



भारत सरकार-रेल मंत्रालय
अनुसंधान अभिकल्प और मानक संगठन
लखनऊ- 226011
e-mail: dse1rdso@gmail.com
Telephone : 0522-2465739

Government of India - Ministry of Railways
Research, Designs & Standards Organization,
LUCKNOW – 226011
Telex: 0535-2424 RDSO-IN
Fax: 91-0522-2452581



No. EL/3.1.28 (DML)

Dated: 13.01.2023

A. Principal Chief Electrical Engineer,

- | | |
|---|--|
| 1. Central Railway, Mumbai CST-400 001 | 2. North Western Railway, Jaipur-302 006 |
| 3. East Central Railway, Hazipur-844 101 | 4. South Central Railway, Rail Nilayam, Secunderabad-500 071 |
| 5. East Coast Railway, Chandrashekharpur, Bhubaneswar-751 016 | 6. South East Central Railway, Bilaspur- 495 004 |
| 7. Eastern Railway, Fairlie Place, Kolkata-700 001 | 8. South Eastern Railway, Garden Reach, Kolkata-700 043 |
| 9. North Central Railway, Subedarganj, Prayagraj-211 033 | 10. Southern Railway, Park Town, Chennai-600 003 |
| 11. Northern Railway, Baroda House, New Delhi-110 001 | 12. South Western Railway, Hubli-580 024 |
| 13. North Eastern Railway, Gorakhpur-273001 | 14. West Central Railway, Jabalpur-482 001 |
| 15. North East Frontier Railway, Maligaon, Guwahati-781 011 | 16. Western Railway, Churchgate, Mumbai- 400 020 |
| 17. Banaras Locomotive Works, Varanasi-221004 | 18. Patiala Locomotive Works, Patiala- 147003 |
| 19. Chittaranjan Locomotive Works, Chittaranjan-713331 | |

B. Chief Workshop Manager

1. Electric Loco Workshop, Eastern Railway, Kancharapara, 24 Pargana (N) -743145
2. Electric Loco Workshop, Central Railway, Bhusaval- 425 201.
3. Traction Motor Workshop, Central Railway, Nasik-422 101.
4. Rolling Stock Workshop, Western Railway, Dahod, P.O. Freelandganj – 389160
5. Charbagh Workshop, Northern Railway, Lucknow- 260 005.
6. POH Shop, South Eastern Railway, Kharagpur-721301
7. POH Shop, Southern Railway, Perambur, Chennai-600 038.

Sub: Uniformity in POH activities, Costing and Review of Must Change Items.

Ref.: (i) Committee Report No. RDSO/2022/EL/RM/0198(Rev-1) of Nov'2022
(ii) Railway Board letter no. 20216/Elect.(TRS)/138/2 Pt. dated 18.01.2023.

Vide letter under Ref. (ii) above, Railway Board has communicated the approval of Committee Report under Ref.(i) above on subject matter. The copy of report alongwith aforesaid Railway Board letter is sent herewith for your kind information & necessary action please.

ARVIND PANDEY
Digitally signed by
ARVIND PANDEY
Date: 2023.02.13
12:26:19 +05'30'

(Arvind Pandey)

for Director General Std. / Electrical

Encl: As above

Copy to:

Secretary (Electrical), Railway Board, Rail Bhavan, New Delhi-110001 (Kind Attn.: Shri Kishore Vaibhav, EDEE/RS/RB): for kind information please.

ARVIND PANDEY
Digitally signed by
ARVIND PANDEY
Date: 2023.02.13
12:27:10 +05'30'

(Arvind Pandey)

for Director General Std. / Electrical

Encl: Nil



भारत सरकार GOVERNMENT OF INDIA
रेल मंत्रालय MINISTRY OF RAILWAYS
(रेलवे बोर्ड) RAILWAY BOARD



No. 20216/Elect (TRS)/138/2Pt.

New Delhi, Dated: 18.01.2023

Director General (Elect.)
RDSO
Manak Nagar
LUCKNOW

Sub: Uniformity in POH activities, Costing and Review of Must Change Item.

Ref: (i) RDSO report No. RDSO/2022/EL/RM/0198 (Rev-1) of Nov'2022 (copy attached).
(ii) Board vide letter No. 2021/Elect (TRS)/138/2 Dated 30.05.2022 & 03.08.2022

Reference (ii) above, Committee nominated by Board on improvement of reliability of three phase locomotive, has submitted the revised updated report. The report has been examined and following is approved by the Board (Member/T&RS).

- (i) The standard list of activities under Para 4.1 (for POH activities for conventional locomotives), Para 4.2 (for POH + Re-cabling activities of conventional locos), Para 4.3 (for MTR activities of conventional locomotives) & Para 4.4 (for POH of 3-phase locomotives) of the report is accepted to have uniformity during POH activities & cycle time. (Copy attached as **Annexure-I**).
- (ii) The reviewed Must Change items of TOH / IOH / POH / POH + RC / MTR under **Annexure-II** is to be followed to have real time based replacement. The items (Must Change) covered under TC 0123 have been classified in three categories are also mentioned in Annexure.
- (iii) All Workshops to follow Uniform POH Unit Costing System for Locomotives prepared by CRIS on AIMS Portal (as recommended by Railway Board's committee of CWM / BSL (Convener), CWM / KPA, DyCEE / KGP constituted vide L.No. 2007/Elect(TRS)/440/4 dated 15/12/2008).
- (iv) Since availability of adequate UES will reduce cycle time of POH, POH workshops to assess their requirement holistically duly considering the load allotted presently and tentative load for next two years (vide POH co-ordination meeting 2022-23 allotment minutes dated 07.03.2022) and submit a proposal duly vetted by associated finance through GM as per extant guidelines.

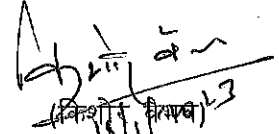
/3059187/2023

While assessing the requirement previous experience regarding scarcity of material may also be taken care off. Workshops should also consider the umbrella work already sanctioned vide Pink book item no. 1225/2022-23 for creation of UES with in workshops before placing their further requirements if any.

- (v) A standing committee constituting of EDSE/RDSO (convenor), CWM/BSL, CWM/KPA, CWM/DHD shall be responsible for conducting annual reviews and shall present the action taken by the loco POH workshop on the directives issued and recommend the action to be taken for improving productivity of workshop in terms of cost, cycle time, utilization of UES and manpower during annual POH coordination meeting.

It is advised to circulate the Instructions to Zonal Railways & Production units and take regular feedback on implementation of Recommendations.

DA : As above


(किशोर वैभव)

कार्यकारी निदेशक विद्युत अभियांत्रिकी (चेल स्टॉक)

फ्लोर सं : 1, कमरा सं. : 113

रेलवे बोर्ड

टेली और फैक्स: 011- 23387736

ई मेल: kishore.vaibhav@gov.in



सत्यमेव जयते

भारत सरकार
रेल मंत्रालय

Government of India
Ministry of Railways

**Report of Committee
On
Uniformity
in
POH activities, Costing and Review of Must Change Item**

Report No. RDSO/2022/EL/RM/0198 (Rev.1)

विद्युत निदेशालय
अनुसंधान अभिकल्प और मानक संगठन
मानक नगर, लखनऊ- 226011

**ELECTRICAL DIRECTORATE
RESEARCH DESIGNS AND STANDARDS ORGANISATION
MANAKNAGAR, LUCKNOW - 226011**

SANJAY KUMAR TIWARI Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:33:15 +05'30' Shri Sanjay Kumar Tiwari, EDRS & Convener	SURENDRA KUMAR Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:02:25 +05'30' Shri Surendra Kumar, CMM/KPAW & Member	RAJESH KULHARI Digitally signed by RAJESH KULHARI Date: 2022.11.17 13:41:44 +05'30' Shri Rajesh Kulhari, CMM/BSL & Member	BINAY KUMAR Digitally signed by BINAY KUMAR Date: 2022.11.16 15:23:47 +05'30' Shri Binay Kumar, CMM/RSW/DHD & Member
--	---	--	---

Committee and Terms of Reference

Committee

Railway Board vide letter no. 2021/Elect(TRS)/138/2 dated 30.05.2022 has constituted committee comprising of following members to bring uniformity among workshops in terms of POH activities and their cycle time, creation of healthy unit exchange spares (UES) for various assemblies / sub-assemblies, review of must change items and adoption of uniform costing system for calculating cost of major schedule is as under

1. Shri Sanjay Kumar Tiwari	ED/RS/RDSO	Convener
2. Shri Surendra Kumar	CWM/KPA/W	Member
3. Shri Rajesh Kulhari	CWM/BSL	Member
4. Shri Binay Kumar	CWM/RSW/DHD	Member

Terms of Reference (TOR)

The term of reference for the committee is as under:-

- (i) To standardize the activities of POH/POH+RC and their time frame to bring uniformity in cycle time of Locomotives.
- (ii) To Plan the activities and UES in such a manner that Healthy UES assemblies / sub-assemblies will be replaced directly instead of utilizing the same assemblies after overhauling to increase the availability of Locomotive.
- (iii) To review the replacement of Must Change items of TOH/IOH/POH/POH+RC/MTR on real time based requirements to avoid any over maintenance in association with Zonal Railways.
- (iv) To adopt uniform costing system for calculating the cost of major schedules. Accountal of any unscheduled work during major schedule should be kept separately.

SANJAY KUMAR TIWARI Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:34:24 +05'30' Shri Sanjay Kumar Tiwari, EDRS & Convener	SURENDRA KUMAR Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:05:20 +05'30' Shri Surendra Kumar, CWM/KPA/W & Member	RAJESH KULHARI Digitally signed by RAJESH KULHARI DN: cn=RAJESH KULHARI, o=ELECTRIC LOCOMOTIVES WORKSHOP, CENTRAL RAILWAY, BUHUSAWAL, ou=ELECTRIC, postalCode=351044, c=IN Date: 2022.11.17 13:10:30 +05'30' Shri Rajesh Kulhari, CWM/BSL & Member	BINAY KUMAR Digitally signed by BINAY KUMAR Date: 2022.11.16 15:24:43 +05'30' Shri Binay Kumar, CWM/RSW/DHD & Member
--	--	--	---

1. Objective

To bring uniformity among workshops in terms of POH activities, their cycle time, review of Must Change Items on real time based requirements and adoption of uniform costing system for the purpose.

2 Background Information

POH Cycle times of different Workshop are different. There is also large variation in the cost of major schedule carried out by different shops despite all the workshops performing same activities for same type of Locomotives and most of the material being procured through RDSO approved sources against similar rates. In view of drastic increase in population of electric locomotives due to 100% electrification of B.G. lines, it is the need of the hour to standardize the various activities of Major schedules to bring uniformity among workshops for a particular Major schedule. The list of Must Change items of TOH/IOH/POH/POH+RC/MTR should also be reviewed on real time based requirements to avoid over maintenance and reducing the cost of major schedules. Further, workshops /sheds should adopt uniform costing system to calculate the costing of major schedules.

At present, there are six workshops i.e. BSL, KPA, CB, PER, KGP & DHD over Indian Railways. These workshops are responsible for carrying out POH, POH+RC, POH+TU, MTR, Special repair of accidental / damaged electric locos, manufacturing of new wheel set against sanctioned RSP and Repair of wheel sets against work order from running sheds of various class (WAG5, WAP1/4, WAP5, WAG9 / WAP7) of electric locomotives. Depending upon class of locomotive to be dealt, lay out of work shop, infrastructure facilities available, the POH shops will have to maintain various type of Unit Exchange Spares & to plan procurement action accordingly. This leads to variation in cycle time, Unit cost of major overhauling schedules among various workshops. The costing also differs depending upon the nature /method of work carried out in the workshops. This is not only affecting the cost adversely but also affecting the reliability of assets. The cycle time of overhauling also varies owing to improper allotment of locomotives i.e. not as per sanctioned capacity / holding capacity/ berthing capacity/manpower and infrastructure facility available with shops. Hence due consideration is to be given while deciding target/ allotment to workshops.

<p>SANJAY KUMAR TIWARI</p> <p>Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:35:08 +05'30'</p> <p>Shri Sanjay Kumar Tiwari, EDRS & Convener</p>	<p>SURENDRA KUMAR</p> <p>Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:06:01 +05'30'</p> <p>Shri Surendra Kumar, CMM/KPAW & Member</p>	<p>RAJESH KULHARI</p> <p>Digitally signed by RAJESH KULHARI DN: c=IN, o=ELECTRIC LOCOMOTIVE WORKSHOP, CENTRAL RAILWAY, Bhusawal, ou=ELECT, pseudonym=351c04d1c12df3a6a2a0721eb982941a1b6469aeb9947481d1c1b44c0d6d232, 4.2.0=at3b7f6b756ac789efca137623e3b838f402820a19628a17278999bae6c23c21, postalCode=425201, st=MAHARASHTRA, serialNumber=37c59f8a679210b030a4da37bf79109c8b497baa92aedc6bdc882b5de7e0c, cn=RAJESH KULHARI Date: 2022.11.17 13:11:55 +05'30'</p> <p>Shri Rajesh Kulhari, CMM/BSL & Member</p>	<p>BINAY KUMAR</p> <p>Digitally signed by BINAY KUMAR Date: 2022.11.16 15:25:20 +05'30'</p> <p>Shri Binay Kumar, CMM/RSW/DHD & Member</p>
---	--	--	--

3. Purpose:

- To standardize the activities of POH / POH+RC and their time frame to bring uniformity in cycle time of Locomotives.
- To Plan the activities and UES in such a manner that Healthy UES assemblies/sub-assemblies will be replaced directly instead of utilizing the same assemblies after over hauling to increase the availability of Locomotive.
- To review the replacement of Must Change items of TOH/IOH/POH/POH+RC/MTR on real time based requirements to avoid any over maintenance in association with Zonal Railways.
- To adopt uniform costing system for calculating the cost of major schedules. Accountal of any unscheduled work during major schedule should be kept separately.

In this connection, review of POH Activities, Cycle Time, Unit Exchange Spares for shops, POH Unit Cost and Must Change Items to be carried out and action plan to standardize these activities to be evolved.

