



RDSO/Lucknow

**ELECTRICAL DIRECTORATE
RESEARCH DESIGNS & STANDARDS ORGANISATION
MANAK NAGAR, LUCKNOW-226 011**

INDEX

S. No.	Topic	Page No.
1.	FUNCTION AND ROLE OF ELECTRICAL DTE	3
2.	INFRASTRUCTURE AND CAPABILITIES	3
3.	ROLE OF DIRECTORS/JOINT DIRECTORS OF VARIOUS GROUPS	3
4.	MAJOR WORK DONE DURING LAST ONE YEAR	5
5.	INFORMATION RELATED WITH VENDOR DEVELOPMENT	9
6.	DETAILS OF NEW SPECS AND AMENDMENTS ISSUED	11
7.	DETAILS OF TECHNICAL AUDIT REPORTS PREPARED AND ISSUED	12
8.	INVESTIGATION/OTHER REPORTS PREPARED & ISSUES	12
9.	STEPS TAKEN BY DTE FOR FACILITATING EASE OF BUSINESS	12
10.	RELIABILITY ENGINEERING	13
11.	RECENTLY COMPLETED PROJECTS	16
12.	ANNEXURE-1: ORGANISATION CHART	17

1.0 Functions and Role of Electrical Directorate:

Electric Traction was introduced in 1925 in the country with 1500 Volt DC system. Later on, the 25 KV AC system was introduced in 1959. With a modest beginning made almost 57 years ago, Electric Locomotives and Traction system have seen remarkable developments in terms of haulage capacity as well as reliability. The Electrical Directorate of RDSO has played a leading role in all these developments.

The functions of the Electrical Directorate include design and development of different kinds of Electric Locomotives and their equipments keeping pace with the changing technologies and need of the times, guiding the Zonal Railways/ Production Units with regard to problems experienced by them in the maintenance and operation of Electric Locomotives and their equipments, acting as a pivot between Railway Board and Zonal Railways in all technical matters pertaining to the performance of Electric Locomotives over Indian Railways. Therefore, the role of the Electrical Directorate is primarily to design and develop new locomotives and equipments with modern technologies and also to assist the Zonal Railways/Production Units in improving the reliability and act as the Technical Advisor to Railway Board.

2.0 Infrastructure and Capabilities:

The office of Electrical Directorate is headed by Principal Executive Director Standards Electrical assisted by officers at the level of Directors (SAG/SG/JA grade). These officers handle the work of different equipments/ their systems used in Electric Locomotives of different designs. Broadly, these have been classified into following groups:

- (i) System Engineering
- (ii) Mechanical Group
- (iii) Pneumatic
- (iv) Three Phase System
- (v) Traction Motor

3.0 Role of Director/Executive Director of the group:

- (i) Director/Executive Director is the in-charge of each group and is assisted by one senior/junior scale officer and 3 to 4 staff in supervisory category. The Organization chart is enclosed in Annexure-I.
- (ii) Each group handle work related to design, development, performance, vendor development and service engineering for the Railways related to different equipment including state of the art technology for overall

- improvement of the reliability, safety and availability of the respective equipment and the locomotives.
- (iii) The overall work involves preparation of specification, development of product/locomotive through reputed manufacturers worldwide, prototype inspection & testing, commissioning and monitoring of their performance in field for overall improvement of productivity of the Indian Railways.
 - (iv) Various problems experienced and reported by Zonal Railways/Production Units are examined/studied from time to time regarding the performance of locomotives/equipment in field and corrective action/guidance are issued in the form of Modification Sheets, Special Maintenance Instructions, Technical Circulars, and Reports etc.
 - (v) Simulation software related to haulage capacity of different kinds of locomotives has been developed and used to simulate and study different conditions of load, gradient, speed etc. Further, a state of art electrical laboratory for testing of various equipment is also being established as an additional facility by the Directorate.
 - (vi) Each group help and guide Railways by issuing different documents such as Specifications, Schedule of Technical Requirements (STR), Special Maintenance Instructions (SMLs), Modification Sheets (MS), Reports, Drawings pertaining to various equipment.

4.0 Induction of new technologies/System Improvements:

- (i) EOTT: This system can do away with Brake Van and Gaurd. Thereby it will increase one more wagon in a freight train.
- (ii) DPWCS: This system will facilitate long haul train operations.
- (iii) LED based twin beam head light: Improvement in Head light for better view of signals & track.
- (iv) Metalized Carbon Strips for pantograph with Auto dropping device : A wearable spare of HRPT
- (v) EP Assisted brake system for 3- phase Electric locomotive application compatible with EP assisted brake system on coaches: This will result in fast application and releasing of pneumatic brakes
- (vi) Development of functionally equivalents cards of GTO based Convertors and MICAS VCU of 3-Phase Electric Locomotive: Promoting of indigenous development.
- (vii) Single phase to three phase 2x130 kVA convertor (SIV) for conventional locomotives: Auxiliary converter with redundancy
- (viii) Computer / Microprocessor controlled air brake for 3 phase electric locomotive : Improvement over electronically controlled pneumatic brakes
- (ix) Development of Hotel Load Converter for WAP7 loco- To facilitate Head on Generation, No need of Power Car.

