

**ENGINEER... Around the World
in 50 Years**

By C.O. Brawner

Review by Richard E. Goodman

The reviewer reacted with pleasure when invited to read Chuck Brawner's memoirs as he had found Brawner's public lectures to be consistently interesting, broadening, and enjoyable. The book possesses all these attributes as well, and is fascinating to read. Admittedly, the opus is somewhat over-inclusive, particularly in superfluous dialogue scenes; and the friendly, folksy tone seems unusual in a book. But geotechnical and mining engineers are well served by the contents and will appreciate the problem-solving anecdotes of a clear-thinking, experienced engineer fighting for safety along with economy in rock and earth work. This is not as dry as it sounds because the narrative is dotted with entertaining travel adventures and personal interactions.

This is not just an auto-biography but also an account of the activities of a large and eminently successful firm — Golder Brawner & Associates — the many individuals involved being carefully identified. It was illuminating to follow the development of this company and the management decisions and marketing style in which Brawner was involved.

Brawner has been primarily a geotechnical engineer who became adept at large rock excavations and mining projects through accumulated experience and networking. He writes: "It is amazing how much new technical knowledge one gains from others." His background in soils engineering gave him a novel perspective in dealing with open-pit mining problems, always sus-

picious of the likely negative effects of ground water on slope and pit-bottom stability. His stabilization measures involving drainage in the brown coal mines of Australia are particularly interesting, but there were many others.

There are many achievements, and much to be learned from Brawner's retrospective look at a lifetime of engineering cases. Here are a few that were particularly interesting to the reviewer:

1. The stabilization of the Drynock flow slide using soil mechanics fundamentals on a grand scale to stop an enormous flow slide threatening a key transportation corridor.
2. A destructive flash flood caused by a creek buoying and uplifting a glacier and the prevention of future damage by pioneering a procedure for ripping a spillway channel across the ice.

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3. Steepening the slopes of open pits by introducing controlled blasting techniques in developing final pit walls. Brawner relates developing and gaining approval for two unprecedented steep slopes — 68 degrees and 80 degrees.
4. A tragic slide on daylighting joints in Keystone Canyon near Valdez, Alaska, following the adoption of an

ill-advised "value-engineering" change in the design of a very high rock cut without informing the designer and gaining his approval.

5. The investigations of railway rock slopes and changes in safety procedures that followed a disaster along the CP rail line (1974).
6. The effects on engineering of methane outgassing, artesian sand beds, and inclined shale layers in the Syncrude tar sand development in northern Canada.
7. The rapid toppling collapse in Steep Rock Mines' Atikokan pit, Ontario, whose large runout was accurately predicted, allowing safe mining operations up to and after the failure.
8. Successful, pioneering application of vacuum-assisted horizontal drains to halt an enormous slide in Malibu, Southern California.
9. Equitable and reasonable handling of a construction dispute in California involving an unworkable design for rock slope support made in the office, i.e. without field visits.
10. The important distinction between *laterite* and *saprolite* (which unlike laterite preserves real weakness along relict discontinuities) in an open-pit gold mine in Guyana and the design change that solved the resulting stability problem.
11. Removal of an unstable and raveling rock wedge from an accessible mine slope in Uruguay by arranging for the army to fire howitzers.
12. The alarming consequences of an improper rock-bolt design for stabilization of slopes along a major new highway development in Saudi Arabia.

The reviewer enjoyed this book and thinks professional engineers and geologists will also. They won't get too much direct help in understanding geotechnical, mining, and construction procedures and terms. But they will feel themselves very present as a great range of problems is addressed. It is likely any reader will learn some new ideas and gain some good, vicarious experience, as well as an entertaining read.

"ENGINEER...Around the World in 50 Years"

By C.O. Brawner

Reviewed by Norbert R.

Morgenstern

In his classic work "The Existential Pleasures of Engineering" the inner self, its insistence on starting with **where we are** and **what we feel** rather than with comfortable shibboleths. But the existential search for the inner truth suggests a sloppy emotionalism that appears to conflict with the engineer's reliance upon logic and the scientific method.

