PILEDRIVER

The Official Publication of The Pile Driving Contractors Association PDCA | Q3 2011 Vol. 8, No. 3

Traylor-Massman-Weeks, LLC
Inner Harbor Navigational Canal Floodwall

Project Spotlight:

- Dock Structure and Crane State Project – Caddo-Bossier Port Commission

PDCA Project of the Year: Land, Greater Than $2 Million

- NASA Taurus-II Rocket Launch Complex – Wallups Island, VA

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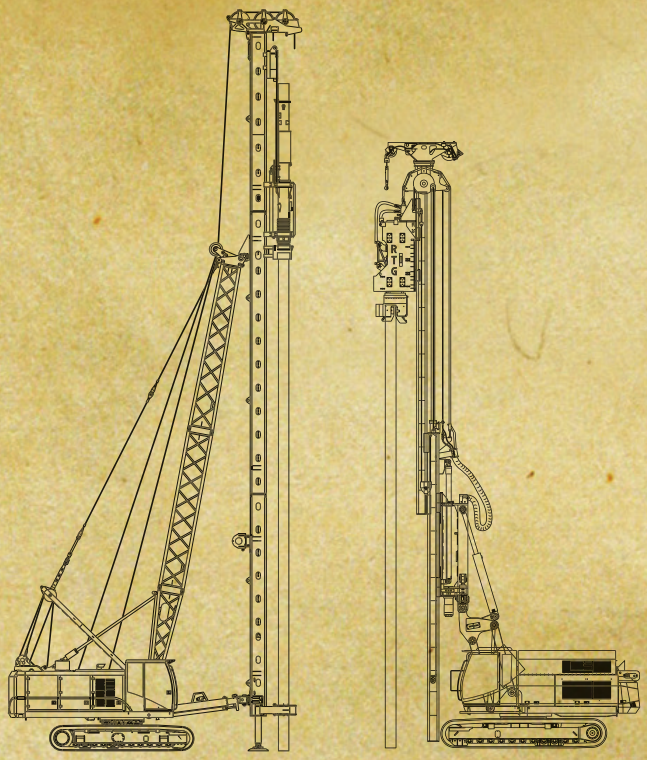

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PDPI Offers the Total Picture

By Herbert "Buck" Darling

It was my great pleasure to attend the last two and a half days of the recently completed Professor's Driven Pile Institute (PDPI) held in Logan, Utah on the campus of Utah State University June 20th through 24th. For those who do not know what this program is or the importance of it to the PDCA, I would like to take a few moments and give you my take.

The PDPI, in the 6th incarnation of its biennial existence, is put on under the watchful eyes of both Joe Caliendo of the Engineering Department at Utah State University and the PDCA. It is designed to entice 20 to 25 college-level professors to attend a five day intensive training seminar on all aspects of the driven pile. Topics range between design considerations and installation techniques to subsurface investigation and pile testing techniques. There is very little left out. At the end of the session, it is hoped that PDCA has given the professors sufficient information to at least improve (if not radically change) the syllabus of their Foundations courses, to provide a much greater emphasis on the driven pile than currently exists.

The PDPI is put on by some of the greats in our industry from our own organization. Unfortunately, naming them all would take up too much space, and because every one of them is vitally important, I would not want to run the risk of leaving someone out. It is held both in a classroom setting on campus and at a field venue a short distance from the University. In the field, we perform demonstrations of the subsurface investigation techniques of drilling with hollow stem augers using split spoon sampling, and cone penetrometer testing. At the same time, demonstrations of pile integrity testing are performed on previously driven pre-cast/pre-stressed concrete pile. The students wander from one venue to the other for the first part of the field event.

> **"The PDPI is put on by some of the greats in our industry from our own organization"**

During these demonstrations, technicians are setting up all the hardware and software necessary to perform static testing and data collection (both manual and automatic) on previously driven hollow, closed-end steel pipe pile. The static testing program involves testing one pile in axial compression and another pile laterally. Measurement methods for deflection run the gamut from low tech dial indicators mechanically measuring movement of the pile top, to the use of inclinometers, and string potentiometers for the same purpose. Load measurement was made by the use of load cells, hydraulic pressure gages, and vibrating wire strain gages. Once all the hardware and software to run them is in place, an actual static compression test and lateral load test is run and the data collected for later analysis in the classroom. This year, as if to drive home a very important lesson on complacency during load test safety, a problem with the lateral load test resulted in the catastrophic failure of the test apparatus. After the dust and test parts settled harmlessly to the ground (fortunately), nobody suffered as much as a scratch. However, the lesson learned, keeping a respectful distance from the equipment, was forever embedded in the minds of this group. The following day, a new closed-end pipe pile was installed and monitored with dynamic testing, along with performance of a pile re-tap on a previously driven pile. Once again, the data was taken back to the classroom for analysis.

After a dinner and awards banquet on Friday evening, the group said their goodbyes, exchanged contact information, and went away from this seminar with not only good information for improving their syllabi back at their respective institutions, but with new friends and contacts for collaboration on the various research efforts being undertaken at the various learning institutions.

So much for the "what is it?" Now for the "why is it important?"

With each one of these seminars we put on, another group of people responsible for the training of future engineers and potential specifiers of deep foundations is educated as to the value and versatility of the driven pile. If 25 professors go out and teach the driven pile to one class of 25 students per year, the professors who attended the very first PDPI program in 2002 have taught approximately 5,000 students over the past eight years; the 2003 class has taught approximately 4375 students. If you do the math, between 2002 and 2009, the professors have potentially taught 15,000 students. That's 15,000 people who now know more about the subject and can take that information on into their post-graduation lives. At the end of the 2011-2012 school year another 625 student could be added to this impressive number. In the nine years since the first PDPI program was presented, over 15,000 people could be out there with our information in their hands!

Another aspect of this program is the feedback we get from the students (professors). This year I was approached by many of the professors with ideas on not only how to make the program more effective, but how to get PDCA more involved in industry. One professor suggested that we tap into the National Transportation Research Board to both offer PDCA assistance in their programs and to learn and assist with what they are up to. In this manner, we would keep ourselves out at the forefront of any new proposed materials, equipment, and technology so that we can hopefully tailor them to the driven pile.

For my experience, though, the greatest thing taken away from this program was the unbridled enthusiasm of the participants. It showed up in the classroom. It showed up in the field. It showed up at the picnic at a local park. It *really* showed up at the final dinner! I have no doubt whatsoever that it will show up in their classrooms as well! This is truly the PDCA doing its finest work in the education arena. This is what we need to do to get our message out. Throughout the training, I could not help but be giddy with the realization that these people were so enthusiastic, willing to learn and to be involved in our industry. A simple question posed to the lecturer would wind up in a whole class discussion on the topic, with a group dynamic that I have not witnessed anywhere in a long time. I was pumped up! They really and truly appreciated what it is that we do in this program and I wanted to do whatever I could for these people. Toward the end of the program, there were requests from some of the participants for further interaction with PDCA by way of invited speaking engagements at their institutions and proposed research ventures. There is no doubt that our message is being heard and being put to good use. There is no doubt that we must keep this program going.

Here is where I pay for my pleasure of attending this fine educational opportunity. One of my most hated activities. You see it coming, no doubt.

The last three times this program was put on, there were funds in place with which to pay for the rooms, the meals, the venues, and all other costs without a formal fund raising program. PDCA and the generosity of the volunteers who plan and perform the lectures and demonstrations pay for everything other than the travel of the professors. These funds were mostly raised in a PDPI specific formal fundraiser last undertaken in 2007. A smaller amount was raised by virtue of an opportunity to contribute to the PDPI specifically found on your annual dues renewal form. I am happy to inform you that the funds are in place for the next PDPI in 2013. However the income for this line item in our budget is not keeping up with the outflow.

I am asking everyone to consider my experience with this year's PDPI and what it meant to the participants and the PDCA. Please also consider the importance of this program to the ability of the PDCA to work for you in ensuring that the driven pile maintains its place not only in the history books, but in the future of our construction industry and all that means to ourselves, our employees, and our businesses. PDCA will be holding a fundraising opportunity for the sole support of the PDPI in the near future. I can assure you that, dollar for dollar, there is no better place for a contribution to work harder for all that we hold dear and all we are trying to accomplish. Long live the driven pile! ▽

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How important is the PDPI program to your business, the PDCA, and the driven pile industry?

By Stevan A. Hall, Executive Director, Pile Driving Contractors Association

A couple of things come to mind that I want to convey in this message.

First, the PDCA 6th Professor's Driven Pile Institute (PDPI) was recently completed at Utah State University in Logan, UT. This very important and very successful PDCA program hosted 21 professors from various universities and colleges across the United States, who currently teach or will be teaching foundation courses to engineering students.

During the week long program, many of the professors commented on their lack of practical experience in the area of deep foundations; and all indicated the brief amount of time they have within their deep foundation course to commit to driven pile. So, how important is this program to your business, the PDCA, and the driven pile industry? The PDPI provides the professors with the tools they need to effectively teach their students about driven pile – from the practical to the theoretical, and now with the technical expertise they derived from the PDPI. Most professors have indicated that the PDPI will also allow them to spend more quality time on driven piles in their deep foundation courses by presenting "ready-made" information contained in the presentations they received at the PDPI.

> "The PDCA 12th Annual Design and Installation of Cost-Efficient Piles (DICEP) conference is fast approaching"

Since the first PDPI program, approximately 130 professors have attended the PDPI. If each professor who attended the course is still teaching 25 engineering students a year about driven pile, that's 14,700 engineering students who know more about driven pile than they would have if their professor had not attended the program. Given these numbers, you cannot help but recognize the positive impact this program has and will continue to have on our industry.

The PDCA has a PDPI "Wrap Up" article in this edition of *PileDriver* magazine that expresses our gratitude and appreciation to all of our members who have made voluntary contributions to the PDPI program over the years. Your financial support has allowed the PDCA to continue this beneficial program. Thanks for your support!

I also want to thank PDCA President, Buck Darling. Buck made the trip from Buffalo, NY to Logan, UT and spent three days observing the program, supporting and encouraging the professors, and letting them know that the PDCA appreciated their attendance and that we are ready to be a resource for them whenever needed.

Secondly, I want to remind everyone that the PDCA 12th Annual Design and Installation of Cost-Efficient Piles (DICEP) conference is fast approaching. The program will be held in Orlando, FL on Thursday, November 3, 2011, and will be a collaborative effort between the PDCA and the PDCA of Florida Chapter.

DICEP is designed for geotechnical, structural and civil engineers; contractors and other firms or individuals who support, conduct business or are associated with the deep foundations, earth retention and/or driven pile industry. The DICEP presentation content will focus on maximizing driven pile efficiency, effectiveness and economy (E^3).

Last, but not least, I want to talk about the PDCA survey sent to all of our members requesting feedback on this year's annual conference held in Savannah, GA. The PDCA wants to thank all of you who participated in the survey. Your responses provided exceptional feedback and a great overview of how you felt about the conference.

The results of the survey have been shared with the Board of Directors and an Ad Hoc Task Force Committee, Chaired by Dave Chapman, PDCA Vice President, which will be

responsible for analyzing the survey responses and incorporating changes into future conferences. Please respond to future surveys, since your feedback allows us to make changes in an effort to continually improve.

One response observed in the survey goes directly to the contractor members of the PDCA. Your participation in PDCA programs has an exponential impact on the success of all PDCA programs, especially the annual conference. Over the past several years, the PDCA annual conference has had anywhere from 50 to 65 exhibitors who support and attend the PDCA annual conference. Their primary reason for being there is you – the PDCA contractor! PDCA contractor members should be the major deputation at any PDCA event – that is why your association is called "The Piledriving **Contractors** Association". From April 25-27, 2012, the PDCA will hold its 16th Annual International Conference and Expo in Albuquerque, NM. Prior to that date, the PDCA Market Development and Education Committees will be assembling a program that will offer contractors value through highlighting numerous advances in your industry, business modeling, economics trends and more, presented by dynamic and knowledgeable speakers, recognized as leaders in their fields. The 2012 annual conference will be a contactors event and one you cannot afford to miss. So contractors, mark your calendars and show everyone that you support the association that supports you. ▼

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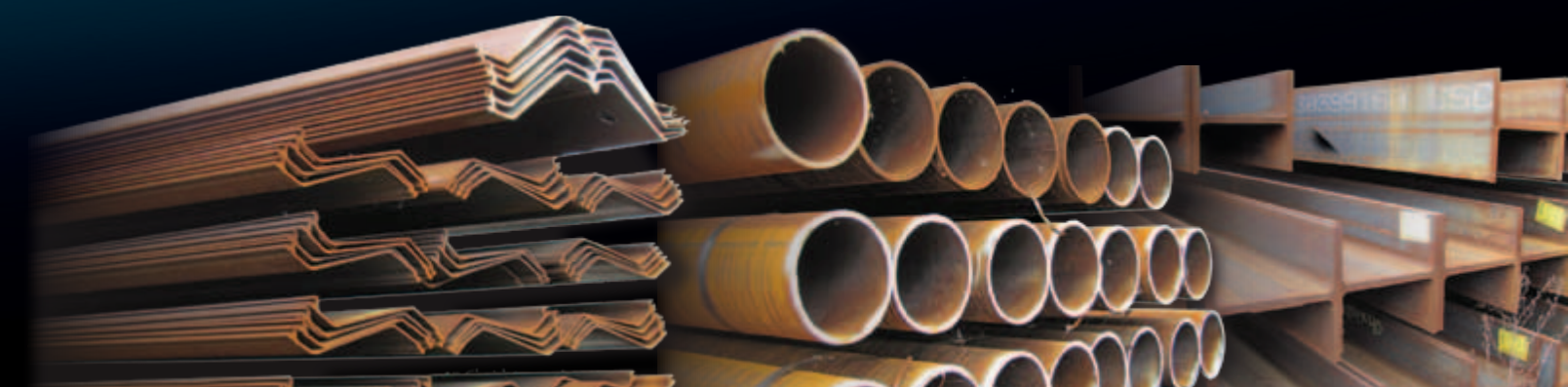

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MEMBERSHIP BENEFITS

General Membership Information

We are the premier association for pile-driving contractors

The PDCA was founded in 1995 to promote the use of driven-pile solutions in all cases where they are effective. We strive to build and maintain working relationships among end users, manufacturers, government agencies, educational institutions, engineers and others involved in the design, installation and quality control of the driven pile.

We are dedicated to advancing the driven pile

As the only organization solely dedicated to pile-driving contractors, we know that you understand the superiority of the driven pile in most applications. We are the only association addressing the intrusion of non-driven solutions that take away business from the driven-pile contractor. The PDCA understands that to survive in today's competitive marketplace, a pile-driving contractor must strive to stay abreast of the latest trends and technologies in the industry. That is why we maintain close ties with the world's leading suppliers to the industry. It's why we provide a broad range of educational programs for university professors, practicing engineers and contractors. And, it's why more and more contractors, engineers and suppliers are realizing that the PDCA significantly increases their value in the marketplace.

We are a direct link to decision makers

Major manufacturers take an active role supporting the PDCA. At our conferences, we bring together the world's leading design manufacturers and technical application experts to assist you in advancing the driven pile as a superior product.

The PDCA works closely with the technical community to format design codes and installation practices. We offer seminars throughout the country for engineers and educators on the capabilities and advantages of the driven pile. We also work with agencies, such as the Federal Highway Administration and state DOTs, which develop specifications for highway building and other infrastructure projects that use driven piles.

We offer timely, valuable services

The PDCA improves your company's bottom line, as well as your stature in the construction industry, through a variety of programs and services:

Job referrals

We are the only organization that provides contractor referrals to end users of driven piles. You tell us where you will drive piles and we will refer you to end users. We also provide referrals to our supplier and technical members.

Peer-to-peer opportunities

With more than 120 contractor members, the PDCA offers many networking opportunities. Whether at our Annual Conference, DICEP conference, our regional seminars, or by just picking up the phone, you'll develop long-lasting professional relationships and friendships in the industry.

Annual membership directory

As a member, you'll receive PDCA's annual membership directory of our contractor, supplier and technical members. Your company is listed along with the piling solutions you employ and states in which you work. This directory is provided throughout the year to construction users on a complimentary basis.

Educational conferences and meetings

The PDCA offers cutting-edge education for contractors, engineers, geotechs and anyone else interested in the driven pile and its applications at two major conferences annually. Members receive discounts on exhibit and registration fees.

- The Annual Conference, held in early Spring since 1997, is a nationally recognized conference that brings together leading contractors, technical experts and suppliers to the piling industry.
- The Design and Installation of Cost-Efficient Driven Piles Conference (DICEP), held each September since 2000, is a nationally recognized conference that brings together geotechnical and design engineers, college professors and contractors to discuss the latest trends in understanding, analyzing and controlling piling costs.