4.0 Standardization of the activities under POH/POH+RC and their time frame to bring uniformity in cycle time of Locomotives:

On Indian railways, Electric loco sheds and workshops are responsible for carrying out major overhauling schedule of Electric locomotives in pre-determined time frame given by the Rly. Board. In POH, schedule of various activities carried out differently by different shops as per local prevailing practices and available facilities/ infrastructure; as such there is no uniformity in the methodology among the POH shops. Accordingly, the activities covered under POH/POH+RC have been standardized as under to bring uniformity in activities and their cycle time of Locomotives. There is variation in time taken to perform various activities (POH /POH+RC/ MTR) by different shops against norms/yard stick. Average time taken by different workshops during the first six months of 2021-22 is as below:

<p>SANJAY KUMAR TIWARI</p> <p>Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:35:49 +05'30'</p> <p>Shri Sanjay Kumar Tiwari, EDRS & Convener</p>	<p>SURENDRA KUMAR</p> <p>Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:06:42 +05'30'</p> <p>Shri Surendra Kumar, CWM/KPAW & Member</p>	<p>RAJESH KULHARI</p> <p>Digitally signed by RAJESH KULHARI DN: c=IN, o=ELECTRIC LOCOMOTIVE WORKSHOP, CENTRAL RAILWAY, BHUSAWAL, ou=ELECT, pseudonym=351c04d1c12d833a2a0721eb982941a15a469c90447491d1a1e4a4d06e2, 2.5.4.20=d83b7104b7564c798efca127b2e36838402820a19628a17278998bae6d23c21, postalCode=422001, ou=RAJAWASHTRA, serialNumber=37cc59f8ab79210b38c4da37b479109c8bc977baa92edeb0d0cc82b5de7e0c, cn=RAJESH KULHARI Date: 2022.11.17 13:13:25 +05'30'</p> <p>Shri Rajesh Kulhari, CWM/BSL & Member</p>	<p>BINAY KUMAR</p> <p>Digitally signed by BINAY KUMAR Date: 2022.11.16 15:25:54 +05'30'</p> <p>Shri Binay Kumar, CWM/RSW/DHD & Member</p>
---	--	---	--

Workshop	POH Conv. AC	POH 3-Phase	POH +RC	MTR
Norms	24 days	28 days	30 days	60 days
BSL	34.3	41.5	45	-
KPA	23.1	34.7	24.6	-
CB	46.25	-	-	-
PER	25.8	-	41.5	-
KGP	33.2	-	50.6	-
DHD	33	-	39.5	40.06
Average Cycle time	32.60	38.10	40.24	40.06

In order to achieve reduction as well as uniformity in cycle time for various major schedule (POH/ POH+RC/MTR) for conventional and 3-phase locomotives, the activities to be undertaken during major schedule has been standardized as per para 4.1, 4.2, 4.3 & 4.4.

<p>SANJAY KUMAR TIWARI</p> <p>Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:36:19 +05'30'</p> <p>Shri Sanjay Kumar Tiwari, EDRS & Convener</p>	<p>SURENDRA KUMAR</p> <p>Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:07:19 +05'30'</p> <p>Shri Surendra Kumar, CMM/KPAW & Member</p>	<p>RAJESH KULHARI</p> <p>Digitally signed by RAJESH KULHARI DN: c=IN, o=ELECTRIC LOCOMOTIVE WORKSHOP, CENTRAL RAILWAY, BHUSAWAL, ou=ELECT, pseudonym=351e04d1c12df3ba0a0721e6902941a1a16946dc90447401d1e1e4dc608f2, 2.5.4.20=883b7104b7564e798efca127b2c368384602820a1962ba1727899bbae6d3c21, postalCode=426201, st=MAHARASHTRA, serialNumber=37cc59f8ab79210b3f0c4da37bd79109b88c977ba92edc6b0dccc882b5de7e0c, cn=RAJESH KULHARI Date: 2022.11.17 13:14:53 +05'30'</p> <p>Shri Rajesh Kulhari, CMM/BSL & Member</p>	<p>BINAY KUMAR</p> <p>Digitally signed by BINAY KUMAR Date: 2022.11.16 15:26:20 +05'30'</p> <p>Shri Binay Kumar, CMM/RSW/DHD & Member</p>
---	--	---	--

4.2 Conventional Electric Locomotive Activities: POH + Re-cabling

Details of Activity / Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Lifting preparation	■																								
Holding		■																							
Paint removing		■	■	■																					
Berthing & Lifting				■	■																				
Bogie dismantling				■	■																				
Loco Equipment removal/stripping				■	■	■																			
Inside cleaning				■	■	■																			
Cable cleaning				■	■	■																			
Inside Painting				■	■	■																			
Under-frame cleaning				■	■	■																			
Bogie Overhauling				■	■	■																			
TM Overhauling				■	■	■																			
Electric Equipment Overhauling				■	■	■																			
Under-frame attention				■	■	■																			
Body attention				■	■	■																			
Modification works				■	■	■																			
Re-cabling of Locomotives & Equippping								■	■	■	■	■	■	■	■	■									
Bogie assembly																									
LT testing																									
Lowering of loco																									
III testing & movement																									
Rain water test																									
Owning Railway																									
Inspection, Booking and attention of booking																									
Cab painting, marking of various switches using stickers or writing work																									
PU painting (external), provision of external stickers or writing work																									
LP/ALP checking, Attention & Trial Run																									
Final Dispatch of loco																									

POH + RC CYCLE TIME – 25 working days for conventional locomotive.

SANJAY KUMAR TIWARI
Digitally signed by SANJAY KUMAR TIWARI
Date: 2022.11.21 12:37:12 +05'30'

Shri Sanjay Kumar Tiwari,
EDRS & Convener

Digitally signed by SURENDRA KUMAR
Date: 2022.11.15 17:08:43 +05'30'

Shri Surendra Kumar,
CMM/KPAW & Member

RAJESH KULHARI

Digitally signed by RAJESH KULHARI
DN: cn=RAJESH KULHARI, o=ELECTRIC LOCOMOTIVE WORKSHOP, CENTRAL RAILWAY, BHUSAWAL, ou=ELECT, postalCode=423021, st=MAHARASHTRA, serialNumber=37C999AB70210B38A6A17B079104C88C977BAA72EDC8B0DC8B2B5DE7EDC, cn=RAJESH KULHARI
Date: 2022.11.17 13:17:56 +05'30'

Shri Rajesh Kulhari,
CMM/BSL & Member

BINAY KUMAR

Digitally signed by BINAY KUMAR
Date: 2022.11.16 15:27:26 +05'30'

Shri Binay Kumar,
CMM/RSW/DHD & Member

4.3 Conventional Electric Locomotive Activities: MTR

Details of Activity / Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Lifting preparation	Blue																																		
Hoisting		Orange																																	
Paint removing		Dark Red	Dark Red																																
Berthing & Lifting			Dark Blue	Dark Blue																															
Bogie dismantling			Dark Red																																
Loco Equipment removal/stripping			Light Blue	Light Blue	Light Blue																														
Ins de cleaning			Light Blue	Light Blue	Light Blue	Light Blue																													
Cable cleaning				Light Green																															
Ins de Painting					Dark Purple																														
Under-frame cleaning					Dark Green																														
Angle Overhauling			Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange
TM Overhauling			Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple	Dark Purple
Electric Equipment Overhauling			Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red	Red
Under frame attention			Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue
Body attention			Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
Insufflation and new fabrication works			Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green
Re-railling of locomotives																																			
Equipping																																			
Re-piping of Locomotives																																			
Bogie assembly																																			
LT testing																																			
Lowering of loco																																			
IIT testing & movement																																			
Rain water test																																			
Owning Railway Inspection, Booking and attention of booking																																			
Cab painting, marking of various switches using stickers or writing work																																			
PU painting (external), provision of external stickers or writing work																																			
LP/ALP checking, Attention & Trial Run																																			
Final Dispatch of loco																																			

MTR CYCLE TIME – 35 working days for conventional locomotive.

SANJAY KUMAR TIWARI
Digitally signed by SANJAY KUMAR TIWARI
Date: 2022.11.21 12:37:36 +05'30'

Shri Sanjay Kumar Tiwari,
EDRS & Convener

Digitally signed by SURENDRA KUMAR
Date: 2022.11.15 17:09:29 +05'30'

Shri Surendra Kumar,
CMM/KPAW & Member

RAJESH KULHARI

Digitally signed by RAJESH KULHARI
DN: cn=RAJESH KULHARI, o=ELECTRIC LOCOMOTIVE WORKSHOP, CENTRAL RAILWAY, BHUSAVL, ou=ELCT,
pseudoym=3510461c12d6f3a2a2d721ab98
2941310b6d909047401d1e1b4c4d6d2,
2.5.4.2b=d88710b675640786ca127b3e36838
f40220a1962ba1727898bae6d23c21,
postalCode=422021, st=MAHARASHTRA,
serialNumber=37c598ab79210b38c6da37bd
7910b8d977ba026d4806d0c08265de70c,
cn=RAJESH KULHARI
Date: 2022.11.17 13:19:27 +05'30'

Shri Rajesh Kulhari,
CMM/BSL & Member

BINAY KUMAR
Digitally signed by BINAY KUMAR
Date: 2022.11.16 15:28:00 +05'30'

Shri Binay Kumar,
CMM/RSW/DHD & Member

4.4 Three-Phase Electric Locomotive activities : POH

Details of Activity / Days	Days	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Lifting preparation	1	■																								
Holding and Incoming Loco Testing	1	■																								
Paint removing	1	■																								
Loco Lifting/Berthing and Shifting of Bogies	1		■																							
Bogie dismantling	4			■	■	■	■	■																		
Loco Equipment removal/stripping	5		■	■	■	■	■	■																		
Inside cleaning	2			■	■	■	■	■																		
Inside Painting	2							■	■																	
Cable cleaning	2							■	■	■	■	■														
Provision of new Cable sleeves/ numbering, replacement of damaged cable	2									■	■	■	■													
Under-frame cleaning	2						■	■	■	■	■	■														
Under-frame attention	2							■	■	■	■	■														
Body attention and heavy repair works	5								■	■	■	■	■													
Electrical Equipment Overhauling & Testing (SB,BCR,TTP,CP,HB,SS,EB, E-cards,Relays, Switch Gear, EPC, OCB,TMC/MRE, etc)	8			■	■	■	■	■	■	■	■	■	■													
Pneumatic Valve & F-70 panel overhauling	5				■	■	■	■	■	■	■	■														
Modification works (Electrical/Mechanical/Pneumatic)	7							■	■	■	■	■	■													
Equipping (Electrical/Pneumatic)	6									■	■	■	■	■	■											
TM Overhauling	6				■	■	■	■	■	■	■	■	■													
Wheel Overhauling	6				■	■	■	■	■	■	■	■	■													
Bogie Overhauling	6					■	■	■	■	■	■	■	■													
Bogie assembly	7								■	■	■	■	■	■	■											
LT testing	3															■	■	■								
Lowering of loco	1																	■								
MT testing & movement	2																		■	■						
Rain water test	1																				■					
Cab painting, marking of various switches using stickers or writing work	2																				■	■				
PU painting (external), provision of external stickers/writing work	4																				■	■	■	■		
Owning Railway Inspection, Booking attention	2																							■	■	
Safety Check & Final Dispatch of loco for Trial Run	1																									■

POH CYCLE TIME – 25 working days for three phase locomotive.

SANJAY KUMAR TIWARI
Digitally signed by SANJAY KUMAR TIWARI
Date: 2022.11.21 12:38:02 +05'30'

Shri Sanjay Kumar Tiwari,
EDRS & Convener

Digitally signed by SURENDRA KUMAR
Date: 2022.11.15 17:10:10 +05'30'

Shri Surendra Kumar,
CMM/KPAW & Member

RAJESH KULHARI

Digitally signed by RAJESH KULHARI
DN: cn=RAJESH KULHARI,
ou=ELECTRIC LOCOMOTIVE
WORKSHOP, CENTRAL
RAILWAY, BHUSAWAL, ou=ELECT,
o=RAILWAYS, c=IN
e=rajesh.kulhari@rrcrao.org,
c=IN, o=RAILWAYS, ou=ELECTRIC
LOCOMOTIVE WORKSHOP, cn=RAJESH KULHARI
Date: 2022.11.17 13:20:55 +05'30'

Shri Rajesh Kulhari,
CMM/BSL & Member

BINAY KUMAR

Digitally signed by BINAY KUMAR
Date: 2022.11.16 15:28:35 +05'30'

Shri Binay Kumar,
CMM/RSW/DHD & Member

Activity	POH (Conv.)	POH (3-Phase)	POH +RC (Conv.)	MTR (Conv.)
Norms/ Yardsticks for Various activities prevailing (in working days)	24	28	30	60
Actual Average time taken by Shops (in working days)	32.60	38.10	40.24	40.06
Revised / Recommended Norms/ Yardsticks (in working days)	20	25	25	35
Reduction in cycle time compared to present actual cycle time	31.98%	33.38%	38.10%	12.63%
Reduction in cycle time compared to present norms/yard stick cycle time	16.67%	10.71%	16.67%	41.67%

5.0 Planning of Unit Exchange Spares (UES):

To meet the standard schedule of activities and cycle time for POH / POH + RC/ MTR as discussed under para 4.1, 4.2, 4.3 & 4.4 above, the principle i.e. “availability of the right material at the right time and at the right place” has been followed in deciding the Unit Exchange Spares.

The norms / yardsticks for allotment of Unit Exchange Spares (UES) to workshops responsible for carrying out major overhauling schedules of Electric Locomotives over Indian Railways should be fixed based on their sanctioned capacity/type of locomotive dealt by shop. As on date there is no provision for allotment of Unit Exchange Spares of different equipment of Electric Locomotive to various workshops responsible for undertaking POH/POH+RC/ MTR activities. It required overhauling of incoming equipment and re-fitment of same in locomotive after overhauling. It results in increase in cycle time of various major schedule and reduction in availability of Locomotive for traffic use. Hence in order to reduce cycle time for various major schedule and to

SANJAY KUMAR TIWARI <small>Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:38:27 +05'30'</small> Shri Sanjay Kumar Tiwari, EDRS & Convener	Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:10:54 +05'30' Shri Surendra Kumar, CWM/KPAW & Member	<small>Digitally signed by RAJESH KULHARI DN: c=IN, o=ELECTRIC LOCOMOTIVE WORKSHOP, CENTRAL RAILWAY, SN=RAJESH KULHARI, pseudonym=351094d3c12d63a2a20721a0822941310b060c959a07491d1e104420902125420c083010407704dca12702a36838f402820a1902ba1778990ba0623c21, postalCode=422201, cn=RAJESH KULHARI, serialNumber=37cc598ba79210b30fa4a437bd7910bdc9775a0a5da5da5a5c8205da5da5c, cn=RAJESH KULHARI Date: 2022.11.17 13:22:34 +05'30'</small> RAJESH KULHARI Shri Rajesh Kulhari, CWM/BSL & Member	BINAY KUMAR <small>Digitally signed by BINAY KUMAR Date: 2022.11.16 15:29:05 +05'30'</small> Shri Binay Kumar, CWM/RSW/DHD & Member
--	---	--	---

cope-up the enhanced workload to various shop, it is essential to provide sufficient quantity of Unit Exchange Spares to various shops responsible for carrying out POH/POH+RC /MTR.