Yet, what if existential searching were to reveal at the core of the human spirit a love for engineering? Or what if engineers, seeking the basis of the satisfactions they derive from their work, were to come upon the very soul-satisfying elixir that existentialists prize?

My proposition is that the nature of engineering has been misconceived. Analysis, rationality, materialism, and practical creativity do not preclude emotional fulfillment; they are pathways to such fulfillment. They do not "reduce" experience, as is so often claimed; they expand it. Engineering is superficial only to those who view it superficially. At the heart of engineering lies existential joy."

C.O. (Chuck) Brawner has provided us with a personal memoir of his professional life that perfectly illustrates Florman's exposition. It brims with the existential pleasures of engineering.

Brawner spent 10 years in Soil and Materials Engineering with the British Columbia Department of Highways. In 1963 he joined Golder Associates and became President of Golder Brawner and Associates, developing that consulting group into a world leader in

Geotechnical Engineering applied to transportation and mining. Subsequently he taught Geomechanics to mining, geological and civil engineering students at the University of British Columbia. He continues to provide specialist consulting services on challenging projects around the world. Underpinning this creative and successful career is a combination of core family values, perseverance, serendipity, creativity and commitment that is brought to life in the pages of this volume and the many illustrative anecdotes and case histories that it contains.

Chuck Brawner is the product of a rural up-bringing in British Columbia and the "can do" quality of this environment permeates his career. Formative influences of faculty and friends, firstly at the University of Manitoba and subsequently at Nova Scotia Technical College are recognized. His initial career with the BC Dept. of Highways is described with a series of case histories that document the remarkable technical challenges encountered in developing transportation infrastructure in British

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Columbia in a period of rapid expansion 40-50 years ago. Interaction with Dr. Hugh Golder during this phase resulted in the invitation to set up the Vancouver office of Golder Associates.

The Chapter on Introduction to Consulting documents in an intimate manner how Chuck Brawner set about converting an initial company investment of \$25,000 into what later became a geotechnical powerhouse. Early lessons on business development abound. A commission related to rock slope stability in 1966 proved pivotal for the future of both Brawner and his company. As result of a successful assignment

with the Kennecott Copper Co., business opportunities grew in the area of mine slope stability. Brawner recognized his limitations to proceed further and undertook a period self-study with international leaders in the field of rock mechanics. His distillation of principles have stood the test of time. Putting this learning to practice resulted in major growth, not only in challenging business, but also in the addition of key personnel. This, and other case histories in the book, illustrate the need for life-long learning in the practice of Geotechnical Engineering.

The rest of the volume is structured on a geographical basis with key case histories provided from experience in Canada, the United States, Australia, the Philippines, China, Russia, Latin America and Africa. The technical content is developed in an intimate manner and it is punctuated with humor and occasional fishing stories, an enduring passion of Chuck Brawner.

The Chapter on Canada provides insight into transformative experience gathered over a 40 year period (1963-2003). It includes the fatal flowslides that arose from the failure of coal mine spoil piles in southern B.C. in 1968, the evolution of the Geotechnical Review Board for the Syncrude Canada project where Brawner has participated from the outset, the brilliant stabilization of the Asbestos, Quebec slide, and the development of 55° rock slopes in the pit at the Mascot Mine. This last achievement draws on the use of controlled blasting that Chuck Brawner has been advocating to good effect for many years. One case history of far-reaching significance resulted in the development of a comparative classification system to identify rock slopes believed to be at greatest risk to operations on the CPR right-of-way. This system is used to guide priority stabilization and is the precursor to that used for many transportation systems around the world. It is an early example of geotechnical risk analysis.

Addition examples of bold value-added practice are found in the Chapters covering experience in the United States. Of particular interest is

the early use made by Brawner of very long vacuum-assisted horizontal drains to stabilize large landslides.

The Chapter on experience in Australia reveals how the firm began to develop clients overseas as the domestic market softened in 1972. This resulted in successful penetration of the Australian market and the opportunity to work with the mining industry there. The remarkable case history of the depressurization of the Morwell Coal Mine is presented in detail. One can only envy Chuck Brawner's capacity for recall of the personal details.