Industry development

The PDCA continually strives to expand market share for the driven pile. The PDCA sponsors the Professors' Driven Pile Institute, held at Utah State University in Logan, Utah. Up to 25 professors from major engineering schools are invited to participate in an intensive, weeklong program that presents them with the latest concepts in driven-pile design, installation and quality control. Some of the leading faculty in the deep foundation field have attended the institute to date. The program supplies the educators with the tools and knowledge to be able to teach their students about the advantages of the driven pile. It promises to have a long-term impact on market share for the driven pile.

Publications and reference materials

As a PDCA member, you will receive our quarterly publication, *PileDriver*, which presents articles on issues and trends of interest to our industry. As a member, you'll receive discounts on advertising in the magazine.

PDCA also offers the *Installation Specifications for Driven Pile-PDCA Specification 103-07* as a CD to all new members at no charge.

"Through its programs and services, PDCA has presented our company with numerous opportunities to continue our business success. It is certainly a cornerstone for growth in a very competitive business."

D.R. Jordan, President and CEO,
Jordan Pile Driving, Inc.

The PDCA also sells *Driven Pile Foundations, Volume I&II*, an FHWA manual on the design and construction of driven piles.

Connect worldwide at www.piledrivers.org

The PDCA's newly redesigned website at **www.piledrivers.org** lets you research the latest trends in the industry and find direct links to manufacturers, suppliers, engineers and others. PDCA members receive a free listing in our member search area, which is being used by an increasing number of end users to find pile driving contractors and services. Our forums area makes it easy for you to connect with others to discuss issues and problems.

Leadership opportunities

Membership in the PDCA provides opportunities for recognition and leadership. Positions are available on the PDCA board of directors and various committees that impact the industry. The PDCA recognizes noteworthy contributions to the industry with our Driven Pile Project of the Year Award, giving opportunities for high profile recognition.

Membership is available to you

There is strength in numbers and we at the PDCA need to count your company when telling government agencies, engineers and suppliers that we are interested in keeping your business viable and in growing market share for the driven pile. We need your ideas and efforts in working together toward a common goal: the use of driven-pile solutions. You can contribute your expertise and assist the Association in developing:

- A greater focus on safety.
- The quality of driven pile products.
- The formatting of codes and specifications for the driven pile.
- Support for a program to help educate students in the use of driven piles.

Join today. Be part of a growing and vibrant organization that will play a key role in the future of deep foundations. Support your industry by completing the membership application in this issue. You will immediately begin to enjoy benefits of membership. ▽

PDCA

PDCA
PILE DRIVING CONTRACTORS ASSOCIATION

Step 1: Company Information

Company Name: _____

Contact Name: _____

Address: _____

Phone: _____ Fax: _____

City / State / Zip: _____

Company Home Page: _____ E-mail: _____

Step 2: Select Membership Type

Important! Read carefully! The PDCA Bylaws define member classifications and qualifications. Dues are established by the PDCA Board of Directors and shown in ( ) for each type.

- ○ **Contractor Member** – General or Specialty contractor who commonly installs driven piles for foundations and earth retention systems.
  - ○ *Contractor I Member Company* – Annual volume > $ 2 million **($850.00)**
  - ○ *Contractor II Member Company* – Annual volume < $ 2 million **($425.00)**
- ○ **Associate Member** – Firms engaged in the manufacture and/or supply of equipment, materials, or services to the pile driving industry.
  - ○ *Associate I Member Company* – Annual volume > $ 2 million **($850.00)**
  - ○ *Associate II Member Company* – Annual volume < $ 2 million **($425.00)**
  - ○ *Local Associate Member Company* **($100.00)**
    Small Associate Company desiring membership in a single local chapter, who only serves that local market, and whose interest is to support the local chapter. Membership must be approved by PDCA Executive Committee.
- ○ **Engineering Affiliate** – Any Engineering company, firm, corporation, or individual (Structural, Geotechnical, Civil, etc) involved in the design, consulting, testing or other engineering aspect associated with driven piles, deep foundations or earth retention systems.
  - ○ *Engineering Affiliate – 1-5 offices* **($100 per office)**
    Listing up to 5 Individuals per office at no additional charge
  - ○ *Engineering Affiliate – 6-11 offices* **($90.00 per office)**
    Listing up to 5 Individuals per office at no additional charge
  - ○ *Engineering Affiliate – 12+ offices* **($80.00 per office)**
    Listing up to 5 Individuals per office at no additional charge
- ○ **Individual Member** – **($50.00)**
  An individual employed full-time by a university or college and teaching Undergraduate or Graduate courses in engineering; or an individual employed full-time by the government. This is a non-voting membership category.
- ○ **Retired Industry Member** – **($50.00)**
  Individual who has reached retirement age, left active employment, and wishes to remain a member. This is a non-voting membership category.
- ○ **Student Member** – **($20.00)**
  Full time students studying towards a bachelor, master or doctorate degree in a regular university program. This is a non-voting membership category.
- ○ **Affiliate Labor Organization Member** – **($100.00)**
  Concerned with pile driving for the purpose of gathering and sharing information. This is a non-voting membership category. Must be approved by the PDCA Executive Committee.

Perforated for easy removal.

Step 3: Member Information

(complete only the category for which you are applying)

A. Contractor Members – check all services that your company provides:

❒ Bridge Buildings
❒ Bulkheads
❒ Deep Dynamic Compaction
❒ Deep Excavation
❒ Docks and Wharves
❒ Earth Retention
❒ General Contracting
❒ Highway and Heavy Civil
❒ Marine
❒ Pile Driving
❒ Other _____

B. Associate and Engineering Affiliates Members – check all products and/or services that your company provides:

Accessories

❒ Cutter Heads and Drill Bits
❒ Dock and Marine Supplies
❒ Hammer Cushions
❒ Safety Equipment
❒ Hoses and Fittings
❒ Lubricants and Grease
❒ Pile Cushions
❒ Pile Points and Splicer's
❒ Rigging Supplies
❒ Other _____

Materials

❒ Aluminum Sheet Piles
❒ Coatings and Chemicals
❒ Concrete Piles
❒ Synthetic Material Piles
❒ Composite Piles
❒ H-Piles
❒ Steel Pipe Piles
❒ Timber Piles/Treated Lumber
❒ Steel Sheet Piles
❒ Structural Steel
❒ Other _____

Equipment

❒ Air Compressors and Pumps
❒ Cranes
❒ Drill Equipment
❒ Drive Caps and Inserts
❒ Hammers
❒ Hydraulic Power Packs
❒ Leads and Spotters
❒ Marine Equipment
❒ Specialized Rigs and Equipment

Services

❒ Consulting
❒ Design
❒ Freight Brokerage
❒ Analysis
❒ Materials Testing
❒ Geotechnical
❒ Marine Drayage
❒ Surveying
❒ Civil and Design
❒ Pile Driving Monitoring
❒ Testing
❒ Trucking
❒ Vibration Monitoring
❒ Other _____

General

❒ Rental
❒ Sales

Step 4: Geographic Areas Where Services and Products Are Available

(All applicants check all that apply)

❒ All States	❒ AK	❒ AL	❒ AR	❒ AZ	❒ CA	❒ CO	❒ CT	❒ DC
❒ DE	❒ FL	❒ GA	❒ HI	❒ IA	❒ ID	❒ IL	❒ IN	❒ KS
❒ KY	❒ LA	❒ MA	❒ MD	❒ ME	❒ MI	❒ MN	❒ MO	❒ MS
❒ MT	❒ NC	❒ ND	❒ NE	❒ NH	❒ NJ	❒ NM	❒ NV	❒ NY
❒ OH	❒ OK	❒ OR	❒ PA	❒ RI	❒ SC	❒ SD	❒ TN	❒ TX
❒ UT	❒ VA	❒ VT	❒ WA	❒ WI	❒ WV	❒ WY	❒ Canada	❒ Mexico
❒ Europe	❒ Germany	❒ Other	_____					

Step 5: Method of Payment

I am providing payment in the amount of: _____

I am making payment in full by: ❒ Check ❒ Visa ❒ MasterCard ❒ American Express

Card Number: _____ Expiration Date: _____

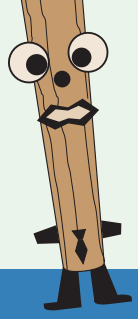
Name on Card: _____ CVV Code: _____

Statement Billing Address: _____

_____

Signature: _____

Please complete this application and mail to:
PDCA – 1857 Wells Road - Suite 215 Orange Park, Florida 32073 or Fax to: 904-215-2977



Did You Know?

1820 Use of cast iron sheet piling in England by Mr. Mathews

1904 Carnegie Steel Company begins rolling sheet piling. They also marketed Friestedt's fabricated sheet piling (1912 Catalog). Their rolled sections were a web with a large circular socket at one end and a "wedge" at the other end – not much in the way of sheet piling section, but they interlocked and functioned as a continuous wall.

1950 ZP22 & ZP27 introduced by Bethlehem and MZ22 & MZ27 by USS. The producing mills were unable "to hold" the Z22 section in the rolls and it disappeared from the market place after a year or so until reintroduced in early 80's. It is interesting that the Bethlehem Steel roll shop drawings are dated 1945 – why the delay in getting in the market place?

Compliments of Scott Whitaker

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1-800-848-6249

Section	Per Unit of Wall		
	Weight	Moment of Inertia	Section Modulus
	lbs/ft² kg/m²	in.⁴/ft cm⁴/m	in.³/ft cm³/m
PZC 37	37.1 181.2	719.6 98,270	68.5 3,680
PZC 39	39.5 192.8	762.1 104,100	72.3 3,890
PZC 41	41.8 204.1	803.6 109,700	76.1 4,090

PZC™ is a trademark of Gerdau Ameristeel

2011 New PDCA Members

The following is a list of all members who have joined the PDCA in the last quarter. The association welcomes everyone on the list!

Contractor Members

Hayward Baker, Inc.
Kevin Lewis
208 Little Santee Road
Colfax, NC 27235
Phone: 336-668-0884
Fax: 336-668-3259
www.haywardbaker.com
kclewis@haywardbaker.com

Miller Bros. Construction
Randall Zeisloft
PO Box 70
Archbold, OH 43502
USA
Phone: 419-445-8110
Fax: 419-445-8212
www.millerbrosconst.com
randyzeisloft@MBCholdings.com

Shimmick Construction Company, Inc.
Scott Laumann
8201 Edgewater Drive, Suite 202
Oakland, CA 94621
USA
Phone: 510-777-5000
Fax: 510-777-5099
www.shimmick.com
slaumann@shimmick.com

Mid-Gulf Foundations, LLC
Tom Howard
7989 Pecue Lane, Suite 5E
Baton Rouge, LA 70884
USA
Phone: 225-752-0404
Fax: 225-752-0404
thoward@midgulfllc.com

Associate Members

American Equipment & Fabricating Corp.
Joe Gelardi
100 Water Street
East Providence, RI 02914
USA
Phone: 401-438-2626
Fax: 401-437-0764
www.american-equipment.com
j.gelardi@american-equipment.com

Independence Tube Corporation
Jim O'Shea
6226 West 74th Street
Chicago, IL 60638
Phone: 708-496-0380
Fax: 708-563-1950
www.independencetube.com
joshea@independencetube.com

Parker Hannifin Corp - Hose Products Division
Angela Brown
30240 Lakeland Blvd.
Wickliffe, OH 44092
USA
Phone: 440-516-3285
www.parker.com
angela.brown@parker.com

PSL North America
K.Kaye Linkendhoger
13092 Sea Plane Road
Bay St. Louis, MS 39520
USA
Phone: 222-822-1823
Fax: 228-533-7768
www.pslna.com
klinkenhoger@pslna.com

Seaboard Steel Corporation
Phil Stanhope
3912 Goodrich Avenue
Sarasota, FL 34234
USA
Phone: 941-335-9773
Fax: 941-351-7064
www.seaboardsteel.com
phil@seaboardsteel.com

T & R Pipeline
Chris Prause
15110 Hooper Road
Houston, TX 77245
USA
Phone: 713-413-9120
www.newsteelpipe.com
cprause@trpipe.com

WHECO Corporation
Jay Shiffler
2989 Kingsgate Way
Richland, WA 99354
USA
Phone: 512-633-7413
Fax: 512-863-9779
www.wheco.com
jshiffler@wheco.com

Colfax Treating Company, LLC
Hollis Ervin
74 Wadley Street
Pineville, LA 71360
USA
Phone: 318-561-6012
Fax: 318445-9144
www.royomartin.com

Decks & Docks Lumber CO., Inc.
Beth Price
1281 Court Street
Clearwater, FL 33756
USA
Phone: 727-466-9663
Fax: 727-442-8999
www.deck-docks.com
bprice@decks-docks.com

Engineering Affiliate Members

Engineering Partners International, LLC
Chad Underwood
2310 White Oak Ct.
Hudson, WI 54016
Phone: 612-751-8648
Fax: 952-884-0491
www.engineeringpartners.net
cunderwood@engineeringpartners.net

eTrac Engineering, LLC
Greg Gibson
637 Lindaro Street, Suite 100
San Rafael, CA 94901
USA
Phone: 707-529-0327
Fax: 415-480-2032
www.etracengineering.com
greg@etracengineering.com

McManus Geotech Limited
Kevin McManus
44 Halifax Street
Nelson, New Zealand 7010
New Zealand
Phone: 64-27-201-7793
k.mcmanus@xtra.co.nz

Professional Service Industries
Jeffrey Campbell
5801 Benjamin Center Drive, Suite 112
Tampa, FL 33634
USA
Phone: 813-886-1075
Fax: 813-888-6514
www.psiusa.com
jeffrey.campbell@psiusa.com

Terra-Mechanics, Inc.
David Harrison
1339 Middle Road Ext., Suite A
Gisonia, PA 15044
Phone: 724-4496250
Fax: 724-449-6254
www.terra-mechanics.com
dave.harrison@terra-mechanics.com

Pile Driving Contractors Association

12th Annual Design and Installation of Cost-Efficient Piles The E³ Conference

The Pile Driving Contractors Association, in partnership with the PDCA of Florida Chapter will host the 12th Annual Design and Installation of Cost-Efficient Piles – The E³ Conference in Orlando, Florida on Thursday, November 3, 2011.

Maximize Driven Pile Efficiency, Effectiveness and Economy – E³!

Who Should Attend?

The DICEP conference is designed for geotechnical, structural and civil engineers; contractors and other firms or individuals who support, conduct business or are associated with the deep foundations, earth retention and/or driven pile industry.

PDH?

The PDCA is approved by the Florida Board of Professional Engineers to provide Professional Development Hours (PDH). All conference participants will be issued a certificate for 6 Professional Development Hours (PDH) for attending this conference.

Exhibitors!

All presentations and functions will be held in the same area as the exhibit hall to maximize exhibitor traffic. Exhibitor space will accommodate 6' table tops ONLY. Exhibitor fee is $400.00. Exhibitor registration includes exhibit space and full conference registration for one person. The PDCA will assign space on a first-registered and paid-in-full basis.

More Information . . .

The PDCA has more information, including a full conference brochure and registration form on the association's website, www.piledrivers.org or call the PDCA at 888-311-PDCA (7322).

Don't Miss the Premier Engineering and Contractor Focused Driven Pile Seminar – November 3, 2011

PDCA
PILE DRIVING CONTRACTORS ASSOCIATION

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6th Professors' Driven Pile Institute Completed

The Pile Driving Contractors Association completed an extremely successful 6th Professors' Driven Pile Institute (PDPI) at Utah State University in Logan, Utah from June 19 – 24, 2011. The PDCA is grateful for the very generous welcome and week-long hospitality the professors, instructors and PDCA receive from Utah State University. The PDCA wants to acknowledge H. Scott Hinton, Dean, USU College of Engineering; and Loren Anderson, Jim Bay, and Ken Jewkes for the support this program receives from these dedicated individuals year after year.

The PDCA also wants to recognize Dr. Joseph A. "Joe" Caliendo for his continued support and participation of the program. Joe has been the driving force at USU for the PDPI since the PDCA first showed up in Logan back in 2002. Joe's dedication and commitment to the PDPI is a major contributing factor in its continued success. "Thanks, Joe!"

The PDCA accepted 21 of the 27 applications for this year's PDPI program. Professor selection was based on information in the applicants' resumes, which were submitted to the PDCA earlier this year. Special consideration was given to those professors teaching graduate or undergraduate courses in deep foundations. Attending professors represented Columbia, Georgia Tech, Texas A&M, Penn State, The Citadel, Auburn, USAFA, George Mason, Oregon State, Arkansas, Wyoming, USC, Southern Illinois, Idaho, Lehigh, Connecticut, Louisiana and Utah State.

