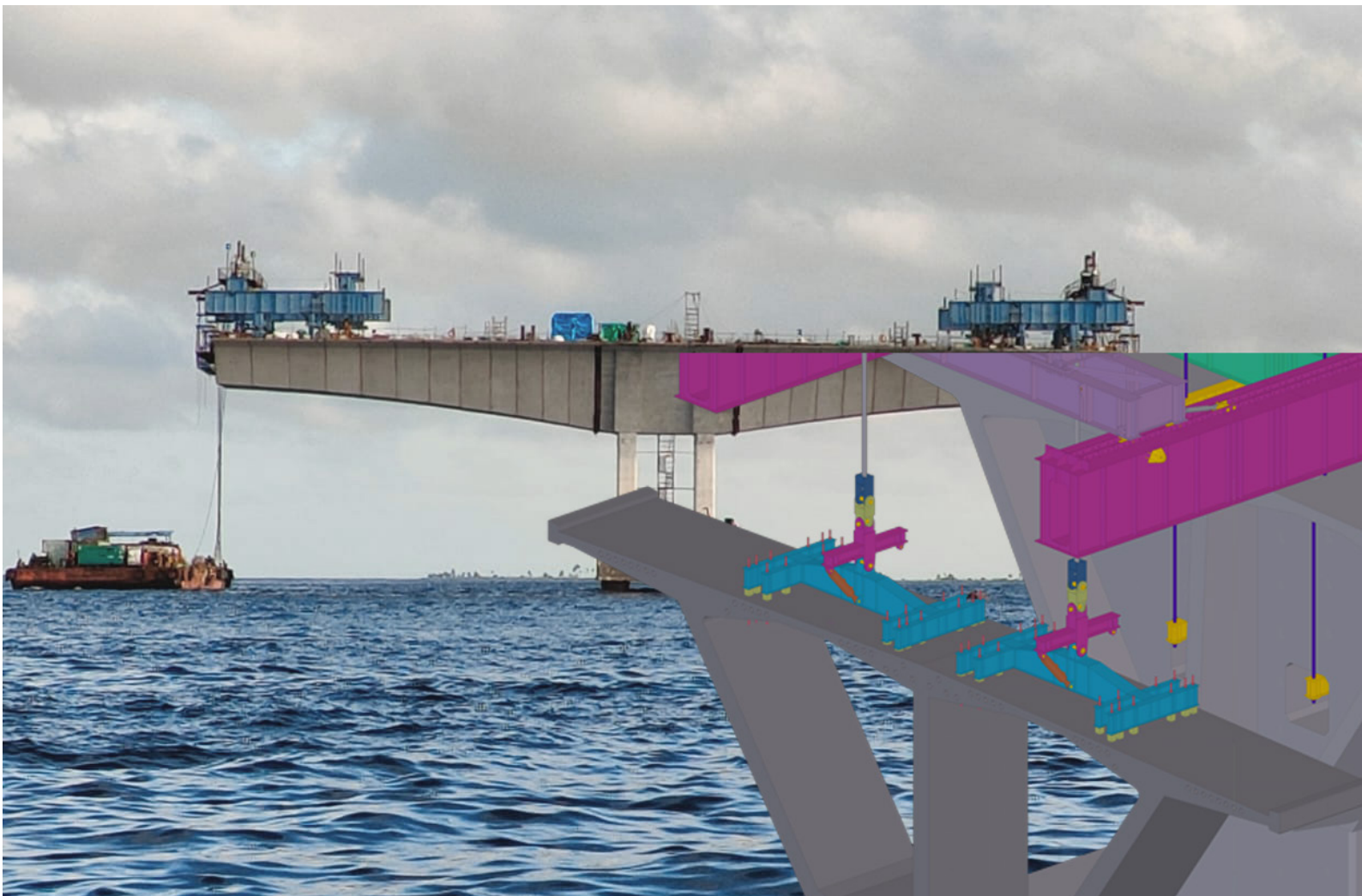




Customer reference

Raising the World's Tallest Precast Navigation Span: Afcons Delivers Engineering Breakthrough Over the Indian Ocean on Tekla Structure



