

Instrumentation

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Introduction

This is the second episode of GIN. The first was in the September 1994 issue of GN, on pages 70 and 71. For those of you who don't have that, here's a repeat of part of the introduction.

The purpose of GIN is to share useful information relating to geotechnical instrumentation. Each part will be brief, and I intend to focus on performance of instruments. As a practitioner, I know how difficult it is to be confident that such-and-such an instrument will work well, and it seems to me that if we share performance information with each other, we will make this less difficult.

This is therefore not "my column", but "our column". Please let me have useful information, in the form "We're about to do...and will tell you how it worked out later", or "We've just learned...", or other material that you think will help others. If your material is other than brief, and I think it's worthwhile, I'll suggest that you flesh it out as a stand-alone article for this magazine. If your material is controversial, and in particular if you want to report on something with which an instrument manufacturer may disagree, I will contact all concerned and mediate as necessary.

Whether or not this idea stays alive will depend more on you than me.

Ed Brylawski of Geonor has suggested also including: "I need to do... Does anybody know how?" topics, and I think that's a good idea. Because this is only the second episode, there's been no time for you to respond to the first, but I hope to hear from you with contributions for future episodes.

Let's Go To Italy

Starting in 1983 there has been a once-every-four-years international symposium, "Field Measurements in Geomechanics" (FMGM). Previous symposia have been in Switzerland, Japan and Norway. FMGM 95 is to be in

Bergamo, Italy, about 40 miles north-east of Milan, between April 10 and 12, 1995. The symposium is organized by ISMES, a private company specializing in applied research and professional, scientific and engineering services. The emphasis of FMGM 95 will be on the use of instrumentation as a technically attractive and economically viable means of addressing geotechnical engineering problems, and the various difficulties involved in implementing geotechnical instrumentation programs.

There will be three sessions:

1. Use of instrumentation to resolve problems associated with design and construction.
2. Problems related to implementation of instrumentation.
3. New technologies.

Each session will consist of a keynote lecture, presentation of papers and a panel discussion.

For more information, either about attending, submitting a paper or exhibiting, contact *Giorgio Pezzetti or Deirdre O'Neill at ISMES, fax 39-35-307710 (from North America dial 011 first).*

The weather should be perfect (but don't blame me!) in Italy in April. Come and enjoy the symposium, the fabulous art and architectural treasures, the great food and chianti.

Continuing Education Course

Some of you will know of the various continuing education courses that I've been involved with over the years. I'm not doing any more instrumentation courses with ASCE, University of Missouri-Rolla, University of Wisconsin-Milwaukee, or Geotechnical News, and am considering starting a series with Norbert Schmidt (ex UMR) and the University of Florida.

A possible first course would be in November 1995, at Cocoa Beach, Florida. It would be a 3-day course, with a registration fee of about \$850, including

the red book, \$50 less if an attendee already has the book. Before committing to this, I'm trying to get a reading on the level of interest out there. If any of you are interested, would you please call or fax me. Thanks.

In-Place Inclinometer, and Portable Borehole Deflectometer

In the first episode of GIN I referred to a new development, by Slope Indicator Co., of an in-place inclinometer with electrolytic sensors. Geokon has also developed an in-place inclinometer, with vibrating wire transducers. Because both these systems create potentially large cost savings for data collection, it shouldn't be too long before users have performance information. Please share it.

Geokon also has a portable borehole deflectometer (red book Section 12.9.4). I'm not aware of other sources in North America. The primary application is for borehole directional surveys in non-vertical boreholes, when the side-to-side alignment is also needed.

This can't be done with gravity-sensing transducers, such as used in inclinometers and in-place inclinometers. The Geokon instrument consists of two beams of equal length connected by an articulated joint, with a vibrating wire transducer at the joint to sense angular rotation between the two beams. Wheel assemblies are provided to allow operation in conventional inclinometer casing.

Fiber-Optic Strain Gages

For many years I've been looking forward to the introduction of fiber-optic technology into our specialty. In Section 12.11.4 of the red book I wrote about the possibility of fiber-optic sensors one day superseding inclinometers, but that still seems a long way away. However, I recently met Dr. Tino Alavie, President of ElectroPhotonics Corporation, Downsview, Ontario, who make fiber-

optic strain gages and readout systems. My own view about strain monitoring (when a remote reading is required) is: "if you can do it with a vibrating wire strain gage, do it with a vibrating wire strain gage".

However, fiber-optic gages may be the instruments of choice if vibrating wire gages can't be used. They are very small, are corrosion resistant, have high dynamic response, have no limitations caused by electrical interference, and are capable of high measurement accuracy. For more information contact *Dr. Tino Alavie, ElectroPhotonics Corporation, 4925 Dufferin Street, Downsview, Ontario M3H 5T6, Canada, tel. (416) 667-7890, fax (416) 667-7799.* If anybody uses these, please let me know.

