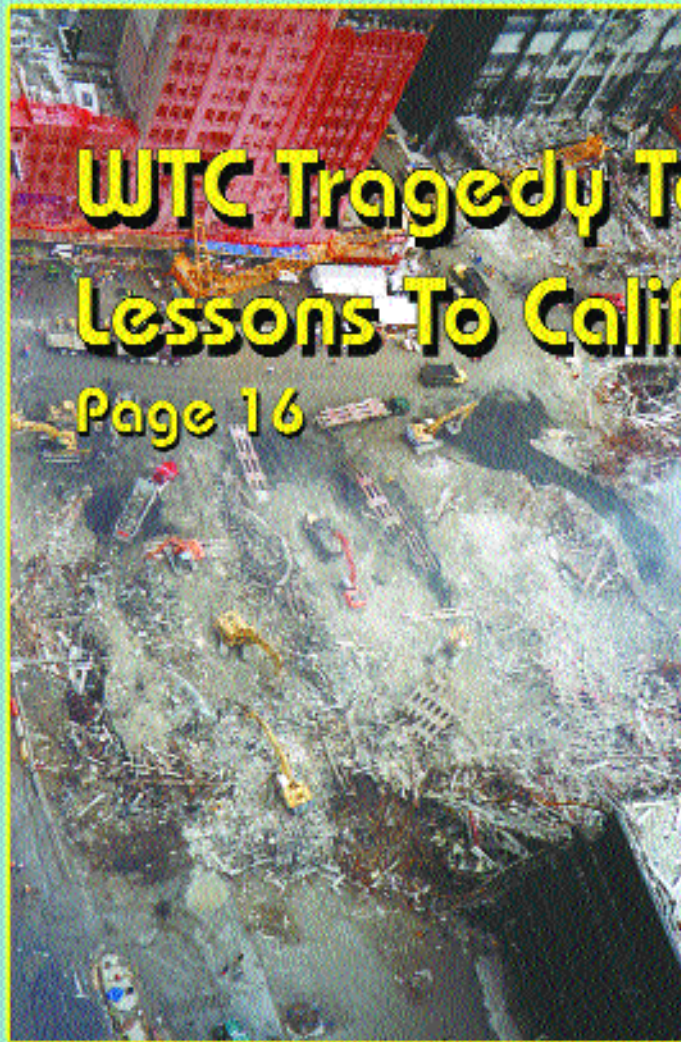


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The Official Publication Of The Pile Driving Contractors Association - Winter 2002 - Volume 3, Number 1

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WTC Tragedy Teaches Important Lessons To California Volunteer

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Balfour Beatty Widens San Mateo Bridge With A Little Help From Its PDCA Friends
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Where Does Your Nest Egg Lay?

For 20 years, 401(k) plans have been a great way for employees to save tax-free money for retirement. Workers whose companies don't offer pension plans find 401(k)s to be an excellent alternative because they can be moved from job to job and employees have control over their assets. In light of the Enron fiasco, President Bush and many Democrats agree on at least one thing: The nation's 401(k) plans need modification. However, the Bush administration and Barbara Boxer, a Democratic senator from California, have different opinions.

Boxer proposes to cap the amount of any one company's stock an employee can own at 20 percent. (Carolyn

Lochhead, *Rocky Mountain News*, Feb. 26, 2002) Many Microsoft workers became millionaires by investing in company stock. Most executives make a major-

ity of their money by participating in stock options and limiting workers' investment percentages. The cap would keep average workers from accumulating a great deal of wealth.

Boxer also proposes limiting the employer's tax deduction for company-matched funds from 100 percent to 50 percent (Lochhead). Most of the money employees at Enron had in stock came from their own purchase of the stock, not from the company's 50 percent match. Many Enron workers lost all their retirement savings as a result of the company's bankruptcy. The dollar amount of their collective losses is estimated to be more than \$1 billion (Lochhead). Boxer cites a lack of diversification as the reason Enron employees suffered losses in their retirement plans.

Bush's proposal would not cap the amount an employee could hold in company stock, and he would keep the tax deduction at 100 percent. But his plan would allow employees to transfer out of company stock after three years (Lochhead). These changes could cause severe problems for the business community. One issue is that smaller companies would be forced to buy back stock from employees, which could cause cash flow problems. This, in turn, would discourage company-matched contributions.

The fact is that changes must be made that will give workers optimal opportunities to invest in their retirement while maintaining control over their decisions. Furthermore, the reforms must provide incentives for companies to offer 401(k) plans and to be able to match employee contributions. As president of the PDCA, I would like to encourage everyone, employers and employees, to fully understand their retirement plans. It's your future. Don't put all your eggs in one basket.



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WTC Tragedy Teaches Important Lessons

For those who volunteered their services at the World Trade Center, the only way to make sense of such a tragedy is to learn from it and move forward.Page 16

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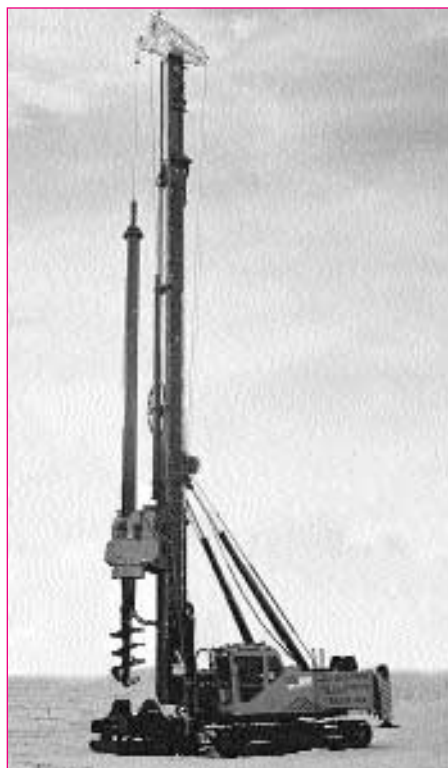
PDCA Web Site Updated

The PDCA Web site, www.piledrivers.org, has been redesigned. A key new feature is a member search, which allows end users to locate contractors, technical associates and suppliers to the driven pile industry. All members are invited to go online to register. For details, call the Association offices or contact headquarters at info@piledrivers.org.

Junttan Releases New Rig

Junttan, Europe's leading manufacturer of hydraulic pile driving rigs and a major supplier of drilling rigs, has released the PM 18-30, a medium sized drilling rig combining heavy duty performance with ease of transportation and high flexibility in handling.

The new model features a 300 kNm torque drill motor for drilling bore diameters up to 1.8 meters.



Junttan's new medium sized drilling rig, the PM 18-30, is also suitable for heavy-duty applications. Easy handling and efficiency combine to offer top performance.

Heinonen, Junttan's new hydraulic pile driving rig is friendlier to the environment and more practical than conventional diesel hammers and mechanical piling rigs because it generates less noise and reduces vibration and harmful emissions.

Junttan's multi-purpose hydraulic piling rigs are suitable for many different applications, including driven piles and various bored piles.

"Our global service covers the customer's individual needs, from design to manufacture of the rigs. We have supplied hydraulic piling rigs and hammers in more than 40 countries all over the world," Heinonen concluded.

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Bush Signs \$32.9 Billion DOT Spending Bill

President Bush recently signed into law a fiscal 2002 appropriations bill for the U.S. Department of Transportation that provides \$32.9 billion for the Federal Highway Program, an increase of \$1.2 billion from last year.

The bill, which the Senate passed unanimously last August but was stalled in the House until Nov. 30, also provides \$3.3 billion for Airport Improvement Grants and \$6.7 billion for federal transit.

The bill was held up in the House over safety provisions for cargo trucks entering the United States from Mexico. A compromise on the issue was finally reached Nov. 29.

FHWA And State DOTs To Partner On Research

The Federal Highway Administration Geotechnical Research Program recently solidified support from state departments of transportation and the private sector to participate in several new research programs.

Seven projects are being initiated to develop FHWA devices and design methodologies to improve geotechnical design practices, including geogauge, deep soil mixing, micropiles, lateral load testing of drilled shafts, impulse shear test systems, segmental retaining wall blocks and access to geotechnical information. For more information, contact Al DiMillio of FHWA at (202) 493-3035 or al.dimillio@fhwa.dot.gov.

Infrastructure Spending To Slow Down?

After several years of double-digit growth that peaked in 1999, the value of highway construction declined 4 percent in 2000 and was expected to drop by the same percentage in 2001. According to FMI Corporation of Raleigh, N.C., this "correction in the market signifies... a leveling out of transportation spending now that the Transportation Equity Act for the 21st Century has come into full effect." However, FMI notes "Overall highway construction should hold steady to the end of TEA-21," which extends through fiscal year 2003.

