

NEWS, ANALYSIS, PROJECTS & BUSINESS INTELLIGENCE FOR THE CONSTRUCTION INDUSTRY

VOLUME 12 • ISSUE 6  
FEBRUARY 2021 • MUMBAI • ₹100

# CONSTRUCTION WEEK

PUBLISHED BY ITP MEDIA (INDIA)

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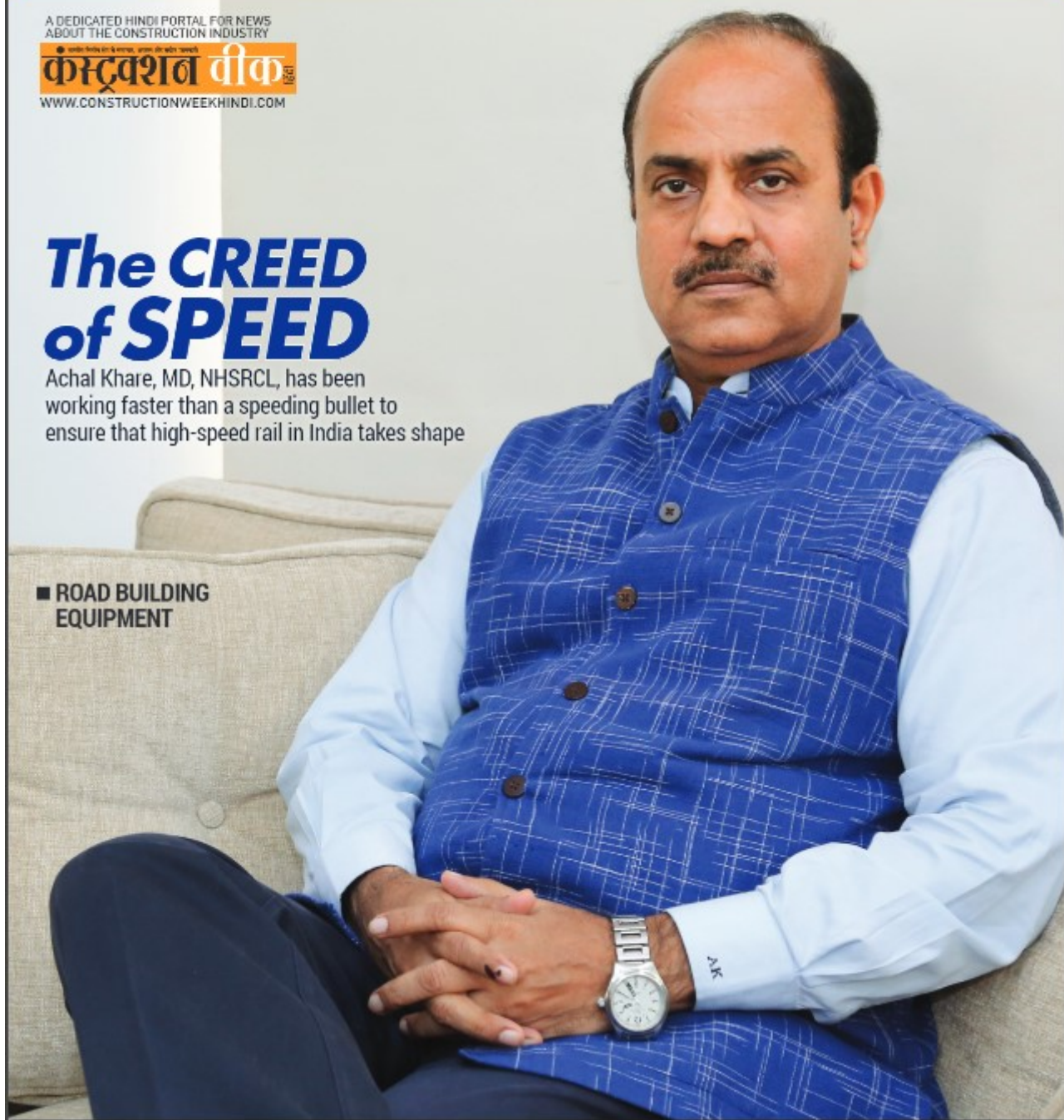
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## The CREED of SPEED

