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THE OFFICIAL PUBLICATION OF THE PILE DRIVING CONTRACTORS ASSOCIATION | Q3 2009 VOL. 6, NO. 3

Professors' Driven Pile Institute 2009

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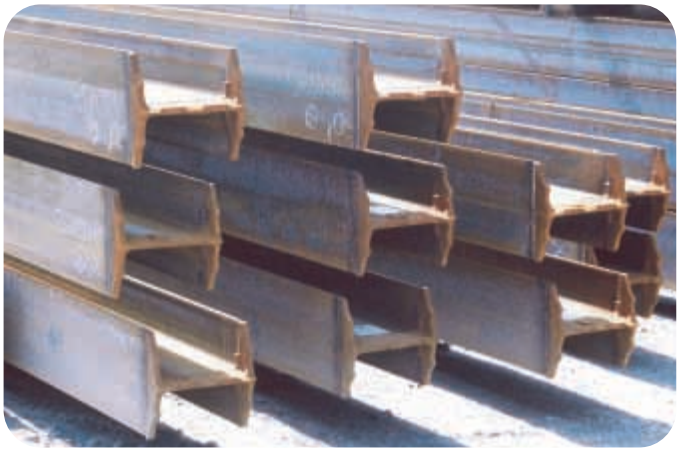

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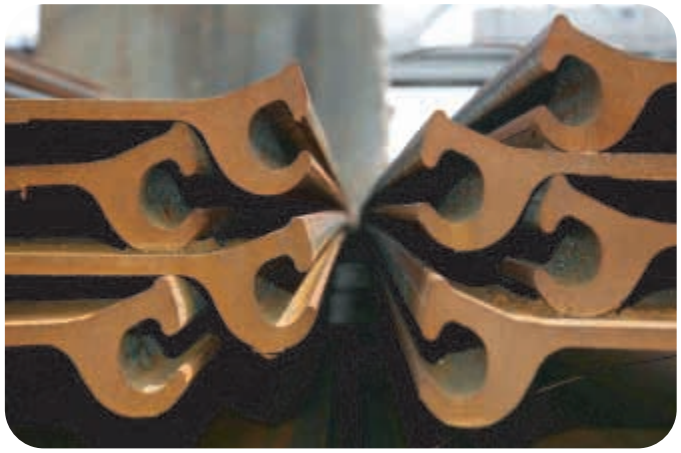

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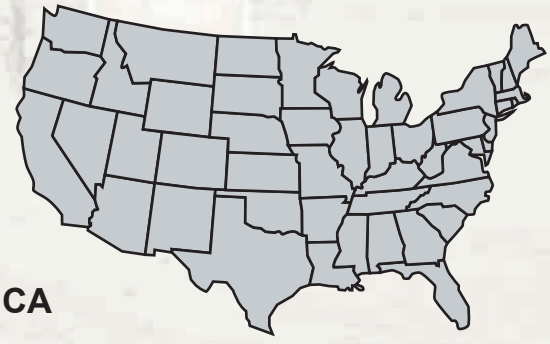

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Have You Got 5 Minutes:

By John King

I just returned from the 5th PDCA Professors Driven Pile Institute (PDPI) held at Utah State University, in Logan, UT. The PDPI was a great success with 26 professors attending the program, representing universities from Fairbanks, AK to Waterloo, Ontario, Canada; from Fresno, CA to Potsdam, NY; from Ann Arbor, MI to Boca Raton, FL; and from Dublin, Ireland to Buston, LA; and everywhere in between. The PDPI is a great PDCA success story, providing the nation's leading engineering professors with the expertise to teach over 5,000 engineering students about driven pile advantages. Without question, this program is the standard by which all "teach the teacher" programs are judged. PDCA members should be proud of this program and the contributions each of you have made towards its success.

I am asking all PDCA members to take five minutes out of their day and contact a professor who attended the PDPI, or, if you prefer, a professor from a college of your choice and ask if there is anything you can do to introduce them to the world of driven pile. One suggestion is inviting the students to a job site to watch piles being driven, demonstrate how a hammer works in conjunction with the crane and leads, or how piles are manufactured. Students, just like the professors, will remember such an experience and hopefully put what they learn into practice or they may want to learn more as they continue their education. If engineering students are learning about deep foundations, PDCA members should do whatever they can to facilitate access to driven pile education. If necessary, do the teaching, and always teach the teacher.

On July 10, 2009, Brian Anderson, professor at UNC Charlotte and a presenter at PDPI, will bring his class of engineering students to Charleston where the PDCA South Carolina chapter will host a program to teach them more about driven piles. First, Palmetto Pile Driving and Parker Marine will show them their pre-stress yards for a presentation on the manufacturing of concrete pile; S&ME will conduct a cone penetrometer test; and then the students will make their way to a job site were Pile Drivers Inc. will drive 105-foot by 12-inch pre-stressed concrete piles. This entire program came about as a result of a five-minute conversation between Anderson and me.

Since the IFCEE '09 in Orlando, FL this past March, I have spoken at a Green Day event in Delaware supporting the environmental advantages of driven piles, played golf with past presidents Harry Robbins and Van Hogan, and past treasurer Trey Ford in Jacksonville, FL during Skyline Steel Company's annual TPC Bash; flew to Newark, NJ for the Geo Coalition meeting and met and had dinner with PDCA's first President Skip Gardella.

I consider myself lucky to be the PDCA President during these tougher economic times, as I get to see the true passion people have for this wonderful industry. In all my travels, every day I see pile drivers meeting with design teams to advocate the advantages and many uses of driven pile. While other deep foundation advocates might talk about their systems, pile drivers can always say the best choice for deep foundations, hands down, is a driven pile.

This message will be getting louder and louder as our chapters continue to grow. PDCA has added Florida to its list of local PDCA chapters and we are close to getting the PDCA of the Northeast Chapter off the ground.

For those of you who did not make it to IFCEE you missed Rusty Signor's talk about how he is promoting driven pile in the Austin, TX area. A few times each month, Rusty throws a driven pile demonstration for engineers at his job site, followed by a Texas BBQ lunch. He has opened up more doors for driven piles and business for himself by just making a few calls and buying a few lunches. Good for you Signor and keep up the good work!

Remember, DRIVEN PILES ARE TESTED PILES! ▼

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Executive Director's Message

By Stevan A. Hall

I want to discuss three topics with you in this message:

First, I want to provide a brief closing statement regarding the PDCA's 5th Biennial Professors' Driven Pile Institute recently held at Utah State University. I am not going to go into much detail, since PDCA past president Van Hogan and a three-year veteran (2003, 2007 and 2009) of the PDPI did such an excellent job of writing an article on the 2009 PDPI for this edition of PileDriver magazine.

PDCA cannot express in enough words or enough times how grateful we are for the financial support we continue to receive each year from our members for this very important program. PDCA knows that your support not only makes the continuation of this program possible, but also allows the PDCA to present it with a quality of excellence unmatched in the deep foundation and earth retention industries today.

Let me put this into perspective another way: your support of the PDPI has provided extensive driven pile training to over 125 professors teaching undergraduate or graduate courses in deep foundations. Conservatively, this translates into more than 7,500 students who have earned a degree in civil or structural engineering, who now know more about driven piles and can put that practical knowledge to work in the field – all as a result of their professor attending the PDPI.

As with any program, there are people behind the scenes who also contribute greatly to the success of the PDPI program. First on the list has to be Joe Caliendo, Utah State University. Caliendo has helped organize all five PDPI programs and coordinate all activities, including: agendas, speakers, field demonstrations, computer labs studies, course material, meals, rooms and so much more. PDCA is grateful for his participation and leadership. Caliendo will tell you that he could not have done so much without the help of his colleagues, who include Loren Anderson, Jim Bay and Ken Jewkes.

PDCA also needs to express our appreciation to all of the instructors who provide superior presentations during the PDPI. These are the guys who put the meat on the bone, so to speak. PDPI speakers create their own presentations, which require a significant amount of time and effort on their part. The value of the material and information they provide is absolutely relevant to driven piles and is presented

in an academically tangible format. A special thanks to the PDPI speakers, George Goble, Van Komurka, Pat Hannigan, Brian Anderson, Frank Raushe, Kyle Rollins, Aaron Budge, Brady Cox and Steve Dapp.

Finally, thanks to Build Inc. and Sun Piledriving Equipment for bringing their crews, hammers, equipment and piles to Utah for the field demonstrations and driving the piles for us. Thanks to Campbell Scientific for the data collection; Conetec Inc., for the CPT demonstration; Jay Apedaile Drilling for the soil sampling SPT; Pile Dymanics for the dynamic load testing; Emeca/SPE USA, for the concrete splices, and Dan Brown & Associates for the load testing supervision.

Secondly, I want to remind everyone that the PDCA has scheduled three educational programs coming up in September and November. On Sept. 24, 25, and 26 the PDCA, in conjunction with Foundation QA, will present the PDA Test Interpretation and Capwap Analysis Skills Development course and the High Strain Dynamic Pile Test Certification Exam at the Crowne Plaza Center City, Philadelphia, PA. For more information, go to www.piledrivers.org; or to register go to www.foundationqa.com.

PDCA has also scheduled the 10th Annual Design and Installation of Cost-Efficient Piles (DICEP) Conference. The program is scheduled for Nov. 19 at the Walnut Creek Marriott, Walnut Creek, CA (just east of Oakland). This year's DICEP theme is "increasing useable pile capacity to reduce project foundation costs; and optimizing dollars per ton of pile bearing to reduce project foundation costs".

And, the PDCA has scheduled a "Pile Driving Inspectors" course at the InterContinental, New Orleans on November 12, 2009. More information on this program will be available in the near future.

Finally, I want to remind everyone that the PDCA will present the 14th Annual International Conference and Exposition on May 6, 7, and 8, 2010 at the Coeur d'Alene Golf and Spa Resort in Coeur d'Alene, ID. This program will feature industry presentations, committee meetings, the 3rd annual PDCA golf tournament, an evening cruise on Lake Coeur d'Alene, theme dinner on the lake, companion's program, exhibitors, receptions and a whole lot more. Mark your calendar for this event – you won't want to miss it. ▼

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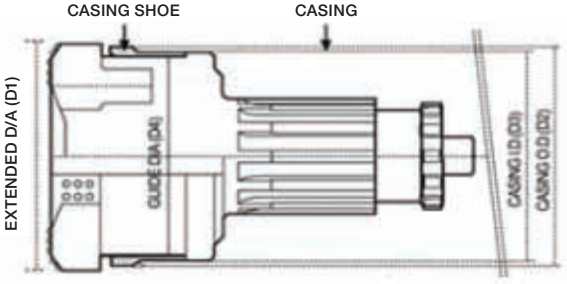

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We are the premier association for pile-driving contractors

The PDCA was founded in 1996 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 has 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.

All PDCA members receive a complimentary copy of the PDCA's codebook, *Recommended Design Specifications for Driven Bearing Piles*, now in its third edition. This book covers all required guidelines for driven piles and includes a suggested bid and payment schedule.

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

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

"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.

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. ▼

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PDCA

MEMBERSHIP APPLICATION

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.

Individual

- ○ **Technical Affiliate Member -** **($100.00)**
  Individual who is involved with the design and installation of driven piles or in teaching the art and science of pile design and installation. May be employed engineers, architects, government or university employees. As a Technical Affiliate, your name and contact information will be displayed in the membership directory as well as on our Web site.

- ○ **Retired Industry Member -** **($100.00)**
  Individual who has reached retirement age, left active employment, and wishes to remain a member.

- ○ **Student Member -** **($20.00)**
  Full-time students studying towards a bachelor, master or doctorate degree in a regular university program.

- ○ **Affiliate Labor Organization Member -** **($100.00)**
  Concerned with pile driving for the purpose of gathering and sharing information.

- ○ **Organization Member -**
  Non-voting membership category. Must be approved by the PDCA Executive Committee.

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 Members – check all products and services that your company provides:

Accessories

- ❒ Cutter Heads and Drill Bits
- ❒ Dock and Marine Supplies
- ❒ Hammer Cushions
- ❒ Other
- ❒ Hoses and Fittings
- ❒ Lubricants and Grease
- ❒ Pile Cushions
- ❒ Pile Points and Splicers
- ❒ Rigging Supplies
- ❒ Safety Equipment

Materials

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

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
- ❒ Pile Driving Monitoring
- ❒ Geotechnical
- ❒ Marine Drayage
- ❒ Surveying
- ❒ Civil and Design
- ❒ Other
- ❒ Testing
- ❒ Trucking
- ❒ Vibration Monitoring
- ❒ Materials Testing

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	❒ International	❒ Other	

Step 5: Method of Payment

I am providing payment in the amount of:

❒ $850.00 ❒ $425.00 ❒ $100.00 ❒ $20.00

I am making payment in full by:

❒ Check ❒ Visa ❒ MasterCard ❒ American Express ❒ Discover

Card Number: _____ Expiration Date: _____

Name on Card: _____ Security Code: _____

Statement Billing Address _____

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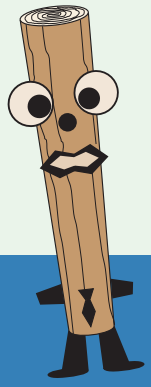

Did You Know?

As a 100-foot-long concrete pile was being lifted into the leads of the pile driving rig, it was placed into a pre-drilled hole approx. 40 feet deep. As the load of the pile was carried by the top block, the rigging gear slid up the pile and proceeded to get stuck between the hammer and the fixed leads. The pile is safely installed 40 feet into the ground and the damaged rigging gear has been removed by contractor personnel. The contractor is removing and replacing all the cable from the pile driving rig.

Is there a required inspection that must be performed before the equipment can be placed back in service?

First and foremost, in any post accident event you must consider the condition of all items in a fixed lead configuration. This means any equipment which may have been effected by

- the static or dynamic forces involved in supporting a load
- instantaneous release of the load
- the reactive forces that are unleashed by the load

The inspection needs to include all structural components from the head-block/sheaves thru the lead structure, to the boom point connector down to the spotter connection.
Examining for distortion to the dimensions and strength of the lead structure as well as weld integrity to the components are all very critical.
Failure to note weakened components and the general structure of the leads may lead to later failure at a critical moment.

A secondary inspection should be made of any items that received impact from the rigging to determine if repairs are required.
It is recommended to ask the manufacturer of the leads for their manual to assist you in identifying what items, including weld points, need to be examined.
In order to best understand what the limitations and original dimensions are of the leads in question, it is also recommended that you contact the manufacturer to discuss.
Many use computerized stress analysis and calculations when they design and manufacture leads and accessories which should be helpful information to you when ensuring if the item can safely remain in service.

Finally, it goes without saying that all rigging should be inspected, disposed of or re-certified before re-use.

