In-Process QC Checklist for Loco KAVACH Installation

Loco ID:	Loco Type:WAP-7 ☐ / WAP-5 ☐ /WAG-9 ☐	Brake Type Name : E-70☐ / CCB ☐
Railway Division :	**Shed Name :**	**Date:**
Refer to Document: 5 16 76 0035 V1.3 In-process QC Procedure for On-board KAVACH Installation in Electrical Locomotives		

S.No	Description of inspection part / area	Observation	REMARKS
1.0	**Document verification : Check the availability of the following documents**		
1.1	Annexure of IC (Inspection Certificate) issued by RDSO.		
1.2	Loco Allocation Letter		
1.3	Loco KAVACH External Harness Connectivity Diagram		
2.0	**Verify Serial Numbers of Equipment as per IC:**		
2.1	Ensure presence of Hologram and S/R Stamp on each equipment		
2.2	Loco KAVACH Main Unit : _____		
2.3	Relay Interface Box : _____		
2.4	Cab Input Box : _____		
2.5	RFID Readers 1: _____		
2.6	RFID Readers 2 : _____		
2.7	LPOCIP (DMI) 1 : _____		
2.8	LPOCIP (DMI) 2 :_____		
2.9	Speedometer 1:_____		
2.10	Speedometer 2 : _____		
2.11	GPS & GSM Antenna 1: _____		

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2.12	GPS & GSM Antenna 2 : _____		
2.13	UHF Radio Antenna 1:_____		
2.14	UHF Radio Antenna 2: _____		
2.15	UHF Radio Antenna 3:_____		
2.16	UHF Radio Antenna 4: _____		
2.17	RFID PS 1: _____		
2.18	RFID PS 2: _____		
2.19	PG 1: _____		
2.20	PG 2 : _____		
2.21	PPC Card 1:_____		
2.22	PPC Card 2:_____		
2.23	VC Card 1:_____		
2.24	VC Card 2:_____		
2.25	VC Card3:_____		
2.26	Voter Card 1:_____		
2.27	Voter Card 2:_____		
2.28	Vital Gate Way Card 1:_____		
2.29	Vital Gate Way Card 2:_____		
2.30	Cab I/P Card 1:_____		
2.31	Cab I/P Card 2:_____		

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2.32	DPS Card 1:_____		
2.33	DPS Card 2:_____		
2.34	Radio unit :_____		
2.35	EMI Filter Unit :_____		
2.36	Radio Modem-1: _____		
2.37	Radio Modem-2: _____		
2.38	Interface Relay Unit Faiveley-1: _____		
2.39	Interface Relay Unit Faiveley-2: _____		
3.0	**LOCO KAVACH :**		
3.1	**Placement of LOCO KAVACH Equipment in Locomotive:** Verify all KAVACH unit and its Peripherals / equipment are connected as per connectivity drawing.		
3.2	**Maintenance Place :** Ensure the availability of sufficient place surrounding the Loco KAVACH for easy serviceability.		
3.3	**Loco Stand Thickness :** Ensure welded loco stand shall be made of 5mm thick steel and standing on four legs. Cantilever structures with two legs shall not be used.		
3.4	**Welding between Loco surface & LOCO KAVACH fixing Stand :** Verify that there are no sharp edge and gaps in the welding of the Loco Kavach unit stand with regard to the loco surface.		
3.5	**Red oxide coating & Painting :** welded portions shall be treated with redoxide coating, before painted with RAL7032 (pebble grey color) paint, to avoid corrosion.		
3.6	**Loco Stand fixing holes:** Ensure that Loco stand fixing holes(M8) are exactly matching with Loco channel fixing holes(M8).		
3.7	**Torque & Marking:** Verify the torque Value of M8 Bolts (20 N-M) and mark with green paint if the torque value is Ok.		