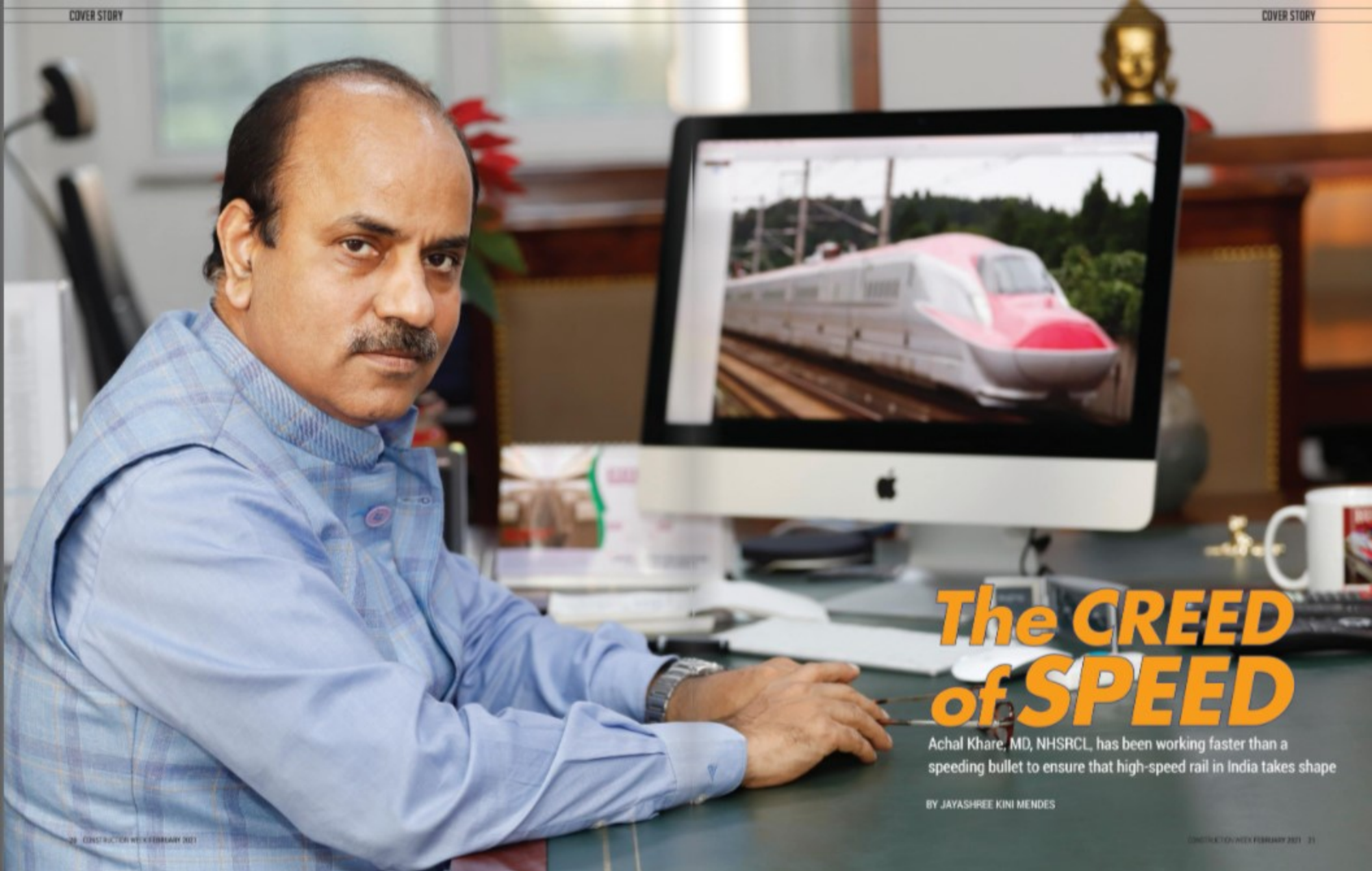
Achal Khare, MD, NHRCL, has been working faster than a speeding bullet to ensure that high-speed rail in India takes shape

■ ROAD BUILDING  
EQUIPMENT









# The CREED of SPEED

Achal Khare, MD, NRSRCL, has been working faster than a speeding bullet to ensure that high-speed rail in India takes shape

BY JAYASHREE KINI MENDES

A few years ago, if Indians were asked about whizzing in a train that would travel 320-350km per hour, they would have scoffed at the idea. Even if the country did get one, it would not be for another 30 years, would be anybody's guess.

