

**GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
LOK SABHA
STARRED QUESTION NO. 241
TO BE ANSWERED ON 05.08.2026**

CERTIFIED KAVACH TRAIN PROTECTION SYSTEM

***241. SHRI GODAM NAGESH:**

SMT. KAMALJEET SEHRAWAT:

Will the Minister of RAILWAYS be pleased to state:

- (a) the details of the commissioning milestones of the indigenous Safety Integrity Level-4 certified Kavach train protection system including total route coverage and the 470-kilometre implementation in a single day in January 2026;**
- (b) the details of 160 kmph Vande Bharat trials on the Delhi–Howrah sector to test system efficacy under semi-high-speed parameters;**
- (c) whether Kavach saturation across Delhi–Mumbai and Delhi–Howrah routes under Mission Raftar and seven other high-speed corridors sanctioned in Union Budget 2026-27 with a 2.93 lakh crore outlay is on schedule and if so, the details thereof and if not, the reasons therefor; and**
- (d) whether any interventions have been made to realize a zero-accident vision by converging Kavach with AI-driven collision forecasting, live telemetry and predictive maintenance across the railway network and if so, the details thereof?**

ANSWER

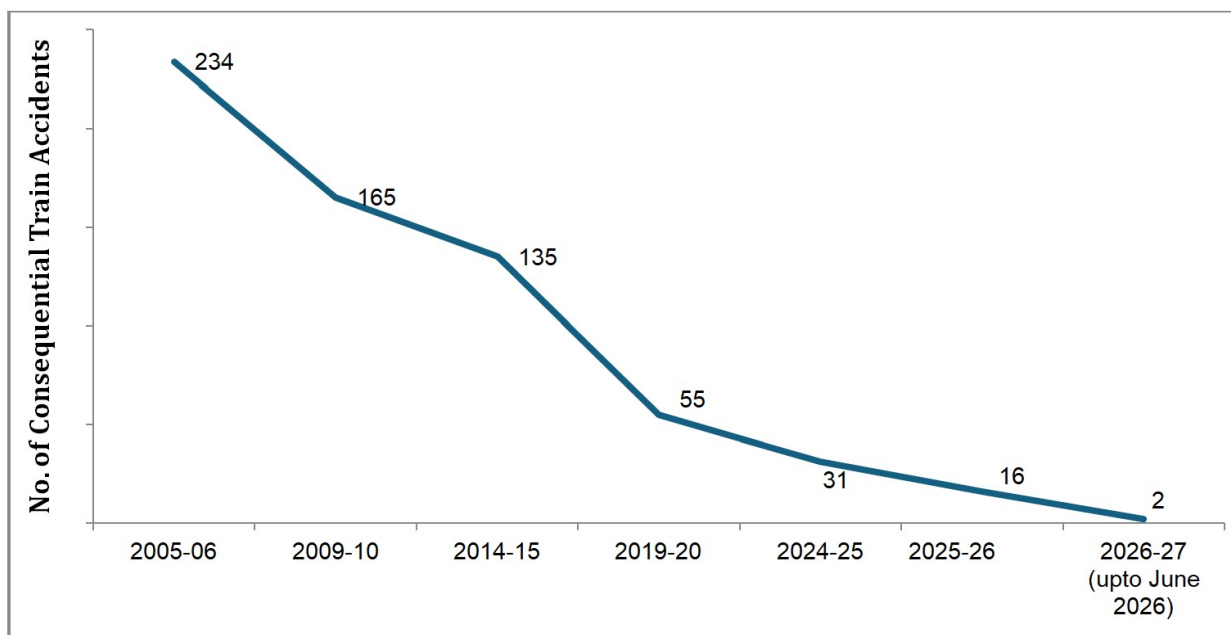
**MINISTER OF RAILWAYS, INFORMATION & BROADCASTING AND
ELECTRONICS & INFORMATION TECHNOLOGY**

(SHRI ASHWINI VAISHNAW)

(a) to (d): A Statement is laid on the Table of the House.

STATEMENT REFERRED TO IN REPLY TO PARTS (a) TO (d) OF STARRED QUESTION NO.241 TO BE ANSWERED ON 05.08.2026 IN LOK SABHA

(a)to (d): Safety is accorded the highest priority on Indian Railways. As a consequence of various safety measures taken over the years, there has been a steep decline in the number of accidents.