The PDCA wants to acknowledge the PDCA of the Gulf Coast Chapter who sponsored Professors Greg Smith, University of Louisiana at Monroe. The Gulf Coast Chapter contributed $1000 to the PDPI program on behalf of Professor Smith, as well as covering his travel expenses to and from the PDPI program.

Through the Professors' Driven Pile Institute, the PDCA has provided the nation's leading engineering professors with the expertise to teach over 14,700 engineering students about driven pile advantages.

Without question, this program is the standard by which all "teach the teacher" programs are judged and is the best way to ensure the continued progress and strength of our industry for the coming years.

A key component in the increased visibility and marketability of driven piles has been our liaison with academia through the PDCA's Professors' Driven Pile Institute. Almost 150 of the nation's leading engineering professors have completed this intensive and comprehensive five-day educational program that provides attending professors with actual, hands-on, real world experience into the world of driven pile. Professors are exposed to classroom presentations from recognized industry leaders, computer lab exercises and field demonstrations, including dynamic and static testing and driving a 52' closed-end steel pile. They come away from this course with the knowledge, skill, and materials to teach their engineering students about the value of driven pile.

They are also presented with information explaining the role of the PDCA in the industry and how we are advancing driven piles through technology, education, marketing, and private and public liaisons.

Build, Inc (long-time PDCA member, Bountiful, UT) has been a major supporter and contributor to the PDPI program providing both financial and logistical support since its beginning in 2002. During each PDPI, Build, Inc mobilizes their crane, leads, hammer, material, and crew to set up and drive a closed-end steel pile on-site, which adds greatly to the overall experience of the professors attending the program.

Richard J. Stromness, founder of Build, Inc, committed himself and his company to promoting driven pile. Today, Build, Inc is carrying on Richard's passion by continuing to drive pile throughout Utah and the surrounding states and as a recognized leader in the pile driving industry.

In 2007 the PDCA established the Richard J. Stromness Award of Excellence to honor Richard and the commitment Build, Inc has made to the PDPI. The award is presented to a PDPI student who displays enthusiasm, participation and excellence in attitude while attending the PDPI.

During the PDPI, the attending students are asked to nominate one student who displays these unique qualities. In 2011, the students nominated Logan Brant, Columbia University as the recipient of the Richard J. Stromness Award of Excellence. PDCA congratulates Logan, who displayed all of the qualities representative of this prestigious award.

2011 Professors' Driven Pile Institute Contributing PDCA Member Companies

(In Alphabetical Order from L to R)

In 2011, PDCA members contributed $14,090.00 to the PDPI. The PDCA would like to acknowledge those members who recognize the value of the PDPI program and made a generous contribution to help support this important program.

Contractors

Alaska Interstate Construction, LLC
Austin Bridge and Road, LP
Boh Bros. Construction Company, LLC
Coastal Bridge Company, LLC
Continental Construction Company
CS Marine Constructors, Inc.
E. C. Korneffel Company
Ed Waters and Sons Contracting Company, Inc.
F. Miller Construction, LLC
George Harms Construction Company
Glenn O. Hawbaker, Inc.
Halverson Construction Company
Herbert F. Darling
Kostmayer Construction Company
L&A Contracting Company
L. H. Bolduc Company, Inc.
Manhattan Road and Bridge
MB Western Industrial Contracting Company
P&H Construction Corporation
Parker Marine Contracting Corporation
Precast Piling Technology, inc.
R. Kremer & Son Marine Contractors, LLC
Richard Goettle, Inc.
Stroer & Graff, Inc.
Texas Gulf Construction Company, Inc.
Weeks Marine, Inc.
ASAP Installations
Marion & Moultrie Dockbuilders
American Deep Foundation & Shoring, Inc.
Blue Iron Foundation and Shoring, LLC
Cajun Deep Foundations, LLC
Commerce Construction Corporation
Corman Marine Construction, Inc.
DeWitt Construction, inc.
Easter Bridge, A Division of Sloan Construction, Inc.
Edward E. Gillen Company
Foundation Constructors, Inc.
Giken America Corporation
Gulf South Piling and Construction
Hawaiian Dredging Construction Company
Jet-Drive General Marine Contractor Company
Kuhn Construction Company
L.G. Barcus & Sons, Inc.
Lawrence Construction Company
Mason Construction
Orion Construction
Pacific Pile and Marine, L.P.
Piling, Inc.
R.E. Burns & Sons, Inc.
Richard E. Pierson Construction Company
Simpson & Brown, Inc.
Taylor Bros. Marine Construction, Inc.
Underpinning & Foundation
Skanska, Inc.
West Construction Company
Ford Pile Foundations
Signor Enterprises

Associates

American Piledriving Equipment
Bermingham Foundation Solutions
Hydraulic Power Systems
Jinnings Equipment
Mandal Pipe Company
Mississippi Valley Equipment Company
Naylor Pipe Company
Northwest Pipe Company
Pile Dynamics, Inc.
Pipe and Tube Supplies, Inc.
Robishaw Engineering, Inc.
Skyline Steel Corporation
Valiant Steel and Equipment, Inc.
DFP Foundation Products, LLC
Flagler Construction Equipment, LLC
Goble PileTest, Inc.
Whitaker Laboratory, Inc.
Bayshore Concrete Products
Gulf Coast Pre-stressed, Inc.
IHC Hydrohammer B.V.
Lally Pipe & Tube
Mississippi River Equipment Company
Monotube Pile Corporation
New England Construction Products, LLC
PACO Ventures, LLC
Pipe and Piling Supplies
Platinum Grover Int. Inc.
Roll Form Group
Trinity Products
Varsteel
Essve Tech, Inc.
Foundation Testing and Consulting, LLC
Van-Smith Concrete Company

Engineering Affiliates

CH2M Hill
Robert Miner Dynamic Testing, Inc.
California Prison Industry Authority
Haley & Aldrich, Inc.
Staytowers Group, Inc.

Special Recognition

The PDCA would like to thank all of the individuals who made presentations or contributed in some way to the success of the 6th Professors' Driven Pile Institute. The PDCA is grateful to all of these individuals, who contributed their time, energy and resources to the PDPI and ask nothing in return, but an opportunity to help the industry and the PDCA.

George Goble (Goble PileTest)	Driven Pile Design Process, Wave Mechanics, Real Time Pile Driving Measurements with PILE CHECK, Field Events
Pat Hannigan (GRL Engineers, Inc.)	Pile Types, Special Design Considerations, Pile Driving Equipment, Wave Equation Applications, GRLWEAP Computer Workshop, Dynamic Measurements, Case Method, PDA Measurements, Field Events
Aaron Budge (Minnesota State University)	Negative Skin Friction (downdrag), Field Events
Joe Caliendo (Utah State University)	Geotechnical Considerations, Driven Pile Construction Specification, Field Events
Kyle Rollins (Brigham Young)	Axial and Lateral Static Load Testing, Design Parameters from Load Testing
Garland Likins (Pile Dynamics, Inc.)	Wave Equation Modeling GRLWEAP, GRLWEAP Computer Workshop, Dynamic Measurements, Case Method, PDA Measurements, CAPWAP Background and Examples, Field Events
Billy Camp (S&ME)	Driven v. Drilled – Deep Foundations, Field Events
Jerry DiMaggio (Jerry A. DiMaggio Consulting, LLC)	LRFD Considerations for Driven Pile Design
Brian Anderson (Auburn University)	FB – PIER Computer Program, FB – PIER Computer Workshop
Van Komurka (Wagner Komurka Geotechnical Group)	Economics of Driven Pile Foundations: Soil/Pile Set-Up and Support Cost Components with Case Studies, Field Events
Loren Anderson (Utah State University)	Site Characterization, Field Events
Jim Bay (Utah State University)	Site Characterization, Field Events
Buck Darling (Herbert F. Darling)	Contractors Perspective on Driven Pile
Eric Hendriksen (Build, Inc.)	Contractors Perspective on Driven Pile

PDPI Completed

Additional Support during Field Events was provided by the following companies. The PDCA is grateful for their support and participation.

- Build, Inc. – Pile Driving and Load Test Fabrication and Set Up
- Campbell Scientific – Data Collection
- Conetec, Inc. (Salt Lake City, Ut) – Cone Penetrometer Demonstration
- Goble PileTest, Inc. – Real Time Pile Driving Measurements
- Jay Apedaile Drilling – Soil Sampling and SPT Measurements
- Pile Dynamics, Inc. – Dynamic Load Testing, PIT Testing
- S&ME – Load Testing Supervision

Special Recognition goes to Joel Komurka, whose assistance during the Field Events proved invaluable – especially to his Dad, Van.

Field Events included:

Pile Driving of closed-end pipe pile with dynamic testing and pile check, re-strike of an existing pile to check for set up, axial and lateral static load tests, pile integrity testing, SPT Energy Measurements, and CPT demonstrations. ▽

Through the Professors' Driven Pile Institute, the PDCA has provided the nation's leading engineering professors with the expertise to teach over 14,700 engineering students about driven pile advantages.

Logan Brant (Columbia University) receives Richard J. Stromness Award of Excellence. From left: Eric Hendriksen, Logan Brant (Columbia University), Joe Caliendo, Buck Darling (PDCA President).

Joe Caliendo – PDPI Award of Appreciation. From left: Buck Darling, Joe Caliendo (Award recipient), George Goble.

Umm Qasr Pier and Seawall completed.

Umm Qasr Pier & Seawall

Pile driving in a challenging location

Introduction

A ribbon-cutting ceremony attended by the Admirals of the Iraqi Navy in September 2010 was the culmination of a two-year long design-build project to create a new naval facility in one of the most turbulent regions of the globe. Overseen by the US Army Corps of Engineers, the Umm Qasr Pier and Seawall marks the first completed port project in post-war Iraq. The project team consisted of CCI, Inc., as general manager; West Construction Company as the marine contractor; and PND Engineers, Inc., as the project engineer – among many other fabricators, technicians, and participants who brought this extraordinary project to a successful conclusion.

Background

Umm Qasr is located at the southern tip of Iraq on an estuary leading to the Persian Gulf, and the only deep-draft port in the country. The new pier facilities provide berthing for patrol vessels charged with protecting offshore oil platforms and securing commercial port infrastructure.

The site provided plenty of challenges. The soils along the shoreline consisted of a high plasticity clay with low shear strength, overlying alluvial clay layers whose strength increased with depth. Under the lowest layer of clay was a dense sand layer. The 16-foot tide range in the estuary created a fluctuating current of up to two knots in either direction.

The initial concepts consisted of fixed platform piers with a concrete deck, similar to existing ones nearby. An alternative design was offered that provided the required water depth for the various vessels, yet eliminated annual maintenance dredging, though use of the OPEN CELL® system. The new design comprises two components: a bulkhead dock for deeper draft ships and a floating dock for smaller patrol boats. Following review by the Corps' Engineering Research and Development Center (ERDC), the alternative design was approved and awarded the project to the team in September 2008.

Pier 1

As the first of two components, Pier 1 consisted of a 1,500-lineal-foot bulkhead. It is intended to berth three pairs of 170-foot-long patrol ships, and provide fueling services, electrical shore power, and potable water. The pier headline is roughly 150 feet beyond the original shoreline and creates eight acres of additional waterfront territory. The bulkhead wall height varies with the highest section approximately 50 feet from top of dock to mud line.

The OPEN CELL system is a method of using driven flat sheet pile with face arcs, the straight tail wall sections which restrain the soil within the cell. Pier 1 was constructed with 45 cells, using 3,300 tons of steel, with sheets varying up to 70 feet long.

Pier 1 was built using three crews. Two crews were waterborne and began at the middle of the bulkhead, working in opposite directions, then returning towards shore. The land-based crew built cells outward from shore and met the waterborne crews midway on the flanks of Pier 1. See Figure 2.

The cells were formed using a single-stage pile template, consisting of two steel platforms, one matching the shape of the arc face and the other the straight tail wall. Templates were supported by four driven piles near the high tide line. Sheet pile with maximum length of 70 feet were driven with a vibratory hammer into to the underlying sand layer, and followed up in some instances with an impact hammer. The sheets of each new cell were first set in place, then the panels alternately driven down to grade in a staggered succession.

To accelerate the consolidation of the soft clay, over 18,500 wick drains were installed 30 feet vertically into the substrate. Afterwards, the interior of Pier 1 was filled with 450,000 cubic yards of sand fill over the course of one month using a custom-built conveyor system.

Lastly, Pier 1 was finished off with 59 fender piles with HDPE sheathing. A perimeter concrete deck was poured after utility services were placed.

Pier 2

The new floating dock was designed to provide berths for five 100-foot-long patrol boats, accessed by a gangway. The steel floats were fabricated and coated in the US, and shipped to the port of Umm Qasr in half unit modules. Once on site, the units were joined at the bolted connections, launched into the water. The 440-foot-long float is held in place by framed

Pier 2 in use.

Figure 2: OPEN CELL Seawall under construction.

18-inch diameter steel piles at 40 feet on center. The piles were driven 30 to 50 feet into the estuary mud, through the pile hoops to ensure no binding through tide cycles. Pier 2 was in service by June 2010, approximately one year after design approval. See Figure 2.

Construction Side notes

Procurement of equipment and materials was a major logistical challenge. The land-based crane was leased in the Netherlands, shipped in pieces through Kuwait, and trucked overland. Barges and hammers were leased in the UAE and towed up the Gulf to Umm Qasr. Steel sheets were supplied by L.B. Foster, Co., rolled at the Gerdau mill in Texas, shipped to the UAE, and transferred onto smaller freighters to Umm Qasr. Importing and offloading materials through Iraqi customs was no small bureaucratic hurdle.

Summer temperatures of 120° F necessitated early morning work periods to avoid the heat, gusty offshore afternoon winds, and occasional dust storms.

Security was an ever-present concern, but the project had no incidents of trouble over the course of two years. A British security company provided a mix of South Africans, Nepalese Gurkhas, and Iraqis to guard the construction camp. A contingent of US Navy officers, part of a Naval Transition Team, helped with the planning of the facilities as well as practical issues that arose during construction.

Conclusion

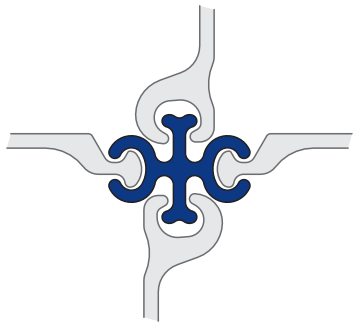
The success of the project was evidenced by the Iraqi Navy's immediate beneficial occupancy, and their consideration of a potential additional floating dock. Results would not have been possible without the determination of the project team to seek out alternative construction methods when needed. The steady support of the Corps of Engineers and their close cooperation with Commodore Muhammad Jawad, the Head of the Iraqi Navy, was invaluable to this completed project. ▼

steel wall connectors

PZ/PZC

PZ-Corner 50°-175°

PZ-Cross



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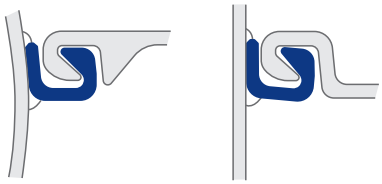

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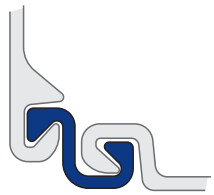

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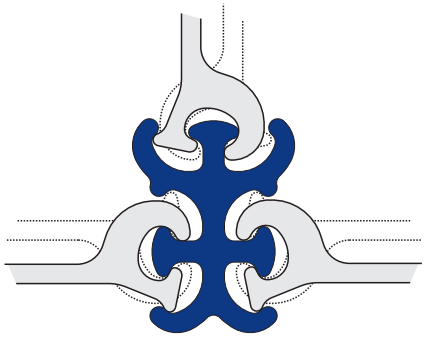

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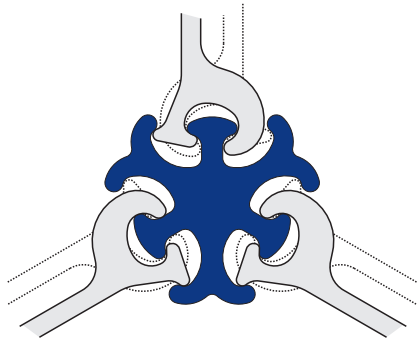
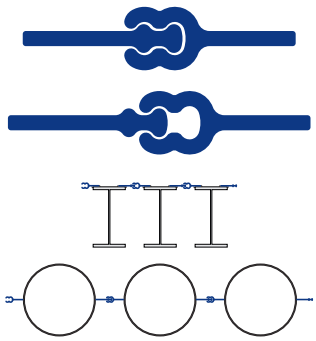
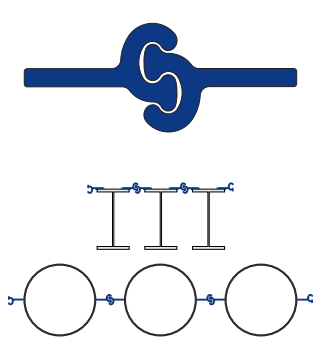


Pipe/Beam

PCM, PCF 180-200



FD180



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The False Claims Act:

What Every Contractor Needs to Know

By Ed Baxa, Jr., (ebaxa@foley.com) and C. Ryan Maloney, (cmaloney@foley.com) - Foley & Lardner LLP

The False Claims Act applies to federal projects and state/local projects receiving federal funds. Under the civil portion[1] of the False Claims Act, at 31 U.S.C. §§ 3729-3733, those who knowingly submit, or cause another person or entity to submit, false claims for payment of government funds are liable for three times the government's damages plus civil penalties of $5,500 to $11,000 per false claim. This is in addition to the related threat of suspension and debarment that oftentimes accompany such claims.

