The 2019 T.C. Graham Prize Recipients Introduce the Future of Bridge Engineering

By Amanda L. Blyth

Bruce and Logan Mullaney, a father-and-son team from Australia, are the recipients of the 2019 T.C. Graham Prize for their proposal titled “Semi-Modular Steel Reinforced Bridge System.” The Mullaney family was presented with the prize in November 2019 at the AIST Leadership Conference in Memphis, Tenn., USA. Iron & Steel Technology had a chance to speak with the winners.

Iron & Steel Technology (I&ST): First let’s talk about your backgrounds.

Bruce Mullaney (B.M.): I have a background in commercial high-rise construction, and also worked in residential and commercial construction. I have always had an interest in new technologies and am always looking for different and better ways of doing things.

Logan Mullaney (L.M.): I am a residential and commercial builder and carpenter. I have had varied experiences throughout the industry, from modular construction through to conventional buildings. Prior to working as the managing director of InQuik, I ran my own residential construction company. I have a passion for farming, and most weekends you will find me helping out a mate of mine who owns a dairy farm.

I&ST: Where did the idea for the InQuik system come from?

B.M.: My brother in-law Jim and I were developing a new fire-rated high-rise housing system that used concrete suspended floors, and when we looked at the drawings we realized that the system could also be used as a bridge! And so our bridge journey began.

I&ST: In the early stages, how did you test out the idea for the InQuik system?

B.M.: Our engineers analyzed the concept behind the system using advanced finite element analysis programs and adjusted our designs to be compliant with the relevant national bridge codes. We also worked on figuring out the self-supporting aspects of the system, and we tested our initial ideas by installing a demonstration bridge on our family farm. This testing exercise was critical to the system’s success, as we ended up completely changing the self-supporting method. We had a tight timeline for the demonstration bridge, as we had planned an opening event where state and federal politicians would cut a ribbon. It snowed while we were pouring concrete two days before the opening! Everyone who attended the event, including road authority engineers, highlighted that we had achieved something bigger than we realized, and this would change the future of bridge engineering. I didn’t think much of it at the time, but the more I refine and develop our system, the more I can see how different the system is to conventional bridge construction, and the advantages it has to its predecessors.

I&ST: Was it difficult trying to “sell” this idea to engineering firms initially?

B.M.: Because the system is a different way of using existing known technologies, engineers were able to check our designs and have security over the product. To my surprise, since the day we introduced our integral bridge product (which didn’t require the standard bearings or tie-downs), almost all of the bridges we’ve sold have been integral. This shows how excited the market has been with our product quality and reliability. The system really is at the cutting edge of steel, concrete and computer design technology.
**I&ST:** What are the largest and smallest InQuik bridges that have been installed?

L.M.: So far the smallest bridge we have built was a scale model 12 inches long, which Bruce spent a month making out of wire, a soldering iron and some thin sheet steel. It turned out to be a real work of art and was used to get our first sales before we had any photos to show. I am sure that one day it will be in a museum on display! The biggest bridge we have built to date is a 130-foot x 30-foot bridge on a regional highway. It was such a great moment to see this bridge opened to traffic. The smallest “real” bridge is a little 20 foot x 10 foot bridge on a private property.

**I&ST:** How will this system increase steel demand?

L.M.: The steel formwork which is used as the shell of our system is roughly 25% of the overall finished weight of the component. We have increased the reinforcement steel sizing for the construction loads, and created a fully monolithic structure with reinforcement steel, which further increases the demand. This delivers a bridge requiring no maintenance for a 100-year minimum design life. When compared with conventional methodologies, the InQuik system increases the steel demand by up to 100%.

**I&ST:** How can this system be used in high-rise construction?

L.M.: The InQuik system has been patented across the world and designed as a methodology. We entered into the market with a bridge system designed for the road network. We further developed it for marine use like jetties and wharves, and designed the system so that it can be used for rail crossings and pedestrian bridges. The same methodology can also be used for car parks, multi-story high-rises, etc. The patented system is a disruptive technology for the infrastructure industry. As we continue to grow with partners, we will further develop new markets and products to suit.

**I&ST:** What has your experience been working in a family-owned company?

B.M.: It has been an amazing experience. My son Hayden and I started the business about 7 years ago, when I started working full time on developing the products while Hayden worked several jobs to support the business in the early days. We had a dream to help the world by providing affordable and easy-to-assemble bridges so that local workers and communities could install them and empower their communities. Hayden then convinced his brothers Ben, Logan and Ryan to join the company; and my brother-in-law, Jim Howell, his daughter Gabby, and myself concentrated on designs and development. Working together on a daily basis brought us closer as a family, which would not have occurred otherwise. This was highlighted when we tragically lost Hayden in late 2018 when he collapsed while working out at the gym and could not be resuscitated.

This completely shook us to the core, and after we had a chance to regroup and move forward, we had a different focus and determination: to continue Hayden’s dream of helping the world. When I accepted the T.C. Graham award, I could only think of how proud Hayden would have been, and wished he was with us to accept it. In an odd way, our business has developed quite a story of its own, and we take the past with us as we make our next steps into the future.

L.M.: It has been a really amazing opportunity and one that I find many people do not have the chance to experience. I left school at 15 to learn carpentry, and I worked for my father (Bruce) for around 3 years until I was qualified. I then went out on my own and completed a college course in construction management and actually ended up employing Bruce to work for me on some projects. We have always been a very close family, and having the opportunity to work together has brought us even closer.

One thing that I find really special is being able to share the ups and downs together; in the good times it is great, and when you get extreme lows, you have someone there for support and to help out. This became really important when, just over a year ago, Hayden suddenly passed away. We had worked together every day for 3–4 years, and losing him was very difficult to manage. He was my go-to and the closest to me in age. Growing up, we played sports together on the weekends, traveled overseas together and even had the same friends. He was my best mate and the single thing for which I am so grateful is that we had worked together in the family business.

**I&ST:** What was your reaction when you’d learned you’d won the Graham Prize?

B.M.: We were very excited and honored, as it was recognition from our peers for the contribution we had made as a team. It’s a bit like winning a gold medal in the Olympics, and it will always be a point of great pride in my life.

L.M.: It is very exciting to be recognized through AIST and to be awarded winners of the 2019 T.C. Graham Prize. Thank you again for the recognition and as we continue to work in the steel industry throughout the world, our involvement with AIST and their partners will continue. Exciting times lie ahead!