Do You Have A Pile Tip?

Piledrivers.org is continually seeking news briefs for Pile Tips, including new product releases. For more information on how to submit items of interest, contact the Association offices at (970) 945-1231 or drop us an e-mail at editor@piledrivers.org.



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Headquarters Contacts

General information: info@piledrivers.org
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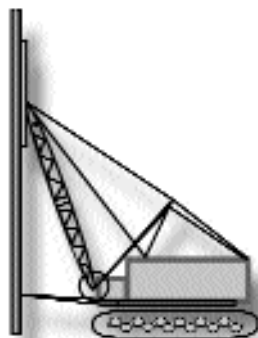


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Frazier Delivers A Quality Product In Pile Driving And As PDCA President

by Jennifer Hart, Editor

One of Jim Frazier's favorite pastimes is playing golf, but his clubs may be gathering some dust this season as he rolls up his sleeves to get to work as the 2002 president of the Pile Driving Contractors Association.



"I look forward to a year focused on educating professors and engineers on the benefits of the driven pile," said Frazier. "We have to tell our story to the people who write specifications for deep foundations.

They need to be aware of the driven pile foundation alternatives."

Frazier began his career in pile driving in 1978 at Lawrence Construction Company in Littleton, Colo. Over the years, he has gained invaluable field experience being involved in all types of ground work for piling and operating cranes, low boys and crane rigging. He relies upon this knowledge every day in his current capacity as piling manager/estimator for Lawrence.

Lawrence Construction Company is a fourth generation family-owned business dating back to 1924. As a heavy highway contractor for the Rocky Mountain region, the company's projects include road and railroad bridges, culverts, arch culverts, box culverts, storm water channel improvements, water division structures, custom pile driving and full-service design/build.

Lawrence's secret to staying in business for more than 75 years in one of the toughest industries around is simple: It does the job right the first time. This philosophy has served the company well over the years. Employees and clients know that Lawrence Construction delivers a quality product.

"We have a very good referral business

mainly because we don't cut corners," said Frazier. "In our small market area, it is critical that we get the job done on time and within budget."

Lawrence Construction's pile driving operations are a separate division of the company and perform mostly subcontract work. Frazier reports that in Colorado, power plants have been sustaining Lawrence's pile driving business.

"I have noticed an increased interest in pile driving recently," said Frazier. "I feel the PDCA has something to do with this."

Lawrence uses conventional cranes with single-acting diesel impact hammers. The diesel hammers are lightweight and easy to move between job sites. Since a good portion of Lawrence Construction's pile driving is done with H-piles into bedrock, the diesel hammer serves the company well.

Frazier has learned a lot about pile driving and employee relations from working at Lawrence Construction. The company takes every precaution necessary to protect its 160 employees. This includes having a full-time safety officer on staff, weekly toolbox meetings and spot evaluations to promote a safe mindset. Frazier observed that this makes good business sense on more than one level.

"Lawrence Construction has a large group of employees with more than 20 years of service with the company," Frazier said. "The majority of our employees work their way up through the company and feel like part of the family. Knowing that management is concerned about safety every day is an inspiration to them.

"From a competitive standpoint, an increased focus on safety not only helps us retain our best employees but keeps our insurance costs competitive."



Lawrence Construction drives pile at Highway 30 in Grand Island, Neb.

Many of those long-term employees represent one of Frazier's biggest challenges. Once these employees retire, Frazier and the company are taxed with finding qualified replacements, often a difficult task. Lawrence Construction is a union contractor and has begun an extensive internal training effort to head off potential staff shortages in the future.

Frazier's involvement with the PDCA stems from one of the company's owners, Earl Lawrence, who was one of the founding members of the organization and brought Frazier to the first Winter Roundtable and Board meeting. After that, Earl stepped back and



Jim Frazier

(Continued On Page 10)

Frazier Delivers (Continued From Page 9)

let Frazier be the company's liaison with the organization. Frazier has since served on the Board of Directors as a member, secretary/treasurer, vice president and

organizations in our business."

Frazier feels that his active interest and involvement with the PDCA has proven to be educational.

"I plan to introduce initiatives that focus on educating the engineers and professors who spec pile driving and teach engineering. I feel this contingent is the PDCA's greatest asset for industry growth."
 - Jim Frazier • Lawrence Construction Co.

"Equipment evolves. New products are introduced. It is tough to keep up on everything," said Frazier. "PDCA is the place where I go to look for technology upgrades, new ways of doing

now president. He continues Lawrence Construction's tradition of participating in industry organizations.

"Our president and vice president, Rick and Bill Lawrence, are both active in the Colorado Contractors Association and have encouraged managers like myself to become involved [in organizations] as well," said Frazier. "This attitude underscores the importance of such

things and industry innovations. As president, I will continue to promote the knowledge base that the PDCA offers."

Frazier has other important agenda items he would like to see enacted during his term.

"The engineer and contractor need to know the benefits of a driven pile," Frazier explained. "With a driven pile, you know what

(Continued On Page 11)



A Northwest Crane drives timber piles in Eastern Colorado for Lawrence Construction in 1935.

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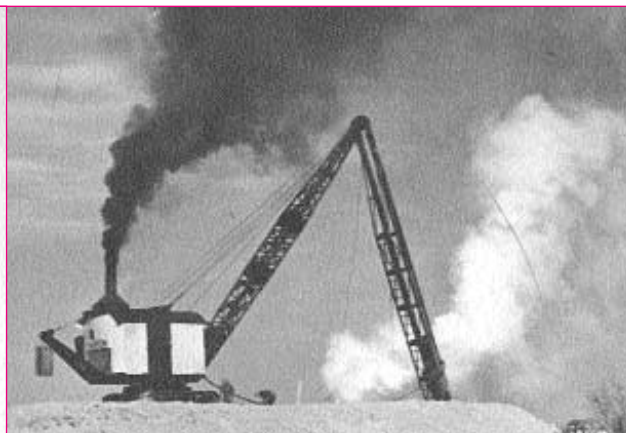
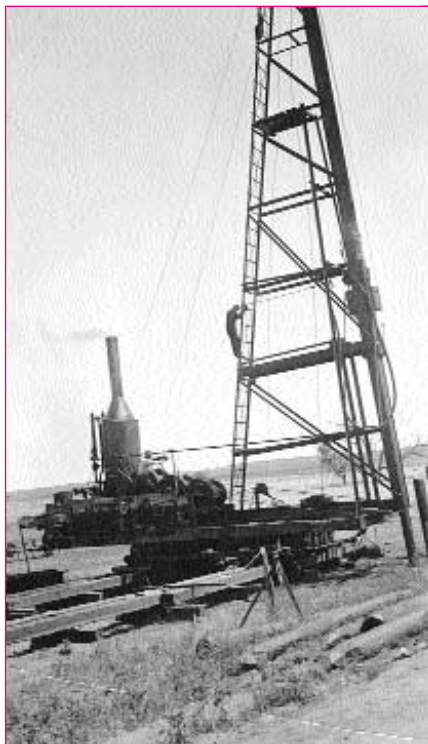
Frazier Delivers (Continued From Page 10)

you are getting, and, after it is installed, you know what you have. There is a comfort level in knowing that every pile is driven to a different depth because that is where it met its refusal depth.

“I plan to introduce initiatives that focus on educating the engineers and professors who spec pile driving and teach engineering. I feel this contingent is the PDCA’s greatest asset for industry growth. The more people who understand driven piles, the more driven piles will be specified for deep foundations. I think the PDCA is already making headway in this arena, and I hope to further continue this trend.”

Frazier is also looking for the Technical Committee to put forth a standardized pile driving specification that would prove helpful to engineers.

“I think almost every pile driving contractor could profit from a standard installation specification that could be given to engineers writing specifications,” said Frazier. “This guide would help engineers feel more comfortable with driven



Left: Lawrence Construction drives timber piles in 1929 with a steam hammer mounted on a skid. Above: In the early 1950s, Lawrence Construction drives battered pile with a Marion crane and steam hammer. The hammer is powered by steam from the crane.

piles, and we as contractors

distribute.”

