CHAPTER 30

Case Study on 84.400km Single Lane Bituminous Concrete Road Paved between Amravati and Akola District on NH53

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ABSTRACT

This case study examines the construction of an 84.4 km single-lane bituminous road between Amravati and Akola on NH-53, completed by Rajpath Infracon Pvt. Ltd. in 105 hours and 33 minutes. Initiated by the National Highways Authority of India (NHAI), this project demonstrates India's growing infrastructure capabilities and commitment to rapid highway development. The project involved a workforce of 720 workers, advanced machinery, and innovative project management strategies to ensure continuous and efficient progress despite challenges. Preparation for the record attempt spanned six months, encompassing feasibility studies, mock drills, and a detailed project roadmap. Robust safety measures, environmental considerations, and disaster preparedness systems underscored the project's holistic approach. The meticulous planning phase involved multiple departments collaborating through deliberations, site surveys, and testing to eliminate ambiguities. The milestone moments of the project highlighted the team's resilience, from enduring extreme heat to overcoming logistical challenges. The paving operation crossed the existing world record by Day 4 and concluded with the completion of 84.4 kilometers, including a 42.2-kilometer double-lane stretch, on Day 5. Additionally, the initiative aligned with environmental sustainability goals by planting over 98,000 saplings along NH-53. This record-breaking project is a testament to the transformative potential of infrastructure development, emphasizing technical expertise, efficient execution, effective planning strategy and a commitment to quality. It demonstrates how innovative approaches and meticulous planning can drive rapid advancements in national infrastructure, contributing to economic growth and improved quality of life.

Keywords: Infrastructure development; Project management; Guinness world record; Sustainability practices.

1.0 Introduction

Rajpath Infracon Pvt. Ltd laid the longest continuous asphalt concrete on NH53, India, from June 3 to 7, 2022, between Amravati and Akola district. The Amravati-Akola Expressway construction started at 6 a.m. on Saturday and finished on Tuesday.

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DOI: 10.17492/JPI/NICMAR/2507030 *ISBN: 978-93-49790-54-4*

The Amravati to Akola section in Maharashtra was laid in 105 hours and 33 minutes. The news was posted by the Honourable Shri Nitin Gadkari on his Twitter handle and also uploaded the photo of the expressway with the Guinness World Record certificate. As per the past record, the record was previously held by ASHGHAL of Qatar on February 27, 2019. The highway was a part of the Al-Khor Expressway and it took 10 days to finish the project. Previously, Rajpath Infracon had also created a world record by constructing a road from Sangli to Satara within 24 hours. This record was set on one of the longest national highways linking eastern and western India under the prestigious national project of 'Bharat Mala Pariyojana'.

2.0 Objective and Scope of the Study

This research investigates highway construction methods applied in mega projects, emphasizing sophisticated equipment and innovative project management techniques to maximize efficiency and quality. The research specifically reviews the Amravati-Akola Highway construction project, assessing planning approaches, stakeholder management, conflict resolution mechanisms, quality and safety practices, and risk management practices. It also investigates combined technological innovations to enhance efficiency and productivity. The research involves a thorough analysis of planning, coordination, and execution-based project management methods. It also analyzes strategies to overcome challenges, maximize the utilization of resources, and achieve deadlines. New-age technologies like drone surveying and Jawli Sutra software will be analyzed to determine their ability to enhance precision and efficiency. Lastly, the research analyzes logistics planning and management strategies that maintain a steady flow of resources.

3.0 Methodology

Since this is a finished data collection project, we have an interviewee and data list prepared to know more about the project. Following are the questions asked to Dr. Trupti Nayak (Chief Operating Officer) and Mr. Surya (Head of Planning), and their respective answers:

Table 1: Questionnaire Table

Questions	**Answers**
Vision behind this project.	Building confidence in India's infrastructure segment and projecting Indian infrastructure at an international level to support its development.
What Planning was done before executing project?	Five months in advance with a mock drill, specialists arranged with checked technical assistance for proper 24/7 functioning.

