Assessing the Requirement of Manpower for Maintenance including Sick Line Attention of LHB Coaches at LTT Depot, Mumbai Division.

Officer
Anil Talreja
Secretary to AGM

Inspector
Santosh R Handore
WSI/BB

Coordinating officer & Supervisors

Shri.Raghuveer
ACDO-II/LTT

Shri.Prakash Kakde
SSE/C&W/LTT

Synopsis of the study

Study Number	: WSCR/MECH/BB/7/18-19

Name of Study	: Assessing the Requirement of Manpower for Maintenance including Sick Line Attention of LHB Coaches at LTT Depot, Mumbai Division.
Approved by	: AGM
Department	: Mechanical
Division	: Mumbai
Date of Commencement	: 22.02.2019
Date of Completion	: 25.03.2019
Date of Submission	: 28.03.2019
No. of Recommendations	: 01
Sanctioned Strength	: 950
No. of Men studied	: 827
No. of posts identified surplus	: NIL
Financial implications	: NIL

Index

Acknowledgement

Work-study team takes this opportunity to express thanks to Shri Sudeep Prasad Sr.CDO/LTT for their valuable guidance rendered to the study team for completion of the study.

Study team is also thankful to Shri Raghuveer ACDO/LTT & Shri. Prakash Kakde SSE (C&W)/LTT, and staff working in LTT Coaching Depot for furnishing necessary information and data required for conducting the study.

Authority and Term of Reference

Work study on. “Assessing the Requirement of Manpower for Maintenance including Sick Line Attention of LHB Coaches at LTT Depot, Mumbai Division.” has been included as a programmed

study Approved by AGM, The terms of reference for the study is to "Assessing the Requirement of Manpower for Maintenance including Sick Line Attention of LHB Coaches at LTT Depot" as per existing norms.

Rational for conducting this study

- Manpower is the most costly and precious resource over Indian Railway and right sizing is the need of the hour.
- Improving the efficiency (output / Input) either by improving the output numerator by decreasing the input (denominator).
- Focusing attention on core activities by reducing / elimination of non-core activities due availability of better process/ technology.

Methodology

- Collection of data in details with reference to quantum of work carried by the staff .
- Discussion with coordinating officer/supervisors
- Analyzing the data in the present working system.
- Making recommendations for need based staff in the present context and recommendations for system improvements.

Chapter 1	Introduction

During 1993-94, Indian Railways decided to look for a passenger coach design which would be lighter and capable of higher speeds compared to their existing rakes. The main features of the Railways' specification were high speed light weight coaches to run on the present infrastructure of the Indian Railways, i.e. the railway, track and environmental conditions in India at an operating speed of 160 km/h. It was decided by the Railways that the design would first be tried in the Rail Coach Factory in Kapurthala (RCF), and upon successful completion of this trial, it would be tried in the Integral Coach Factory in Perambur.

In 1995, after a global selection process, Alstom-LHB received the order from Indian Railways to design and develop a new passenger coach under a transfer of technology agreement. As part of the order, Alstom-LHB had to execute two contracts, one for the supply of "Light Weight High Speed

Coaches for Broad Gauge" which includes the development, design and manufacture of 19 AC 2nd Class Chair Cars, 2 AC Executive Class Chair Cars and 3 Generator-cum-Brake vans and the other contract for the "Technology Transfer" which includes the transfer of technology for design and manufacturing, the training of Indian Railways personnel in the premises of the manufacturer and the technical assistance at RCF during the start of production.

Out of the 24 coaches imported from Germany, all of them mostly being Air Conditioned chair cars, the first lot were used for New Delhi-Lucknow Shatabdi Express on a trial basis. It didn't turn out be successful as the coaches's wide windows were targets of mischief and stone-pelting. Railways had to use sealing tapes to tape up the bruised windows. When these rakes were brought into service, couplers came unstuck and the data collected from the passenger feedback showed that the air conditioning was not "very effective". They were withdrawn from service and after attending to the problems, Railways reintroduced them on the New Delhi-Lucknow Shatabdi Express and proved successful.

The RCF began to manufacture other variants of LHB design like the air conditioned first class, AC 2 tier sleeper, AC 3 tier sleeper, hot buffet (pantry) car etc., from 2001 to 2002, and rolled out its first rake in December 2002. The first such rake was introduced for Mumbai-New Delhi Rajdhani Express in December, 2003 Up to March 2011, 997 LHB coaches were produced by the RCF. All of these coaches are being used in premier super fast express trains like Rajdhani, Shatabdi and Duronto Express and have been offering better passenger comfort.now all the Duronto trains are equipped with LHB coaches

Mechanical department plays a very important role in Indian Railways. They maintain coaches and wagons efficiently as per the periodicity for maximum utilization of rolling stock for timely movement of traffic.

C & W wing of Mechanical department is engaged in & responsible for maintenance of coaching & wagons, different activities given below viz primary maintenance, secondary maintenance, enroute train passing, turn around attention, terminating / originating (inclusive of cleaning and examination at platform but excluding interior dry cleaning of turnaround trains), sick line attention, cleaning & complete washing, only interior dry cleaning, watering, material storage / Accountal, linen management, train escorting staff, waste disposal, pit line sweeping and drain cleaning, security and locking of rakes, ART maintenance etc are carried out in different C &W depots.

In Mumbai division, the mechanical department staff is placed under the administrative control of Sr.DME/BB. The Mechanical staff deployed at C&W depots are engaged in maintenance of rolling stock at certain nominated stations where trains originates / terminates and provision has been made for attention of different maintenance schedules.

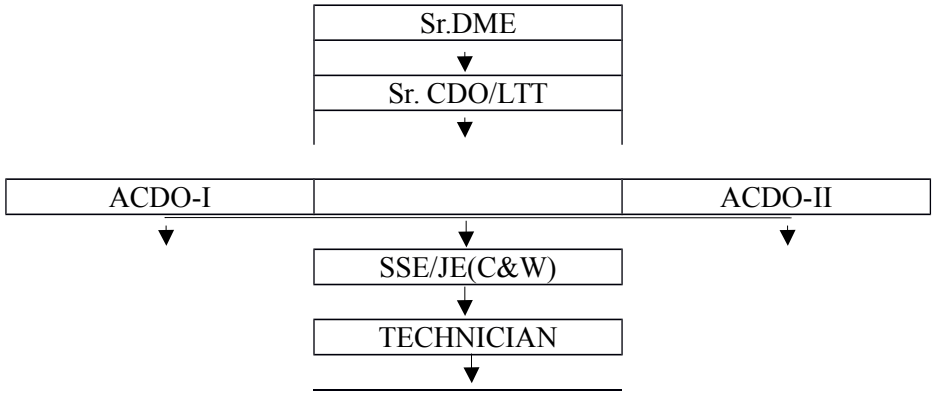
For dealing daily activities, separate staff of various categories have been deployed under the supervision of Senior Section Engineer (C&W).

In course of time and based on experience, various procedures / schedules for maintenance of coaches have been prepared. The schedules and procedures have been largely standardized and issued by Railway Board, RDSO, and IRCA etc. However, in many cases, instructions have been issued for ensuring optimum utilization of staff & increase the manpower productivity.

This study is sponsored with the proposed objective on focusing attention on assessing the requirement of manpower for maintenance of newly introduced LHB Coaches at LTT Depot.

Chapter 2 | Existing Procedure & Critical Analysis

2.0. The organizational structure of Mechanical Department in Mumbai division is as shown below:-



KHALASI

Major Repair activities viz Intermediate Over Hauling (IOH) are being carried out at LTT Coaching Depot. On an average 20 coaches are being given IOH every month from the well equipped repair shed consisting of 25T EOTs and Lifting Jacks.