On a personal level, Frazier admits that his sense of humor keeps him going every day. His well-rounded background and spirit of volunteerism should give PDCA members an indication of what lies ahead – an exciting year for the organization and the industry.

would be receiving information that we can understand and work with. I feel that this guide would be an excellent publication for the PDCA to develop and



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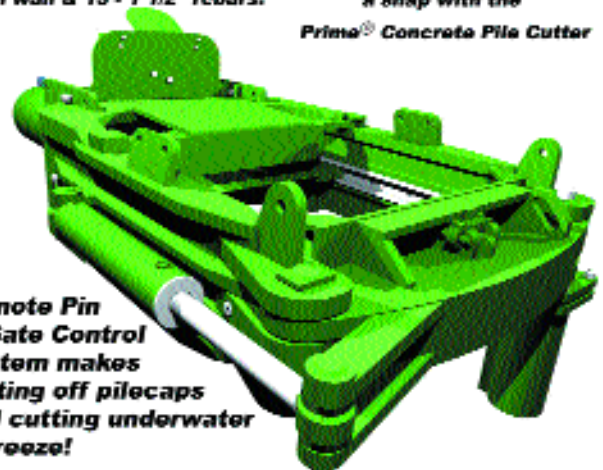


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Preventive Steps For Crisis Management



by Barry C. Roth, P.E., and
Lois A. Valeskie
Municon Consultants

It seems like everywhere you turn these days, people are talking about the "crisis." We're thinking about how we would respond in a similar situation, learning from what others did at the World Trade Center. *Newsweek* Magazine published an observation by one emergency person that "First you put all the egos aside and focus on what needs to be done and who can help." Oprah interviewed Condoleezza Rice, who observed that when informed of the first plane crash she remembered the adage: "Realize the first reports are usually wrong and worse than the reality."

Newsweek ran a story about one of the big brokerage firms whose main office is located outside the disaster zone. When its employees heard about the catastrophe, they got on the phone to some of the big hotels and booked rooms and meeting space to use as offices. They forwarded the phones from their WTC offices to other offices, and, by 3 p.m. the same day, their WTC office staff was relocated and back in business to make reassurance calls to clients. That's a great example of creative thinking, making sure you can keep serving customers who might also be traumatized by events. It was important for this firm to let customers know they were still there to take

care of them.

So what would you do? Construction equipment occasionally fails or tips over or the earth moves when it shouldn't – what then? We've found that just thinking through the "what ifs" beforehand can be half the battle when you're actually confronted with making these once-in-a-lifetime decisions.

Let's begin by defining what a crisis is:

(1) A state of mind where rational behavior is suspended or abridged, commonly to the point where rational action or response is difficult if not impossible and where behavior is characterized by emotional responses.

(2) A sudden and potentially adverse turning point in the course of events attributable to a lack of management planning leading to a sudden cascading increase in adverse scrutiny of work or behaviors.

(3) A situation characterized by some form of perceived failure where the complaining party threatens reprisal or sanctions against you.

(4) A situation where you experience fear, a sudden or decisive change in the course of a project, program or situation.

(5) Where the public is waving its collective actual or symbolic fist in your direction.

Engineers in crisis find other engineers to write long analytical reports about their mistakes, which they hope

will never see the light of day. They hope their project doesn't collapse or burst before they can change their name and leave the country. When contractors make mistakes they call their lawyers and notify their insurance carriers, blame the designers or agencies and leave for destinations without extradition treaties.

What are reasonable immediate mitigating actions?

1. Run away or bury your head in the sand - While in many instances this may be your first reaction, it is usually better to address the underlying reality and problems before they escalate. Don't assume that past procedures and common sense will suffice.

2. Run serpentine; designate a spokesperson - In the movie 'The In-Laws,' Peter Falk instructs Alan Arkin to "run serpentine" to avoid being shot and killed. In our situation, we don't want the media or public attacking, so we suggest media management. Designate a spokesperson to the press or neighbors from the contractor's staff, agency staff or whoever is present assuming the leadership position. Tell everyone else to keep their mouth shut and refer questions to this person.

This person should be capable of repeating these or similar words with feeling: "We don't have all the information yet as to what happened. We're trying to stabilize the situation and will give you more information when we understand more ourselves. I don't want to give you information which is wrong, but we'll talk with you further at a later time." And, if possible, give them a firm time. At least the media can then say, "We're awaiting more information; the situation is changing too quickly to know what's going on," and so on. They look like they're giving information and you haven't committed to anything that could be used against you.

3. Prepare a Crisis Management Plan - Crisis management starts with the management and control of your own emotions. You must set aside any fear of embarrassment, retribution, sanctions, prosecution or threat of termination so you can implement

(Continued On Page 14)

Crisis Management (Continued From Page 13)

reasonable, immediate, mitigating action.

Your Crisis Management Plan, or CMP, should include a management policy and commitment to train personnel in crisis mitigation and procedures. It should include funding for risk management training. Many insurance companies will help you establish these programs, which might reduce your insurance premiums.

Your CMP should include a clear and unequivocal delegation of responsibility, including a chain of command to a designated crisis manager. Who gives the first response and analysis? Require that questions be directed to one person for consistency of information. Require all staff not to offer opinions.

In construction, avoiding problems starts in part with the OSHA-mandated

weekly tailgate safety meetings.

Management also should review its crisis management procedures weekly. It's easy to forget as new personnel come on board that people change positions or projects. Consequently, regular review of your crisis management policies and procedures is necessary.

Elements Of A Crisis Management Procedural Plan

If you are mentally prepared, you might assume a command and control mode where you become very focused. If your staff calls in with a crisis, they might be overwhelmed, in shock and not thinking clearly. It is important for you to get onsite to assume control. Other project members might also assume this crisis mode, so first, get together, request that

all egos be put aside and focus on what needs to be done and who can help. Your CMP should designate who's in charge.

✓ **For first aid involving injury, stop the bleeding, protect the wound and treat for shock** - Ask the police to cordon off the entire area to reduce the risk of being sued for personal injury by compassionate looters. Provide site security if necessary and available to keep the public and other meddlers away from the scene.

This is for the "protection of the community" and could buy you time to assess the situation more accurately. Municon Consultants was involved in a sinkhole failure where everyone in the DPW wanted to come and see. This hindered the people and equipment *(Continued On Page 15)*



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Crisis Management (Continued From Page 14)



trying to stabilize the site against further catastrophic damage.

✓ **Inform management, your engineers, your insurance carriers and your attorneys.**

✓ **Be prepared to assign someone to answer the phones** - This person should be capable of repeating these or similar words with feeling: "We don't have all the information yet as to what happened. We're trying to stabilize the situation and will give you more information when we understand more ourselves." Tell them not to offer opinions or more unfounded information. If some public agencies want to be the only spokesperson and request that all communications go through their staff, let them. Give that phone number to your staff person.

This idea goes back to Rice's comment, "Realize the first reports are usually wrong and worse than the reality." It could also work against you to have someone say something without all the pertinent information, which could be used against you in a claim. It is better to say nothing while sincerely looking like you will at a later point.

✓ **Inform the media** - If the media aren't there already, remember your version should be the first they hear, because it will color their subsequent opinions. Remember the halo effect: If you appear to be cooperative and helpful at the front end, you will benefit from those good

feelings and trust later. If you don't really know what happened, let them know that and inform them that as information becomes available, you will share that with them. Don't give the impression that you

have something to hide.

✓ **Have current phone lists available of agency reps or other project managers, other contractors or specialty subcontractors (a paper version helps if computers aren't available) who can be called in to assist you** -

You will need one set in the main office, in case they need to organize the situation from there, and one in the project office.

✓ **Feed the troops. Arrange to have sandwiches, soup, coffee, sodas and candy bars available for those working to control a crisis situation** - People who are undernourished, cold or in a state of psychological trauma due to unfamiliar media attention can make poor decisions or use poor judgment, which might cause further accidents and lead to plain old fatigue. Be careful not to expect too much from staff and watch for signs of exhaustion. Consider a blanket with nap time or portable heaters a cost of crisis management.

✓ **Document what's going on and take pictures** - Institute a policy of phone memo records, which can help you on all your projects. These forms should be used religiously to document time and date of call, who called from what company, and, as accurately as possible, what was said by both parties. Include a signature line, too. If Bob told Jim to do X at 10 a.m., and Sid came

along at noon and said we're changing it to Y, you'll want a record of this.

Likewise with capturing photographs of the situation: think evidence. Each project office generally has a camera, so make sure you have film and batteries. Don't assume the digital camera will be charged up. As a backup, get some of those disposable cameras. You might even want to throw one in every vehicle, just to have them available and handy.

✓ **Open communication** - Sometimes holding meetings with the homeowners/neighbors to explain what's going on can work to your advantage. Part of each meeting should involve listening to the fears of people and explaining the situation as information becomes available to reassure their safety. If you can arrange for experts or other support people to help you answer questions, invite them.

✓ **Think ahead** - Some projects have a high potential for developing crisis situations, and as professionals you generally know which projects these are. They can include neighbors who are against the project; a design that is untested and risky; and site conditions that are unique and problematic. In these situations, we encourage you to plan for "litigation mitigation."