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Who is the client for this project?	National Highway Authority of India (NHAI)
Was this a Greenfield or Brownfield project?	A brownfield project was initially granted to two companies (8% completion), later to Rajpath Infracon.
What was the contract model for this project?	The project was based on a PPP contract with a hybrid annuity model.
Who were the suppliers for this project?	Indian Oil, HP, BP, Ashok Leyland, Tata Motors, Wirtgen Group, SBI, Union Bank of India
What was the approximate cost estimate of the project?	The approximate cost of the project was ₹22.69 crores.
How was the project's progress tracked?	The progress was monitored by "JAWLI-SUTRA" ERP, four cameras for shooting, and MSP for planning.
What was the full project scope as per the contract?	Finishing of the four-lane Amravati–Chikhli section of NH-6, in Maharashtra, in hybrid mode with annuity, under the "Bharat Mala Pariyojna" scheme.
How was traffic managed during construction?	Traffic was controlled by paving one side alternately, maintaining emergency access, coordinating with the police and inhabitants, and providing assistance to travellers.
How was the quality of work ensured?	Quality was guaranteed by having a well-furnished laboratory, testing of materials, controlled mixing, random checking of batches, and written reports.
What equipment was used, and did it run continuously during construction?	80 dump trucks, 5 batching plants, 6 Tandem rollers, 2 pneumatic rollers, and 1 sensor paver with hopper.
How many labour shifts were there during construction?	The labours were working in three shifts with each shift of eight hours each.
How many labours were involved in this project?	The project employed 728 labours.
How was site safety managed?	Safety ensured through PPEs, barricading, signages, traffic management, safety nets, a 24/7 ambulance, and a fire brigade.
Any training sessions conducted before the project? If yes, what were they?	Training covered GWR compliance, safety, operational discipline, work schedules, QC documentation, and digital monitoring.
Was automation used for site surveying before construction?	Drone survey was done every month of the site before construction starts starting from its planning phase
What challenges were faced during construction?	Challenges included NHAI approvals, batch plant breakdowns, paver auger cracks, and exhausting non-stop work.
What awards or recognitions were received after achieving this feat?	Received appreciation from PM Narendra Modi, CM Eknath Shinde, Minister Nitin Gadkari, and Deputy CM Devendra Fadnavis.
How many plants were used for the project?	Total Five plants used one of Marini with capacity 150TPH and Four of Amaan of 200&100TPH.

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4.0 Project Overview

The Loni village, Amravati district, NH-53 road project included the development of 75-km single-lane bituminous road equivalent to 37.5 km of two-lane shoulders. Sophisticated pavement design, stringent quality control, and Jawli Sutra software facilitated accurate planning and implementation. A quality control laboratory based at Mana Camp tested materials based on NHAI requirements. To limit disruption, traffic management measures involved cooperation with police and residents, short-term lane closures, and providing vital services to drivers. The Guinness World Record attempt enhanced regional connectivity, increased passenger safety, and spurred economic growth, all while meeting strict construction and environmental standards. The facts and numbers that have shaped the history of India's road construction industry will be hard to repeat.

Table 2: Project Statistics

Total Length	75+ kilometres (an actual distance of 84.400 km), Single Lane Bituminous concrete was paved.
Equivalent length	42.200 kilometres Double Lane with Paved Shoulder of Bituminous Concrete.
Start Time & Date	3rd June 2022, 7:27 AM
End Time & Date	7th June 2022, 5:00 PM
Total Time	105hrs 33 minutes
Quantity of Bituminous Concrete Used	36,634 Metric Tonne
Bitumen Quantity used	2,070 Metric Tonne
Tippers Employed	80
Batch mix plant engaged	5
Sensor Paver with Hopper	1
Paver Feeder used	1
Tandem Rollers employed	6
Pneumatic Tyre Roller	2
Total Workers	728

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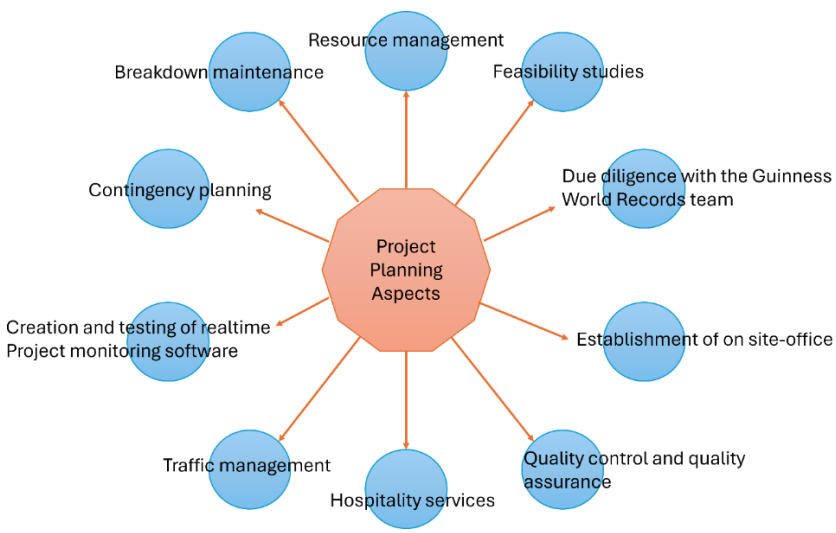
4.1 Milestones of the projects

