheet is a projection tool that allows the user to manipulate the current default data on the sheet in order to predict over/under budget for the future. The Job Worksheet is a good tool for cost to complete evaluations, projections, and "What If" scenarios.

Payroll data can be exported to Accounting, eliminating redundant data entry and streamlining the payroll process.

History of REALabor

REALabor, not originally designed for commercial use, was developed for the in-house use of a Construction Company based in Cincinnati, Ohio with subsidiaries in Louisville, Kentucky and Columbus Ohio. It was developed for the sole purpose of tracking daily labor cost and productivity in a labor-intensive industry without adding tasks to the project supervisor’s daily routine.

REALabor as it is currently named was subsequently enhanced to act as a remote data entry system for the daily recording of the craft work forces' hours and quantities. After its development and deployment it was learned how profitable it is to know this information on a REAL TIME basis. After the introduction to other Companies in the industry it was easy to see that our industry and perhaps others were ripe for such a tool.

Three years in the making, REALabor version 2.0 was introduced to the market at the A/E/C Computers for Construction Trade Show in Anaheim California on November 7, 2000.
Real Time Labor Management Software

If you want to manage your labor force on a whole new level, a REAL TIME level, manage it with REALLabor.

REALLabor is an electronic Daily Timesheet and Budget Analysis Program that allows you to track hours by employees and cost code, so you know where every dollar is going. REALLabor puts immediate daily cost and unit productivity information in your hands, in REAL TIME.

Track labor costs in a quick and easy fashion using the Daily Timesheet, and analyze budget on the Cost Sheets: Daily Cost, Week to Date, Month to Date, Job to Date, and Any Date.

Project into the future using the Job Worksheet to determine best and worst case scenarios or isolate a specific period of time to see how it affected your budget.

You can import your budget from your estimating software program, and export payroll to your accounting package, eliminating redundant data entry.
LAUNCHED STEEL GIRDER BRIDGE ERECTION

Launched Steel Girder Bridge Erection
U.S. 20 Iowa River Bridge

Sometimes the simplest bridge designs come in the most complex and innovative engineering and construction packages. Such is definitely the case with the new U.S. 20 Iowa River Bridge in Steamboat Rock, Iowa. The 1,630-foot bridge was successfully erected during the past year thanks to the design and construction team’s commitment to applying incrementally launched erection in an innovative and previously untested way.

Sited on 10 acres in the Iowa River Greenbelt, the bridge was to be constructed in the heart of an area of historic, ecological and archaeological significance. The project team embraced the challenge of building a new structure that would facilitate vehicular movement but not negatively impact the surrounding natural environment, which is a favored locale for roosting bald eagles, endangered species of freshwater mussels and outdoor enthusiasts.

Environmental sensitivity and economics were the overriding design directives provided by the client, the Iowa Department of Transportation. The project was integral to the state’s effort to expand the U.S. 20 to four lanes, but access to the valley was highly restricted. Construction equipment was prohibited from crossing or entering the river. The construction season initially was limited to an April-to-November timeframe to avoid disturbing the eagles’ roosting behavior. Existing trees set the limits for allowable construction areas. With these stringent requirements established and understood, the project team quickly rules out conventional erection methods for the Iowa River Bridge.

It should be noted that the Iowa River Bridge’s splendor, low-profile steel I-girder design is typical for long-span structures that cross narrower rivers worldwide. What sets this bridge apart is not the structure itself but rather the launched-girder erection technique, which eliminates the need for the temporary erection towers and piece-by-piece “in place” erection of structural steel required by conventional methods.

While it defies all typical erection logic, the innovative construction technique of incrementally launched erection was the only viable answer to the project’s numerous challenges. No one had ever before attempted to build a structure of this type and magnitude on the side of a valley and then literally push it 1,500 feet across the same environmentally protected valley. However, the team knew that conventional erection techniques would have required tremendous temporary modifications to the environmentally sensitive construction site.

The incremental launching technique has been successfully applied for years for erection of more torsionally stable concrete box structures in Europe. It also has been used for a smaller steel box girder railroad bridge in the United States. But it had never before been employed for the launching of a long span I-girder bridge made up of nearly 10 million pounds of structural steel. The project innovation comes in taking a sound concept, adapting it for the new conditions and applying it in a previously unproven way.

Steel assembly for the $21 million bridge began in June 2001. The launch of each of the bridge’s ten 302-foot spans began after the contractor completed steel erection in a specially excavated 15-foot-deep, 600-foot-long launching pit behind the bridge’s east abutment. A temporary launching nose, weighing more than 150,000 pounds, was attached to the front of the first span, and large hydraulic rams pushed the structural steel into place on a system of guided roller bearings. The entire steel bridge deck system, including all diaphragms, lateral bracing and drain pipes, was launched downhill along a .64-percent grade at a pace of approximately one foot per minute. The bridge’s deck concrete was completed in the spring of 2002.

The client and the community have recognized the project as a tremendous success. The client and project team’s insight, commitment and willingness to take a risk have provided central Iowa commuters with a more direct route, with little to no impact on the natural resources they enjoy. And the bridge’s innovative, but now proven, erection techniques are blazing paths for new projects that have followed. Currently a steel I-girder bridge in West Virginia is approaching readiness for its first launch, while another in Ohio is under design and scheduled for launching in 2005.
Launched Steel Girder Bridge Erection
U.S. 20 Iowa River Bridge

Sections of the bridge superstructure were assembled in a 15-foot-deep 500-foot-long launching pit outside the river valley and pushed incrementally across the bridge piers.

“From an engineering standpoint, this project was not just a structural challenge, it required innovative aesthetic, geotechnical, hydraulic and environmental solutions as well.”
-- Dave Rogowiski
HNTB Project Manager and Project Engineer

“This bridge is certainly not business as usual.”
-- Bill Vyncke
IA DOT District 1
Construction Engineer

“A temporary "launching nose" guided span placement and reduced deflection of the 300-foot cantilever.

“With the Iowa River Bridge, we pushed the limits of conventional construction techniques. We also provided the client and community with a bridge that was aesthetically pleasing, cost-effective and could be constructed without compromising the surrounding environment.”
-- Mike Linkovitz
HNTB Resident Construction Engineer
Ultra-High Performance Concrete with Ductility

THE WORLD’S FIRST LONG-SPAN ROOF CONSTRUCTED IN DUCTAL®

THE INNOVATION
In 2001, a clinker silo in Joppa, Illinois became the first building in the world to have a long-span roof constructed with Ductal®. Ductal is a revolutionary, ultra-high performance concrete (UHPC) material that provides a unique combination of ductility, strength, durability, and aesthetic flexibility - with compressive strengths up to 32,000 psi (220 MPa) and flexural strengths of up to 7,200 psi (50 MPa).