With any crisis situation, there are never any easy answers or solutions. Share and discuss this article with your staff, and discuss your firm's problem projects. Start now to put out fires. Implementing some of the easy suggestions (phone lists, getting disposable cameras, finding a deli for food) will help you cope when you're confronted with a crisis situation and give you a sense of control. We test ourselves when we meet these challenges capably and learn to deal with a crisis with confidence.

Barry Roth, PE, is the principal engineer of Municon Consultants. Lois Valeskie is a principal with Municon. They can be reached for questions or comments at (415) 641-2570 or Municon@municon.net

WTC Tragedy Teaches Important Lessons To California Volunteer

by Jennifer Hart, Editor

All Americans were changed in one way or another on Sept. 11, 2001. Many may have lost a sense of security on that day and now take more time to hug and kiss their loved ones as they leave for work or school each day. For those more intimately involved in the tragic event, the healing process is just beginning. For those who volunteered their services to rescue and recovery efforts, the only way to make sense of such a tragedy is to learn from it and move forward. This is the attitude of B.K. Cooper, president of Cooper Crane and Rigging in Vallejo and Novato, Calif., who spent more than a week at Ground Zero as a member of the Federal Emergency Management Agency's (FEMA) Incident Support Team.

About five years ago, Cooper was invited to join the Marin County Search and Rescue Unit. His rigging expertise made him a valuable member of the 55-man task force, which participates in various training programs once a month. He was given the job of rigging manager and was the only non-county employee on the team. Cooper was also charged with conducting an annual training/cross-training class on general rigging and crane rigging operations for county and firefighting personnel. During emergencies, he has been called upon to provide both consulting and actual rigging services.

Cooper's involvement with FEMA indirectly sprang from the 1995 Oklahoma City bombing. Cooper recalled that after FEMA responded to that disaster, the organization realized it needed a rigging specialist on its team and rigging/crane operation training for task team members.

"One of the top structural engineers for FEMA, Dave Hammond, contacted me to help create a class on crane and rigging techniques that can be used in emergency situations," said Cooper. "It took us about two years to complete the curriculum for the class."

FEMA has 28 task teams around the country, eight of which are located in California. Each team consists of 62 members with expertise in medicine, engineering, communications and other specialties that are necessary to round out an emergency response unit. Cooper's first crane and rigging class for FEMA was conducted

at the National Aeronautics and Space Administration's Moffett Field in California in October 2000. Four of California's eight task teams attended, along with other task forces from across the country. California's Task Force 3 assisted Cooper with training. Another class was scheduled for October 2001 but, due to events in New York City, was rescheduled for March 2002.

"California's Task Force 3 is a very active team and was one of the first FEMA teams to respond to the bombing in Oklahoma City," recalled Cooper. "I was asked to join Unit 3 Task Force the day I left for the World Trade Center in New York City after the Sept. 11 attacks. I am now a member of the FEMA Incident Support Team as their crane and rigging specialist."

Although Cooper's three decades in the crane and rigging business made him an excellent resource for FEMA and rescue workers, he could have never predicted how he would actually contribute to the efforts at Ground Zero.

Cooper arrived in Lower Manhattan seven days after the attack and stayed through day 16. At this point, the mission was still termed search and rescue, and there were several key groups involved in the efforts. The Department of Design and Construction (DDC) immediately began coordinating the site on Sept. 11. New York's Fire Department was one of the first groups responding to the terrorist attacks and was managing the search and rescue efforts at Ground Zero. The DDC brought



in four contractors and effectively split up the site into four quadrants. Unions, specialty contractors and FEMA were also active at the site. The group that made a lasting impression on Cooper was New York City's firefighters.

"The Fire Department had been decimated," said Cooper. "They lost 40 of their top chiefs in the collapse of the towers, as well as numerous firefighters and equipment. Survivors were desperately searching to recover their lost brothers; many could be seen digging by hand through the rubble."

With so many different groups and agencies engaged in search, rescue, recovery and cleanup, communication among the crews was very important. Cooper volunteered to assist in the transfer of information to these groups.

"I acted as a liaison between contractors, the city, unions and FEMA," said Cooper. "I reported daily to FEMA with information from the heavy crane workers, Fire Department and other groups on site. You have to remember that the whole situation was incredibly sensitive. Ground Zero was both a crime scene and a job site. There were security issues, hazardous fumes, trip hazards, dangers from falling glass, high heat from burning portions of the building and a lot of workers under tremendous emotional and physical stress."

"I felt that experience I gained from running my company and working with unions, city and county officials and engineers taught me to remain quiet, respectful and wait for the right opportu-



A 700-ton Leibherr operates from West Street. Thirty-eight truckloads delivered the crane to the site.

nity to speak,” he said. “I helped bring information to and from each group and became intricately involved in determining when the efforts changed from rescue to recovery.”

Which, Cooper went on to mention, was never officially announced but was more of a general realization by all those involved.

“Around day 14 or 15, there was a piece of Tower 2 still standing, which we had dubbed the ‘potato chip.’ There was some debate about whether to pull down this portion quickly or take it apart and remove it slowly. The ultimate decision to pull it over signified the switch from rescue to recovery efforts.”

Cooper stayed in New York for another day but, at this point, his work was generally done.

One engineering aspect of the World Trade Center that interested Cooper and presented numerous challenges to search and rescue workers was the slurry wall surrounding Buildings One and Two and partially around buildings Three and Four. The 60-foot high slurry wall or “bathtub” keeps the Hudson River from flooding New York’s subway system. Maintaining the integrity of the slurry wall was of utmost importance to the city, but it created problems during the rescue phase.

“It took about three days to figure out how to move some of the large beams in the heart of the Trade Center wreckage,” said Cooper. “The ground adjacent to the slurry wall could not handle any loading. Cranes had to remain about 75 feet away from the bathtub, and we needed some very large cranes to move beams. Eventually a bridge was built with 50 feet of steel cribbing, of which one end sat on the slurry wall. Workers were then able to use 800- to 1,000-ton cranes to lift the beams.

“Most people don’t realize that 60 stories of the WTC was in the basement.

The slurry wall was three feet thick and went down to bedrock. As workers dig down, the slurry wall is in danger of collapsing. To remedy this, workers dig 15 feet, then install a row of tiebacks. Literally hundreds of tiebacks are needed to secure the wall. That is one of the main reasons it is taking so long to finish clean-up.”

Cooper had the unique opportunity to look underneath the towers and see the actual foundation piles and old subway tubes that were beneath the 110-story buildings.

Cooper saw a lot of life-changing things happen during his nine days at Ground Zero. He was touched to see firemen from each firehouse personally remove their fallen colleagues with dignity from the wreckage. Makeshift memorials gave workers a chance to grieve before returning to the grueling task at hand. Chaplains lent support through warm words and kind gestures to those who needed them. One moment was especially poignant for Cooper.

“I was very concerned with whether I could handle the gruesome nature of Ground Zero. I was able to deal with some of the more difficult sites because I was able to move away from the situation if it got too intense. Many workers were not so fortunate,” he said. “I vividly remember a crane operator, iron worker and chaplain taking a moment to pray together and cry together; then they returned to work. People were there to support you while you cried and emotions were allowed, but everyone also knew they had work to do.”

Cooper also said that support mechanisms were in motion beyond New York. A FEMA representative called Cooper’s wife every day while he was working at Ground Zero. Since he has returned, a Task Force 3 team member regularly calls to check his health, as well as to offer psychological counseling.

Cooper came back to California with a renewed sense of purpose for his home state: prepare city and county to handle an emergency of WTC proportions. Cooper’s first stop was the Office of Emergency Services, where he has met

with county and state officials to discuss how to plan for an emergency situation.

“We all know now that an emergency hits really fast. There is no time to chat about how to deal with it,” he said.

Cooper is developing a database with county and state representatives that will address equipment, personnel, communications and mobilization, but he says each of us can prepare in our own way.

“If you feel you would be needed in an emergency, keep a shoebox full of supplies in your car. An extra set of clothes, a flashlight and some rations could make all the difference in a crisis situation.” – B.K. Cooper



“If you feel you would be needed in an emergency, keep a shoebox full of supplies in your car,” Cooper said. “An extra set of clothes, a flashlight and some rations could make all the difference in a crisis situation. Talk with your family and your employer if you plan to be involved in the management of a crisis. Can they survive without you for a week to 10 days? Who takes over if you need to leave?”

“Get your name to county officials now if you are interested in being involved in emergency missions. You may need to attend some training classes, but it will be well worth the effort.”