Day 1 June 3, 2022	The project commenced at dawn on June 3, 2022, with the ceremonial whistle signalling the start of the paving operations near the remote Loni village at 7:27 AM
Day 2 June 4, 2022	Despite temperatures soaring to 47°C, the field team continued their paving operation, enduring extreme heat and the hot bitumen concrete to ensure project progress. Their perseverance kept the project moving forward under harsh conditions.
Day 3 June 5, 2022	Expert teams from machine suppliers provided 24/7 support, ensuring smooth operations. The dedicated project team closely monitored and maintained the sensor paver, making necessary adjustments throughout.
Day 4 June 6, 2022	On June 6, 2022, at 12:27 PM, the 25.275 km mark was crossed, breaking the world record. The paving continued, while over 98,000 saplings were planted along NH-53 on World Environment Day to promote sustainability.
Day 5 June 7, 2022	The project culminated on June 7, 2022, at 4:50 PM, with the completion of the 75 km stretch. A remarkable 42.200 km of double-lane road was constructed, setting a new Guinness World Record.

4.2 Project planning and monitoring



The planning stage involved the establishment of a core team made up of seasoned professionals from every department. The team had intensive meetings for five months and created strategies to make sure that all details were considered. Micromanagement and contingency planning were emphasized, and a thorough on-site reiki was performed prior to it.

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A complete simulation exercise was held a week prior to the start of the project to confirm that all systems, processes, equipment, and manpower were in place. The perfectionist attitude of the team did not leave any scope for failure. While monitoring and reporting the project, proper documentation and real-time monitoring were critical. Guinness World Records (GWR) sanctioned a panel of independent experts, six highway experts, six quality experts, six timekeepers, six surveyors, and six lawyers working on a rotational basis. A two-active-camera continuous videography system, a backup camera, photographers, and a drone taking aerial photographs every hour provided round-the-clock operation. All information was sent to the London head office of the GWR for checking, in accordance with world record standards.

5.0 Jawali Sutra

For delimiting the scope of work, allocation of resources and specific scheduling were dominant factors in our critical path study. The tasks were thoroughly searched for by the team, identifying those whose holdup could cause the entire project to fail. One solution offering real-time data was devised in order to provide the different departments with rapid, accurate decisions.

6.0 The Juggernaut

Juggernaut was a culmination of three units of equipment: a feeder, a paver, and a weighbridge. The paving machine consisted of a weighbridge, which supplied the asphalt concrete to the feeder, which maintained the material at the desired temperature and fed the paver in the best possible manner. This provided a very accurate paving process and quality road as per NHAI standards.

7.0 Quality Control and Quality Assurance

Quality control and assurance (QC/QA) in road construction using asphalt guarantees compliance with standards to avoid early failure and ensure national assets' sustainability. The required tests are carried out to determine quality, guarantee consistency, and verify contractual specification compliance, and all results are kept for future use.

8.0 Safety audit report (November 5 – November 8, 2024)

8.1 Authority and stakeholders

- Authority: National Highways Authority of India (NHAI), PIU-Amravati
- Independent Engineer: MSV International Inc. & Sterling Indo Consultants Pvt. Ltd.
- Safety Auditor: Civil Baba Infraconsultant Pvt. Ltd.
- Concessionaire: Rajpath Infracon NH-6 Pkg-1 Pvt. Ltd.

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Figure 1: Distance in Kilo Meters Covered by the Paver per Hour