2.1. The existing method of working is that the C&W depot is headed by the Senior Section Engineer assisted by Junior Engineer and other number of Technicians, Ancillary, Khalasis, Safaiwala etc. To have the smooth functioning of the depot, the men power have been divided as per activities into Gangs, each Gang is headed by either SSE or JE consisting of Technician, Khalasis, Safaiwala etc.

LTT Coaching Depot: LTT coaching depot is working under the administrative control of Sr.CDO/LTT and assisted by ACDO-I & ACDO-II followed by Supervisors and Technician staff.

LTT Coaching depot has a primary coach holding of 874 coaches. 39 primary rakes are based here. 25 Primary, 11 Secondary and 10 RBPC trains are maintained by the depot.

There are 05 Platform line, 8 pit lines of 26 coach length each. Besides, 4 washing lines with apron for attention to RBPC trains.

IOH - 518 coaches IOH-ed in the period April 2011 to Feb 2012, average: 43 coaches per month.

There has been an increase in the non-scheduled sick detachment of depot's primary coaches from 336 coaches in 16-17 to 828 coaches in 18-19.

The major reasons of sick marking are as mentioned below

1. Shelled tread – 328 cases in 2018-19 till 31.01.2019 (including 25 LHB coaches). –
2. LHB Springs –243 cases in 2018-19 till Jan 2019.

   The defects like Trimming, Wheel skidding & Wheel Root Radius has been reduces in last three years.

Brief on LHB Coaches:

Till recently, Indian Railways have been transporting passenger traffic mainly through Coaches of ICF design. These coaches are being manufactured at ICF and RCF. A limited number of these coaches are being manufactured at BEML/Bangalore also.

These type of coaches are having limitations in terms of

1. Speed potential;
2. Heavy corrosion;
3. Poor riding comfort;
4. Wearing of parts in the under gear;

To overcome these limitations, Indian Railways entered into supply and technology transfer contracts with M/s. ALSTOM LHB/Germany to initially supply 24 coaches consisting of 19. AC chair cars, 2 AC Executive Class Chair cars and 3 Generator cum Brake vans. The bogies for these coaches are manufactured by M/s. FIAT/SIG Switzerland. These coaches arrived in India and got commissioned in the year 2001and put in service .

These type of coaches are far superior w.r.t. passenger comfort, safety, speed, corrosion, maintenance and aesthetics. These coaches are also longer as compared to ICF design resulting into more carrying capacity. The expected benefits from these type of coaches are as under:-

i. Higher carrying capacity - These coaches are about 2 meters longer than ICF coaches. With this extra length two additional rows of chairs in chair cars or one additional bay in sleeper coaches can be accommodated.

ii. The weight of LHB coach is lesser as compared to ICF design coaches. LHB coach can accommodate 72 passengers as compared to 64 in conventional AC III Tier Coach. Thus giving better pay to tare ratio.

iii. Low corrosion – There will be low corrosion of LHB coaches due to extensive usage of Stainless Steel and better design and manufacturing techniques.

iv. Low Maintenance – Replacement and removal of sub-systems will be required only after one million kilometers.

v. LHB Coaches have aesthetically superior interiors with FRP panels for side wall and roof. They can be removed easily for maintenance, resist water seepage and are wear resistant;

vi. There are no visible screws inside the passenger compartment.

vii. Better passenger comfort: Better Riding Index has been specified as compared to conventional ICF coaches.

viii. LHB coach offers better passenger safety due to:
   1. Use of fire retardant materials for furnishing.
   2. Provision of emergency open able windows.
   3. Vertically interlocked Centre Buffer Couplers.

ix. LHB coach offers better passenger amenities due to :
   1. More space for pantry;
   2. Individual reading light in chair car;
   3. Ergonomically designed chairs with reclining back rest

Overall Dimensions of LHB Coach

1. Gauge 1676 mm
2. Length over body 23540 mm
3. Length over CBC 24000 mm
4. Wheel Base 2560 mm
5. Maximum width over body 3240 mm
6. Maximum distance between inner wheels 12345 mm
7. Window opening 1180x760 mm
8. Distance between centre pivots 14900 mm
9. Height of compartment floor from rail level 1303 mm
10. under tare condition
11. Maximum CBC drop under gross load 75 mm
12. and worn conditions
13. Minimum height from rail level 102 mm
14. Maximum height of centre line of side 1105 mm
15. CBC above rail level for empty vehicle
16. Minimum height of centre line of CBC 1030 mm
17. above rail level for loaded vehicle
18. Maximum tare weight
19. Wheels diameter (New) 915 mm
20. Maximum axle load permissible 16.25 tones
21. Number of toilets - 3 (**for Shatabdi coaches**), there is
22. difference in the no. of toilets for
23. different types of coaches.
24. Higher speed potential 160 Kmph upgradable to 200
25. Ride index of coach* 2.5 at 160 Kmph but not >2.75

- LHB Coach advantages over ICF Coaches:

1. The LHB coaches can travel at a higher speed. The maximum permissible speed for LHB coaches in 160 kmph. These coaches have been tested at speeds ranging 200 kmph. While the ICF coach is permitted to travel at a maximum speed of 110 kmph.
2. The LHB coaches are anti-telescopic. These coaches do not penetrate into the adjacent coaches in case of accidents.
3. During collision or derailment, the LHB coaches do not climb on the adjacent coaches, due to the use of Center Buffer Couling(CBC), instead of the dual buffer system.
4. The LHB coaches are 1.7 meters longer than the conventional ICF coaches. This enhances the seating capacity of the LHB coaches.
5. The coaches are equipped with FIAT bogie, which has lesser moving parts than the ICF bogie. This results in high durability of the bogie and requires less maintenance. FIAT bogie facilitates higher speeds.
6. The weight per meter of this coach is less than the ICF coach and is easier to haul.

7. As the coach is newly designed, the materials used for manufacturing the coach are of superior quality and require less maintenance.
8. Ride Index of the LHB coaches is 2.5–2.75, less than the ICF ride index of 3.25.
9. These coaches are equipped with "controlled discharge toilet system" (CDTS) and Bio-toilets, which are environmental friendly.
10. The LHB coaches use "advanced pneumatic disc brake system" for efficient braking at higher speeds.
11. The coaches have Modular interiors.
12. Noise generated by these coaches is 40% less than the ICF coaches.
13. The Air Conditioning in theses coaches is of higher capacity and is controlled by a micro-processor.
14. These coaches are of lower cost when compared to the ICF coaches.
15. The ICF coaches require Periodic Overhaul(POH) once in 18 months. While the LHB coaches requires POH once in 24 months. EVen the maintenance cost is less than that of ICF coaches.

- Demerits:

1. Due to CBC coupling, the LHB coaches experience more jerks.
2. The LHB coaches are not self generating like ICF coaches. A separate generator car has to used for its power usage purpose.