Availability of Unit Exchange Spares for major items such as Transformer, Traction Motor, Motorized Bogie, Propulsion system, Hotel Load Converter, Brake Panel, Wheel set , Tap changer , HB / SB / FB cubicle, Auxiliary Machines etc. those overhauling time is large will have significant affect in reducing the cycle time of workshop for various major overhauling schedule.

The implementation of UES for workshop will further result in reduction in cycle time and will enhance the out turn of workshop by improvement of shop floor space management.

Apart from above, following measures shall also be implemented to further reduce the cycle time of major overhauling schedules of workshops:

- i. In order to reduce the cycle time, material planning & procurement shall be done well in advance for at least 2 years, in-line with tentative allotment to workshop for incoming years. The tentative allotment (Quantity / Class of Locos) shall strictly be adhered and there should not be modified under normal circumstance.
- ii. Workshop shall issue calling on program to Zonal Railways and same shall be strictly followed by ZRs. In case of any deviation from the issued calling on program, ZRs shall seek permission from RB on case to case basis under intimation to respective workshop. It will result in optimum utilization of berthing capacity, space, man-power and infrastructure facility available with respective shop.
- iii. Outsourcing of Non-Core activities like Painting, Cable stripping, cleaning of wheel set / gear case /Traction Motor, Auxiliary machines etc. In addition to this workshop shall also go for rehabilitation of major equipment viz Main Transformer, Bogie frame, Traction Motor, tap changer, Auxiliary machines etc. from OEM's / approved sources as consider necessary.

<p>SANJAY KUMAR TIWARI</p> <p>Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:39:05 +05'30'</p> <p>Shri Sanjay Kumar Tiwari, EDRS & Convener</p>	<p>SURENDRA KUMAR</p> <p>Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:11:37 +05'30'</p> <p>Shri Surendra Kumar, CMM/KPAW & Member</p>	<p>RAJESH KULHARI</p> <p>Digitally signed by RAJESH KULHARI DN: c=IN, o=ELECTRIC LOCOMOTIVE WORKSHOP, CENTRAL RAILWAY, BHUSANVAL, ou=ELECT, pseudonym=351c04d1c12df3a0a2a0721eb982941a1b9406c29047491d1e1e4c0b0f2, 2.5.2.20=081071000705646796dca1270a368385402820a196c08a1727899b0ae6d23c21, postalCode=42201, sn=RAHARAGH/TRA, serialNumber=37cc598bab79210b39c4da37bd79109c88c977baa92edcd0bdc882b5de7edc, cn=RAJESH KULHARI Date: 2022.11.17 13:23:50 +05'30'</p> <p>Shri Rajesh Kulhari, CMM/BSL & Member</p>	<p>BINAY KUMAR</p> <p>Digitally signed by BINAY KUMAR Date: 2022.11.16 15:29:38 +05'30'</p> <p>Shri Binay Kumar, CMM/RSW/DHD & Member</p>
---	--	---	--

Allotment of Unit Exchange Spares for Electric locomotive for POH/ MTR Work Shop:

S.No.	Equipment	Type of locomotive	Total Unit exchange Spares	Remark
1	Motorized Bogie Complete (Flexi Coil type)	WAP-1 / 4	12 Nos.	The distribution of Unit Exchange Spares among various shops to be decided by Railway Board based on allotment of workload to various shops i.e. number of locomotive/type of locomotive.
2	Motorized Bogie Complete (Bo-Bo)	WAP-5	4 Nos.	
3	Motorized Bogie Complete (Co-Co)	WAP-7	20 Nos.	
4	Motorized Bogie Complete (Co-Co)	WAG-7	28 Nos.	
5	Motorized Bogie Complete (Co-Co Tri-mount)	WAG-5	14 Nos.	
6	Motorized Bogie Complete (Co-Co)	WAG-9/9-H	20 Nos.	
6	Complete wheel set (72 Teeth bull gear) along with axle box with bearing	WAP-7	60 Nos.	
7	Complete wheel set (77/107 Teeth bull gear) along with axle box with bearing	WAG-9/9-H	60 Nos.	
8	Complete wheel set along with axle box with bearing	WAP-5	08 Nos.	
9	Complete wheel set along with axle box with bearing	WAP-4	36 Nos.	
10	Complete wheel set along with axle box with bearing	WAG-7	84 Nos.	
11	Complete wheel set along with axle box with bearing	WAG-5	42 Nos.	
12	Complete Traction motor Type 6FRA 6068	WAP-7 / WAG-9	30 Nos.	
13	Complete traction motor Type 6FXA 7059	WAP-5	08 Nos.	
14	Complete traction Motor Type HS15250	WAP-4/WAG-7/WAG-5	30 Nos.	
15	Transformer Type LOT-7500/7745 KVA	WAP-5/WAP-7	12 Nos.	
16	Transformer Type LOT-6500KVA	WAG-9, 9-H	10 Nos.	
17	Transformer Type 5400 KVA	WAG-7/WAP-1/WAP-4/WAG-5	27 Nos.	
18	Tap changer	WAG-7/ WAP-1/WAP-4/WAG-5	27 Nos.	
19	RSI BLOCK Set	WAG-7/WAP-4/WAG-5	54 Nos.	

SANJAY KUMAR TIWARI Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:39:33 +05'30' Shri Sanjay Kumar Tiwari, EDRS & Convener	SURENDRA KUMAR Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:12:34 +05'30' Shri Surendra Kumar, CMM/KPAW & Member	RAJESH KULHARI Digitally signed by RAJESH KULHARI DN: c=IN, o=ELECTRIC LOCOMOTIVE WORKSHOP, CENTRAL RAILWAY, BHAUSAVAL, ou=ELECT, pseudonym=351c04d1c12df63a0a2a0721eb98241a1b9469cd90447491d1e1e44c60f7, 2.5.4.20=d83b7104b7564e798efca127b2e36838f402820a19628a1727899bbae6d23c21, postalCode=425201, st=MAHARASHTRA, serialNumber=37fc09f6a679210b380c4da37bd79109c88c977baa92edc6b0dc882b5de7e0c, cn=RAJESH KULHARI Date: 2022.11.17 13:25:25 +05'30' Shri Rajesh Kulhari, CMM/BSL & Member	BINAY KUMAR Digitally signed by BINAY KUMAR Date: 2022.11.16 15:30:09 +05'30' Shri Binay Kumar, CMM/RSW/DHD & Member
--	---	---	---

20	Brake Panel set complete along with brake electronics	WAP-7/WAG-9/WAP-5	10 Nos.	
21	IGBT based three phase Propulsion system for complete Loco motive (Consist of SR-1&2 , BUR-1,2&3 and VCU-1&2)	WAP-7/WAG-9/WAP-5	10 Loco set	
22	Auxiliary Cubicle (HB-1 & 2)	WAP-7/WAG-9/WAP-5	10 Loco set.	
23	Auxiliary Cubicle (SB-1 & 2)	WAP-7/WAG-9/WAP-5	10 Loco set.	
24	Oil Cooling blower unit complete.	WAP-7/WAG-9/WAP-5	40 Nos.	
25	Main Compressor 1745 LPM Capacity with motor	WAP-7/WAG-9/WAP-5	40 Nos.	
26	VCB single bottle	Electric Loco	40 Nos.	
27	Set of Auxiliary Motors	Conv. Loco	20 Loco set	
28	Set of Auxiliary Motors	Three phase Loco	20 Loco set	
29	High Reach Pantograph	Elec. Loco	40 Nos.	
30	Fault diagnostic and control system	Conv. Loco	10 Nos.	
31	Smoothing reactor	Conv. Loco	30 Nos.	
32	BA panel complete	Conv. Loco	23 Nos.	
33	Vertical DBR with AC MVRF	WAG-7/WAG-5	18 Nos.	
34	Microprocessor based electronic speed indicating , recording & energy monitoring system (ESMON)	Conv. & 3 phase Locos	32 set	
35	Static inverter (2 x130 KVA)	For conversion in Conv. Locos	23 set	
36	Triplate panel mounted brake system	Conv. Loco	20 set	

<p>SANJAY KUMAR TIWARI</p> <p>Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:39:56 +05'30'</p> <p>Shri Sanjay Kumar Tiwari, EDRS & Convener</p>	<p>SURENDRA KUMAR</p> <p>Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:13:25 +05'30'</p> <p>Shri Surendra Kumar, CMM/KPAW & Member</p>	<p>RAJESH KULHARI</p> <p>Digitally signed by RAJESH KULHARI DN: cn=RAJESH KULHARI, o=ELECTRIC LOCOMOTIVE WORKSHOP - CENTRAL RAILWAY, bhujawala, ou=ELECTRIC LOCOMOTIVE WORKSHOP - CENTRAL RAILWAY, postalCode=382001, st=GUJARAT, serialNumber=97c599fab79210b38c4da37bd79109c88c977baa92eddb0dc882b0de7e0c, cn=RAJESH KULHARI Date: 2022.11.17 13:28:48 +05'30'</p> <p>Shri Rajesh Kulhari, CMM/BSL & Member</p>	<p>BINAY KUMAR</p> <p>Digitally signed by BINAY KUMAR Date: 2022.11.16 15:30:40 +05'30'</p> <p>Shri Binay Kumar, CMM/RSW/DHD & Member</p>
---	--	--	--

6.0 Review of the Replacement of must Change items during major Overhauling Schedules :

At present, workshops are following the RDSO Technical Circular No. RDSO/2013/EL/TC/0123 dated 16/5/2013 for replacement of must change items during major overhauling schedule of electric locomotives. Replacement of Must Change Items during major schedule based on existing norms / yardstick is not economical & also time consuming in ensuring 100% availability of Must Change Items. Since, there are few Must change Items as per TC 0123 having poor availability due to its limited number of approved sources. Hence the list of Must Change item under TC 0123 has been re-examined and securitized on real time basis replacement by committee as under-

The items (Must Change) covered under TC 0123 have been classified in three categories as follows:

Category of Items	Description
Category- A	100% replacement items viz. Items which are subject to continuous wear and tear during service due to extensive duty cycle such as brake block, carbon brush, Panto-carbon strips, bearings, lubricant, Capacitor of Damping panel (VCB, TFP, RC & Other damping panel) & perishable items due to ageing effect etc.
Category - B	The items required to be replaced on condition basis . It has been reported that such items are generally received in healthy condition by workshops. Category-B items also include must change items to be replaced during 2nd POH (WAP-5, WAP-7, WAP-4, WAG-7 & WAG-5) and during 1st POH of WAG-9/9H Locomotives.
Category-C	Items at assembly, component and sub-components level - whether it is economical to replace the sub-component or assembly itself or repairing will be sufficient. It will include high value items. Apart from this, Category-C items includes items identified for technological up-gradation i.e. Provision of Hotel Load Converter / composite Converter / IGBT based propulsion in place of GTO based / Provision of conventional brake rigging system in place of TBU/PBU arrangement in WAG-9/9H locomotive, Major/safety modification work such as strengthening of underslung compressor lugs (MS-484), Traction motor dropping detection system in conventional loco (RDSO MS-487), Heavy mechanical repair work during POH in case of accidental loco / repair of Centre Pivot etc.

SANJAY KUMAR TIWARI Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:40:18 +05'30' Shri Sanjay Kumar Tiwari, EDRS & Convener	SURENDRA KUMAR Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:14:13 +05'30' Shri Surendra Kumar, CMM/KPAW & Member	RAJESH KULHARI Digitally signed by RAJESH KULHARI Date: 2022.11.17 13:33:40 +05'30' Shri Rajesh Kulhari, CMM/BSL & Member	BINAY KUMAR Digitally signed by BINAY KUMAR Date: 2022.11.16 15:31:14 +05'30' Shri Binay Kumar, CMM/RSW/DHD & Member
--	---	--	---

Major Items of Three Phase Electric Locomotives to be replaced on Condition basis including must change items to be replaced during 2nd POH (WAP-5, WAP-7) and during 1st POH of WAG-9/9H Locomotives. (Category “B” Items):

- i. Temperature and Pressure sensor of Transformer & Traction converter must change items during 2nd POH of WAP-5 & WAP-7 Locomotives and Must change item during POH of WAG-9/9H.
- ii. Temperature & Speed sensor of Traction Motor must change items during 2nd POH of WAP-5 & WAP-7 locomotives and Must change item during POH of WAG-9/9H.
- iii. DC link capacitor & Resonance circuit capacitor of Traction Converter must change items during 2nd POH of WAP-5 & WAP-7 locomotives and Must change item during POH of WAG-9/9H. Oil type capacitor to be replaced by dry type capacitor.
- iv. Harmonic filter capacitor must change item during 2nd POH of WAP-5 & WAP-7 locomotives and Must change item during POH of WAG-9/9H. The harmonic filter resistor & insulators to be replaced on condition basis.
- v. TM Terminal board assembly, Power cable of TM ,TM speed sensor probe housing, TM bellow plate on condition basis.
- vi. TM holder plate (WAP-5) to be replaced during 2nd POH of WAP-5 locomotives and Must change item during POH of WAG-9/9H.
- vii. Bull gear (WAG-9/9H/HC, WAP-7) must change item during 2nd POH of WAP-7 locomotives and must change items during POH of WAG-9/9H/HC.
- viii. Complete buffer assembly, Cattle guard must change item during 2nd POH of WAP-5/7 locomotives and must change items during POH of WAG-9/9H/HC.
- ix. Replacement of brake hanger must change items during 2nd POH of WAP-7 locomotives and Must change item during POH of WAG-9/9H.
- x. Side glass, All side body & roof filters, All door locks, Complete Driver seat, Battery box, seal of auxiliary / traction converter doors must change items during 2nd POH of WAP-5 & WAP-7 locomotives and Must change item during POH of WAG-9/9H..
- xi. Replacement of modified heat sink of traction converter must change item during 2nd POH of WAP-5 & WAP-7 and Must change item during POH of WAG-9/9H. Modified heat sink to be provided.
- xii. All fiber Optic cable of Power Converter, including spares must change items during 2nd POH of WAP-5 & WAP-7 Locomotives and Must change item during POH of WAG-9/9H.
- xiii. Inter cooler/ After cooler assembly & Copper interconnecting pipes between intercooler & after cooler of main compressor must change items during 2nd POH of WAP-5 & WAP-7 locomotives and Must change item during POH of WAG-9/9H.

