

BRIDGING THE GAP BETWEEN TRAGEDY AND SUCCESS



The bridge collapse in Genoa in 2018 was a terrible shock. But in only two years, through a very focused effort and cooperation, the city inaugurated a new bridge. Needless to say, safety and security were essential during this one-of-a-kind project.

Text Claudia Flisi

The collapse of the Morandi Bridge in Genoa, Italy, on August 14, 2018, was a catastrophe on every level. When the central section of the bridge buckled in a blinding rainstorm, 43 people from nine countries lost their lives. The city lost a vital link in its road network to the rest of Italy and to Europe (the bridge was actually a viaduct across the Polcevera Valley north of the city). And Italy's reputation for engineering prowess was shattered.

Amid the private anguish and public outcry, Genoa had to deal with the economic repercussions of the disaster. A new bridge had to be built as quickly as possible to minimize commercial damage. At the same time, the community needed reassurance that the new structure would be safe and reliable. Acclaimed Genoese architect Renzo Piano volunteered the services of his firm, and his project served as a prototype for what was to become the Viadotto Genova-San Giorgio (the Saint George Bridge).

Marrying functionality and aesthetics

Speed and safety were not the only considerations, explains architect Stefano Russo, who spearheaded the project for the Renzo Piano Building Workshop: "We were seeking the right marriage of structural requisites and aesthetics. We had to pay attention to both because this bridge is part of the urban landscape."

To accomplish this, he and his firm worked closely with engineers to ensure that bridge form and functionality were appropriate for the specific geographic setting.

Russo's background prepared him for the challenge. He had studied architecture at the famed Politecnico di Milano and began working at Piano's Workshop in 2009. By the time he took charge of the bridge project, he had been living in Genoa for almost a decade, and that familiarity played a role in the development of San Giorgio.

"You have to understand the context of your bridge to design it well, just as an architect needs to understand the needs of doctors when designing a hospital," he explains.

A challenging specification

San Giorgio was conceived as an urban bridge since it spans a valley populated with homes and businesses. "We imagined driving across this bridge as a passenger and wanted to provide a panorama for these travelers. At the same time, we wanted to design a bridge with a light footprint," notes Russo.

This was a challenge in that specifications called for a structure 30 meters wide to accommodate two traffic lanes in each direction, two emergency lanes, and a lane for maintenance. By contrast, the Morandi Bridge was 18 meters wide. To lighten its visual impact across the valley, San Giorgio is supported by 18 elliptical concrete piers. Their form allows light to soften their impact and creates the illusion of less weight and more light.



Stefano Russo
ARCHITECT.
RENZO PIANO BUILDING
WORKSHOP

The steel section in the middle curves and the viaduct narrows at the two ends, also softening overall impact. The deck is made of precast elements and seemingly ‘floats’ above the piers, adding to the effect of lightness. The design resists seismic activity.

The steel elements have a light coating to make the bridge feel bright and harmonious. The form is that of a ship, evoking Genoa’s history as a seafaring center. The bridge is also lit at night, powered by photovoltaic cells, because, “We wanted it to be scenographic 24 hours a day,” says Russo.

Construction challenges also played a part in the bridge design. Fincantieri, one of the companies in the consortium constructing San Giorgio, had two construction sites. Components from one of them came by sea, and pieces moved by land had to be navigable on sometimes-narrow roads. On-site assembly was limited by the lack of space in the highly populated valley. Bridge elements had to be engineered with these constraints in mind.

Safety the top priority

Safety was always top of mind. Innovations include a complex system of internal sensors integrated into the bridge itself. These accelerometers, extensometers, velocimeters, inclinometers, and detectors for joint expansion and differential displacement generate data in real time. Also, robots run along the sides of the bridge to monitor the bridge externally; they transmit data and send alerts whenever maintenance may be needed. If a sensor is damaged, it can be replaced, and the robots can easily be updated.

Using washers that can take it

Underpinning all safety considerations, literally, are the bridge’s nuts and bolts. To secure those where inspection is difficult, the designer opted for wedge-locking washers by Nord-Lock specially designed for use on steel constructions, notes Lorenzo Sartori, technical manager for Fincantieri Infrastructure S.p.A.

One series helps secure the noise barriers of the deck edges of the bridge and ramp. Another series can be found in the bridge runways over which the robots run as they monitor the bridge. These washers are highly resistant to saline corrosion, and their unique wedge design ensures that the bolts they reinforce cannot loosen on their own, elaborates Luca Gheddo, general manager of Nord-Lock Group Italy.

The new Saint George Bridge was inaugurated on August 3, 2020, merely 15 months after construction began. The unforeseen problems that arose included record-breaking rain and Covid-19 lockdowns, but Russo recalls that “everyone involved worked to resolve problems in a way that I have never seen on any construction site anywhere in the world. The city of Genoa confronted a tragedy and worked together to develop a solution. The humanity was incredible.”



Lorenzo Sartori
TECHNICAL MANAGER,
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Luca Gheddo
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CHALLENGE
RELIABLE WASHERS THAT COULD SECURE CRITICAL BOLTED JOINTS IN A SALINE ENVIRONMENT WITH MINIMAL MAINTENANCE.

APPLICATION
FRAMES OF DECK EDGES, BRIDGE RAMP AND BRIDGE PLATFORMS.

SOLUTION
NORD-LOCK SC WASHERS,
NORD-LOCK ORIGINAL WASHERS

BENEFITS
HIGH-CORROSION RESISTANCE AND SECURE BOLTED CONNECTIONS DESPITE STRONG VIBRATION AND DYNAMIC LOADS