The project, estimated at $34M (US), was an upgrade to a cement manufacturing facility. Ductal was used to construct one of three clinker silo roofs while at the same time a conventional steel solution was used on the other two. The steel and Ductal options were each designed by the engineers and tendered competitively. The Ductal roof consists of 24 precast, pie-shaped panels with a 1/2" (12.7 mm) skin thickness for the 58' (18 m) diameter silo. The panels were designed to act as a thin ribbed plate, supporting a two story mechanical penthouse, centered at the top of the cone shaped roof.

INNOVATIVE FEATURES:
- Ductal’s unique combination of superior properties enabled the designer to create thinner sections and longer spans for a tall structure that is lighter, more graceful and innovative in geometry and form.
- This is the first known use of UHPC used in a long-span roof system.
- The ultra light, thin, precast panels did not use any reinforcing bars.
- It took just 11 days to install the Ductal roof, vs. 35 days for the steel roof.
- The Ductal roof panels were more accommodating to the construction tolerances for out-of-roundness and flatness of the top of the slip-formed silo walls.
- The lightweight system did not impact the foundation design.
- Improved site safety: there were fewer personnel climbing over the structure during installation, thereby reducing potential for fall accidents and fewer protruding obstacles such as rebar or steel elements which could cause tripping.
- Reduction in non-renewable resources: due to a reduction in the total quantity of materials consumed and the use of recycled materials in Ductal (such as Silica Fume).
- The Ductal roof is air and water-tight, thereby resulting in reduced environmental impact and reduced maintenance: due to Ductal’s low permeability and improved durability, and the elimination of a waterproofing membrane.
- Due to the lightweight design, the precast roof panels were easily transported (approx. 1200 miles), in loads of 8/truck.
- The ductile behavior of this material is a first for concrete. It has the capacity to deform and support flexural and tensile loads, even after initial cracking.

DUCTAL VS. STEEL
Upon completion, the comparative study proved that the new Ductal solution was the best alternative. The innovative details and advantages reported above provide a strong case in support of this fact.

THE EVOLUTION OF DUCTAL
Three innovative companies, Lafarge SA, Bouygues SA and Rhodia SA, with combined expertise in building materials, construction methods and chemicals, formed a collaboration with the objective of creating a new material with a combination of strength, ductility, durability and aesthetic flexibility. In 1997, 1998 and 2000, several patents were taken, covering a series of inventions in the area of UHPC’s, all under the trademark, “Ductal®”. In 2000, Lafarge North America Inc. entered a license agreement with the partnership and a team was formed, dedicated to the production, marketing and selling of Ductal. To date, Ductal has been used for a number of innovative solutions including projects such as: acoustic sound panels, seawall and bridge anchor plates and beams for a power plant cooling tower.

DUCTAL PROJECTS: PAST, PRESENT AND FUTURE
To date, Ductal has been used for a number of innovative solutions including projects such as: acoustic sound panels, seawall and bridge anchor plates and beams for a power plant cooling tower. In Seoul, Korea, a pedestrian bridge named “The Footbridge of Peace”, has a 425' (130 m) arch constructed entirely with Ductal. Considered a building feat, the bridge has no middle supports and a platform thickness of just 1¾" (3 cm)!

In North America, Ductal products are supplied by Lafarge and custom formulated for each new application or project. Currently the team is focusing efforts on priority target markets with a medium to long-term strategy geared towards applications such as structural wall panels, leave-in-place forms, poles/piles, seismic elements and bridges.
Ultra-High Performance Concrete with Ductility
THE WORLD’S FIRST LONG-SPAN ROOF CONSTRUCTED IN DUCTAL®
Phillip Merrill Environmental Center – Holistic “Green” Office Building

The Chesapeake Bay Foundation (CBF) is the largest conservation organization dedicated to saving the Chesapeake Bay. Their motto, “Save the Bay” defines their mission and commitment. Founded in 1967, the non-profit organization has 110,000 active members and over 180 full-time employees. It is run on an annual budget of $15 million, which is raised almost entirely through private donations. When the decision was made to build a new headquarters in Bay Ridge, Annapolis, Maryland, the foundation stuck to practicing what they preach. Their goal was to make the office a standard for environmental friendliness and energy efficiency, according to William C. Baker, the foundation’s president. The center was completed in December 2000 and designed by the SmithGroup of Washington D.C. The Clark Construction Group, Inc. served as the general contractor.

Numerous innovations were incorporated into the building design in order to achieve a model holistic “green” building. The design was an obvious success and was awarded the first ever “platinum” rating from the U.S. Green Building Council and its Leadership in Energy and Environmental Design (LEED) initiative. LEEDs certified buildings are rated based on five criteria: materials, energy, water, indoor air quality, and site issues. Many consider the Phillip Merrill Center to be one of the world’s “greenest” buildings and clean-building experts have deemed it the world’s most energy efficient and environmentally friendly building. The project has received numerous other awards including Best New Construction from the AGC Washington Contractor’s Award competition. Many groups including ASCE and John Hopkins Greening Committee have toured the site as an example of the benefits of using “green” concepts in building design. In addition, it has been featured in a number of prominent articles, including Civil Engineering in March 2001, Time magazine in August 2002, the Detroit News in May 2002, and National Geographic in September 2002.

The 32,000 square foot building is located on 31 acres of Chesapeake Bay shoreline. The building houses staff offices and an education and training center. The foundation spent an extra $1.5 million on its $6.3 million headquarters to make it green, but estimates it will recover these costs in energy and water savings over the next 10 years. It uses 2/3 of the energy and 1/10 of the water consumption of a comparably sized office building.

Features of the building include composting toilets. The toilets empty into composting vats. After staff members take care of business they throw a cursory handful of mulch down the hatch to speed up the decomposition process. Microbes and bacteria take care of the rest, and the waste is eventually turned into compost. It will be 2004 before they have the first batch of compost. This system is estimated to save $29,000 a year on water and sewage bills and does not send any solid waste to the sewage treatment system. A majority of the materials used were produced and shipped less than 300 miles to the site. In addition, many materials were reused or recycled, such as concrete taken from the foundation of the old Bay Ridge Inn which previously occupied the CBF site and old pickle barrel’s used to hold storm water runoff which is then used for non-drinking needs within the building and fire prevention. The center uses less than 100 gallons of water per day and only 60 gallons of wastewater per day is released to the public sewage treatment plant. Ceiling tiles made from recycled paper, “green” certified plywood, and galvanized steel siding and roofing were used. The steel siding and roofing help keep the building cool by reflecting heat away. Photovoltaic cells contribute to the electric energy for the building. CBF spent an extra $100,000 to use a geothermal heating and cooling system with an expected five years or less payback. A shading system is used to reduce air conditioning usage. The building ground’s are low maintenance and take advantage of natural flora. The Phillip Merrill Environmental Center is a glimpse into future building trends and the need for “greener” building design.
Phillip Merrill Environmental Center – Holistic “Green” Office Building

Figure 1. Front view of Phillip Merrill Center.