In fiscal year 2010, the United States Department of Justice ("DOJ") recovered over $2.3 billion from lawsuits under the False Claims Act.[2] As stated by the DOJ in a November 2010 press release, in 2009-2010, the DOJ's "aggressive pursuit of fraud under the False Claims Act has resulted in the largest two-year recovery of taxpayer dollars in the history of the Justice Department."[3] Given the government's aggressive stance on pursuing claims under the False Claims Act, construction contractors doing government work or work on projects funded with government funds[4] need to be aware of the potential exposure presented by the False Claims Act, as well as actions that can be taken to reduce the risk of such exposure.

Overview of the False Claims Act

Under the False Claims Act, actions against contractors may be instituted by the government or by a private whistleblower, referred to as a qui tam relator, who would bring the action on behalf of the government. Because a private individual relator must have independent knowledge of non-public allegations, the relator is very often an insider at a private company who brings an action against his own employer. Under section 31 U.S.C. § 3730(d), the relator is entitled to share in the recovery from a False Claims Action. An innocent relator may receive at least 15 percent but no more than 25 percent if the government intervenes, or between 25 percent and 30 percent if the government does not intervene (culpability in the conduct alleged can reduce the relator's recovery). To put this in perspective, in fiscal year 2010, private individual relators were awarded $385 million from lawsuits filed under the False Claims Act.[5] Obviously, the potential for a significant personal monetary recovery represents a motivational factor for any contractor employee, regardless of their employment level or years.

Common Types of False Claims Act Violations

Although the False Claims Act is essentially a fraud statute aimed at combating false claims and false statements submitted to the government, its application takes many forms – not all of which are entirely obvious, yet which can trigger massive liability because of treble damages and penalties available to the government and whistleblowers under the False Claims Act. Further, while the False Claims Act imposes liability only when the false claim is made "knowingly," it does not require that the person or entity submitting the claim have actual knowledge that the claim is false. Instead, a claim submitted in reckless disregard or in deliberate ignorance of the truth or falsity of the information, also can constitute an actionable false claim.[6]

The most common type of False Claims Act violations relate to overbilling, billing for work not performed, upcharging, etc. As an example, in the case of *Morse Diesel Int'l v. United States*, a construction contractor was found to have violated the False Claims Act by submitting certified payment applications that included the full amount of bond premiums even though a portion of the premiums were actually refunded to the contractor's parent company by the bond broker. The Court determined that these were false claims and awarded the government over $7 million in treble damages and penalties against the contractor.[7]

In addition to pure false requests for payment, a growing number of actions have been based on a "false certification" theory by which it is alleged that the submission of a claim which expressly or impliedly certifies compliance with a federal statute, regulation, or contract term that has not in fact been complied with renders the claim false or fraudulent, even though the claim itself is not facially false. For example, in *Ab-Tech Construction, Inc. v. United States*,[8] a construction company participated in a federal SBA program that promoted minority-owned businesses. In order to participate, the contractor was required to submit an express certification attesting to its compliance with program requirements. Later, the government learned that the contractor had ceased to be in compliance without alerting the government, and so filed a False Claims Act lawsuit to recover payments made to the contractor after it ceased to be in compliance. The Court held that each invoice the contractor submitted included an implied certification that it was in continuing compliance with the express certification it had previously submitted, and held that the contractor's failure to comply with the terms of this implied certification made its claims for payment false under the False Claims Act.

More recently, the DOJ announced on November 19, 2010, that two Michigan contractors agreed to pay $1.4 million to the government to settle alleged False Claims Act violations relating to a federally-funded construction project at the Detroit Wayne County Metropolitan Airport. The DOJ alleged that the two contractors had falsely claimed that they had used Disadvantaged Business Enterprises (DBEs) for part of the work on the project when they had not.[9]

There are numerous areas where False Claims Act violations can potentially arise in almost every phase of a construction project. For example, information or representations included within the contractor's bid or proposal may be considered false if not fully complete or accurate. Certifications

in the contractor's monthly pay applications as to the quantity of work performed, that all subcontractors have been paid, that all costs are allowable, etc., may also give rise to liability for false claims if not 100% accurate. Claims for additional time or money under the contract with inflated estimates or are that not supported by the contract's terms could also potentially lead to False Claims Act liability.

Reducing the Risk of False Claims Act Liability

While it may be impossible to completely eliminate any possibility of a False Claims Act violation, there are a number of steps that contractors can take to try to reduce the risk of False Claims Act liability. First, understand and work to ensure the accuracy of any certifications made to the government, either in formal, written proposals or claim submissions, or even in informal communications with the government. Often False Claims Act cases are brought based on a number of certifications, including annual or other periodic certifications as well as certifications submitted with each claim for payment. This may also include certifications in requests for change orders or extensions of time. Remember that the certifications need not actually accompany a claim to be actionable, because even if they are not submitted for payment, if the statements are false and cause a later claim to be false, False Claims Act liability can attach. Also, consult with legal counsel before retaining overpayments from the government, as doing so can create liability under the False Claims Act.

Additionally, both training of employees and having an effective compliance program help reduce the risk of False Claims Act claims. It is important that these compliance programs be more than just pieces of paper; they should be robust, active programs and a compliance-oriented tone should be implemented from management down. Instruct employees to monitor work to insure that any certifications of compliance with any statute, regulation, or contract term are accurate and truthful. Scrupulous monitoring of the accuracy of progress payment applications, unit price quantities, equipment rates, etc., is also important. Consider establishing protocols, such as anonymous reporting, to encourage employees to come forward with concerns. Audits may also assist in identifying fraud risk areas or non-compliance that risks False Claims Act liability.

Another potential step is to obtain information from exiting employees. A detailed exit interview can provide valuable information as to any concerns the employee has. If the employee indicates that they have no concerns, consider having the employee sign a statement to that effect. Although this would not insulate the contractor from a later False Claims Act case, it would call in to doubt the employee's credibility. Similarly, formal severance agreements can help limit potential exposure.

It should be also be noted that the False Claims Act has anti-retaliation provisions under which employers can be held liable for retaliating against employees who complain about conduct violating the False Claims Act. Needless to say, contractors should consult legal counsel before demoting, firing, or taking any other adverse action against employees who have reported conduct that may violate the False Claims Act. Likewise, contractors that become aware of potential misconduct by employees that may violate the False Claims Act should consult legal counsel about performing an internal investigation and possibly self-reporting violations to the government. ▼

1. The False Claims Act also provides for criminal liability at 28 U.S.C. § 287, under which a person who presents a false claim to the government knowing it to be false shall be imprisoned up to five years and subject to fines.
2. Department of Justice, November 22, 2010, Press Release: "Department of Justice Recovers $3 Billion in False Claims Cases in Fiscal Year 2010," at http://www.justice.gov/opa/pr/2010/November/10-civ-1335.html (last accessed on July 22, 2011)
3. Id.
4. This article focuses on the Federal False Claims Act, but many states also have their own false claims act statutes with similar provisions related to state government contracts.
5. Department of Justice, November 22, 2010, Press Release: "Department of Justice Recovers $3 Billion in False Claims Cases in Fiscal Year 2010," at http://www.justice.gov/opa/pr/2010/November/10-civ-1335.html (last accessed on July 22, 2011).
6. 31 U.S.C. 3729(b).
7. 79 Fed. Cl. 116 (2007).
8. 31 Fed. Cl. 429 (1994), affirmed by Ab-Tech Const. v. U.S., 57 F.3d 1084 (Fed. Cir. 1995).
9. Department of Justice, November 19, 2010, Press Release: "Two Michigan Construction Firms to Pay More Than $1.4 Million to Resolve Alleged False Claims," at http://www.justice.gov/opa/pr/2010/November/10-civ-1331.html (last accessed July 22, 2011).

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SR9 Lundeen Parkway to SR 92 Intersection Improvements and Widening

History

The Washington State Department of Transportation (WSDOT) is the steward of over 18,000 miles of state highway lanes and 3,600 bridges, with 7,200 full-time employees. WSDOT, working closely with private contractors, is in year five of a twenty-year program that will be the largest capital construction program in their history - delivering more than $15 billion in projects, including 391 highway projects valued at $11 billion.

Problem

A fast-growing area in the Eastern suburbs of Seattle, Snohomish County's population grew by 80 percent between 1980 and 2000 – and as the population has grown, traffic congestion has increased as well.

State Route 9 (SR 9) is the only North-South highway on the East side of Snohomish County and the only major alternative to nearby Interstate 5. This once-rural two-lane road has seen a significant increase in traffic volumes, leading to a rise in collisions, particularly at intersections where drivers have to cross oncoming traffic when making left turns.

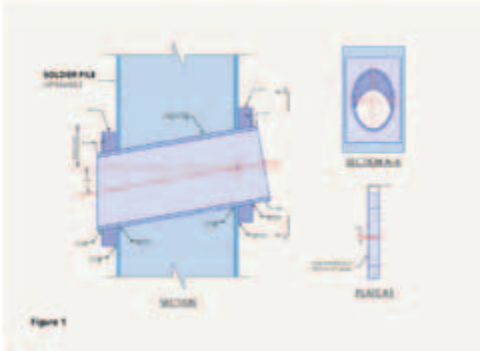
From 1993 to 2000, Snohomish County saw an average of 325 collisions per year on the SR 9 corridor. By 2007, that average had increased to almost 450 collisions per year (an increase of 38%).The WSDOT is working to improve safety and reduce congestion by widening SR 9 to four lanes and adding turning lanes at intersections.

Road widening of the Lundeen Parkway required filling of the lower side of the highway.

This process resulted in the construction of soldier pile walls to support the newly placed back fill material. Skyline Steel was contacted by Malcolm Drilling Company, Inc. to provide wide flange sections for new soldier pile walls. Originally, the project called for wide flange (W14 x 159) sections which were only available at a premium price and are rolled at set times due to tight mill rolling schedules. Temporary casing limitations also made the wide flange product more difficult to install, so Malcolm Drilling was open to alternatives in this application.

Solution

Skyline Steel provided Malcolm Drilling with a cost analysis and suggested using H-piles (HP16 x 162) as a less expensive alternative. This represents cost savings for the project owner, WSDOT. This size of H-pile is stiffer and also has a larger bending moment capacity than the W14 x 159. Due to the uniform geometry of this product, H-piles also allowed for a simplified drilling process. Once design properties and drawings of the proposed sections were approved, Skyline Steel provided customized H-pile beams containing pockets to allow the tie rods to pass through (See Figure 1).



In keeping with the company's goal of serving as a True Project Partner, the Skyline Steel team was actively involved in every

phase of the project including manufacturing, fabrication, coating, and coordinating the logistics for final delivery to the job site. Drawing upon its strengths, Skyline Steel was able to quickly deliver a solution that would normally have required the involvement of multiple vendors. For the client, Skyline Steel's industry expertise and reliability helped deliver significant cost savings, and knocked three weeks off the project's timeline.

Project Time Frame
Wall B or Phase 1: Summer 2010
Wall A or Phase 2: December 2011

Project Partners
Owner/Engineer
Washington State DOT
Mount Vernon, Washington
Ph: 360-428-1593
General Contractor
Granite Construction Company
1525 E. Marine View Drive
Everett, Washington
Ph: 425-551-3100

Sub-contractor
Malcolm Drilling Company, Inc.
Kent, Washington
Ph: 253-395-3300

Products
Product
H-piles: HP16 x 162
Steel Grades
ASTM A572 Gr. 50
Quantity
Wall A: 316 tons
Wall B: 323 tons
Total: 639 tons

Photos courtesy of Skyline Steel, LLC

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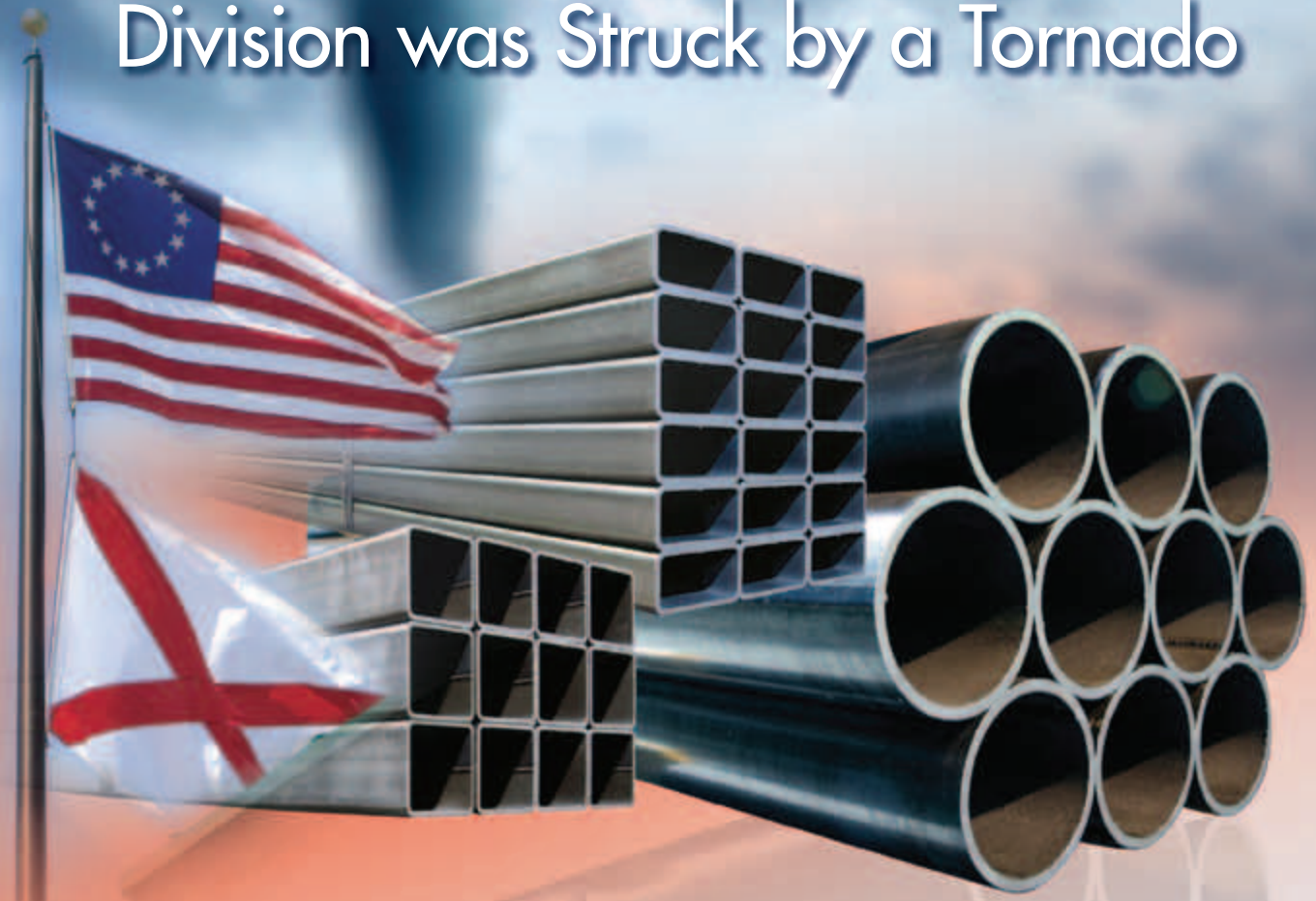
On April 27, 2011 Our Decatur Alabama Division was Struck by a Tornado



On April 28, 2011 We Started Rebuilding

When our Decatur Division was struck on April 27, 2011 by one of the fiercest storms in Alabama's history, our number one concern was the health and welfare of our employees. Thankfully, and most importantly, none of our employees or their families were injured at work or in their homes.