<p>SANJAY KUMAR TIWARI Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:40:42 +05'30'</p> <p>Shri Sanjay Kumar Tiwari, EDRS & Convener</p>	<p>SURENDRA KUMAR Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:14:59 +05'30'</p> <p>Shri Surendra Kumar, CMM/KPAW & Member</p>	<p>RAJESH KULHARI Digitally signed by RAJESH KULHARI Date: 2022.11.17 13:35:23 +05'30'</p> <p>Shri Rajesh Kulhari, CMM/BSL & Member</p>	<p>BINAY KUMAR Digitally signed by BINAY KUMAR Date: 2022.11.16 15:31:47 +05'30'</p> <p>Shri Binay Kumar, CMM/RSW/DHD & Member</p>
--	---	--	---

Page 16 of 46	Issued on .11.2022	RDSO/2022/EL/RM/0198 (Rev.1)
---------------	--------------------	------------------------------

- xiv. 80 Amp Contactor & 150 Amp. Contactor (7 Nos.) to be replaced with contactors along with Shubber circuit & auxiliary switches must change items during 2nd POH of WAP-5 & WAP-7 and Must change item during POH of WAG-9/9H.
- xv. Oil cooling radiator (TFP / SR) must change items during 2nd POH of WAP-5 & WAP-7 locomotives and Must change item during POH of WAG-9/9H.
- xvi. Power supply card (PCU), Gate Drive Card (GDU) of Auxiliary converter and main converter (SR) must change items during 2nd POH of WAP-5 & WAP-7 locomotives and Must change item during POH of WAG-9/9H.
- xvii. Complete Pantograph must change items during 2nd POH of WAP-5 & WAP-7 and must change item during POH of WAG-9/9H.

Major Items of Three Phase Electric Locomotives to be replaced on Condition basis under Category “C” :

- i. Rehabilitation of PCB card (I/O, Processor card etc.) as per RDSO Guidelines No. EL/G/2008/01 Rev-1 as per requirement.
- ii. TBU / PBU kit to be replaced by Conventional brake rigging in WAG-9/9H and WAP-7 as per advise of ZRs during POH.
- iii. Technological up-gradation like provision of Hotel Load Converter / composite Converter / IGBT based propulsion in place of GTO based / Provision of conventional brake rigging system in place of TBU/PBU arrangement in WAG-9/9H locomotive, Major/safety modification work such as strengthening of underslung compressor lugs (MS-484), Traction motor dropping detection system in conventional loco (RDSO MS-487), Heavy mechanical repair work during POH in case of accidental loco etc.

Major Items of Conventional Electric Locomotives to be replaced on Condition basis including must change items to be replaced during 2nd POH (WAP-4, WAG-7 & WAG-5) Locomotives (Category “B” Items):

- i. Complete brush holder assembly is must change items during 2nd POH.
- ii. MMT Duct, Cab fan, Cab heater to be replaced during 2nd POH.
- iii. Main compressor, Auxiliary compressor, End shields of Auxiliary motors are must change items during 2nd POH.
- iv. EMU type inter and after cooler must change item during 2nd POH.
- v. Cattle guard with rail guard, complete side buffer assemblies with fastener are must change items during 2nd POH.
- vi. Replacement of equalizer, compensating beam, links are must change items during 2nd POH.
- vii. Foot step assembly, Battery box, hinges of all door, side body and corridor glasses, cab window assembly are

SANJAY KUMAR TIWARI Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:41:09 +05'30' Shri Sanjay Kumar Tiwari, EDRS & Convener	Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:15:51 +05'30' Shri Surendra Kumar, CWM/KPAW & Member	RAJESH KULHARI Digitally signed by RAJESH KULHARI Date: 2022.11.17 13:43:31 +05'30' Shri Rajesh Kulhari, CWM/BSL & Member	BINAY KUMAR Digitally signed by BINAY KUMAR Date: 2022.11.16 15:32:36 +05'30' Shri Binay Kumar, CWM/RSW/DHD & Member
--	--	--	---

- must change items during 2nd POH.
- viii. Shunt for QF relay must change item during 2nd POH.
- ix. 25 KV vertical cable head bushing must change item during 2nd POH.
- x. DBR resistance grids must change item during 2nd POH.
- xi. Shunts SHA/SHF, C-118 with R-118 are must change items during 2nd POH.
- xii. Replacement of Electromagnetic contactor must change item during 2nd POH.

Major Items of Conventional Electric Locomotives to be replaced on Condition basis under Category “C” :

- i. Provision of 2 x 130 KVA SIV in place of ARNO converter as advised by ZRs.
- ii. Provision of MPFDCS latest version as advised by ZRs.

The must change items during Major schedule has been discussed in detail and revised list of Must Change items including classification of items during major Overhauling Schedules is enclosed as **Annexure-I**.

The proposed revised list of must change items is subject to review based on feedback from Zonal Railways in due course of time.

The revision in the list of must change items during POH results in saving in cost of must change items as mentioned below-

SN	LOCO TYPE	TC-123 COST (Rs) per POH	COST AFTER REVIEW (During 1 st / 3 rd POH) (Rs)	DIFFERE NCE	% COST SAVING (During 1 st / 3 rd POH)	COST AFTER REVIEW (During 2 nd POH) (Rs)	% COST SAVING (During 2 nd POH)
1	WAG-5	10891774	9229635	1662139	15.26%	10891774	Nil
2	WAG-5HB	10942832	9338752	1604080	14.66%	10942832	Nil
3	WAG-7	11382890	9570700	1812190	15.92%	11382890	Nil
4	WAP-4	10993963	9540801	1453162	13.22%	10993963	Nil
5	WAP-5	20857472	17933921	2923550	14.02%	20857472	Nil
6	WAP-7	13696915	10491875	3205040	23.40%	13696915	Nil
7	WAG-9	13707778	13707778	Nil	Nil	NA	NA

SANJAY KUMAR TIWARI Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:42:07 +05'30' Shri Sanjay Kumar Tiwari, EDRS & Convener	Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:16:41 +05'30' Shri Surendra Kumar, CMM/KPAW & Member	RAJESH KULHARI Digitally signed by RAJESH KULHARI Date: 2022.11.17 13:46:06 +05'30' Shri Rajesh Kulhari, CMM/BSL & Member	BINAY KUMAR Digitally signed by BINAY KUMAR Date: 2022.11.16 15:33:11 +05'30' Shri Binay Kumar, CMM/RSW/DHD & Member
--	--	--	---

7.0 Uniform Costing System:

The exiting costing system being followed by Workshops:

Various workshops carry out POH/POH+RC activities which are charged to respective sheds by raising debits. The present system of costing at workshops is as per the method recommended by Railway Board's committee of CMM / BSL (Convener), CMM / KPA, Dy.CEE / KGP for "Modified report on Costing System of POH of Electric Locomotives" vide letter no. 2007/Elect (TRS)/440/4 dated 15/12/2008. Since November-2019 wherein the Cost of Repair for POH schedule has been divided in four groups as under:

Group 'A'- Normal Overhauling Cost (Basic Cost Elements): Basic Cost element of repair activities on locomotives and its major sub-assemblies is the cost of normal overhauling, which is more or less common and fixed for all class of locomotives. It comprises of Labor Cost, Material Cost and On Cost Charges. It is the usual scheduled repair to be attended in all locos and hence the total cost incurred under this group is averaged amongst the locos turned out during that particular month.

Group 'B'- Un-schedule repair (Variable Cost Elements): Variable cost element of repair is the cost of identified unscheduled repair activities, other than those covered during normal POH of locomotive. It also comprises of Labor Cost, Material Cost and On-Cost charges. It is the cost incurred on each loco based on the condition of individual loco.

Group 'C'- Cost of High value item fitted in Loco: Identified but limited number of "High Value" items fitted on the locomotives also constitutes a variable cost element. It comprises of only Material Cost. This cost reflects the high value items replaced in respect of individual loco turned out during the month.

Group 'D'-Cost of Must Change Items fitted in Loco: It comprises of the Cost of the identified number of must change items to be replaced/fitted on the locomotives. It includes only the Material Cost. This cost reflects the Must Change Items replaced in individual loco turned out during the month.

Apart from above, Non-stock Material Cost and Works Contract Cost (Labor & Material) is also included in POH Cost.

<p>SANJAY KUMAR TIWARI</p> <p>Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:43:08 +05'30'</p> <p>Shri Sanjay Kumar Tiwari, EDRS & Convener</p>	<p>SURENDRA KUMAR</p> <p>Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:17:32 +05'30'</p> <p>Shri Surendra Kumar, CMM/KPAW & Member</p>	<p>RAJESH KULHARI</p> <p>Digitally signed by RAJESH KULHARI Date: 2022.11.17 13:44:28 +05'30'</p> <p>Shri Rajesh Kulhari, CMM/BSL & Member</p>	<p>BINAY KUMAR</p> <p>Digitally signed by BINAY KUMAR Date: 2022.11.16 15:33:48 +05'30'</p> <p>Shri Binay Kumar, CMM/RSW/DHD & Member</p>
---	--	---	--

The overhead cost of various POH work shop can be reduced by utilizing the full installed capacity of shops and by allotting the work load 10% more than sanctioned capacity of the shop. The same to be monitored and to be reviewed in due course of time.

Proposed Uniform Costing System of POH

1. All Workshops should follow Uniform POH Unit Costing System for Locomotives prepared by CRIS on AIMS Portal (as recommended by Railway Board's committee of CMM / BSL (Convener), CMM / KPA, DyCEE / KGP constituted vide L.No. 2007/Elect(TRS)/440/4 dated 15/12/2008).
2. A list of Must Change Items (Loco Type / Class-wise) as per **Annexure-I (Category -A)** should be followed by workshops so as to get the actual cost of items replaced for that specific loco across all Workshops can be easily figured out.
3. The list of Items (Loco Type / Class-wise) to be replaced on condition basis **Annexure-I (Category - B)** should be followed by workshops so as to get the actual cost of items replaced for that specific loco across all Workshops can be easily figured out. This cost may vary from loco to loco as per defect / deficiencies advised by owning shed and consideration by workshops.
4. A list of Loco Type-wise High Value Items (**Category-C of items under Annexure-I**) should be followed by all Workshops during booking of designated High Value Items rather than having any ambiguity in deciding / defining the High Value Item. This will help to get the actual cost of High Value Items replaced in specific loco during Major schedule.

SANJAY KUMAR TIWARI Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:43:35 +05'30' Shri Sanjay Kumar Tiwari, EDRS & Convener	Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:18:20 +05'30' Shri Surendra Kumar, CMM/KPAW & Member	RAJESH KULHARI Digitally signed by RAJESH KULHARI Date: 2022.11.17 13:45:23 +05'30' Shri Rajesh Kulhari, CMM/BSL & Member	BINAY KUMAR Digitally signed by BINAY KUMAR Date: 2022.11.16 15:34:45 +05'30' Shri Binay Kumar, CMM/RSW/DHD & Member
--	--	--	---

Recommendations

In order to bring the uniformity among workshops in terms of POH activities, their cycle time, replacement of Must Change Items on real time based and adoption of uniform costing system committee recommends following:

1. The standard list of activities under Para 4.1, 4.2, 4.3 & 4.4 of the report shall be followed to have uniformity during POH activities & cycle time.
2. The Committee proposal under Clause 5.0 shall be implemented i.e. allotment of UES to workshops, target, calling on program, timely material planning & procurement and out sourcing of Non-Core activities to have proper inventory in terms of UES to improve the availability of loco.
3. The reviewed Must Change items of TOH / IOH / POH / POH + RC / MTR under Annexure-I shall be followed to have real time based replacement.
4. The uniform costing system for calculating the cost of POH schedule as proposed by Committee under Clause 7.0 shall be followed.

=====

SANJAY KUMAR TIWARI Digitally signed by SANJAY KUMAR TIWARI Date: 2022.11.21 12:44:00 +05'30' Shri Sanjay Kumar Tiwari, EDRS & Convener	Digitally signed by SURENDRA KUMAR Date: 2022.11.15 17:19:23 +05'30' Shri Surendra Kumar, CMM/KPAW & Member	RAJESH KULHARI Digitally signed by RAJESH KULHARI Date: 2022.11.17 13:46:51 +05'30' Shri Rajesh Kulhari, CMM/BSL & Member	BINAY KUMAR Digitally signed by BINAY KUMAR Date: 2022.11.16 15:35:23 +05'30' Shri Binay Kumar, CMM/RSW/DHD & Member
--	--	--	---

1. MUST CHANGE ITEMS OF WAP5, WAP7, WAG9/9H, WAG9HC LOCOMOTIVES :

The must change item during POH/POH + RC has been classified in 3 category as mentioned below-

Category of items/Activity	Description
Category -A	100% replacement items viz. Items which are subject to continuous wear and tear during service due to extensive duty cycle such as brake block, carbon brush, Panto-carbon strips, bearings, lubricant, Capacitor of Damping panel (VCB, TFP, RC & Other damping panel) & perishable items due to ageing effect etc.
Category- B	The items required to be replaced on condition basis . It has been reported that such items are generally received in healthy condition by workshops. Category-B items also include must change items to be replaced during 2nd POH (WAP-5, WAP-7, WAP-4, WAG-7 & WAG-5) and during 1st POH of WAG-9/9H Locomotives.
Category -C	Items at assembly, component and sub-components level - whether it is economical to replace the sub-component or assembly itself or repairing will be sufficient. It will include high value items. Apart from this, Category-C items includes items identified for technological up-gradation i.e. Provision of Hotel Load Converter / composite Converter / IGBT based propulsion in place of GTO based / Provision of conventional brake rigging system in place of TBU/PBU arrangement in WAG-9/9H locomotive, Major/safety modification work such as strengthening of underslung compressor lugs (MS-484), Traction motor dropping detection system in conventional loco (RDSO MS-487), Heavy mechanical repair work during POH in case of accidental loco / repair of Centre Pivot etc.