- (x) Implementation of Real-time Train Information System (RTIS) on Electric Locos- On line monitoring of various parameters of locomotive & health of equipments.
- (xi) Indigenous development of Radio equipment for Distributed Power Wireless Control System (DPWCS)- to achieve interoperability among DPWCS of different make & in turn improvement in operational efficiency.
- (xii) Provision of LED type light for exchanging signals with train passing staff- To avoid the frequent opening of windows of air conditioned cab for exchanging the signals-MS 0470 issued for implementation.
- (xiii) Review of AC Traction Manual- Owing to technical advancements, new rolling stock and changes in maintenance practices updating of ACTM have been undertaken.
- (xiv) Review of Periodicity of Maintenance Schedule of Electric locomotives- to improve the availability of loco & in turn operational efficiency.
- (xv) Review of codal life of Electrical Assets: The usable life of equipment has improved owing to change in designs, maintenance practices & technological advancements and therefore revision of codal life of Electrical asset is undertaken.
- (xvi) Development of On line failure Monitoring Portal- to facilitate on line failure reporting by ZR/PU
- (xvii) Development of Integrated Converter (Traction Converter + HLC) in same cubicle for WAP5 loco- Owing to space constraint in WAP 5 loco where independent unit of Hotel Load Converter can't be installed, integrated converter has been developed.

5.0 Major Development Work done during last one year:

5.1 Development of End of Train Telemetry (EoTT)

End of Train Telemetry (EoTT) System consisting Head on Train (HoT) and End on Train (EoT) units mounted on Locomotive & last wagon respectively, envisages communicating with each other over radio frequency to replace duty of Guard. This system would enhance the safety in train operation besides improving operational efficiency. P.O placed for 10 sets by ECoR on 14.02.2020 on four firms: M/s AAL- 3 sets, M/s Signotron- 3 sets, M/s Siemens- 2 sets & M/s Tata- 2 sets. Design review of all four firms (M/s AAL, M/s Signotron, M/s Siemens & M/s Tata Power) done . 2 sets of M/s Siemens & 2 sets of M/s Signotron have been put under trial since Nov'21 & Dec'21 respectively. BLW placed order of 250 sets (M/s PPS-200 sets, M/s Hind Rectifier-18 Sets, M/s Medha- 16 sets & M/s Lotus- 16 Ses). Type testing of M/s Signotron & M/s PPS' EoTT systems is under process.

5.2 Development of Regenerative Braking feature in WAG7 locomotive

RDSO vide letter no. EL/3.2.19/RB/Tender dated 29.05.2018 had issued Letter of Acceptance (LOA) to M/s Medha Servo Drives Pvt. Ltd., Hyderabad for

“Development of regenerative braking features in WAG7 locomotives” for one locomotive. As per contract agreement the completion period was within 6 months from date of issue of LOA i.e. up to 28th Nov, 2018. Design document clearance of all additional equipment were provisionally accorded to M/s Medha Servo Drives Pvt. Ltd., Hyderabad vide letter No. EL/3.2.19/RB/Medha dated 14.12.2018. Installation & commissioning of regenerative braking system in WAG7 loco no. 24581 of ELS/LDH had been completed on 28.02.2019 at Loco Workshop Charbagh of Northern Railway. Loco no. 24581, WAG7 of ELS/LDH of Northern Railway fitted with Regenerative braking system was inaugurated by GM/ Northern Railway on 11.03.2019. Loco no. 24581, WAG7 of ELS/LDH of Northern Railway fitted with Regenerative braking system has completed field trial successfully. Project is completed.

5.3 Up-gradation of Speed of WAP7 to 160 KMPH

Under ‘Make in India’ ideology, the speed of existing WAP7 loco has been upgraded from 140kmph to 160kmph. Upgraded WAP7 loco (designated as WAP7HS) can haul 24 coach train at 160kmph. This will reduce the journey time and will improve line capacity. Prototype unit of WAP-7HS locomotive has been manufactured by CLW. Oscillation trials have been conducted successfully. Railway Board vide letter no. 2020/CEDO/SR/06(1) dated 13.03.2020 had accorded the sanction for Introduction of the BG WAP-7HS class of locomotive to RDSO’s General Arrangement Drawing No. SK. EL-5033 [Unique Transportation Code: WAP-7HS; Maximum Axle Load:18.08±2%t] up to a maximum speed of 160kmph by Zonal Railways, on track maintained as per specified under Para 607 of IRPWM Reprint-2004 for operation on Indian Railways. This will be the first indigenously developed high speed & high horse power electric locomotive under ‘Make in India’ ideology.

