GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

LOK SABHA
UNSTARRED QUESTION NO. 807
TO BE ANSWERED ON 04.02.2026

SWADESHI KAVACH PROTECTION SYSTEM

†807. SHRI BRIJENDRA SINGH OLA:

Will the Minister of RAILWAYS be pleased to state:

(a) the reasons for failure to ensure full implementation of Swadeshi Kavach Protection System on the main railway network despite increasing number of accidents;

(b) whether the Kavach system is not foolproof from the safety perspectives and if so, the details thereof;

(c) the extent to which the Government is using predictive maintenance, sensor-based monitoring and fault detection technologies on real time basis to reduce accidents caused by signal failures and track-related defects and the results thereof;

(d) whether any new policy has been implemented to make fire-retardant materials and advanced fire safety systems mandatory in all new passenger coaches and if so, the details of the plans and timeline for the upgradation of old coaches;

(e) the details of unmanned (without security staff) level crossing gates on densely populated roads including Jhunjhunu district in Rajasthan, district-wise; and

(f) the details of the dedicated funds, construction timeline and arrangements for coordination with States to accelerate the process of removing these level crossings?

ANSWER

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

(SHRI ASHWINI VAISHNAW)

(a) & (b): 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.

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

Year	Consequential Accidents
2014-15	135
2025-26 (Till date)	12 (90% lesser)

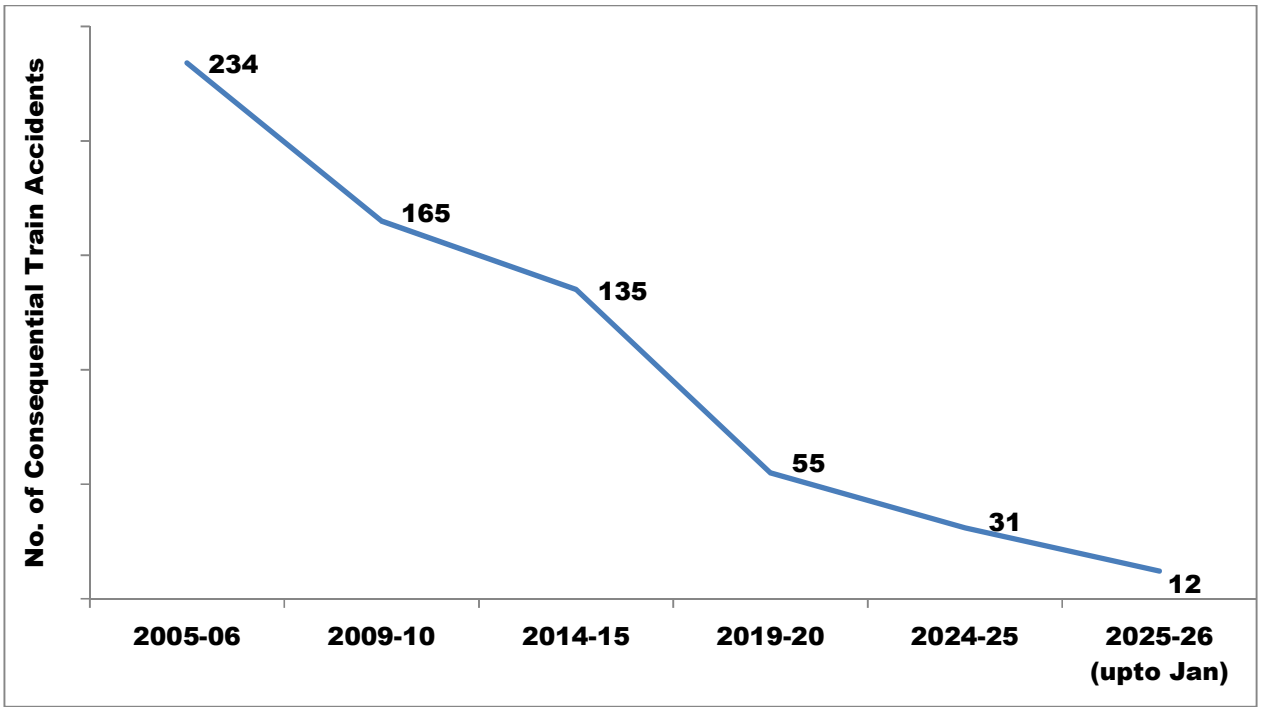
Another important index showing improvement in safety in train operations is Consequential Accidents Index, the details of which are as under:-

Consequential Accident Index:-

Year	Accident Index
2014-15	0.11
2024-25	0.03 (73% lesser)

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

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



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

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

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

2. **Electrical/Electronic Interlocking Systems with centralized operation of points and signals have been provided at 6,660 stations up to 31.12.2025 to reduce accidents due to human failure.**
3. **Interlocking of Level Crossing (LC) Gates has been provided at 10,097 Level Crossing Gates up to 31.12.2025 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 6,665 stations up to 31.12.2025.**
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.**

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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.

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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 counseling 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.

