

Bandra Worli Sea Link

An iconic structure

Transforming dreams to reality

Facilitating a faster commute and reducing traffic jams are the twin goals of the Bandra Worli Sea Link, which is finally opening up to the public today

Vijay Pandya, MUMBAI

The Bandra Worli Sea Link is a civil engineering marvel spanning an arc of the Mumbai coastline. With its cable-stayed towers soaring gracefully skywards, the sea link is a reflection of the modern infrastructure that Mumbai is adding in its progress towards becoming a world-class city. The project is a part of the Western Freeway Sea Project, which, in turn, is a part of a larger proposal to upgrade the road transportation network of greater Mumbai. In the first

phase it will connect Bandra to Worli where as in the subsequent phases the plans are to take it further to Haji Ali and then to Nariman Point. It is a connecting bridge linking the city of Mumbai with its western suburbs and has the potential to bring about permanent and far reaching changes in the travel patterns of the area.

The Bandra Worli Sea Link is primarily meant to provide an alternative to the Mahim Causeway route that is presently the only connection between the south Mumbai and the Western and Central suburbs. The project starts from the interchange at Mahim intersection, i.e. intersection of Western Express Highway and Swami Vivekanand Road at the Bandra end, and connects it to Khan Abdul Gaffar Khan Road at the Worli end.

The project commissioned by the Maharashtra State Road Development Corporation Ltd (MSRDC) and the Maharashtra Government has been built by

HCC (Hindustan Construction Company).

Until now, Mahim Causeway, the North-South connector between the western suburbs and the island city of Mumbai getting increasingly bottlenecked. It takes commuters nearly an hour to travel the 8 km distance from Mahim to Worli.

The Bandra Worli Sea Link will increase the route options of passengers travelling from the island city to the western suburbs and vice-versa and thereby decongest the overstrained Mahim Causeway and western corridor. The Link Bridge consists of twin continuous concrete box girder bridge sections for traffic in each direction. Each bridge section except at the cable-stayed portion is supported on piers typically spaced at 50 meters. Each section is meant for four lanes of traffic complete with concrete barriers and service side walks on one side. The bridge alignment is defined with vertical and horizontal curves.

The Link Bridge layout is categorized into three different parts:

Part 1: The north end approach structure mainly with precast (PC) segmental construction
Part 2: The Cable Stayed Bridge at Bandra channel is with 50m - 250m-250m-50m span arrangement and the Cable Stayed Bridge at Worli channel is with 50m-50m-150m-50m span arrangement

Part 3: The south end approach structure mainly with precast segmental construction.

The project scope was expanded over the last few years due to various community demands (see box) and some unforeseen events resulting in several variations made after the work started.

Thankfully, with four lanes of the Sea Link being opened to the public today and the remaining four due for unveiling by December 2009, Mumbaikars can now finally look forward to a faster commute down this stretch.

HOW THIS IMPRESSIVE EDIFICE WILL CHANGE YOUR COMMUTE

The projected difference in an average road journey from Lovegrove Junction to Mahim Junction

THE SCENARIO TILL DATE

Distance: 7.7 km
 Traffic Signals: 23
 Morning Peak Hour Travel: 35 minutes
 Evening Peak Hour Travel: 38 minutes
 Average Journey Speed: 13 Kmph

NOWE WITH THE BANDRA WORLI SEA LINK

Via Sealink: 4.70 km
 Traffic Signals: 4
 Morning Peak Hour Travel: 6 minutes
 Evening Peak Hour Travel: 6 minutes
 Average Journey Speed: 80 Kmph

Some of the reasons why the project got delayed

The original scope of the work comprised construction of 8 lane 3926 m long bridge including 600 m long cable stay bridge on single tower in the open sea, 449 m long approach, toll plaza, traffic control and surveillance system, signages, illumination, landscaping etc.

Change in alignment

- The structure from Pier No. 34 onwards was shifted 200 m in the sea on Worli end, changing the alignment to join at the connecting point
- Change in alignment resulted increase in Worli end Link bridge from 230 m to 811 m
- Foundation base was altered with proposed specifications
- Part of the superstructure changed from cast in situ to pre cast segment construction style

Change in design of Bandra Cable stay bridge

- Instead of single cable stay tower, a new design of separate cable stay towers for each carriage way was introduced. The new towers have unique specific geometric shape, having legs diverging in one plane and converging in another plane.
- Major changes in the foundation; the number of pile foundation increased from 40 to 52.

- Increased the width and weight of the Segments
- Segment erection methodology got redefined
- When the construction of tower was about to begin, further modifications were introduced:
- Groves design in tower
- Insistence on specific type of tower form-work
- Introduction of cable stay bridge on Worli channel
- A 350-m long cable stay bridge, with a 150-m middle span, was introduced to help the fishermen get access to the Worli side by boat.
- This changed the construction sequence and methodology from the initial plan:
- Additional support piers had to be created for shifting the Launching Trusses from one tower to other
- The major variations were ordered in October 2004 as a result HCC could not do much work in the initial four years and the actual work began only in January 2005.