5.4 Design Review and Development of WAG12 locomotives

The contract for procurement and maintenance of 12000 HP locomotive had awarded to M/s ALSTOM Manufacturing India Ltd. An agreement has been signed between Ministry of Railways and M/s Madhepura Electric Locomotive Private Limited (a joint venture of Ministry of Railway and M/s ALSTOM Manufacturing India Ltd.) for setting up Electric locomotive factory at Madhepura, Bihar (India) and Procurement cum Maintenance of Electric Locomotives. Contract has been done for procurement and maintenance of 12000 HP electric locomotives (800 Nos.). Madhepura Electric Locomotive Private Limited (M/s MELPL) has notified the occurrence of the appointed date on 27.02.2016 with regard to agreement for setting up of Electric Locomotive Factory, Madhepura (Bihar). In the first phase, as per the contract, M/s MELPL has supplied prototype 12000 HP WAG12 electric locomotive. M/s MELPL submitted design documentation as required per Schedule G of the PCMA. RDSO had carried out design review of WAG12 locomotive in compliance with Article 13.1.2 of PCMA. First prototype WAG12 locomotive offered for testing in March 2018 and detailed oscillation trials of WAG12 locomotive carried out initially in July 2018. But WAG12 locomotive found unsatisfactory on account of riding and stability characteristics at 70 kmph on the basis of test results contained in RDSO’s report

no. RDSO/2018/TG/MT-1551/F. After modifying vertical and lateral damper, re-oscillation trial was done in APRIL-2019 but again vehicle exhibit unsatisfactory behaviour in the trial as per Testing Directorate's report no. RDSO/2019/TG/MT1605/F/rev.0 dated 30.04.2019. In order to meet satisfactory trial results M/s MELPL has modified fabricated flat bogie of WAG12 to Fabricated Gooseneck bogie, Traction rod shifted from external side to internal side of Bogie and secondary suspension from resilient pads to helical coil spring. Railway Board vide letter no. 2019/Elect./Dev/440/6 dated 29.08.2019, has allotted unique transportation code for modified 12000 HP locomotive as WAG12B.

First WAG12B prototype locomotive with number 60020 was offered for test & trial by M/s MELPL in November 2019.

- 12000 HP WAG12B locomotive manufactured by MELPL, oscillation trial was started and completed during Dec. 2019 at 110 kmph over SNL-NMDA section of NR.
- Oscillation & EBD trial of WAG12B locomotive has been completed on 19.01.2020 at 132 kmph & 120 kmph respectively over NAD-MTJ section of WCR.
- Final speed certificate for operation of WAG12B class of locomotive up to a maximum speed of 100 kmph issued on 18.02.2020.
- Railway Board sanction for operation of WAG12B class of locomotive over Indian Railway at a maximum speed of 100 kmph had received vide letter no. 2020/CEDO/SR/08 dated 28.04.2020.
- Final speed certificate for operation of WAG12B class of locomotive up to a maximum speed of 120 kmph issued on 18.02.2020.
- CCRS office has sent its recommendation to Railway Board for operation of WAG12B class of locomotive over Indian Railway at a maximum speed of 120 kmph in July 2020.
- Railway Board's sanction for operation of WAG12B class of locomotive over Indian Railway at a maximum speed of 120 kmph had received vide letter no. 2020/CEDO/SR/08 dated 12.10.2020.

Design Features of WAG12B locomotive (12000HP)

- Architecture - BoBo+BoBo
- Wheel Dia - 1250 mm
- Weight - 180 tons (upgradeable upto 200 tons)
- Axle load - 22.5 tons (upgradeable upto 25 tons)
- Starting TE - 706 kN @ 22.5 t ; 785 @ 25t
- Maximum speed - 120 kmph
- Regenerative BE - 514 kN @ 22.5 t ; 563 kN @ 25 t

5.5 Up gradation of WAG9HC to 9000 HP

Under 'Make in India' ideology, the power of existing WAG-9HC loco has been upgraded from 6000HP to 9000HP. Power enhancement of upgraded WAG-9HC loco (designated as WAG-9HH) has increase the balancing speed of WAG9HC locomotive from 35 kmph to 50 kmph. This will reduce the journey time and will improve line capacity. Prototype unit of WAG-9HH locomotive has been manufactured by CLW. Oscillation & EBD trails have been conducted successfully and final speed certificate for operation up to a maximum speed of

100 kmph has been issued in April 2020. Vide letter no. 2020/CEDO/SR/11E dated 18.09.2020, Railway Board has accorded the sanction for use of WAG9HH loco on IR.

