All you need to know about Pamban rail bridge

The 2,050-metre-long old Pamban sea bridge was built between 1911 and 1913. After it faced structural instability, a new railway sea bridge has been constructed near it. It has taken five years (2019-2024) to construct the new bridge, including an eight-month pause due to COVID-19.

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A Coast Guard vessel passes through the old Pamban bridge, with the new railway sea bridge behind it ready for inauguration. File | Photo Credit: L. Balachandar

The new Pamban railway sea bridge, touted to be India's first vertical-lift railway bridge, built in Tamil Nadu at a cost of ₹535 crore is just days away from its much-awaited grand inauguration by Prime Minister Narendra Modi on April 6, 2025 (Sunday). This bridge has been constructed to replace the over 110-year-old Pamban bridge that stands next to it, surviving a historic cyclone in the 1960s.

The 2.05-km long old Pamban bridge with a glorious past is an engineering marvel and served as the sole transportation link between mainland Ramanathapuram and Rameswaram island, that is only a few nautical miles away from Sri Lanka, for over 70 years until a road bridge was built beside it in 1988.

Conception of idea

The idea of establishing rail connectivity between India and Ceylon (Sri Lanka) through Adam's Bridge (a chain of natural limestone shoals connecting Rameswaram island in India with Mannar island in Sri Lanka) in the sea was explored way back in 1876.

However, it was only after 18 years, F.J. Waring, the then Chief Resident Engineer of Sri Lankan Railways made the first proposal in 1894 on the behalf of Ceylon government for bridging 22 miles of sea with Adam's Bridge at a cost of ₹2.59 crore.

Though E.J. Shad Bolt, on behalf of the Indian government, brought the cost down to ₹2.49 crore in 1895, the huge outlay did not justify the anticipated traffic and the idea was abandoned.

Later, in June 1906, a survey to lay track from Madurai to Rameswaram upto Dhanushkodi and to connect Ceylon by steamer service from Dhanushkodi was finalised.

The old Scherzer rolling lift bridge

After two years, the decision to complete viaduct at Palk Strait with a Scherzer rolling lift bridge was taken on November 25, 1908 at Thalaimannar. The bridge was aimed to promote tobacco trade by the growers in Sri Lanka.

The Scherzer rolling lift bridge, patented by the American engineer William Donald Scherzer, was designed by his company, Scherzer Rolling Lift Bridge Company of Chicago. It was constructed by Head Wrightson & Co., Teesdale, U.K.

The construction work of Pamban rail bridge began in June 1911 and was completed in 30 months in December 1913.

Lift span for ship navigation

The 2.05-km long Pamban railway sea bridge was constructed to metre-gauge standard consisting of 145 spans, of 40 feet girders, two spans of 32 feet track girder and one Scherzer rolling lift span of 225 feet (double cantilever truss of 112.5 feet each) for navigational purpose.

The Scherzer rolling lift span, also known as vertical-lift bridge can be opened upwards for a maximum of 81 degrees to facilitate the movement of boats and vessels in the sea, beneath it. The Pamban bridge was opened on February 24, 1914 by Neville Priestley, MD, South Indian Railway Company Ltd. and railway traffic began in the same month.

The bridge, connecting the mainland with Rameswaram island, was opened by Neville Priestley, Managing Director of South Indian Railway Company Limited on

February 24, 1914.

This apart, the project of laying track from Rameswaram to Dhanushkodi and steamer connection was undertaken at a cost of ₹70 lakh. The tickets covering the train journey upto Dhanushkodi and the steamer service from Dhanushkodi to Thalaimannar in Sri Lanka were issued by the then South Indian Railways.

The 1964 cyclone

A severe cyclonic storm also known as the Rameswaram cyclone, that hit Tamil Nadu between December 22 and 23 in 1964, wiped out Dhanushkodi, a coastal town on the southeast tip of Pamban. Due to the catastrophe, the bridge suffered from huge destruction as 103 spans of 12.20 metre steel girders were washed away by tidal waves and 21 spans of prestressed concrete girders and two piers were toppled.

However, the Scherzer rolling lift span and 19 spans of concrete girders withstood nature's fury. The restoration work was completed in March 1965, within a short period of over two months by salvaging the steel girders from the sea bed and replacing some with new girders.

Gauge conversion

Subsequently, during the gauge conversion of Madurai-Rameswaram section, all the pillars were strengthened and 15 of the concrete girders that survived the impact of 1964 cyclone were replaced with steel girders.

The Scherzer span was strengthened by providing additional counter weight to make it suitable for broad-gauge standard.

Railway workers from across south India, like Southern Railway, South Central Railway, South Western Railway, were mobilised for the work of fastening four lakh rivets on the steel bridge structure, said former Senior Divisional Engineer (Coordination), T. Archunan. The works included putting up additional members to the Scherzer span structures by drilling holes and fastening them with rivets. The broad-gauge line was commissioned in August 2007.

Corrosion menace

Over the years, corrosion started to weaken the steel structure. Continuous health monitoring sensors, imported from Germany were fitted to monitor the stability and health of the double-leaf bascule bridge with the help of Indian Institute of Technology -Madras (IIT-M) in 2020.

