Prof. Alfaro Morollo

Geotechnical Engineering

Most engineering projects that come in contact with the earth require the expertise of geotechnical engineers. Typically, these projects include shallow and deep foundations for buildings, earth retaining structures such as basement walls and bridge abutments, road and railway construction, instabilities of hillsides and riverbanks, and engineered slopes such as earth dams, highway cuts, embankments, and dikes for flood protection.

In a larger sense, geotechnical engineering also includes a wide range of earth-related topics, for example, geoenvironmental engineering, geological engineering, rock mechanics, mining engineering, geosynthetics, ground improvement, hydrogeology, and engineering in cold regions. A career in geotechnical engineering offers opportunities to combine field exploration, laboratory studies, computer analysis, engineering design, and travel.

Research

The geotechnical group is actively involved in laboratory testing, field-scale projects, and numerical modeling in topics that include soil mechanics and foundation engineering, geoenvironmental engineering, geosynthetics, soil-structure interaction, groundwater hydrogeology and contaminant transport, ground improvement, and unsaturated soil mechanics.

Current projects include numerical modeling and analysis of instrumented road embankments on peat and degraded permafrost, small-scale deformation analysis of synthetic ‘see-through’ clay using lasers, evaluation of the erosional properties of riverbanks on Lake Agassiz clay, the impact of soil deformation on buried pipelines, probabilistic slope stability modeling based on spatial variability of soil properties, and groundwater modeling of nitrogen transport processes. Recent projects include analysis of sandbag dike performance, evaluation of design methods for rockfill dams, a full-scale field test on the performance of rockfill columns, and geosynthetic-reinforced slopes and embankments.

Facilities

The geotechnical laboratory supports small-scale physical modeling and tests for material properties. Equipment is available for grain size analysis, triaxial tests at high pressures and temperatures, hydraulic conductivity in flexible-wall cells with suction control, 1-D compression, direct shear (including tests in a large-scale direct shear/pull-out apparatus), thermal conductivity, and erosion measurement. Facilities are available for specialized testing involving biological and chemical composition in groundwater and soils. The laboratory houses two temperature-controlled chambers.

Professors in Geotechnical Engineering: Dr. Marolo Alfaro, P.Eng.
Professors and Technician in Geotechnical Engineering

Marolo Alfaro, PEng (Professor) – is currently the Associate Head of the Department of Civil Engineering. He received a BS in civil engineering (magna cum laude) from the University of Mindanao, Philippines, an MEng in geotechnical engineering from the Asian

Institute of Technology, Thailand, and a PhD in civil engineering from Saga University, Japan. He received postdoctoral fellowships from the Royal Military College of Canada and the University of Calgary. He is a professional engineer specializing in geotechnical engineering. His research interests include: geosynthetics for civil engineering applications; ground improvement techniques; stabilization of natural and man-made slopes; northern infrastructure impacted by climate change; and cold regions engineering. He has published widely in technical journals and in conference proceedings. He co-authored a book on ground improvement techniques and a book chapter on geosynthetics. In 2007, he received recognition as runner-up for a 'Best Paper' published in Geosynthetics International Journal. In 2010, he was given the Balik-Scientist Program award by the Department of Science and Technology in the Philippines.

Marolo serves as Vice-President for Canada of the North American Geosynthetics Society, as Councillor of the International Association of Lowland Technology, and as Canadian representative to the Technical Committee on Ground Improvement of the International Soil Mechanics and Geotechnical Engineering. He is a member of several national and international professional societies.