Figure 2. Photovoltaic cells on outside of structure.

Figure 3. Geothermal heating system.

Figure 4. Rainwater collected and used in rest rooms.

Figure 5. Pickle barrel cistern used to collect rain runoff and recycle.

Figure 6. Ed Wintermute shows off the workings of the composting sewage system at Chesapeake Bay Foundation's Phillip Merrill Environmental Center. (photo Bill Clark / Scripps Howard News Service)
Turner Knowledge Network

Turner Construction is transforming the way we work within the construction industry. Through Turner Knowledge Network (TKN) and Turner University, a blend of online learning and knowledge management, Turner is creating a smarter and more conscientious workforce – both internally and with its Channel Partners (owners, architects and subcontractors.) The results of this innovative web based solution include faster, more consistent employee growth and development; enhanced recruiting, retention and development; increased safety awareness on-the-job; cost savings, and increased value to customers.

As construction projects become more complex and risks to clients increase, having the most highly qualified staff and subcontractors becomes imperative. To meet this demand, Turner turned to technology to provide its staff and contractors with information and training to enhance individual goals and job performance at a faster pace. In April 2002, Turner created Turner Knowledge Network and began to deliver knowledge and learning quickly and consistently through an organization of over 4,700 employees across 41 business units in 27 states on 1600 projects and to over 25,000 subcontractors representing over 250,000 trade and craftsmen. This technology allows for “just in time” training.

Turner Knowledge Network is a web-based portal that houses both a Document and a Learning Management System (LMS) that is helping to transfer knowledge and best practices throughout the enterprise. The portal also provides links to up-to-date company and industry news, the weather as well as HR, Benefits and other useful links. It is the “go-to” place for information and learning.

Employees use the LMS to register for both web-based and instructor-led learning appropriate for their position/role. They can track skill requirements, analyze gaps in skills and proficiencies and register for learning that address these knowledge gaps in areas such as Leadership, Management and Technical skills. Some examples of web-based courses offered through Turner University include: OSHA 30-Hour Certification, Prolog (Project Management and Collaboration Software), Mechanical, Electrical and Plumbing, Career Counseling, How to Read a Financial Statement, Business Skills and PC Skills as well as the Turner philosophy on ethics, values and customer service.

Employees use the Document Management System to access documents and forms needed in every step of the construction process, as well as accessing related sites. The information housed in the Document Management System represents 100 years of Turner experience, knowledge and “know-how.” By providing access to best practices, Turner is improving efficiency by leveraging lessons learned. Turner can also use information provided in these systems to help assimilate new hires from all over the country from diverse backgrounds and cultures into the company’s common goals and objectives.

Over the past 6 months, 1000 subcontractors have logged onto TKN and half have register for courses with OSHA being the most utilized course. Internally, Turner employees have registered for over 5,000 courses, with 750 employees taking the OSHA 30-Hour Certification Course (saving time away from the job and travel costs.) Since April of this year, Turner has saved an additional $70,000 in online PC skills training. Building the Turner Knowledge Network and Turner University is helping to distinguish Turner as a world-class employer and builder of choice within the construction industry. Links to TKN will also be found on web sites such as McGraw-Hill, AGC, ASCE and others which reaches a construction audience over a half million.

Turner envisions TKN to be the driving force to pull entire project teams members (Turner staff, owners, architects and subcontractors) into one central location for project collaboration and information sharing and learning. TKN reinforces Turner’s commitment to developing its people and to improving the construction industry.
Turner Knowledge Network
Lonworks Device Controls Technology Platform

LonWorks is a control network technology platform that was developed by Echelon Corporation. It is an open, non-proprietary technology that any vendor may incorporate into their products. LonTalk, the communications protocol used in LonWorks networks, has been adopted as a standard by ANSI (ANSI 709.1). The entire protocol is embedded into a computer chip called the neuron chip. It's easy for vendors to develop compatible products because all products that use the neuron chip are using the exact same implementation of the LonTalk protocol.

LonWorks devices are intelligent. The neuron chip provides computing power of an Apple II computer. Because the devices are intelligent, LonWorks control networks do not need computers or master control panels to operate, and the devices communicate with each other peer-to-peer without any master communications panels or gateways. Thus LonWorks control networks have a flat, non-hierarchical architecture and no single point of failure.

The greatest change from traditional control networks is this: LonWorks based control networks integrate all of a building's subsystems such as HVAC, Lighting, Card Access, and Power Monitoring on a single control network. This yields substantial savings in installation costs because only one network cabling and conduit system needs to be installed. It also means that one contractor is responsible for the design, installation and commissioning of the network that includes all of those subsystems. This is a major paradigm shift from the traditional design & installation process where the HVAC control system is the responsibility of the mechanical contractor and the lighting, card access, security etc. systems are the responsibility of the electrical contractor.

It is an open technology that has been incorporated into devices by many of the major construction industry vendors, including Belimo, Fugi Electric, General Electric, Honeywell, Hubbell, Johnson Controls, Philips Lighting, Siemens Building Technologies, Square D, Trane, the Wattstopper, and many others. Cisco Systems collaborated with Echelon to develop a standard architecture to connect LonWorks networks to the Internet.

It is an international standard that has been utilized in major construction projects in the United States, Europe, and Asia, including the 54,000-seat Pusan Asiad Main Stadium, located in Pusan, Korea; Enel's 47 million home remote electric meter reading project; and the new eastern region headquarters for the Federal Aviation Administration, located adjacent to Kennedy Airport in Queens, New York.

NEURON CHIPS

In order to achieve economical and standardized deployment, Echelon designed the Neuron Chip. The Neuron name was chosen to point out the similarities between proper network control implementation and the human brain. There is no central point of control in the brain. Millions of neurons are networked together, each providing information to others through numerous paths. Each neuron is typically dedicated to a particular function, but loss of any one does not necessarily affect the overall performance of the network.
Lonworks Device Controls Technology Platform

To the developer and the integrator, the beauty of the Neuron Chip lies in its completeness. The built-in communication protocol and processors removes the need for any development or programming in these areas. To refer back to the ISO/OSI reference model of a communication protocol, the Neuron Chip provides the first 6 layers. Only the application layer programming and configuration needs to be provided. This standardizes implementation and makes development and configuration relatively easy.