Number of Consequential Train Accidents has reduced as shown in the table below:-

Year	Consequential Accidents
2014-15	135
2025-26	16 (88% lesser)
2026-27 (upto June 2026)	2

Another important index showing improvement in safety in train operations is Consequential Accident Index, the details of which are as under:-

Consequential Accident Index:-

Year	Accident Index
2014-15	0.11
2025-26	0.01 (91% lesser)

This index measures number of consequential accidents as a ratio of total running kilometers of all trains.

$$\text{Accident Index} = \frac{\text{No. of consequential accidents}}{\text{No. of trains X million kilometers}}$$

The various safety measures taken to enhance safety in train operations are as under:-

- 1. On Indian Railways, the expenditure on Safety related activities has increased over the years as under:-**

Year	Expenditure/Budget on Safety related activities (Rs. in Cr.)
2013-14	39,200
2022-23	87,336
2023-24	1,01,662
2024-25	1,14,022
2025-26	1,17,693
2026-27	1,20,389

- 2. Electrical/Electronic Interlocking Systems with centralized operation of points and signals have been provided at 6,671 stations up to 30.06.2026 to reduce accidents due to human failure.**
- 3. Interlocking of Level Crossing (LC) Gates has been provided at 10,395 Level Crossing Gates up to 30.06.2026 for enhancing safety at LC Gates.**
- 4. Complete Track Circuiting of stations to enhance safety by verification of track occupancy by electrical means has been provided at 6,671 stations up to 30.06.2026.**

- 5. Detailed instructions on issues related with safety of Signalling, e.g. mandatory correspondence check, alteration work protocol, preparation of completion drawing, etc. have been issued.**
- 6. System of disconnection and reconnection for S&T equipment as per protocol has been re-emphasized.**
- 7. All locomotives are equipped with Vigilance Control Devices (VCD) to improve alertness of Loco Pilots.**
- 8. Retro-reflective sigma boards are provided on the mast which is located two OHE masts prior to the signals in electrified territories to alert the crew about the signal ahead when visibility is low due to foggy weather.**
- 9. A GPS based Fog Safety Device (FSD) is provided to loco pilots in fog affected areas which enables loco pilots to know the distance of the approaching landmarks like signals, level crossing gates, etc.**
- 10. Modern track structure consisting of 60kg, 90 Ultimate Tensile Strength (UTS) rails, Prestressed Concrete Sleeper (PSC) Normal/Wide base sleepers with elastic fastening, fan shaped layout turnout on PSC sleepers, Steel Channel/H-beam Sleepers on girder bridges is used while carrying out primary track renewals.**
- 11. Mechanisation of track laying activity through use of track machines like PQRS, TRT, T-28 etc. to reduce human errors.**
- 12. Maximizing supply of 130m/260m long rail panels for increasing progress of rail renewal and avoiding welding of joints, thereby improving safety.**
- 13. Ultrasonic Flaw Detection (USFD) testing of rails to detect flaws and timely removal of defective rails.**
- 14. Laying of longer rails, minimizing the use of Alumino Thermic Welding and adoption of better welding technology for rails i.e., Flash Butt Welding.**

- 15. Monitoring of track geometry by OMS (Oscillation Monitoring System) and TRC (Track Recording Cars).**
- 16. Patrolling of railway tracks to look out for weld/rail fractures.**
- 17. The use of Thick Web Switches and Weldable CMS Crossing in turnout renewal works.**
- 18. Inspections at regular intervals are carried out to monitor and educate staff for observance of safe practices.**
- 19. Web based online monitoring system of track assets viz. Track database and decision support system has been adopted to decide rationalized maintenance requirement and optimize inputs.**
- 20. Detailed instructions on issues related with safety of Track, e.g. integrated block, corridor block, worksite safety, monsoon precautions, etc. have been issued.**
- 21. Preventive maintenance of railway assets (Coaches & Wagons) is undertaken to ensure safe train operations.**
- 22. Replacement of conventional ICF design coaches with LHB design coaches is being done.**
- 23. All unmanned level crossings (UMLCs) on Broad Gauge (BG) route have been eliminated by January 2019.**
- 24. Safety of Railway Bridges is ensured through regular inspection of Bridges. The requirement of repair/rehabilitation of Bridges is taken up based upon the conditions assessed during these inspections.**
- 25. Indian Railways has displayed Statutory “Fire Notices” for widespread passenger information in all coaches. Fire posters are provided in every coach so as to educate and alert passengers regarding various Do’s and Don’ts to prevent fire. These include messages regarding not carrying any inflammable material, explosives, prohibition of smoking inside the coaches, penalties etc.**
- 26. Production Units are providing Fire detection and suppression system in newly manufactured Power Cars and Pantry Cars, Fire and Smoke**

detection system in newly manufactured coaches. Progressive fitment of the same in existing coaches is also underway by Zonal Railways in a phased manner.