Today, the national High-Speed Rail Corporation (NHSRCL), the nodal agency responsible for high-speed rail or bullet trains, is working on seven different routes, with the Mumbai-Ahmedabad High-Speed Rail (MAHSR) being the most talked about. Ask Achal Khare, MD, NHSRCL, about the prestigious projects, and he says, "The depth of work is unimaginable. Today we are awarding some of the largest contracts in the country. Just like covid-19, the bullet train contracts are unprecedented."

For Khare, this is all in a day's work. In his earlier stints, he has tackled and seen through novel projects like Udhampur-Srinagar-Baramulla construction, the \$1 billion railway project between Seremban to Gemas as part of the Kuala Lumpur-Singapore line; coordination of the Dedicated Freight Corridors and the high speed rail project of Mumbai-Ahmedabad, among others.

#### HOW FAST IS FAST ENOUGH

Most Indian government projects have long gestation timelines that can mean patience fatigue. The high-speed rail turned out true to its name. Never has such a gigantic project of massive proportions seen feasibility reports and DPRs and contracts being awarded so quickly. Khare says, "If the project were to see fruition, we had to move quickly. Our major issue was land acquisition and environmental clearances throughout the stretch of the project. The Mumbai-Ahmedabad stretch also has many firsts to its credit. For instance the aerial LIDAR survey is the first for a rail project in India. It is also the same with the SRT survey for the undersea tunnel in Thane, and the underground tunnel that will run 21 km long from BKC to Kalyan Shilphata."

Around 7 km of this underground corridor is under the Thane creek. Of this, 1.8 km long section will be developed under the sea bed, while the remaining part of the stretch is to be built under the mangroves marshland on either side of the creek. A geo-technical investigation of the undersea tunnel area was carried out earlier by engineers from NHSRCL, RITES and Japan's Kawasaki Geological Engineering firm.

The static refraction technique (SRT) survey was a bid to study the sea bed structure, and involved firing a high energy sound wave towards the seabed from below the water surface as well as mapping the refracted sound wave in order to determine the density of the rock under the sea bed.

What gives Khare the confidence is the ability to choose his team of engineering professionals required for this mammoth project. With a laugh, he says, "I was the first employee when NHSRCL was created in 2016. We started with 3-4 persons initially and today are a strong team of 260-plus. The MAHSR project is expected to provide direct and indirect employment to more than 90,000 people."

The government's backing to ensure that the project is executed to meet the deadline is also helping the agency. The Rs 1.08 lakh crore project has a strong backing from Japan - financially and technology.

#### OTHER HSR ROUTES PLANNED:

- ◆ Mumbai-Hyderabad HSR
- ◆ Delhi-Lucknow- Varanasi HSR
- ◆ Mumbai-Nashik-Nagpur HSR
- ◆ Delhi-Jaipur-Ahmedabad HSR
- ◆ Chennai-Mysore HSR
- ◆ Delhi-Chandigarh-Amritsar HSR
- ◆ Varanasi-Patna-Howrah HR







▲ Officials pose at the C-4 contract signing ceremony.





## RIDING TO THE RESCUE

India's strong ties with Japan have helped the country immensely over the last few decades. The country needed a reliable high-speed rail technology that would be efficient, safe and offer long term social and economic benefits. Khare says, "For MAHSR, we are adopting the Japanese Shinkansen technology. This system has been in longest service for more than 55 yrs and with zero passenger fatality. Of course, there will be some changes in the rolling stock to suit Indian conditions like high power air-conditioners and dust protection systems, but the HSR in India will look a lot like Japanese Shinkansen trains."