Cooper suggests remembering daily work functions that could be useful in an emergency. His class for FEMA team members focuses on rigging and pushing a crane beyond capacity for emergency rescues. He covers the risks of doing this coupled with how to mitigate those risks. He also suggests bringing up crisis management at the company’s next safety meeting and discussing what pile drivers can do to make a difference.

“Pile drivers make the best riggers because they use a crane to capacity all day long,” Cooper said. “Contractors bring something to the table because our competitive marketplace breeds success. I encourage you to seek out the disaster management teams in your area and volunteer your services. By the time an emergency hits, it is probably too late.”

Demonstration Emphasizes Pile Driving And Load Testing

By George Goble

A field demonstration emphasizing pile driving and load testing was presented by the Pile Driving Contractors Association during a conference held in Orlando, Fla., Feb. 14 through Feb. 16.

The Conference, attended by approximately 500 people, most of them engineers interested in deep foundations, was hosted by the Geotechnical Institute. PDCA's Friday afternoon demonstration was organized by a committee chaired by Professor Manoj Chopra of the University of Central Florida.

Two 12-and-three-quarter-inch, closed end, steel pipe piles had been driven in late November by PDCA member Ed Waters & Sons Contracting of Jacksonville, Fla. The hammer, a D-8-32, was supplied by another PDCA member, American Piledriving Equipment of Kent, Wash.

During PDCA's demonstration, one of the piles was statically tested in compression and the other in tension. After completion of the load tests, an additional pile of the same size was driven with the same hammer. The load tests and the driving of the additional pile were done by Ed Waters & Sons, and the compression load test was performed by Gray Mullins of the University of South Florida. PDCA member Frank Rausche of GRL & Associates performed the tension test and GRL made dynamic measurements during the driving of the demonstration pile.

PDCA offered a prize of \$1,000 for the person who most accurately predicted the driving record of the pile, based on subsurface information obtained prior to driving the first piles. The prize was presented at the Conference Saturday morning to Ameir Altae.

The usual surprises were encountered. The demonstration pile drove much harder than did the two piles driven in advance, and both of the static test piles carried a much greater load than had been anticipated. The measurements that were collected will be analyzed and a more detailed report will be presented in the Spring issue of *piledrivers.org*.

George Goble is president of George G. Goble Consulting Engineer LLC of Boulder, Colo. He can be reached for questions or comments at (303) 494-0702 or goble@bridgetest.com.



Balfour Beatty Widens San Mateo Bridge With A Little Help From Its PDCA Friends

by Jennifer Hart, Editor

Balfour Beatty Construction Inc., headquartered in Atlanta, is the U.S. subsidiary of the London-based Balfour Beatty plc. It is a full-service civil engineering and construction company and is ranked as one of the top construction firms in the United States. In addition to major road, bridge and interchange projects in Texas, Washington, California and along the Eastern Seaboard, Balfour Beatty is widening the San Mateo-Hayward Bridge in the San Francisco Bay area.

In October 1999, Balfour Beatty was the low bidder on the California Department of Transportation's San Mateo Bridge widening project. The existing bridge has both a high-rise portion and a low-level trestle section, which is much closer to the water. The \$113 million project is for constructing a new 4.7-

mile-long trestle portion of the 7.5-mile-long San Mateo Bridge. The high-rise portion of the existing bridge consists of three lanes in each direction, and the existing trestle portion is two lanes in each direction. The project includes building a new bridge next to the trestle portion of the current bridge that will include three westbound lanes and wide shoulders. The existing trestle will be converted to three lanes eastbound with wide shoulders. The final result will be three lanes each direction over the entire length of the bridge.

Balfour Beatty project manager Mark Johnnie said bidders had the opportunity to bid on three bridge designs. The first alternative consisted of piers spaced 60 feet on center with double tee girders spanning between the piers; the second alternative was piers spaced 90 feet on center with bulb tee girders spanning between the piers and precast prestressed flat slabs forming the gap between girders; and the final alternative was piers spaced 30 feet on center with hollow core slabs spanning between the piers. All three alternatives required a cast-in-place roadway deck. Balfour Beatty's low bid was based on the second option.

Balfour Beatty is 65 percent complete with the 700-working-day project. The company will drive a total of 826 42-inch-diameter precast prestressed concrete cylinder piles, including test piles.

"We are driving the pile into classic bay mud, which is a mix of sand, silty sand and clay, among other things," Johnnie said.

In addition to the precast pile, Balfour Beatty will drive 1,592 36-inch diameter temporary steel piles. These 90-foot-long piles will support the temporary erection platform, (TEP)



from which the new bridge is built.

"All precast elements for this project – pile, girders, caps and flat slabs – are supplied by Pomeroy Corporation in Petaluma, Calif.," Johnnie explained. "These items make the 50-mile trip from Petaluma through the San Francisco bay to our site via barge."

In addition to the pile, the new bridge will require 278 precast concrete caps, 2,169 precast prestressed concrete girders, 19,000 precast prestressed concrete flat slabs, 12 million pounds of structural steel reinforcement and 50,000 cubic yards of structural concrete. After all precast bridge elements are erected, bridge deck reinforcing is installed and then Balfour Beatty places bridge deck concrete, which forms the completed roadway surface.

"Our goal is to erect 270 feet of

(Continued On Page 20)

Project Spotlight (Continued From Page 19)



bridge each week," said Johnnie. "We have been fortunate to meet this goal on a regular basis."

Working on the San Francisco Bay poses all types of challenges for Balfour Beatty, equipment placement being at the top of the list. Johnnie stated that floating equipment such as a derrick barge could not be used because of a contractual requirement that prohibits construction equipment from resting on the bottom of the Bay, which, in the location of the new bridge, would have been a regular occurrence because of shallow water. To overcome this restriction, Balfour Beatty installs all precast bridge elements from the 1,080-foot-long temporary erection platform. On the leading edge of the TEP, a Manitowoc M250 crane drives permanent and temporary piling with a Delmag D100 pile hammer, while on the trailing edge of the TEP, a Sumitomo SC-2500 erects precast girders and flat slabs and removes the TEP. TEP piling is extracted with an ICE 6680 vibratory hammer.

With the marine environment surrounding the bridge, corrosion was a significant concern for the California Transportation Department.

"Caltrans (California Transportation Department) has taken significant steps to minimize potential structural degradation due to corrosion," said Johnnie. "All structural reinforcing steel is epoxy coated; structural concrete contains 15 percent fly ash and 7 percent silica fume; and all exposed concrete surfaces, excluding the roadway deck and barrier rail, are coated with 60 mils of polyurea coating."

Other challenges involve adhering to a stringent storm water pollution prevention plan and safety considerations that stem from working so close to live traffic.

"The existing San Mateo Bridge is an extremely busy artery that connects the East Bay to the San Francisco peninsula. Safety for our employees, CalTrans employees and the traveling public is the top priority for the project," Johnnie explained.

He added that two PDCA-member companies have been instrumental to the success of the project's pile driving operations.

Pilemac, located in Livermore, Calif., supplied the Delmag D100 pile driving hammer and, in conjunction with ICE, the ICE 6680 vibratory hammer. Pilemac also designed and supplied a special adapter that allows the precast prestressed concrete cylinder pile, with extensive vertical reinforcement extending from the pile head, to be driven.

"Both hammers as well as the special adapter have performed well. Pilemac has done an excellent job supporting the project both from a routine equipment maintenance perspective and from a technical basis that is founded on a wealth of pile driving experience and knowledge," said Johnnie.

Specialty Piling Systems, Inc., located in Slidell, La., supplied the pile cushions used to drive the precast prestressed cylinder pile.

"The pile cushions used on the project are unique in that they not only have to be constructed to fit over the seven inch wall of the cylinder pile, they are penetrated 20 times by vertical #11 pile reinforcing bars that extend from the top of the pile. We tried a number of different types of pile driving cushions with marginal success before we hesitantly took a chance on a cushion made East of the Rockies. I wish we had taken the chance earlier because the Specialty Piling Systems cushion has performed



superbly," said Johnnie.

Johnnie finds it personally rewarding to be involved in such a fast-paced and challenging engineering project.

"Because the project is so repetitive, every day is an opportunity to improve," he said.

He and his 65-person crew expect to complete the project on time.

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Slope Failure Presents A Unique Challenge

By Kevin Barber

Marmer Brothers Construction, LLC

An unanticipated hillside slope failure always presents a unique and complex geotechnical engineering challenge. When such a failure occurs within 100 feet of a newly constructed multi-million-dollar shopping center at the bottom and multi-million-dollar dwellings at the top of the hillside, the construction task is complicated by limited space as well as by the need to remedy the failure as soon as possible. Such was the challenge for PDCA-member Marmer Brothers Construction, LLC, of Hillside, N.J.

