सत्यमेव जयते

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS

Book of Rules for PCSTE Sanction of KAVACH Implementation on Indian Railways

Issued by

SIGNAL AND TELECOM DIRECTORATE
RESEARCH, DESIGNS & STANDARDS ORGANISATION
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Revision History

SN.	Issue	Version	Reason of Amendment
1	First	1.0	First Issue

1 KAVACH- The Indian Railway ATP

Railway		Division	
Section Name		Section details	
No of stations		No of Mid-Section	
Applicable RDSO specification			

2 Introduction

2.1 Purpose

2.2 Reference Documents

2.3 Scope of work

2.3.1 Details of section
(Section Name, Section Details, Number of Stations, Number of Mid-section LC gates/IB huts/Auto huts with towers, Applicable RDSO specifications for KAVACH Installation)

2.3.2 Absolute Block Signalling system overview

2.3.3 Automatic Block Signalling system overview

2.3.4 KAVACH Details
(Make of KAVACH, Details of Stationary KAVACH Executive Checksums, Station Kavach location and details of connected RIUs).

3 System Description

3.1 Signalling Description

3.1.1 Types of Signals, their Aspects

3.1.2 Signal Naming Rule

3.1.3 LC gate Naming Rule

3.1.4 Reference Documents

SN	Stationary Kavach ID	SIP No	TOC No	Working Time Table	ESP	Index Plan

3.1.5 Entry and Exit Signals, Direction of Travel their interpretation in sections of Movement Authority

SN	Stationary Kavach ID	ENTRY SIGNAL NAME	EXIT SIGNAL NAME	ENTRY SIGNAL ASPECT	EXIT SIGNAL ASPECT	ENTRY SIGNAL NAME	MA IN SECTIONS

3.2 Stationary KAVACH

3.2.1 Stationary Kavach ID Naming Rule

3.2.2 RFID Tag ID Naming Rule

3.2.3 TIN ID Naming Rule

3.2.4 Maximum number of Simultaneous Moving and Stationary trains

3.2.5 Listing the details

SN	Station Name	Station Code	Stationary Kavach ID	RFID Group ID	TIN Group ID	Maximum Simultaneous movements	Maximum Stationary Trains

3.2.6 RFID placement and Linking distances

SN	Stationary Kavach ID	ENTRY SIGNAL	EXIT SIGNAL	REF RFID (Signal Foot Tag)	RFIDs in the route and linking distances	Distance between Entry and Exit Signal

3.2.7 SIM Cards details

SN	Stationary Kavach ID	Primary SIM		Secondary SIM	
		ID	Post paid / pre paid	ID	Post paid / pre paid

3.3 Track Profile Description

3.3.1 Centre line of Stations

3.3.2 Maximum Permissible Speed

SN	Stationary Kavach ID	ENTRY SIGNAL	EXIT SIGNAL	REF RFID (Signal Foot Tag)	Distance from ref RFID	Location	MPS

3.3.3 Gradient Profile

SN	Stationary Kavach ID	ENTRY SIGNAL	EXIT SIGNAL	REF RFID (Signal Foot Tag)	Distance from ref RFID	Location	GRAD_TYPE	GRAD_VALUE	GRAD_LENGTH	N_VALUE

3.3.4 Turnout Profile

SN	Stationary Kavach ID	ENTRY SIGNAL	EXIT SIGNAL	REF RFID (Signal Foot Tag)	Start Distance from ref RFID	Length	Turnout speed

3.3.5 LC Gate Profile

SN	Stationary Kavach ID	ENTRY SIGNAL	EXIT SIGNAL	REF RFID (Signal Foot Tag)	Start Distance from ref RFID	LC gate Name	LC Gate Type

3.3.6 OHE mast or mileage Posts Profile

SN	Stationary Kavach ID	ENTRY SIGNAL	EXIT SIGNAL	REF RFID (Signal Foot Tag)	Distance from ref RFID	Location	OHE Mast / mileage post details

3.3.7 TSR Route IDs

SN	Stationary Kavach ID	ENTRY SIGNAL	EXIT SIGNAL	TSR Route IDs	TSR Route ID Start distance