PDCA Did You Know

The first meeting of what was to eventually become the Pile Driving Contractors Association was held at the O'Hare International Airport, Chicago, Illinois in 1994. The purpose of this initial meeting was to discuss the potential success of an organization that would exclusively represent the driven pile industry.

PDCA President John King (Pile Drivers, Inc., Hollywood, SC) went to great lengths to make sure the list below included everyone that attended the historic meeting. If you are aware of any additional people that attended this meeting, please let the PDCA know their names. The meeting was set up by Mr. Chuck Whitaker of Skyline Steel Company and included the following individuals:

- Robert Brode, W.M. Brode Company, Newcomers, OH
- Wood Ford, Ford Pile Foundations, Inc, Virginia Beach, VA
- Richard Stromess, Build Inc, Bountiful, UT
- Wayne DeWitt, DeWitt Construction, Vancover, WA
- Reginald Lee, Hawaiian Dredging Construction, Honolulu, HI
- Tom Wysockey, Thatcher Engineering, Chicago, IL
- D.R. Jordan, Jordan Pile Driving, Inc., Mobile, AL
- David Jack, Kiewit Pacific, Concord, CA
- Earl Lawrence, Lawrence Construction Company, Littleton, CO
- Chuck Whitaker, Skyline Steel, San Francisco, CA
- Skip Gardella, Norwalk Marine Contractors, Norwalk, CT
- Doc Jinnings, Hercules Equipment, Fort Wayne, IN

John King and the members of the PDCA express their sincere thanks and gratitude to all of these men who took a chance, displayed a true sense of vision and leadership and started the PDCA.

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Herbert F. Darling Inc. Company Spotlight

By Herbert F. "Buck" Darling III

History of the Company

The task for the day on the July 1, 1937 was to order the opening of the books of subscription for shares in the newly forming corporation that would come to be known as Connelly Brothers Inc., which had been operating in some capacity since approximately 1918. There were 1000 shares available, set at $100 a piece. The shareholders, in order of the number of shares held were to be, Mr. M. J. Connelly, who had lost his brother and business partner, Mr. Herbert Darling Sr., and Mr. T. Gordon Gutting. Soon after the shares were sold, the first meeting of the shareholders was called at the business' location in the Second National Bank Building in Cincinnati, OH. At the meeting, the board of directors was elected. Three shareholders were elected directors. The code of regulations of the corporation were written and agreed to by vote of the new board. And finally, the officers of the corporation were set, with Mr. Darling as president, Mr. Gutting as vice-resident, and Mr. Connelly as secretary and treasurer.

The brothers carried out the business of heavy construction in and around the Ohio area for approximately three years after incorporation. The corporation bought equipment from Connelly, which included two model 104 and two model 4 cranes manufactured by the Northwest Engineering Company. They also purchased one #5 and #6 air hammers manufactured by McKiernan Terry, and two compressors totaling 550 cubic feet per minute to run them.

Most of the work Connelly Brothers Inc. did was in the sewage treatment fields which were a primary concern at the time. These projects included work on sewage treatment plants, large diameter pipelines, and tunneling contracts at which Connelly Brothers had become skilled. During this time, Connelly decided that without his brother, he didn't want anything to do with the business anymore. Connelly Brothers Inc sold its assets to Darling Sr., forming the company Herbert F. Darling Inc.

Having heard of massive construction spending in New York State involving the sewage treatment and power plant

construction industries, Herbert F. Darling Inc was moved to Lockport, NY to take part in the construction of a new power plant involving hard rock tunnel work for the raceways, and the plant itself. Two years later the company was moved again to the Village of Williamsville, NY (a northeast suburb of Buffalo, NY) where it remains to this day.

Over the years, Herbert F. Darling Inc. gradually transformed from a general contracting company that did heavy, industrial, utility, and tunnel work, along with some pile driving, to a deep-foundation, shoring and marine contractor specialist with some general construction work that involved mostly pile driving. Due to the emergence of other construction companies interested in utility and public works projects, Darling was forced to change – as we could no longer offer competitive rates while maintaining our high standards.

Herbert Darling graduated from Dartmouth College in Hanover, NH in 1925. After college, he went directly to work for Connelly Brothers, and later formed Herbert F. Darling, Engineering Contractors. The company was incorporated in 1967, which became known as Herbert F. Darling Inc. The company was run under the Darling Sr. until his unexpected passing in 1968. A hastily implemented succession plan was formed that was almost undone by the IRS. This nearly resulted in the closing down of the business in order to pay estate taxes. Having successfully navigated the transition, Herbert F. Darling, Jr. took over the helm.

Herbert F. Darling III (Buck) started with the company in 1981, and worked for his Dad until 1987 when it was decided, against conventional wisdom, that Buck's brother-in-law, Tom Weaver would be brought on board as a partner to assist in the ever more complex task of running a modern-day successful company. Weaver would take charge of the financial/tax/insurance aspects of the day-to-day running of the company, with Buck administering the field work. This decision would be found most beneficial in the future. In 1999, the two partners of the corporation were left to their own devices in the day to day operation of the company, with Darling Jr. still covering their backsides. In 2003, Darling Jr. formally retired, leaving the two partners with a successful and healthy corporation. The company remains healthy and strong and hopefully will well into the future under current management.

A legacy of foresight, truth, fairness, and dignity

Throughout the entire history of the company, the leadership and employees have shown great foresight in employee/employer/client relations. This foresight would be expected of all the different generations of management that would lead it. Darling Sr. was instrumental in the formation of union benefit plans that secured the financial future and well-being of his employees. He routinely told his employees how valuable they were to him and the long-term success of the company. They were a part of his family. Every employee had a stake in perpetuating the stellar reputation of the company. This has led to much industrial work being performed by the company in the early days without so much as a contract or a bid in place. For many years in the heyday of the steel mills and chemical plants in the area, no work had to be bid on at all. You were there, you did the job well, and plant management kept you there based on your performance. This in turn led to other work in other places, owing solely to your reputation. Darling's reputation allowed it to get contracts through the lean times as well, even when potential clients would receive 8 to ten bids on a project. Back then, your company's reputation meant something, and work was the reward. The reputation of the company has been and continues to be jealously guarded by not just management, but by all its employees. Everyone knows the value of a safe job done well.

All three generations of Herbert F. Darling management have participated in the negotiation of fair union contracts, holding them in high regard. The company cannot exist without the union, and the union cannot exist without their signatories. Market recovery has always been high on the list of these negotiations, leading to some very difficult but important concessions by both the union and management in order to ensure the continued viability of union construction. Without these types of negotiations, the future of both company and union are uncertain.

Keeping up with technology and safety

Foresight meant keeping up with the technological changes that have evolved over the years, as well as running safe jobsites. In order to be successful, one has to at least keep up with these changes and be a leader in incorporating new technologies into the safe and successful completion of any given project. Herbert F. Darling Sr. understood this and was ahead of the game in equipment purchase, as he purchased the newest cranes of the time. This made the workload easier and safer for his employees. Darling Jr., who also believed in staying current and cutting-edge, invested heavily in computers and software, providing his employees with the latest tools for successful bidding and construction management.

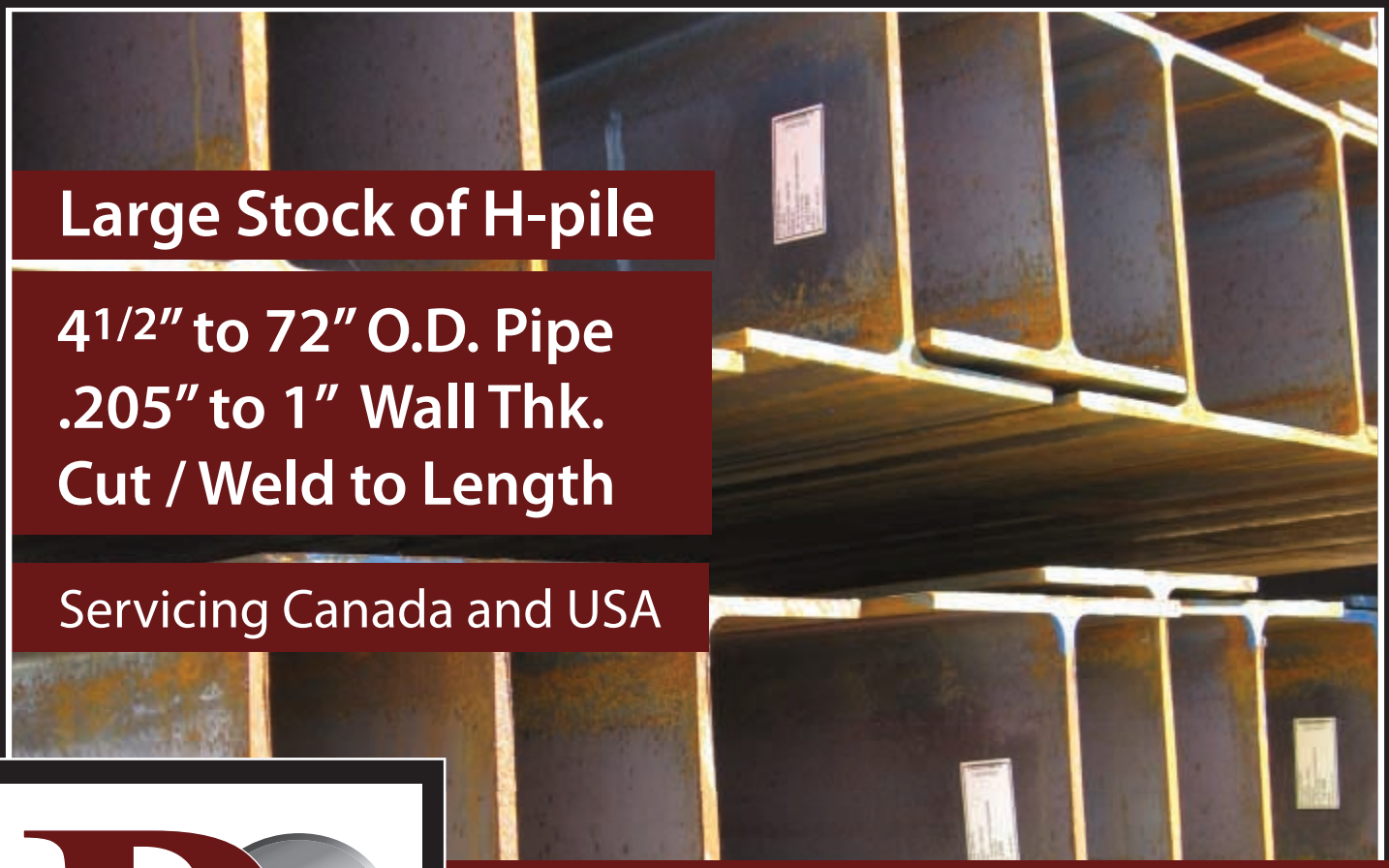
He also took great risk in utilizing the emerging technologies of the pile driving industry, implementing in the mid-'70s the use of mandrel driven, corrugated steel shell piles on the Buffalo Sewage Treatment Plant project, which required 13,217 piles. Darling Jr. was also instrumental in bringing the resonant hammer to the Buffalo light rail rapid transit projects of the early 1980s. This project was done in close proximity to the many storefronts located on Main Street in downtown Buffalo, NY. The so-called Bodine hammer successfully drove

hundreds of soldier piles for the cut and cover sections of the subway without any damage to structures from the vibratory hammers. This hammer had many problems with breakdowns and almost guaranteed the failure of the project. But the persistence of Darling Jr. along with a fine group of pile drivers and operators who contributed to the re-design of parts of the unit the project, the project was a huge success.

The current management of Herbert F. Darling Inc. hopes to be a part of the resurrection of the Bodine hammer. Resonance Technologies Inc.'s newest incarnation of a much simplified, more dependable, and more powerful resonant hammer will greatly speed up pile driving. It will also help to reduce insurance claims through minimal to non-existent transmission of vibration.

Herbert F. Darling Inc. has come to be a third generation, family held construction company dedicated to safe and cost-efficient performance. Not many companies, construction or otherwise, live to see the successful transition from first to second generation ownership, never mind beyond. With the guidance of 69 years of past management, and with its crew of union construction professionals in the form of superintendents, operating engineers, pile drivers, laborers and teamsters, it is well suited to perform high quality work for the foreseeable future.

Lately, the PDCA has come to have its own influence on the continued success of the company. As one member among many, the PDCA's ability to advocate for the safe and economical use of driven piles cannot be understated. It is also a great source of information on how to safely and economically make use of driven piles in unique situations. The PDCA is keeping the industry vital by providing avenues for better communications between project owners, geo-technical engineers, structural engineers, company management, and employees. Indeed, the future of the pile driving industry is bright. ▼



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Drive-Con HAMMERS HOME customer service

Having the best equipment in the industry certainly makes Drive-Con's job easier. As a distributor of J & M Foundation Equipment and American Piledriving Equipment (APE), Drive-Con provides the Mid-Atlantic area with a variety of foundation equipment. Both J & M and APE have the reputation of manufacturing some of the best equipment in the industry, designed for maximum production with low operation and maintenance costs. When you combine superior equipment with a company that believes in service as their top priority, you have all the right ingredients for success.

Drive-Con started in 1987 as a small distributor of pile driving equipment in Jessup, Maryland. Jessup is a halfway point between Baltimore, MD and Washington, D.C. so the location was perfect for supplying and servicing both markets. Since its start, Drive-Con has grown exponentially and has moved its location a few miles north to Annapolis Junction, Maryland. But one thing has remained constant since day one – the dedication every employee has to providing the customer with the very best service and support.

Drive-Con is proud of the success they have achieved over the years, and they are proud of their dedicated employees for making that success possible. The philosophy driving Drive-Con is that each customer is as important as the next and every customer is considered a long-term commitment, not a short-term prospect.

With the support of the engineers and staff at J & M and APE, Drive-Con is able to assist customers with any job under any condition, even when special setups are required. Between the three companies, they have used their equipment all over the world and have seen just about every unique job situation.

Terry Lee, Jill Kennedy, and the late Frank Moger were the three founders of Drive-Con. Moger worked for Stanhope Steel as a salesman for years and had a long list of loyal friends and customers in the construction industry. Lee started in the industry when he was a teenager by helping his father repair pile driving equipment. Lee's reputation as a trusted, dependable expert in the pile driving equipment industry follows him to this day. Kennedy started as a secretary with no knowledge of pile driving equipment, but with the help of experts in the industry she has since learned the business. Since neither Lee nor Kennedy had business training or engineering backgrounds they had to rely on establishing long-term customer relationships through exceptional service. Both attribute Drive-Con's success to its hardworking, dedicated employees, who all strive for the same goal – satisfied customers.