Overview

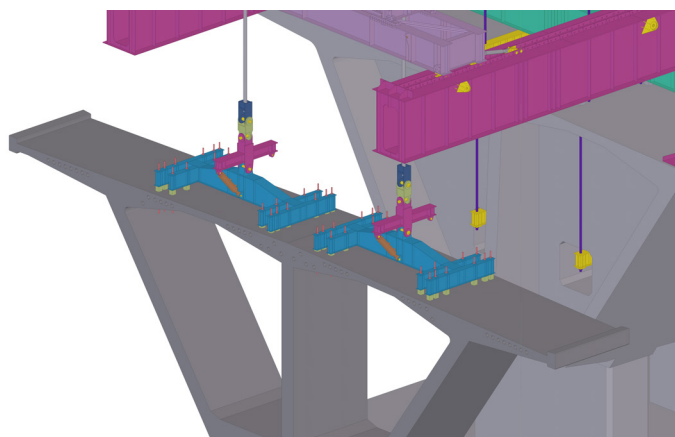
Afcons Infrastructure Ltd. is a major Indian engineering and construction (EPC) company specializing in complex, high-value projects in sectors like marine, urban infrastructure (metro and bridges), oil & gas, and hydro & underground. As part of the Shapoorji Pallonji Group, Afcons executes challenging projects domestically and internationally, with a strong track record in constructing high-profile infrastructure, including India's first undersea tunnel and numerous bridges and metro lines. The company is recognized globally for its expertise in marine and bridge construction and holds a significant presence in more than 25 countries.



LOCATION: Mumbai, India

Building a Lifeline Across Islands

The Greater Malé Connectivity – Malé to Thilafushi Link Project is a 6.74 km bridge and causeway network connecting Malé with Villingili, Gulhifalhu and Thilafushi. Commissioned by the Ministry of Construction, Housing & Infrastructure, the project marks India's first large-scale infrastructure initiative in the Maldives. Afcons Infrastructure Limited is leading the engineering and construction scope, delivering complex marine and precast segment works under challenging ocean conditions. The project features the tallest precast navigation span segment in the world, measuring 8.23 metres in depth and 25.73 metres in width, with a weight of 216 MT.



Engineering Against the Ocean: Lifting 216 MT at 11.8 Metres Over Open Seas

Constructing a 6.74-kilometer sea bridge in the open ocean presents severe technical challenges, including deep water, strong currents, and high waves, especially during the monsoon season. The high salinity of the ocean also accelerates the corrosion of materials, requiring durable and corrosion-resistant construction and maintenance. The construction required building multiple navigation bridges, marine viaducts in deep and shallow waters, and at-grade roads, a complex logistical undertaking.

Further, a critical design challenge involved limiting the lifting gantry to 125 MT to control cantilever moments during construction, in line with permanent works design parameters. This required precise planning, advanced modelling and strict construction sequencing to ensure structural stability and safety at every stage.



“Tekla software is a powerful tool used during the erection phase of construction to determine and utilize the center of gravity (COG) for various structural elements. By providing precise COG data, Tekla improved the safety, accuracy, and efficiency of lifting and installation operations. Further precise modeling helped minimize waste by generating accurate material take-offs and supporting efficient, prefabricated construction methods. Adoption of Tekla is most effective as part of a broader shift to BIM-based workflows, rather than as a standalone software implementation.”

Mr. Yallappa Sonavane – Asst. Manager, Design (Draughtsman) – Afcons Infrastructure Ltd.



Salient Features of the Derrick System for Navigation Span Segment Erection

The derrick system employed for the erection of navigation span segments is a specialized lifting mechanism designed to address unique site constraints and operational challenges. Its key features are as follows:

High Cantilever Capacity:

- The system is engineered to lift segments from a maximum cantilever length of 11.8 meters, which is critical for avoiding interference with existing structures such as pile caps.
- This extended reach ensures safe and precise placement of segments mitigating risks of collision and optimizing space usage in challenging marine conditions.

Heavy Load Handling:

- Each segment weighs approximately 216 metric tons (MT).
- The derrick is structurally designed and equipped with high-capacity lifting gear to manage such substantial loads reliably and safely.

Modular and Efficient Design:

- The derrick is designed to be modular such that four segments (on either side of pier head) are erected at maximum cantilever of 11.8m.
- The derrick is then dismantled from splice locations, and both the modules are deployed sideways for next segment erection.



“The girder members have different profiles at each node, and the multiple connections could have been very difficult to detail through any other software. Use of Tekla Structures proved to be very user friendly and by creating a 3D view to visualize in addition to clash checking proved helpful in identifying the errors.” recalled