SN	DESCRIPTION	TOH	IOH	POH	Remarks	Category of items /Activity
A	LOCO BODY					
1	PU painting of locomotive.	X			<ul style="list-style-type: none"> During IOH, exterior loco body & cab to be painted. During POH, complete painting (exterior, interior along with surface finish) to be carried out. 	A

2	Roof Hatch Gaskets & rubber seals					
	The pantograph, converter roof hatch gaskets and rubber seals around the pantograph and converter roof hatches and the roof beam.	X				A
3.	Body Structure					
	Fiber body above buffer and CBC coupler (WAP5 & WAP7 only).	X	X			A
	Decals (stickers).	X				A
4	Exterior					
	Seals involved in fitment of side body and roof filters.	X	X			A
5	Draft gear & couplers:					
	Complete CBC assembly including Draft gear.	X	X			A
	Transition coupling (WAP5, WAP7)	X	X			A
	Transition coupling (WAG9/9H)	X	IOH2/IOH4			A
	Knuckle, devis, devis pin and yoke pin	X				A
	Striker block wear plate.	X				A
6	Buffers:					
	Complete Buffer assembly	X	X		Must change item during 2 nd POH of WAP-5/7 and must change item during POH of WAG-9/9 H	B
	All Rubber buffing elements, fasteners	X				A
7	Cattle guard:					
	Cattle guard along with its hardware	X	X		Must change item during 2 nd POH of WAP-5/7 and must change item during POH of WAG-9/9 H	B
					Fasteners of cattle guard	A
8	Doors and Foot Steps					
	Cab / Machine room window seals, foot steps	X			On condition basis	B

	Cab / Machine room door seals, foot step hardware	X				A
9	Washer and Wipers:					
	Wiper motor driver shaft seal, wiper arm blades, pneumatic and water hoses, wiper idler shaft seal	X				A
10	Wind screen and windows:					
	Front lookout glass and side glass (WAP5/WAP7)	X	X		Side glass replacement Must change item during 2 nd POH of WAP-5/7	B
					Front look out glass are required to be replaced as must change item	A
	Front lookout glass and side glass(WAG9/9H)	X	IOH2/IOH4			A
	Seals of cab windows, Sliding window, Splashed shield, windscreen shield and rubber flap on the cab side window drainage channel outlet.	X	X			A
B1	Under frame:					
1	Sanding equipments:					
	Sand in all sand boxes.					A
	Sander hosepipe, seal in the sand box lids and sanding equipments fasteners					A
2	Battery Box:					
	All fasteners of battery boxes.	X	X			A
	Battery box ventilation hose.	X	X			A
B2	Bogie and Running Gear:					
1	Secondary Suspension					
	All Secondary Suspension springs.	X	X			A
	Dampers.	X	X			A
	The lateral bump stops.	X	X			A
	Insulating bases of secondary suspension (WAP5 only).	X	X			A
2	Primary Suspension					

	All Primary Suspension springs.	X	X			A
	Primary suspension spring insulating base	X				A
	Primary Dampers.	X	X			A
3	Traction link					
	Traction link, pivot head ring, traction link fasteners	X	X			A
	Safety sling, pins and R- clips.	X				A
	Aclathan / Vulkollan Rings and tab washers.	X				A
	All fasteners of Aclathan / Vulkollan ring retaining plate.	X				A
	All Nylock Nuts opened for lifting of locos at: A. Secondary Dampers (Yaw, Vertical, horizontal) B. Primary Dampers top side. C. Traction link D. Gear Case Support arm.					A
4	Bogie Frame and brake Gear:					
	All pins and pads of brake rigging.					A
	All bushes of brake rigging	X				A
	All rubber components, hoses and fasteners on the bogie.	X				A
	The hoses between – a) Bogie frame to brake cylinders b) Bogie – Body hose connection.	X				A
	Overhauling kit of brake caliper.	X	X			A
	Replacement of Brake hanger of WAP7/WAG9/WAG-9H/WAG-9HC	X			Must change item during 2 nd POH of WAP-7, and must change item during POH of WAG-9/9 H	B
	Replacement of safety sling of brake hanger of WAP7/WAG9					A
5	Wheel set & Axle Box:					
	Taper Roller bearing unit (CRU 150/SKF, BC2-0067A) for WAP7, WAG9 & WAG9H.	X	X			A
	Axle Box Racers (WAG9/9H)	TOH2 /TOH	X			A

		5				
	Taper Roller bearing Unit (SKF 1639457A) for WAP5.	X	X			A
	Fasteners of brake discs (WAP5)	X	X			A
	Axle box "O" rings and axle box cover gasket.					A
	Axle box fasteners	X	X			A
6	Gear case/ Transmission					
	Gear case oil.					A
	Gear case bearing along with associate components (for WAP5 only).	X	X			A
	Gearbox oil seal / "O" rings.	X				A
	All gear case fasteners and TM fixing bolts.	X	X			A
	Drain plug washer and oil filling plug washer.					A
	Gauge glass oil seal.					A
	Gear case support arm (for WAP5 only) & Axle guide rod.	X	X			A
	TM support arm WAG-9/9H, WAP-7	X	X		Must change item during 2 nd POH of WAP-7, and must change item during POH of WAG-9/9 H	B
7	Crown Gear Coupling (WAP5)					
	The membrane and the oil of Crown Gear coupling.					A
8	Spheriblocs					
	The Spheriblocs of the axle guide rod (WAP5)	X				A
	The Spheriblocs of the gear case support arm , TM support arm (WAP5)					A
	The Spheriblocs of the axle guide rod (WAP7/WAG9/9H).	X				A
	The Spheriblocs of the TM support arm (WAP7/WAG9/9H).					A

	Spheriblocs of all types of dampers	X				A
C	Power supply System					
1	Pantograph					
1.1	Low Speed Pantograph type AM12, IR01, PAN01 & EL-01 for freight locomotives					
	As per TC No. RDSO/2007/EL/TC/0094(Rev"0")					A
1.2	High Speed Pantograph for ME locomotives					
	Type AM92 and IR03H as per SMI No. 2016/EL/SMI/0292,Rev. '0' dated 27.06.2016 Type WBL-85 As per OEM's maintenance manual					A
1.3	High Reach Pantograph for all Electric locomotives					
	As per OEM's maintenance manual					A
1.4	Complete Pantograph	X	X		Must change item during 2 nd POH of WAP-5/7 and must change item during POH of WAG-9/9 H	B
2	Primary voltage Transformer:					
	The rubber cable conduit between transducer & terminal box and the roof cable duct.	X				A
3	High voltage bushing insulator:					
	High voltage bushing seal, cork gasket.	X				A
	Complete 25 KV vertical cable head bushing	X	X		Must change item during 2 nd POH of WAP-5/7 and must change item during POH of WAG-9/9 H	B
4	Main circuit breaker (VCB):					A
	All items specified in latest version of RDSO's Special maintenance instruction no. ELRS/SMI/0236					A
5	Harmonic Filter Resistor:					
	Harmonic filter resistor junction box cable gland , seal	X				A
	Replacement of the seal of the filter resistor.	X				A
	Harmonic Filter Capacitor	X	X		Must change item during 2 nd POH of WAP-5/7 and	B

					must change item during POH of WAG-9/9 H	
	Harmonic Filter resister and insulators	X	X			B
6	Main transformer:					
	Silica gel in breather assembly.					A
	All sealing gaskets including tank cover gasket of TFP(WAP7)	X	X			A
	All sealing gaskets including tank cover gasket of TFP(WAG9/9H)	X	IOH2/IOH4			A
	All rubberized cork sheets.	X				A
	All TFP bushings rubber seals (As per TC 0076 latest version).	X				A
	All transformer foundation bolts & bushing lock nuts	X	X			A
	Transformer Oil (WAP-5/7)	X	X			A
	Transformer Oil (WAG9/9H)	X	X			A
	Main transformer drain oil cock rubber parts	X	X			A
	Transformer conservator gauge glass gasket, rubber parts(WAP5/7)	X	X			A
	Transformer conservator gauge glass gasket, rubber parts (WAG9/9H)	X	IOH2/IOH4			A
	Oil hose (vent tube) from main transformer to conservator, equalizing pipe along with accessories.	X				A
	Oil Cooling Radiator Complete(WAP-5/7)	X	X		Must change item during 2 nd POH of WAP-5/7	B
	Oil Cooling Radiator Complete(WAG9/9H)	X	X		Must change item during POH of WAG-9/9H	B
	TFP Pressure Sensor & Temperature Sensor	X	X		Must change item during 2nd POH of WAP-5/7 and must change item during POH of WAG-9/9 H	B
D.	Propulsion System					
1	Traction Converter:					
	The rubber parts of servo motor of pre-charging & main contactor.	X				A

The rubber parts of main cylinder of pre-charging & main contractor.	X				A
The air cooling hoses, seals on the traction converter doors (WAP5/WAP7/WAG9/9H).	X				B
Silica gel in breather assembly.				On condition basis (Reactivated)	B
Converter Oil (WAP5/7)	X	X			A
Converter Oil(WAG9/9H)	X	IOH2/IOH4			A
Contact tips of Electro-pneumatic and Electro-magnetic contactors(WAP7)	X	X			A
Contact tips of Electro-pneumatic and Electro-magnetic contactors(WAG9/9H)	X	IOH2/IOH4			A
Traction converter oil flexible pipe line(WAP7)	X	X			A
Traction converter oil flexible pipe line(WAG9/9H)	X	IOH2/IOH4			A
Stuchi Coupling rubber parts(WAP5/7)	X	X			A
Stuchi Coupling rubber parts(WAG9/9H)	X	IOH2/IOH4			A
DC link capacitor & resonance circuit capacitor(WAP-5/7)	X	X		1. Dry type capacitor Must change item during 2nd POH of WAP-5/7	B
				2. Oil filled to be replaced with dry type.	A
DC link capacitor & resonance circuit capacitor(WAG9/9H)	X	X		1. Dry type capacitor must change item during POH of WAG-9/9 H	B
				2. Oil filled to be replaced with dry type.	A

	Traction converter gauge glass rubber parts(WAP7)	X	X			A
	Traction converter gauge glass rubber parts(WAG9/9H)	X	IOH2/IOH4			A
	As per RDSO guidelines modified heat sinks to be provided on SR rack (WAP-5/7)	X	X		Must change item during 2 nd POH of WAP-5/7 and modified heat sink to be provided	B
	As per RDSO guidelines modified heat sinks to be provided on SR rack (WAG-9/9H)	X	X		Must change item during POH of WAG-9/9H and modified heat sink to be provided	B
	Internal Cooling fan complete(WAP-5/7)	X	X			B
	Internal Cooling fan complete(WAG9/9H)	X	IOH2/IOH4			B
	SR Pressure Sensor & Temperature Sensor (WAP-5/7)	X	X		Must change item during 2 nd POH of WAP-5/7	B
	SR Pressure Sensor & Temperature Sensor (WAG9/9H)	X	X		Must change item during POH of WAG-9/9H	B
2	Traction Motor:					
	Traction motor bearing (DE + NDE) along with Outer/Inner labyrinth pins and accessories.	X				A
	Suspension tube bearing	X	X			A
	Bull gear (WAG9/WAG9H/WAP7)	X	X		Must change item during 2 nd POH of WAP-7, and must change item during POH of WAG-9/9 H	B
	TM pinion (WAG9/WAG9H)	X				A
	TM pinion (WAP7).	X				A
	End plate "O" Rings & the gaskets on the terminal box of TM.	X				A
	TM bellows.	X				A
	Gasket of temperature sensor cover.					A

	The helical inserts of Junction box of TM	X	X			A
	Holder fixing bolts	X	X			A
	Power cable of TM	X	X			B
	Temperature sensor complete assembly including cable	X	X		Must change item during 2 nd POH of WAP-5/7 & must change item during POH of WAG-9/9 H	B
	All plastic conduit pipes	X	X			A
	All hardware of TM body	X	X			A
	TM holder plate for suspension (WAP-5/7/WAG-9)	X	X		Must change item during 2 nd POH of WAP-5/7 & must change item during POH of WAG-9/9 H	B
	TM holder plate for suspension 12R(WAP-5)	X	X			
	Bellow plate of TM	X	X			B
	TM Speed Sensor(WAP-5/7)	X	X		Must change item during 2 nd POH of WAP-5/7	B
	Temperature Sensor(WAP-5/7)	X	X			
	TM Terminal board assembly(WAP7)	X	X			B
	Speed Sensor probe housing(WAP7)	X	X			B
	TM Speed Sensor(WAG9/9H)	X	X		Must change item during POH of WAG-9/9 H	B
	Temperature Sensor(WAG9/9H)	X	X			
	TM Terminal board assembly(WAG9/9H)	X	IOH2/IOH4			B
	Speed Sensor probe housing(WAG9/9H)	X	IOH2/IOH4			B
3	VCU bus station and Electronics of Power Converter & Auxiliary Converter:					
	Back up batteries in VCU bus station diagnostic & communication computers, DIA, DDA1 & 2.	X				A
	UIC socket seal gasket.	X	X			A
	All Fiber-optic cable of Power Converter, including spares.	X	X		Must change item during 2 nd POH of WAP-5/7 & must change item during POH of WAG-9/9 H	B
	Rehabilitation of cards as per RDSO guidelines No. EL/G/2008/01 Rev.1 with latest amendment. as per requirement	X				C
	Instrument cooling fans.	X				B

	VCU ,Traction Converter & Auxiliary Converter bus station software reloading	X	X			A
	Power Supply card (PCU) and Gate Drive Card (GDU) of Traction Converter	X	X		Must change item during 2 nd POH of WAP-5/7 & must change item during POH of WAG-9/9 H	B
E	Auxiliary System					
1	Auxiliary converter:					
	Gasket of DC link capacitor bank.	X				A
	Gasket of WRE, GG and battery charger modules.	X	X			A
	Bearing of internal cooling fan	X				B
	Seals on the Aux. Converter cabinets & equipment modules.	X				B
	Contact tips of EMC.	X	X			A
	Contact tips of contactors in the BUR 1, 2 & 3.	X				A
	Set of rotary switch	X	X			B
	All DC link bank capacitors	X	X			B
	Male & female contact of GG & WRE module	X	X			B
2	Battery Set					
	Battery(WAP5/7)	X	X			A
	Battery(WAG9/9H)	X	X			A
	Battery Box	X	X		Must change item during 2 nd POH of WAP-5/7 & must change item during POH of WAG-9/9 H	B
3	Lights					
	Head light gasket, head light seals (between headlight retaining ring & head light housing), Marker Light rubber gasket and its "O" rings and the flasher light gasket (Between flasher & loco roof).	X				A
	Head light lamp.					A
4	Oil Cooling Piping:					
	The "O" rings in the main transformer & main converter oil cooling piping joints.	X				A
5	Oil Cooling Pumps:					

	The bearings & “O” rings.					A
6	Oil Cooler Blower / Motor:					
	The bearings of oil cooler blower motor and associate component.					A
	Impeller of oil cooler blower	X				A
7	Oil Cooler Blower Seals:					
	The seals between the oil cooler blower & the filter duct, between the oil cooler blower filter & the pantograph roof hatch on the oil cooler blower unit, between the oil cooler blower & machine room floor, on the oil cooler blower filter & ducting and on the oil cooler blower inspection door (WAP5/WAP7).	X				A
	The seals between the oil cooler blower & the filter duct, between the oil cooler blower filter & the pantograph roof hatch on the oil cooler blower unit, between the oil cooler blower & machine room floor, on the oil cooler blower filter & ducting and on the oil blower inspection door (WAG9/WAG9H).					A
8	Machine Room Blower Motor:					
	The drive & non drive end bearings along with associated components.					A
9	Machine Room Blower Seals:					
	The seals of machine room blower filter & duct, inspection door, blower filter & ducting and between the machine room blower and machine room floor, between the machine room blower filter and filter duct and the machine room blower filter duct seal and wear plate (WAP5/WAP7)	X				A
	The seals of machine room blower filter plenum & duct, inspection door, blower filter & ducting and between the machine room blower and machine room floor, between the machine room blower filter and filter duct and the machine room blower filter duct seal and wear plate (WAG9/WAG9H).					A
10	Traction Motor Blower Seals:					

