

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

RAJYA SABHA
UNSTARRED QUESTION NO.1568
ANSWERED ON 01.08.2025

IMPLEMENTATION OF KAVACH SYSTEM

1568 SMT. RAJANI ASHOKRAO PATIL :

Will the Minister of RAILWAYS be pleased to state:

- (a) the number of major train accidents, including derailments and collisions, reported during last five years, along with casualty figures;
- (b) whether lack of implementation of the Kavach system contributed to these accidents;
- (c) the current coverage of the Kavach anti-collision technology in kilometers and percentage of total railway network;
- (d) whether any inquiry reports have indicated lapses in signaling, infrastructure or staffing; and
- (e) the steps being taken by the Ministry to prioritise passenger safety over infrastructure beautification and privatisation efforts?

ANSWER

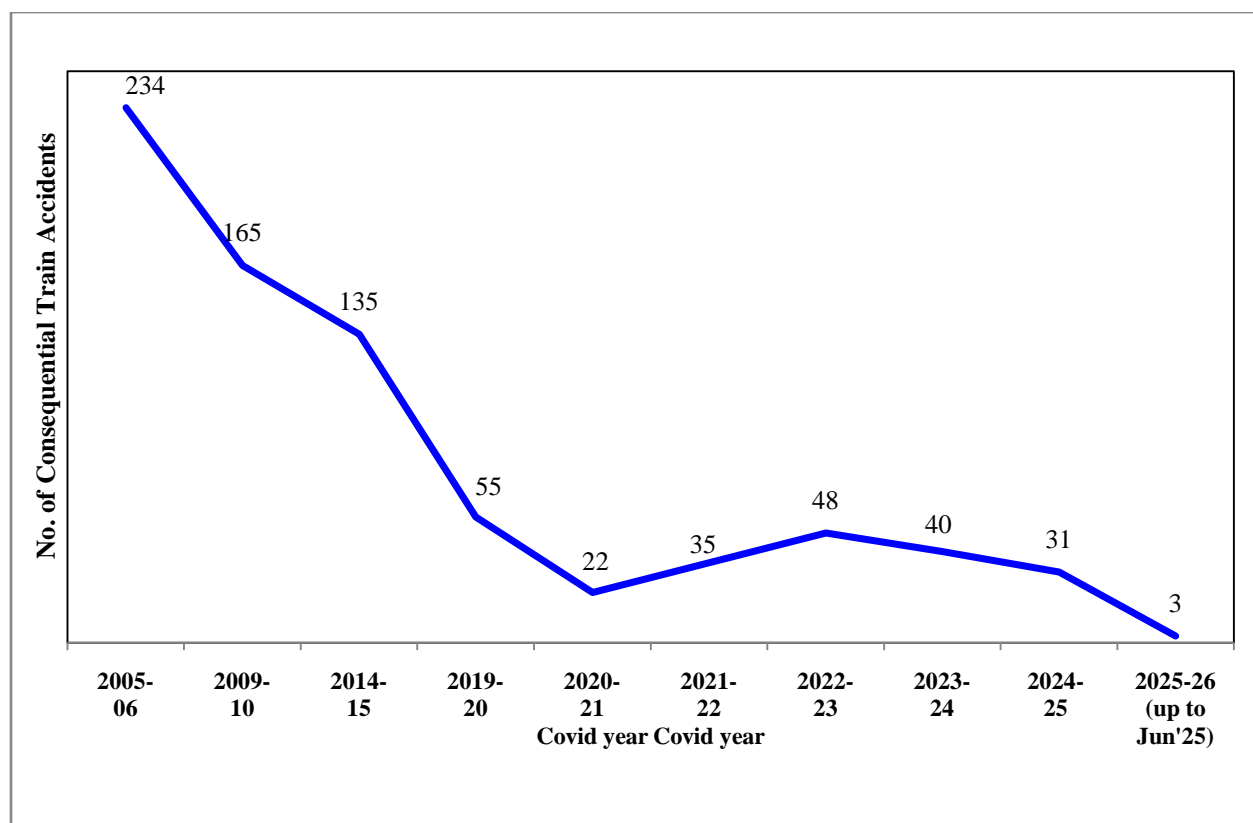
MINISTER OF RAILWAYS, INFORMATION & BROADCASTING AND
ELECTRONICS & INFORMATION TECHNOLOGY