Most LonWorks devices take advantage of the functions of the Neuron Chip and use it as the control processor. The Neuron Chip is a semiconductor device specifically designed for providing intelligence and networking capabilities to low-cost control devices. The Neuron Chip includes three processors that provide both communication and application processing capabilities. The device manufacturer provides application code to run on the Neuron Chip and I/O devices to be connected to the Neuron Chip. Echelon Corporation designed the original Neuron Chip, and successor members of the family now designed and manufactured by Echelon’s manufacturing partners. Cypress Semiconductor and Toshiba are all current producers of Neuron Chips. Multiple suppliers create a competitive environment for the Neuron Chips, provide reliable sources for the chips, and help drive prices down.

The Neuron Chip is a system-on-a-chip with multiple processors, read-write and read-only memory (RAM and ROM), and communication and I/O subsystems. The read-only memory contains an operating system, the LonWorks protocol, and an I/O function library. The chip has non-volatile memory for configuration data and for the application program, both of which are downloaded over the LonWorks network. At the time of manufacture, each Neuron Chip is given a permanent unique-in-all-the-world 48-bit code, called the Neuron ID. A large family of Neuron Chips is available with differing speeds, memory type and capacity, and interfaces. Approximately 24 million Neuron Chips had been shipped as of mid 2002.

A complete operating system including an implementation of the LonWorks protocol, called Neuron Chip Firmware, is contained in ROM on, or attached to, every Neuron Chip. Most LonWorks devices include a Neuron Chip, which has an identical, embedded implementation of the LonWorks protocol. This approach eliminates the “99% compatibility” problem and assures that connecting LonWorks devices together on the same network requires little or no additional hardware. The Neuron Chip is actually three, 8-bit inline processors in one. Two execute the LonWorks protocol; the third is for the device's application. The chip is, therefore, both a network communications processor and an application processor, significantly reducing the implementation cost for most LonWorks devices.
FIBER-OPTIC LASER TECHNOLOGY FOR DECONTAMINATING METALS

The laser, once a laboratory curiosity, has emerged as a powerful industrial tool. Millions of lasers have found their way into the marketplace ... from the supermarket register to the home stereo system. As larger, more powerful, laser systems have become available, a variety of industrial uses from cutting to welding have become commonplace. The ability to deliver energy remotely, precisely, and under computer control makes lasers the systems of choice for many industrial jobs.

In 1989 the U.S. Department of Energy identified, as a key mission, the remediation of facilities that were used for the production and use of special nuclear materials. Many of these facilities need to be decontaminated prior to decommissioning and contain many millions of pounds of valuable metals that could be recovered for industrial use. In the majority of instances, the contamination is restricted to a small layer close to the surface of the material and if that layer can be selectively removed from the bulk of the material, the vast majority of the metal would be potentially recyclable. However, traditional methods of surface cleaning (e.g., steel wool and soap solutions) are time and labor intensive and can require the use of liquids that become contaminated themselves, requiring special disposal. As a result of these problems most of these metals are not treated, are classified as radioactive wastes, and are buried in landfills. This depletes both landfill space and metal resources.

In 1990 a research team at the Ames Laboratory began work to test whether lasers could be used to selectively remove the surfaces of contaminated metals so that treated metals could be released for unrestricted use. By 1992 a test on a contaminated section of aluminum duct had demonstrated success. The treated material met all conditions for unrestricted release set by the Department of Energy. Virtually no secondary waste was generated during cleaning and the computer controlled laser permitted the operator to work far from the workpiece to prevent radiation exposure.

The Fiber-Optic Laser Technology for Decontaminating Metals was developed in 1995 as a result of a collaboration between the Ames Laboratory laser decontamination team and the Idaho National Environmental and Engineering Laboratory (INEEL). It improved upon the method developed in Ames by introducing a fiber optic delivery system that permits laser energy to be efficiently ported to remote locations where it can be used for surface cleaning.

INEEL has many materials that are highly radioactive and require isolation in glove boxes and hot cells. Porting laser energy from an industrial laser to materials within such environments posed several problems. The laser originally selected in Ames for decontamination work, an excimer laser operating in the ultraviolet portion of the optical spectrum, was incompatible with fibers that work best in the visible or near infrared portions of the spectrum. Conventional near infrared lasers had very short pulse lengths and repeatedly caused damage to fibers that could not be tolerated in an industrial system that needed to be reliable and rugged.

The solution was provided by an acousto-optic Q-switched laser that operates in a compatible part of the optical spectrum and has pulse widths sufficiently broad to preclude fiber damage. The surface cleaning efficiency obtained with this laser exceeded that demonstrated with any other laser system tested in Ames. Most importantly, the laser delivery fiber, optics head, and collection cell could be flexibly deployed using robotics end-effectors at remote locations. This system was patented in 1998 and was licensed to ZawTech International in that year.

The application of lasers to radioactive decontamination is only one of many that can be envisaged for this system. A focused laser beam that is sufficiently powerful to ablate microns from a stainless steel surface will destroy hazardous chemical or biological contamination on surfaces. The ability to conveniently direct that energy by fiber optics means that the cleaning operation can be conducted safely.
FIBER-OPTIC LASER TECHNOLOGY FOR DECONTAMINATING METALS

The first demonstration of success in metal decontamination via laser cleaning was accomplished by showing how contaminated aluminum ductwork could be cleaned via excimer laser treatment. The key thing to note in the graph below is that useful decontamination could be accomplished at up to 2 m²/hour. This answers the common question of how lasers, focused to small areas, can perform useful work on a “macroscopic” scale.

![Graph showing decontamination factor vs. material transport speed]

Fig. 1 Decontamination of aluminum ductwork using excimer laser

Results above were obtained by averaging the percentage alpha and beta decontamination achieved at five different material transport speeds. Percentage decontamination factor equals 100 for perfect decontamination.

The fiber-optic laser system was tested against chemical decontamination methods on stainless steel coupons with simulated radioactive contamination (cesium (Cs) & Zirconium (Zr)). Results show that the laser, which produces little secondary waste, outperformed chemical cleaning. In lab tests the fiber-optic laser system outperformed the excimer laser system in speed and effectiveness.

<table>
<thead>
<tr>
<th>Cleaning Agent</th>
<th>Cs-D₁</th>
<th>Zr-D₁</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber-optic laser</td>
<td>&gt;1000</td>
<td>20.6</td>
</tr>
<tr>
<td>Turco 4502</td>
<td>5.5</td>
<td>(0)</td>
</tr>
<tr>
<td>Nitric Permanganate</td>
<td>2.8</td>
<td>1.1</td>
</tr>
<tr>
<td>Organic acids</td>
<td>3.1</td>
<td>1.6</td>
</tr>
<tr>
<td>Nitric/Oxalic</td>
<td>4.5</td>
<td>1.3</td>
</tr>
<tr>
<td>TUCS</td>
<td>4.8</td>
<td>3.3</td>
</tr>
<tr>
<td>Nitric (800 ppm HF)</td>
<td>6.1</td>
<td>13.8</td>
</tr>
<tr>
<td>Fluroboric acid</td>
<td>12.6</td>
<td>37.2</td>
</tr>
</tbody>
</table>

The decontamination factor (D₁) is computed by dividing the original concentration of the chemical on the surface of the coupon by the amount remaining. For example, a D₁ of 15 is equivalent to removing 93.2% of a contaminant.
ECO-Block™ Insulating Concrete Forms

Insulating Concrete Forms (ICFs) are one of the fastest growing sectors in the North American construction industry. It is estimated that in 1998, twenty thousand residential homes were constructed using ICF exterior walls. It is estimated that 100,000 homes will be built using ICFs by 2003. These forms consist of hollow blocks or panels made of plastic foam that construction crews stack into the shape of exterior walls. Reinforcing steel is added and then concrete is poured between the foam forms. The forms remain in place permanently providing a strong and energy-efficient structure. Nearly every major code organization in the United States and Canada has accepted this construction technique.