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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	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 Nos.	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 2013-24: 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: 8,948	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

Implementation of Kavach:

i. 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).

ii. 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.

iii. 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.

iv. Kavach was adopted as National ATP system in July, 2020.

v. 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.

vi. Based on deployment of Kavach version 3.2 on 1465 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.

vii. 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.

viii. 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.

ix. After extensive and elaborate trials, Kavach Version 4.0 has been successfully commissioned on 1297 Route Kilometres, covering the high density Delhi - Mumbai and Delhi – Howrah routes. On the Delhi – Mumbai route Kavach ver 4.0 has been commissioned on Junction cabin – Palwal – Mathura – Nagda section (667 Rkm) & Ahmedabad – Vadodara – Virar section (432 Rkm) and on the Delhi – Howrah route on Gaya – Saramatanr (93 Rkm) and Bardhaman - Howrah section (105 Rkm).

x. Further, track side Kavach implementation work has been taken up on 23,360 RKM covering all GQ,GD,HDN and identified sections of Indian Railways.

xi. Progress of key items of Kavach on High density routes including Delhi– Mumbai & Delhi– Howrah corridors are as under:

SN	Item	Progress
i	Laying of Optical Fibre Cable	8570 Km
ii	Installation of Telecom Towers	938 nos
iii	Station Data Centre	767 station
iv	Installation of Track side equipment	5672 RKm
v	Provision of Kavach in Loco	4154

xii. Tender has been finalised for equipping 6,300 Electric Locomotives with Kavach version 4.0 and another tender for equipping 2,679 Diesel Locomotives is under finalisation.

xiii. 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 48,000 technicians, operators and engineers have been trained on Kavach technology. This includes about 45,000 Loco Pilots & Assistant Loco Pilots. Courses have been designed in collaboration with IRISET.

xiv. The cost for provision of Track Side including Station equipment of Kavach is approximately Rs. 50 Lakhs/Km and cost for provision of Kavach equipment on locomotives is approximately Rs. 80 Lakh/Loco.

xv. The funds utilized on Kavach works so far up to Dec'25 is Rs. 2,573.36 Crores. The allocation of funds during the year 2025-26 is Rs. 1673.19 Crores. Requisite funds are made available as per the progress of works.

(c): Technological improvements in Indian Railways (IR) are a continuous process. Some of the Artificial Intelligence based predictive maintenance applications are as follows:

i. Pilot initiatives involving Artificial Intelligence/Machine Learning (AI/ML) driven predictive maintenance of Signalling system is being undertaken over Indian Railways. At some of the stations it has been used to evaluate efficacy of maintenance. Measurable outcome includes limited Prediction Logics and Alerts mechanism.

ii. Oscillograph Monitoring System (OMS) and Track Recording Car (TRC) are used to identify defects, predict maintenance requirement and analyze health of track. For detection of internal defects in rail and welds, Ultrasonic Flaw Detection (USFD) testing is carried out regularly at prescribed frequency. Indian Railways has adopted 'Phased Array Ultrasonic Testing' technology for flaw Detection in flash butt weld, which is an advance technology.

iii. 1) IR has adopted advanced/improved technologies like Online Monitoring of Rolling Stock System (OMRS), Wheel Impact Load Detector (WILD) for predictive maintenance of Rolling stock.

2) A Memorandum of Understand has been signed between IR and Dedicated Freight Corridor Corporation of India Limited (DFCCIL) in July 2025 for induction of wayside Machine Vision based Inspection System (MVIS). This is an AI/ML driven system for detecting hanging parts or missing components in moving trains.

3) A Memorandum of Understanding has been signed between IR and Delhi Metro Rail Corporation to induct Automatic Wheel Profile Measurement System (AWPMS). The AWPMS allows for automatic non-contact measurement of train wheel profile ensuring real-time measurement of wheel geometry and wear.

(d): The inherent design of rolling stock is done keeping in mind various safety provisions. Further modification and up-gradation of coaches to enhance fire safety is a continuous and ongoing process on Indian Railways (IR). Following measures have been taken for safety including fire safety in coaches:

i. **Provision of Minimum two Fire Extinguishers in all coaches over Indian Railways.**

ii. **Fire Detection & Suppression System has been provided in fire prone areas of Power cars and Pantry cars.**

iii. **Fire and smoke Detection system has been provided in coaches as per extant guidelines.**

iv. **Water mist type fire suppression system is being provided on pantry cars and power cars in phased manner.**

v. **Provision of emergency windows in coaches for evacuation in case of fire.**

vi. **Use of Fire-retardant material as per global fire-retardant norms in coaches for seats/berths, panels, flooring, insulation, toilets etc for improved fire safety.**

vii. **Use of fire retardant E-beam cable in coaches.**

viii. **Use of different level of protection in the form of fuses, Miniature Circuit breaker (MCBs) and Motor protection Circuit Breakers (MPCBs) in the electrical circuits to prevent the damage from electrical faults/surges.**

ix. **Provision of Aerosol based fire suppression system in electrical cabinets.**

x. **Further, up-gradation of material in line with global standards is regularly being carried out with fitment of new generation material in Amrit Bharat & Vande Bharat Sleeper trains.**

xi. **Display of "Fire Notices" for widespread information in all**

coaches to inform and alert passengers regarding various "Do's" and "Don'ts" to prevent fire. These include messages regarding not to carry any inflammable material, explosives, prohibition of smoking inside the coaches and penalties etc.

xii. Prohibition of flame based cooking in coaches.

Regular maintenance of various fire safety equipments/components as per the prescribed periodicity is carried out by the designated officials at Depots/Sheds for ensuring their proper upkeep.

(e) & (f): All Unmanned Level Crossings (UMLCs) on running lines of Broad Guage (BG) network of Indian Railway including the state of Rajasthan have been eliminated by 31.01.2019.

Elimination of level crossings (LCs) is a continuous and dynamic process of Indian Railway. Such works are taken up on the basis of its impact on safety in train operations, mobility of trains & impact for road users and feasibility etc.

Nos. of ROBs/ RUBs constructed on Indian Railways during the period 2004-14 vis a vis 2014-25 (Dec'25) is as under:

Period	ROBs/ RUBs constructed
2004-14	4,148 Nos.
2014-25 (Dec'25)	13,882 Nos.

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