5.6 COCR of Push Pull Operation

Confirmatory Oscillograph Car Run (COCR) of Special Rajdhani Express train with a rake comprising of 22 LHB AC (EOG) variant coaches including two LHB Generator Vans with single WAP7 locomotive at front of rake and single WAP7 locomotive at rear of rake (Push-Pull operation) at maximum speed of 130 kmph between Howrah (HWH) to New Delhi (NDLS) and back on track maintained as per Para 607 of IRPWM third reprint-2019 has been done from 19.11.2019 to 25.11.2019 and report has been issued vide report no. RDSO/2019/TG/MT- MT-1661/F, Rev.0 Dt. 11.12.2019 Amendment-Nil.

Based on the test data recorded, it is concluded that for all the vehicles covered under the trial, the average no. of vertical and lateral acceleration peak values are within the limit of 0.25 peak/km set by Policy Circular No. 6 mentioned in Para 5.1 of this report and the maximum value of vertical and lateral acceleration does not exceed 0.35 g at any location over the trial route.

5.7 Development of unified specification of CVVRS

In order to monitor the activities of LP and ALP for post accident analysis, RDSO has developed specification no. RDSO/2015/EL/SPEC/0118 Rev.1 issued on 24.10.2019 for Crew Voice and Video Recording System and issued to Zonal Railways/CLW for further necessary action.

5.8 Development of 2 * 130 KVA SIV

Four vendors namely M/s Hind, M/s Siemens, M/s ABB & M/s Medha have applied for fresh vendor registration. These firms have been included in vendor directory as developmental sources with limited quantity of initial supply. Prototype testing of SIV by M/s Hind & M/s Siemens have been completed. One unit of SIV of M/s Hind is under field trial and one unit of SIV of M/s Siemens is under fitment at ELW/BSL.

5.9 Development of Interoperable DPWCS

The specification of Interoperable DPWCS for AC Electric locomotives bearing no. RDSO/2019/EL/SPEC/0142 Rev. '0' was issued on 03.04.2019. 58 sets (3-phase loco) & 9 sets (conventional loco) of DPWCS are in operation. Interoperability has to be tackled at two levels i.e. Hardware Level & software level. The interoperability required at hardware level has been completed with indigenously developed data radio through M/s BEL/Panchkula. The interoperability at software level requires common communication protocol for different OEMs of DPWCS. The Common Communication protocol has been advised to firms & have changed their existing DPWCS software accordingly and same is under validation by firms. The trials to prove interoperability is likely

to start in 2nd week of Dec'2020. The interoperability will lead to benefits like Flexibility in operation of locomotives fitted with DPWCS of different make, Import substitution & simplifying the requirements for obtaining an operator's license for radios from Wireless Planning & Co-ordination (WPC) wing of Telecommunication etc.

5.10 Provision of anti-falling arrangement for traction motor in 3-phase locomotives

To avoid the falling of TM online due to breakage of TM support in WAP-7/WAG-9H locomotive provision of anti-falling traction motor arrangement was discussed during the meeting cum workshop held at ELS/GZB on 25.07.2019. Proposed designs of the firms M/s Ashika Commercial Pvt. Ltd, Kishangarh, Rajasthan and M/s Anup Malleables Ltd., Dhanbad were finalized with minor dimensional/correction based on successful fitment of the proposed designs during demonstration held at ELS/CNB on 03.09.2019. On trial basis M/s Ashika Commercial (P) Ltd. Kishangarh provided anti-falling TM arrangement in ELS/AQ based WAG9H loco no. 31388 and WAP7 loco no. 30465 & M/s Anup Malleable Ltd. Dhanbad provided anti-falling TM arrangement in ELS/TATA based WAG9H loco no. 31662. Fitment trial of both firms Anti falling arrangement is found satisfactory and no problem noticed till date. Further, M/s Ashika Commercial (P) Ltd., Kishangarh, Rajasthan provided Anti falling arrangement successfully in ELS/GZB based WAP7HS (High Speed) loco no. 30750 on 01.08.2020.

5.11 Conversion of WDG4 loco to cost effective WAG11 Ver4 loco

Banaras Locomotive Works (BLW) has been advised to undertake the conversion of one WDG4 locomotive to cost effective WAG11 Ver4 locomotive vide this office letter no. EL/11.5.5/20 dated 23.11.2020.

