

Introducing Japanese slab track to India

Work has started on the installation of ballastless track on the Mumbai – Ahmedabad high speed line, marking the first application of J-slab technology in India. Two local production plants have been developed with support from Japanese consultants.

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Tracklaying on the Mumbai – Ahmedabad high speed line started near Surat in August.

Despite earlier delays with approvals and land acquisition, construction of the 508 km Mumbai – Ahmedabad high speed line in western India is now in full swing, following the signing of the last of the 11 civil works contracts on August 10 2023.

A significant milestone was reached on August 31, with the start of tracklaying work at Surat. Project promoter National High Speed Rail Corp Ltd has elected to adopt the Japanese J-slab ballastless trackform, which it says is being used in India for the first time. In March 2021 Nhsrc signed a memorandum of understanding with Japan Railway Track Consultants to assist with track design.

J-slab has been used extensively on the Shinkansen network in Japan and Nhsrc anticipates that it will have a life of around 60 years. Japanese applications come in two variants — solid and framed. Given the climatic conditions in India, the designers have elected to use the framed version for the Mumbai – Ahmedabad line. Nhsrc explained to *Railway Gazette International* that this type was suitable for use on earthworks, elevated viaducts and bridges, as well as in tunnels.

Laying the slabs

The track structure is assembled using pre-cast track slabs onto which the rails are fastened. These slabs are supported

on a reinforced concrete trackbed which is cast in-situ, 2 420 mm wide and around 300 mm deep. A layer of cement-asphalt mortar is provided between the concrete base and the slabs to ensure a degree of resilience in the trackform. Reinforced concrete anchors are incorporated to provide longitudinal and lateral restraint to the track slab. These anchors are 260 mm high and 520 mm in diameter; they are positioned at approximately 5 m centres.

The line itself will be laid with 60 kg/m JIS rails, supported on the slabs using tie plates and fastenings. Adjustable shims are used between the tie plates and the rail pad to ensure an accurate alignment, while a prevention device is also installed to preclude against rail turn-over. A reference pin attached to the reinforced concrete anchors is used to ensure the optimum horizontal and vertical alignment for train operation at up to 320 km/h. Three types of inserts are required, of which the Type-A inserts are being procured from Japan.

Local production plants

Two manufacturing plants have so far been established in India for production of the pre-cast slabs. The first of these was opened at Anand, southeast of Ahmedabad, on September 30, having been completed



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opened at NHSRC's Surat depot in May 2023. This is being used to train Indian staff working on the T-2 package between Vapi and Vadodara. The facility is expected to train up to 1 000 engineers, work leaders and technicians over the course of the project.

With backing from Japan International Co-operation Agency, a team of around 20 specialists from JARTS is providing 15 different courses covering all aspects of track construction. These include training for site managers, the slab manufacturing process, laying of the in-situ concrete trackbed, reference pin surveying and data analysis, slab track installation, rail welding, and turnout installation.

Use of the J-slab design is licensed by the Japan Information & Culture Centre, and JICC has been appointed to supervise the mechanised tracklaying in order to ensure that the desired quality is achieved.

A variety of tracklaying plant has been procured for the assembly phase, including slab-laying machines and wagons to supply and install the cement-asphalt mortar layer. Specialised rail feeder cars will also be used.

Japan Railway Technical Services provides training courses for Indian engineers and technicians.

in just eight months. Occupying an area of 10 ha, the plant is expected to produce more than 45 000 pre-cast track slabs over the next two or three years.

The highly automated facility has been developed to supply track elements for a 116 km section of the double-track route, which requires approximately 200 slabs per track-km. It is equipped with 60 high-precision moulds which can each produce one track module per day. The plant has room to store up to 9 000 completed slabs pending delivery to site.

The second slab manufacturing facility is being developed at Kim, northeast of Surat, which will supply the J-slabs required for the 236 route-km between Vadodara and Vapi. This will be a larger plant, which will have capacity to produce 120 slabs per day once it is fully operational.

Both facilities have been equipped with fully automated rebar processing machines, as well as a rebar yard for cage fabrication, and an advanced concrete distribution system. Electric travelling cranes and gantry cranes are used to move the components and slabs around the site. Reverse osmosis plants have been installed to filter all water used in the production process.

The special moulds required for casting the track slabs at the first two plants have been supplied from a Japanese mould manufacturer, but

NHSRC anticipates that any future moulds would be procured locally through the country's 'Make in India' initiative.

Close co-operation

NHSRC expects the tracklaying to be a major challenge for local contractors, given the very stringent tolerances for high speed operation. Before the start of slab production, Japan Railway Technical Services organised a training course in Japan for Indian engineers and technicians, along with appropriate certification.

As part of the technology transfer agreement, a local training centre was

