

55 JOB STORY: THE BETTER OPTION – TWO TADANO CRANES (AC 1000-9 AND AC 500-1) LIFT 50-TONNE STEEL STRUCTURE AT CEMENT WORKS IN GUJARAT.



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ENGINEERING, PROCUREMENT, CONSTRUCTION & INFRASTRUCTURE

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REACTIONS FROM THE INDUSTRY



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AIN'T NO MOUNTAIN HIGH ENOUGH

The mega tunnels of Samruddhi Mahamarg are an engineering marvel. However, this longest expressway in the country posed immense geographical challenges, which were ably met by the experts at Afcons.



The Maharashtra Samruddhi Mahamarg, the longest expressway in the country, is 701-km long and connects Mumbai with Nagpur. With part of the expressway now operational, the focus has shifted to the remaining packages of the corridor.

After becoming fully operational, the travel time will reduce by half between the two cities. The expressway will accelerate the development of industrial corridors between Mumbai and Nagpur.

Afcons has delivered two packages – Package-2 and Package-14 – in this entire corridor, which are complex and highly structure-intensive. The Package-14 at Igatpuri will have the country's widest and Maharashtra's longest road tunnels, and it will also give motorists a breathtaking view of the Sahyadri ranges while driving on Viaduct-II, which has been built over a dense forest area overlooking the mountains. It is, perhaps, the most critical package in the entire

Samruddhi corridor because it comprises India's widest road tunnels in the Kasara Ghat area along with two viaducts, and an interchange.

Geographical challenges

The package is 13.1km long and will connect Pimpri Sadroddin in Nashik with Vashala Budruk in Thane. The location of the project made the construction an arduous task.

"The project location falls in Igatpuri, the highest rainfall zone in Maharashtra. Some years, we faced unprecedented rainfall that took a toll on our tunnel construction as well as impeding our efforts at Viaduct-II. Because of a dense forest area, mountainous terrain, high rainfall, and lack of access roads, we had to tread with extreme precaution. Due to heavy showers and dense fog, visibility remained an issue. However, we used the best safety practices to enable a safe work environment," said Sekhar Das, Project Manager, Afcons.

Tunnelling in downward gradient

The major focus of the execution was on twin tunnels, which were completed in a record time of two years despite the pandemic. The tunnels at Igatpuri are divided into three sections — shaded tunnel, cast in-situ cut and cover tunnel, and main bored twin tunnel.

At the start, the shaded tunnel is provided to reduce the water catchment area near the tunnel face. For achieving the safe overburden for the construction of the main tunnel, cut and cover with similar size of the tunnel is provided.

Due to the geographical locations, the tunnels were constructed with the New Austrian Tunnelling Method (NATM) by adopting the Heading and Benching excavation technique. In addition to the heading and benching excavation to facilitate speedy excavation of the tunnels, the project team also adopted a unique methodology in construction of the tunnels.

Initially, two vertical shafts were planned for the tunnels. After a detailed review of the terrain and execution methodology, one vertical shaft was changed to an inclined shaft, which in turn facilitated the tunnel excavation by opening multiple work fronts.

The inclined shaft was strategically placed at the centre of the tunnel length, which helped to complete the excavation in record time. The same inclined shaft can now be used as an escape tunnel in case of any emergency.

“The tunnels are designed with 2.49 per cent downward gradient and S-curve shape to mitigate the steep slope of the Ghat section. As part of construction and pre-construction activities, we obtained permission from the authorities to form access roads in the forest area. Since the roads were narrow and steep, heavy vehicle movement was impeded. The bulk construction material had to be stored at the Igatpuri side and moved in small quantities,” the Project Manager said.

The mega tunnels were completed in a record time of two years despite the pandemic, heavy monsoon, and other challenges. Each tunnel is 7.78km long and 17.6m

wide, with three lanes in each direction.

Viaduct through Sahyadri ranges

There are two viaducts in the project. Viaduct-II, which is 1.2km long, was the second most challenging part of the project after the tunnels. It had to be constructed over a forest area with practically no approach roads.

In the absence of access roads, transportation of material to the Viaduct-II location was a major challenge. On top of that, negotiating the monsoon and setting up a camp in the area was an extraordinary task.

Besides its location, there was another unique challenge at Viaduct-II — its height. The viaduct is a balanced cantilever cast in-situ bridge with a length of 1.2km. There are 35 piers, with the highest pier standing at 60m (equivalent to 20 floors). There are 29 spans, and the longest span measures 98m.

The reinforcement steel cage was assembled on the ground, and the entire reinforcement module was lifted and placed for various components, including pier lifts, pier caps, hammer heads, segments, along with modification of the Cantilever Form Traveller (CFT) shutter. The project team was able to reduce the cycle time of 5.0m balanced cantilever segment casting from 15 to 09 days.

“Working at 60m height in a valley facing strong wind and heavy rainfall was not easy. However, adequate safety measures were taken to complete the work. We are happy to complete the project and finish

the minor works within the stipulated period,” Das added.

Tunnel features

The twin tunnels are provided with a cross passage every 300m to facilitate evacuation in case of any emergency. There are a total of 26 cross-passages in both tunnels. Besides this, a lay by area is provided every 750m to park any breakdown vehicles.

The tunnels are equipped with the most advanced fire protection system. It is noteworthy to mention that a high-pressure water mist system, which is a first for any tunnel in India, has been installed in the tunnels.

Afcons has also delivered Package-2 of Maharashtra Samruddhi Mahamarg in Wardha ahead of schedule. The 58.4km-long Package-2 was the most structure intensive, with more than 200 structures in the project. It was inaugurated in December 2022 by honourable Prime Minister Shri Narendra Modi as part of Phase-1 of the Samruddhi corridor.

PKG-14 highlights

- w Total length: 13.1km.
- w Includes Maharashtra's longest and India's widest road tunnels.
- w Tunnel length: 8.0km.
- w Tunnel width: 17.6m.
- w Tunnelling completed in a record time of two years despite pandemic.
- w Multiple cross passages inside tunnels.
- w Tunnels equipped with modern ventilation, fire-fighting, and safety systems.
- w First ever high-pressure water mist system in any tunnel in India for fire safety.
- w 02 Viaducts.
- w 01 Interchange.



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