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3.8	**Cable connections:** Verify the connections on the Loco external cable are made correctly according to the "Loco KAVACH External Harness Connectivity Diagram" and without any overlaps.		
3.9	**Wire Stress:** Routing of wires to be done without stress and without sharp bends.		
3.10	**Cable securing:** Verify that all peripheral cables for the loco kavach unit are routed and securely fastened using the appropriate metal clamps.		
3.11	**Connector fitment :** Ensure that all the external cable circular connectors are fully locked properly with Loco Kavach receptacles.		
4.0	**EMI Filter Box:**		
4.1	**EMI Filter Box Fixing** : Fix M5x16mm screws and nuts on the EMI Filter Box to the loco stand with torque of 5 N-m.		
4.2	**Cable routing** : Ensure all the cables routed through PG gland without sharp bends, stress and tied with metalclamps.		
5.0	**RIB & CAB INPUT BOX**		
5.1	**Space between RIB & CAB Input** : Ensure enough space available in-between cab input box and RIB unit for easy access of cables		
5.2	**Welding** : Ensure RIB and CAB Input box stand welding is without gap, cracks and joint breaks.		
5.3	**Torque :** The M5X16mm bolts shall be tightened with 5 N-m torque, using a torque spanner and marked with green paint after torque verification.		
5.4	**Cable routing** : Ensure all the cables routed without any stress, sharp bends andtied with cable ties.		
5.5	**Connector fitment:** Verify that cables are connected with respect to labels and ensure allthe external cable circular connectors are fully locked properly with enclosure (LOCO KAVACH) receptacles.		

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6.0	**DMI (LP-OCIP)**		
6.1	**DMI Mounting Place:** Check the DMI mounted place is good enough at driver desk, which can be operated easily by Loco pilot.		
6.2	**DMI Mounting Stand:** Ensure that DMI mounting stand is properly welded without any joint gaps and can be withstand to loco vibrations.		
6.3	**Torque & Marking:** The M5X16mm screws shall be tightened with 5 N-m torque, using a torque spanner. The screws heads shall be marked with green paint after torque verification		
6.4	**DMI Cable :** Make sure the DMI cable can be easily accessed by the projection at the bottom of the stand.		
6.5	**DMI Stand Colour** : The welded portion of stand shall be treated with red oxide coating, before being painted with RAL7032 (Pebble Grey color) paint, to avoid corrosion.		
6.6	**Cable routing** : Ensure all the cables routed without any stress, without sharp bends and tied with metal clamps.		
6.7	**Cable Booting** : Verify that the cable booting is not damaged / peeled out while or after routing the cable. Ensure that the circular connectors are fully locked with DMIunit enclosure receptacles.		
6.8	**DMI-1 Cable Connection** : DMI-1 cable shall be connected to MC1 at Loco Kavach unit.		
6.9	**DMI 2 Cable Connection** : DMI-2 cable shall be connected to MC3 at Loco Kavach unit.		
7.0	**RFID PS Unit**		
7.1	**RFID PS Unit fixing** :The M5X16mm screws shall be tightened with 12N-m torque, using a torque spanner to Loco Kavach stand. The screws heads shall be marked with green paint, after verifying the torque value.		
7.2	**Cable connections :** Ensure that cable connections are given at the corresponding location with respect to labels provided at Loco Kavach.		

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7.3	**Cable routing :** Ensure that cables are routed properly without hanging and tied properly with cables ties		
7.4	**Connector locking :** Ensure the circular connectors are properly locked with RFID box unit receptacles.		
8.0	**LOCO Antenna and GPS_GSM Antenna :**		
8.1	**Radio Antenna Welding** : Check the Radio antennas base plate welding done properly without any joint gaps and cracks.		
8.2	**Welding :** Ensure that welding done good enough, such that antennas can be withstandloco vibrations, while running with higher speed		
8.3	**Antenna Mounting** : Antennas are to be mounted within stipulated height to avoidOHE line contact.		
8.4	**LMR400 Cables Connections**: Ensure that the LMR400 (TX-1, TX-2, RX-1 & RX-2) cables are connected to their respective location		
8.5	**LMR200 Cables Connections**: Ensure that the LMR200 (GSM1, GPS1, GSM2& GPS2) cables are connected to their respective location		
8.6	**LOCO Antenna Cables Routing** : Ensure that the cables are routed properly through the 2" steel reinforced pipe/hose to avoid environmental damages and pipe/hose tied to supporting welded rods using cable ties		
8.8	**Red oxide coating:** Ensure that the all welded portions shall be treated with red oxide coating, before painted with RAL7032 (pebble grey color) paint, to avoid corrosion.		
9.0	**Pneumatic Fittings and EP Valve, Cocks Fixing**		
9.1	**Pneumatic fittings:** Confirm that all pipes and fittings used in the assembly are from the approved BOM, and taken from the I&C kit supplied from the factory. Any locally procured items must be checked for compliance to the approved BOM.		