New Corps of Engineers Manuals

The Corps of Engineers is about to publish two new Engineer Manuals (EMs), both of which include guidelines for use of instrumentation.

First, EM 1110-1-1908, "Instrumentation of Embankment Dams and Levees" is in semi-final draft, and will replace the two-part EM 1110-2-1908, "Instrumentation of Earth and Rock-fill Dams", Part 1, Groundwater and Pore Pressure Observations, dated August 1971 and Part 2, Earth-Movement and Pressure Measuring Devices, dated November 1976.

The manual is being written by a group of geotechnical engineers within the Corps, with a little bit of help from their friends. Expected availability date is spring 1995. For more information, contact *USCE Publications Depot, 2803 52nd Ave., Hyattsville, MD 20781-1102.*

Second, a new EM, "Tunnels and Shafts in Rock" is in progress, and will replace EM 1110-2-2901, with the same title, dated September 1978. The manual is being written by Parsons Brinckerhoff Quade & Douglas, Inc., together with a team of consultants, under the leadership of Birger Schmidt. Expected availability date is 1995. For more information contact *Birger at (415) 243-4629, or USCE Publications Depot, address as above.*

Applications Guide by Slope Indicator Co.

Slope Indicator Co. has recently assembled the second edition of an Applications Guide for their geotechnical and structural instrumentation. Copies can be obtained from Slope Indicator Co.

Learning from Experience, Part 1

Several years ago I wrote a series of articles for this magazine, "Lessons Learned from Imperfect Field Monitoring Programs" (Vol. 3, Nos. 1-3, 1985, for anyone who has a good filing system). Many of the lessons learned were my own, resulting from mistakes that I'd made myself. I closed them out with:

We can increase the quality of each other's work by sharing our mistakes, and these articles have been an attempt to move in that direction. Let's continue to share our mistakes with each other.

The Editor added:

"Share Your Mistakes." **GEOTECHNICAL NEWS** invites readers to submit technical notes on the successes and failures of instrumentation and monitoring of their projects.

Can you guess the response? Zero! I suppose it's human nature to resist admitting mistakes, but it sure helps others! So here's a repeat plea - send me crisp things for this column, and we'll exclude your name if you wish. If you have a problem with client approval, we don't need to name the project for the message to be constructive.

Learning from Experience, Part 2

As a follow-up to Part 1, when allowed by my clients to do so, I've been specifying that people responsible for instrumentation field work shall, in their final report, include an assessment of instrumentation performance. The purpose is so that we can learn what was good and not good, and can feed this information both to manufacturers who supplied the instruments, and to others who might benefit.

A good example of the benefit of this approach is one of the Supercollider contracts. Shannon & Wilson were awarded a contract to monitor the first two shafts during and after excavation,

and their contract called for a comprehensive final report, with an assessment of instrumentation performance. They provided a detailed assessment, which has been shared with the manufacturers involved:

Geokon:

- MPBX with linear pots in head
- Vibrating wire piezometer
- Vibrating wire strain gage
- Datalogger

Geotechnical Instruments:

Inclinometer

Interfels:

INCRES incremental extensometer (see first episode of GIN, in GN, September 1994)

Roctest:

MPBX with linear pots in head

RS Technical:

Pneumatic piezometer

Slope Indicator Co.:

Inclinometer

Tape extensometer

Pneumatic piezometer

Solexperts Ltd.:

Portable curvometer/distometer

Solinst Canada Ltd.:

Portable clinometer/extensometer

There's a temptation to publish these assessments (which list both pros and cons), but I feel more comfortable with a "gently, gently catchee monkey" approach. The best I can do is:

- Users: please adopt this approach of requiring a performance assessment whenever you can, and share with manufacturers.
- Manufacturers: please review the assessments carefully, discuss and resolve with the writers as necessary, feel great about the pros and do all you can to fix the cons.

Some Trivia: Proposal Presentations

I've been involved with a number of proposal review panels, and associated face-to-face "presentations of credentials." By listening, one learns some do's and don'ts. The worst: a proposer who started the presentation with "we've submitted proposals to you for six previous projects, which were not successful, and we think it's now our turn." The job was lost right there, and

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the message is obvious. The best: When asked who would actually be supervising the work full-time, the lead presenter put his hand on the shoulder of his helper and said, "us - what you see is what you get." The message: don't let the project people be obscured by the marketing people. Perhaps this shouldn't be under a heading "trivia", because it really isn't trivial.

Closure

A repeat of the closure to the first episode: please take seriously my suggestion that by sharing information we'll help each other. Send me discussions, new material, whatever you think may be useful, to 16 Whitridge Road, South Norwalk, MA 01760. Tel. (508) 655-1775.