We cannot thank our employees, customers and suppliers enough for their incredible support, strength and patience during these extremely difficult times. We can promise you this:

Our Divisions in Chicago and Marseilles, Illinois will continue to work around the clock to supply you with the quality, service and delivery you have come to expect from Independence Tube. We are in the process of rebuilding the Decatur Division, and will be back servicing our loyal customers as quickly as possible.

Until then, we are purchasing tooling for our Marseilles Division to be able to manufacture the 8", 10" and 12" Pipe Size tubing that only our Decatur Division produced. We will be back selling our large ITC50 Pipe Size and A252 Pipe Piling in a few months. We will keep you posted of our progress.

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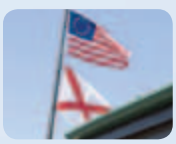

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PDCA Project of the Year: Land, Greater Than $2 Million

NASA Taurus-II Rocket Launch Complex Wallups Island, VA

By John C. Ryan, PhD, PE, Ryan Structural Engineers, Mount Pleasant, SC

The NASA Taurus II rocket launch complex for the Mid-Atlantic Regional Spaceport was made possible through innovative construction methods combined with careful coordination between the design team and pile driving contractor. By utilizing an innovative concrete pile splice and state-of-the-art pile driving equipment to install piles of widely varying length and capacity, significant advantage of driven prestressed concrete pile was realized over competing foundation systems. The flexibility of the construction method, when coordinated with the geotechnical testing program, resulted in significant cost and schedule advantages as the pile-driving contractor was able to react to optimization of the foundation design during production.

The full project scope included a launch complex comprised of a water tower, elevated rocket launch pad, ramp and bridge, flame deflector, lightening towers, deluge basin, storage tanks, and piping supports. Allowable design capacities for the piles were 75 to 120 tons in compression and 0 to 55 tons in tension. The geology of the area varied somewhat. In general the site was underlain by approximately 15 ft of very loose silty-sand, underlain by approximately 50 ft of very soft clay, peat, and medium sand layers (N=0 to 10), underlain by approximately 30 ft of medium to very dense sand (N=10 to 60), underlain by approximately 30 ft of fat, stiff clay, underlain by a dense to very dense sand (N=60-100). Based on historical pile installation at this facility, 100 ft long piles were initially considered the standard minimum length for all conditions.

Total efficiency of the project occurred as a result of effective communication at two distinct points in time during project planning. During the bid process, the pile driving contractor was able to show significant cost savings with the innovative concept of installing all piles using a single type of pile driving rig, and using splices where pile lengths exceeded 66 ft. The simple concept required only one operator and one ground-man per rig during production driving. A single forklift delivered piles to one or two production areas at a time. With this process, 2-3 man crews installed up to 7,148 ft (44 m) long, plumb and battered piles, or up to 25, 65 ft long plumb piles per 8-hour day with a single machine. Machine operators could also locate piles with ±1-in. precision and battered piles with ±1-degree precision using hydraulic controls and inclinometers, integrated within the machines. Production rate and overall jobsite efficiency allowed for achieving an aggressive schedule, required by the owner. In addition, the owner realized value in minimized exposure to risk of accidents through reduced personnel contact with the piles, smaller crews, less equipment, and shorter pile segments.

Subsequent to the initial bid phase, the Geotechnical Engineer, in coordination with the contractor, undertook the following initiatives to further reduce the cost of the foundation contract by maximizing geotechnical capacity of the driven piles: (1) demonstrate 75 ton capacity of 14-inch prestressed piles, driven to 65 ft embedment, and (2) conduct a test pile program to develop driving criteria, and minimize final pile embedment length in each sub-project area.

Due to the fact that higher capacities were utilized at lesser embedment depth than had been used previously at the Mid-Atlantic Spaceport, 15 percent of all piles were evaluated using high-strain dynamic testing and subsequent CAPWAP analysis.

(Continued on page 51)

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Access Bridge Foundation

The access bridge consisted of piles with top of pile elevations varying from grade to 15 ft above grade. Pile lengths varied from 66 ft to 148 ft in length. 66 ft long piles were installed in a single piece. Greater pile lengths were installed in two or three pieces. Pile location, alignment, and final elevation were critical, as piles were left long to support elevated caps for bridge girder support. Piles were driven to final elevation without false work or templates. Splicing the piles made it possible to drive all lengths with a single type of pile driving machine.

Water Tower Foundation

The water tower foundation consisted of 148 ft long, 14 in. prestressed piles, installed with various batter inclinations, up to 1:3. Three piece piles were used with splices each. Larger pile sizes would have been required if driven full length. In addition, the use of small rigs and spliced piles allowed the contractor to drive piles from within the excavated area, eliminating the need for substantially larger equipment.

Launch Pad/Flame Trench

The launch pad and frame trench foundation required 130 to 145 ft long piles, including plumb and battered piles, with inclination up to 1:3. All piles in this foundation were installed in 3 segments using 2 splices each. The piles were installed in a 10 ft deep excavation, sloping up to grade on one side.

Pipe/Misc. Equip. Support

Piping foundation and miscellaneous equipment supports occurred across the site. Single piece piles were installed at 65 ft embedment depth for all of these foundations. Using the same equipment for these shorter piles that was used for longer piles, allowed for mobilization in and out of other mini-sites without leaving equipment or crews under-utilized, waiting for water tower, bridge, and launch pad foundations to be re-designed and released for construction.

Pile Driving Innovations

Robotically Fabricated Pile Splices

The Emeca Pile Splice was used for all spliced piles. The Emeca Pile Splice is a robotically fabricated, mechanical pile splice. Two identical welded steel assemblies, consisting of a faceplate, patented locking mechanisms, and steel reinforcing bars, mate to form each splice. The steel assemblies are precast into the ends of pile segments, using guides to maintain square ends during casting. Pile segments are joined in the field during driving operations by placing an upper pile segment on a pre-driven lower segment and installing locking pins using a hammer. The automated robotic fabrication process results in nearly identical assemblies, greatly simplifying field fit-up. Splices are usually joined in the field in three minutes or less. For this project, all piles of length in excess of 66 ft were spliced. Single splices were used for pile lengths up to 120 ft, and two splices per pile for lengths greater than 120 ft. Spliced piles reportedly cost 5-7 percent more than full length piles of equal length and prestress. However, the actual cost of full-length piles would have been greater after considering the increase in pile size and pre-stress required for han-

dling longer piles. Splicing piles allowed for standard bottom segment lengths to be cast and driven, while final pile lengths were modified during production. Subsequently, middle pile segment and top segment lengths were adjusted, optimizing the length and capacity of the driven pile foundation.

Purpose-built, Hydraulic Pile-Driving Equipment

The Junttan PM-20 hydraulic driving rig was used for installation of all piles. Several aspects of the advanced system were relied upon to execute the most efficient pile driving program possible. On-the-fly variable hammer energy, allowed the operator to adjust driving energy from 8,000 ft-lb to 20,000 ft-lb as the pile tips passed through varying resistance offered by the soil. This optimized installation time, while minimizing driving stresses. The maximum amount of energy available was approximately 44,000 ft-lb. The excess hammer capacity was critical when mobilizing the full capacity of piles after set-up during re-strike. The integrated hydraulic controls of the machine allow for precise placement, and inclination of the piles, without requiring men to touch the pile during placement, and without the use of templates or false work. Overall, higher precision of pile location and orientation, while limiting risk to pile driving crews resulted.

Job-site Efficiency

The project required significant flexibility in pile driving operations due to the highly variable work sites within the overall scope of work and engineering design revisions during production pile driving. Since all pile segments were less than 66 ft long neither special transportation nor use of cranes to unload piles on site was necessary. Forklifts were used to unload and store piles at a convenient location, and subsequently deliver pile segments to production areas across the site.

Summary

As a result of the innovative use of equipment and spliced prestress concrete pile, and careful coordination of between the design team and the contractor, Sun Marine delivered the pile foundation on schedule with a reported 12-15 percent cost savings to the Mid-Atlantic Spaceport. ▽

Photos courtesy of John C. Ryan

Junttan PM-20, driving battered piles in water tower excavation.

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Dock Structure and Crane State Project for Owner Caddo-Bossier Port Commission

By Robert Baker / Karla Lemmler, Baker Pile Driving and Site Work, LLC.

This project started bidding in 2009 which consisted of production pile driving scheduled to start in early 2010 and work on the original contract to be completed in December 2010.

> "The issue of driving piles on a moving shoreline created great challenges. Every few feet the sand and clay strata seemed to move in conjunction with the flow of the old Red River bed."

The dock is located on the edge of the Red River in Shreveport, Louisiana. It is a body of water known by the Army Corps of Engineers for it's often shifts in location, depths and sand bars. It is controlled by a number of locks and is viewed by most as a difficult river to work on.

The location of the project is approximately 80 percent land based and 20 percent marine based. Due to the Red River's constant changes we decided to drive all piles from land. This decision resulted in a cost savings with no rental rates for barges and tug boats needed to perform the marine pile driving portion of the job and averted the potential cost of standby time due to the natural rise and fall of the river and adverse weather conditions. We rigged out a 9260 American Crane with fixed leads and a 50' spotter. The reach allowed us to drive the piling from shore. To achieve pile driving from land we designed a steel template that allows lay out over the river and at that point the pile driving began.

The issue of driving piles on a moving shoreline created great challenges. Every few feet the sand and clay strata seemed to move in conjunction with the flow of the old River bed. Due to these conditions we experienced large differences in how the pile drove from one pile to the next. One pile may rebound while the one next to it drove with ease. We struggled with inconsistencies during the testing phase. Due to all of

the inconsistencies we decided to bring in Paul Bullock, PhD, P.E. of Tolunay-Wong Engineer, Inc. and through his PDA work we were able to understand what had to be done to solve the issues we faced. This resulted in changing the hammer to a hydraulic B.S.P. supplied from Jinnings Equipment. This was a major step forward. Changing the hammer gave us variable speed and energy which helped drive the piles efficiently. Also, the hammer change prevented damage to the marsh area that we were working in. The lower noise output and no dirty air discharge created a pleasant environment for all concerned.

The piles were transported in by truck and barge from two different pile producers and the Port was able to unload most of the piles at its own dock This resulted in no down time due to lack of materials. As a result production was very efficient.

The 800 concrete piles were mixed sizes of 16 and 18 inches and the lengths were 68 and 83 feet long. The piles after driving would stand above ground and water about 8 to 10 feet. This would leave the dock dry during unusually high tides and flooding. We had to make sure each pile was 100 percent complete after we drove it because we could no longer reach the pile as the project progressed. With the help from the General Contractor's survey team, re-driving of a pile was never an issue.

Upon completion of the structure it will serve as a crane deck to unload material at the Caddo-Bossier Port to service the oil field needs of an exploding natural gas market.

The General Contractor, Cecil Gassiott and the Caddo-Bossier Port Commission can both take pride in what they have helped put together for the people of Louisiana.

Typically, North Louisiana is known as a strong auger cast market. Baker Pile Driving and Site Work, LLC was successful in showing all critics that a driven pile is a tested pile even in Shreveport. We custom built a crane with the capability to perform the task at hand. We utilized state of the art Geotech support and we overcame extreme weather conditions from 105 degree heat with 100 percent humidity to 10 degree cold with ice and snow storms. We used different pile suppliers to extract their specialties and use the owner's port facility to unload barge loads of pile that were shipped in from the Mississippi Gulf Coast. We were able to give back to the local communities by hiring many locally skilled welders, machinist and craftsman.

We also capitalized on the Junttan pile driving rig's high technology while still relying on the conventional strength of the friction rig.

This project offered a challenge for both man and machine, not only on land but also water. In my experience this is the type of project that builds character, develops confidence and leadership, and allows the next challenge to be a stepping stone and not a mountain.

Baker Pile Driving seldom bids on run of the mill jobs and this was no exception. It was a test from beginning to end. We look forward to a challenge and our next is right around the corner in the Big Easy. ▼

Photos courtesy of Baker Pile Driving and Site Work, LLC.

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Inner Harbor Navigational Canal Floodwall

By Jansson Wurster

The Inner Harbor Navigational Canal Surge Barrier Project is the largest design-build civil-works contract in the history of the Corp. of Engineers. Traylor-Massman-Weeks, LLC, which was comprised of Traylor Bros. Inc., Massman Construction Co., and Weeks Marine, Inc., was awarded the $330 Million contract to construct 7,500 linear feet of barrier floodwall connecting the Mississippi River Gulf Outlet (MRGO) to the Gulf Intercoastal Water Way (GIWW) through the marshlands of Southeast Louisiana, just 10 miles East of New Orleans. This Floodwall is part of a widespread effort to protect the City of New Orleans from future hurricanes and provides a front line of defense from storm surge entering the city from the Gulf of Mexico.

> **"This Floodwall is part of a widespread effort to protect the City of New Orleans from future hurricanes and provides a front line of defense from storm surge entering the city from the Gulf of Mexico."**

The IHNC Floodwall is founded by 1271 each 66-inch diameter spun cast concrete cylinder piles 144 feet long weighing 91 tons. These piles were driven at 6-feet center to center leaving a six inch gap between them and were held to a specified tolerance of plus/minus three inches in the horizontal direction and plus/minus three inches in the vertical. The installation of the 66-inch cylinder piles was the crucial milestone of the advanced measures to close the access way from the Gulf of Mexico to the City of New Orleans by fall of 2009. To fill the gaps between the 66-inch cylinder piles, 2538 each 18-inch square concrete piles 59'-9" long were placed in pairs into jet grouted plumes on either side of the cylinder piles. The voids between the cylinder piles and the 18-inch closure piles was filled with 4,000 psi grout and contained within the annulus by bag socks made of "Fab Form Ballistic Nylon Pile Jackets" and secured together with 3 each 1 ½ inch diameter stainless steel tie rods. To stabilize the wall from the intense hurricane winds and surge, 645 each 36-inch diameter steel piles were driven on the protected side of the wall in two sections, connected with a field splice, totaling 238 feet long on a 1.5:1 batter and located 12-foot center to center. All of the piles were then cleaned out and infill concrete placed; batter piles were placed to Elev. -20.00 feet (5 feet below mudline), and the cylinder piles were placed to -86.00 feet (61 feet below mudline). Precast concrete caps, 335 each ranging from 85 to 25 tons, were then set onto the 66-inch cylinder piles and keyed into the 36-inch batter piles. These caps were then

secured into position by installing a 2 ½" diameter-150 ksi high strength rod through the precast cap and anchored into the batter piles, the installation was complete when the 2 ½" diameter rod was post tensioned to a seating force of 325 kips. The main precast cap units were 17'-6" long by 14'-9" wide by 6' tall providing a roadway for utility vehicles to inspect and maintain the structure. Each cap spanned three each 66-inch cylinder piles and two each 36-inch batter piles leaving a 6'-6" gap between caps intertwined with reinforcing steel to be filled with formed cast in place concrete. A parapet wall was constructed at a final elevation of +26.00 feet on the flood side atop the precast cap with alternating merlon and crenel sections creating a "weir" effect to regulate the storm surge if it were to topple the wall. Finally a guard-rail system was assembled on the protected side of the precast cap completing construction.

The nature of work at the IHNC Floodwall presented many construction challenges. The first of which was sole site access via water and therefore required the use of floating equipment and a custom engineered trestle system with the ability to support templates in excess of 250 tons founded completely upon friction piles. The trestle system was designed to allow maximum occupancy of equipment to the 350 feet wide by 7,760 feet long dredged access channel. The trestle system consisted of 36"Ø x 130' steel piling with double 50' long, 36" tall track girders spanning each pile bent establishing a track system for template / platform travel. PDA testing for these pile confirmed capacity in excess of 575 kips. Design criteria also required hurricane induced lateral loading as construction was scheduled to run through the entire 2009 and most of the 2010 hurricane seasons. Total length of the trestle system was approximately 2000' and required constant removal and reinstallation to keep construction activities on schedule. Operations ran nearly 24 hours per day with material suppliers struggling to keep up. In addition, 26,000 CY of in-situ spoil material was removed from the driven pile, 18,170,000 lbs of reinforcing installed and 68,000 CY of concrete placed by October 2010 with TMW, LLC accruing over 1 million man-hours and zero lost time accidents reaching 100 percent completion within the 18 month scheduled timeframe.