- Basic difference between ICF & LHB Coaches is as below:

Specification	Integral Coach Factory	Linke-Holfmann-Busch (Alstom)
Ride Index[1]	2.6 at 160 kmph in vertical modes and 3.4/3.5 at 160 kmph in lateral mode	2.5 but not exceeding 2.75 both in vertical & lateral modes
Economic Advantage	Tested speed of max 160 kmph	Tested speed of max 180 kmph
	Service speed of max 130 kmph	Service speed of max 160 kmph
	Very high oil leakage	No problem of that sort at all
Maintenance	Intermediate Overhauling (IOH) 9 months or 2 lakhs km	Intermediate Overhauling (IOH) 18 months or 5 lakhs km
	Periodic Overhauling (POH) 18 months or 4 lakhs km	Periodic Overhauling (POH) 36 months or 10 lakhs km
	Regular coats of paint required	No painting required for six years
Bogie Frame	Box type with headstock	H-type chasis without headstock.
Wheel and Axle	Wheel base - 2896 mm	Wheel base - 2560 mm thus improved ability to negotiate curves
	Max distance between inner wheels 11887 mm	Max distance between inner wheels 12345 mm
Bearing Arrangement	Spherical roller bearing	Cartridge Tapered roller bearing which in turn needs lesser maintenance
Bogie Frame-Axle Joint	Rigid	Articulated by control arm
Primary Suspension Unit	Coil springs with dashpot level	Coil springs are nested with hydraulic damper & control arm

Secondary Suspension Unit	Secondary springs on lower spring beam through hangers	Secondary springs directly mounted on the sides of frames
Bogie Body Joint	Through center pivot	Through pivot assembly on transverse beam & bracket on doom
Brake system	claspe type brake	Axle mounted disc brake
Maintenance requirement in POH	**Always More Due to :**	**Very less Due to :**
	Axle guide arrangement	Wheel with improved curving characteristics
	Spherical Roller Bearing	Cartridge Tapered Roller Bearings
	Clasp brake	Disc Brake
	More Pin Joints	Bogie frame, springs & rubber components
Anti-rolling arrangement	Not provided	Provided

Maintenance of Coaches and Practices in Open Line Depots

Nomination of a Depot

i) All passenger coaching vehicles (PCVs), other coaching vehicles (OCVs), owned by individual railways should be allotted a base depot for primary maintenance

ii) The base depot to which the coaches are allotted will be responsible for their maintenance. This depot will also be responsible for the secondary maintenance of the coaches as prescribed by the Railway.

iii) Due to exigencies of service a coach of another depot can be retained with the sanction of the Chief Mechanical Engineer (CME). It should, however, be subjected to necessary examination and repairs including maintenance schedules in the manner as it belonged to the depot.

Primary and secondary maintenance of trains at coaching depot

Primary End

1. The attention during primary maintenance should be made more intensive with special emphasis on the following aspects:

1. The brake gearing should be properly adjusted ensure **100% brake power.**
2. Brake pad of brake disc should be changed as and when required.
3. All missing passenger amenity fittings must be replaced and the rake must be turned out as 'Zero-Missing-Fitting' rake.
4. Intensive cleaning of coach toilets and lavatory.
5. No coach should run overdue schedule.

2. Clear maintenance time of 6 hours on the pit as per train schedule. Any exception to be jointly decided by COM/CME of the Railways.

3. Provision of proper washing cum maintenance pit line facility with adequate testing equipment and high pressure water cleaning arrangement.

4. Adequate gang strength with proper supervision.

The Other End

1 Whenever the lie-over is more than 2 hours at the platform or the rake is stabled in the yard, the rake should be locked and positive security should be provided.

2. Amenity and cleaning attention is ***carried out best on the washing lines*** where complete infrastructure by way of men, material and machines are available.

Ideally, for cleaning and watering, the rakes should be taken to washing lines as far as possible. In the event of this being not feasible, such rakes can be returned from platform/

yards. However, the minimum infrastructure to be provided at the platforms from where trains are returned without secondary maintenance should be as under:

i) One storage room for essential safety and passenger amenity item.

ii) Road transportation facility for ferrying material from the main depot to the platform.

iii) Adequate number of mobile high pressure jet cleaning machines or high pressure water pipe line running around the platform /yard line.

iv) Washable apron on the platform lines with the covered drains to facilitate movement of maintenance staff.

v) Walkie-Talkie/mobile telephones for quick and easy communication.

vi) Standard watering hydrants.

vii) Flood light at the platform ends for rolling-in examination at night and 110 V inspection lights along the side of the track for night examination of the under gear.

3. The decision, whether such trains may be shunted for working on pit line or attended at platform itself, has to be taken carefully after weighing these factors by the mechanical and Traffic HODs on the zonal Railway on case to case basis.

4. The status of implementation of revised pattern of coaching trains should be reviewed every year in the month of June by Mechanical and Operating branches at Divisional level and any discrepancy should be removed.

Special Repairs

i) The special repairs (Non-POH repairs) by workshops are those repairs, which can not be done in the sickline with their existing facilities or are specifically prohibited to be carried out on the divisions.

ii) Special repair coaches should be sent to the base workshops only after obtaining the permission of the Chief Mechanical Engineer and according to the calling in program of the workshop.

iii) For requesting permission for non-POH repairs, the supervisor in charge of the depot should prepare a complete list of damages and deficiencies and forward it to Divisional Mechanical Engineer for getting permission of the Chief

Mechanical Engineer to book the coach to the shop for non-POH repairs. A copy of the list of damages and deficiencies should simultaneously be sent to the workshop concerned for planning it in their calling-in programme.

Maintenance Schedules to be followed In Coaching Depots

a. To maintain coaching stock in good condition, the following maintenance schedules are prescribed to be carried out in carriage depots on divisions where rake has been based for primary maintenance.

(i) Trip Maintenance Schedule i.e. **D1 Schedule- Every Trip/Weekly**

(ii) Monthly Maintenance Schedule i.e.**D2 Schedule- 30 days ± 3 days**

(iii) Six Monthly Maintenance Schedule i.e.**D3 Schedule 180 days ± 15 days**

b. Maintenance schedules are required to be carried out by the base depots to which coaches are allotted. In emergency, when due to any reason coaches cannot reach their base depots and maintenance schedules become due, D1 & D2 schedules can be undertaken by the carriage depots where the coaches are available. 'D3'schedule should be done at base depot only.

c. Each coach should be stenciled at a suitable place on its end panel, the code name of the base depot and a schedule chart. The date and station code of the depot where a particular schedule is carried out should be stenciled at the appropriate place in the schedule chart immediately when the schedule is completed.

Schedule Examination

Schedule `D1' is required to be given every trip/weekly at the nominated primary maintenance depot within the normal primary maintenance time on a washing/pit line

in a rake. A coach need not be detached from the rake for Schedule `D1' examination unless it requires such repairs which cannot be attended in pit line or within the prescribed maintenance time on the pit line.

Detachment a Coach

A coach is detached from the rake due to several reasons such as:

i) For shop schedules.

ii) For maintenance of major break–down/ mal-functioning of any sub assembly etc. the decision whether the coach is to be detached from the formation, for attending to maintenance/replacement of major subassembly is dependent on maintenance requirements, operational convenience, time availability etc. The decision is taken by the Engineer (C&W). Coach failure report as per Annexure 'F' should be made. For failure components/assemblies during warranty, action to be taken for warranty claims.

Procedure

The activities performed to detach a coach with Air Brake system are as follows:

i) Safety precautions shall be taken to prevent injury while detaching/attaching a coach.

ii) Remove the clamps on the cut-off angle cocks. Close the cut-off angle cock of both feed pipe and brake pipe on both sides of the coach that has to be detached.

iii) Close the cut-off angle cocks of the feed and brake pipe of adjacent coaches.This is to ensure that the air pressure locked up in the air hose coupling gets vented to atmosphere through the vent hole of the cut-off angle cock.

iv) Observe above mentioned safety measures to close all the four cut-off angle cocks on either side of the coach to be detached so that while opening air hose coupling, it may not cause injury due to air pressure inside.

v) Release the brake of the coach to be detached by pulling the manual release lever of the distributor valve.

vi) Open the Feed Pipe and Brake Pipe hose coupling from both sides of the coach.

vii) Uncouple the coach by operating uncoupling handle.

Observe all other safety measures as prescribed.