3.3.8 Section type details

SN	Stationary Kavach ID	ENTRY SIGNAL	EXIT SIGNAL	REF RFID (Signal Foot Tag)	Section type	Shunting Limit Tag or not	Communication required in Nominal or not	Communication required in Reverse or not

3.3.9 Track Description Details

SN	Stationary Kavach ID	ENTRY SIGNAL	EXIT SIGNAL	REF RFID (Signal Foot Tag)	Distance from ref RFID	Track Description	Start Location	Length

3.3.10 Adjustment Tag/ Junction Tag Details

SN	Stationary Kavach ID	ENTRY SIGNAL	EXIT SIGNAL	REF RFID (Signal Foot Tag)	Location Adjustment	Junction Adjustment	Hazards identified	Mitigation Measures

4 National Values

4.1 Stationary KAVACH Configurable Parameters

4.1.1 Station related
Station Boundary (UP and Down Limits), Type of block, Shunt Direction, Shunt Limit TIN, Shunt Limit, IP address, Port 1 number and Port2 number.

4.1.2 Radio Modem
Power, Frequency Resolution, Control frequency, transmitting frequency, receiving frequency.

4.1.3 Time Slot management

4.1.4 Timeout parameters
Communication time out, Deregistration time out

4.1.5 Time related

4.1.6 Distance related

4.1.7 SoS related

4.1.8 Data Logging

4.1.9 GSM APN details

[Please refer Annexure-A3 of KAVACH specification for complete details]

4.2 Onboard Kavach Configurable Parameters

4.2.1 Loco related
Onboard ID, Max Speed, Wheel Dia1, Wheel Dia2, Loco acceleration,

4.2.2 Radio Modem
Power, Frequency Resolution, Control frequency, transmitting frequency, receiving frequency.

4.2.3 RFID Readers
Reader1 offset from front end and back end, Reader2 offset from front end and back end, Location Accuracy, L_Doubtover, L_Doubtunder.

4.2.4 Speed sensor related
Tacho Pulses/Rev, Tacho type and its mounting direction.

4.2.5 Speed Margins

4.2.6 Margin Distances

4.2.7 LP Reaction Time

4.2.8 Time Slot management

4.2.9 Timeout parameters
Communication time out, Override time out,

4.2.10 SoS related

4.2.11 Data Logging

4.2.12 GSM APN details

4.2.13 Fault Codes

[Please refer Annexure-A2 of Kavach specification for complete details]

4.3 TSRMS Configurable Parameters

4.3.1 Sections, Stations in section, RE/Non-RE

4.3.2 OHE Pole or mileage post, RFID, Distance from RFID, TSR Route ID and Stationary Kavach ID.

4.4 NMS Configurable Parameters

4.4.1 Prompt requirements

4.4.2 SMS requirements

4.4.3 Display requirements

4.4.4 Report requirements

[Please refer Annexure-G of Kavach specification for complete details]

5 Site installation

5.1 RFID Tags

5.1.1 RFID Tag Data Validation Report

5.1.2 RFID Tag Placement Verification Report

5.2 Radio

5.2.1 Towers

SN	Stationary Kavach ID	Tower height	Soil test report	Approved Foundation drawing	Approved Tower drawing	Approval from division	SACFA Clerance

5.2.2 Communication coverage Report

- Communication charts showing coverage up to the communication mandatary area for transmission and reception of control and operational frequency shall be submitted.

- The summary shall be as follows:

5.2.2.1 Transmission side (Control Frequency)

SN	Stationary Kavach ID	Tx Communication Mandatory area limit	Tx Frequency	Tx frequency reception distance at mobile unit	Is distance more than Communication mandatory Area?

5.2.2.2 Transmission side (Operational Frequency)

SN	Stationary Kavach ID	Tx Communication Mandatory area limit	Tx Frequency	Tx frequency reception distance at mobile unit	Is distance more than Communication mandatory Area?

5.2.2.3 Reception side (Control Frequency)

SN	Stationary Kavach ID	Rx Communication Mandatory area limit	Rx Frequency	Rx frequency reception distance from mobile unit	Is distance more than Communication mandatory Area?

5.2.2.4 Reception side (Operational Frequency)

SN	Stationary Kavach ID	Rx Communication Mandatory area limit	Rx Frequency	Rx frequency reception distance from mobile unit	Is distance more than Communication mandatory Area?