While Drive-Con is a relatively small company, over the years it has provided equipment to some of the largest jobs in Maryland, Virginia and Washington, D.C. Their equipment was used on the Coleman Bridge project in Yorktown, Virginia, which was a project that used unique bridge building techniques in order to minimize traffic disruption. It was the first time in the U.S. that a bridge was built 30 miles off-site and floated on barges to its permanent location. Drive-Con has supplied equipment on portions of the Woodrow Wilson Bridge, the Baltimore Ravens stadium, the new Washington Nationals Ballpark, the National Harbor project-Gaylord Hotel and the World War II Memorial.

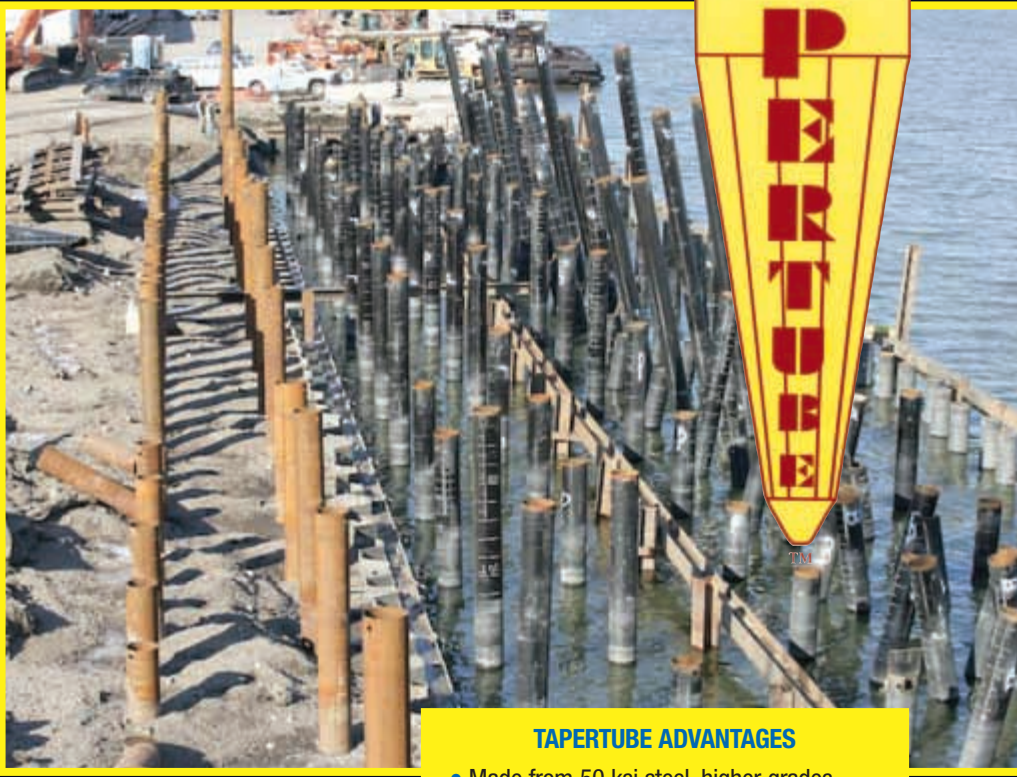
They currently have equipment on two of the largest jobs in the metro area. The Intercounty Connector project is an ongoing design/build project in Maryland that will link existing and proposed development areas with an 18 mile tolled highway. The project is estimated to cost about $2.5 billion. Drive-Con has equipment on each of the five phases, the first of which began in 2007. The other massive project in the metro area is the HOT Lanes Project. This project is a design/build job worth approximately $1.4 billion and has over 50 bridges and overpasses on it. HOT lanes are tolled lanes that

operate alongside an existing highway. Buses, carpools (HOV-3), motorcycles and emergency vehicles will have free access to HOT lanes, and drivers with fewer than three occupants can choose to pay to access the lanes. Tolls for the HOT lanes will change according to traffic conditions in order to regulate demand for the lanes and keep them congestion free. Drive-Con has had both diesel pile hammers and vibratory driver/extractors on this project.

Despite these uncertain economic times Drive-Con is on a strong and steady course. The variety of equipment available to Drive-Con and its customers is expanding with the new APE pile driving rig, which can be equipped with a hydraulic impact hammer, diesel hammer, or a vibratory hammer. It has been used to drive over 4,000 pipe pile on a project in Florida. The company is also excited about "going green". All the new power units are equipped with the EPA Tier 3 off-highway compliant engines. More and more projects are requiring cleaner running equipment so J & M and APE provide alternative bio-friendly vegetable-based fuels and lubes to make all of their equipment environmentally safer.

Over the last 22 years, Drive-Con has provided hundreds of customers with the pile driving equipment necessary to complete a large range of projects. With a reputation for outstanding service, Drive-Con will continue to build their customer base while working to maintain their long-term relationships with many local companies. Superior equipment, dedicated employees, and unparalleled customer service and support will ensure continued success for Drive-Con. ▼

THE SHAPE
OF THE FUTURE...



Port of Wilmington Job – Reconstruction of Berth #4 – Kuhn Construction

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For starters Tapertubes are tougher, actually made from 50 ksi steel where another producer claims to cold work to 50 ksi from a lower grade steel. And Tapertubes can be produced with walls that are significantly thicker: .500" for example, compared with the 3 gauge maximum (.239") of a competitive product.

This extra thickness eliminates additional steel reinforcements and coatings, and allows piles to be driven harder and faster. The result: more piles driven, higher production, lower costs.

Tapertube piles are available in an array of shapes and sizes to meet your soil and capacity requirements.

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- Full-butt welded splices for direct bearing of pipe extension on Tapertube
- Drive-fit DFP S-1800 sleeves may be used instead of welding to extend piles
- Heavier thickness provides greater drivability, eliminates need for coating and reinforcement

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Timber Pile
Building History for Tomorrow

Timber pile has deep historic roots and for good reason. Wood works. Unlike any other building material, wood is renewable, recyclable and most importantly sustainable. One would have to assume that when the Swiss Lake Dwellers first used pile 6,000 years ago to raise their homes to protect themselves from wildlife, they understood what the value of a stable structure meant to their own sustainability. Today we understand the engineering advantages of timber pile, thanks to the Romans who built the first bridge over the Tiber River in 1620 B.C. And we marvel at the beauty of the cities of Venice and Ravenna built between 100 B.C. and A.D. 40o. Of course, we cannot overlook the fact one of America's most iconic cities, New Orleans, is built on timber piling.

Modern wood preserving in the United States traces its history back to the mid-1800s when railroad ties were first treated. According to the Timber Piling Council, today there are wide varieties of preservatives offered by the pressure treating industry. Few of them are suitable for salt water applications, where the majority of timber pile installations occur. The most widely used chemical for saltwater application is copper chromated arsenate (CCA) which is used to treat Southern Pine. Douglas fir piling is preserved with ammoniacal zinc arsenate (ACZA).

Treated timber piles boast many construction advantages, including a long life span. The FHWA Driven Pile Manual states foundation piles submerged in ground water will last indefinitely, and fully embedded treated concrete capped foundation piles, partially above groundwater, will last 100 years or more. The original drawings of the San Francisco Ferry Building of 1896 show the structure sitting atop 5,000 redwood piles. When the structure was examined in 1981, the piles, driven 80 feet into the mud of the San Francisco bay, were shown to be in perfect condition. The longevity of treated timber piling compliments the relatively short growth cycle of the material. Currently well managed plantations grow almost 28 per cent more trees than are harvested every year. Timber piles take advantage of this plentiful natural renewable resource.

Today piling is a mainstay of foundation systems from manufacturing plants, commercial buildings, airport projects and residential construction. The history of piling speaks to its dependability. As economic, social and environmental times change, piling will remain the "go to" for our marine and foundation needs.

Wood's positive impact on construction has been understood for centuries, but today we also understand the positive environmental impact. Wood contributes far fewer greenhouse gases during the manufacturing process than its non-renewable counterparts. Furthermore, as the world's only renewable building material, trees provide benefits as they grow - they are an incredible way to sequester carbon. That is, trees remove the bad greenhouse gases from our atmosphere.

Timber piles have a proven track record and a unique combination of benefits - strength, affordability, ease of use and environmental superiority. As you can see timber piles have a long and proud history of advancing civilization in all parts of the world. But, we don't have to look to history to find the Tower Bridge in London, the Royal Palace of Amsterdam or the U.S. Custom House in Charleston SC to be proud of the contributions of driven timber pile. Let's reflect on timber piling to rebuild and protect the storm ravaged U.S. Gulf coast or the "dream homes" being built in coastal regions around the United States.

Timber Piles are building tomorrow's history today. ▼

Successful Steel Sheet Pile Driving

Special Aspects of Driving

By Jeffrey H. Greenwald, P.E., CAE
Executive Director, North American Steel Sheet Piling Association

This is the last of three articles covering installation of hot-rolled steel sheet piling and is based on the *Best Practices – Steel Sheet Piling Installation Guide* from the North American Steel Sheet Piling Association. www.nasspa.com.

Introduction

Steel sheet piling (SSP) is a hot-rolled structural shape with interlocks on the flange tips which allow individual sections to be connected to form a continuous, earth-tight and water resistant steel wall. Applications include both permanent construction [retaining walls, bulkheads, bridge abutments, graving docks, cut-off walls, mooring dolphins and pier protection cells] and temporary structures [cofferdams for building excavations, trenches, piers for bridges, and lock and dams on the inland river system]. The wide variety of applications presents an equally broad array of installation conditions, some of which may require altered driving methods or other concessions. This article discusses situations and aspects of driving that may require special consideration, such as test driving to evaluate soil driveability, driving under water, enclosed cofferdams and vibration effects.

Test Driving

Test driving is used to assess the driveability of the soil when this is otherwise difficult to assess using traditional methods. Test driving allows the installer to determine an adequate pile section, which, when driven by a suitable hammer, will reach the required depth. Test drives should be performed in the line of the final wall to ensure the results are applicable to the finished project. The number of test drives required will depend on the size of the project and on the variations of the subsoil strata. Good control of the pile and the hammer is required, and driving records must be taken. Subsequent extraction of the piles may give supplementary information on subsoil strata, soil strength and other soil attributes.

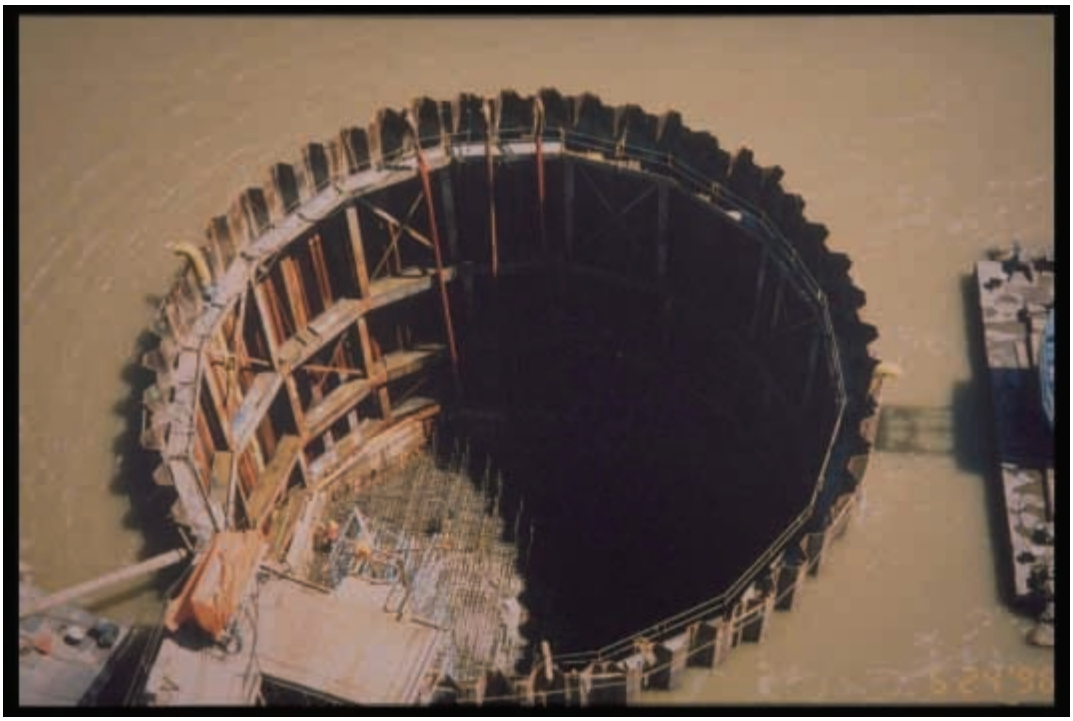

Figure 1. Test driving can be used to assess soil conditions

Driving in Restricted Headroom

In some situations, such as under bridges, the height between the soil level and the structure is insufficient to allow normal pile threading/setting. One possible solution is to drive the pilings in short lengths, butt-welded or splice-plated together. As the driving proceeds, the joints will conform to the full strength of the section. In general, however, splices are avoided for economic reasons.

A preferred method of driving with limited headroom is to assemble a panel of SSP horizontally on the ground, with the length of the SSP less than the available headroom. Using this method, the panels are bolted to temporary wailing and lifted into a vertical position. Driving is commenced using a double-acting hammer mounted in a cradle suspended at the side of the pile. As soon as sufficient headroom is available, the hammer is moved to the normal driving position.

Another approach is to increase the headroom by excavating a trench along the proposed line of the pile. Alternatively, the initial penetration may be achieved by jacking the SSP down from the overhead structure, if permitted.

Driving Under Water

When SSP must be driven below water level, a follower should be inserted between the hammer and the pile head. The follower should be long enough to ensure the hammer is always above water. Double-acting hammers, working with compressed air may work underwater. Some vibratory hammers and hydraulic hammers will also work while submerged. Driving should be performed in panels to allow interlocking above the water level.

Vertical Loads

Steel sheet pile sections can be designed for substantial vertical loads. Indications of the potential bearing capacity can be given if, at the end of the driving, the required penetration resistance (set) is achieved and the hammers are in accord with the soil conditions and pile section. Test loadings may be carried out to prove the bearing capacity. Should the pile length prove to be insufficient, additional steel sheet pile sections could be spliced on and the modified pile driven deeper until the required bearing capacity is achieved.

Ground Vibrations Caused by Pile Driving

When a pile is driven into the ground, some of the driving energy is transmitted into the adjacent soil and can be experienced on the surface as vibrations. The vibrations can cause discomfort to occupants of nearby buildings, and may cause concern over the risk of neighboring property damage. A first step to damage limitation would be to either measure or estimate the free ground vibrations based on details of the type and length of pile, the type of hammer and its energy rating, and the ground conditions. An assessment of the sensitivity of the neighboring structure to the ground vibrations should be performed. While publications are available to offer guidance on safe levels of vibration for various structural types, the conditions of the building and of the ground should also be considered. The building may already be stressed from differential settlement or uneven loading to the point that a small dynamic strain may be sufficient to trigger damage.