	The traction motor blower filter, plenum, wear plate and duct seals (WAP5/WAP7).	X				A
	The traction motor blower filter, plenum, wear plate and duct seals (WAG9/ WAG9H).					A
	The seals on the TM blower filter & ducting (WAP5/WAP7)	X				A
	The seals on the TM blower filter & ducting (WAG9/ WAG9H).	-				A
	The seals between the TM blower & machine room floor and between the plenum box and body side panel (WAP5/WAP7).	X				A
	The seals between the TM blower & machine room floor and between the plenum box and body side panel (WAG9/ WAG9H).	-				A
	The seals on the TM blower inspection cover (WAP5/WAP7)	X				A
	The seals on the TM blower inspection cover (WAG9/ WAG9H).	-				A
11	Traction Motor Blower Motor:					
	The drive & non drive end bearings along with associated components.					A
12	TM & Oil cooler Blower Scavenger:					
	The hoses at the oil cooler blower filter scavenger boxes (WAP5/WAP7).	X				A
	The hoses at the oil cooler blower filter scavenger boxes (WAG9/ WAG9H).	X				A
	The equalizer hoses between the TM & oil cooler blower scavenger & the filter (WAP5/WAP7).	X				A
	The equalizer hoses between the TM & oil cooler blower scavenger & the filter (WAG9/ WAG9H).	X				A
	The seal at the oil cooler blower scavenger duct slip joint (WAP5/WAP7).	X				A
	The seal at the oil cooler blower scavenger duct slip joint (WAG9/ WAG9H).					A

	The seals and gaskets on the TM and oil cooler blower scavenger ducting (WAP5/WAP7).	X				A
	The seals and gaskets on the TM and oil cooler blower scavenger ducting (WAG9/ WAG9H).					A
	Rubber hoses.	X				A
13	TM & Oil cooler Blower Scavenger Motor:					
	The driving & non-driving end bearings along with associated components.					A
14	Machine Room Blower Scavenger Motor:					
	The driving & non-driving end bearings along with associated components.					A
15	Machine Room Blower Scavenger:					
	The flexible duct between the machine room blower scavenger motor and filter.	X				A
	Rubber hoses.	X				A
	The equalizer hoses between the machine room blower scavenger motor and the filter (WAP5/WAP7).	X				A
	The equalizer hoses between the machine room blower scavenger motor and the filter (WAG9/ WAG9H).	X				A
	The seals and gaskets on the machine room blower scavenger ducting (WAP5/WAP7).	X				A
	The seals and gaskets on the machine room blower scavenger ducting (WAG9/ WAG9H).	X				A
16	Main Compressor Motor:					
	The main compressors drive motor bearings along with associated components.					A
17	Cab heater/Blower motor and crew fan motor:					
	Bearing of cab heater Blower motor and crew fan motor.	X				A
18	Cubicles:					
	The rubber parts of servo motor of EP Contactors in cubicles.	X				A

	The rubber parts of main cylinder of EP Contactors in cubicles.	X				A
	Contact tips of EP contactors(WAP-5/7)	X	X			A
	Contact tips of EP contactors(WAG9/9H)	X	IOH2 /IOH 4			A
	Filter of fire detection unit.					A
F	Air Supply and Pneumatic System:					
1	Main Compressor:					
	The main element & the safety element of the air intake filter & other parts as prescribed in manual.	X				A
	Suction air filter element.					A
	Compressor oil.					A
	Secondary oil filter.					A
	Gaskets of concentric valves.					A
	The main compressor resilient mountings & mounting pads.					A
	CP delivery pipe.					A
	HP & LP cylinder, HP & LP concentric valves all make.	X				A
	Concentric valve kit.	X				A
	Delivery hose of main compressor.					A
	Inter cooler after cooler assembly	X	X		Must change item during 2 nd POH of WAP-5/7 & must change item during POH of WAG-9/9 H	B
	Copper Interconnecting pipes between intercooler and after cooler (WAP5/WAP7).	X			Must change item during 2 nd POH of WAP-5/7 & must change item during POH of WAG-9/9 H	B
	Copper Interconnecting pipes between intercooler and after cooler (WAG9/WAG9H).	X				
	Overhaul kit of Inter cooler after cooler assembly (WAP5 & WAP7).	X	X			A
	Overhaul kit of Inter cooler after cooler assembly (WAG9 & WAG9H).	X	IOH2 /IOH 4			B
	Overhauling kit of Main Compressor-Oil free (Faiveley/Elgi / Knorr Bremse)	X				A

	Overhauling kit of Main Compressor-Oil lubricated (D&M/SML(Faiveley) /Elgi) (WAP5/ WAP7)					A
	Overhaul kit of Main Compressor-Oil lubricated (D&M/ SWML (Faiveley)/Elgi) (WAG9/ WAG9H)					A
2	Auxiliary Compressor:					
	Air delivery hose between the auxiliary compressor and brake frame & overhauling kit.					A
	Compressor oil.					A
3	Pneumatic Valves, Cocks and Filters:					
	All rubber components (WAP5/WAP7).	X				A
	All rubber components (WAG9/ WAG9H).	X				A
4	Horn:					
	Horn gasket and other rubber parts of Horn.					A
5	Brake Pneumatics:					
	Overhauling kit of Complete E-70 / CCB brake system.	As per OEM's instructions				A
	Overhauling kit of driver brake controller and automatic brake controller.					A
	TBU and PBU kit (WAP7).	X			TBU/PBU to be replaced by conventional brake rigging as advised by ZR's during POH	C
	TBU and PBU kit (WAG9/ WAG9H).	X			TBU/PBU to be replaced by conventional brake rigging as advised by ZR's during POH	C
	Brake activating mechanism (main cylinder & parking brake cylinder)	X				A
	Complete Conventional Brake rigging along with pins, bushes & fasteners (WAP7)	X	X			A
	Complete Conventional Brake rigging along with pins, bushes & fasteners (WAG9/9H)	X	IOH2/IO H4			A
6	Air dryer					
	Overhauling kit of air dryer(As per OEMs manual , make wise)					A
	Body connector male & female	X	X			B

G	Interior					
1	Cab Door and Machine Room Door:					
	The door seals, door window seals.	X				A
2	Driver's Seat:					
	The seat cover and cushion of driver seat.			X		A
	Complete Driver seat.	X	X		Must change item during 2 nd POH of WAP-5/7 & must change item during POH of WAG-9/9 H	B
3	Cab Interior					
	Antiskid floor cover in cab.					A
4	Cab Equipment:					
	Vigilance, Sanders, PVEF pedal switches.	X				A
	All switches BPFA, BLPR, ZPRD, BLDJ, ZPT, BPVR etc.	X				A
	Cab activation switch.	X				A
	Cab heater flexible duct.					A
H	Overhaul the EM and EP Contactors in different Modules	The rubber parts (180 deg C class) of servomotor should be changed in alternate TOH. Depending upon the experience in future, the periodicity may be increased gradually up to IOH.			May be overhauled in IOH Schedules	B
I.	ADDITIONAL ITEMS :					
SN	DESCRIPTION OF ITEM/SUB ASSEMBLIES	REPLACEMENT DURING POH		Remarks	Category of items /Activity	
1.	TEST ROOMS ITEMS					
i)	Pre Charging contactor, Main Contactor EPC of SR, FB Panel Copper contact Tips to be replaced.	To be replaced			A	
ii)	80 Amp Contactor	To be replaced		Must change item during 2 nd POH of WAP-5/7 & must change item during POH of WAG-9/9 H	B	
iii)	150 amp contactor (07 nos) to be replaced with contactors along with Snubber Circuit & auxiliary switches.	To be replaced				

iv)	Replace 100% FB Panel EP Contactor Insulating base C Type.	To be replaced		A
v)	FB Panel Air Supply Pipe Line Set to be replaced by new one.	To be replaced		A
vi)	All Driver Desk Switches	To be replaced		A
vii)	All pneumatic panel solenoid valves to be replaced by modified ones.	To be done in POH ,if not done earlier		B
viii)	All auxiliary switches of pre-charging and EPC contactor	To be replaced		A
ix)	Angle transmitter	To be replaced		A
2.	ITEMS OF RELAY SECTION			
i)	Indication Lamps	To be replaced		A
ii)	All gauges	To be replaced		A
iii)	63 Amp MCB of OCB ,TMB 59.1/1 ,59.1/2, 53.1/1 and 53.1/2	To be replaced		A
iv)	40 Amp MCB of CP 47.1/1 and 47.1/2	To be replaced		A
v)	MRB contactor 54.2/1 and 54.2/2 with timer	To be replaced		A
vi)	Contactor 136.3, 126.5, 136.4, 126.7/1, 130.1, 211, 126.6, 126.7/2	To be replaced		A
vii)	BPVG push button switch	To be replaced		A
viii)	Marker Light	To be replaced		A
ix)	All Programme Switches	To be replaced		A
x)	All desk meters, Push button switches	To be replaced		A
xi)	All types of push button switches	To be replaced		A
xii)	Flasher light Unit & Lamp Unit	To be replaced		A
xiii)	All tube lights & CFL lamps with fittings	To be replaced		A
xiv)	DC-DC Converter	To be replaced		A
3.	ITEMS OF INSPECTION SECTION			
i)	All side filters & roof filters (MRB,TMB,OCB)	To be replaced	Must change item during 2nd POH of WAP-5/7 & must change item during POH of WAG-9/9 H	B
ii)	All door locks	To be replaced	Must change item during 2nd POH of WAP-5/7 &	B

			must change item during POH of WAG-9/9 H	
--	--	--	---	--

Note:

- (i) The lubricants shall be used wherever applicable as per RDSO's technical circular No. ELRS/TC/0034(Rev.4) dated 21-7-2008 or latest.
- (ii) The must change items for WAP7, WAG-9/9H locomotives fitted with conventional type brake rigging shall be as per RDSO Modification sheet No. RDSO/2009/EL/MS/0381 dated 7-9-09 and RDSO letter EL/3.1.35/2 (3 phase) dated 20-10-11.

2. MUST CHANGE ITEMS OF CONVENTIONAL ELECTRIC LOCOMOTIVES DURING IOH & TOH SCHEDULES

No Change is proposed in existing Technical Circular No. ELRS/TC/0029(Rev '01') - 2002 and ELRS/TC/0031 (Rev' 01') - 2002 for must change items during IOH & TOH schedule respectively.

3. MUST CHANGE ITEMS OF CONVENTIONAL ELECTRIC LOCOMOTIVES DURING POH SCHEDULES

S.N.	Item and its sub-assemblies	Replacement during first POH	Replacement during Second POH	Remarks	Category of items /Activity
01	Traction Motor				
i)	Gear case- passenger loco - goods loco	To be replaced	To be replaced		A
ii)	Suspension bearing (plain sleeve) along with lubricating pad assly.	Re-metaling/ Replacement			A
iii)	Oil pump for suspension bearing	Only pinion to be replaced.			A
iv)	Traction Motor bellow	To be replaced			A
v)	Traction Motor pinion	To be replaced			A
vi)	Sandwich mounting assembly	To be replaced			A
vii)	Gear in two halves for suspension bearing oil pump	To be replaced			A
viii)	Hitachi TM suspension tube bolt	To be replaced			A
ix)	PE end bearing	To be replaced			A
x)	CE end bearing	To be replaced			A
xi)	Brush holder assembly of TM	Complete brush holder assembly to be replaced on conditional basis	To be replaced		B

		otherwise overhauling of brush holder assembly to be done			
xii)	All carbon brushes liners, gaskets, needle roller bearings of TM	To be replaced			A
xiii)	Teflon ring of armature	To be replaced			A
xiv)	Insulating rod, 5565/675 & 5565/740	To be replaced			B
02	Auxiliary Machines				
i)	Auxiliary motor bearing	To be replaced			A
ii)	Auxiliary Compressor		To be replaced		A
iii)	MVMT Impeller	To be replaced			A
iv)	MVMT Duct		To be replaced		B
v)	HP & LP valves	To be replaced			A
vi)	Crank Shaft of Main Compressor	On condition basis			B
vii)	MPH, MVS, MVSL	To be replaced			A
viii)	MVRH impeller	To be replaced			A
ix)	Main compressor		To be replaced		A
x)	Axial fan for SIV Motor	To be replaced			A
xi)	DC & AC MRF	On condition basis	To be replaced		B
xii)	All churning fans of SIV	To be replaced			A
xiii)	All door and panel rubber gaskets of SIV	To be replaced			A
xiv)	All end shields of auxiliary motors		To be replaced		B
xv)	All auxiliary motors		*Rewinding after 12 years *Replacement of Aux motors after 18 years	On condition basis	C
03	Pantograph				
i)	Bow assembly with plunger	To be replaced			A
ii)	Upper Arm assembly	To be replaced			A

iii)	Other items as per TC-94 for freight locos and as per OEMs manuals for passenger locos	To be replaced.			A
04	All Damping panels				
i)	VCB Damping panel	To be replaced			A
ii)	TFP damping panel	To be replaced			A
iii)	Capacitors of RC network	To be replaced			A
iv)	Other Damping panels	To be replaced			A
05	Roof				
i)	Twin beam Headlight Reflector with holder, gaskets & bulbs	To be replaced			A
ii)	25 KV condenser bushing	To be replaced with vertical take-off CHT assembly	To be replaced		B
06	VCB/DJ				
i)	Air dryer sieve	To be replaced			A
ii)	Other items/components	To be replaced as per RDSO's latest version of SMI No. ELRS / SMI/0223 & 236 for kits of single and double bottle VCBs			A
iii)	DJ	To be replaced with single bottle VCB			A
iv)	Double bottle VCB		To be replaced with single bottle VCB		A
07	Transformer				
i)	Transformer oil	To be replaced.			A
ii)	Tap changer N-32 (including SMGR)	RDSO's TC No.0102 (latest revision) to be followed			A