ECO-Block forms utilize leading ICF technology as a result of the company’s research and development. Their research and development is dedicated to continuous improvement. ECO-Block forms are modular blocks made of expanded polystyrene (EPS) and can be used to build concrete walls, floors, ceilings, and tilt-up construction. Sidewalls made of expanded polystyrene allow builders to pour concrete in extreme weather conditions of heat or cold. EPS provides an insulated environment in which the concrete “wet cures” allowing the concrete to reach maximum strength. ECO-Block is superior to earlier ICF systems because it is cost competitive. Reduced EPS mold and manufacturing costs are passed on to customers. ECO-Block provides superior strength during the crucial period of the concrete pour. It is more versatile because the same side panels are used for concrete walls on any thickness from 4” to 24.” It is also easier to transport. Components allow assembly on site with almost no dead air space during shipping.

ECO-Block was named a Top 100 Product Pick by Building Products magazine in May 2000. It has been featured on the Discovery channel’s “Gimme Shelter” program. In addition, ECO-Block is a member of the U.S. Green Building Council. ECO-Block has numerous distributors including Home Depot. The Massachusetts State Highway Department has called for the use of ECO-Block on its “Areaways” network of municipal tunnels rehabilitation project in Boston.

The advantages of using ECO-Block ICFs are:

- **Environmentally friendly** – reduces the use of wood products
- **Energy efficient** – provides excellent insulation and reduces heating/cooling costs typically as much as 50%
- **Sound suppressing** – interior rooms are effectively shielded from street noises
- **Quick construction** – a four person crew can finish one house in 2-3 days
- **Extremely strong** – walls are “cast-in-place” monolithic, reinforced concrete
- **Versatility** – any standard interior or exterior can be applied

A study commissioned by the Portland Cement Association concluded that homes built with ICF exterior walls require an estimated 44% less energy to heat and 32% less energy to cool than comparable wood-frame houses. The combined performance of the R-Value of the expanded polystyrene, the stabilizing effects of the thermal mass of concrete and the reduced air infiltration gives ICF walls up to R-50 insulation.

ECO-Block is a proven product that has gained widespread acceptance by residential and commercial builders alike.
ECO-Block™ Insulating Concrete Forms

Figure 1. This picture displays the versatility and flexibility of the ECO-Block ICF building system. All three sizes are shown: 4 inch (102 mm), 6 inch (152 mm), and 8 inch (203 mm). On left is the standard side panel; on right is the standard side panel with connectors attached.

Figure 2. The blocks are stacked together to demonstrate placement of re-bar.

Figure 3. ECO-Block line of products.
U-Tier® Automatic Rebar Tying Machine

The U-Tier Automatic Rebar Tying Machine was introduced in 1998 and is fast becoming a workingman’s best friend. U-Tier is uniquely designed to replace the manual and backbreaking process of tying rebar. U-Tier saves contractors both time and money and is the first product of this type.

U-Tier holds the crossed reinforcing bars, feeds the tie wire, winds, cuts, and ties in one action. The result is a strong, single strand, double wrap tie. It is the only machine available in the world to tie 1 mm (18 gauge) diameter wire. Each tie is a double strand tie, which is completed in 1.6 seconds. U-Tier decreases wasted wire and is the most economical machine in the marketplace. The suggested retail price of the U-Tier machine is approximately $1,800. U-Tier can be used in numerous applications including highways, roads and bridges, concrete slabs, precast/prestressed, electrical vaults, foundations, cages, and manholes.

The machine runs on a 12V Nickel-Cadmium battery and can perform up to 450 ties between recharges. The machine is lightweight weighing between 6-7 pounds. U-Tier machines require purchasing wire from U-Tier. The wire is sold by the case and there are 40 spools in each case. Each spool will produce 120 to 200 ties so a case of wire will tie a minimum of 4800-8000 ties. U-Wire retails for approximately $120/case. The cost per tie varies between 1.5 cents to 2.5 cents per tie.

Advantages of U-Tier include saving time through productivity improvements, reduction of on the job injuries, consistent results, and reduction of material costs by decreasing wire consumption. U-Tier is an innovative, state of the art machine that is changing the way reinforcing steel is tied and vastly improving the ergonomics of the task.
U-Tier® Automatic Rebar Tying Machine

Figure 1. U-Tier VUT Model

Figure 2. Demo of U-Tier being used.

Figure 3. U-Tier HUT Model

Figure 4. Photo of tied joint.

Figure 5. Schematic of joint tied with U-Tier
Close-Range Photogrammetric Measurement for Structural Analysis

Dimensional surveys of structural features are generally required to document existing conditions for engineering analysis and planning. Traditionally, survey crews obtain measurements using conventional equipment and methods, which involve physically placing measurement devices on every key feature. For a recent bridge renovation project, James W. Sewall Company was contracted to conduct a dimensional inspection survey for a cable suspension bridge while minimizing traffic interruption on a major state route. Safety was also a critical issue - traditional methodology dictated that a person climb upon each of the four suspension cables to the two bridge towers. Sewall utilized digital close-range photogrammetry to measure structural features with high accuracy, increased safety, and minimal impact on traffic flow.

**Origin:** Photogrammetric techniques, measuring objects from photographs, have been utilized since the late 1800s. These methods are most commonly used for mapping large areas from aerial photographs. Close-range photogrammetry is a technique for accurately measuring objects directly from photographs or digital images captured with a camera at close range. Multiple, overlapping images taken from different perspectives, produces measurements that can be used to create accurate as-built 3D models. Knowing the position of camera is not necessary because the geometry of the object is established directly from the images. Close-range photogrammetric methods have been successfully applied to projects in archaeology, architecture, automotive and aerospace engineering, and accident reconstruction.

