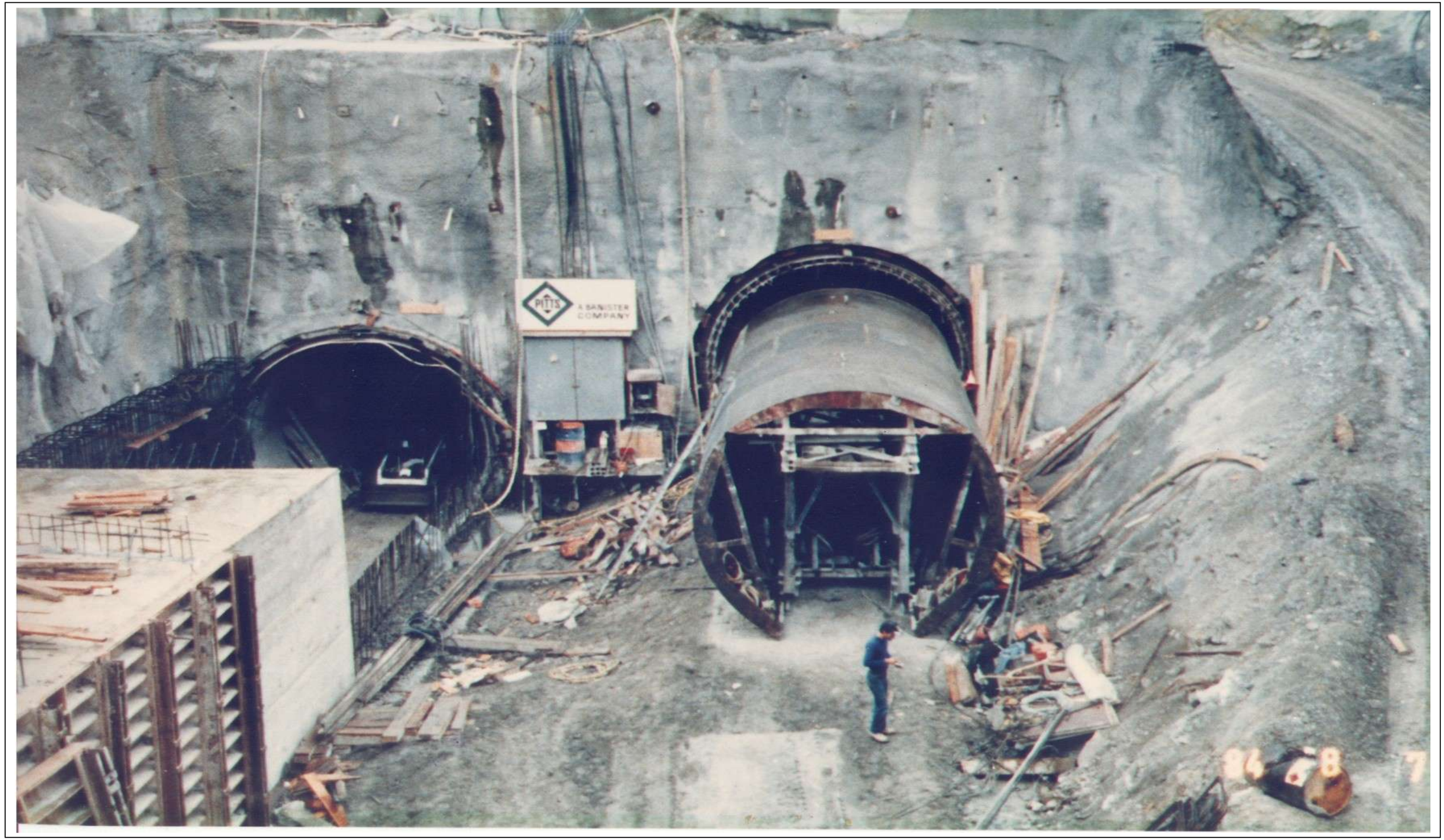
HEAVY CONSTRUCTION PORTFOLIO

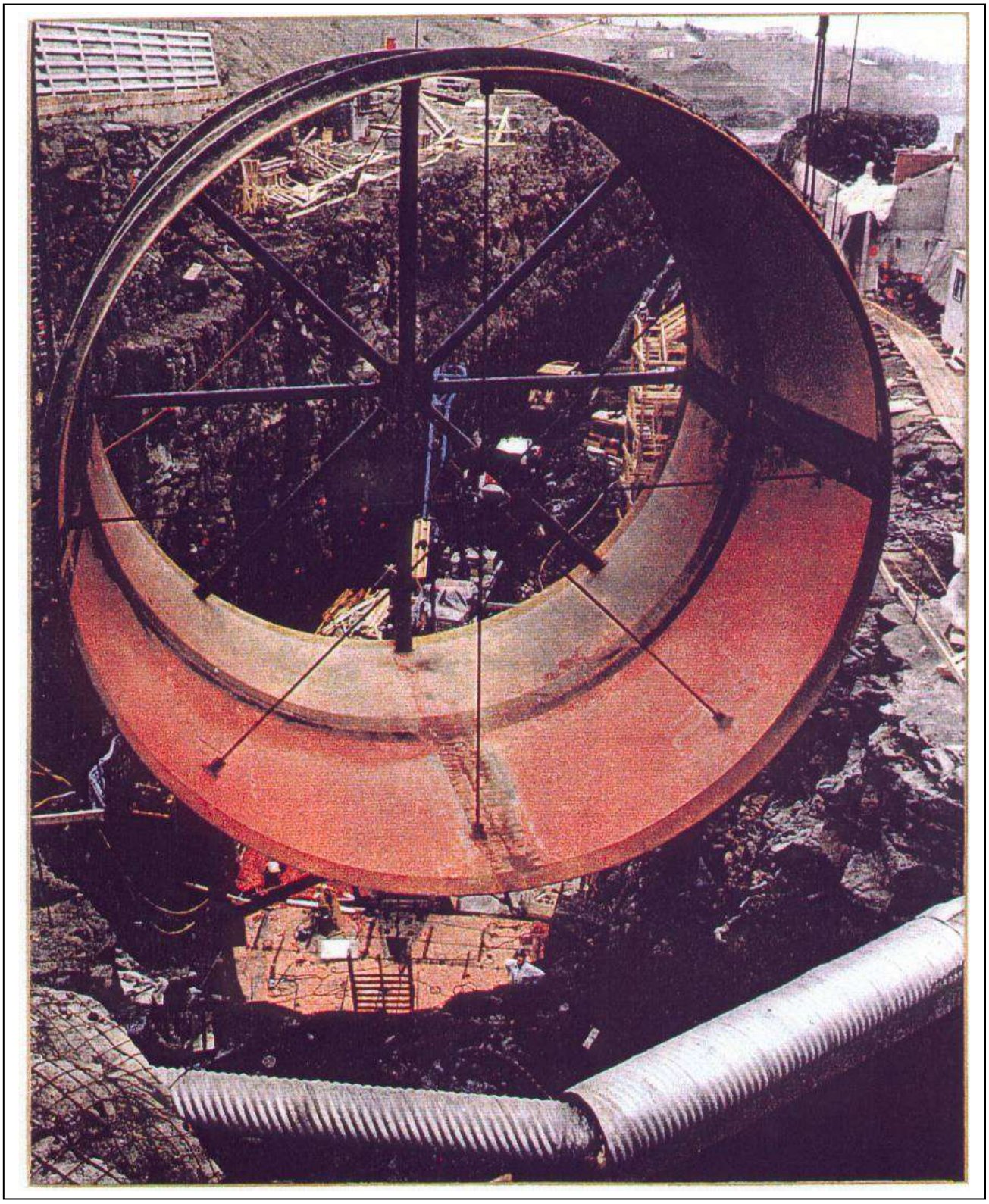
OF

KEN DEXTRAS, P. ENG.

Kicking Horse Canyon Park Bridge and Road Works
Golden, British Columbia



Vancouver ALRT – Stadium Station and Subway
Vancouver, B.C.