Reducing Vibration Effects

The concerns and probable number of complaints due to driving can be reduced if neighbors of a SSP installation site are visited and: a) given a clear description of the extent and duration of the activity; and b) given an explanation of the relatively low probability of structural damage, despite their human perception of vibrations.

On the site itself, the major variable is the choice of hammer and its mode of operation. For example, impact hammers may be controlled by the operator in terms of drop height or energy input and ground vibrations can be reduced if site measurements or observations dictate, particularly at shallow toe penetrations. Vibratory hammers are very effective pile drivers in granular soils and typically generate only modest vibrations. The vibrations, however, are continuous and periodic, and they may cause problems if a nearby building element has a resonance at a similar frequency. In addition, these vibrations attenuate rapidly, which may be a factor if a sensitive building is at a critical distance from the source.

Hydraulically operated pile jacking systems or presses minimize both noise and vibrations and may be appropriate when soil conditions allow. This method is particularly well-suited for use in cohesive soils. Jetting or pre-drilling may also be beneficial in conjunction with any of the above driving systems to facilitate driving. Whatever installation method is used, good driving practice will minimize the disturbance and damage risk to neighbors and their property. If the building may be at risk, before driving and after driving surveys may be undertaken to evaluate any induced damage, whether that damage was caused by vibration alone, by vibration as a trigger when superimposed on other strains, or as a result of pile-induced differential settlement.

Figure 2. Screening can reduce the amount of noise from pile driving

Enclosed Cofferdams

Enclosed cofferdams present the unique challenge of precisely aligning the first and last steel sheet piles. Installation recommendations depend on whether the enclosed cofferdam is rectangular or circular. When panel driving a rectangular cofferdam, for example, the crane should have sufficient reach to enable each pile to be interlocked into the previously set pile. Working around the perimeter, the final and closing panel must be set and interlocked with the partly driven first pair of SSP before starting the driving. This ensures satisfactory closure of the cofferdam. In small cofferdams, it is advantageous to set all SSP before driving, so as to alleviate possible difficulties in closing the cofferdam.

Rectangular cofferdams can also be driven using the set and drive method, where each steel sheet pile is driven to full depth before setting the next pile. In this case, driving should start and stop at five double pilings from the final corner. Closure of the cofferdam is achieved by adjusting the wall alignment either inwards or outwards to suit the dimensions of the pilings being used. It is important that the

Figure 3. Precision alignment for closure of cofferdams

pilings remain vertical during driving of the plain and corner pilings. If necessary, any tendency for pile lean should be corrected by using taper piles. If the cofferdam dimensions must be strictly adhered to, then special fabricated piles will probably be required.

For circular cofferdams, the length of the piles, its straightness and the soil pressed into the interlock during driving have a considerable influence on the achievable rotation between piles. The rotations in turn considerably increase friction at the interlocks. For small cofferdams, it is prudent where possible to set and interlock all the SSP around a driving template before starting to drive. Driving should progress in stages using a short leading increment of one pile to the adjoining piles.

For large circular cofferdams, strict control on pile verticality must be maintained, preferably using panel-driving techniques to facilitate closure of the cofferdam. It may also be necessary to rearrange the final panel by slightly increasing or reducing the radius of the cofferdam, or by introducing a specially fabricated pile. Note that small diameter cofferdams may not be achievable with interlock rotation alone, and therefore may require pre-bent pilings or fabricated special pile to achieve the tighter curve.

Summary

Steel sheet pile is readily available and transportable, and is often an economical solution for a durable, long-lasting wall system. The variety of installation methods makes SSP applicable to a wide range of both permanent and temporary structures. Attention to detail in unusual or unique driving situations helps ensure an economical installation.

About NASSPA

Founded in 2003, the North American Steel Sheet Piling Association (NASSPA) is dedicated to the promotion of hot-rolled steel sheet piling. The association is dedicated to providing information and guidelines on a broad range of technical, research, marketing, education and communications activities. NASSPA also provides a forum where the users of steel sheet piling technology can interact and discuss best practices. ▼

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Professors' Driven Pile Institute 2009

The Pile Driving Contractors Association conducted its 5th biennial Professors' Driven Pile Institute at Utah State University in Logan, UT, June 15-19. Steve Hall and Dr. Joe Caliendo hosted 26 college professors from Fairbanks, AK, to Dublin, Ireland.

The professors were treated to five days of intense instruction on driven pile design, installation and testing. Courses were taught by Dr. Joe Caliendo, Dr. George Goble, Dean Wynn Walker, Dr. Loren R. Anderson, Dr. Jim Bay, Pat Hannigan, Kyle Rollins, Ken Jewkes, Aaron Budge, Dr. Brian Anderson, Van Komurka, Frank Rausche, Steve Dapp and Brady Cox.

After three and a half days of classroom instruction, the class moved to the off-campus test site in the Cache Valley for field demonstrations. The students were able to observe a variety of soil investigation methods, testing, data collections and pile installation demonstrations.

- Jay Apedaile Drilling demonstrated soil sampling and SPT measurements.
- Conetec, Inc., provided a cone penetrometer demonstration.
- Campbell Scientific provided data collection services.
- Dan Brown and Associates provided supervision for static compression and lateral load tests conducted on previously driven piles.
- Build Inc., drove a 16" x 45' closed-end pipe pile and re-struck a previously driven pipe pile using a single-acting diesel hammer.
- Sun Pile Driving drove two 12" x 50' prestressed, concrete piles in 25' spliced sections with a Junttan PM20.
- GRL Engineers provided PDA services and CAPWAP analyses on the re-strike of the existing pile, the installation of the new pipe pile and the installation of one of the new concrete piles.

The test site infrastructure has been constructed through the years. We now have a permanent reaction stand so that static loads tests can be run on any of the pipe piles driven in our test area. The steel beams used for the frame were donated by Ford Pile Foundations and Skyline Steel in 2007. The reaction stand was erected by Build Inc. and Utah State University engineers.

The test site also doubles as a cow pasture, which shows how compatible pile driving can be with the surrounding environment. The reaction beam also houses a bird's nest. A couple of Bullock's Orioles had built a nest with eggs that were still in great shape after the testing was done.

After the field demonstration, the class returned to the classroom to review the results of the testing and analyses.

A final dinner was held on Friday evening in Logan, UT to celebrate the end of a busy week. Dr. William Kitch of California State Polytechnic University, Pomona, was presented with the Richard J. Stromness Award of Excellence, as the most outstanding member of the class as determined by the class participants.

This latest class marks over 125 professors that the PDCA has instructed in driven pile design and testing. This could not have been accomplished without the foresight and generosity of our members, the dedication and generous contributions of Build Inc, the tireless work of Dr. Joe Caliendo and his instructors, the hospitality of Utah State University, the dedication of our Executive Director Steve Hall, and the vision of past PDCA presidents, and board members too numerous to mention.

The PDCA provides numerous educational opportunities to practicing engineers. However, it is crucial to our industry to expose engineering students to driven pile design during their formal education. The best way we can do that is to educate the educators and give them the tools to teach the benefits and applications of driven piles to their students. Please remember this program and make a contribution to its continued success when you renew your membership dues each year. ▼

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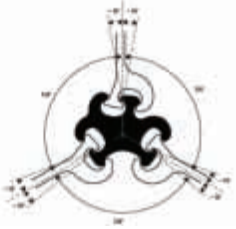

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1. According to the North American Steel Sheet Piling Association (NASSPA) ASTM A690 steel offers greater resistance to seawater corrosion than ordinary steel. See Port Technology International articles:

http://www.nasspa.com/images/stories/Port Technology 39-27.pdf

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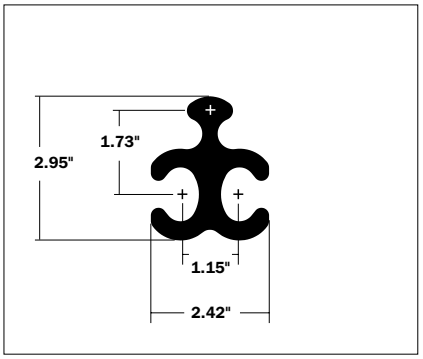
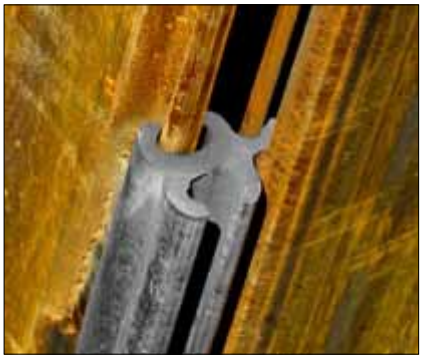
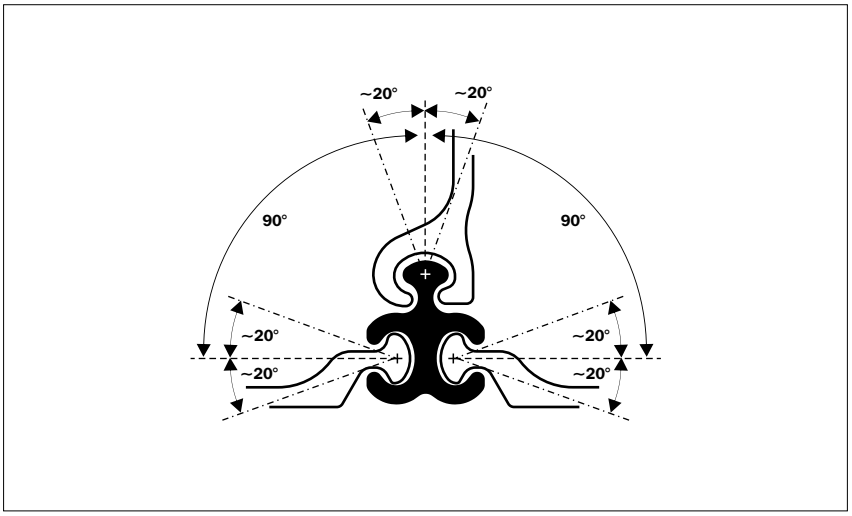


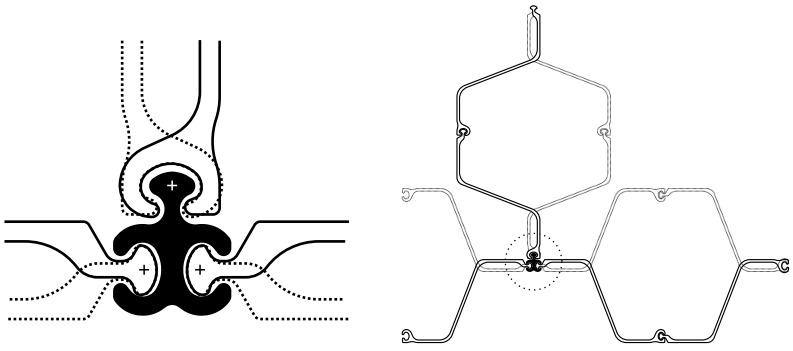




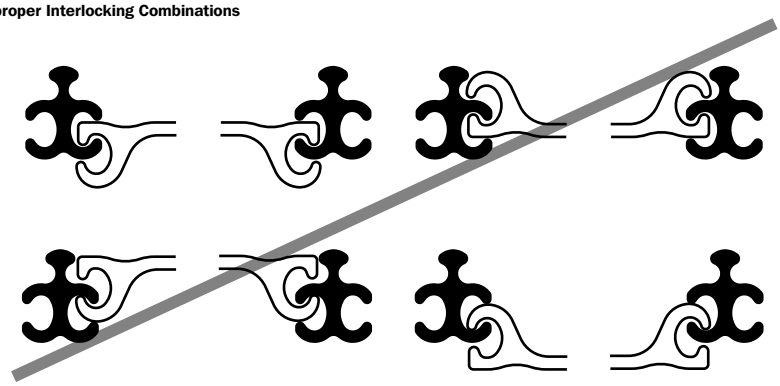
Installation Guidelines

1. General interlocking guidelines call for a ball-to-socket or a socket-to-ball connection. Please review the proper interlocking examples listed.
2. Thread the connector into the interlock while the sheet pile is out of the ground.
3. Adjust the connector to the appropriate position.
4. Tack or spot-weld the connector in place (typically a 10" weld attaching the connector to the sheet pile at the top is sufficient).
5. Drive/extract the sheet (with the connector attached) as you would normally.

Proper Interlocking Examples



Improper Interlocking Combinations



Please note:

1. Swing or rotation stated are typical but can vary by 10° or more due to rolling tolerances found in sheet pile interlocks.
2. PilePro® connectors are protected by patents.

The Morris Island Lighthouse

Phase I Foundation Stabilization Project

Project of the Year

Taylor Bros. Marine Construction Inc (Beaufort and Wilmington, NC) along with WPC Inc. (Charleston, SC branch) teamed up to complete a challenging ocean project to save a Charleston icon. The Morris Island Lighthouse is known by everyone in the Charleston area and has a rich history. Since construction was completed in 1876, the lighthouse has endured 10 - Class I or greater - hurricanes, the 1886 Charleston earthquake, and the bombing of Folly Beach during World War II. Through all that, Morris Island only started to erode with the construction of jetties at the entrance of Charleston Harbor from 1876-1896, which were built in order to improve shipping access. In the 1890s, the lighthouse was approximately 2,700 feet from the shoreline (Figure 1a). By 1938, the shoreline was at the lighthouse (Figure 1b) and the exposure of its foundation to the Atlantic Ocean began.

The exposure of the lighthouse foundation to the ocean led to the deterioration of the underlying timber piles and timber matting on which the structure is founded. A steel sheet pile cofferdam was installed around the lighthouse in 1939 to protect the lighthouse foundation. Over the years, that sheet pile corroded away above the mud line, once again exposing the lighthouse's foundation. Over time, the timber piles under the lighthouse have degraded severely primarily due to Ship-worms (Teredo norvegica) compromising the foundation integrity and moving the lighthouse towards collapse. With help from the State of South Carolina and the U. S. Army Corps of Engineers, some great Charleston area citizens got together and created the group Save The Light, which did indeed save the light. In order to protect and stabilize the Morris Island Lighthouse from further damage, a steel sheet pile cofferdam was designed by the U.S. Army Corps of Engineers. This design consisted of a 72-foot in diameter ring of 46-foot long PZ-40 sheet pile, with toe scour protection provided by approximately 2000 tons of riprap outside of the sheet pile. The new PZ-40 sheeting was installed within 6 feet of the existing lighthouse foundation.