(SHRI ASHWINI VAISHNAW)

(a) to (e): 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. Consequential Train Accidents, which include collisions and derailments also, have reduced from 135 in 2014-15 to 31 in 2024-25 as shown in the graph below.

It may be noted that the Consequential Train Accidents during the period 2004-14 was 1711 (average 171 per annum), which has declined to 31 in 2024-25 and further to 3 in 2025-26 (upto June).

The no. of consequential train accidents during the last five years are depicted in the Graph below:-



Consequential Train Accidents on Indian Railways and casualties (including railway passengers and railway personnel) therein are as follows:-

Period	No. of Consequential Train Accidents	No. of Deaths	No. of Injuries
2004-05 to 2013-14	1,711	904	3,155
2014-15 to 2023-24	678	748	2,087

As per the inquiry reports, the causes of the accidents that occurred during the last five years broadly include track defects, loco/coach defects, equipment failures, human errors etc.

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:-

Expenditure on Safety related activities (Rs. in Cr.)						
	2013-14	2022-23	2023-24	RE 2024-25	BE 2025-26	
	(Act.)	(Act.)	(Act.)			
Maintenance of Permanent Way & Works	9,172	18,115	20,322	21,800	23,316	
Maintenance of Motive Power and Rolling Stock	14,796	27,086	30,864	31,540	30,666	
Maintenance of Machines	5,406	9,828	10,772	12,112	12,880	
Road Safety LCs and ROB/ RUBs	1,986	5,347	6,662	8,184	7,706	
Track Renewals	4,985	16,326	17,850	22,669	22,800	
Bridge Works	390	1,050	1,907	2,130	2,169	
Signal & Telecom Works	905	2,456	3,751	6,006	6,800	
Workshops Incl. PUs and Misc. expenditure on Safety	1,823	7,119	9,523	9,581	10,134	
Total	39,463	87,327	1,01,651	1,14,022	1,16,470	

2. Electrical/Electronic Interlocking Systems with centralized operation of points and signals have been provided at 6,635 stations up to 30.06.2025 to reduce accident due to human failure.
3. Interlocking of Level Crossing (LC) Gates has been provided at 11,096 level Crossing Gates up to 30.06.2025 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 6,640 stations up to 30.06.2025.
5. Kavach is a highly technology intensive system, which requires safety certification of highest order. Kavach was adopted as a National ATP system in July 2020. Kavach is provided progressively in phased manner. Kavach has already been deployed on 1548 RKm on South Central Railway and North Central Railway. Presently, the work is in progress on Delhi-Mumbai and Delhi-Howrah corridors (approximately 3000 RKm). Kavach has been successfully commissioned over Kota–Mathura section (Delhi – Mumbai route) covering 324 Route Kilometers on 30.07.2025.
6. 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.

7. System of disconnection and reconnection for S&T equipment as per protocol has been re-emphasized.
8. All locomotives are equipped with Vigilance Control Devices (VCD) to improve alertness of Loco Pilots.
9. 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.
10. 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.
11. 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.
12. Mechanisation of track laying activity through use of track machines like PQRS, TRT, T-28 etc. to reduce human errors.
13. Maximizing supply of 130m/260m long rail panels for increasing progress of rail renewal and avoiding welding of joints, thereby improving safety.
14. Ultrasonic Flaw Detection (USFD) testing of rails to detect flaws and timely removal of defective rails.
15. Laying of longer rails, minimizing the use of Alumino Thermic Welding and adoption of better welding technology for rails i.e., Flash Butt Welding.
16. Monitoring of track geometry by OMS (Oscillation Monitoring System) and TRC (Track Recording Cars).
17. Patrolling of railway tracks to look out for weld/rail fractures.
18. The use of Thick Web Switches and Weldable CMS Crossing in turnout renewal works.
19. Inspections at regular intervals are carried out to monitor and educate staff for observance of safe practices.
20. 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.
21. Detailed instructions on issues related with safety of Track, e.g. integrated block, corridor block, worksite safety, monsoon precautions, etc. have been issued.

