

REBUILDING THE GENOVA BRIDGE

Constructing a new bridge in record time to replace the one that collapsed in Genoa in 2018 was a high-profile project. All companies and suppliers were scrutinized as nothing was allowed to go wrong.

Text Claudia Flisi **Photos** Luca Rei/Shutterstock and Nicolò Campo/Getty Images

GENOVA SAINT GEORGE BRIDGE (VIADOTTO GENOVA-SAN GIORGIO)

INAUGURATED
AUGUST 3 2020

ARCHITECT
RENZO PIANO

TOTAL LENGTH
1,067 METERS

WIDTH
30.80 METERS

NUMBER OF LANES
4 (PLUS 2 EMERGENCY LANES)

FINCANTIERI INFRASTRUCTURE

THE COMPANY

FINCANTIERI INFRASTRUCTURE IS A SUBSIDIARY OF FINCANTIERI S.P.A., THE FOURTH-LARGEST SHIPBUILDING COMPANY IN THE WORLD.

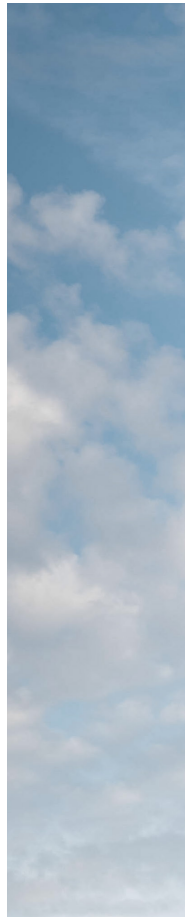
OPERATING HEADQUARTERS
VERONA, ITALY

PRODUCT LINES

SUSPENSION BRIDGES, VIADUCTS, ARCH BRIDGES, CABLE-STAYED BRIDGES, RAILWAY BRIDGES, TOWERS, BUILDING STRUCTURES, AIRPORTS, MARITIME WORKS, FLOATING MODULAR SYSTEMS



Lorenzo Sartori
HEAD OF THE TECHNICAL OFFICE
FINCANTIERI INFRASTRUCTURE



Tragedy struck Genoa, north-western Italy, on the morning of August 14, 2018. During a torrential rainstorm, the city's Ponte Morandi (Morandi Bridge) collapsed so suddenly that some thought it had been struck by lightning. The disaster killed 43 people, destroyed homes and businesses, and exposed infrastructure problems that had existed for decades.

Videos taken at the time of collapse reveal a flexing of the bridge deck followed by the detachment of cables, breaking of a cross-beam, twisted girders, falling towers and finally, the buckling of the 210-meter central bridge section. All punctuated by the screaming of spectators as the occupants of more than 30 cars and three trucks plummeted 45 meters to their deaths.

Warning signs were unheeded

Technically, Ponte Morandi was a viaduct, not a bridge — a cable-stayed structure 1,182 meters in length, spanning Genoa's Polcevera Valley. It connected two areas of the city and formed part of the road network linking Italy to France. When it was completed in 1967, its innovative design by engineer Riccardo Morandi — making use of pre-stressed concrete encasings for its steel cables — was a source of national pride.

But traffic in 1967 was about six million transits annually. By the early 2000s, that amount had quadrupled, and the bridge began to show the strain. Warning signs were unheeded due to technical ignorance and political neglect.

In the aftermath of the disaster, the government vowed to dismantle what remained of Ponte Morandi and replace it with a new, safe and reliable viaduct. Renowned Genovese architect Renzo Piano offered his services for free, and the construction contract for what was to become Viadotto Genova-San Giorgio (the Genoa Saint George Bridge) was awarded to PERGENOVA, a consortium created ad hoc for the project.

Construction faced many challenges

To save time, there was no bidding process but PERGENOVA's credentials were impeccable. Its three participants were Fincantieri Infrastructure, a subsidy of Fincantieri SpA, Italy's largest shipbuilding company, WeBuild SpA, Italy's largest engineering and general contractor group (then called Salini Impregilo), and Italferr, a state-owned engineering firm focusing on transportation-related infrastructure.

Fincantieri Infrastructure specializes in complex engineering, procurement, and construction projects using steel, such as bridges, port facilities, or stadiums. Its expertise draws from the long-established shipbuilding heritage of its parent.

