LOADTEST, Inc.
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"Providing confidence in foundations through load testing around the world"

UPCOMING CONFERENCES

June 2-4, 2003:

Fourth International Geotechnical Seminar on Foundations on Bored and Auger Piles - hosted by The Soil Mechanics Department of the Ghent University • Main Hall of Ghent University (Aula Building) Volderstraat 9, Ghent
Dr. Mel England will be presenting the paper: "Bi-directional static load testing – State of the Art" - M. England BSc MSc PhD MIC

June 22-25, 2003:

Soil and Rock America 2003:
12th Pan-American Conference/39th US Rock Mechanics Symposium
Boston, MA
Mr. D. Kort will be attending.

Oct. 22nd-24th, 2003:

Deep Foundations Institute
28th Annual Conference on Deep Foundations
Eden Roc Resort & Spa • Miami Beach, FL

Feb. 4th-7th, 2004:

Drilled Foundation & Drilled Geo Support – ADSC, ASCE
Equipment Exposition, Design & Construction Conference • Orlando FL

RECENT O-CELL TESTS

- Mississippi River, Greenville, MS
- Segundo Puente el Canal de Panama (Second Bridge over the Panama Canal)
- 3rd Ave. Bridge, Harlem, NY
- Crosstown Expressway, Tampa, FL
- Rio Grande, Aricibo, PR
- Gurabo River Bridge, Gurabo, PR

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LOADTEST

TELLTALES

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LOADTEST OPENS UK OFFICE

LOADTEST has opened an office in the United Kingdom, as of March, 2003. Dr. Melvin England (formerly of Cementation Skanska) is heading up the office. Dr. England may be contacted at the following address:

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STAY IN THE LOOP

If you have an address change, or know of someone that would like to be added to the TELLTALES subscribers list, please send an email to telltales@loadtest.com.

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VALUE ENGINEERING – A GREAT CONCEPT WHY ISN'T IT USED MORE FREQUENTLY?

Paraphrased from a paper delivered by Jorj Osterberg in October, 1999.

Value Engineering is a great concept, potentially saving billions of dollars in construction costs and in many cases, providing improved, safer designs. This ultimate potential of value engineering may not be realized for some time, but it is possible right now, for engineers, designers, contractors and owners to save tens, if not hundreds of millions of dollars a year. There are many reasons for the current situation which value engineering would alleviate:

- A tendency of designers to "play it safe" by being overly conservative
- A reluctance to deviate from "accepted practice" for fear of future legal action
- Antiquated and inflexible building codes
- The "it's not my money, so why should I care" attitude
- Do it the way it was always done
- Ignorance or indifference of the owner about potential savings

The rule of thumb that Dr. Osterberg recommends is **"how would I do it if I were paying for it?"** Certainly safety and obeying the law are of the utmost concern. After that we should seek the most economical, functional and practical solutions, followed by studying how costs can be cut. Keeping in mind that other engineers, contractors and even owners can have good ideas too. Often, an informal peer review can make a difference.

The following case histories highlight examples of LOADTEST projects where our clients have realized significant savings using Osterberg Cell™ technology. Having performed over 700 O-cell™ load tests we have much information in our database, which supports the need for and the importance of value engineering. We estimate that in approximately **50%** of our test projects LOADTEST's involvement, **has saved money for the client, net of the testing costs.** In about **45% of the projects, savings could not be realized, either because testing was performed too far into the production process or because** the engineer's estimates were so close to the measured ultimate that the foundation did not need to be modified. The remaining **5%** realized a different form of savings, by avoiding future liability or remediation, after tests showed that the design had grossly underestimated the foundation capacity. Let's look at a few cases where the "Do it Early, Use the Data!" attitude has returned significant savings to the owner.

Bridge over Rio Grande

LOADTEST

www.loadtest.com

DO IT EARLY, USE THE DATA

As a value engineering tool, the successful implementation of an O-cell™ load test program should have two important characteristics, summarized best as; **"do it early"** and **"use the data."** While the majority of our clients have confirmed savings as a result of testing, a number of them did not realize those savings because the program was not implemented early enough in the design process to incorporate the data, or the data simply was not used because the engineer was comfortable knowing the foundations were over-designed. Dr. Jorj Osterberg expressed his own brand of frustration at the seeming reluctance of engineers to economize on foundation design in his value engineering paper excerpted herein. **(full text available at www.loadtest.com/downloads)**

US281 Bridge over the Solomon River Osbourne, KS

Ten years ago LOADTEST, with its patented O-cell™ technology, emerged as an industry leader in providing cost-effective, efficient and non-destructive testing of deep foundation capacity. Pioneers like Case Foundation, Converse Consultants and New Jersey Transit saw then what engineers and contractors see more and more every day: O-cell™ technology can save money.

PROJECT #381

In 1994, while working on an adjacent section of the Kearney Connection, a New Jersey Transit project, Case Foundation peformed two preliminary load tests as part of the foundation design process for the nearby, proposed Secaucus Transfer Station. The drilled shafts under construction on the nearby project, in similar subsurface conditions, required **10 to 17 ft-long rock sockets** designed to support a compressive load of 600 tons. After reviewing data from the two preliminary O-cell™ load tests and incorporating the information into their design, foundation engineers altered the required socket lengths to **two and a half feet of rock embedment** to carry the same 600-ton design load. **Estimated savings on the foundations, as reported by Engineering News Record, amounted to $9,000,000.**

PROJECT PROFILE

- **381 – Secaucus Transfer Station, Secaucus, NJ**
- **November 1994**
- **Contractor: Case Foundation Co.**
- **Owner: New Jersey Transit**
- **Subsurface: 40 – 50' of overburden underlain by 2' – 4' of fractured rock, then hard sandstone/shale**
- **36" diameter rock socket 2.5ft in depth**

MAX LOAD/MOVEMENTS:

- **5000 kips/0.35" up, 1.00" down**
- **4000 kips/0.90" up, 0.60" down**

PROJECT #566

The following projects illustrate the power of O-cell™ technology to economize on foundation design.