5.12 Important letters/documents issued:

- (i) RDSO guideline No. EL/G/2008/01 Rev.4 regarding Rehabilitation of PCB Cards.
- (ii) Instructions for improving the reliability of motor supports of bogies of WAP7/WAG9/WAG9H.
- (iii) Replacement schedule of spheriblocs in coaching locos.
- (iv) Revision of Periodicity of major schedules (TOH & IOH) of WAP5 locos in line with WAP7 Locomotives.
- (v) Uses of Spheriblocs in three phase Electric Locomotives.
- (vi) Revised periodicity of maintenance schedule of electric locos (WAP7, WAG9, WAP4 & WAG7) have been circulated to Zonal Railways vide RDSO vide letter no. EL/3.6.1, dated 13.1.2020,

- (vii) Instruction for withdrawal of MS 405 & implementation of MS 446 have been communicated to Zonal Railways/PUs/Workshops vide RDSO letter no. EL/2.2.21, dated 04.11.2020

6.0 Information related with Vendor Development:

The various developmental works related with vendor registration is summarized as below:

- (i) Involving Industry in Specification drafting activity
- (ii) Specifications being reviewed with inputs from all stakeholders
- (iii) Direct enlistment of new vendors as Developmental Vendor for items having limited vendors
- (iv) Increasing Vendor Base- Open ended EOIs invited for items less than 3 vendors
- (v) All information pertaining to vendors are uploaded on RDSO website.
- (vi) Regular updation being done.
- (vii) All long pending cases cleared

Status of Vendor Registration Cases

S. No.	Directorate	Total pending cases in Oct'2020	Additions in the November 2020	Cleared during Oct' 2020	Pending
1.	Electrical	18	1	0	19

Make in India policy initiative

- (i) Compliance to Public Pr. Policy (Pref. to MII) Order – 2017 dtd 4 June 2020.
- (ii) The items where sufficient Indian capacity exists are being identified.
- (iii) Restrictive clauses in Specifications being reviewed..

Digital Initiatives launched

- (i) Digital Inspection Certificates (ICs) being issued.
- (ii) Paperless Vendor Registration System implemented (01/07/2020)
- (iii) Procurement of products & services through GeM for items available on GeM

6.1 Expression of Interest (EOI):

In order to develop more vendors EOI has been floated for following items of Electrical Dte.

- (i) Axle Box Bearing For WAP5 Locomotives
 - a. Main Gear bearing for Aluminium Gear Case of WAP5
 - b. Intermediate Gear bearing for Aluminium Gear Case of WAP5.
 - c. Pinion bearing
- (ii) LED based twin beam head light
- (iii) Expression of Interest (EOI) was published for 'Third Party Audit and Certification of the Modification carried out in Software & Hardware of WAP5/WAP7 Locomotives for Safe Operation in Push-Pull Mode' vide Note No. EL/3.1.35/4 dtd. 06.05.21.

7.0 Details of new specs and amendments issued:

2019-20:

- (i) RDSO/2019/EL/SPEC/0142 Rev.'0'- Specification for Interoperable Distributed Power Wireless Control System.
- (ii) RDSO/2019/EL/FRS/0027 Rev. '0'- Functional Requirement specification (FRS) of 4-Quadrant Converter for Conventional Electric locomotives converted from diesel (ALCO) locomotive.
- (iii) RDSO/2015/EL/SPEC/0118 Rev. '1'- Specification for Crew Voice & Video Recording System (CVVRS) for Electric and Diesel Locomotives.
- (iv) RDSO/2007/EL/SPEC/0053/Rev.'1'- Technical Specification for Elastic Ring used on Three Phase Drive Electric Locomotives(WAP5, WAP7 & WAG9)
- (v) FRS No. RDSO/2019/EL/FRS/0025 Rev.'0'- Functional Requirements Specification of End-of-Train Telemetry (EoTT) System for Indian Railways
- (vi) RDSO/2008/EL/SPEC/0025/Rev.'6'- Specification for Vigilance Control Device to be used in 25 kV AC TAP changer Locomotive.
- (vii) RDSO/2007/EL/SPEC/0054 (Rev'3')- Technical specification for High Reach Pantograph for AC Electric Locomotives.
- (viii) RDSO/2017/EL/SPEC/0134 (Rev'1')- Specification of twin Beam LED head light for Electric Locomotives.

2020-2021 :

- i. Final draft specification of Single Phase to Three Phase 2 x 13 KVA SIV, Spec no. RDSO/2018/EL/SPEC/0140, Rev. 1 along with reasoned document uploaded on RDSO website for comments/suggestions.
- ii. Following three final draft STR along with reasoned document uploaded on RDSO website for comments / suggestions:
 - RDSO/2007/EL/STR/0015, Rev.1, for Main Compressor on 18.11.20.

- RDSO/2011/EL/STR/0076, Rev.2, for Brake System for three phase Electric Locomotives on 24.11.2020.
 - RDSO/2008/EL/STR/0049, Rev.2, for manufacture of Pantographs for Electric Locomotives on 23.11.2020.
- iii. Final draft specification bearing no. RDSO/2008/EL/SPEC/0067,Rev.3 along with reasoned documents for Cable transit system with EPDM rubber modules in Electric Locomotives/EMU/MEMU/Metro have been prepared and uploaded on RDSO website for suggestions/comments from ZRs/PUs vide note no. EL/2.2.37, dated 23.11.2020.
- iv. Final draft Schedule of Technical Requirement bearing no RDSO/2014/EWL/STR/0082, Rev-1 along with reasoned documents for manufacture & supply of cable transit system with EPDM rubber modules for Electric Locomotives/ EMU/ MEMU/ Metro have been prepared and circulated to ZRs/PUs for their comments vide note no. EL/2.2.37, dated 23.11.2020.
- v. Final specification no. RDSO/2018/EL/SPEC/0139(Rev-1) and Draft STR no. RDSO/2018/EL/STR/0091(Rev-1) for development of functionally equivalent cards for GTO based converters and MICAS VCU has been reviewed and revised documents have been uploaded on RDSO website.
- vi. Final draft of Specification No. RDSO/2007/EL/SPEC/0051 Rev. 3 of Spheriblocs for 3 phase locomotives has been uploaded on website for 15 days on 12.11.2020.