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9.2	**Copper Pipes:** Confirm that copper pipes are bent using appropriate bending tool, and that there no kinks or sharp bends in the pipe.		
9.3	**Copper Tube** : Ensure that copper tube length is measured with respect the connectivity from loco pneumatics to EP Valve, BP cock, Horn cock and valve arrangements.		
9.4	**Copper pipe connections:** Ensure that copper pipe connections made properly with approved make (Ex. Fluid Control) ferrules and TEE-joints used.		
9.5	**Threaded Connections:** All threaded connections must be sealed with Teflon paste (Not With Teflon Tape), which is supplied in the I&C kit.		
9.6	**Pneumatic Lines Connections:** Check the pneumatic lines with a soap solution to make sure there are no loose connections. When the soap solution is applied to the joints, no air bubbles should be seen. The soap solution must be cleaned after the test.		
10.0	**Pressure sensors Installation in LOCO:**		
10.1	Ensure all these pressure sensors shall be installed under CAB1 driver desk.		
10.2	Ensure MR sensor should be 16 bar, and remain BP,BC1,BC2 are 7 bar		
10.3	Ensure all pressure sensors should be installed on T-Joints		
11.0	**IRU (Faively) UNITS FIXING FOR E70 TYPE LOCO :**		
11.1	**IRU Fixing Place** : Ensure that sufficient place available for IRU fixing at bottom of the driver desk of both the CABs		
11.2	**IRU Supporting Angles** : Ensure that supporting angles for IRU units are welded properly to withstand loco vibrations		
11.3	**Welding:** Ensure that welded portion should be neat and clean. Check that there is no welding gaps and cracks		
11.4	**Fixing of IRU :** Ensure that the IRU units fixing holes are matching with supporting angels		
11.5	**Red oxide coating :** Ensure that the welded portion shall be coated with red oxide and painted with RAL7032 (Pebble grey color) paint.		
11.6	**Cable connections :** Ensure that cable connections are given at the corresponding location		

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	with respect to labels provided.		
11.7	**Cable routing :** Ensure that cables are routed properly without hanging on ground and tied properly with cable ties.		
12.0	**PSJB, TPM UNITS FIXING FOR CCB TYPE LOCO :**		
12.1	**PSJB Fixing** : Ensure existing PSJB removed and Handed hovered to Loco Shed Rail team, And install factory supplied PSJB		
12.2	**TPM Unit Fixing** : Ensure that TPM module is installed right side to the MPIO module		
12.3	**Fixing of PSJB and TPM :** Ensure that the PSJB and TPM units fixing holes are matching with supporting clamps		
12.4	**Cable connections :** Ensure that cable connections are given at the corresponding location with respect to labels provided.		
12.5	**Cable routing :** Ensure that cables are routed properly without hanging on ground and tied properly with cable ties.		
13.0	**SIFA VALVE FIXING FOR CCB TYPE LOCO :**		
13.1	Ensure SIFA Valve is installed with mounting frame under DBC panel in CAB-1 side		
13.2	Ensure the mounting location of the SIFA valve shall be easy for operations and maintenance		
13.3	Ensure SIFA valve manifold shall be fixed to mounting frame by using hardware provided along with the installation Kit		
13.4	**Welding:** Ensure that welded portion should be neat and clean. Check that there is no welding gaps and cracks		
14.0	**PG's and Speedo Meter Units Fixing :**		
14.1	**PG1 and PG2 Installation**: Ensure that PG1 and PG2 are installed on allotted axles(1/2/3/4/5/6) of locomotives on left and right side.		