27. Regular counselling and training of staff is undertaken.

28. Concept of Rolling Block introduced in Indian Railways (Open Lines) General Rules vide Gazette notification dated 30.11.2023, wherein work of integrated maintenance/ repair/replacement of assets is planned up to 52 weeks in advance on rolling basis and executed as per plan.

The details of the Safety related works related to better maintenance practices, Technological improvements, better infrastructure and rolling stock etc. undertaken by Railways are tabulated below:-

SN	Item	2004-05 to 2013-14	2014-15 to 2025-26	2014-26 Vs. 2004-14
	Technological Improvements			
1.	Use of high-quality rails (60 Kg) (Km)	57,450 Km	1.63 Lakh Km	More than 2.8 times
2.	Longer Rail Panels (260m) (Km)	9,917 Km	87,219 Km	Nearly 9 times
3.	Electronic Interlocking (Stations)	837 Stations	3,691 Stations	More than 4 times
4.	Fog Pass Safety Devices (Nos.)	As on 31.03.14: 90 Nos.	As on 31.03.26: 31,693 Nos.	352 times
5.	Thick Web Switches (Nos.)	Nil	35,971 Nos.	
	Better Maintenance Practices			
1.	Primary Rail Renewal (Track Km)	32,260 Km	57,583 Km	1.78 times

2.	USFD (Ultra Sonic Flaw detection) Testing of Welds (Nos.)	79.43 Lakh	2.25 Crore	More than 2.8 times
3.	Weld failures (Nos.)	In 2013-14: 3,699 Nos.	In 2025-26: 272 Nos.	93 % reduction
4.	Rail fractures (Nos.)	In 2013-14: 2,548 Nos.	In 2025-26: 208 Nos.	92% reduction
Better Infrastructure and Rolling Stock				
1.	New Track KM added (Track Km)	14,985 Km	36,429 Km	Almost 2.5 times
2.	Flyovers (RoBs)/Underpasses (RUBs) (Nos.)	4,148 Nos.	14,362 Nos.	More than 3 times
3.	Unmanned Level crossings (Nos.) on BG	As on 31.03.14: 8,948	As on 31.03.26: Nil (All eliminated by 31.01.19)	Removed
4.	Manufacture of LHB Coaches (Nos.)	2,337 Nos.	49,366	More than 21 times

Implementation of Kavach:-

- 1. Kavach is an indigenously developed Automatic Train Protection (ATP) system. Kavach is a highly technology intensive system, which requires safety certification of highest order (SIL-4).**
- 2. Kavach aids the Loco Pilot in running of trains within specified speed limits by automatic application of brakes in case Loco Pilot fails to do so and also helps the trains to run safely during inclement weather.**

- 3. The first field trials on the passenger trains were started in February 2016. Based on the experience gained and Independent Safety Assessment of the system by Independent Safety Assessor (ISA), three firms were approved in 2018-19, for supply of Kavach Ver 3.2.**
- 4. Kavach was adopted as National ATP system in July, 2020.**
- 5. Implementation of Kavach System involves following Key Activities:**
 - a. Installation of Station Kavach at each and every station, block section.**
 - b. Installation of RFID Tags throughout the track length.**
 - c. Installation of telecom Towers throughout the section.**
 - d. Laying of Optical Fibre Cable along the track.**
 - e. Provision of Loco Kavach on each and every Locomotive running on Indian Railways.**
- 6. Based on deployment of Kavach version 3.2 on 1,465 RKm on South Central Railway and experience gained, further improvements were made. Finally, Kavach specification version 4.0 was approved by RDSO on 16.07.2024.**
- 7. Kavach version 4.0 covers all the major features required for the diverse railway network. This is a significant milestone in safety for Indian Railways. Within a short period, IR has developed, tested and started deploying Automatic Train Protection System.**
- 8. Major improvement in Version 4.0 includes increased Location Accuracy, Improved Information of Signal Aspects in bigger yards, Station to Station Kavach interface on OFC and Direct Interface to existing Electronic Interlocking System. With these improvements, Kavach Ver.4.0. is planned for large scale deployment over Indian Railways.**

9. After extensive and elaborate trials, Kavach Version 4.0 has been successfully commissioned on 2,633 Route Kilometres as on 31.07.26, covering the high density Delhi- Mumbai and Delhi-Howrah routes as below:

SN	Section	Progress (Route Km)
(1)	Delhi-Mumbai route: 1,423 Rkm	
i	Tilak Bridge – Junction cabin – Palwal – Mathura –Kota-Nagda-Ratlam– Vadodara-Virar section	1,327
ii	Vadodara – Ahmedabad section	96
(2)	Delhi – Howrah route: 1,210 Rkm	
i.	Chippyana – Tundla – Kanpur – Subedarganj section	563
ii.	Kanpur – Lucknow section	71
iii.	Mirzapur - DDU (Excluding) section	64
iii.	DDU(FOC)-Bhabua Road section	50
iv.	Sasaram - Pheser section	43
v.	Gaya -Sarmatarn- Nimiaghat section	159
vi.	Chota Ambana - Bardhaman – Howrah section	260

The above includes, three sections namely Vadodara - Virar, Gaya - Sarmatarn & Jn Cabin – Palwal, totalling about 470 Rkm, Kavach in which commissioned on 30.01.26.

10. In addition, track side Kavach implementation work has been taken up on 21,794 RKM covering all GQ,GD,HDN and identified sections of Indian Railways.

11. The total Progress of key items of Kavach on Indian Railway sections are as under:-

SN	Item	Progress
i	Laying of Optical Fibre Cable	11,547 Km
ii	Installation of Telecom Towers	1,721 Nos.
iii	Station Data Centre	1,009 station
iv	Installation of Track side equipment	7,726 RKm
v	Provision of Kavach in Loco	6,290 Nos.

12. In addition, work for installation of Kavach in 7,190 Locomotives and 1,200 EMU/MEMU has been taken up.

13. Further, Kavach Trials at 160 Kmph have been held successfully in Chipyana Buzurg - Tundla section in the Delhi-Howrah route with Vande Bharat Trainset.

14. The funds utilized on Kavach works so far up to Jun'26 is Rs. 3,875 Crores. The allocation of funds during the year 2026-27 is Rs. 2,066 Crores. Kavach work is going at good pace in the entire country. Requisite funds are made available as per the progress of works.

Increasing of Speed potential on Indian Railways:

Speeding up of trains is a constant endeavor and a continuous process which is dependent upon upgradation of tracks, signaling system, OHE, high powered locos, modern coaches etc.

Upgradation and improvement of railway tracks on Indian Railways to increase the speed potential have been carried out in a big way during last 12 years. The measures for track upgradation include use of 60 kg rails,

wider base concrete sleepers, thick web switches, weldable CMS crossings, longer rail panels, H Beam sleepers, modern track renewal and maintenance machines etc.

As a result of above measures, there has been significant increase in speed potential of the tracks. The details of speed potential of railway tracks during 2014 vis-a-vis 2026 are as under:

Sectional Speed (kmph)	2014		2026	
	Track Km	%	Track Km	%
130 & above	5,036	6.3	24,173	22.5
110 - 130	26,409	33.3	62,482	58.1
< 110	47,897	60.4	20,897	19.4
Total	79,342	100	1,07,552	100

It may be seen that about 81% of the railway tracks on Indian Railways have been upgraded to 110 Kmph and above.

Further, two major routes i.e New Delhi – Mumbai & New Delhi – Howrah of the Golden Quadrilateral have been taken up for enhancing the speed potential up to 160 Kmph under Mission Raftaar.

Budget Utilization 2026-27:

Out of total Budget grant of Rs.2,93,030 Cr. in 2026-27, till July'26, expenditure of Rs. 1,14,973 Cr. has been incurred i.e. about 39%.

High Speed Corridors:

Presently, the Mumbai-Amdavad High Speed Rail (MAHSR) Project (508 km) is under execution. The Project is passing through the States of Gujarat, Maharashtra and Union Territory of Dadra & Nagar Haveli with 12 stations

planned at Mumbai, Thane, Virar, Boisar, Vapi, Billimora, Surat, Bharuch, Vadodara, Anand, Amdavad and Sabarmati.

Entire land (1389.5 Ha.) for MAHSR project has been acquired. All Statutory Clearances have been obtained. All 1651 utilities have been shifted. The delay in land acquisition in the State of Maharashtra has impacted the project till 2021. The land acquisition picked up in 2022 in Maharashtra.

The progress of various major items so far is as under:

Item	Progress
Piers	452 kms.
Girder	356 kms.
Track Bed	209 kms.
OHE Masts	190 kms.