- Scale check of Staff of LTT Coaching Depot is given below:

Sr.No	Designation	GP	SS	MOR	VAC
1	SSE	4600	51	46	5
2	JE	4200	29	22	7
3	MCM FTR	4200	85	75	10
4	MCM Carpenter	4200	12	6	6
5	MCM Wielder	4200	3	5	2
6	MCM Trimmer	4200	3	4	1
7	MCM Machinist	4200	2	2	0
8	MCM Painter	4200	5	5	0
9	MCM Crane Operator	4200	2	1	1
10	MCM M/W/FTR	4200	1	1	0
11	MCM Meson	4200	1	0	1
12	Carpenter -I	2800	23	10	13
13	Carpenter -II	2400	4	1	3
14	Carpenter-III	1900	7	10	3
15	Carpenter-III RCD	1900	0	0	0
16	Wielder-I	2800	9	9	0
17	Wielder-II	2400	3	1	2
18	Wielder-III	1900	2	0	2
19	Trimmer-I	2800	7	2	5
20	Trimmer-II	2400	4	8	4
21	Trimmer-III	1900	3	0	3
22	Machinist-I	2800	4	2	2
23	Machinist-II	2400	0	2	2
24	Machinist-III	1900	0	0	0
25	Painter-I	2800	9	5	4
26	Painter-II	2400	3	4	1
27	Painter-III	1900	1	4	3
28	Crane Operator-I	2800	4	2	2
29	Crane Operator-II	2400	0	2	2
30	Crane Operator-III	1900	1	1	0
31	MW Fitter-I	2800	2	1	1
32	MW Fitter-II	2400	0	0	0
33	MW Fitter-III	1900	1	1	0
34	Truck Driver-I	2800	0	0	0
35	Truck Driver-II	2400	1	1	0
36	Truck Driver-III	1900	2	1	1
37	Mason-I	2800	1	0	1
38	Fitter-I	2800	246	68	178
39	Fitter-II	2400	20	92	72
40	Fitter-III	1900	89	68	21
41	FTR-I (RCD)	2800	2	2	0

42	FTR-II (RCD)	2400	0	0	0
43	FTR-III (RCD)	1900	1	1	0
44	CDMH (B PEON)	1800	1	0	1
45	KH/Helper	1800	301	266	35
46	Trainee Khalasi	1800	0	3	3
47	Khalasi RCD	1800	5	2	3
48	Peon	1800	0	1	1
Total			**950**	**737**	**213**

- **Primary Train Maintained At LTT Coaching depot :**

SN	Train No	Train Name	Time		Load	From	To	Freq.	Frequency days		Type of BPC
			Dep	Arr.					Dep.	Arr.	
LHB Coach Rakes											
1	22115/16	LTT-KRMI AC Exp.	01.10	23.55	20	LTT	KRMI	1	4	4	P. RBPC
2	11085/86	LTT-MAO DD Exp.	05:30	17:10	08	LTT	KRMI	3	3,5,7	4,6,1	P. RBPC
3	12171/72	LTT-Haridwar	07.55	23.45	20	LTT	HW	2	1,4	3,6	100 %
4	22127/28	Anandwan Express	11:30	13:45	22	LTT	KZJ	1	1	3	P. RBPC
5	11011/12	LTT-H.S. Nanded Exp.	12.05	23.55	22	LTT	NED	1	3	4	P. RBPC
6	11017/18	LTT-KIK	12:05	23:45	22	LTT	KIK	1	6	2	P. RBPC
7	11071/72	Kamayani Exp	12.40	22.50	22	LTT	BSB	7	Daily	Daily	P. RBPC
8	22121/22	LTT - LKO AC EXP	14.20	17.30	22	LTT	LKO	1	6	1	P. RBPC
9	22109/10	LTT - NZM AC Exp.	14:30	11.45	20	LTT	NZM	1	2	4	P. RBPC

10	11079/80	LTT-GKP (Via-Balrampur)	15:50	16.00	22	LTT	GKP	1	4	7	P. RBPC
11	12293/94	LTT-ALD DURONTO	17.25	14.55	20	LTT	ALD	2	1,5	3,7	P. RBPC
12	12223/24	LTT-ERS DURONTO	20.50	18.15	14	LTT	ERS	2	2,6	4,1	P. RBPC
13	11015/16	Kushinagar Exp	22.45	04.20	22	LTT	GKP	7	Daily	Daily	P. RBPC
14	12101/02	Jnaneswari Exp	20.35	05.50	22	LTT	HWH	4	1,2,5,6	2,3,5,7	100 %
15	12151/52	Samarasta Exp(via NGP)	20.35	07.30	22	LTT	HWH	2	3,4	7,1	100 %
16	11061/62	Darbhanga Pawan Exp	12.15	03.40	22	LTT	DBG	7	Daily	Daily	100 %
17	22113/14	LTT-KCVL	16:55	04:10	22	LTT	KCVL	2	2,6	2,5	P. RBPC
18	12143/44	LTT-Sultanpur Exp.	16.40	04.10	22	LTT	SLN	1	7	3	P. RBPC
19	11053/54	LTT-AMH Exp.	16.40	12.15	22	LTT	AMH	1	3	6	P. RBPC
20	22103/04	LTT-Faizabad Superfast	14.30	05.00	23	LTT	FD	1	1	4	P. RBPC
ICF Coach Rake											
1	11043/44	Madurai Exp	00.15	05.45	23	LTT	MDU	1	5	1	P. RBPC
2	12167/68	LTT BSB SUP SPL	00:35	12:30	24	LTT	BSB	7	Daily	Daily	P. RBPC
3	12165/66	Varanasi Exp	05.23	21.30	24	LTT	BSB	3	1,4,5	7,3,6	P. RBPC
4	11067/68	Saket Exp	05.23	21.30	24	LTT	FD	2	3,6	1,6	P. RBPC
5	22129/30	Tulsi Exp	05.23	21.30	23	LTT	ALD	2	2,7	2,4	P. RBPC
6	11055/56	Godan Exp	10.55	16.15	24	LTT	GKP	4	7,1,3,5	1,3,4,6	P. RBPC
7	11059/60	Chapra Exp	10.55	16.15	24	LTT	CPR	3	2,4,6	2,5,7	P. RBPC
8	11083/84	LTT-KZJ	11.30	23.15	17	LTT	KZJ	1	5	7	P. RBPC
9	11075/76	LTT-Bidar Exp.	12.05	23.55	17	LTT	BIDR	1	2	3	P. RBPC
10	11073/74	LTT-MAS Exp.	13.20	16.00	23	LTT	MAS	1	1	3	P. RBPC
11	11081/82	LTT-GKP Exp.	15.50	23.00	24	LTT	GKP	1	3	6	P. RBPC
12	12153/54	Habibganj Exp	16.25	07.30	24	LTT	HBJ	1	4	6	P. RBPC
13	12161/62	Lashkar Exp	16.25	23.00	24	LTT	AGC	1	5	7	P. RBPC

14	12107/08	Luknow Exp	16.25	23.00	24	LTT	LKO	3	1,3,6	1,3,5	P. RBPC
15	12173/74	Udyognagari Exp	16.25	6.00	24	LTT	PBH	2	7,2	3,1	P. RBPC
16	12145/46	Puri Exp	20.35	07.30	23	LTT	Puri	1	7	4	100 %
17	11013/14	Coimbatore Exp	22.35	14.30	24	LTT	CBE	7	Daily	Daily	P. RBPC
18	12141/42	LTT-Rajendra Nagar	23:35	15:15	24	LTT	RJBP	7	Daily	Daily	P. RBPC