**Innovative Use:** Working closely with the engineering firm Parsons Transportation Group, Inc., Sewall used digital close-range photogrammetric techniques to produce accurate, precise dimensional measurements of the half-mile-long Waldo-Hancock cable suspension bridge between Prospect and Verona, Maine. Sewall acquired digital images of the bridge from a helicopter using Kodak DCS660 and Imetric digital cameras and controlled the images utilizing real-time kinematic (RTK) GPS methods. From the photographs, Sewall provided information on the current bridge and cable geometry for structural analysis. The measurements included elevations and offsets for the cables, trusses, and piers, as well as the main tower and cable bent elevations. Measurements for critical dimensions of the bridge were measured to accuracy comparable to that of a conventional survey. If specified, however, accuracies exceeding 0.01 foot can be achieved through close-range photogrammetric methods.

**Benefits:** Compared to traditional surveying methods, this measurement approach was efficient and rapid, significantly reducing the time required to collect data in the field. Measurements collected in less than three days in the field would have taken 10 days in a conventional survey. Second, it was considerably safer. Sewall surveyors were able to obtain precise measurements without physically accessing each measurement point. Third, the method was non-intrusive, creating minimal impact on traffic flow. Finally, the process produced a comprehensive visual record of existing site conditions from which any identifiable features can be measured or geometrically assessed at a later date.

The same process can be used to obtain dimensional measurements efficiently on inaccessible structures such as tunnels and dams, and large or complex facilities such as refineries or water treatment plants. Close-range photogrammetric measurements can be integrated with 3D modeling and reverse engineering processes. The acquired data is infinite and the cost savings substantial.
Close-Range Photogrammetric Measurement for Structural Analysis

Engineering plan of the Waldo-Hancock Bridge showing measurement points

Waldo-Hancock Bridge

Punch mark control station

"Most Beautiful Steel Bridge" AISC Annual Award of Merit 1931

Establishing GPS control

Monitoring temperature during measurement

Capturing imagery

Screenshot of photogrammetric measurement
PRESTRESSED CFRP REPLACES STEEL

2003 Nova Award Nomination 30

The Bridge Street Bridge Deployment Project
Southfield, Michigan

The Bridge Street Bridge Deployment Project consisted of the replacement of a failing bridge over the Rouge River in the City of Southfield, Michigan, with two parallel concrete bridges. Each bridge contains 3 spans over a 204-foot length and carries traffic in a boulevard configuration. While the first bridge constructed, Structure A, used standard AASHTO pre-cast concrete girders and steel reinforcement, the second bridge, Structure B, was constructed of precast concrete double tee beams that were reinforced, pre-stressed and post-tensioned with rods, tendons, and strands produced from carbon fiber reinforced polymer (CFRP).

CFRP products are made from very small diameter fibers of carbon, about the diameter of human hair. These long fibers are woven together and encased in epoxy. Carbon fiber reinforced polymer offers many advantages over steel when used as concrete reinforcement. CFRP is a light weight material with an improved tensile strength over steel. In addition, CFRP is corrosion resistant. This difference should allow improved longevity for the reinforcing material and the entire structure.

The quantity and extent to which carbon fiber reinforced polymer was used in place of steel in the Bridge Street Bridge Deployment Project has established another benchmark for advanced composite technology in a civil engineering application. There is no other bridge of this type anywhere in the nation, nor in the world. Internal pretensioned tendons and external post-tensioned cables were ultimately selected to be the project flexural reinforcement. The non-prestressed reinforcements in the beams and deck structure used CFRP manufactured in bent configurations, straight CFRP rods, CFRP grid reinforcements, and stainless steel reinforcing bars. To optimize bridge durability, the only metallic items embedded were stainless steel.

The bridge caught the attention of City officials when a hole through the bridge deck developed in 1992. One of the primary challenges that the City faced was that the bridge provided sole access to the Bridge Street Industrial Park, housing over fifty light industrial businesses. After exploring more than twenty potential solutions, the concept of building two parallel bridges side by side was selected as the most appropriate solution in 1994.

The cutting edge technology that made this bridge project innovative was a result of research conducted by Southfield-based Lawrence Technological University (LTU) on the complete substitution of high strength carbon fiber products in place of conventional flexural steel reinforcing bars and tendons. LTU's research was a continuation of collaborative work with the University of Windsor in Ontario, Canada. In 1996, the bridge design concept that resulted from this research was recognized by the Civil Engineering Research Foundation (CERF) with the Charles Pankow Award for Innovation. The Bridge Street project provided a timely opportunity to apply this CFRP research to full scale construction.

To assure the success of the project, a multi-task program was assembled for modeling, testing, monitoring, and acquisition of CFRP reinforcements and special services. A diverse group was formed to meet regularly as a task force to explore the possibilities and challenges of design and construction with CFRP. This group grappled with the formidable challenge of forging an overall program for the safe design of a public structure without the benefits of applicable state standards and federal codes.

The Bridge Street Bridge Deployment Project has met the immediate need to provide safe, convenient access to the Bridge Street Industrial Park. The dual bridge concept has also provided an opportunity for on-going study and comparison between the conventional steel and innovative CFRP reinforced structures. Both were constructed with a series of gages and sensors embedded within their structural elements and mounted to exterior surfaces to facilitate continuous monitoring using remote sensing technologies. The data that is collected over the next five years will be made available to researchers, federal and transportation authorities, and the National Science Foundation.

Ultimately, this project is anticipated to demonstrate that the use of carbon fiber reinforced polymer material as structural reinforcement can dramatically increase the potential service life of highway bridges thereby reducing safety hazards and maintenance costs. Promoting confidence in the use of advanced composites will make a positive contribution to many industries including but not limited to civil engineering, automotive, and aeronautics.
The Bridge Street Bridge Deployment Project
Southfield, Michigan
Michigan Construction Careers Recruitment Web Site

Why it is innovative: When surveyed, one of the top concerns of owners/users and contractors alike is the need to recruit the "brightest and best" into the construction industry. Although websites as entities are far from innovative, a website of this type is. It is innovative and enormously effective. It is the first of its kind for the construction industry in this country, and possibly the world. We utilized the technology that students today are the most comfortable with to expose them to the tremendous opportunities in the construction industry. The site answers the questions of students, counselors and teachers. It provides the information at the level that will garner the best utilization for this targeted audience. Diverse levels of students are utilizing it: high school students, graduating high school students, former college students and current college students. This site is the commitment of one organization to elevate the industry, not just themselves.

All members of the Industry in Michigan work to determine the best possible way to solicit apprentices, journey workers and office personnel. The Greater Michigan Plumbing & Mechanical Contractors Association (PMC) participates enthusiastically with the above on manuals, shows, etc. Even so, our commitment to career development led us to research and develop a more innovative way to reach today's youth and technically inclined worker. In an effort to assist not only our industry, but the total construction industry, the PMC took on the task of developing and maintaining a website that covers every segment of Michigan's organized construction industry. It lists all training schools and outlines in detail, the educational requirements, personal requirements, and the type of work involved in each particular discipline. A companion manual was also prepared and is in its 4th printing with over 12,000 copies distributed.