2021-22 :

- i. Final specification of EoTT RDSO/2021/EL/SPEC/0244 Rev '0' uploaded on website on 11.5.2021

8.0 Technical Audit Reports prepared and issued are as under:

Dated	Letter/Document No.	Description
25.10.2019	RDSO/2015/EL/TAR/0021 Rev. '0'	Technical audit report of M/s FTRTIL towards failures leading to non application of brake through Driver Brake Controller (DBC/A9) in service zone in three phase electric locomotives.

9.0 Investigation/Other Reports prepared & issues are as under:

Report No.	Description
RDSO/2019/EL/IR/0186 Rev'0', dated 10.06.2019	Technical Investigation Report of Axle seizure due to Bearing failure of Traction

	Motor type 6FRA6068 fitted in Locomotive No. 30549/WAP-7/SRC on 24.04.2019 between Bhusawal– Badnera section on Bhusawal division.
RDSO/2019/EL/RM/0187 Rev'0', July'2019	Technical Report on Important Fasteners for Electric Locomotives.
Report No. 49/19.	Metallurgical Investigation of broken traction motor support lug of loco no.30382/WAP7/GZB.
RDSO/2019/EL/RM/0188 Rev'0', Sept'2019	Compendium on Push Pull Operation of WAP5/WAP7 Locomotives over Indian Railways.
MP.Misc-347, September 2019	Finite element analysis of fabricated bogie frame of WAP7 Locomotive.
RDSO/2020/EL/RM/0191 (Rev. '0') Nov'2020	Report On Conversion of WAP1/WAP4 Electric Locomotives for Mixed Traffic

10.0 Steps taken by Electrical Dte for facilitating ease of business.

- (i) Electrical directorate has developed a common vendor development procedure in accordance with ISO cell directives.
- (ii) The procedure is also available on RDSO website www.rdsso.indianrailways.gov.in
- (iii) Status of vendor registration (Fresh) case wise made available online.
- (iv) Status of vendor up-gradation case wise made available online.
- (v) List of specifications & Schedule of Technical Requirements (STR) available online for items for which registration is done by Electrical Dte.
- (vi) Compilation of Data and presenting in MSG Meeting.
- (vii) System of Publishing of EOI for development of sources for new items.
- (viii) Uploading of Specifications/STR on RDSO Website before finalizing it.

11.0 Reliability Engineering:

Following SMLs/MSs/TCs have been issued during year 2019-2020 & 2020-2021 (upto Nov'2020):

11.1 Special Maintenance Instructions:

2019-2020:

- (i) RDSO/2019/EL/SMI/0328,Rev.0 dated 26.08.2019.

2020-2021 :

Nil.

2021-2022:

- i. RDSO/2021/EL/SMI/0329, Rev.0 dated 21.5.2021

11.2 Modification sheets:

2019-2020:

- (i) RDSO/2019/EL/MS/0477 (Rev 0) dtd. 18.06.2019: Operations of WAP-5/WAP-7 in push pull.
- (ii) MS No. RDSO/2019/EL/MS/0480, (Rev-0) has been issued vide letter no. EL/3.1.35/2/(Elect) dated 05/12/2019 for Modification in earth fault circuit for elimination of spurious message on account of earthing of control cables in 3-phase locomotives.
- (iii) RDSO/2019/EL/MS/0478 (Rev 0)- Adoption of Traction motor labyrinths of TM type 6FRA6068 as per original dimensions given by ABB to eliminate problem of gear case oil ingress in TM.
- (iv) Addendum-I to MS-0412 dated 08.07.2020 was issued regarding location of ULV isolating cock in compliance to 39th MSG decisions.

2020-2021

- (i) Draft Modification Sheet for 'Modification in MRB circuit working in cooling mode in IGBT based WAP5, WAP7, WAG9/9H class of locomotives' has been circulated to Zonal Railways and PUs vide this office letter no. EL/3.1.35/17 dated 19.08.2020.
- (ii) Modification Sheet for Energy Saving in 3-phase freight electric locomotives has been issued to Zonal Railways and PUs vide this office letter no. EL/3.1.35/17 dated 30.09.2020.