- **Secondary Train Maintained At LTT As On 01.02.2019**

Sr. No	PM Rly.	Train No	Type of Coach	Train Name	Time		Load	From	To	Freq	Frequency days	Round Trip Km		
					Dep	Arr.						Dep.	Arr.	
1	NFR	12519/20	LHB	LTT- KYQ AC Exp.	07:50	17:50	19	LTT	KYQ	1	7	6		5174
2	ECR	15547/48	LHB	LTT-Jaynagar	11.20	07.30	18	LTT	JYG	1	4	3		3922
3	NFR	22511/12	LHB	Kamakhya Karmabhoomi Exp	11.25	23.15	19	LTT	KYQ	1	3	1		5880
4	SER	18610/09	LHB	Ranchi Exp	15.50	12.05	20	LTT	RNC	1	6	5		4024
5	SC	12219/20	LHB	Secunderabad Duronto	23.05	11.05	16	LTT	SC	2	3,6	3,6		1546
92														

Sr. No	PM Rly.	Train No	Type of Coach	Train Name	Time		Load	From	To	Freq	Frequency days		Round Trip Km
					Dep	Arr.					Dep.	Arr.	
1	ECOR	22865/66	ICF	LTT - Puri SF Exp	00.15	13.35	22	LTT	Puri	1	4	3	3702
2	ECOR	12879/80	ICF	LTT BBS Super Fast Exp.	00.15	13.35	23	LTT	BBS	2	3,6	2,5	3576
3	NFR	15645/46	ICF	Guwahati	08.05	20.00	22	LTT	GHY	2	3,6	2,5	4314
4	NFR	15647/48	ICF	Guwahati (Via BGP)	08.05	20.00	23	LTT	GHY	1	5	4	5468
5	ER	12336/35	ICF	Bhagalpur	08.05	20.00	23	LTT	BGP	3	7,2,4	1,3,6	3832
6	ECR	12546/45	ICF	Raxaul Karmabhoomi	11:20	06.05	23	LTT	RXL	1	1	6	4081.4
7	ECR	15268/67	ICF	Jan sadharan Exp	15:50	06.15	23	LTT	RXL	1	2	1	3834.2
8	SER	18029/30	ICF	Howrah Exp	22.00	04.50	22	LTT	HWH	7	Daily	Daily	3900

- **RBPC Trains Maintained At LTT as on 01.02.2019**

Sr. No	PM Rly.	Train No	Type of Coach	Train Name	Time		Load	From	To	Freq	Frequency days		Round Trip Km
					Dep	Arr.					Dep.	Arr.	
1	SER	12811/12	ICF	Hatia Exp	00.15	13.35	**24**	LTT	THE	2	7,1	6,7	3412
2	ECOR	22848/47	ICF	LTT-VSKP Via NGP	00:15	13:35	**20**	LTT	VSKP	1	2	1	3298
3	NE	15017/18	ICF	Gorakhpur Exp	06.35	18.40	**23**	LTT	GKP	7	Daily	Daily	3426
4	ECOR	18519/20	ICF	LTT Visakhapatanam	06:55	04:40	**22**	LTT	VSKP	7	Daily	Daily	3002
5	NR	14313/14	ICF	Bareilly	08.05	20.00	**18**	LTT	BE	1	1	7	3216
6	SR	16345/46	ICF	Netravati Exp	11.40	16.40	**23**	LTT	TVC	7	Daily	Daily	3608
7	SC	17222/21	ICF	LTT-KAKINADA	12:25	11:05	**17**	LTT	COA	2	7,4	7,4	2600
8	CR	12117/18	ICF	Godavari Exp	15.00	13.00	**17**	LTT	MMR	7	Daily	Daily	490
9	SR	12619/20	ICF	Matsyagandha Exp	15.20	06.35	**23**	LTT	MAJN	7	Daily	Daily	2372
10	SR	12201/02	ICF	Garib Rath Express	16.55	11.45	**15**	LTT	KCVL	2	1,5	1,5	3624
11	NE	15063/64	ICF	LTT- GKP Exp	17.50	16.20	**18**	LTT	GKP	1	2	2	1748
12	SWR	17318/17	ICF	LTT - HUBLI Exp	18.45	07.15	**16**	LTT	HUBLI	7	Daily	Daily	1468
13	SWR	17322/21	ICF	LTT-HUBLI Exp	21:15	16:55	**18**	LTT	UBL	1	7	7	1586
14	ECR	13202/01	ICF	Patna Exp	22.15	11.30	**24**	LTT	RJBP	7	Daily	Daily	3394
15	SER	22886/85	LHB	Antoydaya Exo.	13.20	23.45	**18**	LTT	TATA	2	2,6	1,5	3410
16	CR	11201/02	LHB	LTT - AQ	15:50	13:20	**22**	LTT	Ajni	1	1	1	2042
17	SC	11205/06	LHB	LTT-NZB Exp	16:40	13:55	**22**	LTT	NZB	1	6	6	1410
18	NE	12541/42	HYBRID	GKP LTT SUP Express	11.10	04.00	**22**	LTT	GKP	7	Daily	Daily	3360

1. Holding of Primary 51 Rake 1100 Coaches
2. Holding of Secondary 20 Rake 439 Coaches
3. Holding of RBPC 41 Rake 865 Coaches

For performing maintenance operations on above listed trains a gang consisting of at least 22 technician staff is formed to look into the maintenance of primary, secondary and RBPC trains , each gang is entrusted with 02 rakes/shift. Activity wise breakup of a gang is as below:

1. Under gear activities: 03 staff.
2. Air Testing : 05 staff
3. Brake Power : 02 staff
4. Schedule maintenance : 04 staff
5. Amenities :03 staff
6. Carpenter : 03 staff
7. Welder : 01 staff
8. Trimmer : 01 Staff

Total: 22 staff.

Work study team during the course of Work Study observed the actual working practices adopted by LTT coaching depot and visited on site i.e. PIT lines and tried to understand and ascertain the activity wise position of staff while carryout maintenance of LHB rake in a stipulated time frame as per established norms ,

The sequences of operations performed while primary maintenance right from arrival of Rake to pit line to handing over is as below:

- Procedure involved in maintenance of LHB coaches at depot:

1. Timely receival of Rake
2. Maintenance siding no.
3. Load of Rake

- Rake protection

1. Line block
2. Line Release
3. Unfit memo if any
4. Replacement if any

Once the rake is placed on pit line i.e. maintenance siding following under gear and interior activities are carried out

A. In Under gear activities staff has to ensure following things,

1. Wheel and axle check
2. break disc wear check
3. axle bearing and instruments
4. electric equipments
5. control Arm check
6. Primary suspension check
7. break equipment check
8. check handbrake equipment
9. pneumatic equipment check
10. bogie frame
11. rotation limiter check
12. anti roll bar assembly check
13. secondary suspension check
14. damper check
15. traction centre check
16. rubber pad check
17. bearing running temperature check
18. Bearing inspection.

Under gear Fittings.

a) CBC and supporting device and operating lever along with locking pin.
b) Bogie frame, **boaster** assembly cable& safety brackets.
c) Primary and secondary springs and dampers.
d) Salient block of control arm, roll link, traction link, traction centre.
e) Lateral longitudinal bump stop.
f) Roll link, control arm, traction link & traction centre.
g) Safety fittings of bogies.
h) Wheel axle & brake Disc (wheel profile & defects as per PDSO CMI K003.
i) CTRB condition from outside & grease oozing etc.
j) Earthling device.
k) Fitment of all under gear items inspection for corrosion cracks, breakage and damages if any.

l) under slung water tanks and security arrangements
m) Vestibule fall plates and securing fasteners.
n) Handbrakes and other equipments of guard compartments.