What it changed or replaced: When developed, it was the first website for all segments of the construction industry. There were many sites for a single trade, none for the total industry. Students attempting to analyze the industry gave up trying to interpret what made up the industry. Time has given us the opportunity to evaluate its effectiveness. The website has, for the first time, changed the way the industry is viewed by possible applicants. This innovative approach to contacting potential applicants provided a marked increase in the number and quality of applicants. An even greater benefit has been the strong interest that high school/middle school teachers, and college counselors have in the site. We continue to do school presentations, construction forums, various job fairs and statewide conferences, such as those for Parents, School Boards, Principals, Counselors, and Construction Instructors. The website has greatly impacted how those presentations are now viewed and has increased dramatically the response from the individuals involved. Military and Veteran's organizations have also become involved with the site and utilize it to help make a transition from "Helmets to Hard Hats".

This pioneering Website has provided appreciable results. Training Programs are reporting more qualified applicants from contacts with the site. One program went from previously receiving mainly applicants with GED's and high school graduates to over 60% of their last group of applicants having more than a high school education.

Replacing the traditional call for information, the site was developed so that anyone, in any part of the State of Michigan could, via the site contact any local training program for answers to questions, and/or to file their name for consideration. Each week the PMC continues to answer questions and forward inquiries from the site to training centers. Since going on-line in July of 1999, the site has received over a million and a half hits (an inquiry past the home page) enabling interested individuals the opportunity to learn more about a career in the construction industry.

Where and when originated: The site was developed at the offices of the Greater Michigan PMC in May and June of 1999 and continues to be updated and changed on a weekly basis. As the site continues to obtain national recognition through news reports and discussion at trade association levels, we are now seeing other sites of the same nature being established. Information from our site has been sent throughout the country. Innovative, effective and being emulated.
Ditch Witch® DWP Service-Line Trencher

The Machine
In the late 1940s in Perry, Oklahoma, Ed Malzahn had the idea to build a compact trenching machine that could replace the pick and shovel work involved with installing residential utility services from the alley or main line to the house. By 1949, he had successfully produced the first Ditch Witch model DWP trencher.

The DWP trencher was a simple, but very unique design patented by Ed Malzahn in 1955: It put the endless conveyor digging chain design concept used on larger ditch digging machines into a small package. Small two-piece buckets with sharp finger-like edges were mounted on a vertical chain to gouge out chunks of dirt. The buckets were attached in sequence onto an endless moving chain that carried them down a ladder type mechanism to chew out chunks of soil, then upward to dump the “spoil” in neat piles on the ground as they began the downward descent to bring up more dirt. A four-inch wide trench with a digging depth of twenty-four inches was the goal.

The operator was seated on a contoured metal seat, facing simple lever controls to raise and lower the digging device. The air-cooled seven-horsepower engine supplying power for the working end also gave the trencher mobility, transferring power through a belt drive. The trencher moved on a welded frame with four small wheels and pneumatic rubber tires, like those used on lawn tractors. It also had a ratchet drive to utilize the operator’s arm and shoulder muscle to move the trencher forward and backward.

The Innovation
The DWP trencher was the first compact service-line trencher ever developed and produced. Before its creation, utility service lines were dug by hand. This process was slow. Larger trenchers existed, but they were too expensive for plumbers and couldn’t always fit into the areas where service lines were needed. The DWP trencher’s compact size, low cost and productive trenching transformed the process of digging utility service line trenches from manual labor to an affordable, mechanized process. This made installation of running water, indoor plumbing, and other utilities affordable to the common household worldwide.

The world’s first service-line trencher, the DWP, has evolved into today’s technologically advanced Ditch Witch® brand of equipment designed for installation of all underground utilities including telephone, cable TV, and fiber optic communication cables. The success of the DWP trencher launched a new category of underground construction equipment and literally created an industry.

Significant Dates
1948 - Inspiration for the original Ditch Witch trencher occurred.
1949 - First production model DWP trencher was completed in Perry, Oklahoma.
1952 - Established first specialist dealer in Oklahoma City.
1953 - Marketing organization was created in Perry.
1958 - Incorporated as The Charles Machine Works, Inc.
1958 - First international dealership was opened in Australia.
Ditch Witch® DWP Service-Line Trencher

Ed Malzahn digs a 4-inch wide trench with the DWP trencher.

The DWP trencher is used to prepare for the installation of a water line.

The first production model DWP trencher.

The DWP assembly line in 1950.

The ASME National Historic Mechanical Engineering Landmark

Today's Ditch Witch® Trencher.
POST PROTECTOR

As Sales Manager for a Pennsylvania based "Post Frame" or "Pole" Building Company, I recognized that many consumers, architects and engineers are concerned with the life expectancy of pressure treated wooden posts below grade.

In Post Frame Construction, rather than a typical continuous foundation, 8' O.C. pressure treated posts are placed on footings 42" below grade. Each post hole is then backfilled with soil or concrete. The posts act as the foundation for these buildings and represent the muscle for the balance of the framework. Though "pressure treated" poles are utilized, the fact remains, they are wood and wood decays. Culprits such as moisture, varied soil types, insects, concrete backfill, animal waste and varied post quality to name a few.

Post Frame Construction is attractive for its speed, design flexibility and value. This construction type has come "off the farm" and now restaurants, offices, automobile showrooms, warehouses, etc. are going post frame. The only issue holding many back from using post frame is the "post life concern."

Made from a specialty virgin polyethylene which possesses characteristics perfectly suited for the application. The material has hundreds of years if geo-application life expectancy. Flexible, pliable and quite strong it is able to effectively guard against all elements that cause post decay.

A 5' length sleeve which encapsulates the post. An 1/8" wall thickness throughout and (4) raised designated lag locations - one on each face at varied heights. Post Protector Protector simply slides over the post prior to its insertion into the ground. Four 3" X V2" stainless steel lags and washers are provided. Installed, the lag head and washers torque compresses the pliable sidewall, sealing that location and joining Post Protector to the post.

Post Protector is commonly 3'6" below grade and extends 18" above the grade to the inside of the building. It acts as a post location expansion joint for your concrete floor. A series of horizontal and vertical channels allow the post to breathe and any moisture to escape. Post Protector also allows for concrete backfilling with no ill effects. Concrete against a typical treated post will promote decay long term. Post Protector welcomes concrete backfill and by doing so achieves 12,000 + lbs. of uplift protection per post.

Environmentally, Post Protector eliminates the risk of the chemical treatment CCA (Chromated Copper Arsenate) from leaching into ground water and soil.