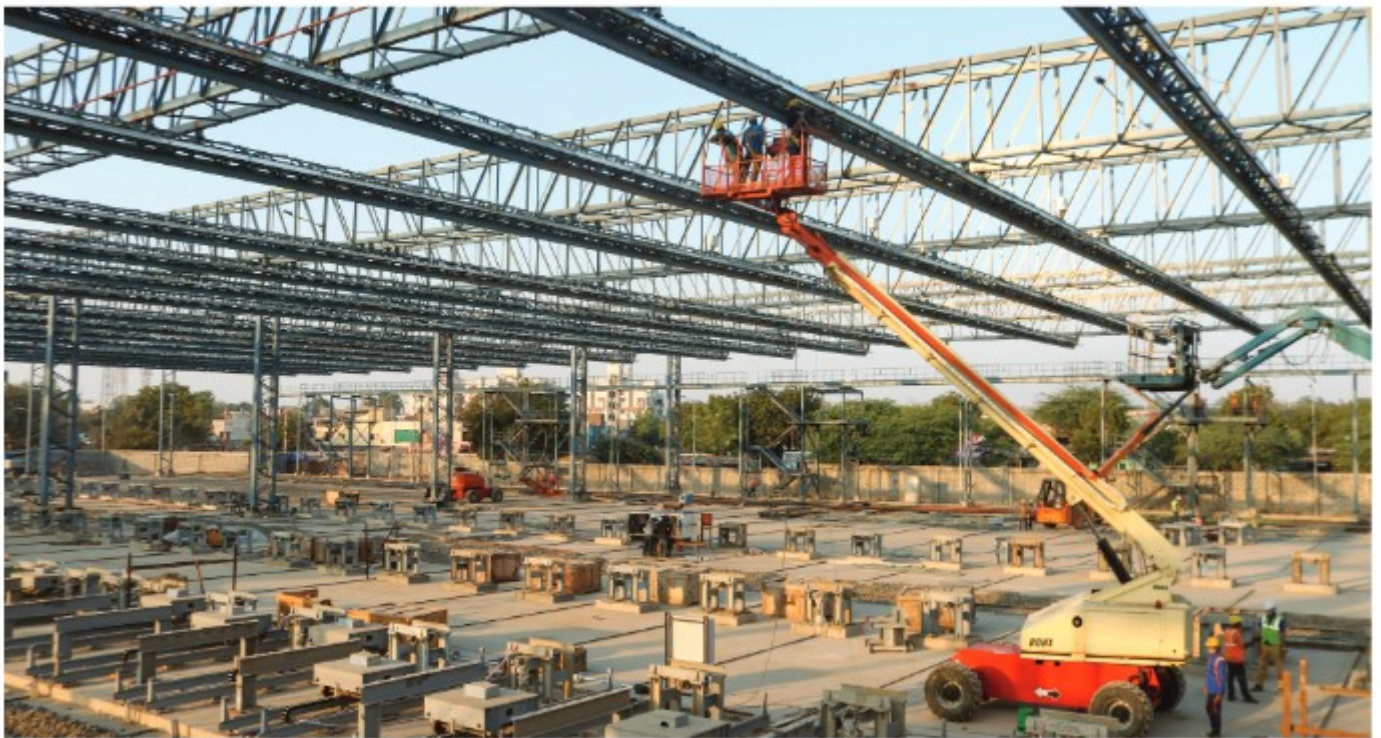
Since there is no precedent for HSR in India, the team at NHRCL had to learn each aspect of the technology from ground zero. "HSR technology is a lot different from Metro primarily because of speed, which is almost four times the speed and has its own technical challenges ranging from track construction technology, signalling, rolling stock design and even civil construction. For example, girders for HSR are 68% heavier than those used in metro rail system. This translates to stronger foundations & pile work, higher requirements of steel, heavier lifting operations and such other intense requirements," says Khare.

Japan is helping India with the technology and training of its personnel not only for construction but also for opera-

FOR MAHSR, NHRCL HAS  
AWARDED MORE THAN 90%  
CIVIL WORK CONTRACTS IN  
GUJARAT.



▲ NHRCL has been prompt to speak to locals before acquiring land.



▲ Construction underway at FBW Engineering workshop, which is being relocated to make way for Sabarmati rolling stock depot.



tions, maintenance & management, training of drivers and other crew members. "We are also working with Japan to bring in new construction technology for faster and quality construction. Railway Technical & Research Institute (RTRI) Japan is already working with us in driving innovation and cost effective solutions," says Khare.

As far as the MAHSR is concerned, NHSRCL has awarded more than 90% civil work contracts in Gujarat. It has commenced construction work for Sabarmati passenger hub, HSRTI hostel building, and more recently C-4 & C-6 packages comprising 64% of MAHSR alignment including five HSR stations, train depot in Surat and one mountain tunnel of 350m. A contract for procurement and fabrication of 28 steel bridges (superstructure) has also been awarded. Khare says, "Utility shifting is in full swing and 1185 utilities of 1651 have already been moved. About 6728 trees have been transplanted along the alignment and more than 74,000 have been planted. Power sourcing arrangements have been completed and MoUs signed with various power sourcing companies. These companies are now working towards building sufficient infrastructure for supplying power to MAHSR."



