

Bridge of rings

by Fawzia Sheikh

The roughly crafted ring that Canadian engineering graduates wear on the small finger of their working hands looks to lay people like a token adornment signaling entrance to an esteemed club. Yet the Iron Ring is in fact a lasting reminder that graduates must take an ethical and diligent professional path.

Rumours have persisted for decades that the Iron Ring is forged from the debris of the first Quebec Bridge, a structure spanning the St. Lawrence River that collapsed in 1907 and caused dozens of deaths. Though the story is untrue, there are still people “thinking, hoping, dreaming that was the original thing,” says Rémy Dussault, ing., Quebec warden-in-chief and administrator of engineering at the James Bay Energy Corp. in Montreal. “If



Size matters: The Quebec Bridge is still the world's largest cantilever design.

a bridge falls somewhere in Canada, three months later I get called [by people asking] whether we're making the rings with beams from that bridge,” says Dussault.

It's little wonder that a poignant legend arose from the twisted wreckage of such a tragedy. Opinion is divided on the purpose it serves, however. The Iron Ring story reminds engineers to “remain modest with respect to the profession” because past colleagues have made catastrophic mistakes, says Bruno Massicotte, ing., a civil engineering professor at École Polytechnique, in Montreal who has studied the disaster. Historian Norman Ball, director, Centre for Technology and Values, University of Waterloo, and author, *Mind, Heat and Vision. Professional Engineering in Canada 1887-1987*, is more cynical, describing the Iron Ring fable as a romantic notion that is “a real comfort to the people who know things aren't working well.” Perhaps revisiting the events of that fateful summer can help explain the lingering fairytale surrounding the notorious Quebec Bridge.

Mismanaged project

Serious mistakes were made almost from the moment the Phoenixville Bridge Co. of Pennsylvania won a contract to build the world's longest cantilever bridge about 10 km outside of Québec City. To begin with, renowned American bridge builder

Theodore Cooper, enthusiastic about being involved with the project, took on the role of chief engineer. Ailing, Cooper worked remotely from his offices in New York and never visited the site. Yet he approved the bridge designs and specifications of engineer Peter L. Szlapka, a Phoenixville employee who had no experience in the erection stage of bridge construction.

The first sign of trouble came in the early days of August 1907, when it was discovered that pieces of steel that had been welded together were bent, sparking a flurry of letters between Cooper and engineers Norman R. McLure and John Sterling Deans. McLure uncovered more defects later that month, and ordered that construction stop until he and Cooper could discuss the matter in New York. However, in McLure's absence, additional steel was loaded onto the bridge. Cooper later sent a telegram, which may have been delayed by a telegraph strike, reiterating McLure's earlier warning.

On August 29, terror struck when the unstable bridge fell. Approximately 75 workers lost their lives and 11 were injured. A royal commission blamed the tragedy on poor structural design, bad management and overconfidence. Luck was not on the builders' side again, when a closing span fell into the river and killed 13 men in 1916. A second contract to



What becomes a legend most: Your Iron Ring wasn't forged from this wreckage, but the myth fits with Kipling's prose.

build the bridge had been signed in 1911 with the St. Lawrence Bridge Company, a new firm created by the Dominion Bridge Company of Lachine, Quebec, and the Canadian Bridge Company of Walkerville, Ontario. The Quebec Bridge was finally finished in 1917.

Learning from disaster

The 1907 incident remains the “largest engineering disaster in Canada,” says Massicotte. It resonated throughout the engineering world as opponents questioned the sophistication and safety of the cantilever style—a notion that was resurrected when the second version of the Quebec Bridge suffered its setback. In nearby New York, criticism also mounted as work continued in 1907 on the Queensboro Bridge, a similar design that saw completion two years later.

A major concern immediately following the Quebec collapse was whether it altered certain attitudes and practices within the profession. Did it give way to tougher rules? “You can't regulate being careful,” says Ball. “You don't need to change the regulations. You need to change how ‘careful’ you think. And the whole management of that project was fundamentally stupid.” Engineers weren't the only ones to blame, however, since the “government waived the normal checking of data,” he says. One thing that did change is that teamwork became a greater focus of major projects, says Massicotte. “When you have more people looking at a project, you have less chance that you'll make a gross error.”

Experts have conducted extensive research to pinpoint more precisely the cause of the Quebec Bridge failure, a

moment in engineering history that provided a solid training ground. Failures are the only time that engineers discover how far they can push technology, notes Dussault. “You can really evaluate your factors of safety and your design parameters when you have a failure because you can measure, take samples, and see where you were when you thought you were somewhere else.”

The profession has made strong gains in understanding past technical shortcomings and the Iron Ring story continues to swirl because it helps people make sense of their world. “None of us can escape our mythologies,” Ball says. “We can only trade them in for different ones.”

Fawzia Sheikh is a freelance writer based in Toronto.