5.2.3 Time Slot allotment chart

- Maximum trains that can be handled by Stationary KAVACH shall be 28.
- In case of exceptional circumstances, the main lines and connected lines from main line shall be given preference.

SN	Stationary Kavach ID	Max No of simultaneous movements and associated Packet Length from station	Max No of Stationary Movements	Total Time Slots Required	Time slots allotted (<28)

5.3 Signalling

5.3.1 Relay wiring diagrams

SN	Stationary Kavach ID	Prepared by	Checked by	1st level testing at site by	2nd level testing at site by	Approved by	Integrated with Station circuits or not

5.3.2 Contact Analysis Charts

SN	Stationary Kavach ID	Prepared by	Checked by	1st level testing at site by	2nd level testing at site by	Approved by	Integrated with Station circuits or not

5.3.3 Bit Charts

SN	Stationary Kavach ID	Prepared by	Checked by	1st level testing at site by	2nd level testing at site by	Approved by

5.4 Point wise compliance to TAN issued by RDSO

5.5 KAVACH Related

5.5.1 Utilization of Input Boards
(Please Indicate Spares Available in absolute quantity as well as percentage)

5.5.2 RFID Tag layouts

SN	Stationary Kavach ID	Drawing No	Prepared by	Checked by	Approved by

5.5.3 RFID Tag Data

SN	Stationary Kavach ID	Drawing No	Prepared by	Checked by	Approved by

5.5.4 KAVACH Table of Control

SN	Stationary Kavach ID	Drawing No	Prepared by	Checked by	Approved by	FAT by	SAT by

5.5.5 KAVACH Track Profile Table

SN	Stationary Kavach ID	Drawing No	Prepared by	Checked by	Approved by	FAT by	SAT by

5.5.6 KAVACH Table of Control (TSL)

SN	Stationary Kavach ID	Drawing No	Prepared by	Checked by	FAT by	Approved by	SAT by

5.5.7 KAVACH Track Profile Table (TSL)

S N	Stationary Kavach ID	Drawing No	Prepared by	Checked by	FAT by	Approved by	SAT by

5.6 Test Reports

5.6.1 KAVACH TSR speed control test reports

SN	Stationary Kavach ID	Route ID	Imposed location by TSRMS	TSR Authorized by Onboard Kavach	SAT by	Is any Safety infringement observed?	Is any Capacity Loss observed?

5.6.2 KAVACH PSR speed control test reports

SN	Stationary Kavach ID	Entry Signal	PSR	Start Distance	SAT by	Is any Safety infringement observed?	Is any Capacity Loss observed?

5.6.3 KAVACH SPAD Prevention test reports

SN	Stationary Kavach ID	Entry Signal	Exit Signal	Stopping Distance from Exit Signal	SAT by	Is any Safety infringement observed?	Is any Capacity Loss observed?

5.6.4 KAVACH Rear End collision test reports

SN	Stationary Kavach ID	Entry Signal	Exit Signal	Stopping Distance from Rear Loco	SAT by	Is any Safety infringement observed?	Is any Capacity Loss observed?

5.6.5 KAVACH Head ON collision test reports

SN	Stationary Kavach ID	Entry Signal	Exit Signal	Stopping Distance	SAT by	Is any Safety infringement observed?	Is any Capacity Loss observed?

5.6.6 KAVACH Unusual Stoppage in Block section test reports

SN	Stationary Kavach ID	Entry Signal	Exit Signal	Stopping Distance	SAT by	Is any Safety infringement observed?	Is any Capacity Loss observed?

5.6.7 Manual SoS Generation from Stationary KAVACH test reports

SN	Stationary Kavach ID	Entry Signal	Exit Signal	Stopping Distance	SAT by	Is any Safety infringement observed?	Is any Capacity Loss observed?

5.6.8 Manual SoS Generation from Onboard KAVACH test reports

SN	Stationary Kavach ID	Entry Signal	Exit Signal	Stopping Distance	SAT by	Is any Safety infringement observed?	Is any Capacity Loss observed?

