



CRANE

ENGINEERING AND
FORENSIC SERVICES

May the Force Be With You

But what force does it take?

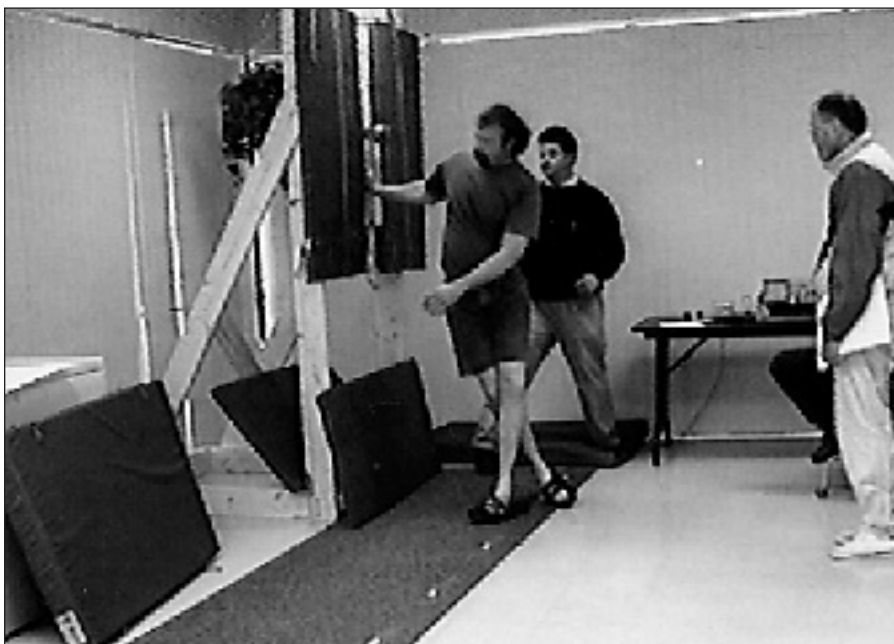
A student living in a state university resident hall claimed he had sprained his ankle, turning it as he approached a wire-glass window. The ankle turn caused him to lose his balance and stretch out his falling hand and arm against the window. His hand hit the window, and the glass broke. As his arm traveled through the broken glass, the student's arm was cut, potentially hindering his plans to become a surgeon. The student brought suit against the university.

When the university's attorney began the discovery process, however, the plaintiff's statement did not correspond with the observations of other students. Upon further investigation, the plaintiff's explanation of the incident seemed less and less probable. Was it really possible that the student's

fall, as described by the plaintiff, could cause the glass to break? How much force does it take to break wire-reinforced window glass?

To answer these questions, Crane Engineering and Forensic Services and a university professor specializing in kinesiology developed and implemented a two-pronged test protocol using test human subjects who were the plaintiff's approximate height and weight. Participants were asked to recreate the ankle twist and resulting fall as described by the injured student. These test falls against a padded wall were videotaped, and the force of each fall was measured with a dynamic load cell (a force-measuring device). Based on these human studies, the professor was able to determine how a person

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As reflected in this frame excerpted from a videotape, at Crane Engineering, human subjects approximately the same height and weight as the plaintiff were used as test subjects to help determine the force created by the reported fall.

PROPER

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Cheaper By the: Dozen

Always a good deal?

When a fire-pump manufacturer identified a casting vendor in Mexico that could supply thin-wall fire-pump motor housings for less money than any other casting firm, the company was happy it would be able to save some money. Unfortunately, the initial housings the manufacturer received from the vendor were of lower quality than required.

As a result, the manufacturer hired a metallurgical engineer to evaluate the product samples and provide the new vendor with the “perfect recipe” for product success. Although quality improved, it was clear additional guidance was needed. The metallurgical engineer was sent for an on-site visit of the plant, further evaluating the product samples and observing the production process.

The culprit proved to be poor castings made from lower-strength irons using inconsistent melting processes. Using higher-strength irons and a consistent melting process ensures all cavities in a mold are filled with proper

strength iron. Although the Mexican vendor was doing all that it could under the circumstances to meet the desired standards, it just couldn't produce a

product acceptable to the manufacturer.