22. Preventive maintenance of railway assets (Coaches & Wagons) is undertaken to ensure safe train operations.
23. Replacement of conventional ICF design coaches with LHB design coaches is being done.
24. All unmanned level crossings (UMLCs) on Broad Gauge (BG) route have been eliminated by January 2019.
25. 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.
26. 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.
27. 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.
28. Regular counselling and training of staff is undertaken.
29. 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:-

S.N.	Item	2004-05 to 2013-14	2014-15 to 2024-25 (till March 25)	2014-25 Vs. 2004-14
	Technological Improvements			
1.	Use of high-quality rails (60 Kg) (Km)	57,450 Km	1.43 Lakh Km	More than 2 times
2.	Longer Rail Panels (260m) (Km)	9,917 Km	77,522 Km	Nearly 8 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 31.03.25: 25,939	288 times
5.	Thick Web Switches (Nos.)	Nil	28,301 Nos.	
Better Maintenance Practices				
1.	Primary Rail Renewal (Track Km)	32,260 Km	49,941 Km	1.5 times
2.	USFD (Ultra Sonic Flaw detection) Testing of Welds (Nos.)	79.43 Lakh	2 Crore	More than 2 times
3.	Weld failures (Nos.)	In 2013-14: 3699 Nos.	In 2024-25: 370 Nos.	90 % reduction
4.	Rail fractures (Nos.)	In 2013-14: 2548 Nos.	In 2024-25: 289 Nos.	More than 88% reduction
Better Infrastructure and Rolling Stock				
1.	New Track KM added (Track km)	14,985 Km	34,428 Km	More than 2 times
2.	Flyovers (RoBs)/ Underpasses (RUBs) (Nos.)	4,148 Nos.	13,808 Nos.	More than 3 times
3.	Unmanned Level crossings (nos.) on BG	As on 31.03.14: 8948	As on 31.03.24: Nil (All eliminated by 31.01.19)	Removed
4.	Manufacture of LHB Coaches (Nos.)	2,337 Nos.	42,677	More than 18 times

Kavach Implementation

1. Kavach is an indigenously designed, developed, and manufactured 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 1465 RKm on South Central Railway, a lot of experience was gained. Using that 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 in 324 kms of Mathura-Kota section for advance version of Kavach 4.0, this section is approved by Independent Safety Assessor (ISA). This is also the first section to be approved by ISA. Kavach Version 4.0 has been commissioned over Kota–Mathura section covering 324 Route Kilometers on 30.07.2025.
10. Progress of Key items comprising Kavach system on Indian Railways upto 14.07.25 is as under:-

S.No.	Items	Progress
i.	Laying of Optical Fibre Cable	5856 Km
ii.	Installation of Telecom Towers	619 Nos.
iii.	Provision of Kavach at Stations	708 Nos.
iv.	Provision of Kavach in Loco	1107 Locos
v.	Installation of Track side equipment	4001 Rkm

11. Project for equipping 10,000 Locomotives has been finalized. 69 number of loco sheds have been prepared for equipping with Kavach.

12. Bids for track side Works of Kavach for approximately 15,000 RKm have been invited covering all GQ, GD, HDN and identified sections of Indian Railways, out of which works of 14847 RKm have been awarded.
13. Specialized training programmes on Kavach are being conducted at centralized training institutes of Indian Railways to impart training to all concerned officials. By now more than 30,000 technicians, operators and engineers have been trained on Kavach technology. Courses have been designed in collaboration with IRISSET.