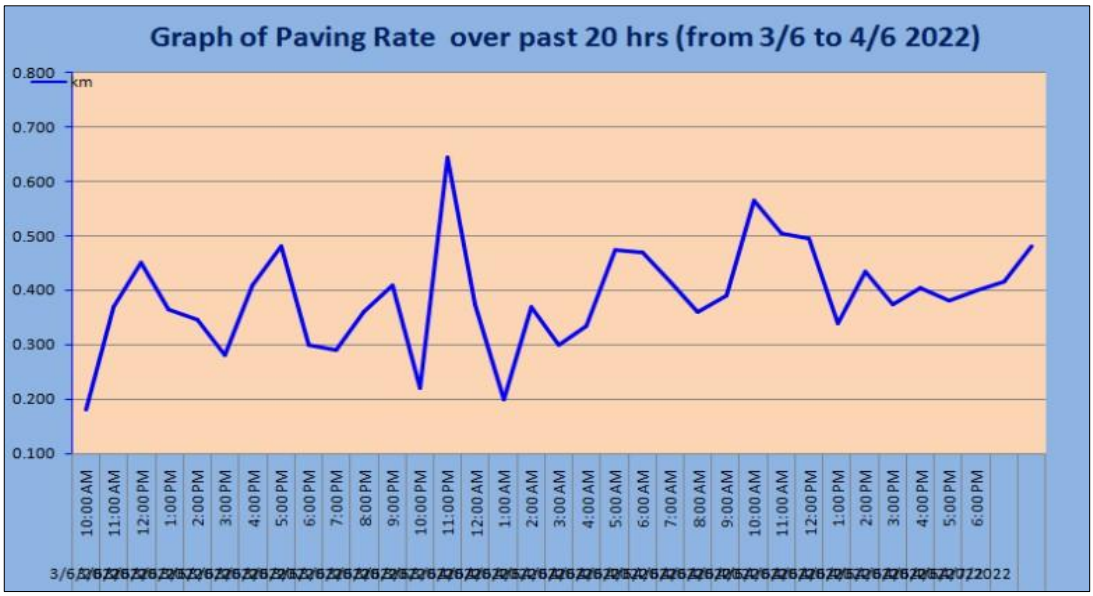

Figure 2: Temperature of the Laid Bituminous Concrete

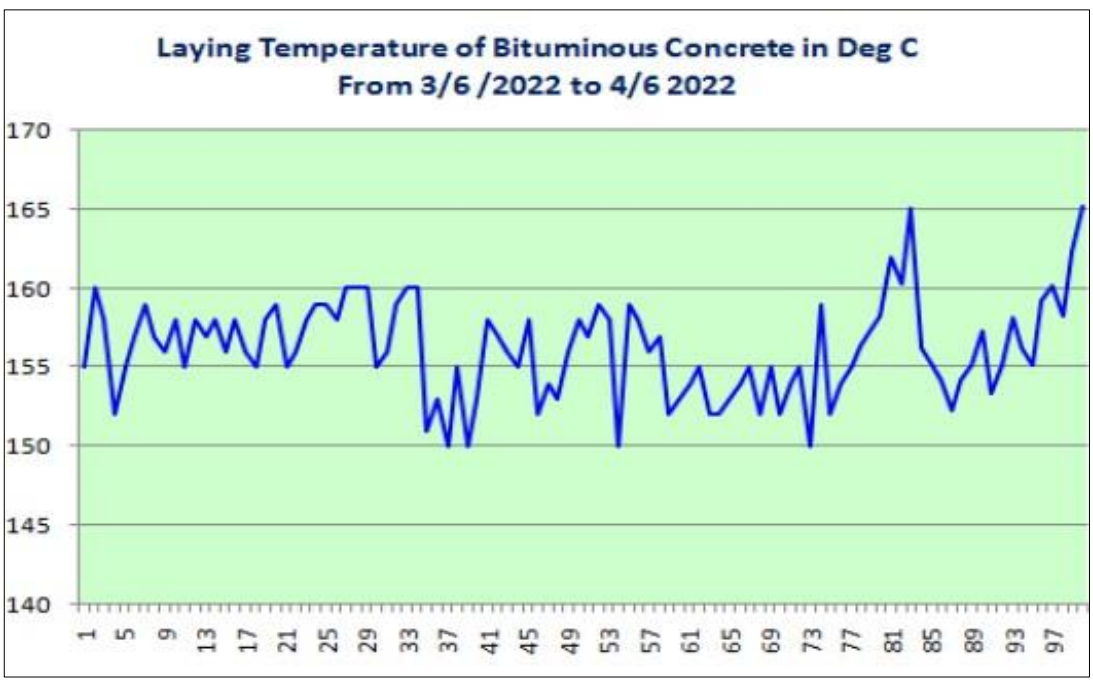

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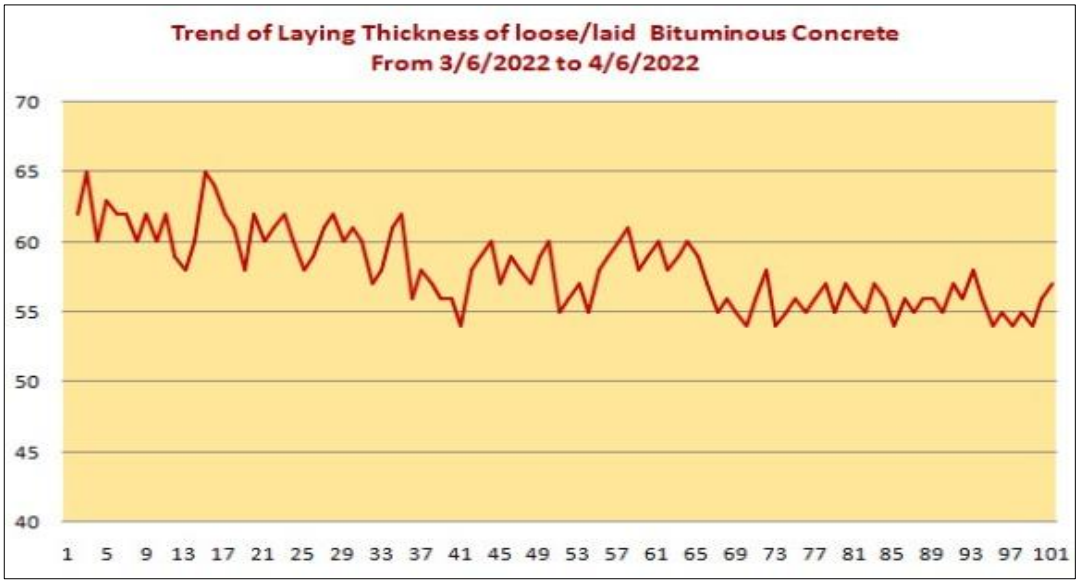
Figure 3: Thickness of the Laid /Loose Bituminous Concrete (before Rolling)



8.2 Safety measures implemented

- Personal Protective Equipment (PPEs): Mandatory for all workers.
- Barricading & Signages: Installed to manage traffic flow safely.
- Traffic Management Personnel: Deployed round the clock.
- Emergency Services: 24/7 availability of ambulances with medical staff.
- Fire Safety: On-site fire brigade stationed throughout the project duration.
- Mobile Office & Monitoring: Safety team actively monitored compliance with safety norms.

9.0 Sustainability

9.1 Reducing carbon footprint

In the National Road No. 53 project, 98,000 saplings were also planted to enhance vegetation cover. The plants are well cared for to help them grow and serve as habitats for different species of birds in the previously barren Mana Camp region. The effort helps in conserving energy, reducing climate change, conserving biodiversity, enhancing public health, and stimulating economic growth.

9.2 Water conservation

Farm ponds have been created in a number of sites, such as Anbhora, Sanjapur, Dalimbi, Dudhalam Chandak, Jamthi, Kurum Vadgaon, and Mana, to remedy water shortages. The ponds

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have substantially enhanced groundwater levels, restored dry wells, and improved irrigation capacity within villages that experience water shortages. This sustained effort toward water conservation continues to yield enduring benefits to the area.

Table 3: Safety Audit Matrix

Issue Location	Concern Identified	Risk Level	Recommendation	Compliance
Km 175+350	Vegetation blocking visibility at minor road intersection	Very High	Trim/remove vegetation	Completed
