GEO

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MICROPILES MAKE IT A BREEZE

CONSTRUCTING FOUNDATIONS FOR RENEWABLE ENERGY RESOURCES

PROFILE

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Why did you get into the Geotechnical field?
During my research days, I came across the following statement by Karl Terzaghi, (father of conventional soil mechanics) **"There is no glory in foundations."** Unlike the very nice, state-of-the-art architectural images of structures glorifying their image and status, it is the action of the foundations – and their interactions with the surrounding soil and that of the structure – that would glorify its existence.

The most challenging part of a geotechnical engineer's job is to find ways to connect businesses, link roads, and enable access to education and health care that is resilient but also sustainable.

Geotechnical engineering can consume a vast amount of resources including concrete, steel, and use of land. We also get involved in the early phase of a project whether it be ground investigation or preliminary design. It is for these reasons that we have immense potential in improving sustainability within the civil engineering field.

Poulos, (2003) observed that until the latter half of the 20th century, contractors controlled many aspects of deep-foundation design from investigation and design to construction and remediation. However now – analysis, design and construction are undertaken by independent specialists.

Even though the changes proved beneficial, the disadvantages must not be ignored. These include ambiguity and conflict in technical areas and design processes, as well as challenges in communication. These challenges will have a direct effect on time, manner, and the quality of project deliverables.

What trends have you seen in the Geotechnical field over your career and what has changed the most?
Geotechnical engineering has generally been regarded as a part of civil engineering and this is still the case. The fundamental principles of mechanics and hydraulics have underpinned its development. Recognition of the particulate nature of soils and rocks, their geological origin, as well as their variability has led to the birth, nurturing, and development of the disciplines of soil mechanics and rock mechanics. The ups and downs in the fortunes of civil engineering have largely reflected the destiny of geotechnical engineering and this continues to be the case. Yet it is also valid to consider geotechnical engineering as an important bridge between geology, geomorphology, and civil engineering.

Moreover, the field has been influenced by mining and environmental engineering and these relationships continue to develop. Many areas of geotechnical engineering require an integrated and multi-disciplinary approach. In such applications, regarding geotechnical engineering merely as a subset of civil engineering will lead to an incomplete understanding of problems and the development of inadequate or incomplete solutions. Narrow perspectives can also stifle progress and innovation. One must also consider links between geosciences and geotechnical engineering in terms of common concerns and needs such as obtaining, organizing, validating, displaying and interpreting surface and subsurface data. Cooperation with geoscientists is also required for the development of specific areas of study and application such as geotechnical earthquake engineering, coastal engineering, and marine geomechanics.

Thus, one must look at the big picture for understanding past developments and present practices, and for developing valid perspectives of the future. This should not mean simply following

Uskmouth – Before

Uskmouth – After

Ashbridges Bay Wastewater Treatment Plant

well-worn paths and considering progress only in terms of improvements, adjustments and modifications of the current elements of what is regarded as good practice. Adopting new paradigms may be desirable or even necessary.

The long-term future of geotechnical engineering would of course be influenced by many factors. It would also be useful to consider the unique challenges that are facing the world today, the truly global issues such as global warming, sea level rise, rapid population growth, depleting water and energy resources, increasing urbanization, and increasingly poor ground conditions for foundations and earth structures.

Considering routine problems in the future, continuation of present trends might suffice, provided the latest and versatile methods and techniques such as, sophisticated analytical models and tools, knowledge-based modeling and spatial tools such as GIS are adopted widely and efficiently, in addition to simple but robust analytical and probabilistic methods. This requires greater efforts in research and technology transfer from research teams to the profession and from the developed societies to the developing world along with the commitment of adequate resources for such tasks.

In your opinion, what are the greatest challenges facing the field?
There are many great challenges, but one challenge we face, not just as Geotechnical Engineers, but as Civil Engineers is communication. Engineers are not traditionally known for their level of communication, but the time has come for us to step aside and learn how to communicate our technical information in a way that is clearly understood by stakeholders. This is crucial to allow infrastructure to remain fully operational at all times. With the world moving closer towards distributed data, information can be disseminated in the hands of operators and users – this is one of the biggest challenges we face as civil engineers.

Looking at large engineering companies, it is evident that the engineers of today are pushed aside and left management of the engineering firms to others. We also face the battle for recognition and respect from the mainstream clients. The most important issue today facing geotechnical engineering is the lack of innovation and value-engineering since the majority of projects are cost-driven.

How do you see Geotechnical Engineering changing in the future?
As civil engineering progresses to design larger buildings, bridges, and other structures to meet mankind's growing needs, geotechnical engineers must develop new techniques and models to supports these structures. The buildings are becoming taller and bridges are becoming wider and longer, carrying more weight and requiring extra support from the ground underneath. The field of geotechnical engineering will be advancing with every new structure and one of the biggest developments will be to back up our innovations by solid engineering theory.

With the great development of information system technology, geophysical testing and other technical advancements, engineers are able to think outside the box and utilize their innovations to solve geotechnical problems.

I don't see mankind's growing needs as an obstacle, but as a challenge. I have faith that with a developing community, geotechnical engineers will achieve remarkable things.

What are the top three projects you worked on and why?
I had the opportunity to work on some prestigious projects in Canada, UK, and the Middle East. I have chosen the following three because of their social, engineering and economical aspects:

1. Deer Park Lodge Slope Investigation, 76803 Bluewater Highway, Bayfield, ON (2013)
This is an expert witness case and involved installation of a drainage system during 2007 using Horizontal Directional Drilling (HDD). The technique had gone horribly wrong resulting in significant ground movements and loss of ground. A serious concern that arose was the lack of recognition by the lead engineering team and the client in conducting a geotechnical investigation prior to design and construction of the project. This resulted in a negligence verdict.

2. Uskmouth Power Station, Newport, Wales, UK (2003–2005)
This is a story of development and redevelopment of the site as a power station. This project had major social, political and economic impacts on the society as generations were employed at this plant. Established in 1948, the plant was running with two major stations, A and B. Station A was demolished in the early 1990's. The result was social and economic deprivation. The plant's redevelopment in 2007–8 has boosted local and national economics.

3. Ashbridges Bay M&T Pumping Station Upgrade Project, Toronto, ON (2014)
The project consisted of constructing a new screen structure, pumping station, electrical building, distribution structure and approximately two kilometers of subgrade conduits and tunnels. The project signifies the use of many geotechnical tools in determining the subsurface conditions, soil/rock characteristics, and complex in situ testing in difficult ground. In essence, the investigation consisted of deep, vertical and inclined boreholes, borehole imaging technique, 3-D subsurface modelling, a geophysical survey, in situ dilatometer testing, in situ over coring rock stress measurements and others.

What would you like to tell everyone about yourself that not many people know?
The one thing people need to know about me is that I dream in colors and not in black and white. I see no limits to my achievements and goals, other than those I set for myself.

I do not lead a boring life and my goals are as high as my achievements. Through my job, my career and my family, I am always thriving for remarkable things, sometimes I may fail and most times I succeed. The key to my success lies in the lessons I learnt from those mistakes. I live my life believing, "there is always a way". G