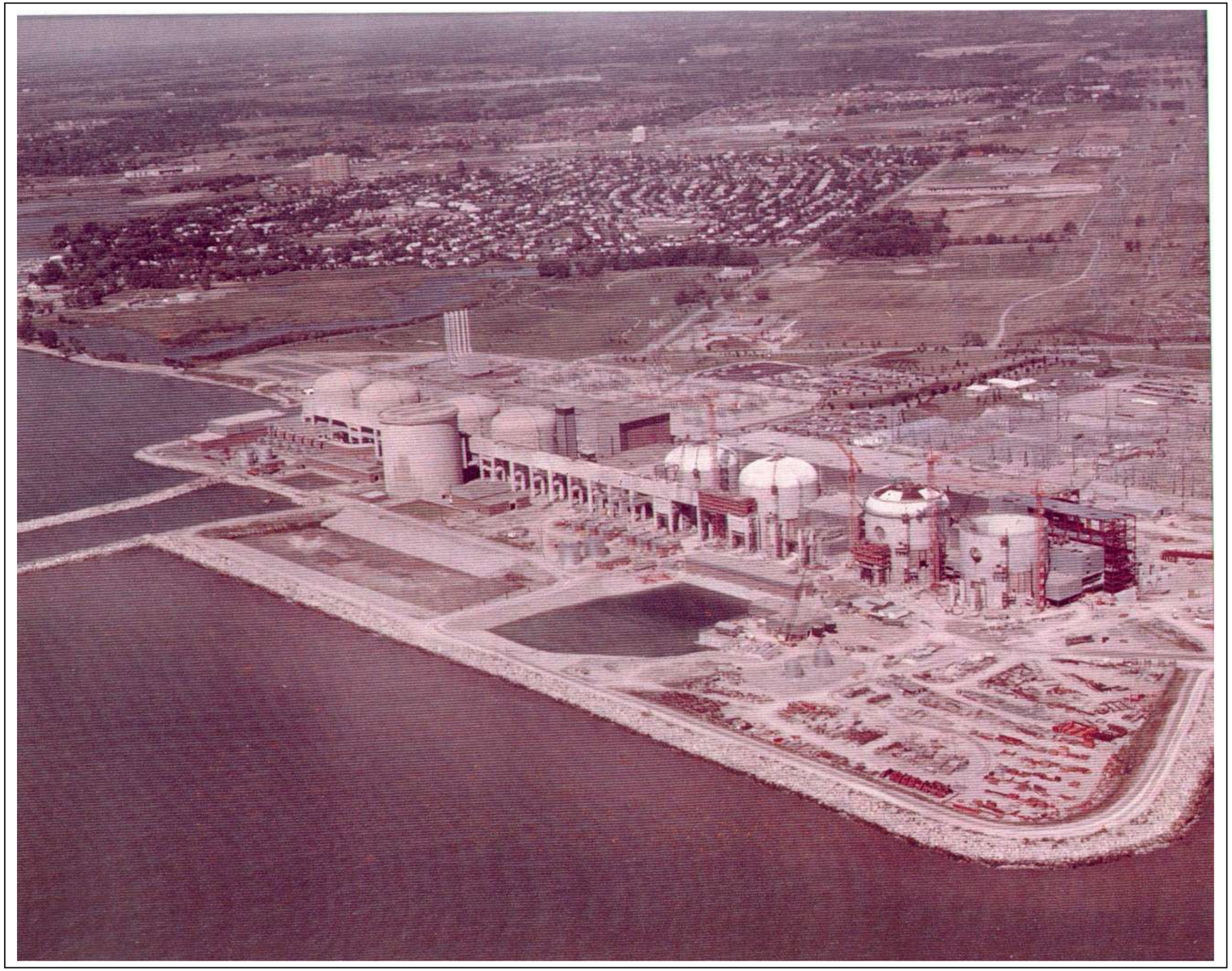


Whitehorse "4th Wheel" Power Project
Whitehorse, Yukon

INLET

OUTLET

Dickson Dam Diversion Tunnels and Gate Shafts
Innisfail, Alberta



Pickering “B” Generating Station
Pickering, Ontario

OFFSHORE

ONSHORE

Wesleyville Generating Station
Wesleyville, Ontario

Wreck Cove Underground Power Complex
Wreck Cove, Nova Scotia

SPECIAL SUPPLEMENT: Excavation Shoring

HEAVY CONSTRUCTION NEWS

JANUARY 1990

Shotcrete shoring expands eastward

NATIONAL SHORING LTD.

A JOINT VENTURE

SUITE #206 - 90 BURNHAMTHORPE RD. WEST
MISSISSAUGA, ONTARIO L5B 3C3
TEL: (416) 896-9760 FAX: (416) 277-1446

Shotcrete shoring expands eastward

A POPULAR SHORING system in British Columbia that uses shotcrete and soil anchors has moved east in the past two years to job sites in Alberta and Ontario. Originally known as "soil nailing," the technique is now called the Ground Control Method by a Vancouver-based design-build firm, National Shoring Ltd.