Safety is always the major consideration in bridge construction, but the circumstances of the Genoa project underscored its absolute priority for PERGENOVA. Suppliers and sub-contractors were chosen based on stellar credentials, but also competitive cost and speed of implementation. [➤](#)



They faced challenges both foreseen and unexpected. The former included the tight timetable and a restricted construction site. Demolition of the remains of the old bridge continued through late June 2019, having to take into account the residents living nearby. Unforeseen complications included more than 100 days of rain – the most in a century – beginning in late 2019. Then in early 2020, COVID-19 struck.

Many innovative solutions

Lorenzo Sartori, head of the technical office for Fincantieri Infrastructure notes:

“The bridge was designed to be conceptually simple and safe, fast and easy in production and assembly.”

It is 1,067 meters long and consists of 19 steel-concrete spans supported by 18 reinforced concrete piers. The design deliberately suggests the hull of a ship, a nod to Genoa’s role as a port city and the symbolic importance of this project. Sartori adds that his company’s collaboration with Renzo Piano represented “the chance of a lifetime to work with an architectural genius.”

Among the innovations of this project:

- the elimination of many bureaucratic obstacles, thus accelerating completion,
- photovoltaic panels to produce the energy used by lighting, sensors, and other systems day and night, lowering the environmental impact,
- a special dehumidification system to avoid the formation of saline condensation that could weaken the structure over time,
- four robots that run continuously along both sides of the lower surface of the deck. They inspect, identify, and signal any anomalies to a control center operated 24 hours a day.

Cooperation key to success

The Saint George Bridge was inaugurated on August 3, 2020, a mere 15 months after construction began. It is too soon to judge the structure’s performance over time but its beauty, functionality, and symbolic importance are unassailable. Sartori observes that the project was “a personal and professional experience for a very large group of people from many backgrounds who gave their all and showed what can be done when everyone is working together toward a shared goal.”



Remains of the old bridge had to be demolished for the construction of the new one

TECHNICAL INSIGHTS

A WINNING WEDGE FOR A SYMBOLIC BRIDGE



Luca Gheddo
GENERAL MANAGER
NORD-LOCK GROUP ITALY



Frank Götz
INDUSTRY MANAGER
NORD-LOCK GROUP

The challenge was daunting for Luca Gheddo, general manager of Nord-Lock S.r.l., and Lorenzo Sartori, head of the technical office for Fincantieri Infrastructure, when they met in August 2019.

The new bridge that was planned for Genoa needed bolts that would not loosen under stress, including dynamic loads and traffic vibrations.

Moreover, these bolts, once installed, could not be inspected – much less tightened – continually. So, the washers had to be reliable in an elevated setting with difficult access in a saline environment. The solution, they decided, lay with Nord-Lock wedge-locking washers, which utilize tension instead of friction to secure each bolted joint.

These washers provide high corrosion resistance, confirming their durability in the harsh environmental conditions of Genoa, Italy's busiest port. These results are proven by more than 1,000 hours of ISO 9227 salt spray testing.

According to Frank Götz, EMEA industry manager for building and steel construction at Nord-Lock Group, some engineers hesitate to use them for fear they do not meet the exacting standards of European construction regulation (EN 1090-2).

But in fact, Nord-Lock washers do meet these standards, while also increasing safety and decreasing life cycle cost.

Sartori was convinced, and Nord-Lock washers were chosen based on specific functionalities. One series helps secure the frames of the deck edges as well as the bridge ramp, with a wedge design ensuring that the bolts they reinforce cannot loosen on their own, despite exposure to the strong vibrations and dynamic loads characteristic of the bridge and ramp.

Separately, a series of steel construction washers are specially designed for use on steel constructions and HV/HR sets (high strength structural bolting assemblies for preloading). They can be found on the bridge platforms where the VDC (vehicle dynamic control) robots patrol the lower surface of the deck to spot and report on anomalies.

Fincantieri Infrastructure was pleased not only with the technical specifications of the washers but with Nord-Lock's speed in providing necessary certification, technical assistance, and product delivery in a timely fashion. The first orders were delivered in January 2020, recalls Gheddo.