The manufacturer determined it needed to find another casting vendor – although at a slightly higher price – to save money in the long run. The Mexican vendor, however, was lauded for its efforts to make the grade and may be able to make product improvements once economical electric melting systems – which produce greater consistency – become available in that region. ■



Quality materials and consistent melting processes are key to solid, long-lasting parts.

Documentation

As you like it

Most of the engineering and materials projects pursued at Crane Engineering involve several disciplines, such as metallography, SEM/EDS, chemical analysis or mechanical testing. All of these produce data that are vital to the client's understanding of the work performed. These test results become, in effect, the final product.

Traditionally, project documentation was in the form of an engineering test report. The test and associated photographs, charts and graphs were

assembled into a single document and mailed to the client.

With recent developments in the area of digital photography and data storage and transmission, many new possibilities exist, in addition to the traditional “hard copy.” You may wish to consider some of these media and file format options for your next project.

E-mail with .jpg attachments:

A conventional e-mail message can be sent with file attachments (photos, charts, etc.), usually in “.jpg” format.

These file attachments can usually be used and inserted into a typical word processing program, such as Microsoft Word. Although .jpg files are some of the smallest digital image files possible, big images – especially photos – can still become quite large and may require long download times over conventional modem lines.

E-Mail with .pdf attachments:

A full report that already has images imbedded into it can be converted to a .pdf (Portable Document Format) file prior to transmission. The advantage is a much smaller file and greatly reduced transmission times. However, the client must have, at a minimum, Adobe

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Documentation *continued from previous page*

Acrobat Reader software to open the document. (This software is available at no charge from www.adobe.com.) Acrobat Exchange (part of the full Acrobat software package) may also be used.

ZIP disk: If a report includes numerous digital photo image files, which

may include large individual scans of data output from a test instrument (such as EDS), it is often useful to place all of the images on a portable 100 MB Zip disk. This allows the scans to be saved in a larger, higher-resolution format that is advantageous if the client wishes to reprint any of the images at

a larger size. Prior to transfer of the images to the Zip disk, clients should indicate if a high-resolution format is indeed desired.

Photo prints: Photographs, either digital images or scans of conventional photos, can be printed at sizes up to approximately 12-1/2" x 17" if required. ■

Valued Vendors

Setting the pace for excellence

Providing responsive, quality service is integral to Crane Engineering's success. As a result, Crane Engineering sets high expectations for itself and its vendors – from testing labs to photo finishers. Crane Engineering values its quality vendors and in upcoming issues of the Probe it will share stories with you about valued vendors, such as the company below, who help set the pace for excellence.

Clear, concise photographs of incident scenes are absolutely necessary for case and project documentation. Crane Engineering estimates it takes 70 rolls of 36-exposure film each month. That is 2,520 photographs! Over the years, Crane Engineering has found one photo finisher that processes each and every image with care and clearly stands above the rest: PhotoKing of Wayzata, Minn. The company picks up all rolls of film right from Crane Engineering, processes them and then delivers them back to Crane the next day.

"PhotoKing has a 'bend-over-backwards' kind of attitude," says Tom Crane, president of Crane Engineering. "They even initiated a service that has helped us tremendously – a coding system for the back of our photographs. It has streamlined our documentation system and helped us serve our clients even better. You can't ask for more than that."

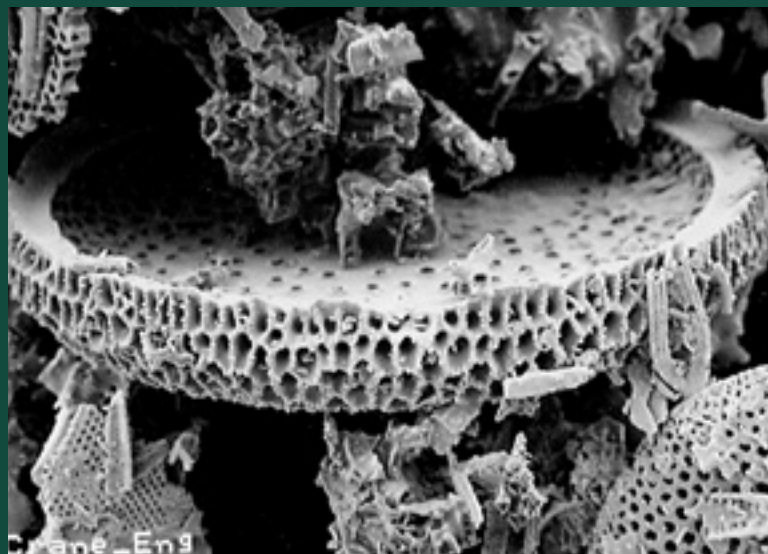
PhotoKing President Steve Duncan indeed found a way to make the usually undecipherable lettering on the back of photographs actually mean something – and mean a lot for Crane Engineering. He also offered Crane the use of photo CDs long before everyone else was

using them – and even brought in a professional photographer to give Crane engineers some tips for improving photography at incident sites.