One of the goals of National Shoring, a joint venture of several construction-related companies, is to crack the downtown Toronto high-rise market. Phil Duchen, project manager for National Shoring's Mississauga office, says it's going to be difficult to get into the Toronto core, which has long been a stronghold for conventional shoring systems such as steel soldier piles and timber lagging as well as concrete caissons.

But as Toronto engineers, architects, owners and building officials become more familiar with GCM, it will become easier for the firm to compete, he says. "I'm not knocking the other systems—I think there's a place for all of them—but there are times when we are a cost-effective alternative."

Safe system

Duchen says there are still some sceptics asking the big question, "Is the system safe?" His response: "I honestly believe there are so many safety processes built into what we're doing that nobody should have any fear of the system. I don't believe we ever create a bad or unsafe situation. If we come across a questionable area of soil, we install additional anchors."

Even though GCM does not incorporate piling, it is as safe as the conventional soldier pile method, says Ken Dextras, president of National Shoring. He says the system has several advantages:

- Shoring costs can be cut as much as 30%, depending on ground conditions.
- Digging and shoring can start as soon as a building permit is obtained, resulting in a time saving.
- Flexibility is built into the system, not only in the shape and slope of the excavation walls but also when underground services are encountered.
- Space savings can be realized, for example, along property lines where piles

GROUND CONTROL METHOD shoring went down 14 m for 28-storey condominium building in downtown Vancouver. Seven-storey structure at west end of site was underpinned using GCM.

By Engineering Editor George A. Peer

can otherwise consume valuable rentable space.

• A nearly vertical shotcreted face will allow the contractor to go with one-sided forming (instead of two-sided) for the basement walls.

Dextras says most of the cost savings come from the small amount of materials and equipment used with GCM. There are no expensive pile rigs, steel piles or lagging. The newer method employs an air track drill, a shotcrete pump and a hydraulic jack for the anchors. Also, labour time is significantly less on a GCM job.

Since there is no waiting for a piling rig to start driving the first few piles and for labourers to install initial lagging, two to four weeks can be saved because the digging can start right away.

High anchor load

Dextras says GCM is actually an improvement over "soil nailing," which has also been used extensively in the United States and Europe. "Nails," or steel rods, are inserted into the face of the excavation with little or no stressing. The GCM system differs from the soil nailing procedure in two ways: (1) soil nailing berms are usually 30 m long, compared to the GCM berms, which are about only 4 m long and (2) soil nails are hand-stressed to a maximum of 5 kips while the GCM anchors are hydraulically loaded to 30 to 40 kips.

"Our system has a great degree of safety," Dextras says, citing the higher anchor load and the minimal berm size.

National Shoring has so far carried out 15 shoring jobs using GCM. Six of those have been in Metro Toronto, including a job completed last summer in the city of North York. It was for a 21-storey low-rental apartment building on Weston Rd. being built by Penn-Co Construction Ltd., Campbellville.

Gord Lindsay, director of Penn-Co's southern Ontario operations, is a GCM

RECORD 20 m deep GCM cut was stabilized for section of Edmonton's LRT system.

LIKE all GCM jobs, Edmonton shoring was done same time as digging. Space-consuming struts were not needed.

PENN-CO job has been one of six National Shoring assignments in Metro Toronto. Shoring company hopes to crack downtown Toronto high-rise market.

convert. "I find the system fast, cheap and very good," he says. "I plan to use it on many jobs." Lindsay says he believes he saved about 20% or 25% on the shoring work by choosing GCM, enabling Penn-Co to get the project. Penn-Co, which has other offices in western Canada, is doing the North York building for the Humberview Housing Co-operative.

The North York site allowed National Shoring to illustrate the flexibility of its system. Because there was an old sewer near the roadside, "we had to dip the anchors a little steeper to avoid it," Duchen says. A telephone company duct was avoided by shortening anchor length without sacrificing the design load.

A typical GCM installation (also called the berm-and-panel technique) is performed on a three-day cycle:

Day 1 A number of alternating berms (with odd numbers) are laid out along one side of the site. A backhoe operator makes sloped cuts 3.6 m to 4 m wide and 1.5 m to 1.8 m deep. The angle of the berm slope varies with the soil; it will be steep if the material is clay, flatter if it is loose sand. Anchor holes (usually 6 m long) are drilled into the berm at a slight downward angle to the horizontal. Anchors are installed and grouted, with the front end of the anchors set snug inside the berm so they will line up later with the excavation wall.