The progress of stations is given below:-

S.N.	Station	Status
1	Sabarmati	Foundation & structural works completed. Finishing work have been taken up.
2	Amdavad	
3	Anand/Nadiad	
4	Vadodara	Structural works completed and finishing works have been taken up. At Surat, Bilimora and Bharuch Track works have also been taken up.
5	Bharuch	
6	Surat	
7	Bilimora	
8	Vapi	

9	Boisar	Foundation works have been taken up and in advanced stage. Structural works have been taken up.
10	Virar	
11	Thane	
12	BKC (Mumbai)	This is an underground station. Foundation works almost completed and Base Slab has been taken up.

The progress on the River Bridges is as under:-

S.N.	River Name	Status
1	Sabarmati River (480m)	Sub-Structure work completed, Superstructure work has been taken up.
2	Meshwa River (120m)	Bridge construction completed. Track works completed and OHE works have been taken up at Mohar River. Track works in progress at Vatrak River.
3	Vatrak River (280m)	
4	Mohar (Shedhi) River (160m)	
5	Mahi River (720m)	Foundation completed. Pier works and Girder launching have been taken up.
6	Vishwamitri River (80m)	Bridge construction completed.
7	Dhadhar River (120m)	
8	Narmada River (1366m)	21 out of 25 wells completed; 6 out of 24 spans launched
9	Kim River (120m)	Bridge construction completed.
10	Tapi River (720m)	09 out of 13 Pier Cap completed.

11	Mindhola River (240m)	Bridge construction completed. Track and Electrical works have been taken up.
12	Purna River (360m)	
13	Ambika River (200m)	
14	Venganiya River (200m)	
15	Kaveri River (120m)	
16	Kharera River (120m)	
17	Auranga River (320m)	
18	Par River (320m)	
19	Kolak River (160m)	
20	Daman Ganga River (360m)	
21	Darotha River (80m)	
22	Jagani River (360m)	Substructure works have been completed.
23	Vaitarna River (2320m)	17 Pile Cap and 15 Pier (out of 58) completed.
24	Ulhas River Branch (120m)	Temporary Access Bridge (TAB) completed to start the foundation work.
25	Desai Khadi River Bridge (400m)	Geo-technical Investigation (GTI) has been completed and Design work has been taken up.

The work of the under-sea tunnel (approximately 21 km) has commenced, out of which 4.8 km of tunnel between Ghansoli and Shilphata in Maharashtra has been completed.

On the Surat - Vapi section (97 km) entire civil works including river bridge construction, have been completed and 86% of the track bed has been laid.

To strengthen national transport infrastructure, provide a fillip to regional connectivity, economic growth, tourism, investment and employment generation, and encourage modal shift from road and air transport to rail, the Government has announced the development of the following seven new High-Speed Rail (HSR) corridors in the Union Budget 2026-27: -

- (i) Mumbai–Pune**
- (ii) Pune–Hyderabad**
- (iii) Hyderabad–Bengaluru**
- (iv) Hyderabad–Chennai**
- (v) Chennai–Bengaluru**
- (vi) Delhi–Varanasi**
- (vii) Varanasi–Siliguri**

Post Budget announcement, the cost updation, alignment finalization etc. have been taken up in DPR. Based on the experience gained from MAHSR project, National High Speed Rail Corporation Limited (NHSRCL) has taken up activities for a standardised set of designs and technical specifications for the Infrastructure of future corridors, such as viaducts, bridges, tunnels and stations, train control systems including train protection systems etc.

Being highly capital intensive, the decision to sanction any HSR Corridor/ Project depends on many factors such as outcome of DPR, techno-economic feasibility studies and availability of resources such as financing options etc.

Technological improvements in Indian Railways (IR):

Technological improvements in Indian Railways (IR) are a continuous process. Some of the major technologies deployed/Piloted over Indian Railways are as under:

- 1. Machine Vision Inspection System (MVIS):** MVIS is an Artificial Intelligence (AI)/ Machine Learning (ML) based system which generates alert on detecting any hanging, loose or missing components of moving trains.
- 2. Wheel Impact Load Detector (WILD):** WILD is a way-side inspection system that measures the impact of wheel on track to identify the defective wheel in Rolling Stock.
- 3. Integrated Track Monitoring Systems (ITMS):** ITMS are deployed for comprehensive inspection and monitoring of Railway tracks. The ITMS utilizes machine learning and image processing to monitor and detect defects in railway track components such as rails, sleepers, and fastenings. The data from ITMS is analysed for urgent and planned maintenance of track. Presently four (04) ITMS are deployed for track recording and monitoring of IR track.