Km 193+600 & 218+100	Missing/partially placed signboards at minor junctions	High	Install speed breakers and proper signage (as per IRC 67-2022)	Completed
Km 186+400	Missing New Jersey Crash Barrier (NJCB) and anti-glare screen	High	Install NJCB with anti-glare screens	Not in Concessionaire's scope
Km 182+500 & 183+500	Missing Object Hazard Markers (OHM)	High	Install OHM before MBCB/crash barriers (as per IRC 79-2019)	Completed
Km 192+350 & 175+350	Missing acceleration/deceleration lanes for fuel pumps	High	Provide 100m acceleration & 70m deceleration lanes (as per NH Circular)	Not in Concessionaire's scope
Km 195+000	Missing MBCB at high embankment curve	High	Install MBCB as per IRC guidelines	Completed
Km 200+500	Faded road markings and missing road studs at narrow bridge	High	Repaint markings and install road studs (as per IRC 3.1 & 9.5)	Completed
Km 216+800 & 220+000	Unprotected gantry signboards (risk of collision)	High	Install MBCB or guard rails	Partially completed

10.0 Research Challenges

The case study faced some research challenges, such as limited access to financial, technical, and proprietary project information due to confidentiality issues. Real-time construction methods and performance information were limited. Guinness World Records (GWR) document approvals caused delays. The size and complexity of the record-breaking project made detailed analysis challenging. Moreover, time and budget limitations within the academic calendar hindered the establishment of on-the-ground relationships, restricting access to important project information. In spite of this, the study was able to record important details of planning, implementation, and innovation, yielding important lessons for the conduct of future large-scale infrastructure projects.

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