08	Cab				
i)	BL Box complete with switches	To be replaced			A
ii)	Rubber mat	To be replaced			A
iii)	All relay covers	To be replaced			A
iv)	Bakelite separators of TK panel	To be replaced			A
v)	A9 valve	To be replaced			A
vi)	BL box of driving desk	To be replaced			A
vii)	Cab fans	On condition basis	To be replaced		B
viii)	Cab heaters	On condition basis	To be replaced		B
ix)	Cab window assembly complete	To be replaced			A
x)	All gauges, meters, indication panel & light fittings	To be replaced			A
xi)	Wiper servo motor assembly complete with arms/blades/control valves	To be replaced			A
xii)	Master Controller (Cam switches) & rollers	To be replaced			A
xiii)	DC-DC Converter	To be replaced			A
xiv)	Flasher light unit & Lamp box.	To be replaced			A
xv)	Marker Light	To be replaced			A
xvi)	All Push buttons	To be replaced			A
xvii)	All PCB Relay Contacts & springs	To be replaced			A
xviii)	RU of all voltmeters	To be replaced			A
xix)	Analog NR	To be replaced with digital NR		On condition basis (since all analog NR has been replaced by digital NR)	B
xx)	Indication panel	To be replaced			A
xxi)	FDCS	All PCB Cards to be rehabilitated			C
xxii)	VCD	Foot switch and push button to be replaced.			A
xxiii)	Complete Driver and Asstt. Driver seat	To be replaced		On condition basis	B
xxiv)	Driver/Assistant Driver seat cushion and it's cover	To be replaced			A

xxv)	Front look out glass and corridors glasses	To be replaced			B
09	Corridor				
i)	Pressure switches and air flow relays-micro switch and diaphragm	To be replaced			A
ii)	All NR valves, NC4, NC7 valves	To be replaced			A
iii)	Body filters	On condition basis	To be replaced		B
iv)	SMGR-PR valve	To be replaced			A
v)	All gauges	To be replaced			A
vi)	Electro-magnetic contactor	To be overhauled	To be replaced		B
vii)	Micro switch of relays	To be replaced			A
viii)	Time delay relay timer	To be replaced			A
ix)	Shunt for QF relay & traction ammeter		To be replaced		B
x)	RC network	To be replaced			A
xi)	TM cable cleats	To be replaced		On condition basis	B
xii)	All programme switches including HOM switch, selector switch, SPDP toggle switch & D type fuses	To be replaced		All program switches	A
				HOM switch and D type fuses on condition basis	B
xiii)	All gauges and meters	To be replaced			A
xiv)	Auxiliary contactors for EP contactors with power contact tips, all insulators and hardware's including square head bolt.	To be replaced			A
xv)	Rehabilitation of Safety relays by OEM		To be Rehabilitated as per guidelines of Railway Board.		A
xvi)	Tri-plate panel All valves rubber components, all valves base gasket, O ring between plates,NC-4&NC-7 valves and pressure switches	To be replaced			A
xvii)	EPC, C-145,shunting contactors	To be replaced			A

	a) Servomotor Piston Bucket, Gasket Piston Bucket & Felt Ring b) Fixed & Mobile Contacts c) Complete shunt Assembly d) Aux Switch with Cam.	To be replaced To be replaced To be replaced To be replaced			A
xviii)	Reverser a) Fork & all Dowel Pins b) Servomotor Piston Bucket, Gasket Piston Bucket & Felt Ring c) Finger & Drum Contacts with brass ball. d) Aux Switches e) Notching Lever Complete	To be replaced To be replaced To be replaced To be replaced To be replaced			A
xix)	HOM AIR Valve	To be replaced		On condition basis	B
xx)	RSI Block PTFE Cable	To be replaced		On condition basis	B
xxi)	Hinges of all doors	To be replaced		On condition basis	B
10	Under frame				
i)	Battery lead acid	To be replaced			A
ii)	Battery box		To be replaced		B
iii)	Replacement of Vertical/horizontal dampers	To be replaced			A
iv)	Side buffer assembly rubber buffing element and its fasteners	To be replaced			A
v)	Complete side buffer assembly with its fasteners		To be replaced		B
vi)	Complete CBC assembly	To be replaced			A
vii)	EMU type inter and after cooler		To be replaced		B
viii)	Set of cover for SL	To be replaced			A
ix)	Cattle guard with rail guard		To be replaced		B
x)	Air Dryer	Overhauling Kit to be replaced in POH as per instructions of RDSO			A
11	Bogie				
i)	Springs	To be replaced			A
ii)	Spring seat & equalizer of tri-mount bogie	To be replaced			A

iii)	Replacement of equalizer, compensating beam, Link		To be replaced		B
iv)	Pin, bushes, modified center block, side bearer, D-shackle (high adhesion bogie), tie rod for equalizer, snubbers, split cotters	To be replaced			A
v)	Complete brake rigging along with pins, bushes & fasteners	To be replaced			A
vi)	All spring seats, wearing plate, all synthetic liners/pads, oil seal felts, pins, bushes, high tensile fasteners, safety clamps of bogie & axle box etc.	To be replaced			A
vii)	Foot step assembly		To be replaced		B
viii)	Maintenance kits of brake cylinder	To be replaced			A
ix)	Sander pipe arrangement including rubber hose for sanders	To be replaced			A
x)	WAP-4 bogies items: outer & inner straps, Conical thrust pad, Hanger pin, bush, Brake head spring, brake hanger, happy pad	To be replaced			A
xi)	Wheel items: Axle box bearing, MSU & its bearings, (DE& NDE side)MSU bolts, Axle box complete	To be replaced			A
12	General				
i)	All perishable items like rubber gaskets, rubber grommets, felts, rubber pipes, hoses rubberized cork sheets, oil seals etc.	To be replaced			A
ii)	Brake block, carbon brushes, silica gel, grease nipple, metalized carbon strip for pantograph etc.	To be replaced			A
iii)	All oil and greases	To be replaced			A
iv)	Replacement of filters, pipelines, ceramic filters in DJ & SMGR	To be replaced			A
v)	MU coupler jumper pins	To be replaced			A
vi)	All type of washers, spring washers etc.	To be replaced			A
vii)	Various ball type isolating cocks, check valve, pressure cut out switch etc.	To be replaced			A
viii)	diaphragm for horns with horn valve	To be replaced			A
ix)	All flexible shunts	To be replaced			A

x)	Auxiliary Switches (SMGR, MP, CTF, J, C-118	To be replaced			A
xi)	A9 & SA9 pipe line	To be replaced with stainless steel pipe line			B
13	Electrical items				
i)	DBR grids		To be replaced		B
ii)	Shunts SHA/SHF		To be replaced		B
iii)	C-118 with R-118		To be replaced		B
iv)	All capacitors other than in damping panels	To be replaced (including Oil type to be replaced with dry type)			B
14	Loco Body				
i)	PU painting of locomotive	To be incorporated as per standard procedure already advised vide Report No. ELRS/IR/0115(Rev'0') of Sept'06.			A



सत्यमेव जयते

भारत सरकार-रेल मंत्रालय
अनुसंधान अभिकल्प और मानक संगठन
लखनऊ .226011

Tele/Fax : 2465739 & 42229 (Rly)

e-mail: dse1rdso@gmail.com
nikhil.1939@gov.in

Government of India - Ministry of Railways
Research, Designs & Standards Organization,
LUCKNOW – 226011



RDSO-QAE0LKO(POL)/10/2021

Principal Chief Electrical Engineer

Date: As signed

1. Central Railway, Mumbai CST-400001
2. North Western Railway, Jaipur-302006
3. East Central Railway, Hazipur-844101
4. South Central Railway, Rail Nilayam, Secunderabad-500071
5. East Coast Railway, Chandrashekharpur, Bhubaneswar-751016
6. South East Central Railway, Bilaspur- 495004
7. Eastern Railway, Fairlie Place, Kolkata-700001
8. South Eastern Railway, Garden Reach, Kolkata-700043
9. North Central Railway, Subedarganj, Prayagraj-211033
10. Southern Railway, Park Town, Chennai-600003
11. Northern Railway, Baroda House, New Delhi-110001
12. South Western Railway, Hubli-580024
13. North Eastern Railway, Gorakhpur-273001
14. West Central Railway, Jabalpur-482001
15. North East Frontier Railway, Maligaon, Guwahati-781011
16. Western Railway, Churchgate, Mumbai- 400020
17. Chittaranjan Locomotive Works, Chittaranjan -713331
18. Banaras Locomotive Works, Varanasi -221004
19. Patiala Locomotive Works, Patiala-147003

Technical Circular No. RDSO/2013/EL/TC/0123 Rev.'0' Amendment 4.

Sub: Amendment No. 04 to Technical Circular No. RDSO/2013/EL/TC/0123 Rev.'0' regarding Re-cabling, TM Temperature & Speed Sensor and replacement of 150A to 200A rated BUR Contactors of 3-Phase electric locomotive during POH.

Ref: i) Railway Board Letter no. 2026/Elect.(TRS)/138/5 dated 09.01.2026.
ii) RDSO's letter of even no. dated 09.03.2026.

Vide letter under reference (ii), the Amendment No. 04 to the Technical Circular No. RDSO/2013/EL/TC/0123 Rev.'0' dated 16.05.2013 duly incorporating accepted recommendations for Re-cabling in 3-Phase Electric Locomotives has been circulated to all Zonal Railways and Production units for comments/suggestions.

The comments/suggestions from Zonal Railways/PUs have not been received except acceptance of WCR.

In view of above, the technical circular has been finalized and issued for implementation. This is for kind information and necessary action please.

Nikhil Singh
Digitally signed by Nikhil Singh
Date: 2026.05.11 18:26:16 +05'30'
(Nikhil Singh)
DSE/System

Encl: As above

Copy to:-

Secretary (Electrical) (Kind attention: Sh. Venkatsubramanian, ED/RS-I/RB)
Railway Board, Rail Bhavan,
New Delhi-110001

Amendment No. 04 to Technical Circular No. RDSO/2013/EL/TC/0123 Rev.'0' for 'Re-Cabling in 3-Phase Electric Locomotives'

A. Re-cabling after 9 years:

- A.1. Complete re-cabling of control cables of propulsion system of M/s BHEL make locos with M/s ELDRA make cable if SR, BUR and TCN VCU of BHEL make IGBT Propulsion system to be replaced.
- A.2. Traction Motor (TM) power cables from TM junction box to TM terminal box to be replaced.
- A.3. Existing 25 sq.mm cable size of cable no. 1121A/B, 1122A/B & 1123A/B (from BUR contactors 52/1 to 52/4 to 52/5) to be replaced with 35 sq.mm.
- A.4. Existing 150A rating BUR Contactors (52/1 to 52/5) with 200A rating Contactors, to be replaced initially in WAP-7 during 1st POH (9 years) and in POH for WAG-9/9H (18 Years).
- A.5. Hotel Load Converter IVC and UIC Coupler cables to be replaced in every POH in WAP-7.
- A.6. TM Temperature Sensor and Speed Sensor cables from under frame to SR to be replaced.
- A.7. Fibre Optic Cables provided between SR, BUR and VCU to be replaced based on dB loss.

B. Replacement during POH and after 18 years of service:

- B.1. Control and earthing cables to be replaced during POH of WAG-9 and 2nd POH of WAP-7 after 18 years of service in 3-Phase Electric Locomotives.
- B.2. Complete cable listed in Annexure 3 to be replaced.

C. Circular Connectors:

- C.1. Replacement of complete circular connectors (male & female) listed in Annexure-2 during every POH in WAP-7/5 (once in 9 years) and during IOH schedule by sheds (9 years) & during POH schedule (18 years) in WAG-9.
- C.2. Checking of insulation resistance of other circular connectors during POH, carrying out hot air blowing of circular connectors and replacing the same as complete set (male & female) if the IR value still found low (below 20MΩ- in dry condition). Annexure -1 & 2.

D. Lugs

- D.1. Uses the correct size of Lugs as per CLW specification no. CLW/ES/3/0130 to be ensured with crimping 'Indent crimping'.

E. Earth shunts from cable trench trays to loco body on both sides of trays are to be provided.

For 70 sq.mm Cable: From TFP to HB2

SN	Cable No.	From						Loop No.	Length In M
		Equip.	Cord No.	Terminal No.	Equip.	Cord No.	Terminal No.		
1.	100	Bogie1 TM1	240	10/1	E/Box	103	XI10A	161	1.35
2.	100	Bogie1 TM2	240	10/2	E/Box	393	XI39A	162	1.35
3.	100	Bogie2 TM3	740	10/3	E/Box	603	XI60A	163	1.35
4.	100	Bogie2 TM4	740	10/4	E/Box	893	XI89A	164	1.35
5.	1103	BUR Cable	2UB/TFP		BUR Cable	S11103.01/HB2			
6.	1103	BUR Cable	2VB/TFP		BUR Cable	S1117.01/HB2			
7.	1103	BUR Cable	S1103.01/B2		BUR Cable	1050.01/BUR1			
8.	1103	BUR Cable	S1103.01/B2		BUR Cable	1050.02/BUR2			
9.	1103	BUR Cable	S1103.01/B2		BUR Cable	1050.02/BUR3			
10.	1117	BUR Cable	1117.01		BUR Cable	1050.01/BUR1			
11.	1117	BUR Cable	1117.01		BUR Cable	1050.02/BUR2			
12.	1117	BUR Cable	1117.01		BUR Cable	1050.02/BUR3			

For 6 sq.mm Cable: Oil Pump Cables

SN	Cable No.	From						Loom No.	Length
		Equip.	Cord No.	Terminal No.	Equip.	Cord No.	Terminal No.		
13.	1167B	SR-MPH 2	476	63/2	HB2	675	XB67B.03 (8)	241	14 m
14.	1168B	SR-MPH 2	476	63/2	HB2	675	XB67B.03 (11)	241	14 m
15.	1169B	SR-MPH 2	476	63/2	HB2	675	XB67B.03 (14)	241	14 m
16.	1167A	SR-MPH 1	526	63/1	HB1	325	XB32B.03 (8)	230	14 m
17.	1168A	SR-MPH 1	526	63/1	HB1	325	XB32B.03 (11)	230	14 m
18.	1169A	SR-MPH 1	526	63/1	HB1	325	XB32B.03 (14)		
19.	1157A	TFP-MPH 1		XK32P 01	TFP-MPH 1		MPHT1		
20.	1158A	TFP-MPH 1		XK32P 01	TFP-MPH 1		MPHT1		
21.	1159A	TFP-MPH 1		XK32P 01	TFP-MPH 1		MPHT1		
22.	1157B	TFP-MPH 2		XK67P	TFP-MPH 2		MPHT2		
23.	1158B	TFP-MPH 2		XK67P	TFP-MPH 2		MPHT2		
24.	1159B	TFP-MPH 2		XK67P	TFP-MPH 2		MPHT2		

Fibre Optic Cables With Connector

SN	Cable No.	Length (in Meters)	Core	Core No.	From	Connection	To	Connection
1.	811	7	Yellow	F126A	CEL1	411.WG	BUR1	426/1.BB
2.	811	7	Orange	F226A	CEL1	411.WH	BUR1	426/1.BA
3.	812	11	Yellow	F115A	CEL1	411.WE	SR1	415/1.RB
4.	812	11	Orange	F215A	CEL1	411.WF	SR1	415/1.RA
5.	813	26	Yellow	F211	CEL1	411.WA	CEL2	412.WB
6.	813	26	Orange	F111	CEL1	411.WB	CEL2	412.WA
7.	814	26	Yellow	F112	CEL1	411.WC	CEI2	412.WD
8.	814	26	Orange	F212	CEL1	411.WD	CEI2	412.WC
9.	815	22	Yellow	F126C	CEL1	411.WI	BUR3	426/3.BB
10.	815	22	Orange	F226C	CEL1	411.WJ	BUR3	426/3.BA
11.	816	11	Yellow	F115B	CEL2	412.WE	SR2	415/2.RB
12.	816	11	Orange	F215B	CEL2	412.WF	SR2	415.2.RA
13.	817	8	Yellow	F126B	CEL2	412.WG	BUR2	426/2.BB
14.	817	8	Orange	F226B	CEL2	412.WH	BUR2	426/2.BA
15.	820	26	Yellow	F,,,	CEL1	411.,,,	CEL2	412.,,,
16.	820	26	Orange	F,,,	CEL1	411.,,,	CEL2	412.,,,