Engineers designing the foundations for a six-story office building in California, saw an opportunity to save the owner money on the project. Representatives of Associated Soils Engineering, Inc. estimated that they would be able to shorten the rock socket lengths if they could prove the anticipated additional capacity.

Due to seismic considerations in the area, the foundations were required to extend into a non-liquefiable rock zone, through 65+ ft. of overburden. While the foundations consisted of 24", 36" and 48" diameter shafts, Associated Soils astutely chose to test a 4-foot diameter shaft, **realizing that scaling down unit friction values was much safer than scaling up**. After testing to an equivalent top load of over 3.5 times their 775 kip design load (and still not reaching ultimate capacity), they determined that their design load could be carried with less than 1/10th inch displacement. By incorporating the test data into their design, and the test shaft into the finished foundation, the designers were able to pass on to the owner more than $150,000 in net savings **(including all costs associated with the test program)** from the original $850,000 estimate for the foundation. By testing early and using the data; **A net savings of 18%.**

PROJECT PROFILE

- **566 – Mission Valley Office Building, San Diego CA**
- **January 2000**
- **Contractor: Anderson Drilling**
- **Subsurface: approx. 18' of clayey silt underlain by 45' of silty sand to sand and an 8' cobble seam over soft rock. The tip of shaft was extended approx. 32' into rock for a total shaft length of 103 ft.**
- **48" diameter shaft**

MAX LOAD/MOVEMENTS:

- **5620 kips/0.25" up, 3.25" down**
- **2020 kips/0.08" up, 0.95" down**

Crosstown Expressway Tampa, FL

PROJECT #641

A large pharmaceutical company was moving forward on plans for a new facility which covered approximately 2.5 acres, with subsurface conditions consisting of varying thicknesses of stiff sandy elastic silt overlying a weathered limestone rock. Preliminary subsurface investigations warned of subterranean flow, sinkholes and essentially negligible resistance from the overlying elastic silt. As a result the drilled shaft foundations, required to carry loads up to **2550 kips,** were originally at **4.5 ft. and 6 ft. in diameter** extending to depths of **180 ft.**

The original plan required a minimum embedment into the weathered limestone of **16 ft. to 33 ft.**, pushing the estimated cost to over $4 million. While the design incorporated provisions for foundation testing, the tests were to be performed on production shafts as proof tests, with no opportunity for utilizing the test results to economize on design.

When representatives of the foundation contractor proposed an alternative foundation design, they brought with them some very welcome news to the owners – significant cost savings! The owners were cautiously optimistic about the proposed redesign, but accepted the proposal. And the foundation contractor turned to LOADTEST to prove out the redesign and secure the cost savings for the owner.

The value engineering proposal included a more extensive subsurface investigation and a preliminary test to obtain full-scale design parameters for their new foundations. The additional subsurface exploration confirmed the uniformity of the overlying stiff sandy silt layer throughout the site, but also found the so-called weathered limestone rock formation to be spotty at best. When the foundation contractor excavated 2 ft. diameter pilot holes, the rock formation turned out to be downright elusive. What they did find was a sort of marl formation, which was closer to a clayey, calcareous gravel with shell fragments.

Due to the scarcity of the rock formation, representatives of the foundation contractor and LOADTEST, designed a test for a **dedicated test shaft, 5-ft. in diamter by 100 ft. deep**, excavated **entirely in the stiff elastic silt "overburden".** The test was carried out to a combined side shear and end bearing load of over **6,200 kips.** The data indicated that for an equivalent **"ultimate limit state" top loading of 3,400 kips**; the shaft would settle less than 0.5 inches. Incorporating the measured unit shear values in the redesign, the foundation contractor was able to reduce the shaft lengths to less than 120 ft., even on the most heavily loaded shafts, and pass on a **savings of over $1 million** to the owner!

By testing early and using the data, the foundation contractor's engineers reduced the **factor of uncertainty,** enabling them to provide an economical and responsible design; ultimately completing the project on time and saving the owner 25% of the original cost!
Nice work gentlemen!

Pont Sur Le Lac Nokoue Benin, Africa

WE ASK

Can value engineering be used more frequently?

Could value engineering have saved more money than it has?

These questions may sound rhetorical. At LOADTEST, while we believe the answer to both is yes, we have observed a few reasons why value engineering does not get used more frequently. The following observations are typical of some of the "road blocks" we have encountered.

- The lead group evaluating the value engineering is also the design group.
- Building codes can be obsolete and in some cases severely limit value engineering concepts. (Of course safety and sound principles should never be compromised)
- Fear of legal action when using a "less expensive" method.

Designers have little or no incentive to go through a value engineering assessment; in fact there may be a disincentive because the designer is not compensated for his extra time.

- Presumptive values for unit resistance are sometimes used when testing could easily confirm higher values.
- Public projects are paid with public funds and there can be a tendency to spend the funding more freely and without the financial oversight of many private sector projects.
- Owner unaware of better more efficient methods of design and construction, as this is generally left up to the designers.
- Many design firms are not aware of the process of value engineering, and those that are aware can limit the process to public projects.

LOADTEST's global perspective and experience gives us a unique perspective of the deep foundation industry. Having performed over 700 load tests in 28 countries with hundreds of partners, LOADTEST has observed a common thread around the world; the desire to save money on foundation construction costs. We believe that the utilization of value engineering and testing processes can assist dramatically in achieving that goal.