B. Air testing procedure

1. On arrival of the rake on pit line, completely drain the AR tank (125 litres & 75 litres) of all the coaches by opening the drain cock, to remove the water in air.
2. Initially, couple the BP hose of the test rig with the BP hose of the rake & then charge the BP pressure to 5.0 kg/cm2. Keep the FP angle cock of both end power cars in close position. Check the FP gauge fitted in the power car, if the gauge does not show any pressure, the NRV of all the coaches are ok. If, FP gauge shows any pressure, the NRV of any coach in the rake is defective. In this condition, check the rake for NRV defective by taking the coaches in parts. NRV found defective in particular coach should be replaced.
3. Open all the four cocks of rake, couple BP & FP hose pipe of test rig with the BP & FP hose pipe of the rake. Charge the BP & FP to 5.0 kg/cm2 & 6.0 kg/cm2 respectively. After building of pressure in BP & FP, disconnect the test rig BP & FP hose pipe from the rake hose pipes & open both the angle cocks, due to which air pressure will be exhausted in atmosphere & brake will be applied. Wait for 20 to 25 minutes.
4. After 20 to 25 minutes, check the complete rake from one end. Note down the coach nos. found with release brake cylinder. Check whether, AR tank of the coach is charged or empty. If AR tanks found empty, write down Empty AR on the respective coach. If found charge, pull manual release of DV to check whether CR tank is charged / empty. If CR found empty, write down Empty CR on respective coach. With this, all the defects in the rake can be checked.
5. Again, connect BP & FP hose pipe of the rake & test rig & then charge BP to 5.0 kg/cm2 & FP to 6.0 kg/cm2. Connect BP & FP gauges with dummy on free end of other power car.
6. Check the BP & FP pressure gauges in front power car, BP pressure should show 5.0 kg/cm2 & FP pressure should show 6.0 kg/cm2. If there is any difference in any pressure, check by fitting master gauge if still the pressure is not showing 5.0 kg/cm2 in BP & 6.0 kg/cm2 in FP, check for leakage & attend.
7. Close the BP & FP angle cock of test rig for 03 minutes. Monitor the leakage in both BP & FP. The leakage should not be more than 0.6 kg/cm2 in 03 minutes.
8. Attend the coaches in which AR empty & CR empty are found. Check the AR tank & pipe line from the back of the brake panel for leakage. Similarly, check CR tank & pipe line & dummy plug on the brake panel. If defect is still noticed after attending the leakage, than mark the coach sick for detailed investigation & single car testing in sick line.
9. Start the pressure & charge the BP to 5.0 kg/cm2 & FP to 6.0 kg/cm2. Drop the BP pressure by 1.6 kg/cm2, brake should apply in all coaches. Start the leakage checking with the help of soap solution from one end. During soap solution testing, check all the BP & FP hose pipe, all hose pipe connectors, Main pressure pipe line, Angle cocks, Brake cylinder pipe line, CDTS pipe line. Similarly, check & attend leakage in components on Brake panel like DV, FP & BP filter, NRV, all isolating cock, brake indicator, brake accelerator & brake cylinder with soap solution.
10. Isolate the isolating cock on Brake panel & check all brake callipers & brake pad of all cylinders. In isolated condition, all brake pads should be released simultaneously. Similarly, on opening of isolating cock all Brake cylinder should operate & brakes should apply.
11. Check the brake indicator when brakes are applied, indicator should display red colour. However, when the brakes are released from isolating cock the brake indicator should display green colour. If on brake release condition, brake indicator is not showing green or on brake applied condition brake indicator is not showing red, then the brake indicator is defective. Repair / replace the brake indicator.
12. The BP & FP pressure gauges in the others end power car should show pressure 3.4 kg/cm2 & 5.8 - 6.0 kg/cm2 respectively. If any difference in above pressure is noticed that means there is any cross connection in BP & FP connection. Attend the same & ensure BP pressure 3.4 kg/cm2 & FP pressure 5.8 - 6.0 kg/cm2.
13. Charge the BP & FP pressure to 5.0 kg/cm2 & 6.0 kg/cm2 respectively. Check the brake indicator of complete rake, all coaches should be in released condition. If any coach is not

released, it means that the CR of that particular coach may be overcharged & there is an internal defect in DV. Mark the coach sick for detailed investigation.

14. Check PEASD of at least 03 coaches. During PEASD checking, brakes should apply in all coaches & the brake accelerator should operate. Coach numbers should be noted in maintenance dairy.
15. Now closed the pressure supply from the test rig. Operate the emergency guard van valve of front power car guard van. BP pressure should become 0.0 kg/cm2 in approx. 25 to 30 sec in front power car & approx. 40 to 50 sec in rear power car. Open the pressure supply & charge BP & FP to 5.0 kg/cm2 & 6.0 kg/cm2 respectively. Now again closed the pressure supply from the test rig. Operate the emergency guard van valve of rear power car guard van. BP pressure should become 0.0 kg/cm2 in approx. 25 to 30 sec in rear power car & approx. 40 to 50 sec in front power car. Check for any significant difference in time for droppage of BP pressure to 0.0 kg/cm2 between front & rear power cars. If any, there may be blockage in BP line of any coach. If found, attend the same. Continuity test of the rake is now completed.
16. In both the power cars, check the condition & mounting of hand brake cables fitted on both the brake cylinders. Rotate the hand wheel fitted in guard van clockwise to apply the brakes, after full rotation brake should apply in both the brake cylinders & hand brake indicator should show red. Rotate the hand wheel anti clockwise, now brakes of both the cylinders should get release & hand brake indicator should show green.
17. Charge the BP & FP to 5.0 kg/cm2 & 6.0 kg/cm2 respectively. Close the BP & FP angle cock of test rig for 03 minute. Monitor the leakage in both BP & FP. The leakage should not be more than 0.6 kg/cm2 in 03 minutes.
18. Isolate the isolating cock of BP & FP of the test rig & angle cock of BP & FP of the cock. Uncouple both hose pipes & open both the angle cocks of coach. After draining of pressure from both the BP & FP hose, release the complete rake by pulling the manual release handle of the DV of each coach & ensure the brake indicator of all coaches should display green colour. Ensure that all BP, FP & BC gauges fitted in power car are calibrated & showing correct reading.

C. Brake testing

1. Brake equipment like hosepipe, BP/FP for leakage, Safety brackets for brake equipments.
2. availability of clamps
3. functioning of WSP system & Dump valve

WSP testing procedure :

a) Initially with no pressure, the WSP processor in all the coaches should be OFF. If any Processor is in ON condition, there is problem in any of pressure switch, wiring or K-05 relay. Attend the same.
b) Start the BP & FP pressure. The processor should automatically ON when BP pressure reaches 1.6 to 2.0 kg/cm2 in M/s KNORR WSP system & when FP pressure reaches in M/s FTIL WSP system.
c) Check & attend for loose/proper fitment of WSP components like speed sensor, junction box, dump valve, dump valve connector & pressure switch.
d) Drop the BP pressure by 1.6 kg/cm2, brake should apply in all the coaches. Now check the WSP processor for correct reading ‘99’ on the electrical panel inside the coach. If the reading shows ‘99’, it means that the WSP system is OK. Operate the test button on the processor to check the proper working of dump valves. The dump valve should operate in a sequence & pressure should be exhausted from brake cylinder. If the dump valve is not operated in proper sequence attend the same. Similarly, check & attend the WSP system of all the coach. All the WSP system should be in operating condition in the rake.

4. release time in seconds
5. Brake pad and clearance of Brake pad.
6. Brake cylinder & callipers.
7. Brake position on 6kg/CM^2 reduction.
8. Ensure horizontal position of load levelling valve.
9. Normal brake release test.

10. PEASD testing.
11. Brake panels and fittings.

D. Schedule Maintenance:

Schedule is required to be given every trip/weekly at the nominated primary maintenance depot within the normal primary maintenance time on a washing/pit line in a rake. Similarly D2 & D3 Schedules has to be followed as per norms for primary and secondary trains.