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S.No	Description of inspection part / area	Observation	REMARKS
14.2	**PG1 & PG2 Connections** : Ensue the PG1 is connected left side and PG2 on right side, while sitting from the LP desk at CAB-A side.		
14.3	**PG Fixing** : M8X16mm screws shall be tightened with 20 N-m torque,using a torque spanner. The Bolts/Screws shall be marked with green paint after torque verification.		
14.4	**PG Sensor position :** Ensure that the PG head(sensor) is positioning to top side from ground/railor left/right side for safety purpose.		
14.5	**Cable routing :** Ensure that PG cables routing made properly with metal clamps / cable ties.		
14.6	**Speedometer Boxes fixing** : Ensure that the Speedometer boxes are fixed nearby PG. Speedometer holes and fixing clamp holes are to be matched evenly. Verify the M5 allen key bolts torque 12 N-M.		
14.7	**Welding of supporting clamps :** Ensure that speedometer supporting clamps are welded without any gaps and cracks.		
14.8	**Speedometer Cables** : Ensure that cables from PG to Speedometers and from speedometer units to Loco Kavach unit are connected properly.		
14.9	PG1 Connections : Ensure that PG1/ SPD Meter 1 connected to MC8 at loco Kavach unit.		
14.10	**PG2 Connections** : Ensure that PG2 / SPD Meter 2 connected to MC22 at loco Kavach unit.		
14.11	**Cable routing :** Ensure that external cables are routed to their respective speedometer units.		
14.12	**Connector locking :** Ensure that the external cable circular connectors are properly locked with speedometer box unit receptacles.		
15.0	**RFID READER ASSEMBLY :**		
15.1	**RFID Readers bracket Welding** : Check the RFID Reader brackets are welded bottom of the locomotive at both the CABs.		
15.2	**Welding quality :** Ensure that welding done properly, such that the RIFD Reader can be withstand for loco vibrations during running.		
15.3	**Channels tightness : Verify** the tightness for channels fixing screws (M8X16mm) by using		

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	torque wrench (20N-M).		
15.4	**Height : The** height shall be maintained from the rail to the bottom of RFID Reader is450mm ± 50mm for proper reading of tags in high speed cases.		
15.5	**Red oxide coating :** Ensure that the welded portion shall be coated with red oxide and painted with RAL7032 (Pebble grey color) paint.		
15.6	**Cable trench :** Verify that RFID reader cables are routed properly through theloco trench without any overlaps and over-stress. Ensure that cable shall not have any sharp bends in routing and millconnectors without any damage while routing.		
15.7	**Connector connectivity:** Ensure that MIL connectors connectivity is as per the connectivity drawing.		
15.8	**RFID -1 connectivity:** Ensure that RFID Reader-1 is connected to MC6 at Loco Kavach.		
15.9	**RFID -2 connectivity:** Ensure that RFID Reader-2 is connected to MC7 at Loco Kavach.		
15.10	**Circular connectors:** Ensure that the circular connectors are properly locked with RFID box unit receptacles.		
16.0	**EARTHING :**		
16.1	**Earthing** : Ensure that earthing done with 4Sq.mm Yellow/Green cable for (a) Loco Kavach main unit, (b) Relay Interface Box, (c) CAB Input Box, (d) LP-OCIP -1 and (e) LP-OCIP-2 unit		
16.2	**Earth Cable:** Ensure that cable continuity, lugs crimping and tightness of earth cable.		
16.3	**Earth Cable routing:** Ensure that the earth cables are routed through the conduit and routed properly and tied with metal clamps / cable ties.		

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17.0	**Radio Power:**		
17.1	Ensure to configure the RADIO-1 Power to 10Watts, if Radio shows 1Watt.		
17.2	Ensure to configure the RADIO-2 Power to 10Watts, if Radio shows 1Watt.		

Name of the Inspector :	**Approved By (Name) :**
Signature :	**Signature :**
Date:	**Date:**