Marmer Brothers was approached by Vollers Excavating & Construction Company, Inc. of North Branch, N.J., the site contractor at the Watchung Square Mall on Route 22 in Watchung, N.J. Following a slope failure along the back side of the shopping complex, Vollers consulted with Marmer Brothers' chief engineer, Michael Blendy, P.E., to develop the most effective remedy to the site conditions. Several alternative concepts were evaluated and Marmer Brothers recommended interlocking steel sheet piles and tiebacks attached directly to the sheet piling, which eliminated the need for wales. Final design drawings were prepared by the project geotechnical engineer, retained by the building's owner.

Marmer Brothers was responsible for driving the 30-foot AZ-36 sheets. This task was performed by the company's 80-ton Manitowoc 3000 WV equipped with an American Piledriving Equipment 150-ton vibratory hammer and power pack.

"We feel the APE 150T is the most versatile and best constructed vibratory hammer in the business," said Marmer Brothers President Nestor L. Martinez. "We have owned it for more than three years, and it has been working almost every day since its purchase. We have used it for a variety of applications,

including driving H-Beams."

Due to slope failure concerns, a 2,000-linear-foot wall of sheeting was completed in six days.

Right behind the sheeting installation, Marmer Brothers, along with Terra Drilling Company, Inc., a Hudson, Mass.-based geotechnical design and construction specialist, began installing 210 kip tiebacks. Because of the need to support the slope, sheeting and tieback operations worked alongside each other. The joint venture of Marmer Brothers and Terra, coupled with outstanding support from Vollers, enabled the project to progress quickly. To secure the wall, it was necessary to

drill and lock off all tiebacks on the top row. The sequence of events included sheeting driven by Marmer Brothers, which in turn burned holes into the tieback installation. Following the installation of the tiebacks – the majority of which were installed by Terra – Marmer Brothers welded a tiepoint to distribute the load to the sheeting. C.M.C., Inc. of Paterson, N.J., fabricated the tiepoint assemblies. Three days after installation of the tiebacks, testing was performed and accepted tiebacks were locked off.

Once the top row was completed, excavation began for the second and, in certain cases, the third row. However, due to concerns of undermining the sheeting, it was decided that Vollers would excavate "horse stalls" approximately 40 feet wide in which tiebacks would be installed and locked off simultaneously. Following successful testing, the horse stall was either expanded or the contractor was required to jump to another stall. Obviously, such

an arrangement required delay and sometimes hourly updates of the construction progress as well as any wall movement. Despite these daunting challenges, Marmer Brothers and Terra Drilling completed the 2,000-linear-foot sheeting wall with 379 tiebacks in three-and-a-half months and slightly ahead of schedule.

The success of the project was aided greatly by PDCA member Skyline Steel Corporation, which provided the sheeting in a short turn-around time. Dwyidag Systems International also provided excellent support by providing well coordinated tieback material deliveries.

"The project was a construction feat," Frank Ferraro, Vollers' project executive, waxed reflectively. "There were

times when I thought the schedule would be compromised due to the complex sequence of events from driving sheeting to installing tiebacks to testing and locking the system off. However, due to the perseverance of everyone involved, as well as the superior skills of Marmer Brothers and Terra Drilling and the performance of the system, we ultimately made it happen in a timely manner."

"There were times when matters were heated and the men and the equipment were pushed to their limits, but there was never any doubt that we would conquer the mountain. That was our mission and we made it happen," added Tom Lynch, Terra Drilling's superintendent on the project.

The newly constructed wall protects both stores and homeowners.

"There were times when matters were heated and the men and the equipment were pushed to their limits, but there was never any doubt that we would conquer the mountain."

– Tom Lynch • Terra Drilling

Kevin Barber is the chief executive officer for Marmer Brothers Construction, LLC. He can be reached for questions or comments at (908) 851-2100.

Construction Safety Audit: Are You Ready?

by James C. Czaja

Many agencies may enter a job site to determine the level of compliance with a host of safety regulations. OSHA, the home office or perhaps the insurance company may take a look at what you are doing. Their first inquiry will be to see your safety plan. If you have a poor plan or perhaps no plan at all, you may be subjected to a fine or project delays that are costly to everyone. On the other hand, if you have a good safety plan, they will try to determine if you are following it.

Tools and additional information that will help put together and implement a good safety plan are imperative. Thomas Kavicky, safety director for the Chicago and Northeast Illinois District Council of Carpenters, suggested an audit form offered by the Construction Safety Council of Illinois. As Tom and I reviewed the form, it became evident to both of us that this was an excellent tool for implementing and improving safety plans. Many contractors who seek a safer, more productive job site have contributed to the content of this form.

Safety pays – the secret is out. Every contractor has some level of safety program. However, how elaborate that safety program is depends on the owners or agencies that are letting the contracts.

The safety plan will vary for each job site. It needs to make sense for the specific tasks being accomplished. For example, a job site that has lead levels beyond the permissible exposure limits would require pre-job and post-job blood sampling to determine exposure. Those records would need to be kept for 30 years. However, it would not be necessary to subject every employee on every type of job site to blood screening – only those where lead is present at higher levels. Therefore, this procedure would not be a part of a universal safety program. However, a standard test for a universal safety program may be the ability of an employee to lift 50 pounds. Another procedure may be a pre-job or pre-hire drug screen. Both would determine fitness for work and make sense for safety on most job sites.

A pile driver is hired at a certain level

of experience that would be expected to increase because self-improvement is encouraged and, in some cases, required. For example, a certified welder may be qualified to A.W.S. (Section D1.1 with E7018 electrode). To increase that pile driver's skill level, it may not be necessary to become certified on pipe for high pressure, but classes in non-destructive testing, heat treating or metallurgy would be beneficial.

The same is true for the construction safety plan. Like the worker who should improve, so too should the safety plan be improved. It should be looked at as a living document that must be shaped, massaged and constantly improved, all while making sense at a specific job site.

Safety pays – the secret is in Table 1. I offer you a glimpse of this nine-page document that is so inclusive, you might even find something to add to the most elaborate safety plan. This section will give you an idea of how the categories are organized.

Safety pays – are you ready? Test your safety plan against the audit form. (See Safety Quiz on page 24). Match two of the subtitles in Group B to the various titles in Group A, and check your answers at the end of this article.

You may not agree with the placement of all the subtitles. Depending on your experience on different types of job sites, variations are OK. Keep in mind that this is a suggestion, not the final word.

Next to consider in your safety plan is the "what if" factor, or the contingency plan. The contingency plan could easily be listed under two-thirds of the categories of the audit form. The "what if" factor is a very useful tool in deal-

ing with the unpredictable element of construction – the public.

The renovation of Soldier Field has started in Chicago. The early stages after demolition will require the placement of several thousand H piles. The project is moving ahead slowly. In a normal football season, there would be four or five rigs putting in long hours driving the bearing piles. However, since the Chicago Bears made the playoffs, the project could not move along as swiftly as originally planned. The football games were not the only consideration, though. There are many tourist areas in the vicinity of Soldier Field. The Shedd Aquarium, the Planetarium and the Field Museum all share the same parking facilities. Hence, all are affected and will affect every phase of the renovation. This is one example of how the highly unpredictable element of construction – the public – can alter plans.

The Soldier Field project is a Turner, Barton, Malow, and Kenny joint venture. Thatcher

(Continued On Page 24)

Table 1

Client _____

Job site location _____

Senior site rep _____

Senior safety rep _____

Person(s) making inspection _____

1. Program Administration

- A. Safety meetings
 1. Central Safety Committee
 2. Fire Protection Committee
 3. Site Safety Committee
 4. Tool box
 5. New/rehired daily safety orientation
- B. Supervisor Safety Manual use
- C. First aid training, EMT
- D. Required reports and records (OSHA poster/OHSA 200 log)
- E. Organizational chart
- F. Weekly and daily inspections
- G. Are emergency telephone numbers, such as Police Department, Fire Department, doctor, hospital, ambulance posted?
- H. Emergency procedures
- I. Required posters displayed
- J. Mutual aid agreements in area
- K. Insurance liaison
- L. Accident investigations – close calls

Construction Safety Audit (Continued From Page 23)

Engineering of Gary, Ind., the piling contractor, is in the process of setting up and completing load tests, per design specifications. The company's contingency plan was to give ownership of the project through a bit of information to the people who use the facilities in and near Soldier Field. An example of a one-time contingency plan that has become standard operating procedure is the pedestrian peek holes in plywood security fences. The public is put safely behind a security fence but can see the job site, rather than have them satisfy their curiosity in the middle of a gate for vehicular traffic.