(a) circa 1876 (b) circa 1938 (c) 5/2007

Figure 1. Selected Morris Island Lighthouse Photographs with Time.

Site Conditions

The lighthouse is approximately 1,600 feet from the shoreline (Figure 1c). Figure 2 presents the shorelines in 1854 and 1979 relative to the lighthouse. The exposure of the lighthouse foundation to the Atlantic Ocean severely

deteriorated the timber components (i.e. timber piles and timber matting) of the lighthouse foundation, as shown in Figure 3.

A staging area for the project was designated at the north end of Folly Island, but it was not feasible for use due to extensive shoaling just south of the structure itself. The closest lay- down yard available was chosen in North Charleston, which is about a 12-mile tugboat and barge trip from the lighthouse.

Piling Selected

A total of 136 PZ-40 sheet pile by 46 feet long were installed to create the wall. The steel sheeting required 16 mils (two coats) of coal tar epoxy polyamide on the top 15 feet of each sheet (i.e. to the mud line). Each sheet also had one 24 pound zinc anode welded to it at the 15 foot paint interface line. The basic design concept is presented in Figure 4. The contract also called for the removal of the concrete debris from the 1939 repair, the installation of a geo-textile filter cloth below the toe protection riprap barrier, and the installation of six 12-inch square pre-stressed concrete (PSC) piles to be used for a future boat access dock.

Challenges

The following challenges surrounded the installation of the PZ-40 sheet piling around the historic structure:

- Access to the Lighthouse: Access to the lighthouse was difficult due to changes in tides, waves, wind conditions,

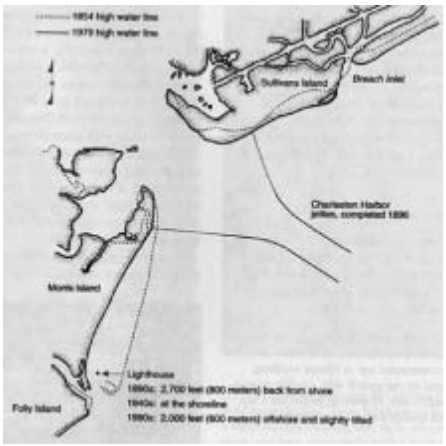


Figure 2. Morris Island shorelines relative to Charleston Harbor jetties (Courtesy of http://www.wcu.edu/coastalhazards/Libros, after Zarillio et al., 1985).

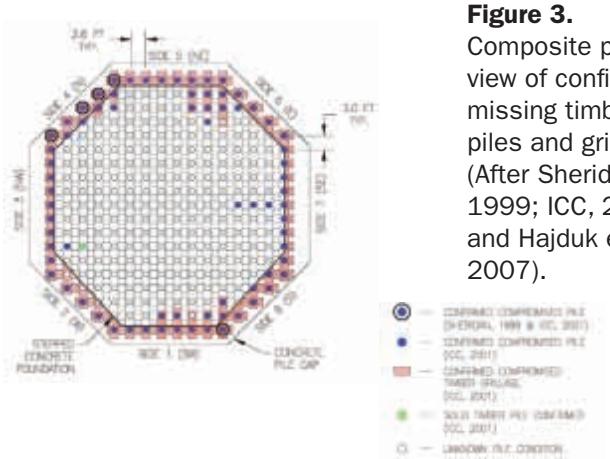


Figure 3. Composite plan view of confirmed missing timber piles and grillage (After Sheridan, 1999; ICC, 2001; and Hajduk et al., 2007).

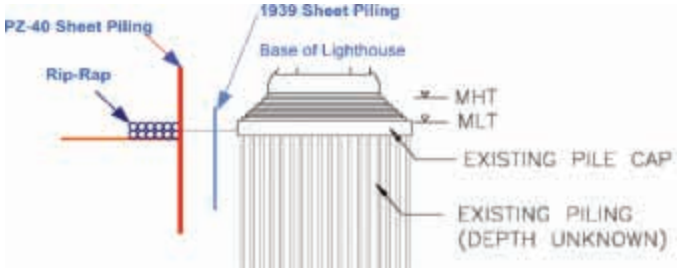


Figure 4. Morris Island Lighthouse New Sheet Pile Cofferdam Conceptual Design.

Figure 5. Typical wave conditions at Morris Island Lighthouse.

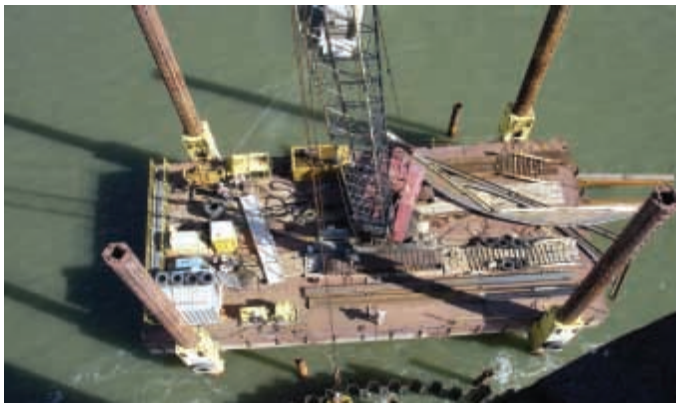


Figure 6. Jack-up Barge at Morris Island Lighthouse (taken from on top of lighthouse).

and the shifting of sand bars around the lighthouse. Figure 5 shows typical wave conditions around the Morris Island Lighthouse.

A jack-up barge was employed to overcome the sea state challenges and provided a steady crane and work platform for the installation of the PZ-40 sheeting and associated HP piling for the template. The jack-up barge is presented relative to the lighthouse in Figure 6. Accessing the jack-up barge via small boat, and moving the jack-up barge still remained problematic during high sea days.

- **Potential Damage to a Historic Structure:** Given the proximity of the new sheeting to the historic lighthouse and the compromised nature of the existing lighthouse foundation, the possibility of the sheet pile cofferdam installation causing damage was a major concern. Therefore, the specifications called for the development of a vibration control plan (VCP) and pre & post condition surveys of the structure.

The pre-condition surveys of the structure showed that the structure had extensive cracking throughout and an existing rigid body lean. In addition, computer modeling of the lighthouse was conducted to determine its natural frequencies. A system of documenting and categorizing the existing cracks was developed and the existing lean measured. An example of the existing cracks is presented in Figure 7, while Figure 8 presents a compilation of lean measurements through the years.

The vibratory hammer was sized as small as possible to minimize adjacent structure vibration, and to ease crane handling. An APE model 50 was initially chosen, and a plot of peak ground vibration versus distance from the driven pile was developed. Figure 9 shows the plot and the resulting limitations based on existing limits for fragile structures (a conservative approach). Based on the pre-condition survey results, computer modeling, analysis of lighthouse existing documentation, and vibration analysis using data from the PDCA driven pile ground vibration case history database, an extensive instrumentation plan was developed that would monitor the lighthouse during all construction activities, to

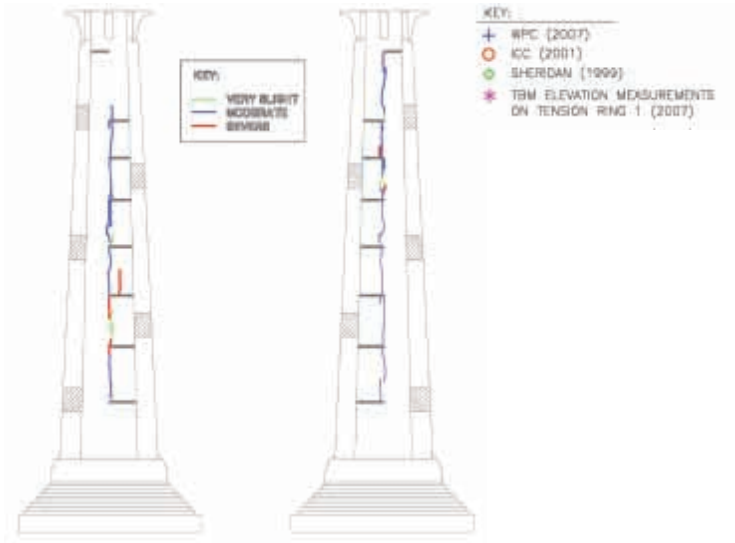


Figure 7. Documented existing interior cracks for the Morris Island Lighthouse.

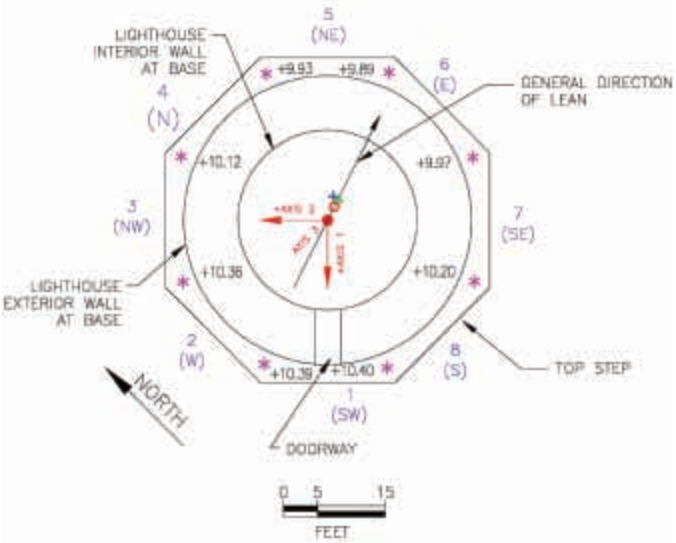


Figure 8. Existing lean measurements (Plan View).

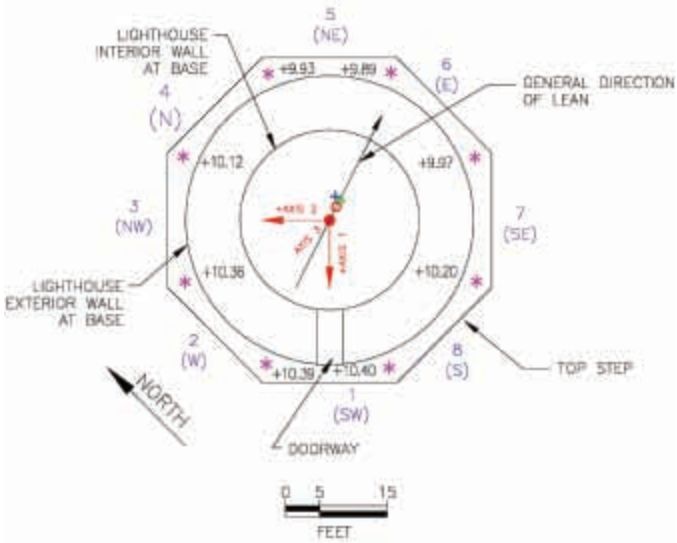


Figure 9. Predicted vibrations from APE model 50 vibratory hammer (developed using PDCA driven pile case history database).

include driven pile installation. The instrumentation would measure structure tilt, existing crack movement, vibrations, and environmental factors such as temperature, wind speed and direction, etc. This monitoring data was placed on a website to be viewed by all interested parties. Figure 10 shows a screen shot from the data monitoring website.

- **Buried Debris:** Remnants of the old lighthouse building foundations, walls, and portions of the 1939 repair were located around the structure. All of this debris was located below the mean low tide water level, with most below the existing mud line. Figure 11 shows a foundation from the old light keepers' residence, visible at low tide.

While some of the debris could be located at low tide, the exact location of the majority of these obstacles was unknown. The debris around the lighthouse prevented the installation of numerous sheet pile to the required embedment. An extensive pile-probing program, consisting of driving and removing an HP pile concentrically around the lighthouse while plotting location, was implemented to determine the extent of the debris field around the lighthouse. The results of this pile-probing program are presented in Figure 12. After an extensive evaluation of different options, such as removal of the debris and expansion or contraction of the sheet pile cofferdam, the decision was made to increase the size of the vibratory hammer to an APE model 150 and utilize a gravity drop hammer on stubborn piles and "punch" through the debris. This option was successfully implemented.

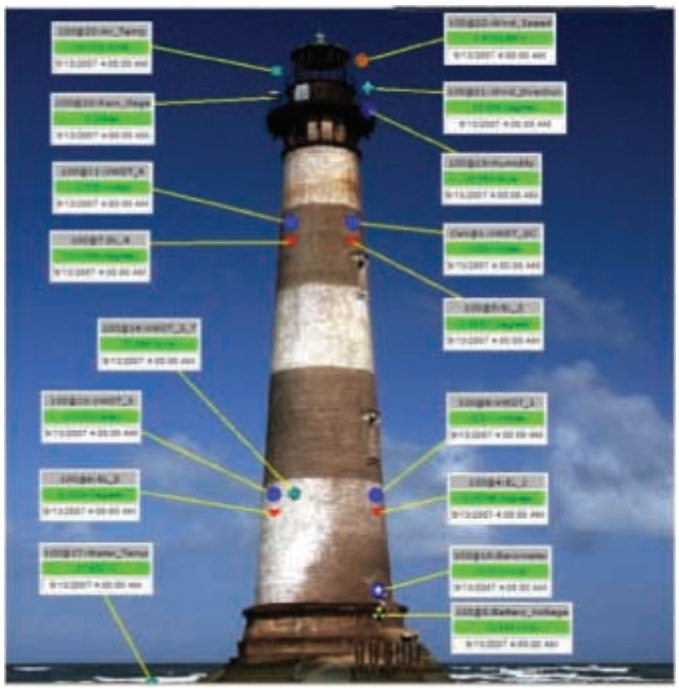


Figure 10. Morris Island Lighthouse data monitoring website

Exciting Moments

This project seemed simple during the bid process – install a sheet pile wall, and then a riprap system for toe protection. Taylor Bros. Marine visited the job site six times during the bid process, and the sea conditions were perfect each time due to a shoal that

Figure 11. Existing Debris around Lighthouse.

wrapped around the lighthouse, mitigating rough seas. When Taylor Bros. arrived on location, that shoal was gone, and rough seas, with wave heights ranging from two to six feet, were the norm. Although expensive, work proceeded with the use of a jack-up barge. Once the jack-up was on station, the project flowed nicely, until the unforeseen buried debris was encountered. The debris was encountered right after removal of the concrete remnants from the 1939 wall cap. As seen in Figure 13, these remnants acted as a barrier protecting the foundation from rough seas. Shortly after the removal of the remnants, a prolonged period of high winds (Nor' Easters) set in with very rough seas, and time was required to execute the debris location program and develop a new course of action.