▲ More trees have been transplanted and planted than uprooted.



▲ Another consent agreement programme underway.



▲ The HSR training institute at Vadodara.



▲ A joint measurement survey at a proposed site for Boisar station.





▲ Construction is underway at flash butt welding workshop in Ahmedabad.

The near success of the project has encouraged the team to go in for more routes. Khare says, "We will be preparing detailed project reports (DPRs) for seven new corridors. These require a number of studies and surveys. We will submit our reports to the Ministry of Railways in a phased manner. The final alignment and locations of the stations and depots will be in consultation with the government."

Interestingly, in keeping with the campaign of Atmanirbhar Bharat, NHRCL has stoutly stuck to some basic principles. He says, "We have worked out an exhaustive list of products/services that can be provided by Indian companies hence boosting local rail equipment vendors and cost optimised solutions to the project. We have formed a High Speed Railways Innovation Centre (HSRIC) in collaboration with IITs, IISc and RTRI Japan. HSRC will undertake research, de-



▲ The Sabarmati passenger hub under construction in Ahmedabad.



#### SOME UNIQUE FACTS ABOUT THE MAHSR:

- ◆ Proposed HSR corridor will pass through Thane creek. Since this is a protected sanctuary for flamingo and mangroves, rail tracks will be made undersea through a tunnel. This tunnel will be longest rail transport and 1st undersea tunnel of India. Tunnel will be a single tube with 13.2 meters diameter to be executed by both NATM and TBM methods in different sections.
- ◆ Light detection and ranging (LiDAR) is adopted for the 1st time in a railway project in India primarily because of its high accuracy (100 mm).
- ◆ Approximately 92% of the high-speed railway track will be elevated through viaducts and bridges.
- ◆ Trains will be equipped with most advanced signaling system as used in Japanese Shinkansen trains. It comprises of primary train detection through coded digital audio frequency track circuits and secondary detection through analog axle counters. Cables used for signaling system will be high quality gas filled ATC cables for higher reliability and safety. This is the first time in Indian railways that we will be using gas filled cables. Benefits of using this is that they help in quick detection of cable crack or breakage and are moisture resistant.
- ◆ All cars will be fitted with active suspension system that will minimise lateral vibrations due to car body swaying. Besides conventional suspension system which uses spring and the lateral damper, active suspension consisting of actuator and controls vehicle body movement will be used.
- ◆ Japanese Shinkansen technology is known for its safety records. Same will be used for MAHSR. System will be fitted with most advanced crash avoidance system, automatic brake application in case of over speeding, etc.
- ◆ HSR will pass through some vulnerable seismic zone (Kutch, Koyana-Warna region and Latur-Osmanabad). Hence, it will be equipped with early earthquake detection system. This system will enable automatic power shutdown when primary waves emerging from an earthquake epicenter is sensed. Trains will have power failure detection device which will evoke emergency brake when the power shutdown is detected.

development in relevant fields of high-speed rail technology by leveraging Indian technical capabilities so as to contribute to rail transportation and self-reliant nation through development of indigenous capabilities and cost-effective solutions. A number of projects are already assigned to various IITs and work is progressing well in these projects."

#### ON THE RIGHT TRACK

What Khare and his team realise and know is the need for training engineers on HSR. NHRCL has already constructed a training track and hostel building in Vadodara. It expects to complete the High Speed Rail Training institute soon. "Our aim is to train HSR workforce not only for India but also other countries at this institute. The institute is planned for multidisciplinary training with streams in technical training, onboard crew training and various construction related techniques. We aim to bring a paradigm shift in the manufacturing and construction philosophy in India through this institute," says Khare.

As a starter, a number of personnel exchange pro-



▲ The proposed design of the Ahmedabad station.

grammes are being planned with Japanese government wherein people from here will travel and work side-by-side with their Japanese counterparts and learn technology and skills. The main focus would be on operations and maintenance of the systems when ready.

When you have the two main drivers (Make in India and Transfer of technology) as a benchmark, it will be easier for India to set up manufacturing facilities, generate jobs, upgrade skills, give a boost to allied industries (steel, cement, etc.) and get a foothold on upcoming technologies being used. ■