POWER CABLES:

Sl. No.	Size of Cable	Location	
		From	To
1	150 Sq.mm	Harmonic Filter Cubicle (XI37A)	Harmonic Filter Resistor (On Roof)
2	120 Sq.mm	TM Junction Box (Under Frame)	TM Terminal Box
		SR-1 (XH42B) SR-2 (XH57B)	TM Junction Box (Under Frame)
3	70 Sq.mm	Boing Frame (Near TM)	Earth Return Current Box (Axle Box)
		Transformer	HB-2 Panel
		HB-2 Panel	BUR-1/2/3
4	35 Sq.mm	Battery Box 1/2	Insu Batter Box ½
		Batter Box	MCB 111 & 112
		Contactors 52/4, 52/5	HB 1 Panel Coupler XH32A
		BUR-3	MCB 110
5	16 Sq.mm	OCB-1 MCB 59.1/1	XB 32B
		XB 32B	OCB-1 Motor
		OCB-2 MCB 59.1/2	XB67B
		XB67B	OCB-2 Motor
		OCB-1 MCB 59.1/1	HB-1 Panel XH32A
		HB-1 Panel XH32A	HB-1 Panel XB32B
		HB-1 Panel XB32B	HB-2 Panel XB67B
		HB-2 Panel XB67B	52.4/1 Contactor
		52.4/1 Contactor	OCB-2 MCB 59.1/2
		Battery MCB 110	XK77C:02
		XK77C:02	Battery MCB 112
6	10 Sq.mm	Battery MCB 112	MCB 130.4
		MCP-1	HB-1 Panel XK32A
		MCP-2	HB-2 Panel XK67A
7	6 Sq.mm	SR-MPH 1 (63/1)	HB Panel-1 (XB32B:03)
		SR-MPH 2 (63/2)	HB Panel-2 (XB67B:03)

	TFP-MPH 1 (63/1)	HB Panel-1 (XK32P:01)
	TFP-MPH 1 (63/2)	HB Panel-2 (XK67P:01)

FIBERR OPTIC CABLES WITH CONNECTOR:

Sl. No.	Cable No.	From	To
1	811	CEL-1 (411)	BUR-1 (426/1)
2	812	CEL-1 (411)	SR-1 (415/1)
3	813	CEL-1 (411)	CEL-2 (412)
4	814	CEL-1 (411)	CEL-2 (412)
5	815	CEL-1 (411)	BUR-3 (426/3)
6	816	CEL-2 (412)	SR-2 (415/2)
7	817	CEL-2 (412)	BUR-2 (426/2)
8	820	CEL-1 (411)	CEL-2 (412)

COUPLER CABLES

Sl. No.	Size of Cable	Location	
		From	To
1	0.5 Sq.mm (9P+S)	Filter Bank Panel (XE37A:01, Type 9 Pin, Sub D)	SR-1 Panel (415.AA/1, 9 Sub D)
2	0.5 Sq.mm (9P+S)	Filter Bank Panel (XE37A:02, Type 9 Pin, Sub D)	SR-2 Panel (415.AA/2, 9 Sub D)
3	0.5 Sq.mm (9P+S)	Filter Bank Panel (XE37A:05, Type 9 Pin, Sub D)	SR-1 Panel (415.AA/1, 9 Sub D)
4	0.5 Sq.mm (9P+S)	Filter Bank Panel (XE37A:06, Type 9 Pin, Sub D)	SR-1 Panel (415.AA/1, 9 Sub D)
5	0.5 Sq.mm (3P+S)	SR-1 Panel (415.AI/1, Type 9 Pin, Sub D)	Differential Amplifier-1 (214.C/1, 5 Pin Coupler)
6	0.5 Sq.mm (9P+S)	SR-1 Panel (415.DA/1, Type 9 Pin, Sub D)	TM-1 Temp. Sensor (98.A/1, 5 Pin Coupler)
7	0.5 Sq.mm (9P+S)	SR-1 Panel (415.DC/1, Type 9 Pin, Sub D)	TM-2 Temp. Sensor (98.A/2, 5 Pin Coupler)
8	0.5 Sq.mm (9P+S)	SR-1 Panel (415.DE/1, Type 9 Pin, Sub D)	TM-3 Temp. Sensor (98.A/3, 5 Pin Coupler)
9	0.5 Sq.mm (2X2P+S)	SR-1 Panel (415.DI/1, Type 9 Pin, Sub D)	TFP-1 Temp. Sensor (210.5A/1, 5 Pin Coupler)
10	0.5 Sq.mm (2P+S)	SR-1 Panel (415.HA/1, Type 9 Pin, Sub D)	TM-3 Speed Sensor-1 (93.2A/1, 5 Pin Coupler)
11	0.5 Sq.mm (2P+S)	SR-1 Panel (415.HA/2, Type 9 Pin, Sub D)	TM-1 Speed Sensor-2 (93.2B/1, 5 Pin Coupler)
12	0.5 Sq.mm (2P+S)	SR-1 Panel (415.HC/1, Type 9 Pin, Sub D)	TM-2 Speed Sensor-1 (93.2A/2, 5 Pin Coupler)
13	0.5 Sq.mm (2P+S)	SR-1 Panel (415.HC/2, Type 9 Pin, Sub D)	TM-2 Speed Sensor-2 (93.2B/2, 5 Pin Coupler)
14	0.5 Sq.mm (2P+S)	SR-1 Panel (415.HE/1, Type 9 Pin, Sub D)	TM-3 Speed Sensor-1 (93.2A/3, 5 Pin Coupler)
15	0.5 Sq.mm (2P+S)	SR-1 Panel (415.HE/2, Type 9 Pin, Sub D)	TM-3 Speed Sensor-2 (93.2B/3, 5 Pin Coupler)
16	0.5 Sq.mm (3P+S)	SR-2 Panel (415.HI/2, Type 9 Pin, Sub D)	Differential Amplifier-2 (214.C/2, 5 Pin Coupler)

17	0.5 Sq.mm (9P+S)	SR-2 Panel (415.DA/2, Type 9 Pin, Sub D)	TM-4 Temp. Sensor (98.A/4, 5 Pin Coupler)
18	0.5 Sq.mm (9P+S)	SR-2 Panel (415.DC/2, Type 9 Pin, Sub D)	TM-5 Temp. Sensor (98.A/5, 5 Pin Coupler)
19	0.5 Sq.mm (9P+S)	SR-2 Panel (415.DE/2, Type 9 Pin, Sub D)	M-6 Temp. Sensor (98.A/6, 5 Pin Coupler)
20	0.5 Sq.mm (2X2P+S)	SR-2 Panel (415.DI/2, Type 9 Pin, Sub D)	TFP-2 Temp. Sensor (210.5A/2, 5 Pin Coupler)
21	0.5 Sq.mm (2P+S)	SR-2 Panel (415.HA/3, Type 9 Pin, Sub D)	TM-4 Speed Sensor-1 (93.2A/4, 5 Pin Coupler)
22	0.5 Sq.mm (2P+S)	SR-2 Panel (415.HA/4, Type 9 Pin, Sub D)	TM-4 Speed Sensor-2 (93.2B/4, 5 Pin Coupler)
23	0.5 Sq.mm (2P+S)	SR-2 Panel (415.HC/3, Type 9 Pin, Sub D)	M-5 Speed Sensor-1 (93.2A/5, 5 Pin Coupler)
24	0.5 Sq.mm (2P+S)	SR-2 Panel (415.HC/4, Type 9 Pin, Sub D)	M-5 Speed Sensor-2 (93.2B/5, 5 Pin Coupler)
25	0.5 Sq.mm (2P+S)	SR-2 Panel (415.HE/3, Type 9 Pin, Sub D)	M-6 Speed Sensor-1 (93.2A/6, 5 Pin Coupler)
26	0.5 Sq.mm (2P+S)	SR-2 Panel (415.HE/4, Type 9 Pin, Sub D)	M-6 Speed Sensor-2 (93.2B/6, 5 Pin Coupler)
27	0.5 Sq.mm 9P+S)	Cab-2 SPM (94.2A, Type 9 Pin, Sub D)	SPM-PG (94.1A)
28	0.5 Sq.mm 2P+S)	Cab-1 SPM (94.3B, Type 50 Pin, Sub D)	Cab-2 SPM (94.2B)
29	1.5 Sq.mm & 1.0 Sq.mm (2P+S)	Cab-1 Panel A (XK12A, 61 Pin Type 40-61S)	Cab-1 SB (XF13A:01/02/03/04) and P/Volt TFP (224.2/1)
30	1.5 Sq.mm & 1.0 Sq.mm (2X2P+S)	Cab-1 A9 (293.A/1, 19 Pin Type 22-14S)	Cab-1 SB (XF13A:03) and Pneumatic Panel (260.A, 19 Pin)
31	1.5 Sq.mm & 1.0 Sq.mm (2P+S)	Cab-2 Panel A (XK87A, 61 Pin Type 40-61S)	Cab-2 SB (XF86A:01/02/03/04) and P/Volt TFP (224.2/2)
32	1.5 Sq.mm & 1.0 Sq.mm (2X2P+S)	Cab-2 A9 (293.A/2, 19 Pin Type 22-14S)	Cab-2 SB (XF13A:03) and Pneumatic Panel (260.A, 19 Pin)
33	1.5 Sq.mm & 1.0 Sq.mm (2P+S)	Cab-2 Panel (XK13A:02, 61 Pin)	Cab-2 SB (XF13A:01/02/03/04) and P/Volt TFP (224.2/1)
34	1.5 Sq.mm & 1.0 Sq.mm (2P+S)	Cab-1 F-Panel (XK86A:02, 61 Pin)	Cab-1 SB (XF86A:01/02/03/04) and P/Volt TFP (224.2/2)
35	1.5 Sq.mm	Cab-2 F-Panel (XK13A:01, 35 Pin)	Cab-2 SB (XF13A:02/03/04)
36	1.5 Sq.mm	Cab-1 F-Panel (XK86A:01, 35 Pin)	Cab-1 SB (XF86A:02/03/04)
37	2.5 Sq.mm	Cab-1 Panel C (XK14C, 35 Pin) Type 40-35	Cab-1 SB (XF13A:01/02/03/04)
38	2.5 Sq.mm	Cab-1 Panel D (XK18D, 31 Pin) Type 32-31	Cab-1 SB (XF13A:01/03/04)
39	2.5 Sq.mm	Cab-1 Master Controller (150.A/1, 13 Pin) Type 32-13	Cab-1 SB (XF13A:02)
40	2.5 Sq.mm	Cab-1 RA (69.6A/1, 4 Pin Type 24-S)	Cab-1 SB (XF13A:06)
41	2.5 Sq.mm	Cab-2 Panel C (XK85C, 35 Pin Type 40-35)	Cab-2 SB (XF86A:01/02/03/04)
42	2.5 Sq.mm	Cab-1 RA (69.6A/2, 4 Pin Type 24-S)	Cab-2 SB (XF86A:06)

43	6 Sq.mm	TFP-MPH 1 Terminal Box (62/1)	HB Panel-1 (XK32P:01,4 Pin Type 24-4S)
44	6 Sq.mm	TFP-MPH 2 Terminal Box (62/2)	HB Panel-2 (XK67P:01,4 Pin Type 24-4S)
45	16 Sq.mm	Battery Box	SB Panel-2 (XK77C:02, 4 Pin Type 40A-4)

EARTHING CABLES:

Sl. No.	Size of Cable	Location	
		From	To
1	1.5 Sq.mm	LM Roof-1 (330/11 &12)	MASSE (Chassis ground)
		Push Button Roof-1 & 3 (327/1 & 2)	MASSE (Chassis ground)
		LM Roof-2 (330/21)	MASSE (Chassis ground)
		LM Roof-3 (330/31 &32)	MASSE (Chassis ground)
		B-1 Panel (MASSE 115)	Cab-1 SB XF13A.01
		F-2 Panel SB XF 86A.01	MASSE 885
2	2.5 Sq.mm	A-9 Cab-1 & 2 (293/1 &2)	MASSE (Chassis ground)
		SPm-1 &2 (94.2 & 94.3)	MASSE (Chassis ground)
		SCTMB-1/2 (55/1 & 2)	MASSE (Chassis ground)
		MRB-1/2 (54.A/1 & 2)	MASSE (Chassis ground)
		SCMRB-1/2 (56/1 & 2)	MASSE (Chassis ground)
		RA-1/2 Blower (69.6/1 & 2)	MASSE (Chassis ground)
		Cab-1 & 2 Fans (69.7/1,2,3 & 4)	MASSE (Chassis ground)
		Socket Roof-1 & 3 (334.2/1 & 2)	MASSE (Chassis ground)
		F-Panel 1 & 2 (MASSE)	Cab-1 SB XF13A.01 Cab-2 XF86A.01
		Master Controller-1 & 2 (150/1 &2)	MASSE (Chassis ground)
		Amp. Sensor TFP oil-1 & 2 (214/1 &2)	MASSE (Chassis ground)
		Flasher Light-1 & 2 (318.3/1 & 2)	MASSE (Chassis ground)
		Spot Light Cab-1 & 2 (325.21/1 & 2, and 325.22/1 &2)	MASSE (Chassis ground)
		Cab Light-1 & 2 (325/1 & 2)	MASSE (Chassis ground)
		Roof-2 (74.2)	MASSE (Chassis ground)
		3	
	TFP-MPH 1 & (62/1 & 2)		MASSE (Chassis ground)
	SR-MPH 1 & 2 (63/1 & 2)		MASSE (Chassis ground)
4	10 Sq.mm	F-Panel ½	MASSE (Chassis ground)
		TMB-1/2 Connector (53.A/1 & 2)	MASSE (Chassis ground)
		OCB-1/2 Connector (59.A/1 & 2)	MASSE (Chassis ground)
		MCP-1/2 (47/1 & 2)	MASSE (Chassis ground)
5	16 Sq.mm	SB Panel-1/2	MASSE (Chassis ground)
6	35 Sq.mm	HB Panel-1/2	MASSE (Chassis ground)
		BUR ½	MASSE (Chassis ground)
7	70 Sq.mm	Earthing Choke	MASSE (Chassis ground)
8	95 Sq.mm	SR-1/2	MASSE (Chassis ground)
9	120 Sq.mm	Filter Cubicle	MASSE (Chassis ground)