During this period, the lighthouse started leaning at an alarmingly accelerated rate. Needless to say, this placed pressure on the Corps of Engineers and Save the Light to choose a course of action, and then on Taylor Bros. and WPC to execute it. The previously detailed plan was picked, and the wall was erected. As the wall was closed, the wave action on the lighthouse was eliminated, and the tilt ceased. In all, the lighthouse leaned an additional eight or so inches over, as measured by WPC's very precise instrumentation backed up by a good ol' plumb bob hanging from the top of the structure (figure 14).

The toe protection phase was arguably the most risky, because it had to be performed from a floating barge. About 2000 tons of bedding stone and riprap were placed on a cloth,

Figure 13. 1939 wall cap remnants

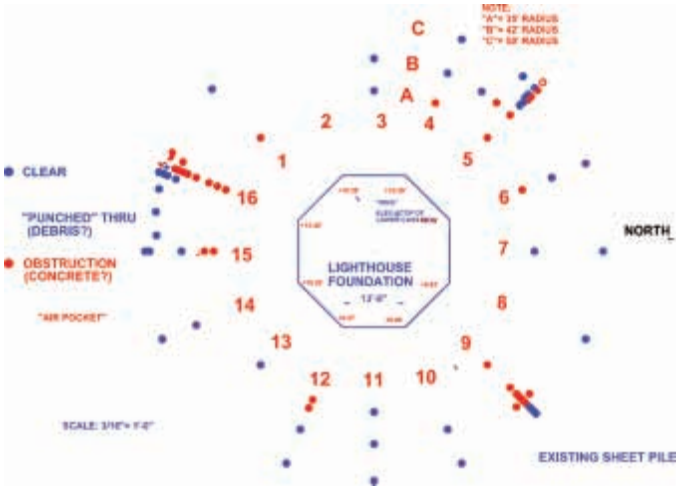


Figure 12. Pile Probing Program Results

geotextile filter barrier 25 feet from the wall. The barrier was sown onto two-inch pipe frames to permit placement from a barge with a large excavator (figure 15). Once each of the eight frames circling the wall was lowered into position, the bedding stone followed by riprap were placed on that section to hold it in place.

The barge was held stationary (sort of!) with numerous heavy fiber lines attached to the sheet pile handling holes. Tide boards were attached to the wall and the excavator bucket was marked for surveying depths. Fortunately very little excavation was required to place the bedding material at the correct elevation, and the rock went in smoothly. See figure 16 for an aerial photo of the rock operation, courtesy of Mr. Larry Workman.

Safety

Safety was of utmost concern for this project, given the difficult working conditions. Therefore, a rigorous project safety program was developed that exceeded the U.S. Army Corp of Engineers' safety requirements. Daily risk management, supervision, excellent guidance by the onsite Corps of Engineers field rep., and a "safety above all else" attitude prevented any injuries or accidents on the project. Despite working in an extremely challenging and hazardous environment, Taylor Bros. Marine received a U.S. Army Corps of Engineers contractor's safety award for the project.

Project Completion

As shown in the structure monitoring data over the course of the project, the installation of the sheet pile cofferdam provided immediate protection for the lighthouse. In addition, the installation of the PZ-40 sheeting, associated template piling, and various dock piling did not damage the structure. This was verified by the post-condition survey, which showed that no damage to the historic light-

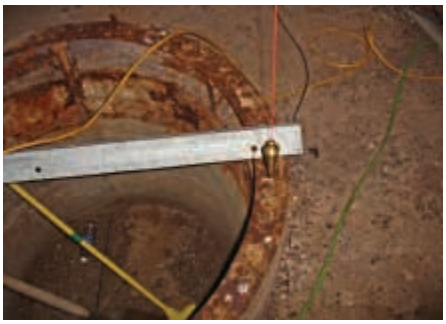


Figure 14. Plumb Bob

Figure 16. Rock Operations

Figure 15. Geotextile Cloth Placement

Figure 17. Waves breaking over the Morris Island Lighthouse Sheet Pile Cofferdam.

house occurred during the project. An example of the protection provided is presented in Figure 17, which shows a wave breaking on the sheet pile cofferdam. The new PZ-40 steel sheet pile cofferdam provides the historic Morris Island Lighthouse with the protection it needs from the Atlantic Ocean, allowing for future foundation stabilization and renovation work and for future generations to enjoy its beauty.

Driven Piles Protecting the Past, Helping Preserve the Future. ▼

This article was prepared by Josh Adams and Prof. Edward Hajduk, pHd. of WPC, Inc, and Julius Taylor, III of Taylor Bros. Marine Construction, Inc.

Submitted by:
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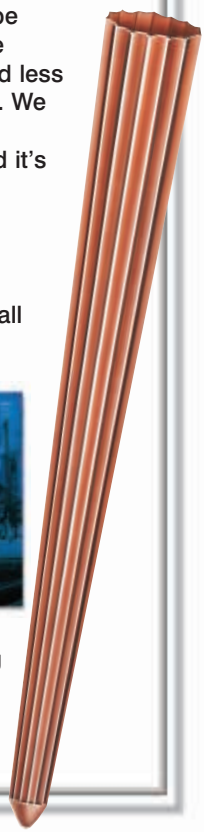

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The Wintersburg Channel Emergency Sheet Pile Repair

By: Michael Carter – Giken America Corporation

The term levee usually conjures up images from the aftermath of Hurricane Katrina in New Orleans, or perhaps the picturesque fields of Holland's dike's and a little Dutchman by the name of Hans Brinker. Most will go on with their daily business without ever knowing the vast levee systems currently in place in the U.S. and North America. The truth of the matter is there are several thousand miles of levees in the U.S. stretching from Maine to California which will need to be maintained. The U.S. Army Corps of Engineers have identified 146 levees that may fail in the event of a flood. As the number of large maintenance projects grow, and funding for these projects become increasingly scarce and competitive, the levee infrastructure in the U.S. continues to deteriorate.

One does not typically think of Southern California as a flood-prone area, however, 42 of the 146 levees identified with a potential for failing are in California. In 2006/2007 9.5 inches of precipitation placed a toll on the Wintersburg Channel levee system in Huntington Beach, CA. The Wintersburg Channel collects stormwater from a 28 square mile watershed located in the upland areas of Orange County and transports the water to the Pacific Ocean just north of the Bolsa Chica Wetlands.

The increased rainfall amount over a short duration caused severe erosion to the banks of the levee system, such that now visible vertical faces were creating a emergent situation for the county flood department. The county had been working on repairing the levee for several years, however, the repairs were put on hold by the state permitting agencies. The recent rainfall events had created a situation which caused the county to declare that an emergency repair is necessary for approximately 4,000 feet of the northern levee in order to prevent a possible breach that could flood up to 1,500 homes.

After reviewing the situation, the county engineers decided a cantilevered steel sheet pile wall installed on top of the levee was the best solution to address the immediate concerns of the levee breaching. The biggest issue would be accessing the 4,000 foot long area where sheet piles would be needed.

The county was faced with an unstable levee with only five to 10 feet of working space from the top of the levee, an

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un-navigable stormwater channel adjacent to nearby homes to the south, and an environmentally sensitive wetland to the North. Access to the site was available from Graham Road to the east of the levee. This appeared to be the only access to the 4,000-foot-long stretch, but how do you mobilize pile driving equipment in such tight confines on an unstable levee?

The best approach appeared to be a top-down construction system that would not further deteriorate the existing levee system. Orange County flood engineers John Spencer and Ali Fayad contacted Giken to determine the feasibility of installing such a cantilever steel sheet pile wall in such a tight area. Giken's equipment was an ideal application for this project since the Hydraulic Press equipment installs steel sheet piles with no noise, no vibration, and it sits on previously driven piles requiring minimal access. It also had the ability to act as a top-down construction system by using the Giken Reaction Base (GRB) system. This system includes mounting the powerpack to ride on top of the sheet pile wall, a support crane that also rides on top of the wall, and a pile runner that can deliver the steel sheet piles from the top of the wall from the initial staging area.

Using a non-vibratory hydraulic press system called the Silent Piler, concerns were addressed regarding what effect vibrations would have on the stability of the levee. The Silent Piler emits only 69 decibels at 23 feet, so it also addresses the noise pollution concerns of the nearby residents. The GRB system successfully addressed the difficult access restrictions, and was the ideal application for installing the steel sheet piles for this emergency situation.

"The entire operation went very well and all the guys working on the project worked as a team."

– Joseph Teeter

Since the project was classified an emergency, the county was able to award a sole source solicitation for contractors to complete the project, however, the county did decide to shortlist five potential contractors to bid the project with only a five day advertisement period. The county did include a sole source specification, which indicated the GRB system had to be used to install the steel sheet piles. The project duration was only 90 days from Notice to Proceed to completion which included material procurement.

JF Shea Construction of Walnut, CA was the low-bidder and was awarded the contract shortly after bids opened. Notice to proceed was given to JF Shea during the preconstruction meeting on Nov. 1, 2007. With the clock ticking, JF Shea had only 90 days to order the 4,000 wall feet of PZ-35s in A690 grade steel, and install the wall and cap. Skyline Steel was able to advance the mill rolling from February 08 to December 07, which allowed material to be delivered and staged during the holidays. After the first of the New Year, only the material and cap needed to be installed within 45 days. The tricky part of the project was since the sheet piles had been increased to 45 feet in length a larger clamp crane was necessary to hoist the sheets to

the Silent Piler, which was still on the open seas en route to the U.S.

During the bidding process, Shea was able to secure access from a midway point along the piling alignment via a municipal pump station driveway and abandoned bridge across the Wintersburg Channel. By being able to access the middle of the alignment, two separate rigs could be utilized, one heading west and one heading east to reduce the overall installation time.

"Odin Myre, JF Shea's site superintendent, and his crews had prepared the site perfectly and were clearly on the ball with this type of operation," commented Michael Carter, Giken's U.S. regional manager, who oversaw the project with the project manager, Joseph Teeter.

With the quickly approaching deadline, and an unknown production rate, Shea had inquired into providing two separate crews per rig. Anticipated production rates were limited due to the lack of soils available at the time of the bid. Of the two soil borings available, one indicated very soft silty sandy soils, the other dense silty sandy soils with gravel.

Giken originally scheduled the two separate rigs to arrive a week and a half apart to ensure sufficient spacing

between the rigs. Once the first rig was up and operational, two 12-hour shifts were used with the support of a small, 30-ton Favco Crane, which was used to pick up the sheets from the backside of the levee where they were staged during the holidays. Each crew averaged 35 to 40 pair (130-150 wall feet) per 12 hours for the eastern heading. The first half of the wall was installed before the other piling rig was delivered to the site. This allowed for a single machine to be used instead of two machines, saving in additional mobilization.

Once the eastern heading was completed, the 20-ton clamp crane specially ordered for this project was delivered to the site and assembled. Both machines worked westward through the night to the original halfway starting point. From this point, access was significantly more limited, encroaching within a few feet of the sensitive wetlands, as well as working on top of a levee only four feet wide in some places. In addition to the clamp crane, the power pack was retrofitted with a unit runner to allow for the power pack to roll on top of the wall. It was also fitted with a pile runner, which is able to carry three pairs of PZ35 at 45 feet to the piling operations by clamping and rolling on top of the sheet pile wall.

The crews continued working two 12-hour shifts westward with both Shea and Giken crews working around the clock to complete the project in time. Production rates were still held consistent at 35 to 40 pair per 12-hour shifts through the night even when driving sheets directly above and over an exposed high pressure gas line.

At the same time, the composite cap was installed on the eastern portion of the wall. The sheeting wall had been completed in only 18 working days from start to finish.

"The entire operation went very well and all the guys working on the project worked as a team from both companies," said Teeter. The operation was dependant on all the machines and crews working in unison from the initial offloading picker, to the front-end loader, to the secondary support crane, to the pile runner, to the clamp crane, and finally to the Silent Piler. All in all it was completed without a hitch, despite a small electrical issue with the pile runner, which was fixed with support from Robert Shea's master mechanic and crew.

Of all the projects I have been a part of thus far, keeping in mind that this was an emergency project, it was without

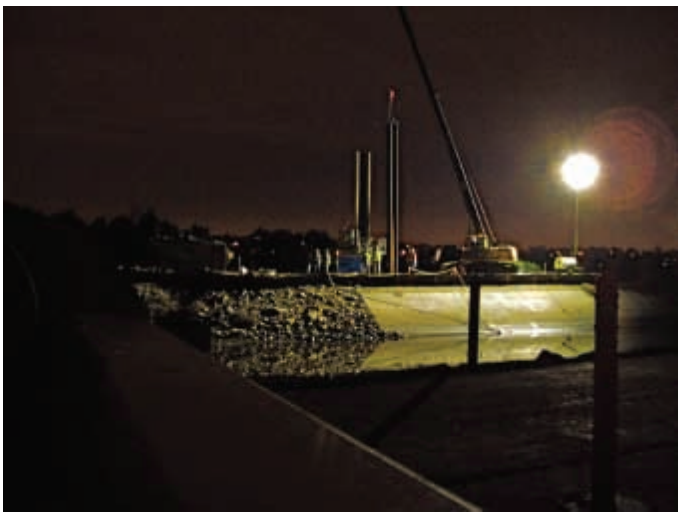
"Odin Myre, JF Shea's site superintendent, and his crews had prepared the site perfectly and were clearly on the ball with this type of operation,"

- Michael Carter.

a doubt the best sign of teamwork I have seen from the owner, the contract, the subcontractor, and the material supplier.

Other than prohibiting the local residents access to the top of the levee where several walked on a daily basis, the only complaint registered by the local residents was now that this levee was stronger, the southern levee should be evaluated and more sheeting should be pressed to unsure the southern levee was stable.

Orange County is currently evaluating reinforcing other portions of the Wintersburg Channel levee system using the press system. ▼



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Cajun Deep Foundations Garners an A+ in T-Wall Construction

The United States Army Corps of Engineers New Orleans District (USACE) chose Cajun Constructors and Cajun Deep Foundations to build a new, cast-in-place concrete T-Wall approximately 3,200 linear feet in length. The project was located in Harvey, LA. The wall was the first of five phases built to protect over 200,000 residences and businesses on the east side of the Harvey Canal from hurricane flooding. Due to the heavy weight of the in-place wall and poor supporting capacity of existing sub-surface soils, the wall had to be buttressed underground by steel H-piles. The H-piles transferred the heavy wall loads through highly organic soils and very soft clays to more stable soils 120 feet below the surface. Additionally, an underground sheet pile cut-off wall was installed to protect from water seepage beneath the slab. Wall construction included a continuous base slab that was 19 feet wide by five feet thick. Atop the slab was a continuous wall that was 20 feet tall and 2 feet 6 inches thick. The cast-in-place concrete formed an upside down T, hence the name "T-Wall."