The Chapters on the Philippines and on Latin America contain several benchmark experiences with tailings management including the Atlas Consolidated Mines fatal liquefaction flow (Philippines) and the failure of the Omai tailings dam (Guyana). These, including others involving pit stability issues, illustrate this engineer in action.

The Chapters on China and Russia are lighter in technical content but this is compensated by entertaining tales of

the pleasures, trials and tribulations of the international expert "on the road". Chuck Brawner remains active to this day on a variety of challenging assignments. This is illustrated in the Chapter on Africa where he describes recent work guiding the design and construction for an underground plug to resist up to a 5,800 foot head of water in a mine in South Africa; if not a world record, certainly a world-class challenge.

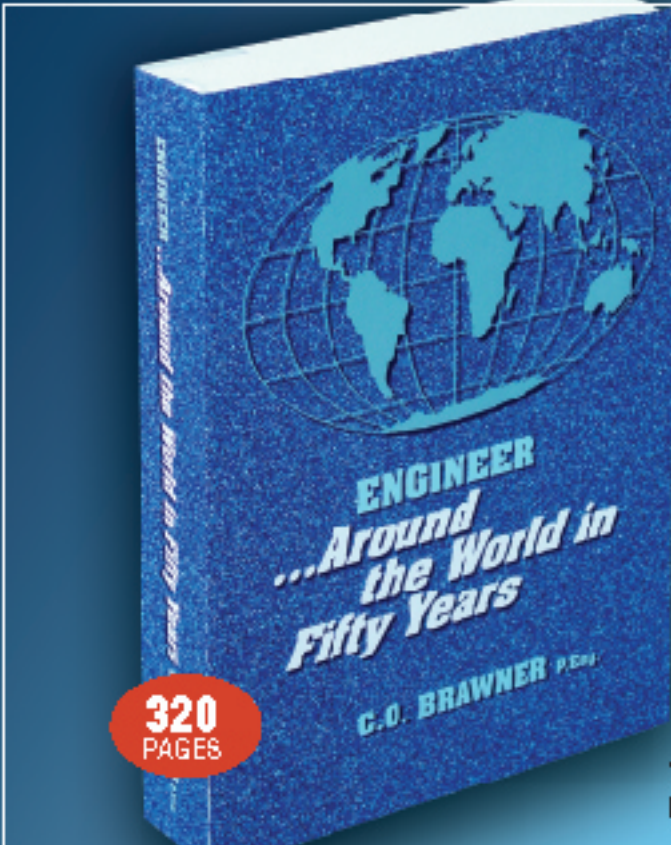
All who read this informative and entertaining volume will benefit from an appreciation of Chuck Brawner's broad contributions, ranging from technical innovation to sound business practice. Those of us who have had the pleasure of working with him are delighted to celebrate his achievements; those who have been mentored and taught by him will be refreshed by this volume, and others will be inspired by the challenge of Geotechnical Engineering recounted here.

The final Chapter is titled Reward. It modestly contains only the letter from the Canadian Geotechnical Society ad-

vising him of the receipt of the prestigious Leggett Award, his introduction at the award ceremony and his reply. He closes his reply with the following:

"...This experience has been challenging, educational, enjoyable and gratifying. I can honestly recommend the geotechnical field to any aspiring engineer."

At the end of his seminal volume, Florman presents a scene where a cableway and mine have been successfully developed by means of a creative engineering effort. Then, at the celebration dinner, with the wine flowing and the people dancing, a special exultation is felt by those engineers who did the job that needing doing. Florman urges the engineer not to avoid the party but to recognize that they are twice blessed – that if wine and dance are manifestations of mankind's primordial, existential spirit, no less so is the professional practice of engineering. Hopefully, Chuck Brawner will continue to join in the party for many years to come.



ENGINEER
...Around the World in Fifty Years
C.O. BRAWNER P.Eng.

320 PAGES

ENGINEER
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What the readers are saying...

- ♦ *'Loved the title...unique...just like the book'*
- ♦ *'Impressed with the breadth and variety of scale of the many case history examples'*
- ♦ *'Easy to understand plain English — make this the most practical geotechnical text I have ever read'*
- ♦ *'Valuable addition to any geotech's tool bag'*

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