Day 2 Vertical cuts, or panels, are made at the odd-numbered berms, and wire mesh and shotcrete (usually 100 mm) are applied. Berms are cut for the even-numbered panels on the first wall.

Day 3 Anchors in the odd-numbered panels are stressed, and vertical cuts, wire mesh and shotcreting are done at the even-numbered panels.

The cycle is repeated until the site is surrounded by a shallow, shotcreted, anchored cut. The crew goes to the next level, starting with even-numbered berms.

GCM was used last spring in downtown Vancouver to shore up a 14 m deep excavation at Smithe and Burrard sts. It was also used to underpin a seven-storey building adjacent to the site. James Consulting Inc., Vancouver, is handling construction management for a 28-storey condominimum building.

Peter Gray, on-site project manager for James Consulting, is a firm supporter of GCM. "We can pretty well anticipate how long it's going to take to dig the hole [using GCM]," he says, adding that in Vancouver, shotcrete shoring is four to six times cheaper than soldier piles, which are rarely used.

Deepest job

The deepest GCM job done to date, 20 m, was for a 150 m long tunnel portal as part of Edmonton's light rail transit expansion. The tunnel work is being done on the south side of the North Saskatchewan River by Stuart Olson Construction Ltd., Edmonton. The portal excavation was executed by Mustang Engineering & Construction Ltd., Nisku, Alta.

The 4600 m^2 shoring job—the largest job National Shoring has done so far—required eight rows of anchors to hold back three walls of wet sand and clay. The shotcrete system was effective because it eliminated using struts which would have spanned the excavation if soldier piles had been employed.

"The shoring worked extremely well," says Jon Masters, site manager for Stanley Associates Engineering Ltd., which is overseeing all construction for the city. "Obviously those big form panels would have been very difficult to handle if you had a mass of struts all around," Masters says. "It would have meant stick-building almost all the forms for the walls." ♦

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RESUME

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Relevant Experience

Dextras Innovation Group, New Westminster, B.C.

April 1997 – Present **President**
Heavy Construction Bid Reviews
Patent and Trademark Analysis
Nationwide

General Duties and responsibilities:

- Review Heavy Construction bids for potential Value Engineering Change Proposals.
- Assess technical feasibility, prepare documents and manage patent and trademark applications.

Specific accomplishments:

- Bid reviews for Sea to Sky Highway, KHC Park Bridge, Fitzsimmons Creek and numerous other run-of-river IPP's.
- Penstock Works Railroad and Gantry System (Patent no. 2,692,548).
- Sewage Treatment Dosing System (Patent no. 2,589,340).
- Road Works Shield and Gantry (Patent no. 2,406,494).
- Building Wall Humidity Control System (Patent no. 2,302,795).
- Thermopylae (Trademark no. TMA530,491).

Bilfinger Berger BOT, Toronto, Ontario

June 2006 – March 2007 **General Partnership Operations Manager**
Kicking Horse Canyon Phase 2 Project
Golden, B.C.

General Duties and responsibilities:

- Manage a large design-build-finance-operate (P3) team of professionals to maximize returns and minimize risk to the General Partnership Concessionaire.

Specific accomplishments:

- Technical review and assessment of alternative methods of slope support (Tecco Mesh).
- Launch investigation and re-design of major design oversight (Pier 5 instability).
- Risk and liability assessment of girder launch.
- Revise definition of Prime Contractor and reduce associated liability.
- Design and implement a Quality Control Completion system to streamline and focus QC documents.
- Implement major revision to Independent Certifier payment mechanism.

Dextras Engineering & Construction Ltd., New Westminster, B.C.

July 1985 – December 2004 **President**
Design and Construction Management
Lower Mainland, B.C.

General Duties and responsibilities:

- Design, assess economic feasibility and construction management of land development projects.

Specific accomplishments:

- Whispering Falls sub-division in Maple Ridge B.C. for Bosa Development Corporation. Residential development on 200 acres of rough terrain, requiring 4 small bridges, 5km of roads and associated water and sewer works.
- Arena proposal for Fraser River Sports and Entertainment Group in New Westminster and Surrey.

National Shoring Ltd., New Westminster, B.C.

July 1987 – November 1994 **President**
Design-Build Shoring Contracts
Nationwide

General Duties and responsibilities:

- Design, prepare bids and manage construction of numerous earth retention (shoring) contracts in B.C., Alta. and Ont.