Schedule proposed the most difficult challenge due to the sheer magnitude and complexity of the overall project. Due to the confined work area within the access channel and extremely fast tracked schedule, TMW, LLC began two separate headings of 66-inch pile driving, jet grout installation, and 18-inch closure pile installation. In order to accommodate the accelerated 18 month schedule, TMW, LLC immediately began installation of permanent work four days following the official Notice to Proceed by driving the first of 1271 each 66" diameter x 144' long concrete cylinder pile on May 9, 2009. Shortly thereafter on May 29, 2009 a second heading of 66" diameter concrete pile of the same configuration began as well.

The first 66-inch pile driving heading, South Heading, consisted of the Weeks 526 American Revolver rated at 350 tons with a hanging fixed leads system. This crane began driving piles

north of the half way point of the floodwall and began driving south toward the MRGO channel, accounting for 843 each of the 1271 total 66-inch piles. This inimitable set up consists of an all in one configuration pile driver with the capabilities to loft, drive, and pre-drill in one continuous cycle using GPS positioning and a sophisticated "HydroPro" survey software. This up to date technology utilized two GPS antennas, one on each side of the bottom gate, along with an inclinometer installed within the leads system that allowed the operator to virtually see and control the position as well as the pitch and roll of each pile during the entire installation sequence. This set up also has the unique capability to disconnect its own pile rigging to provide a safer atmosphere for the crew members, in which they do not have to attempt to handle this very large and very heavy rigging at high elevations. The Raymond 60X, 150,000 ft-lbs steam driven hammer, was used to drive the piles for the South Heading. To comply with the specifications, a two tiered side loaded template accompanied by a telescopic platform, which traveled by

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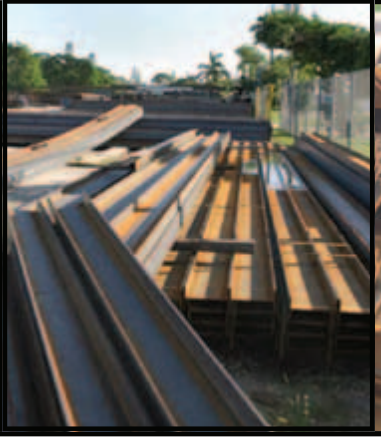

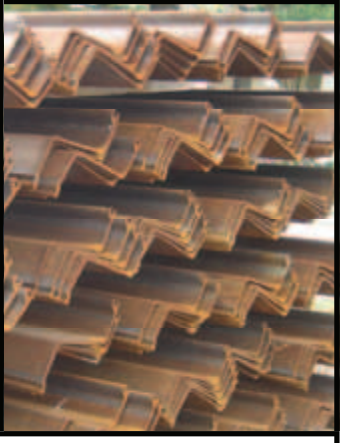

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means of the trestle system, assisted the 526 with the positioning and installation of the 66-inch cylinder piles. The South Heading completed the installation of 843 each piles in 124 working days, on October 21, 2009, resulting in 7 piles driven on average per day. The daily best for the 526 crew was 13 piles driven in a 24 hour shift. A typical pile driving cycle lasted approximately 2 hours.

The North Heading operation began on May 29, 2009 and drove 427 each of the 1271 total 66-inch concrete cylinder piles and averaged 5 piles per shift. This operation consisted of a Manitowoc 4600 Series 3 Ringer on a barge to loft the piles and set into a set of leads mounted on a traveling 75 feet high tower along the trestle system. This tower moved along the trestle powered by electric driven rail trucks and a template was positioned with conventional GPS survey equipment. After the pile was set on location the rigging would be disconnected and the crane would swing to the barge and connect the hammer, a Bruce 3013 hydraulic impact hammer with 286,000 ft-lbs. The hammer was placed atop the pile and it was driven to grade.

Driving the 36-inch steel batter piles was another engineering marvel due to the lengths of the piles and the 1.5:1 batter to which they had to be installed. The 250 ton - two staged platform that was necessary to install these piles also traveled along the trestle system by electric driven rail trucks. The piles were set in two sections and connected by a welded field splice totaling 238 feet. This was a two crane operation consisting of a Manitowoc 999 setting the pile sections into the leads, which were held by a Manitowoc 7000 ringer. The hydraulic impact hammer, BSP-CG240 (176,320 ft·lbs), used for this operation was mounted inside of the Berminghammer leads and controlled by a hydraulic winch. Six hundred and forty-five each piles were driven averaging 4 piles per day during June 9, 2009 through April 10, 2010.

In summary, 4,454 individual permanent piles and countless temporary pile were installed in exactly 11 months and 1 day completing a major portion of the largest civil-works design-build project ever taken on by the USACE and obtaining superior levels of flood protection for the city of New Orleans and the surrounding area. At one time there were over 100 pieces of floating marine equipment, which included 20 floating cranes that occupied the dredged access channel in order to perform the 15 separate operations necessary to complete the floodwall. This was accomplished through precise planning and the hard work of over 300 employees, hourly and salary, accruing over a million man hours without a single lost time accident in an 18 month schedule. With this incredible record, TMW, LLC was recently presented with the "2010 Superior Safety Performance" award from both the Mississippi Valley Region of the Corp. of Engineers and the New Orleans Hurricane Protection Office. TMW, LLC also received the "2011 Outstanding Project of the Year" award from the Deep Foundations Institute. ▽

Photos courtesy of Jansson Wurster

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Construction of New Breasting Dolphins for National Gypsum Company's (NGC) Richmond, California Terminal

By Jan Stockon

A recent underwater inspection of the 1960s-era structure revealed corrosion of the steel H-Piles, in particular just below the concrete jackets. NGC decided to replace the existing concrete and steel H-Pile dolphins with new dolphins that would allow berthing by a range of vessels that call at the Terminal, both currently and in the future. Although the Terminal is primarily utilized by a stern unloading bulk carrier, the CSL Trailblazer, the contemplated new dolphin layout would have to accommodate other bulk carriers with different conveyor locations.

NGC and the engineering firm, Ben C. Gerwick Inc., analyzed dolphin layouts and explored various dolphin designs. NGC decided to replace 3 of the 4 dolphins with new 66" diameter monopiles, concrete caps, fender panels with UHMW pads and cone fenders; and new connecting walkways. In addition, the main loading platform would receive 6 new 24" diameter pipe piles, a new concrete deck and modifications to the walkways. NGC selected CS Marine Constructors, Inc. to perform the construction.

Several constraints forced the construction into a restrictive and compressed work window. Permits from the Bay Conservation and Development Commission, US Army Corps of Engineers, California Regional Water Quality Control Board and the City of Richmond limited in-water work (primarily piledriving) to a "fish window" between June 15 and November 30 each year. As the Richmond Terminal is actively in operation, work had to be conducted between ship unloading operations – and either the new Dolphin C needed to be operational or the existing Dolphin 3 had to remain in service. Also walkways needed to be refit or replaced and secured 24 hours prior to vessel arrivals.

The steel monopile type design provided a number of advantages. First, the monopile design allowed for significant offsite prefabrication and a shortened on-site construction duration. Since the Terminal had to remain operational during construction, the shorter construction time allowed the dolphins to be built between vessel arrivals. Second, the steel monopiles could be installed using a vibratory hammer, avoiding some of the permitting complications and potential marine species impacts associated with using impact hammers in the San Francisco Bay. To guarantee suitability throughout the design life of the dolphins, the piles were designed long enough to accommodate the possibility of future increases in dredging depth.

The 66" diameter monopile was selected with a variable wall thicknesses to consider both mooring and berthing demands and to optimize construction costs. CS Marine furnished & delivered the monopiles in one piece. Each monopile measured out at 130ft in length and weighed 65 tons.

In addition to the 3 new dolphins, the existing loading platform was strengthened and expanded by driving 24" diameter steel pipe piles around the perimeter of the platform. Dowels were epoxied into the existing concrete and then cast-in-place concrete was placed to form the deck expansion and connect the 24" piles to the existing platform.

Prior to mobilizing onsite, CS Marine precast the concrete decks at their yard on Mare Island which were then transported on a flat barge to the site. The "DB Carquinez" (125-ton Derrick Barge) and an APE 400 vibratory hammer were mobilized on site to drive the 66" diameter x 130ft long monopiles. Unanticipated hard driving was encountered on the first pile which led to early refusal about 3' above the required tip elevation.

Because the piles were designed with the thicker wall portions intended to be at the critical point of fixity, and to ensure the corrosion protection coatings were located in the correct zones, the geotechnical firm of Treadwell and Rollo and the engineering firm of Gerwick coordinated closely to develop a solution by slightly shortening the remaining piles at the tip. Once the piles were driven and cut off, the prefabricated head pieces were spliced onto the piles. Fenders, handrails and walkways were then installed and the new dolphins were ready to receive vessels.

The overall equipment involved in the project; barge, crane and hammer.

A close-up version showing the placing/guiding of the monopile into the template.

A night shot showing the vibrating of one of the monopiles.

Just as the piledriving was a unique operation, so also was the demolition activity. Since the environmental fish window had closed in November 2010, the demolition of the now obsolete existing dolphins was scheduled to commence in June of 2011. Again the "DB Carquinez" was towed back to the Richmond Terminal, this time with an empty flat barge on which to land the demolition debris. Each dolphin was removed in one piece and weighed slightly more than 90-tons. The existing concrete jacketed HP14x89 steel piles were extracted or cut off below the mudline, and placed on the flat barge for transport offsite.

The last piece of the puzzle is to reduce the dolphins into truckable size chunks to be transported to a concrete recycling company.

Collaboration

The CS Marine Constructors team of Mark Weisz, Jeff Thompson and Casey Stockon worked closely with NGC staff Stephen Miller, Maynard Sinclair, Gene Whittington, Steven Ciapponi and Mike James; Gerwick's Ted Trenkwalder and Jack Gerwick; and Treadwell and Rollo's Haze Rodgers to survey, design, permit and construct the project within schedule and budget constraints. ▼

Photos courtesy of Jan Stockon

One of the completed new NGC breasting dolphins.

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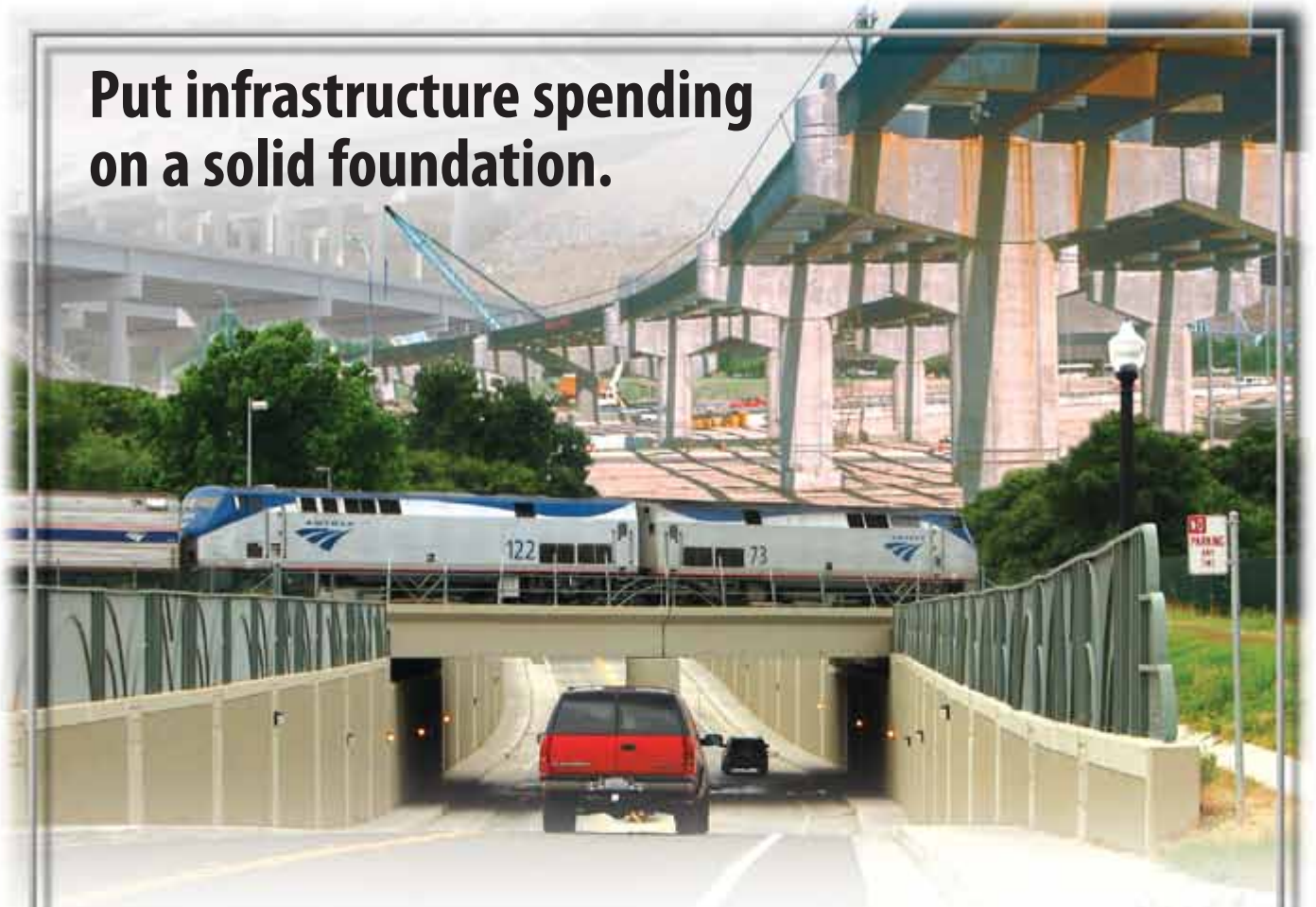

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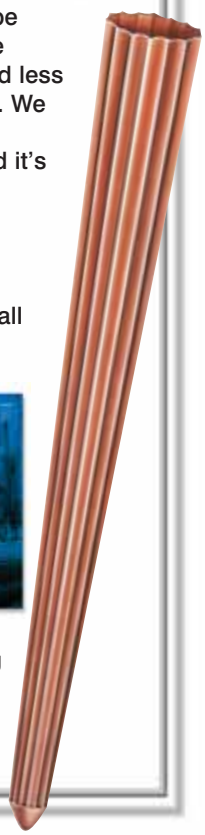

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Getting Employees to Apply Training On-The-Job

How to Turn Hope into Reality

By Raed S. Haddad

Training is a rite of passage for many employees and required for the certifications and knowledge needed to progress in their careers. While organizations may take the time to prepare an employee for training and budget for them to attend a learning course, most organizations still struggle to assess and support the transfer of learning from training programs into the workplace.

According to the American Society for Training & Development, there is a 70/20/10 rule when it comes to learning and development. Research shows employees learn:

- 70 percent through real-life and on-the-job experiences;
- 20 percent through mentoring or coaching; and
- 10 percent through formal training.

Therefore, organizations must ensure that learning be applied on-the-job in an immediate way to improve actual employee performance and generate a positive business impact.

What is required for the transfer of training to the workplace? This question has been posed by researchers since the early 20th century, but has intensified in recent years due to economic challenges, an evolving workforce, and increased organizational focus on measuring and justifying training investments.

In general, the transfer of learning takes place when organizations:

- develop an overall learning transfer plan;
- implement tools and processes to reinforce the application of learning post-training;
- measure if and to what extent learning is applied on the job; and
- advocate for full manager support and involvement.

To identify breakdowns in the transfer of learning and develop best practices for addressing these gaps, ESI International conducted a survey in March 2011. Titled *Applying Training and Transferring Learning to the Workplace: How to Turn Hope into Reality*, the global study highlights the shortfalls in applying training and opportunities for improvement.

Survey Findings Both Surprising and Encouraging

More than 3,000 government and commercial training-related managers assessed three key phases in the application and transfer of learning: pre-training strategies, post-training reinforcement and rewards or incentives used to motivate employees.

Overall, the study highlights several weak areas in the on-the-job application of learning, including manager support, trainee preparation, incentives, and an overall formal design and measurement process. Findings show that:

- 60 percent of those surveyed do not have a systematic approach to preparing a trainee to transfer, or apply, learning on-the-job.
- When asked what specific rewards motivate trainees, almost 60 percent say the "possibility of more responsibility," followed closely by an impact on their HR/performance review. Only 20 percent indicate that there is any financial reward or other incentives.
- 63 percent say managers formally endorse the program, while only 23 percent of managers hold more formal pre- and post-training discussions.

But most surprising, the study suggests that organizations start out optimistic and hopeful that they are fully committed and engaged in the transfer of learning, but upon further questioning, one finds that hope and reality are two very different things when it comes to the transfer of learning in the workplace.