Real Estate appraisal values can be positively affected. Appraisers do not value post frame buildings strongly because of the posts questioned integrity as the building ages. Post Protector removes that question. Many view Post Protectors as offering continuous foundation performance at a fraction of the cost.

The Post Protector concept originated 8 years ago. It has been offered as an option to its Pennsylvania building division for 3 years and debuted nationally February 2001.

Currently Post Protector is growing swiftly in the Northeast. Farmers, ranchers, equestrians and general post frame consumers are excited about the benefits. With the widespread acceptance, Post Protector should become a standard throughout the post frame world.
POST PROTECTOR

- Unsurpassed moisture and insect protection.
- Exclusive post uplift protection.
- Allows for concrete backfill without post decay.
- Environmentally safe – prevents chemical leaching from pressure-treated posts into soil or ground water.
- Building’s Real Estate appraisal value stays strong over time.
- Strong yet pliable specialty virgin material - won’t crack when the weather gets rough - unaffected by all elements that are currently decaying wooden posts.
- Simple slide-on installation.

- Continuous Post Venting System - allows the post to breathe.
- “Lifetime Post” offers the peace of mind that your investment is sound.
- Continuous Foundation Performance utilizing typical post frame construction technique.
- Patented design.
ELECTRIC MINI-EXCAVATOR

What the innovation is:
Michigan Concrete Sawing purchased one of the first electric mini-excavators in the country. This tool is similar to other mini-excavators you see on construction sites with the exception it is powered by an electric motor. The electric motor operates without creating fumes of any kind. It also is extremely quiet. The only noise it generates is the sound of the bucket as it moves through the material being excavated.

The excavator can dig to a depth of 60" and will out work a crew of 5-6 laborers.

Why is it innovative:
While excavators have gotten much smaller in recent years, this is the first tool powered by an electric motor. The construction workers who have seen this tool in operation have been amazed. One of the plumbers said, "that tool must have been invented by a plumber."

What has it changed or replaced:
This excavator is not designed to compete with larger excavators for outside work. It is designed for any job where carbon monoxide fumes would be a problem. It is ideal for excavations inside of hospitals, schools or the basements of any building. It eliminates the hazards created by use of internal combustion engines inside. Even when these tools are equipped with scrubbers they still consume a great deal of oxygen and can quickly deplete the oxygen supply.

Where and when it originated, has been used, and is expected to be used in the future:
The company we purchased this tool from imported several mini-excavators from Japan without engines. They did this with the intent of installing electric motors to power the hydraulics. Michigan Concrete Sawing and Ohio Concrete Sawing were among the first purchasers of this tool.
ELECTRIC MINI-EXCAVATOR

ELECTRIC POWERED MINI EXCAVATOR

Michigan Concrete Sawing is always looking for new ways to increase its value to customers. Recently, we purchased one of the first electric powered mini-excavators in the United States. The only difference between our electric mini-excavator and the diesel powered excavators is that our is powered with a 480 Volt electric motor. While it is not designed to compete with a larger excavator on outside work, this amazing tool is designed to make interior excavation much easier than digging by hand. If your job requires interior excavation normally be done by hand this tool will save you time and $$$. The excavator fits through a 32” doorway and can dig 5’ deep. It has over 2,000 lbs. of lifting capacity.

Many of our bigger trucks are now equipped with 480 volt, 3-phase generators. We use these generators to provide power for our electric slab saws. These electric saws have proven to be extremely valuable when we are working inside hospitals, shopping malls or areas congested with other construction workers. Our new excavator will plug into our trucks and not require any downtime waiting to be hooked up to 480 volt power.

On a recent job, we were told the excavator accomplished in one hour the same amount of work it would have taken two men a couple of days. The next time you are working inside a hospital, shopping mall or any tight area requiring excavation give Michigan Concrete a call for the excavation and the sawing if it is needed.
Ground Penetrating Radar Systems

This technology has been modified over the last few years and is now being offered as a tool to assist the construction and engineering industry with solving problems regarding the location of items in and below concrete slabs and the location of underground utilities.

Ground Penetrating Radar Systems, Inc. (GPRS), based in Sylvania, OH has been using this technology for just over one year and has helped numerous contractors and engineering firms throughout the Midwest with locating just about anything they have wanted to find on their specific job-sites. The capabilities ground penetrating radar (GPR) has to offer are being improved continuously. GPRS has recently purchased software that will take the scans from the radar survey and put them into a three-dimensional format for the customer. (See following page).

Why is GPR Innovative?

GPR is innovative because it provides a definitive explanation to questions that otherwise had no easy way of determining the answer. There are other methods of locating, but nothing that is as cost effective or as convenient as GPR. A GPR survey can be conducted in an occupied building without disturbing any residents. On large surveys, several thousand square feet can be scanned in one day.

What GPR has Changed?

X-rays have been used in the past, and are still used to a degree, for imaging structural elements within concrete slabs. The main disadvantage of using X-ray is the cost of having to pay per image. If it takes five or six pictures to find a clear area to drill, which is common, the customer would have to pay for each image. By using the radar, the antenna is simply moved along the surface until a clear area is found. This process takes no more than a few minutes. X-Rays also emit radiation; there is nothing hazardous about radar. GPR frequencies are low enough that they can be used next to sensitive equipment without any disturbance whatsoever.
GROUND PENETRATING RADAR SYSTEMS

Ground Penetrating Radar Systems

Ground Penetrating Radar Used at the New McNamara Terminal at Detroit Metro Airport

One of the largest construction projects in the Midwest is the new $1.2 billion, recently completed, McNamara Terminal at the Detroit Metro Airport. This terminal will serve as a hub for Northwest Airlines. For passenger convenience, a Western Hotel is being incorporated into the main terminal building.

Pace Mechanical is the mechanical contractor for the hotel, which is due to open in September of 2002. The concrete structure utilizes post-tensioned cables for reinforcing. It is critical when making the penetrations in the floor for the various mechanical systems that these cables are not cut. Pace Mechanical and Waltersworth/Aldering decided to use the new technology to locate the post-tensioned cables prior to drilling.

Should You Add This New Technology to Your Specifications?

What is Ground Penetrating Radar?

Ground Penetrating Radar is a technology developed by geophysicists to help them locate valuable natural resources, by transmitting ultra wide band radio frequencies into the ground. Geophysicists are able to detect anomalies that may represent oil, natural gas and other resources without the expense of drilling.

Archaeologists use ground penetrating radar to explore historical sites. Use of ground penetrating radar gives them the ability to excavate areas that show the greatest promise.

Ground Penetrating Radar is proving to be a valuable tool in commercial construction. This technology allows the contractor to precisely locate reinforcing, electrical conduit, water and sewer lines and voids in and below a concrete slab. The radar is much safer than x-rays and can be done in structures without disrupting the occupants.

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