11.3 Technical Circulars:

2019-2020:

- (i) RDSO/2019/EL/TC/0151 Rev.0-Technical Circular for measurement of 'C' Clearance in MSU assembly of 6FRA-6068 Traction motors in WAG/WAP7 class Locomotives.

- (ii) RDSO/2019/EL/TC/0152 Rev.0-Operation & Maintenance instructions for Real-time Train Information System (RTIS).
- (iii) RDSO/2019/EL/TC/0153 Rev.0-Acknowledgement of Vigilance Control Device (VCD) through PVEF in Microprocessor based control and fault diagnostic system (MPCS) version-3.

2020-2021:

- (i) The Technical Circular no. RDSO/2020/EL/TC/0154,Rev.'0',dated 19.11.2020 regarding procedure for manual CAB selection in Electric Locomotives fitted with Distributed Power Wireless Control System (DPWCS) in train consist have been issued & same has been uploaded on RDSO website vide RDSO letter no. EL/3.1.3/DPWCS, dated 19.11.2020.

11.4 Important Reliability Meetings held recently to review performance of following equipments:

- (i) Reliability meetings on performance of HV cable with Plug & CHT with OEMs & Railways.
- (ii) Meeting for performance review meeting of ESMON at ELS/GZB on 04/04/2019 with OEMs of ESMON & Railways
- (iii) Minutes of Meeting held at RDSO on 11.04.2019 related to high reach pantograph.
- (iv) Meeting on development of High Reach Pantograph as per specification No. RDSO/2007/EL/SPEC/0054 Rev.'3'
- (v) Meeting on Performance of High Reach Pantograph Type IR-05HR on 24.01.2020 at RDSO.
- (vi) Meeting on Performance of High Reach Pantograph Type LX 3600 on 24.01.2020 at RDSO.
- (vii) Meeting on Performance of High Reach Pantograph Type WBL-85HR on 24.01.2020 at RDSO.
- (viii) Meeting with Zonal Railways, Electrical and Signal Directorates of RDSO and TCAS developing firms through Video Conference on 24.08.2020.
- (ix) Meeting on DFCCIL TPWS through Video Conference with Railways and OEMs of TPWCS on 25.08.2020.
- (x) Meeting on 13.03.2020 for Proving the Interoperability between DPWCS of different makes through Tele Conference.
- (xi) Performance Review Meeting of 180 KVA Static Converter held at RDSO on 19.07.2019
- (xii) Meeting for the issues related to modified MSU drive system and MSU bearings of WAG-9/WAP-7 locomotives at RDSO on 10.10.2019
- (xiii) Minutes of Meeting of 'Axle Lock incidences on three phase Electric Locomotives' held at SER/HQ on 10.01.2020 & at ELS/SRC on 11.01.2020

- (xiv) Performance Review Meeting of Microprocessor based control and fault diagnostic system (MPCS) held at RDSO on 19.07.2019.
- (xv) Meeting at ELS/GZB on reliability issues on electronics cards of E-70 brake system.
- (xvi) Meeting held at RDSO on 02.05.2019 regarding E-70 brake system for 3-phase Electric Locomotives.
- (xvii) Minutes of Meeting on reliability related issues of Brake system of 3-Phase Electric Locos held at RDSO dated 29.11.2019.
- (xviii) Reliability of propulsion system of three phase locomotives.
- (xix) Meeting on issues of IGBT based aux and power converter of M/s Medha.
- (xx) Meeting for development of four quadrant control converter for WAG7 electric locomotive.
- (xxi) Meeting on issues of IGBT based aux and power converter of M/s BTIPL.
- (xxii) Meeting on issues of IGBT based aux and power converter of M/s CGPISL
- (xxiii) Meeting held at RDSO, Lucknow on 10.06.2019 on reliable scheme for operation of trains in push-pull mode.
- (xxiv) Meeting at Railway Board on 22.07.2019 on interfacing the passenger comfort amenities like Passenger Information System (PIS), Door Opening and Closing System etc with the TCN Compliant VCU.
- (xxv) Meeting at Railway Board on 27.08.2019 on Operation of Trains with Electric Locos in Push-Pull Mode.
- (xxvi) Reliability meetings on performance of Spheribloc used in three phase loco held at RDSO on 21.08.2019 & 04.12.2019.
- (xxvii) Meeting on reliability issues of traction link used in three phase locomotive held at RDSO on 06.06.2019.
- (xxviii) Meeting on reliability issues of Elastic ring used in three phase locomotive held at RDSO on 18.12.2019.
- (xxix) Meeting on reliability issues of Aluminium alloy axle guide link of electric locomotive held at RDSO on 18.12.2019.
- (xxx) Meeting was held at ELS/Bhilai on 13.12.2019 with M/s ABB to discuss the reliability issues. Representatives of RDSO, Zonal Railways and OEM were participated in the meeting. MoM was issued in this regard vide letter no. EL/11.5.5/21 dated 06.01.2020.
- (xxxi) Meeting was held on 17.12.2019 at RDSO, Lucknow with M/s CGL, M/s BTIPL and M/s Medha to discuss the reliability issues. Representatives of RDSO, Zonal Railways and OEMs were participated in the meeting. MoM was issued in this regard vide letter no. EL/11.5.5/21 dated 06.01.2020.
- (xxxii) Meeting was also held on 27.01.2020 at BHEL/EDN, Banglore to discuss the reliability issues. . Officers from Railway Board, RDSO, Zonal Railways and representatives from OEMs were participated in the meeting. MoM was issued in this regard vide letter no. EL/11.5.5/21 dated 12.02.2020.