E. Amenities :

1) Interior activity

1. Lavatory
2. Main door
3. Other door
4. Window glasses
5. Seat/berths
6. Lavatory fittings
7. Mirrors
8. FRP panels curtains
9. Pest control etc.

Above mentioned activities are strictly ensured in primary/Secondary maintenance of a train in maintenance depot.

Work study team has been furnished with data of coach type wise failures attended in LTT Coaching Depot in last Three Years, which is as below:

A. Cause wise failures in **LHB Coaches** for last Three Years :

HEAD	CAUSE	2016-17	2017-18	2018-19
	Brake Binding/Single Car	0	1	2
	DV	1	4	0
	Brake caliper	3	0	2
	BC pipe/BC	3	0	2
	Brake Pads (Cought Fire)	0	1	0
	Hand Brake/Leveling valve	0	3	7
	TOTAL	**17**	**16**	**21**
INTERIOR	Berth	0	2	3
	Heavy carpentry/trimming work	0	1	1
	Main door/Foot Board	1	1	1
	WRA Pipe Line	0	0	0
	Rolling shutter/window glass	0	1	1
	Water tank	10	9	10
	Bio-Tank	0	2	3
	Roof leakage	5	5	7
	Luggage door	0	4	2
	Vestibule rubber/side wall/fall plate	13	19	13
	Disinfestation		1	1
	Lav. Pan /floor/f/valve dummy	2	2	1
	TOTAL	**31**	**47**	**43**
SUSPENSION	LHB Spring	**57**	**131**	**243**
	Air Spring/Air bellow	10	4	25
	TOTAL	**67**	**135**	**268**
UNDERGAER	WILD message	15	0	0
	CBC Operating handle	0	2	1

	supporting plate spg bkn	7	12	5
	Pad damage	0	0	1
	Bump stop Broken/bent	10	6	1
	Damper	0	3	2
	Control Arm/ Anti Roll Bar/safety lug	0	8	45
	Draft Gear Ass./ locking nut	1	0	6
	CRO/Trolley(lateral clearence)	2	0	11
	TOTAL	**35**	**31**	**72**
WHEEL	Grease Ozing out	0	5	8
	Groove	0	2	0
	Warm box	0	1	0
	Metal chipped off	0	31	19
	Shelled tread	**185**	**260**	**329**
	Radius too small	1	1	0
	Sharp flange	0	4	2
	Skidded	0	29	2
	WSP	0	2	3
	Spread Rim	0	4	5
	Flat placec on tyre	0	**17**	**45**
	Wheel disc/brake disc	0	1	1
	Other	0	10	10
	TOTAL	**186**	**367**	**424**
GRAND TOTAL		**336**	**596**	**828**

B. Cause wise failures in **ICF Coaches** for last Three Years :

HEAD	CAUSE	2016-17	2017-18	SUB TOTAL
AIR BRAKE				
	BP/FP pipe,A/cock	11	10	10
	PEASD	0	0	1
	Brake Binding	2	0	1
	Single car testing	0	0	0
	DV	2	1	1
	Through Insp.	0	0	0
	BC pipe	2	0	0
	CR/AR/BC	3	11	5
	TOTAL	**29**	**25**	18
BRAKE RIGGING	Brake cylinder	3	6	0
	Hand Brake	0	1	0
	Truss Bar/Wire rope/H Stock	0	1	2
	Z Lever	1	0	1
	Axle rubbing	2	0	0
	Draw bar housing/pin	1	0	0
	TOTAL	**7**	**8**	3
BUFFING GEAR	Buffer Plunger/Case	6	7	3
	Buffer Socket	9	8	0
	Low buffer height	4	0	0
	Destruction Tube	4	3	1
	Buffer Shifted	2	0	0
	Buffer Dropping	4	0	0
	TOTAL	**29**	**18**	4

INTERIOR	Berth		3	1	2
	Heavy Carpentry work		9	2	3
	Heavy Trimming work		7	2	0
	Lav. Door		5	0	0
	Main door/Hand rail		11	4	5
	Pvc		2	1	0
	Rolling shutter		6	5	4
	Water tank		**51**	**29**	**26**
	Window profile/glass		0	0	2
	WRA/NRV		7	3	2
	Bio-Tank		63	1	**84**
	Roof leakage		0	0	1
	Side filling pipe		0	0	0
	Lotta pipe		0	0	0
	Luggage door		4	3	0
	Cumunication door		2	0	0
	Vestibule rubber/side wall		4	0	0
	Pipe line		4	0	1
	disinfestation		2	6	**16**
	Painting		1	0	0
	Lav. Pan /floor/f/valve dummy		7	4	0
	Aluminium rake missing/theft		0	0	0
	TOTAL		**188**	**61**	146
SUSPE-NSION	Dashpot spring		5	3	2
	Bolster spring		8	1	0
	Supension lug/Bolster Lug		0	0	0
	Lower plank		1	2	1
	Dashpot oil cup/cover		0	2	2
	TOTAL		**14**	**8**	5
UNDER GEAR	Anchor link		4	12	2
	Equalising stay rod		14	11	1
	Trolley crack/trolley corner lug		5	2	3
	Wild message		3	0	0
	Trough floor corr.		0	0	0
	B/bock hanger, BSS Hanger/Link		3	0	0
	Screw coupling		0	1	0
	Connectig Rod		0	0	0
	Sole bar/cross beam		3	2	2
	TOTAL		**32**	**28**	8
WHEEL	Axle box	Canted/Nut bkn	56	37	11
		Grazing	**78**	**48**	**8**
		Grease oozing	**S**	**24**	**22**
		Wing crack	7	2	0
		Warm box	4	1	1
	Deep flange		8	12	1
	Groove		3	0	1
	Metal chipped off		**10**	**42**	**18**
	Shelled tread		**3**	**22**	**26**
	Metal deposited		1	0	0
	Radius too small		6	1	2
	Sharp flange		2	4	6

	Skidded	27	5	0
	Spread Rim	0	1	0
	Flat placec on tyre	1	3	1
	A/box cover bkn	18	4	4
	Wheel pitted/Wheel change	0	0	0
	Other	0	6	0
	TOTAL	**224**	**212**	101
GRAND TOTAL		**523**	**360**	285

C. Cause wise analysis of Primary Coach Detachment LHB for last three years up to Jan-19

Sr.No	Cause wise analysis of Primary Coach Detachment LHB (Non-Schedule) MECH, 2018-19			
	HEAD	2016-17	2017-18	2018-19
1	AIR BRAKE	17	16	21
2	INTERIOR	31	47	43
3	SUSPENSION	67	135	268
4	UNDERGAER	35	31	72
5	WHEEL	186	367	424
	Total	336	596	828

4. Cause analysis of Primary Coach Detachment ICF (Non-Schedule) for last three years upto Jan-19

Sr. No	Cause analysis of Primary Coach Detachment ICF (Non-Schedule) MECH,			
	HEAD	2016-17	2017-18	2018-19
1	AIR BRAKE	29	25	18
2	BRAKE RIGGING	7	8	3
3	BUFFING GEAR	29	18	4
4	INTERIOR	188	61	146
5	SUSPENSION	14	8	5
6	UNDER GEAR	32	28	8
7	WHEEL	224	212	101
		523	360	285