For example, while two-thirds of respondents estimate that they apply more than 25 percent of training knowledge back on-the-job, they have little concrete proof. Almost 60 percent say the primary method for proving or measuring this estimate is either informal/anecdotal feedback or "simply a guess."

The study points out some striking contradictions in how well organizations think they transfer learning and the lack of proof to back up their estimate of learning transfer or on-the-job application. Client experience at ESI shows us that organizations often fail to establish success criteria or identify expectations for learning engagements. This is a key pre-training strategy in order to measure trainee performance against agreed upon standards.

On the other hand, when it comes to post-learning tools and programs, survey responses show employees leveraging an ever-expanding array of tactics to recall information learned during training, including post course discussions with the manager or team leader, on-the-job tools, informal support such as social networks or online forums, and communities of practice such as peer groups and coaching.

The top three strategies indicated as the most important for the transfer of learning are that trainees have the time, resources and responsibility to apply learning; trainees have manager support; and the instruction approach simulates the actual work environment.

Employees need to know that the application of learning is a priority for management. Management can show this by aligning training with company strategy and motivating employees by setting expectations beforehand and offering incentives for them to succeed.

Ways to Increase the Application of Learning

Through open-ended questions, the survey also asked respondents to share specific learning transfer tactics and identify best practices. The responses resemble a wish list of actions that management or sponsors should do more of, and they fall broadly into the following areas:

- Incorporate real projects in the training
- Conduct more training and/or better marketing and communication on what exists
- Communicate a transparent measurement strategy
- Establish change management guidelines
- Increase managers' involvement before and after training
- Make training more relevant

Trainees should understand that the organization or sponsor expects them to apply what is learned and that there will be an assessment of training impact by collecting data from them and other stakeholders, such as clients.

In the end, holding employees accountable for learning transfer means the onus is on organizations to communicate the vision and reasons why a change in knowledge/ skills/competencies is needed to support the company's growth. ▽

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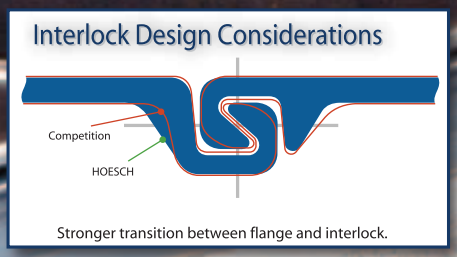

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Long-term 1400 Ton fully instrumented multi-jack pile load test in Southern Peru.

By Kevin Williams

> "Within the Fugro group of companies, Fugro Consultants represents one of the strongest geotechnical and materials testing resources in the industry."

Fugro Worldwide

Established in 1962, Fugro collects and interprets data related to the earth's surface and the soils and rocks beneath, and provides advice for the purposes related to the oil and gas industry, the mining industry and the construction industry. Worldwide, Fugro operates in 50 countries with more than 13,500 employees in approximately 275 locations. Our services are divided into three divisions, namely Geotechnical, Geosciences and Survey.

Within the Fugro group of companies, Fugro Consultants represents one of the strongest geotechnical and materials testing resources in the industry. With a focus on major markets, we promote the advancement of geo-consulting specialties including geologic hazard and risk assessments; earthquake engineering; site characterization; coastal/nearshore services; laboratory testing; and foundation engineering. With a 700-plus-member team of engineers, geologists, scientists, and technicians, Fugro Consultants delivers projects through a network of local offices and specialty technical centers in the United States, Panama, and Canada. Through this arrangement, we are on the ground and ready to serve projects in hometowns and far beyond.

Deep Foundation Testing Services

As a key component in our geotechnical service line, deep foundations testing is provided from most of our major offices in the United States, Panama, and Canada. Tim Roberts manages the regional deep foundation practice along the Gulf Coast and has been in the deep foundation/piling business for over 35 years. "Our services typically include wave equation analyses and pile drivability studies, installation monitoring, material and weld testing, static and dynamic PDA load testing, and pile integrity testing. Fugro also owns all of its field testing equipment to improve schedule and availability for projects and has a large

Fugro collects and interprets data related to the earth's surface and the soils and rocks beneath, providing advice for several industries.

pool of trained and experienced field personnel to pull from when needed," commented Roberts. Personnel can be either an engineer or a certified technician as required by the project.

Recent project experience includes a large refinery expansion at Motiva in Port Arthur, Texas, work for the USACE on storm water control projects in New Orleans, and development of the oil sands projects in Northern Alberta, Canada. When required, we have the capability to mobilize up to eight PDA monitors and crews, as well as 20 trained field technicians/engineers to run full-time monitoring programs.

While Fugro has the resources to work on large projects, we understand the significance of shorter duration and smaller projects. Smaller duration projects — typically less than 100 piles — make up a high percentage of our work. These projects may only require a single inspector/engineer for one or two days; here schedule is even more important to contractors with a shorter installation period.

In addition to data collection, Fugro has the experience and capabilities to interpret field data. We have found it is in this stage of the project where cost savings may be realized. In performing a load test to the maximum capacity of a pile, we are typically able to recommend that a shorter pile is suitable for the project. Shorter piles may not only save the project pile material costs, but also considerable installation time, allowing weeks or months to be trimmed from the project schedule. Fugro works with both owners and contractors to support design and testing for deep foundation projects.

Health and Safety Program

When it comes to health and safety — there is no compromise. Our vision is that Fugro companies will provide the safest places to work in the geotechnical, survey, and geoscience industry. Our commitment to safety is evidenced by our certification according to the internationally recognized Occupational Health and Safety Assessment Series, OHSAS 18001:2007. We have a full-time Corporate Health and Safety Director, as well as an H&S Coordinator in each office. Safety training for all new employees is mandatory, and we have a committment to contuinued safety awareness for every employee.

We Are Growing

In January 2009, Loadtest USA, based in Gainesville, Florida, became part of the Fugro group of companies. The acquisition helped expand Fugro's deep foundation testing capabilities. Joseph M. Cibor, P.E., President of Fugro Consultants, commented, "Bringing Loadtest USA into the group has been a very successful venture for both companies and has allowed us to expand both our regional presence, as well as enhance our overall deep foundation testing capabilities."

Although Loadtest is mostly known for the use of the Osterberg Cell technology in drilled shafts, the same technology can be used in driven test piles. "In certain applications, particularly the marine environment, the use of Loadtest technology is a solid alternative to a traditional top-down load test. It reduces both the need for reaction piles as well as a reaction frame," stated Ray Wood,

Fugro collecting Data on the New Orleans Storm-Surge Protection Levees.

Fugro provided inspection, load testing, and NDT Services for the New GIWW Closure Project.

Senior Vice President, Fugro Loadtest USA. "We expect that if more design firms were aware of the potential application of the Osterberg technology to driven piles, that their use would be expanded, specifically for single segmented precast concrete piles and steel pipe piles." Furthermore, Loadtest has significant capabilities to fully differentiate instrument piles, unit end bearing, and unit side friction.

The combination of Loadtest technology with Fugro's resources allows us to support our clients' deep foundation testing needs and pave the way to future growth in the deep foundation testing service line.

Our engineers, scientists, and technicians have the advantage of drawing on six decades of geotechnics experience. This promotes well-founded decisions in scoping a project and in producing results when and where needed. Spanning a variety of markets in local jurisdictions and across the world, Fugro Consultants always has something interesting going on. ▽

Photos courtesy of Fugro Consultants, Inc.

The land of opportunity

Junttan specializes in laying reliable foundations, enabling both the constructor and the society to succeed and flourish. Our piling machines represent the best in business, providing purpose-built efficiency, uncompromised operational safety and uncontested reliability. Our expertise and determination help you to discover the best possible piling solution for every need and situation, so that even those pieces of land that might seem unapproachable at first, can be turned into areas that add value to the environment in a respectful manner. Junttan can help every development and construction project to be carried out smoothly, thus contributing to successful business operations and sustainable development.

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Finnish pile driving manufacturer celebrates 35 years of making world-class pile driving rigs

By Gloria Taylor

To get a glimpse of the future, it is sometimes helpful to take a look back. The saying couldn't be more true than it is today for Junttan Oy of Finland.

The Finnish manufacturer of top-quality Junttan pile driving rigs just celebrated its 35th anniversary with clients, owners and staff at its factory in Kuopio on May 6 of this year. The event was attended by Junttan's key customers around the world: founder Pentti Heinonen, majority owner Ilkka Brotherus and knowledgeable staff who keep the company humming year round.

It was also the perfect setting to introduce the all-new PMx24 piling rig, which the company calls "the latest technology in the field of pile driving", to a prestigious product line that already includes the PMx22, PMx24, PMx25 and the PMx20.

The "X" series represents the most advanced rigs in the company's stellar history which has always placed Junttan Oy at the top of pile driving equipment around the globe thanks to strong commitment, superior focus on clients' needs and strong research and development practices.

These new models replace all of Junttan's current piling rigs up to PM25H but represent once again the best and most modern design elements for the efficient workhorses, which have revolutionized pile driving equipment and field practices since Junttan was founded in 1976.

Quality first

Junttan builds "purpose-built" pile driving rigs, which the company interprets as "built with no compromises". As a result, it has enjoyed many firsts, including being the first to develop a fully hydraulic pile driving rig in 1979.

"The first rigs were based on excavator base machines, but soon we understood that this concept had too many limitations to achieve the best possible productivity and efficiency in pile driving," explains Tommi Lähteinen, director, marketing and distribution.

"That's why Junttan developed a completely purpose-built hydraulic pile driving rig in 1983. The model name was PM20. It created a standard for efficient hydraulic pile driving and the base concept is today still the same. The unsurpassed pile handling capabilities, outstanding stability, easy transportation and fast set-up together with uncompromised efficiency in pile driving are even today the features only those Junttan purpose built piling rigs can achieve."

The same high standards were applied to its hydraulic hammers.

"Finland has a long tradition in driving non-prestressed, square concrete piles in extremely difficult soil conditions (uneven bedrock close to the ground surface, soft layers, boul-

(continued on page 41)

In the Junttan 35 anniversary celebration, the Junttan pile driving rig # 1600 and the first new PMx24 model was handed over to its happy owner, Mr. Rogerio Almeida, the director of GNG Construcoes e Comercio LTDA, Brasil.

The engineers of Junttan are dedicated to reach for the best possible production efficiency and operational life time, in accordance to the principals of sustainable development.

ders, frost). Junttan hydraulic pile driving equipment is optimized for high performance pile driving in the most difficult soil conditions, with no compromises in ensuring the pile integrity," added Lähteinen.

Junttan developed the first hydraulic hammer more than 30 years ago, raising the productivity and controllability of pile driving to a totally new level. The physical principles of Junttan pile driving equipment are developed for maximum pile penetration and for minimal pile damages. The energy can be adjusted steplessly for any driving conditions and the hammer performance is not affected by any external circumstances.

"This means, that we can safely drive piles where many other methods or equipment cannot be used," said Lähteinen.

During its anniversary, the company also launched a brand new hydraulic hammer series, the SHK–series that covers hammer sizes from 3 to 9 metric tons.

The revolutionary hammer innovation is known by the nickname Shark. SHK hammers are based on the renowned Junttan technology, but thanks to new innovations, their efficient, silent, and environmentally-friendly operation has been taken to a whole new level.

Junttan hammers are also used without Junttan rigs. For these purposes, Junttan manufactures hydraulic power units, which now have also entered the X era. The anniversary featured the launch of the Junttan 10XCU power unit that uses the same advanced, sustainable technology as all other Junttan X series products.

Countries around the world were quick to recognize Junttan's innovative ways and superior performance, and business grew for the Finnish manufacturer. Today, the rigs are at work in no fewer than 40 countries around the world.

Junttan's anniversary was also a time to publicly commit to "refreshing its brand" which Junttan describes as a continuing quest for the best leading products, a time to "sharpen the promise" to meet the challenges of the future and a commitment to continue to build a respected and strong company.

As part of a refreshed brand image, Junttan has adopted a slightly modified color theme for the company with a basic color of blue. The new rigs also sport the signature new blue.

"It's challenging to keep every single person within the growing Junttan family aware of who we really are and want to be," according to the marketing and distribution director.

"We now emphasize those basic values and success factors that have made Junttan famous all over the world: determination, dedication, reliability, responsibility and doing things until the end – as well as we can," he said.

"Our new slogan 'Respecting Ground' stands for all that we are in addition to understanding the soil (ground) to be able to create the best equipment to build foundations on."

Respecting Ground also stands for:

- respecting the roots (ground) of Junttan and the experience and values we have.
- understanding that by doing our basic work (ground) in the best possible way, we are able to win the trust of our customers.
- supporting the most environmentally-friendly and sustainable piling methods and developing equipment that will leave as small a foot print as possible.

Junttan rigs have performed well on some of the most demanding worksites such as Alberta, Canada's oilsands and at some of the most sensitive projects such as the Lincoln Memorial in the United States. As a result, many job owners now specify in their tenders that pile driving contractors must use Junttan equipment if they hope to be successful in their bids.

Sophisticated Junttan technology is used in various world famous projects and even at the reconstruction of valuable historical monuments like Jefferson and Lincoln memorials at Washington D.C.

A Brief History of Junttan Oy

1976 - Junttan founded by Pentti Heinonen.

1979 - Develops fully hydraulic hammer, dramatically improving efficiency.

1983 - Completes PM20, first hydraulic piling rig manufactured exclusively for pile driving.

1984 - Begins exporting by delivering PM20 machine to Swedish company and starts exports to Denmark.

1990s - Junttan becomes Europe's leading manufacturer of hydraulic pile driving rigs.

1993 - New HHK-A series of hydraulic hammers launched.

1996 - First heavy-duty rig PM 26-40 launched.

1970s 1980s 1990s

Looking ahead

The company moved to new facilities in 2008, which will allow Junttan to exercise more flexibility in production and to manufacture more equipment to meet a growing world demand.

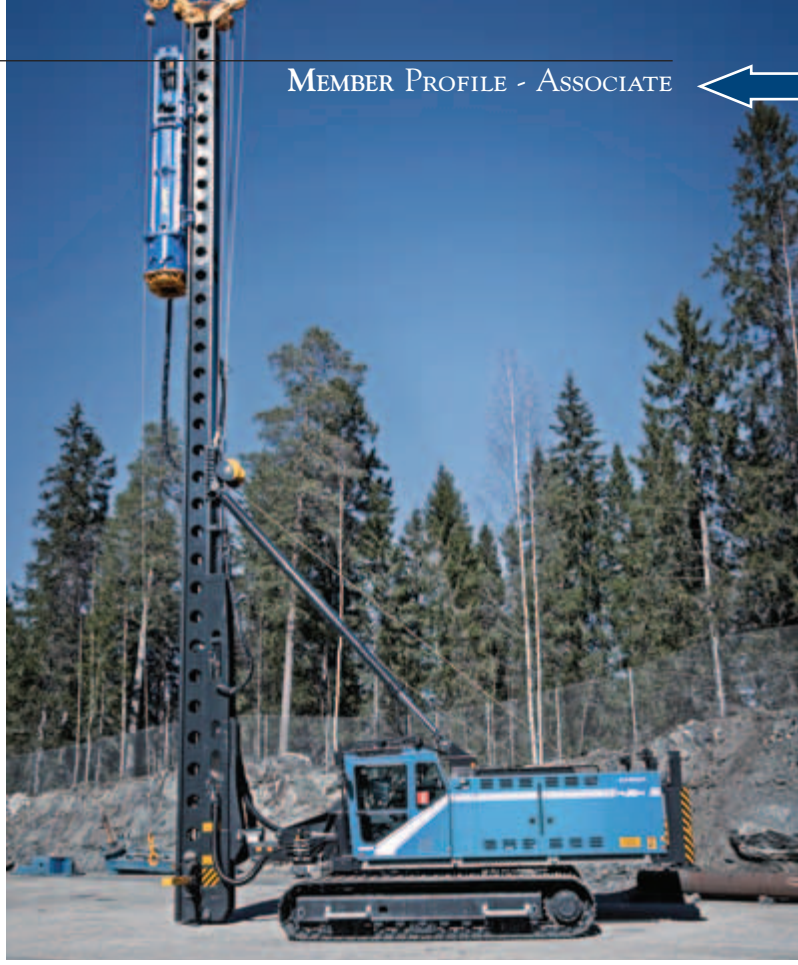
"We also have a strong owner base, and during the recession, we were able to develop new products which are now launched and ready to conquer the world. All this gives us a solid foundation for the future," stated Lähteinen.

More products, more sales mean Junttan must also boost its after-sales operations, including service training programs, to meet the challenges of growth.