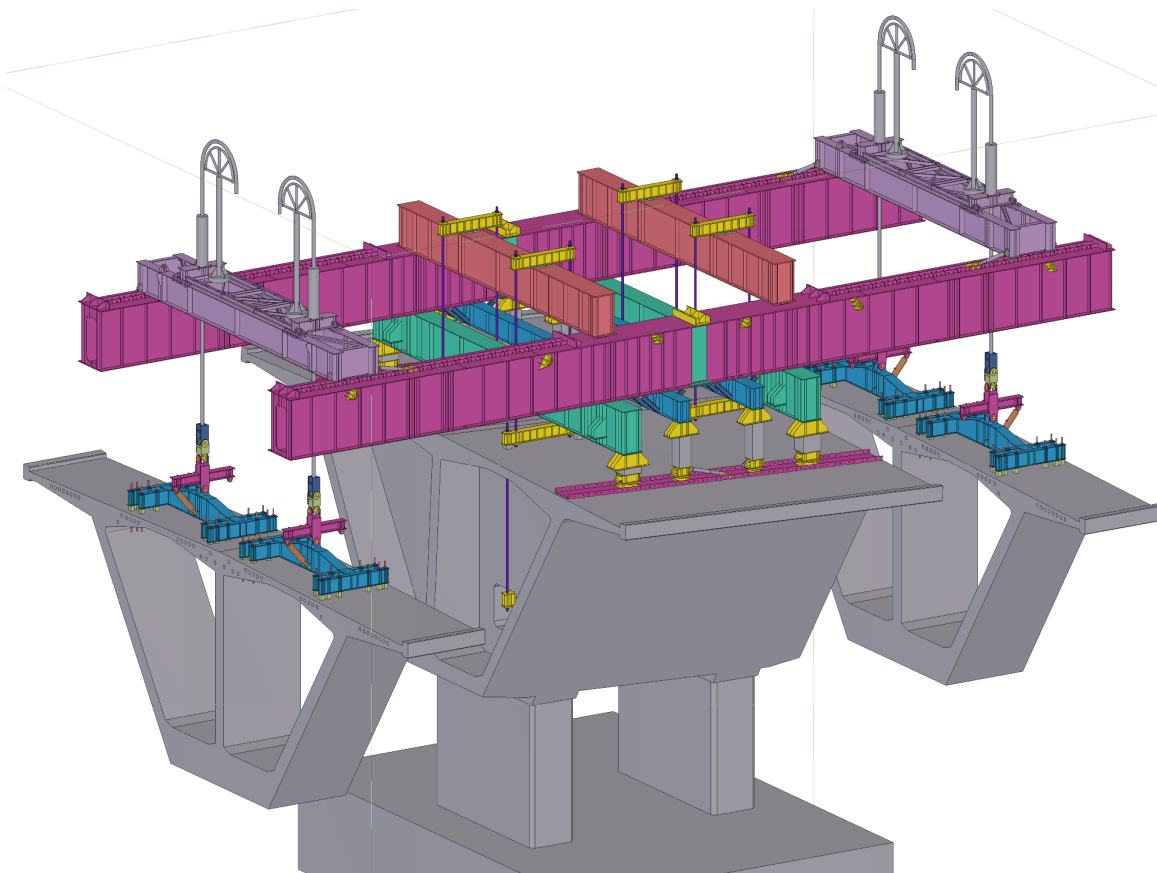
Mr. Raturaj Sawant – Manager, Design – Afcons Infrastructure Ltd.



Digital Precision at Scale: How Tekla Powered Complex Marine Engineering

In relation to the challenges encountered, the benefits of adopting Tekla Structure were manifold, as follows:

- The custom components command enabled the team to complete the model in limited time.
- Likewise, the clone drawings command supported the project executing team to prepare part drawings of all similar components.
- Part drawing preparation time was reduced, making part marking, modification & identification easier.
- Further, with customization of component to required detail, bill of quantity was extracted to any required format.
- Center of gravity of individual parts/assemblies guaranteed accuracy in model camber creation.
- Powerful clash detection to identify and resolve conflicts between various structural elements.
- Extraction of various reports and schedules directly from the 3D model, saved time and greatly improved accuracy.
- Automated tools and streamlined workflows for tasks like part numbering, drawing creation, and material take-offs significantly sped up the design and detailing process.

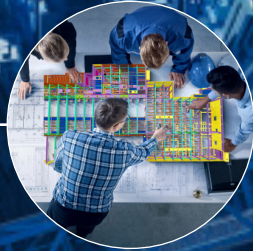




Educate



Design



Detail



Fabricate



Construct

Tekla software by Trimble

Boost your potential, work in new ways and make a positive impact. Create reliable designs, harness automated processes and collaborate seamlessly to gain relevant insights for better decisions. Offer your customers the best service - create truly constructible building information.

About Trimble

Trimble is an industrial technology company transforming the way the world works by delivering solutions that enable our customers to thrive. Core technologies in positioning, modeling, connectivity and data analytics connect the digital and physical worlds to improve productivity, quality, safety, transparency and sustainability.

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