This project presented Cajun Deep Foundations, LLC with some very difficult challenges: a very aggressive schedule required by the USACE, excessive pile lengths and large equipment all confined to a very constricted work space. It was going to take a comprehensive plan of attack, superior management and strict site supervision to ensure the work was delivered on time.

The Plan of Attack

To meet scheduling demands, Cajun's plan was to attack the project with multiple crews and equipment thereby increasing daily production and decreasing duration. "In most situations, adding equipment and crews to meet an aggressive schedule would seem like an obvious solution," said Cajun Deep Foundations project manager Chris Thompson. "However, with the tight space we had, the large equipment and excessive pile lengths, adding manpower was much easier said than done. It took a great deal

of forethought and logistical pre-planning to make sure we maximized manpower and equipment, but still had room to work."

The ultimate plan called for the project to be divided into separate sections, creating two defined work areas both progressing from north to south. Given that sheet pile installation had to occur prior to H-pile installation, two sheet pile crews went to work first - one in each area. Once sheet pile installation progressed to the point to provide safe working distances, H-pile crews fell in line behind the sheet pile crews. All four worked concurrently moving down the wall line. As planned, sheet pile installation progressed faster than H-piles. When the sheet pile crews completed their work at the end of their respective work areas, they moved back down the line to a strategic location, converted to H-pile operations, and began installation. At this point, a total of four H-pile crews were working and all continued—five days per week, 10 hours per day—until completion.

Long on H-Piles. Short on Options.

The excessive lengths of the H-piles proved to be another challenge. With required pile lengths of 130 and 140 feet, two options were considered for the installation procedure. Option 1: have the piles delivered in two pieces, install the bottom half, weld splice the top half to the bottom, and then complete the installation of the pile. Option 2: have the piles delivered and installed full length (no splices). It quickly became clear that choosing option 1 would

make meeting the project schedule extremely difficult, if not impossible. However, while option 2 meant time savings, it also meant additional challenges. The piles, and driving hammer, leads and accessories weighed in excess of 50,000 pounds (and driving leads exceeded 160 feet in length). Consequently, this option required cranes weighing 250 tons with lifting capacities of 230 tons that would somehow have to be supported on unstable working surfaces. A skilled planning team consisting of top-level management down to employee crane operators, developed over 15 crane lift plans that were then professionally engineered. To address unsta-

ble working surfaces beneath the heavy cranes, Cajun incorporated the use of a double-tiered system of timber crane mats that served to evenly distribute and disperse the heavy loads. This matting configuration was also professionally engineered to ensure the cranes would be safely supported and stable. Not only did the successful execution of option 2 allow the project to be completed on schedule, it also eliminated the time and cost of splicing the piles providing significant cost savings to the USACE and ultimately the taxpayers.

Creative Installation

Once again, with required H-pile lengths of 130 and 140 feet, a separate resourceful plan and special installation procedure was developed. Typically, H-pile installation requires one crane. While holding the pile driving leads and hammer, the crane lofts the pile from the ground into the driving leads (bailing), sets the pile to the planned location and the pile is installed. Since the H-piles were so long, this procedure would have damaged the piles due to excessive bending stresses during the lofting phase. Our alternate procedure added a second crane to loft the pile into the driving leads. Two strategic pick-up points were calculated to greatly reduce bending stresses. The installation crane set the pile driving leads to pile location and set the leads to the proper angle. The second crane then lofted the H-pile and placed it in the pile driving leads. Next, the installation crane installed the pile. Due to the efficiency of the crew, and the skill of the operators, this alternate installation method proved to be just as productive as the typical method. No H-piles were damaged and productivity levels maintained the project schedule.

In addition, the installation of 81 to 85-foot sheet piles proved difficult as well. With sheet piles, because they are interlocked together to form a continuous wall and are installed in pairs, each must remain level and plumb during installation. Not only did these pile lengths significantly increase the difficultly factor in keeping piles plumb, level, and within specified tolerances, but the consistently strong winds at the site also added to the difficulty causing the sheet piles to act like giant steel sails. To address these challenges, Cajun designed and built a custom two-tiered installation template. The template featured sheet pile guides at ground level for the bottom tier, as well as guides at 15 feet above ground level for the top tier. The sheet piles were installed through the top and bottom guides, which provided lateral support aiding in keeping piles both plumb and steady as winds blew. The template also included personnel access at the top tier so crewmembers could direct the sheet piles through the top guide during installation. Despite lengthy sheet piles and

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volatile wind, Cajun was able to install all sheet piles within USACE's specified tolerances.

H-pile Procurement Problems

Although Cajun had developed a method to install excessively long H-piles, another obstacle had to be overcome—procurement. With the H-piles being fabricated in Blytheville, AR. the trucking of such long piles was both costly and time consuming since only three piles could be hauled at a time. If shipped via trucks, the vehicles would also require special permits and trailers, along with state police escorts. After studying the problem, Cajun noticed the pile fabrication mill had easy access to the Mississippi River, which connected to the Harvey Canal, which was directly adjacent to the work site. Cajun transported the piles on hopper barges from the mill to an offloading site on the Harvey Canal that was acquired, improved, and equipped with barge unloading equipment. In the end, all piles were successfully delivered and unloaded with no negative impacts on the project schedule and a significant cost savings was recognized by the USACE and ultimately by the taxpayers.

Space Planning

"Like many of the projects we work on, the confined space was an overall challenge that affected every decision we made at every turn," explained site manager Ken Krebsbach. "The construction easement ran the length of

Cajun Deep Foundations, LLC Project Scope

Piling Work

- Furnish, deliver, and install 213,830 liner feet of HP14 x 89 steel H-piles (1,643 each at 130 to 140 feet in length). Piles were installed on batters (angles) ranging from 1h:12v to 1h:2v
- Furnish, deliver, and install 261,562 square feet of PZC 18 steel sheet piles (3,200 running wall feet at 81 to 85 feet in length)

Equipment Used for Pile Installation

- Driving Cranes – Manitowoc 4100 Series 2, 220-ton crawler crane
- Support Cranes – Manitowoc 3900, 100-ton crawler crane; Manitowoc 4000, 175-ton crawler crane
- H-Pile Impact Driving Hammer – APE 7.5a hydraulic hammer (rated energy 24,000 ft-lb)
- Sheet Pile Vibratory Driving Hammer – APE 200T (driving force @ 1650vpm, 1788 kN or 201 US tons)

"In most situations, adding equipment and crews to meet an aggressive schedule would seem like an obvious solution. However, with the tight space we had, the large equipment and excessive pile lengths, adding manpower was much easier said than done"

- Chris Thompson, Cajun Deep Foundations

the wall with only 80 feet on one side available for operations, which is a pretty tight squeeze. Power lines running along the edge of the easement added to the challenge."

Cajun had to devise a plan to fit installation cranes sitting on stabilization mats 30 feet wide, truck unloading and pile handling cranes, and a fleet of support equipment all while maintaining haul roads wide enough to allow tractor trailer trucks to deliver the long piles to the installation locations. Equipment was constantly on the move creating a heavy barrage of traffic. Additionally, the work area was surrounded by existing overhead power lines and businesses that remained in operation throughout the project. Once more, it was successful pre-planning that made these difficult installation circumstances possible. Cajun teams developed scaled drawings that indicated: where each piece of equipment would be located, the equipment operating ranges (operating space), and the routing of delivery trucks through the space. No variations from the drawn out plan were permitted. Numerous flagmen and monitoring personnel were used to assist in ensuring the plan was executed properly and to avoid potential collisions. Peters Road, a heavily traveled roadway that ran parallel to the wall only 50 feet from pile locations, also served to restrict work space. Although piles were installed from the opposite side of the wall from the road, they were set on angles, which meant they had to be suspended over the road. To ensure public safety, traffic was not allowed to run beneath the suspended loads. A plan was developed in conjunction with Cajun, LA Department of Transportation, Jefferson Parish Sheriffs Department, and the USACE to stop traffic in 15-minute increments while the piles were installed. With Jefferson Parish deputies directing traffic, this plan worked successfully. Installation rates were maintained with no delays to the project schedule and no incidents with the public traffic.

Overall, this project contained a variety of challenges on all levels. However, through the hard work, planning, and innovation of Cajun's project team, all obstacles were overcome. When it came to helping the people of Louisiana on this T-Wall project, Cajun Deep Foundations definitely made the grade! ▼

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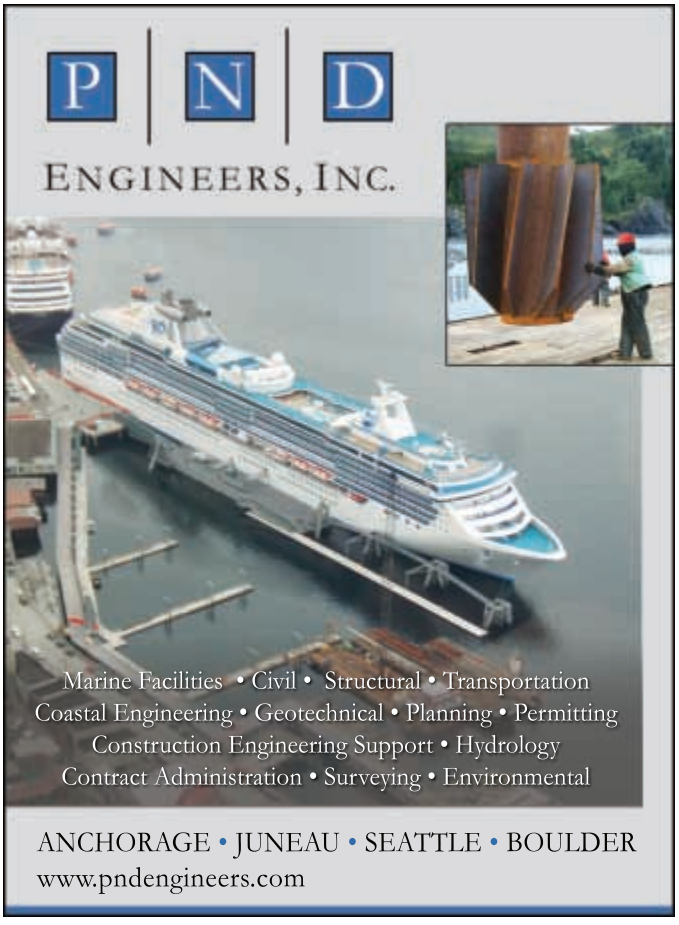

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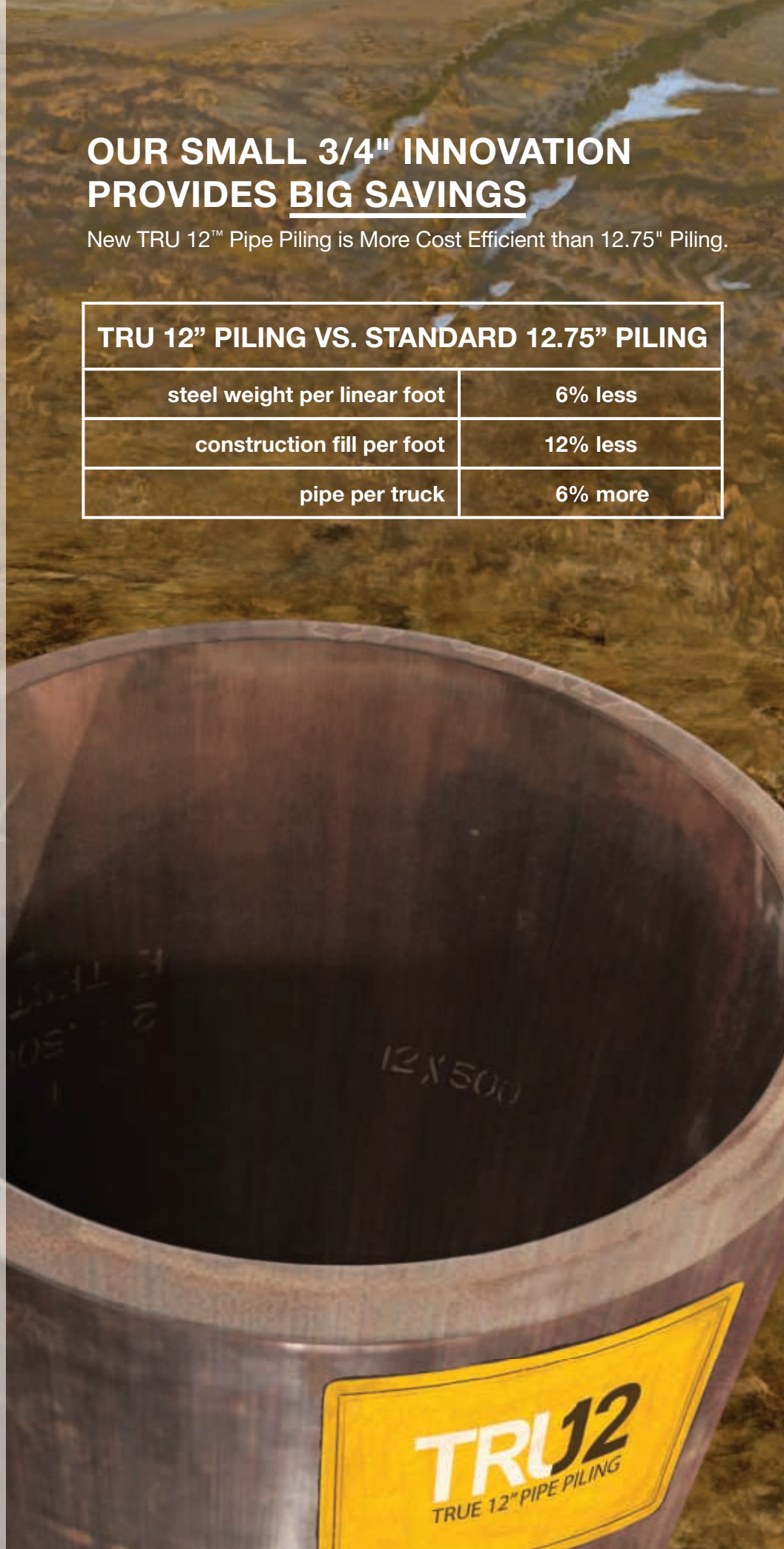

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Creating A WORLD CLASS SAFETY PROGRAM

The following presentation will relay a three and a half year journey documenting an opportunity presented to me in October, 2004. The opportunity was to lead a mid-size construction company's safety program. The company's name was Corman Construction and their subsidiary, Corman Imbach.