Your dreams are not yours alone



FACTS AT A GLANCE

Cost : Rs. 1634 Crore (Cost of all packages including escalation & IDC.)
Type of Project : Build Operate Transfer (BOT)

Project Features

- 8 lanes exclusively for fast moving vehicles with limited access (four wheelers and above).
- 2 lanes proposed to be reserved for buses.
- 16-lane toll plaza with automated toll collection system.
- "Intelligent Bridge" with sophisticated surveillance, information, guidance and emergency support systems.
- Main Cable Stayed Bridge 500 m long spanning across Bandra Channel.
- Second Cable Stayed Bridge 150 m long spanning across Worli Channel.

- Landscaping and promenade development.
- A cloverleaf interchange at Mahim intersection and a flyover at Love Grove junction to ensure faster and safer traffic dispersal at both ends
- Vertical clearance of 20 m below Bandra Cable Stayed Bridge for water transport
- State-of-the-art construction technology
- Emergency crossovers and Disaster Management Program

Quality Assurance

Features incorporated to enhance bridge performance and durability include:

- High performance concrete (grade M60 with micro silica slurry) to enhance durability
- Fusion bonded epoxy coated reinforcement as anti-corrosive treatment
- Pre-cast technology ensures quality production of segments

- Instrumentation to monitor vital bridge parameters

Power Supply and Road Lighting Systems

- Diesel generators and auto mains failure panels to cater as emergency backups.
- Adequate lighting levels and energy saving luminaries.
- Lightning protection at bridge tower and control room.
- Facade lighting for bridge tower and special lighting in landscaped area.

The Bridge consists of twin continuous-concrete box girder bridges for traffic in each direction. The Bridge (except the cable-stayed portion) is supported on piers typically spaced at 50 meters. Each section is meant for four lanes of traffic, with anti-crash barriers and service sidewalks on one side.

Basic Benefits

- Estimated savings in fuel and Vehicle Operating Costs (VOC): Rs. 100 Crores per annum (1999yr.Base)
- Considerable savings in travel time (20 to 30 minutes) due to increased speed and reduced delays (23 signals avoided)
- Stress free driving
- Reduced accidents
- Reduction in traffic on existing roads because of traffic diversion to the Sea Link
- Reduction in Carbon Monoxide and Nitrogen Oxide Levels in Mahim, Dadar, Prabhadevi and Worli along existing roads
- Reduced noise pollution in Mahim, Dadar, Prabhadevi and Worli along existing roads
- No adverse effect on fisheries, marine life and livelihood of fisherman
- Landscaping along the approaches and waterfront promenade will enhance the environment and add green spots to the city

QUOTE CORNER

Dr. Dilip B. Boralkar, Former Member Secretary of MPCB

The vehicular traffic passing from Bandra, Mahim, Dadar, Prabhadevi and part of Worli can now take Bandra - Worli Sea Bridge. This will bring in the environmental health benefits in terms of saving the exposure of vehicular emissions to the inhabitants of this area. Additionally, due to smooth flow of traffic, fuel consumption would also be less; this means less emission of air pollutants and better air quality in Mumbai city. For compounding the environmental benefits, the Bandra -Worli Bridge should be extended to north (Haji Ali) and to south (Versova) as soon as possible. The bridge is pride of nation.



Araby EL Shenawy, Engineer and head of the Project Management Consulting team, from Egypt

The method of balanced cantilever was adopted for the construction of the deck for Bandra Cable-stayed Bridge. This is considered to be one of the biggest cable-stayed bridges in the world with concrete deck built with this method of construction. It was therefore a real challenge to monitor the behavior of the structure during all erection stages and to compare the same with the behavior of the corresponding theoretical computer model of the bridge, to ensure the achievement of the desired geometry at the end of construction. It was also essential to control the stresses in the critical bridge elements during every single construction stage to ensure the adequacy of the bridge elements all the time... Bandra Worli Sea Link project will definitely be of great benefit to the people of Mumbai as it will reduce the traveling time between its ends. The benefit will be further maximized when the bridge is extended to Nariman Point as planned by MSRDC."

Len Gower, a Canadian survey expert, who worked on evolved survey methodology for complex geometry of pylon

I was working on a project in China at that time and my friend from India had sent me picture of the cable-stayed bridge. The picture hooked me so much that I left the on going project of Sutong Bridge and came to India. I have done nine projects and they all have same boring design. I wanted to do something new, challenging and interesting so I joined this project. This sea link is technically challenging and aesthetically pleasing. I think this sea link is lucky...



SAFE AND LONG LASTING STRUCTURES

50,000 MT. of Fusion Bonded Epoxy Coated (FBEC) bars have been used in this bridge.

Over 30 countries have mandated FBEC in their national specifications. In India, FBEC bars have been used in more than 450 Bridges, Flyovers, Buildings & Jetties. Globally, over One Million-RCC structures have used FBEC for CORROSION free life.

CONGRATULATIONS

FOR CREATING
A LONG-LASTING
MONUMENT IN MUMBAI

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