Crane Engineering extends its thanks to Steve Duncan and his PhotoKing employees for a job extremely well done. ■



Steve Duncan is president of PhotoKing in Wayzata, a valued Crane vendor.



You'll dig the answer to this one.

What is it? See page 4 for the answer to this issue's mystery image.

The Force continued from page 1

with a twisted ankle falls. He was also able to calculate the average force with which the subjects' hands struck the window. The answer? 120 lb. of force.

With these questions answered, one remained: How much force is required to break a wire-glass window? Complicating the matter, the specific window in question had previously been dam-

aged and not repaired. This required further laboratory testing.

A padded mechanical ram that was the size of the student's hand and generated forces consistent with those determined earlier was constructed. The damaged wire-glass window was recreated and mounted in a frame. Then the ram was swung in a downward arc, striking the surface of the wire glass.

Even at 230 lb. – a force far surpassing the possible range determined in the human study – the ram never penetrated the wire mesh and no glass was broken away from the window.

With the support of these tests conducted by the professor and Crane Engineering, the case was settled in favor of the state university. ■

NOTES

Sollars Obtains Licensure. Scott A. Sollars, a mechanical engineer with Crane Engineering since 1996, recently became a licensed professional engineer in Minnesota. In his position with the firm, Sollars is responsible for analyses of mechanical systems and design, mechanical and material failures, explosions and fires. Congratulations, Scott!



Scott A. Sollars, P.E.

Thomas R. Crane in Minnesota Lawyer. In a February 2000 article titled "Jury awards \$1.2 million in gas explosion" in *Minnesota Lawyer*, Thomas R. Crane was cited as a key expert witness for a case handled by attorney Michael S. Kreidler of Stich, Angell, Kreidler, Brownson & Ballou, P.A. The plaintiff was a man injured when his fireplace exploded in 1997. Crane testified that in his opinion the explosion was caused by the characteristics of the gas fireplace insert.

Norm Is on Vacation. Crane's resident Golden Retriever Norm decided to take advantage of the great spring weather and start in early on his summer vacation. He has opted for an "ecologically beneficial" vacation package that mainly consists of sleeping on the grass next to the flower garden. His column will resume in the fall.



Trade Show Update. Crane Engineering has participated in a number of trade shows in 2000, including ASM International, DRI Product Liability Seminar in Las Vegas, Minnesota Chapter of IAAI and the Northwest Loss Association. Watch for us at the upcoming Minnesota Paralegal Association meeting, the Minnesota State Bar Association Trade Show and the Minnesota Law and Technology Show, to name a few.

Welcome, Holly. Holly Jacobson is an administrative assistant supporting the materials group. We're glad to have Holly on board as a member of our team!

Greatest Engineering Achievements. On February 22, the greatest engineer-

ing achievements of the 20th century were announced by the National Academy of Engineering. The list of achievements was selected and ranked by a committee of leading engineering experts from academia, industry and a range of engineering disciplines. The top five are electrification, the automobile, the airplane, safe and abundant water, and electronics. Air conditioning and refrigeration ranked 10th, household appliances ranked 15th, and high-performance materials rounded out the list at number 20.

Seminars and Tours Available. If you'd like a seminar conducted for your organization on site-investigation techniques or if you'd like a tour of our facilities, please call Carol Liljequist, general manager, at (763) 557-9090. We'd be glad to help!

New Area Code. Please note for your records that our new area code is 763. ■

"You'll dig the answer to this one." Taken using Crane's SEM/EDS, the mystery image in this issue is diatomaceous earth, the perfect material for a healthy flowerbed. Gardeners hit with spring fever are eager to dig into this nutrient-rich earth composed of skeletons of small prehistoric aquatic plants related to algae (diatoms), the perfect home for tulips and daffodils.

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