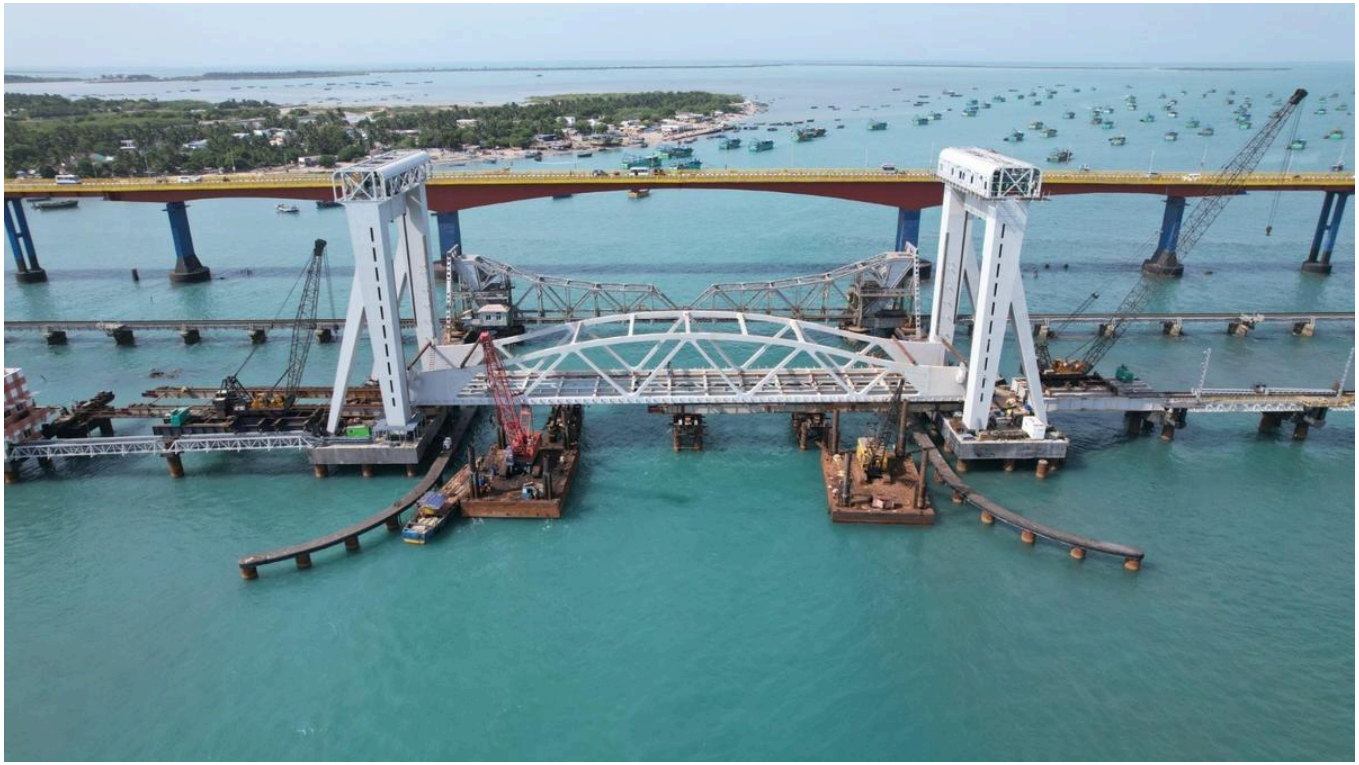
This helped to continue operation of train services on the old Pamban bridge for two more years until the train operation had to be suspended in December 2022 and later permanently stopped after the sensors emitted alarm over excessive vibrations during train movement. The engineers felt that the bridge, that served for over a century, was beyond repair.

New rail bridge

The construction of new Pamban rail bridge adjacent to the existing one was started by Rail Vikas Nigam Limited (RVNL) in 2019 when the old bridge began to face

frequent technical difficulties and structural instability. It was stalled for nearly eight months due to COVID-19 outbreak. Besides, minor changes in design and rough sea also delayed the work.

The work was finally completed in November 2024 at a total cost of ₹535 crore. On the old bridge, trains were operated at a speed of only up to 10 kmph. But now, on the new bridge, trains can be operated at a speed of up to 98 kmph.



Aerial view of the new and old Pamban bridges and the road bridge in Ramanathapuram district of Tamil Nadu | Photo Credit: Special Arrangement

RVNL chose to construct a vertical lift span for ‘simply support’ without any obstruction in the navigational route of ships, said Chairman and Managing Director of RVNL, Pradeep Gaur. The engineers have used polysiloxane paint which could avoid the need for frequent painting on the steel structure, for a minimum of 35 years.

Southern Railway General Manager R.N. Singh said the old bridge would soon be dismantled and parts of it would be preserved.

Tribute to William Scherzer

“We should pay tribute to William Scherzer, who designed the double-leaf lift span at a very young age. He has produced such a brilliant structure, the design of which has been used in 150 bridges across the world,” said Mr. Gaur.

The Pamban bridge, with his design, has stood for more than 100 years.

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