5. Work Load Maintained by Coaching Staff as on 01.02.2019 is as given below:

Coaches Maintained at LTT Coaching Depot (as on 01.02.2019)								
Sr.No.	**Type of Coach**	**Nos. of Rake**	**Load**	**Freq.**	**Avg AC coach/day**	**Avg Non AC coach/day**	**Avg WCB coach/day**	**Total Coaches Per Day**
Primary Trains								
1	ICF	**23**	**318**	**50**	**37.14**	**120.13**	**4.57**	**161.84**
2	LHB	**25**	**386**	**48**	**62.58**	**74**	**3.97**	**140.55**
Total		**48**	**704**	**98**	**99.72**	**194.13**	**8.54**	**302.39**

Secondary Trains								
1	LHB	**5**	**96**	**6**	**9.57**	**6.15**	**0.43**	**16.15**
2	ICF	**15**	**182**	**18**	**9.27**	**48.01**	**0.85**	**58.13**
Total		**20**	**278**	**24**	**18.84**	**54.16**	**1.28**	**74.28**
RBPC Trains								
1	HYBRID	1	20	1	0.43	2.43	0	2.86
2	LHB	**3**	**62**	**4**	**1.42**	**10**	**0**	**11.42**
3	ICF	**37**	**282**	**65**	**34.58**	**156.57**	**3.29**	**194.44**
Total		**41**	**364**	**70**	**36.43**	**169**	**3.29**	**208.72**

Critical Analysis

Work Study at LTT Coaching Depot is carried out with a view to assess manpower required for Maintenance of LHB Coaches including Sick Line Attention accordingly, work study team visited Coaching Depot at LTT followed by discussions with nominated Officers & Supervisors and have concluded this study.

LHB coaches were introduced with a view to having 1) Higher carrying capacity 2) lesser weight 3) higher Passenger accommodating Capacity in 3AC coaches 4) Low corrosion 5) Low Maintenance 6) Better passenger comfort comparing to ICF coaches.

Presently in LTT Coaching depot, is having 48 rakes for primary maintenance out of which 25 rakes are of LHB type (386 Coaches) and 23 Rakes are of ICF made (318 Coaches) which means 52 % of total rakes is of LHB and 48% is of ICF made. Similarly in secondary type of maintenance 20 Rakes are available, out of which 05 rakes are of LHB type (92 Coaches) and 15 rakes are of ICF type (181 coaches) which is 75% of total rakes and 25 % LHB type of total rakes. Staff is also to be spare 41 Rakes of RBPC trains, in which 3 rakes are of LHB type(62 coaches) , 37 rakes of ICF type (282 coaches) and 01 rake having 20 Hybrid type of coaches, percentage wise coaches 7.31 % LHB type ,90.23% of ICF type and 2.43% of hybrid type rakes are available for maintenance activities.

This depot is having sanctioned strength of 950 staff including supervisory staff and 737 staff actual on roll staff carrying 213 vacancies. This on roll staff is being utilised in many activities like Sick Like attention as there is number of Sick attempts of Coaches especially in LHB type of Coaches, Scheduled activities, IOH activity etc along with primary/secondary maintenance, moreover having mix type of Rake holding (ICF & LHB Rakes) and frequent swapping of primary rakes due to late running of trains, with the incoming rake of one train working on some other train resulting in an adverse effect on train maintenance.

Though Indian railway is moving towards operation of LHB coaches all over Indian railways, presently there are no norms available for maintenance of LHB coaches. And manpower is utilised as per prevailing norms issued for ICF coaches further considering the requirement of staff and technical expertise in Work Study Organisation of Central Railway, time study of entire activities of coaching depots cannot be undertaken.

However It is observed during the work study that due to various advanced features of LHB coaches requires lesser time for maintenance compare to ICF coaches moreover it is also observed that the manpower requirement for LHB coaches is also lesser comparing to ICF coaches, considering the facts Work Study Team physically joined the staff working on Pit Line in actual maintenance of train No 12101 DN as a part of exercise to calculate exact time required to maintain one LHB coach and tried record time taken by staff to perform each activity required to be carried out during Primary maintenance of train. Following observations in time were recorded.

Head	Activity	Time Taken (in minutes)
Air Brake		
1	Brake equipment like hosepipe, BP/FP for leakage, Safety brackets for brake equipments.	1.5
2	Availability of clamps	
3	Functioning of WSP system & Dump valve	3
4	Release time in seconds	
5	Brake pad and clearance of Brake pad.	0.5
6	Brake cylinder & callipers.	1.5
7	Brake position on 6kg/CM2 reduction.	
8	Ensure horizontal position of load levelling valve.	
9	Normal brake release test.	0.5
10	Brake panels and fittings.	0.5
11	PEASD testing.	0.5
Under gear Fittings.		
1	CBC and supporting device and operating lever along with locking pin.	0.5
2	Bogie frame, boaster assembly cable& safety brackets.	1.3
3	Primary and secondary springs and dampers.	0.5
4	Salient block of control arm, roll link, traction link, traction centre.	1
5	Lateral longitudinal bump stop.	
6	Roll link, control arm, traction link & traction centre.	
7	Safety fittings of boggies.	0.5
8	Wheel axle & brake Disc (wheel profile & defects as per PDSO CMI K003.	1
9	CTRB condition from outside & grease oozing etc.	0.5
10	Earthling device	0.3
11	Fitment of all Undergear items inspection for corrosion cracks, breakage and damages if any.	0.5
12	Under slung water tanks and security arrangements	0.5
13	Vestibule fall plates and securing fasteners.	0.5
14	Handbrakes and other equipments of guard compartments	0.5
Interior activity (Excluding internal Coach cleaning which is outsourced activity)		
1	Lavatory	Simultaneous activity
2	Main door	
3	Other door	

4	Window glasses	
5	Seat/berths	
6	Lavatory fittings	
7	Mirrors	
8	FRP panels curtains	
9	Pest control etc.	
Total		15.6

On the basis of above time recorded, it is found that tentative time required for maintenance of a Single coach of LHB type and ascertaining all the parameters as per RDSO Coach manual subject to the coach being in normal maintenance position. It is derived that time taken to carry out maintenance of a single coach is 15.6 minutes/coach i.e. for a rake of 22 coaches total time required is 15.6 X 22 = 5.72 hrs.

Presently a gang of 22 staff is deputed to carry out maintenance of each LHB rakes. The distribution of staff is as below:

Sr. No	Maintenance Activity	No of Staff
1	Under Gear Activity	3
2	Air Brake	5
3	Brake Pad	2
4	Interior (lavatory, Doors, Seats, Windows, curtains in AC coaches etc.)	8
5	Schedule maintenance	4
Total Staff		**22 staff**

Presently abovementioned number of staff is being utilised for maintenance of LHB as well as ICF coaches whereas Work Study team while calculating the time required for maintenance of LHB coaches and actual manpower involved in these activities, has noticed that actual staff required to carry out maintenance of LHB coaches a stipulated time can be as under:

Sr. No	Maintenance Activity	No of Staff	Distribution of staff
1	Under Gear Activity	3	02 Staff for each side + 01 Staff middle side (Pit bay)
2	Air Brake	4	1 at test rig + 2 for WSP + 1 for Brake pad
3	Interior (lavatory, Doors, Seats, Windows, curtains in AC coaches etc.)	3	02 Carpenter + 01 trimmer

It is therefore observed that for primary maintenance of LHB coaches 2.2 coach/man is found sufficient requirement of manpower which can be further 50% less manpower requirement for secondary type of maintenance considering the activities defined in secondary type of maintenance.

However the above inference is based on only observance of work carried out by each staff at a point of time where there is no fault is noticed and the coach selected for time recording been found fit.

Moreover LTT coaching depot is maintaining number of rakes with ICF coaches and LHB coaches also, so in present scenario, sanctioned strength cannot be adjudged separately for LHB coaches only.

Hence work study team is of the opinion that actual manpower requirement for LHB coaches may be reviewed again when ICF coaches are permanently phased out totally and replaced with LHB coaches.

****