This company's present safety program has an EMR of .72 but in 2004 had hit a high of 1.19. The company's top management decided the direction they were heading was not working and were willing to try anything to attain the world class safety program they were striving for. This program had to be one that workers believed in, one that would empower the workers to be a part of creating a safety culture that would provide a workplace free of hazards. The program must also be one that sets Corman as a leader in the field construction safety. Some of the benefits the company felt they would receive by attaining a good safety record were: fewer injuries, incidents and better statistics that would make them more competitive in the bidding process and improve their image. The first thing that needed to happen was to change their safety culture, as a safety manager I knew that was important.

In this presentation I will relay to you what , where , and how the EMR of 1.19 in 2004 reached a present day EMR of .72, as well as the journey from the back of the pack to our current status as leaders in construction safety in the Baltimore and Washington areas.

The type of work preformed by Corman Construction and their subsidiary Corman Imbach is extremely high-hazard work. The jobs performed by both companies consist of road work, bridge construction, utility work, and marine construction.

Since 2004, the workforce fluctuated between 500 to 600 workers. The demographic of the workforce was 54 per cent Hispanic and 46 per cent other (black and white) of both skilled and unskilled labor levels. The company, although non-union, employed union sub-contractors as needed. The geographical area that the company did work in reached from Wilmington DE to Baltimore, MD to Washington, DC. We also did work in the Northern VA area all the way to 77 miles south of Richmond VA, and back up the coast to Maryland.

I accepted this challenge knowing I had my work cut out for me. I relayed to top management my first order of business would be to spend the next three months in the field observing how work was completed. How was safety addressed on a daily bases? I was eager to know what skills and knowledge the workers, foremen and superintendents had. And if they were implementing the skills they did possess on the job site.

Through observing the work being completed, I came to understand how they addressed daily safety compliance issues. And, by talking to the workers I was able to understand what their knowledge level of safety was. Months went by and it became obvious from observing the work being performed that safety was not being applied at the jobsite. The employees just didn't know or understand what was required of them in order to be in compliance with safety standards on the construction site.

Once I had identified the problem I thought about how I would approach top management and relay to the workers their basic lack of safety knowledge. Approaching CEOs to tell them their safety training was ineffective is a message they do not want to hear, and could be career killer.

The tools I utilized to get my message across were my laptop, LCD projector, digital camera, and the many before-and-after pictures I took. Through the years I've found it's hard to argue with a picture. Think about this: you're the new kid on the block that has come through the door and is about to overturn the apple cart. Confronting the superintendent that has worked for the company for over 20 years you definitely want to be in control of the situation. One thing you don't want it to turn into is a "my word against yours" game – particularly when it's old-timers vs. new-comers. But your word and a picture is a lot more convincing.

The management accepted my recommendation that in-house training could turn our program around 180 per cent when coupled with on-site monitoring to ensure safe prac-

tices are being implemented. I also evaluated what training Corman's other two safety managers needed to receive in order to be a part of their aggressive, safety training program.

Once evaluated, the managers were provided with the necessary training in order for them to teach workplace safety to Corman's staff, ensuring that they reach their goal of total in-house training by their safety department. The safety managers were sent to attend OSHA 500 Train the Trainer, Fork Lift Train the Trainer, ASSTA Traffic Manager, Traffic Technician, Flagger Trainer, JLG Aerial Lift trainer, CPR/First Aid Train the Trainer, and Scaffold Train the Trainer. In addition we put together Confined Space training, Excavation training, Crane Operator Safety training, and finally Equipment Operator Safety training.

After our safety managers completed their training, they started to participate in the training cycles. This improved their self-confidence, provided a one-on-one introduction to the safety supervision process, and gave them expertise in implementing safety techniques at the workplace.

Within six months of my coming on board, our aggressive training schedule slipped into high gear. We now train four days a week in the afternoon, with classes starting after work. While resistance was evident in the beginning, three years later people want to be included in the training. The first year these new practices were implemented, results were noticeable.

Corman Construction belonged to a peer group with five other contractors of similar size and background that performed annual audits on various aspects of the company. This helped give them an indication as to how employees perceived their company. One and a half years after starting at Corman, I was given several questionnaires, one of which contained 15 questions that could only be answered through supervision of the job sites. The questions were related to the workers perception of the company's safety program. I gave out over 120 questionnaires, knowing the more questionnaires I handed out the more accurate the result would be. The results came back with Corman placing first in 11 out of 16 categories, while placing third in the remaining five categories. This was an important piece of information, as it revealed to management that our safety culture was changing for the better.

Training, training, and more training is helping to ensure that things are changing for the better - more inspections, a higher visual presence out on the jobs correcting techniques when they are not safe, and encouraging staff when jobs are done safe and well.

Also in place were other safety-related tools aimed at assisting management keep safety on their minds at all times. First, each week, crews were to have a toolbox talk, which is an information session on safety specific to the particular job they were doing. Second, the foreman would be required to complete a stop card twice a week, which is a card aimed to help guide him/her through a visual safety evaluation of the job site. These cards were turned into the safety department, logged in, and read by me. The job site supertendant was required to complete a job site safety inspection once a week. Safety meetings were held throughout the year for supervisors in order keep the up to date with where we were at with our safety program and give them our current safety statistics. These meeting also recognized foramens and supervisors, whose crews had gone accident-free for a six month period and a 12 month period. The safety meetings also gave staff and management a chance to express ways in which we could improve.

While we were seeing positive results with the training and monitoring on-site, the other piece of the puzzle is risk management. If you do not manage the injuries that you do have success will undoubtedly elude you. The secret was first relaying to the supervisors that every single person is responsible for managing on-the-job injuries. It starts with the foreman, who notifies the safety department that a worker has been injured while evaluating injury and providing on-site medical treatment, if necessary. If on-site medical treatment is not adequate, the injured person will be transported, along with a coworker form the job site, to a clinic or hospital. At the hospital, we would inform the doctor of our return to duty policy and our commitment to providing light work or alternative work assignments for those who have suffered on-the-job injuries. We would also encourage the doctor to use over the counter pain medication.

With our added safety monitoring, job supervisors have become sharply aware of accidents that have happened on their job sites and how they were handled. Through training, education, and monitoring the work performed on-site using OSHA compliance and hazard elimination, management has noticed the number of accidents and injuries drop. In 2004, the EMR was1.19. In 2005, the EMR dropped to .84. In 2006, the EMR dropped to .72, and in 2007 the EMR was .72. Due to a now safer workplace, our insurance costs dropped and we're saving in accident-related expenses. Other accomplishments attained in 2007 include the completion of Corman's first partnering agreement with Federal OSHA at the Frederick Douglass Bridge in Washington, DC. The job was completed with zero lost-time accidents and zero recordable accidents. In 2007, in the ABC of Baltimore, Corman had the best safety record of any company that logged between 1 million and 3 million man hours.

Corman has become a leader in safety that encourages their safety managers to be active in the safety community. In 2007, Corman's corporate safety manager received the SPY Award from the ASSE Chesapeake Chapter in Baltimore Md for being the safety professional of the. The corporate safety manager is currently working with the Washington Metropolitan Area Construction Safety Association as their residing President. ▼

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The PDCA has scheduled the 10TH Annual Design and Installation of Cost-Efficient Piles (DICEP) Conference on Thursday, Nov. 19, 2009. This year's premiere engineering and contractor-focused driven pile conference will be held at the Walnut Creek Marriott, Walnut Creek, CA on Thursday, November 19, 2009.

The DICEP conference will focus on engineering issues relevant to pile driving. The theme for this year's DICEP conference is:

1. Increasing useable pile capacity to reduce project foundation costs, and
2. Optimizing dollars per ton of pile bearing to reduce project foundation costs

The DICEP conference will include five-50 minute presentations on these two topics.

The conference is intended to provide practical and relevant information on driven pile design that can be used by structural, civil and geotechnical engineers. The conference also contains important information that will appeal to contractors, owners, developers, government employees and those connected to the driven pile industry.

Sponsorship and exhibitor opportunities will also be available on a limited basis.

Further information on the DICEP conference, registration and Walnut Creek Marriott will be available soon on the PDCA website and through various PDCA publications. You can contact the PDCA at 888-311-PDCA (7322) or email us at steve@piledrivers.org for more immediate information.

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CROWNE PLAZA CENTER CITY PHILADELPHIA, PA SEPTEMBER 24 - 25, 2009 HSDPT EXAM - SEPTEMBER 26, 2009

The PDCA is pleased to announce the upcoming presentation of a PDA Test Interpretation and CAPWAP Analysis Skills Development Workshop and a High Strain Dynamic Pile Test Certification Exam. PDCA will present the two-day PDA workshop on Thursday and Friday, Sept. 24 and 25, 2009 at the Crowne Plaza Center City, Philadelphia, PA. The HSDPT Certification Exam will follow on Saturday morning, September 26, 2009.

The program is designed for PDA Testing engineers in the consulting, construction and government sectors.

PDCA has secured a special conference rate of $129 per night at the Crowne Plaza. Reservations must be made individually by calling the Crowne Plaza at 866-618-0410. Be sure to reference the Pile Driving Contractors Association or conference code PDC to obtain this special conference rate. The reservation deadline is September 2, 2009.

Participants must bring their own computer laptops with PDA-W and CAPWAP programs loaded. Workshop versions of PDA-W and CAPWAP will be available upon request. Data sets will be provided for analysis. The meeting room will be equipped with power outlets for recharging laptops.

The cost of the PDA Test Interpretation and CAPWAP Analysis Skills Development course and HSDPT Certification Exam includes all material, continental breakfast, morning and afternoon breaks, and buffet lunch.

Course Fees:	PDA 2-day Workshop	$525
	Government Employees	$325
	HSDPT Certification Exam	$300

Online payment can be made through PayPal by visiting www.foundationqa.com and clicking the "Register and pay online for seminars and workshops" link. You can also click the "Register and pay online for the HSDPT examinations" link to register for the certification exam. Both links are located on the right side of the website's home page.

For more information contact the PDCA office at 888-311-PDCA (7322),by email at steve@piledrivers.org or visit the PDCA website, www.piledrivers.org; or you can contact Foundation QA via email at Melanie@foundationqa.com or go to their website, www.foundationqa.com.

PDCA
PILE DRIVING CONTRACTORS ASSOCIATION

High Strain Dynamic Pile Testing (HSDPT) Certification Explained

Melanie McKie, Foundation QA

High Strain Dynamic Pile Testing (HSDPT) is a highly specialized and powerful technique for pile capacity evaluation and pile construction control. The technology is now commonly used in many countries around the world. Because the technique is so specialized, many project owners and their engineer representatives are unlikely to have the skills to critically or independently evaluate the quality of the testing or the consequent advice. This places additional responsibility on the testing provider. As dynamic pile testing is used as a quality assurance technique for foundations, it is fundamental that persons providing such services are themselves the subject of a quality assurance process.

Like most technology, in the right hands the Pile Driving Analyzer (PDA) can be a powerful tool with great benefits to the construction process, or in the wrong hands, a tool that is ineffectual, misleading or even wrong. Proper use of the PDA requires the test engineer on site to be knowledgeable and skilful in data acquisition and for the PDA Test signatory to have additional skills in data interpretation. The necessary knowledge and skills are tested in the HSDPT Certification Examination. The certification program has now been in place for 10 years, and is being recognized and specified by an increasing number of private and public sector clients.

The Examination

The HSDPT exam itself consists of 90 multiple-choice questions, and accompanying reference data. It is split into two sections as follows:

Part A: Data Acquisition for high-strain dynamic pile tests: This part tests skills and knowledge that are fundamental to ensuring that correct procedures are maintained during data acquisition in the field; that the tester has a good background in material properties; and that data problems can be identified and rectified in the field.

Part B: Data Interpretation for high-strain dynamic pile tests: This part tests skills and knowledge that are fundamental to ensuring that the data recorded can be adequately interpreted in the field so that proper and timely advice can be given to the client. This part covers assessment of stresses, damage detection, driving system performance, and capacity evaluation.

Certification Levels

The HSDPT Certification system is a two-tiered system with six levels. The first tier is designated "PDA Tester" and is awarded either at the Provisional, Basic or Intermediate level, on the basis of their performance in Part A of the examination alone. Although it is ultimately at the discretion of the Client and the project specification requirements, it is intended that a person with PDA Tester status is qualified to undertake PDA testing in the field, and has sufficient knowledge to competently undertake this task, ensuring the data is of appropriate quality.

The second tier is designated "PDA Signatory" and is awarded either at Advanced, Master or Expert level on the basis of their separate performance in Parts A and B. Again, although it is ultimately at the discretion of the client and the project specification requirements, it is intended that a person with PDA Signatory status will be qualified to interpret and analyze the PDA test results, and then provide appropriate advice and guidance to the client under his or her signature.

The qualifying scores are as follows:

PDA Tester

Provisional:	minimum 45% pass on Part A
Basic:	minimum 50% pass on Part A
Intermediate:	minimum 75% pass on Part A

PDA Signatory

Advanced:	minimum 75% pass on Part A, and minimum 70% pass on Part B **or** combined Part A and B percentages totalling 150% or greater
Master:	minimum 85% pass on Part A, and minimum 80% pass on Part B **or** combined Part A and B percentages totalling 170% or greater
Expert:	minimum 93% pass on both Parts A and B

The validity period of certification differs according to the level achieved – the higher the level, the longer the certification is valid for. In all cases, an annual renewal fee is payable to keep certification current. At the end of the validity period, individuals must re-take the exam in order to be re-certified.

Benefits of HSDPT Certification:

1. Verification for providers and clients alike that testing personnel have appropriate minimum skill levels
2. Feedback to testers on areas where skills can be improved
3. Feedback to employers of testers on areas which need attention to minimize risk exposure
4. A marketing tool to convince new clients of capability
5. An edge in competitive bid proposals
6. Ability to provide services to clients who require quality services as demonstrated by satisfactory completion of the examination
7. Certified PDA Testers contact details are available on the Web

Exam locations:

The HSDPT exam is held around the world in conjunction with industry seminars, workshops and conferences, or can be taken by arrangement individually at any time at one of thousands of Regus Serviced Office locations across the U.S. and internationally.

PDA Modular Training Program:

Testers can prepare themselves for the examination with the comprehensive self-paced PDA Modular Training Program, which assists PDA Testers to develop their knowledge and understanding of Dynamic Pile Testing and prepare for the HSDPT Exam. Further details are available at www.foundationqa.com or www.foundationqc.com.

For all information relating to the HSDPT Examination and Certification program, please visit www.hsdptregister.org or email melanie@foundationqa.com. ▼

Passing

PDCA wishes to express our sincere condolences to the family and friends of Otto Kammerer. Otto was the founder and chairman of the Board for Pileco Inc. Otto passed away on March 26, 2009, at the age of 78 after a long and successful career in the foundation construction industry. Otto was well-known and respected within the foundation industry. He will be missed.

2009 New PDCA Members

The following is a list of all members who have joined the PDCA in 2009. The association would like to welcome everyone on the list!

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