- (xxxiii) Meeting on operational issues of WAG12B locomotive faced by Zonal Railways (ECR & NCR) held on 22.07.2020 with M/s MELPL, CELE/ECR & CELE/NCR.
- (xxxiv) Meeting held at Railway Board on 13.03.2020 for provisioning of TPWS and GSM equipment in three phase WAG-9/9H locomotives.
- (xxxv) Meeting on fitment of TPWS and GSM-R in Three phase WAG-9H class Locomotive held on 25.06.2020.
- (xxxvi) Meeting on interfacing of DPWCS with brake system & TCN VCU with OEMs and Railways on 11.06.2020.
- (xxxvii) Meeting for Proving the interoperability between DPWCS of different makes through Tele Conference with OEMs of DPWCS on 27.07.2020.
- (xxxviii) Meeting with CLW & OEMs of DPWCS on 09.11.2020 for DPWCS.
- (xxxix) A meeting was conducted by Railway Board through Video Conferencing on 12.11.2020 on failures of traction motor type 6FRA6068 associated with mechanical components and bearings and attended by RDSO, CLW, DLW and manufacturers of traction motor namely M/s BHEL, M/s CGL & M/s Saini Electricals. PED/RS/Railway Board expressed serious concern regarding increasing trend of traction motor failures. Minutes of Meeting has been issued vide letter No. EL/2.2.13 dated 16.11.2020 for implementation. Minutes of Meeting has also been uploaded on RDSO's website.
- (xi) Minutes of Virtual meeting held on reliability related issues of Brake System of 3-Phase Electric Locomotives conducted on 08.10.2020 have been issued to Railway Board, Zonal Railways and firms vide RDSO letter no. EL/3.2.19/3-Phase dtd. 09.11.2020.
- (xli) Meeting was held on 13.11.2020 and 17.11.2020 through Web/Video Conference with Railway Board and CLW to discuss the reliability issues of Harmonic filter capacitor of M/s Sunny make supplied by M/s Yash Capacitors Pvt. Ltd.
- (xlii) Meeting through Web/Video Conference was held on 12.11.2020 to discuss the reliability issues of different make Hotel Load Converter fitted in 3-phase electric locomotives. Representative from M/s Siemens, M/s BHEL, M/s Medha, M/s S. International and Zonal Railway were present.
- (xliii) Meeting through Web/Video conference was held on 03.12.2020 to discuss the reliability issues of M/s BHEL make IGBT based propulsion equipment of 3-phase electric locomotives with Railway Board, Zonal Railways, PUs and M/s BHEL.
- (xliv) Meeting through Web/Video conference was held on 11.12.2020 to discuss the reliability issues of M/s ABB make IGBT based propulsion equipment of 3-phase electric locomotives with Railway Board, Zonal Railways, PUs and M/s ABB.
- (xlv) Meeting through Web/Video conference was held on 28.05.2021 to discuss the reliability issues of M/s BHEL make IGBT based propulsion equipment of 3-phase electric locomotives with Railway Board, Zonal Railways, PUs and M/s BHEL. MoM was issued by CLW vide letter No. C-D&D/T/34(Part)/Progress dtd. 01.06.21.
- (xlvi) Meeting through Web/Video conference was held on 18.06.2021 to discuss the reliability and operational issues of WAG12B locomotive with Railway Board, Zonal Railways and M/s MELPL.

12.0 Recently completed major projects/achievements:

- 11.1 Up-gradation of Speed of WAP7 to 160 KMPH: The upgraded loco has been designated as WAP7-HS. Railway Board vide letter no. 2020/CEDO/SR/06(1) dated 13.03.2020 had accorded the sanction for Introduction of the BG WAP-7HS class of locomotive.
- 11.2 Sanction of the Ministry of Railways, Railway Board was obtained for Introduction of operation of 12000 HP WAG11 locomotives (converted from WDG4 Diesel Loco).
- 11.3 Up gradation of WAG9HC to 9000 HP WAG-9HH locomotive
- 11.4 Design Review and Development of WAG12B locomotives.

Organisation Chart of Electrical Directorate