These contractors should be applauded for their effort to involve the public. In this two-year project, the management of traffic in and around Soldier Field will require constant vigilance.

Let's consider the safety audit form and take a look at two areas that would be most beneficial for controlling and protecting pedestrian and vehicle traffic.

17. Barricades

- A. Floor opening;
- B. Roadways, sidewalks and stairs;
- C. Adequate lighting;
- D. Traffic controls;
- E. Trenches and excavations;
- F. Special work: overhead, sandblasting, radiation, hydroblasting and pressure vessels;
- G. Equipment working - action area, hazard area;
- H. Signs as required;
- I. Elevator shaft openings;
- J. Fencing;
- K. Job site security.

20. Road Construction

- A. Correct vehicle maintenance and operation;
- B. Laws and ordinances observed;
- C. Competent flagmen properly dressed, instructed, posted;
- D. Equipment not blocking right-of-way;
- E. Traffic control through construction site - stop signs and speed limits;
- F. Adequate marking and maintenance of detours and obstructions;
- G. Dust control;

H. Adequate lighting;

I. Equipment parking, not to obstruct traffic;

J. High visibility vests or jackets on workers.

Implementing and enforcing barricades and road construction is not the exclusive responsibility of the piling contractor. This is where the safety plan returns to the administration program. Central safety committee meetings should delegate responsibility in each instance to all interested parties. Each has a responsibility to carry this information to the front line employee in the form of toolbox talk or that of more intensive training, as needed. Specialized training may require updates. This continuing education can be a tool to keep your safety plan first rate. By using the host of tools available, you will keep your safety plan alive and well - and you will be

ready for the construction safety audit.

For a complete Construction Safety Audit Form, contact: Construction Safety Council of Illinois • 4415 West Harrison St., Suite 407 • Hillside, Ill. 60162 • (708) 544-2082 • (800) 552-7744.

Answers to the Safety Quiz: 1 - O, H; 2 - P, T; 3 - S, M; 4 - G, Q; 5 - N, E; 6 - K, D; 7 - C, I; 8 - R, U; 9 - J, A; 10 - B, V; 11 - F, L.

James C. Czaja is the business representative, pile drivers and commercial divers, Local Union #578, Chicago. He is president of the Pacific Coast Council of Piledrivers and a member of the National Piledriver Advisory Committee for the United Brotherhood of Carpenters. He can be reached for questions or comments at (708) 846-2466 or by e-mail at JCCzaja@aol.com.

Safety Quiz

Match two of the subtitles in Group B to the various titles in Group A, and check your answers at the end of this article.

Group A

- | | |
|--------------------------------------|--------------------------|
| 1. Orderliness and Material Storage | 7. Motor Vehicles |
| 1. | 1. |
| 2. | 2. |
| 2. Fire Prevention/Protection | 8. Welding and Cutting |
| 1. | 1. |
| 2. | 2. |
| 3. Personal Protective Equipment | 9. Barricades |
| 1. | 1. |
| 2. | 2. |
| 4. Confined Space Procedure | 10. Pile Driving |
| 1. | 1. |
| 2. | 2. |
| 5. Environmental | 11. Hazard Communication |
| 1. | 1. |
| 2. | 2. |
| 6. Hoists, Cranes, Derricks, Rigging | |
| 1. | |
| 2. | |

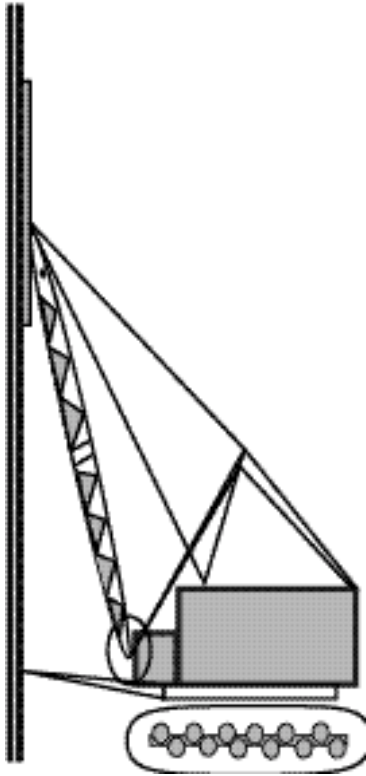
Group B

A. Trenches and excavations; B. Tag line; C. Current bonafide licenses maintained in personal file; D. Choker, chains, slings and shackles inspected and maintained; E. Contingency plan; F. Job site survey on site; G. Stand-by person; H. Correct use of material handling equipment; I. All personnel seated and seats provided; J. Roadways, sidewalks and stairs; K. Crane chart in cab; L. Employees trained in haz-com; M. Capability and condition of employee; N. Certified shipper and ultimate disposal site - EPA approved; O. Control of combustibles; P. Client liaison; Q. Permits retained a minimum of two years; R. Electrical equipment grounded properly; S. Helmets and hoods; T. Flame and work permits; U. Fuel gas and oxygen separation in storage; V. Ear protection area posted.

PDCA Membership Application

(Continued on back)

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Title: _____

Phone: _____

Fax: _____

Address: _____

City/state/zip: _____

E-mail: _____

Home page: _____

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(check one)

- Contractor
- Associate
- Technical Affiliate
- Student

Sponsored By: _____

Contractor Company Description

(check all that apply)

- | | |
|---|--|
| <input type="checkbox"/> Pile Driving | <input type="checkbox"/> Deep Dynamic Compaction |
| <input type="checkbox"/> Marine Contracting | <input type="checkbox"/> Bulkheads |
| <input type="checkbox"/> Earth Retention | <input type="checkbox"/> Other _____ |
| <input type="checkbox"/> Bridge Building | |

Associate Company

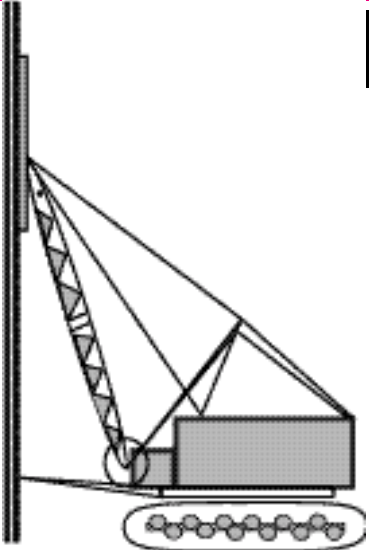
(check all that apply)

- | | | |
|---|--|--|
| <input type="checkbox"/> Rental | <input type="checkbox"/> Steel Fabrication | <input type="checkbox"/> Off Shore Leader System |
| <input type="checkbox"/> Sales | <input type="checkbox"/> Wick Installation Equipment | <input type="checkbox"/> Wick Drain Supplies |
| <input type="checkbox"/> Vibratory Drivers/Extractors | <input type="checkbox"/> Sheet Piles | <input type="checkbox"/> Drilling Supplies |
| <input type="checkbox"/> Steel Beams | <input type="checkbox"/> Drills | Pile Hammers |
| <input type="checkbox"/> Pipe Pile | <input type="checkbox"/> De-Watering Pumps | <input type="checkbox"/> Vibratory |
| <input type="checkbox"/> Timber Pile | <input type="checkbox"/> Composite Pile | <input type="checkbox"/> Diesel |
| <input type="checkbox"/> Concrete Pile | <input type="checkbox"/> Cushion Materials | <input type="checkbox"/> Hydraulic |
| <input type="checkbox"/> Cranes | <input type="checkbox"/> Pile Driving Leads | <input type="checkbox"/> Air/Steam |
| <input type="checkbox"/> Fixed/Swinging Leads | <input type="checkbox"/> Wick Drain | <input type="checkbox"/> Other _____ |
| <input type="checkbox"/> Steel Sheet Piling | <input type="checkbox"/> Cutter Head | <input type="checkbox"/> Other _____ |
| <input type="checkbox"/> H Bearing Piling | <input type="checkbox"/> Drill Bits | <input type="checkbox"/> Other _____ |
| <input type="checkbox"/> Pile Point & Splicer | <input type="checkbox"/> H-Beam | <input type="checkbox"/> Other _____ |
| <input type="checkbox"/> Jet Pumps | <input type="checkbox"/> Plastic Sheet Piles | <input type="checkbox"/> Other _____ |
| <input type="checkbox"/> Plastic Pipe Piles | <input type="checkbox"/> Drive Caps | <input type="checkbox"/> Other _____ |
| <input type="checkbox"/> Inserts | <input type="checkbox"/> Dock Supplies | |

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Technical Affiliate Company Description

(check all that apply)