5.6.9 NMS evidences for all the above tests

5.6.10 Staff training

Other Documentation Concerned Branch officer of division from **S&T**, **Operating**, **TRSO**, **TRD, Engineering** shall certify that their staff in the section are adequately trained for Kavach Operations and Maintenance.

6 Other Documentation

6.1 Stationary Kavach

6.1.1 SWR Amendments with introduction of Kavach SMOCIP operation

6.1.2 FAT reports and Certificates

6.1.3 SAT reports

6.1.4 Jointly signed pre commissioning check list

6.1.5 OEM Installation certificate

6.1.6 Datalogger Validation Report for Kavach Relays

6.1.7 Meggaring/OTDR details of cables

- from Kavach to OFC hut
- from Kavach to SM room for SMOCIP
- from Kavach to RIUs

6.1.8 Adequate Power Supply Planning Reports

- Stationary Kavach
- Remote Interface Units
- Tower Locations
- SM OCIP
- TSRMS

6.1.9 KMS Registration details

6.1.10 Supply of adequate loco simulators and installation of stationary Kavach test benches.

6.1.11 Management of spares

6.1.12 Maintenance staff nomination and posting.

6.2 Onboard Kavach

6.2.1 About Locos

- Details of nomination of type of Locos, type of BIUs and Loco Shed.

6.2.2 Product Test certificates

- Inspection certificates of Onboard Kavach
- Inspection certificates of BIU and test reports

6.2.3 Others

- Certificate from Shed that Kavach test yard is installed and routine maintenance of Kavach will be undertaken and use of only approved components in Kavach related loco/EMU/trainset interface.
- Jointly signed pre commissioning check list
- Approved fitment diagrams
- Approved circuit diagrams by the shed.
- OEM Installation certificate

6.2.4 KMS Registration details

6.2.5 Training – Concerned Branch officer of shed shall certify that the staff are adequately trained for Kavach Operations and Maintenance.

6.2.6 Management of spares

6.2.7 Maintenance staff nomination and posting.

6.3 Towers

6.3.1 Tower location approval plan Tower location approved plan

6.3.2 Soil Investigation Reports and recommendation for type of foundation

6.3.3 Details of the Approved tower foundations and structural drawings

6.3.4 Approved Quality Assurance Plan (QAP) for tower fabrication for 3rd party Inspection

6.3.5 3rd party Inspection Certificate for Tower fabrication (as applicable)

6.3.6 Test reports for Cement, Sand, Aggregate M20, Steel and Cube test pertaining to tower foundations

6.3.7 Stage-wise field inspection report for Tower foundation

6.3.8 Tower Verticality Test Report

6.3.9 Approved Cable route plan from Kavach to Tower location.

6.3.10 Approved Cable Connectivity Diagram for Kavach to Tower.

6.3.11 Approved Cable route plan from Kavach to Tower location.

6.3.12 Typical Earthing Plan for Kavach Tower.

6.3.13 Approved Tower fencing diagram

6.3.14 Meggaring and OTDR details of cables from Kavach to Tower

[Clause 6.3.1 to 6.3.8 are applicable for new towers only]

6.4 Manuals

6.4.1 Stationary Kavach

- Maintenance check list
- Signed Pre-commissioning check list
- Configuration manuals

6.4.2 Onboard Kavach

- Maintenance check list
- Signed Pre-commissioning check list
- Configuration manuals

6.4.3 TSRMS

- Maintenance check list
- Signed Pre-commissioning check list
- Configuration manuals

7 ISA Report

7.1 About ISA

Name of the ISA engaged for assessment as per the RDSO Empanelled list, His other credentials

7.2 OEM's organization structure

Details of project manager, designer, tester, verifier, validator, Assessor etc. including RAMS manager setup for monitoring, analysis, diagnosis and corrective action for incidences, who shall submit MTBF on monthly basis.

7.3 Fulfillment of Safety Related Application conditions mentioned in the generic safety case

7.4 Specific Application Safety Case (SASC) requirements of KAVACH deployed in section.

7.5 Hazard log and mitigation measures

7.6 ISA Field audit report.

7.7 Final ISA assessment Report

8 Performance Report

8.1 Daily Incidences summary for 30 days

8.2 Operational Availability

- (minimum 98.5%)