"That's why we have set the development of our after-sales operations and global partner network to have the highest priority during our strategy season for the next three years," said Lähteinen.

"To achieve our vision to be the most successful piling equipment manufacturer in the world and the most desired partner in its field will require a lot of work, but keeping our 'respecting ground' ideology in mind at all times will surely guide us to achieve our goal." ▽

Photos courtesy of Junttan Oy.



As part of a refreshed brand image, Junttan has adopted a slightly modified color theme for the company with a basic color of blue. This also stands for the rigs, those now have a new bluish outlook as a standard color theme.

2001 - New HHK-S hydraulic hammer range launched.

2005 - New drilling rig platform launched.

2006 - Junttan becomes part of the PiloMac group.

2007 - Launches biggest hydraulic hammer HHK 25S and 1,000th hydraulic hammer.

2008 - Manufactures 500th Piling rig; moves to new plant.

2000s

2010 - The Brotherus family becomes majority shareholder.

2010s - Acquires ExcaDrill rock drilling business unit from Pilomac Oy.

2010

May 6, 2011 - Junttan Oy celebrates its 35th anniversary in Kuopio, Finland with clients, owners and staff.

2011

Salt Damage to Wood

"Fuzzy Wood" Often Confused with Fungal Decay

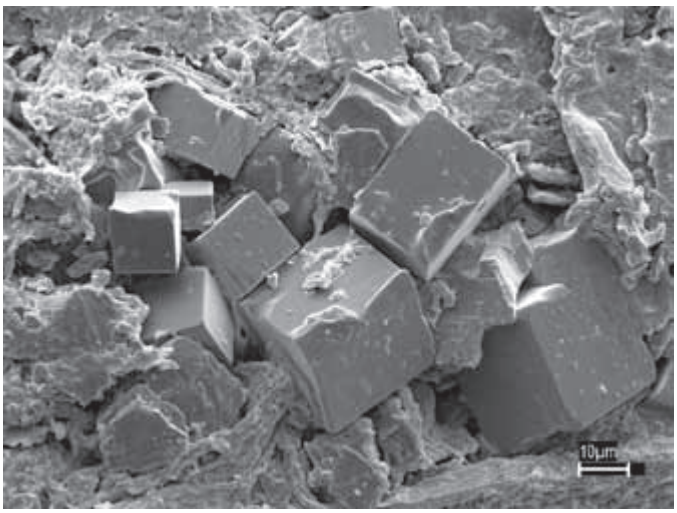
Techline: Fuzzy wood (salt damage).

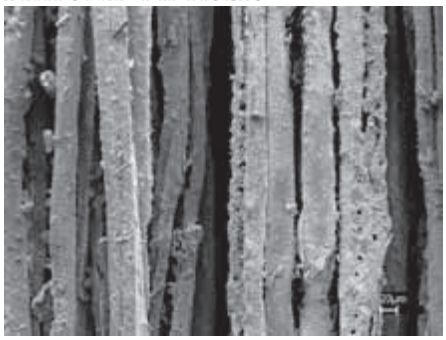
There are many types of deterioration that can affect wood in-service. One potential problem that dock owners are faced with is the occasional development of "fuzzy wood" caused by salt uptake into the wood (Figure 1). This salt damage is sometimes seen in wood that is chronically exposed to salt such as marine pilings, bridge decks where salt is used as a de-icer, utility poles that are splashed with road salt or wood associated with salt storage. It is also referred to as "salt kill" or salt defibration.

Wood in this instance acts like a bundle of straws that wicks salt water into the wood structure, As the wood surface is exposed to heat and drying (as from direct sunlight), the water evaporates and salt crystals are formed in wood cells (Figure 2) Over time the physical forces exerted by the salt crystals pushes the fibers of the wood apart, causing the "fuzzy" appearance (Carol Figure 3a). This phenomenon is often seen in extreme environments, both hot and cold. Past research at FPL has shown that salt damage can accumulate in as little as 5 years of repeated wetting and drying cycles. Salt damage can be observed on untreated wood, or wood treated with waterborne preservatives, such as CCA (Copper Chromated Arsenate) and ACQ (Alkaline Copper Quat). It does not usually occur on wood treated with oily preservatives such as creosote because the oil forms a barrier to the salt movement. (Although salt damage can be unsightly,

Figure 1 (Left): Pilings in Charleston, SC. damaged by salt exposure. This piling was located in a marina and subjected to frequent wetting and sea-spray.

Figure 2 (Bottom): Scanning electron micrograph of salt crystals found in fuzzy wood samples from a pile in Charleston, SC SEM micrograph provided by Tom Kuster, chemist at FPL.





the fuzzy wood needn't be a cause for alarm. The gradual sloughing off of the wood surface proceeds slowly and the wood beneath the affected area remains sound. Salt damage has been observed on poles and piles that are still in service after 25 – 30 years. Paints, coatings or barriers have been suggested to prevent the movement of water from the wood surface, but the efficacy of these treatments is unclear.

Salt damage is sometimes confused with fungal decay, although characteristic signs of salt damage are considerably different than that of fungal decay. Two kinds of fungi are primarily responsible for structural failure of wood–brown-rot fungi (Fig. 3b) and white-rot fungi (Fig. 3c). When wood is infected with brown-rot fungi, the wood darkens and cracks across the grain in a cubicle pattern. It eventually shrinks and becomes crumbly. When white-rot fungi infect wood, the wood may lose color and appear bleached. White-rotted wood does not crack or shrink. It retains its outward shape and often feels spongy. A third less important kind of decay, called soft-rot decay (Fig. 3d), occurs under very wet conditions or on wood surfaces that are alternately wet and dry over a long period of time. Soft-rot generally causes the outer surface of the wood to become soft when it is wet, but the zone immediately under the soft rot is typically still firm. None of these fungi can grow in conditions of high salt. Chemical preservatives provide the best protection against deterioration of wood by decay fungi in outdoor applications. ▽

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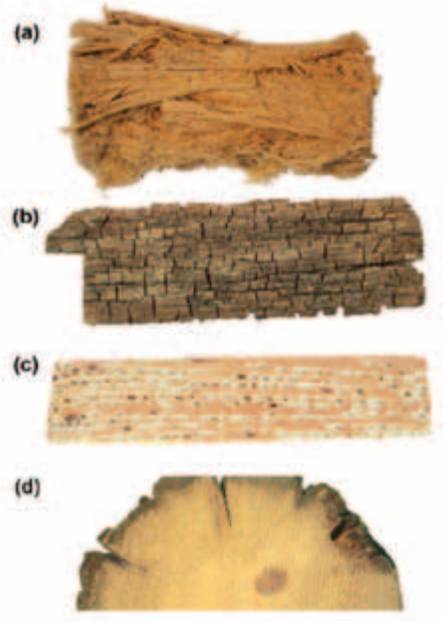

Figure 3: Examples of salt damage (a), brown rot decay (b), white rot decay (c) and soft rot decay (d).

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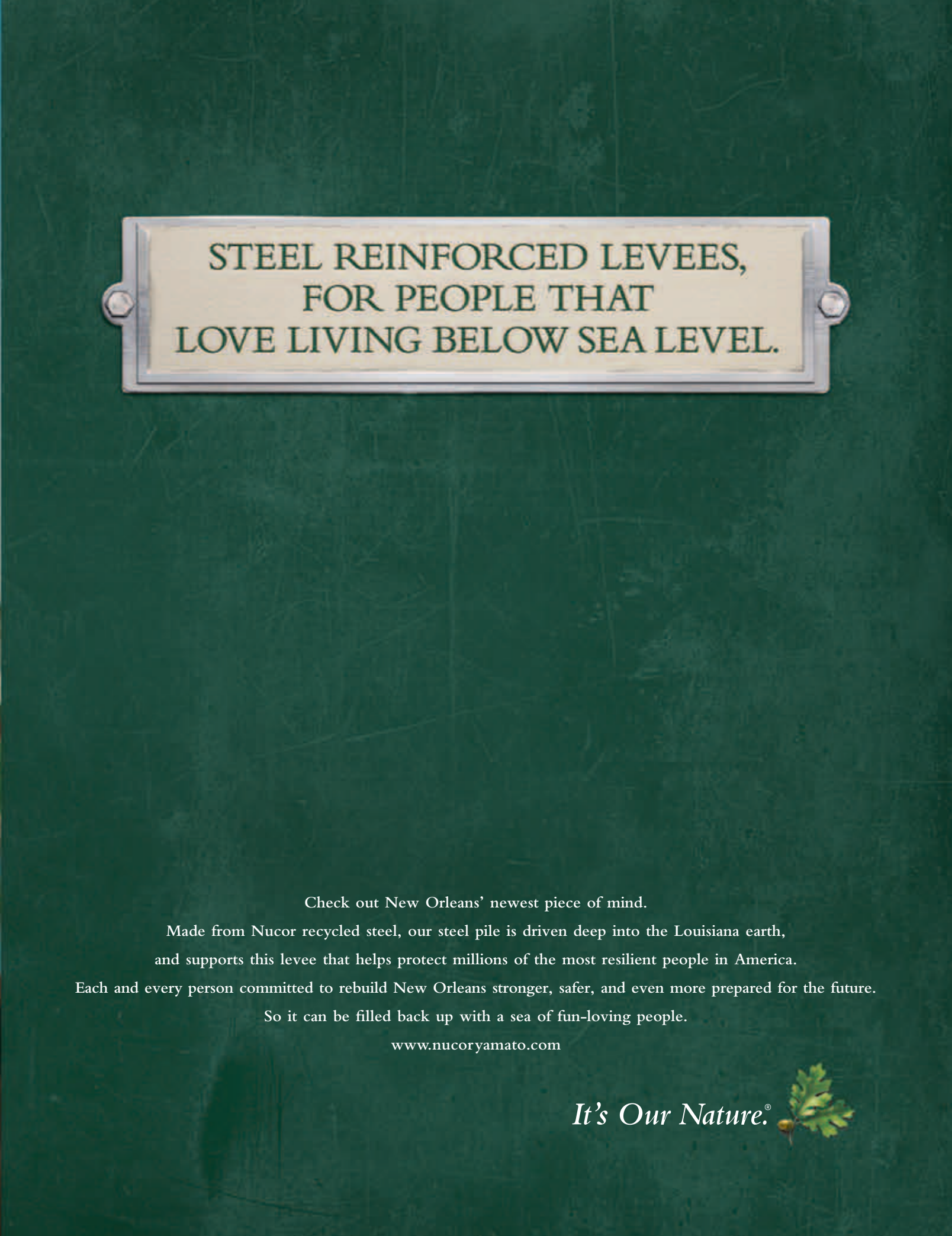

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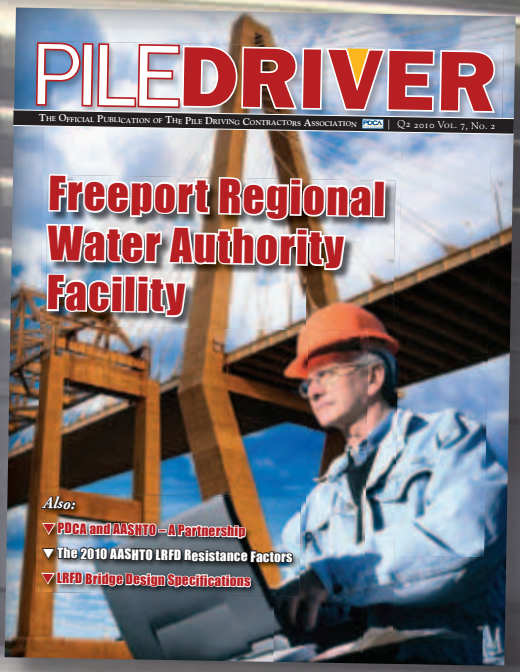

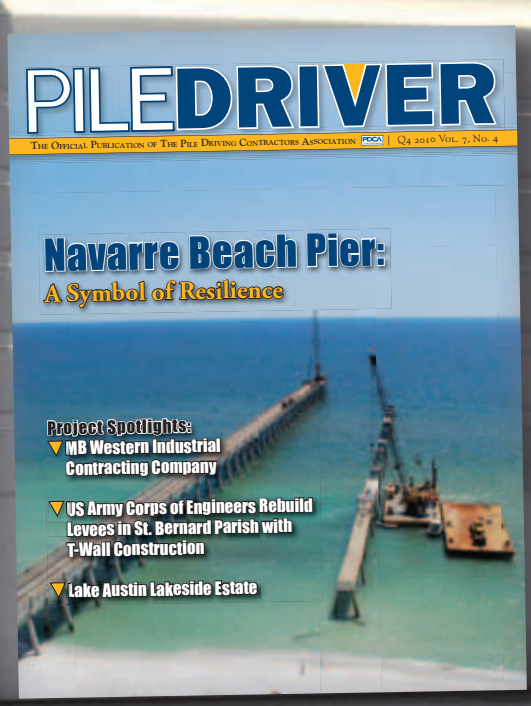

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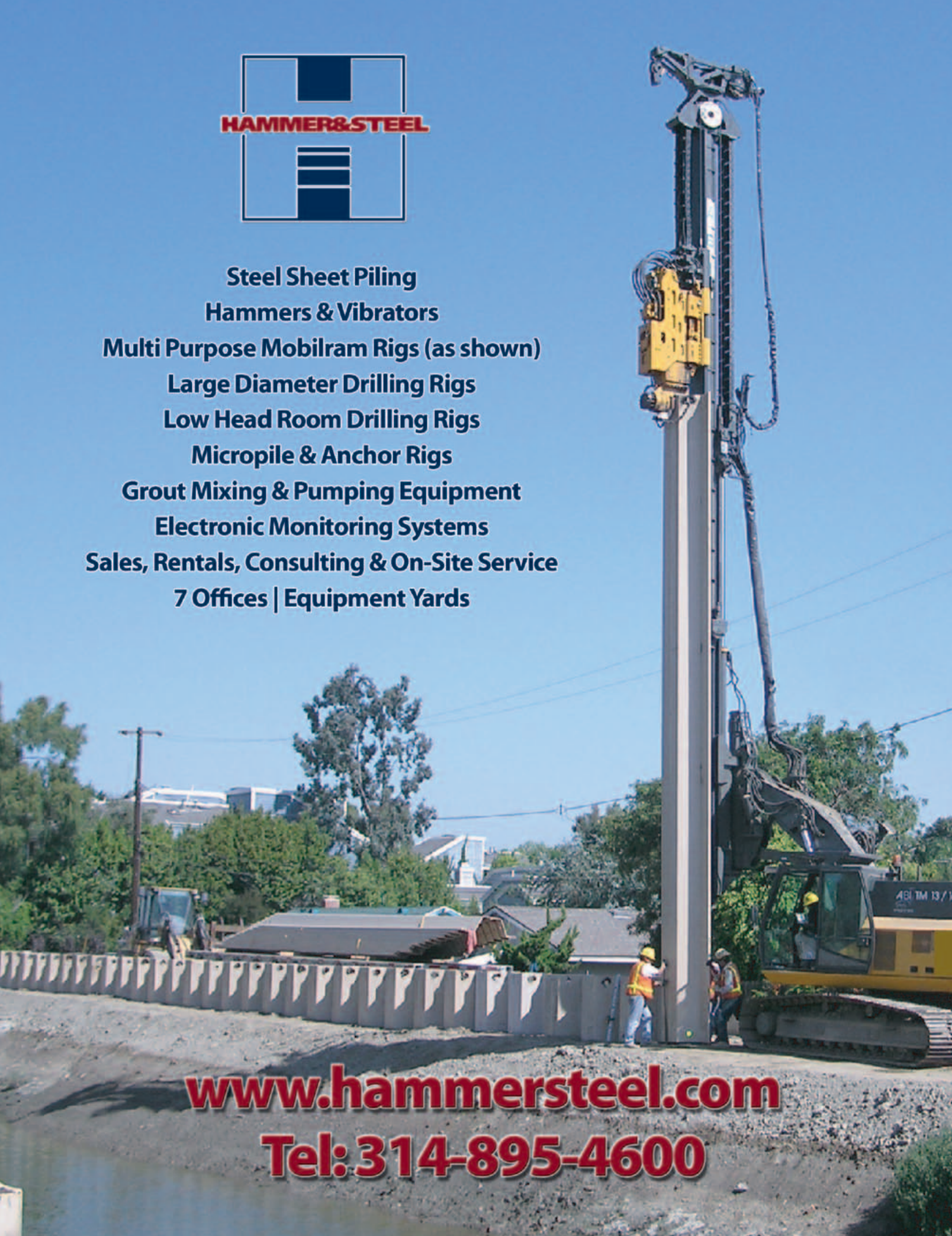
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