- | | |
|---|--|
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| <input type="checkbox"/> Design | <input type="checkbox"/> Geo Technical Engineers |
| <input type="checkbox"/> Testing | <input type="checkbox"/> Pile Monitoring |
| <input type="checkbox"/> Vibration Monitoring | <input type="checkbox"/> Civil Engineering |
| <input type="checkbox"/> Surveys: | <input type="checkbox"/> Other _____ |
- Description _____

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(all applicants check all that apply)

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| <input type="checkbox"/> FL | <input type="checkbox"/> MN | <input type="checkbox"/> OR | <input type="checkbox"/> Other _____ |
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Just Like The Real Thing

Crane Simulators Offer A New Generation Of High Tech Training Tools

By Clyde M. Stauffer IV

My heart was racing as though I was in the middle of running a marathon, the perspiration beads on my forehead threatened to gather and run into my eyes like a small river and the muscles in my shoulders were cramping and starting to stiffen up. It was getting harder to hold onto the controls because my hands were clammy and cold from the tension. I had been trying to land the AH-1W Super Cobra helicopter on the deck of the rocking LHX for the past hour and could not make touchdown. The safety officer had already waved me off twice, and I was low on fuel. As I was concentrating on my next approach, my ears were buffeted with a noise that sounded like a gut-stuck pig. I looked at the warning/annunciator panel and discovered that there was a fire warning in engine #1. I was losing power and going down.

I rapidly keyed my intercom and told my instructor to "Cut the crap! Turn off the malfunctions, give me some clear air and let me land this thing." I had a dinner appointment and had to get back to the hotel to change.

This was my first experience in an AH-1W Super Cobra training simulator, and I had spent the past hour learning and experiencing the realism of the training device. The really amazing point of my experience was that during my time in the simulator, I had crashed into the deck of the LHX half a dozen times and was finally learning the correct procedure to landing the helicopter when the instructor decided to make the session more of a challenge. Even though I have never actually flown a helicopter, I was able to use the simulator to practice critical maneuvers in a non-threatening environment. I was able to walk away from disaster and have a good laugh at dinner. Training simulators are better than the real thing. They let you experience almost all the aspects of realism but in a controlled and safe environment.

In the mid-1930s, Edwin Link developed the first practical simulator. These trainers were used extensively by the U.S. Army Air Corps to enhance its pilot training program and to ultimately reduce the occurrence of air accidents. From this primitive beginning, the field of simulation-based training has exploded. Today simulation training is an accepted practice in many industries and professions where simulators are used to increase both safety and productivity. Some examples include flight training,



"A simulator will never replace the necessary hands-on component of an effective training program, but it does provide a critical link between classroom and on-the-job training."

ship operations, gunnery ranges, sports and driving. Even the medical education profession is using simulators to teach doctors how to diagnose patients with problems that are only rarely encountered.

As recently as the late 1990s, realistic simulators were very expensive and required specialized computers, graphics processors and motion systems that were not easily adapted to different training models. In general, traditional simulators normally would cost several million dollars and were used only in limited applications. However, with the advent of low cost, high speed microprocessors, major improvements in image generation technology and the increasing costs of accident liability, simulation-based training has come into its own.

Crane training simulators initially were introduced in the port and maritime industry. These systems were expensive, difficult to maintain and relatively primitive in function and presentation. However, they did show the industry that there was a significant advantage to using simulation to train operators: Accident rates decreased and productivity increased.

Recently a new generation of crane training simulation has entered the marketplace. New computer technology has opened the door to highly realistic, affordable training systems that can be easily integrated into existing training programs. The new technologies have not only been adapted for port and maritime cranes but for construction and industrial applications.

Using simulators in a crane training program can produce immediate and obvious benefits. Specifically, the crane operator has the tools to rapidly apply knowledge discussed in the classroom in a realistic and safe learning

(Continued On Page 30)

The Real Thing (Continued From Page 29)

environment. Basic skills are learned faster and poor skills are immediately identified and corrected. Inexperienced operators can learn how to avoid dangerous situations and



recover faster if a problem occurs. In addition, training setup times are reduced to almost zero, thus allowing the operator more time to practice actual maneuvers.

A simulator gives an organization's training department a tool that can be easily tailored to focus on specific areas to be taught, but it also provides instructors with an initial screening process. Does the operator being trained have the inherent ability to react correctly when an emergency situation occurs? Even though operators have been talked through the correct procedures a dozen times, what will happen when the adrenaline is flowing and they are trying to remember what they were taught? At this time, you can only hope for the best. In a traditional training program it would be potentially catastrophic and foolish to permit the operator to put actual operational equipment into a dangerous situation to teach a correct recovery procedure. However, the simulator allows the instructor to easily set up a scenario that will train the operator with the knowledge and reflexes to respond correctly.

An organization can use simulation training as a tool to directly increase operator efficiency and safety without removing production equipment from inventory. Equipment maintenance and repair costs are significantly reduced, and, by stressing safety training and teaching good habits, a company will see a direct reduction in liability risk and its associated costs.

The use of a crane simulator in a training curriculum directly benefits everyone. However, a simulator will never replace the necessary hands-on component of an effective training program. What it does provide is a critical link between classroom training and on-the-job training. For example, a study was done to test the effectiveness of simulator-based training on the execution of a complex heavy lift, dual crane procedure. The object to be lifted weighed more than 165 tons and required a complex set of movements before it could be correctly positioned. The size and shape of the object was such that two cranes were required to perform the lift.

The Group #1 team was comprised of experienced crane operators who were qualified on the associated cranes but had never done the actual lift maneuver. Several teams from Group #1 were independently timed, taking an average of more than four hours to perform the operation.

The Group #2 team also was comprised of experienced crane operators who were skilled on the crane and had never performed the exercise. However, prior to the timed runs, they spent a day practicing the operation on a crane simulator. Their average time was slightly less than one hour.

For reference, it normally takes experienced teams around 45 minutes to perform the operation.

Even though it is only a single example, this study shows the direct benefit a simulator can provide when used in conjunction with a comprehensive training program. Other test cases have produced similar results.

Since September 1997, the U.S. Army Transportation School at Ft. Eustis, Va., has used simulators to train more than 3,300 crane operators.

"Simulation has given our student operators the ability to take a crawl, walk, run approach to training by moving from performing simple operations in a controlled environment to mastering complex operator tasks without the risk of injury to the student or damage to the

equipment," said Chief of Training William Elburn.

In January 2000, the International Union of Operating Engineers (IUOE), under the direction of General President Frank Hanley, signed an agreement to purchase crane training simulators for integration into its apprentice training program and since then has bought 24 units.

"The simulators are a great step in training for our locals. They provide a good training avenue for both the apprentice and the seasoned journey-person," said Steve Brown, IUOE director of construction training.

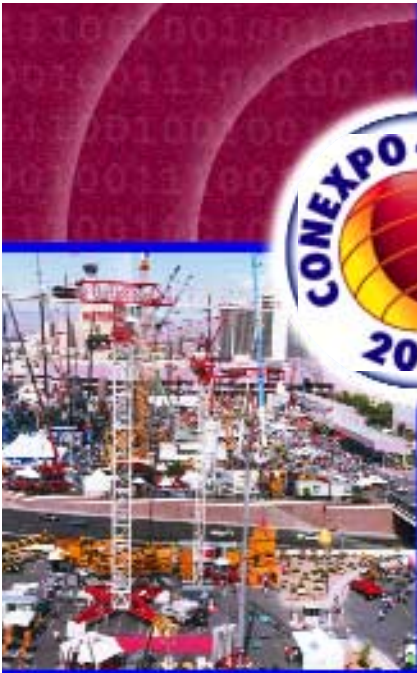
We are all familiar with the sophisticated computer games our kids play. The graphics are superb, the sounds are breathtaking and the game play is excellent. However, these are just games; they are not sophisticated training tools. Computer-based training simulators are designed to model actual operational equipment in realistic situations. Computer games have been designed to be fast and flashy. A properly designed training simulator has an effective user interface, realistic dynamic models, real world scenario representation and correct feedback to convince the student/operator that he or she is in a true situation. Realistic feedback is required to reinforce the results of operator input. Studies show that when a training simulator is designed to be flashy like a computer game, training effectiveness is eliminated. A well-designed simulator is invaluable for effective training.

Training is no longer an option. The cost of equipment, risk of litigation, need to create a safe working environment and proposed certification requirements all mandate effective crane operator training. Crane simulation is a realistic solution to real world demands.

Clyde Stauffer is vice president of new business for KQ Corporation. He has been involved with the design, implementation and marketing of a wide variety of computer-based simulation training systems. He can be reached for comments or questions at (801) 571-9094, extension 223.



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