Specific accomplishments:

- Set up Partnership and exported Canadian version of "soil nailing" earth shoring technique to rest of Canada which became known as the "Ground Control Method" of shotcrete and anchors.
- Designed and built largest GCM supported walls in all of Canada at SLRT project in Edmonton for Stuart Olson Ltd. Project was performed as an alternate to an Owner designed system of struts and involved 70 ft. deep cuts in ancient landslide material under artesian water conditions. Project won major awards and was published in Heavy Construction News.
- Designed and built special shotcrete "spiling walls" for use with rakers in lieu of anchors.

Pitts Engineering Construction, Edmonton, Alberta

July 1983 – July 1985 **Project Engineer / Manager**
Vancouver ALRT Stadium Station and Subway Project
Vancouver, B.C.

January 1983 – July 1983 **Claims Engineer**
Head Office Assignment
Edmonton, Alberta

August 1982 – January 1983 **Intake Engineer / Superintendent**
Whitehorse 4th Wheel Power Project
Whitehorse, Yukon

September 1980 – August 1982 **Field Engineer / Project Engineer**
Dickson Dam Diversion Tunnels Project
Innisfail, Alberta

May 1980 – September 1980 **Field Engineer**
Calgary LRT Projects
Calgary, Alberta

General Duties and responsibilities:

- Manage a wide variety of heavy construction projects throughout Canada. Design temporary works (formwork, falsework, shoring, underpinning etc.), negotiate contracts with suppliers and sub-contractors, prepare cost reports and payment certificates, correspond with Owner/Engineer and prepare claims.

Specific accomplishments:

- Prepared "Full Face" alternate for Vancouver ALRT contract which won us the bid.
- Designed and built a siphon to handle large water inflow from adjacent power canal on Whitehorse contract.
- Designed and built numerous rock support and concrete placing schemes on Dickson Dam contract. Published paper and presented same at CSCE conference in Edmonton.

Ontario Hydro, Wesleyville G.S. and Pickering G.S. "B"

April 1979 – May 1980 **Assistant Reactor Engineer**
Quality Control Dept.
Pickering G.S. "B"

March 1978 – April 1979 **Assistant Civil Contracts Engineer**
Civil Contracts Dept.
Wesleyville G.S.

July 1977 – March 1978 **Assistant Scheduling Engineer**
Scheduling Dept.
Wesleyville G.S.

General Duties and responsibilities:

- Assistant to on-site Section Heads in Nuclear and Oil fired thermal generating stations in Ontario.

Specific accomplishments:

- Prepare and implement a simplified QC tracking system for various reactor components at Pickering project.
- Design and construction of air curtain to protect on shore works from concussive effects of underwater blasting.
- Prepare economic (complete or terminate) analysis for outstanding civil work at Wesleyville project.

Beaver Maritime Ltd., Montreal, Quebec

June 1976 – July 1977 **Design Engineer / Penstock Engineer**
Wreck Cove Power Project
Wreck Cove, Nova Scotia

General Duties and responsibilities:

- Design and construction of a wide variety of temporary works for an underground hydroelectric project in Nova Scotia.

Specific accomplishments:

- Designed and built a head frame for a 55 degree and 1200 ft. deep penstock slash and concreting operation. Frame and hoist were later purchased by Owner for permanent use.
- Built a layered styrofoam model of underground powerhouse construction showing connections to penstock bifurcations, access tunnels, draft tube and tailrace.

Education

Post Secondary

McGill University, Montreal, Quebec
Graduated May 1976 in Civil Engineering

St. Lawrence College of Applied Arts & Technology, Kingston, Ontario
Graduated May 1973 in Civil Engineering Technology

Secondary School

Glengarry District High School, Alexandria, Ontario
Graduated Grade 12 June 1969 in the Arts & Science Discipline

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References

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Dave Flavin, PLS, Precision Surveys Ltd., Golden, 778-229-8567
Bob Parsons, P. Eng., Translink, Langley, 604-455-0165
Gordon Spratt, M. Eng., P. Eng., Spratt Emanuel, Vancouver, 604-872-1211
Don Lister, M.Sc., P. Eng., Golder Associates, Victoria, 250-881-7372
Hugh Hawk, P. Eng., Delcan, Calgary, 403-228-9450
Nat Bosa, Bosa Development Corp., Vancouver, 604-294-0666