EASTERN RAILWAY

WORK STUDY REPORT

ON

REVIEW OF STAFF STRENGTH VIS-À-VIS WORKLOAD OF HEAT TREATMENT SHOP AT LILUAH WORKSHOP

(STUDY NO. WSER -13-20-21)

(Submitted on: 11.03.21)

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BY

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ACKNOWLEDGEMENT

The study team hereby acknowledges its deep gratitude to Chief Works Manager/ Liluah for allowing the study team to conduct the study.

The study team will ever thankful to Dy. CME/Coaching/ Liluah, PE/ Liluah and WPO/Liluah for their appropriate opinion and co-operation by supplying the necessary data to the study team.

The study team is also very thankful to Senior Section Engineer, Junior Engineer and other staff of Heat Treatment Shop and PCO for providing necessary information in connection with the subject study.

METHODOLOGY ADOPTED

The following methodology has been adopted in carrying out the study:

- Collection of data
- Discussion with concerned officers and Supervisors of Heat Treatment Shop
- Study of existing workload
- Critical analysis of workload and manpower

TERMS OF REFERENCE

The subject work study has been undertaken by the GM's Efficiency Cell during the current financial year 2020-2021 as per recommendation done vide CWE's L.No. MG/791/MPP (WS) dated. 10/07/20 with the following terms of references:

(i) Evaluate the quantum of existing workload.

(ii) Examine the deployment of Staff against workload.

(iii) To identify saving achievable in terms of manpower.

SUMMARY OF RECOMMENDATION

Sl. No.	Recommendations	Para reference
1	It is recommended that the revised total requirement of Artisan staff to carry out the entire departmental workload presently catered by Heat Treatment shop will be 34 which would result in surrender of 29 (63-34) posts as against the present total sanctioned strength of 63 posts.	3.10

EXECUTIVE SUMMARY

Study Name & No.:	"REVIEW OF STAFF STRENGTH VIS-A-VIS WORKLOAD OF HEAT TREATMENT SHOP AT LILUAH WORKSHOP" ***(STUDY NO.WSER-13-20-21)***
Year of conducting the study:	**2020-21**
Terms of reference:	(i) Evaluate the quantum of existing workload. (ii) Examine the deployment of Staff against workload. (iii) To identify saving achievable in terms of manpower.
Methodology:	• Collection of data • Discussion with concerned officers and Supervisors of Heat Treatment Shop • Study of existing workload • Critical analysis of workload and manpower.
Existing Sanctioned Strength *(Artisan staff & Helper category staff only)*	***63***
Existing Men on Roll *(Artisan staff Helper category staff only)*	***31***
Vacant post	***32***
Revised Requirement	***34***
Proposed Surrender	***29***

CHAPTER-I

1.0 INTRODUCTION:

Indian Railways is the life-line of nation for providing Transportation facility over the length and breadth of the country. Its vision is to provide efficient, affordable, customer-focused, environmentally sustainable integrated transportation solutions and to be the vehicle of inclusive growth, connecting regions, communities, ports and centres of industry, commerce, tourism and pilgrimage across the country.

1.1 Indian Railways manufactures much of its rolling stock and heavy engineering components at its six manufacturing plants, called Production Units, which are managed directly by the Ministry. Popular rolling stock builders such as CLW and DLW for electric and diesel locomotives; ICF and RCF for passenger coaches are Production Units of Indian Railways. Over the years, Indian Railways has not only achieved self-sufficiency in production of rolling stock in the country but also exported rolling stock to other countries. Each of these production units is headed by a General Manager, who also reports directly to the Railway Board. Thus, Indian Railways manages and maintains all those infrastructures. Management of those huge infrastructures have to be done in accordance with the organization's vision.

1.2 Besides the above, in Indian Railways, various Railway Workshops plays a vital Role in connection with POH/ROH/IOH/NPOH repair of different kinds of Wagons, coaches *(both AC & Non-AC)* and Locomotives *(both Diesel & Electric)*.

1.3 To cope up with the above changing scenario, Infrastructural development is not only required in the area of manufacturing & periodical overhauling of various types of passenger coaches, goods wagons and Diesel/Electric Locomotives only, overall infrastructural development is necessary in whole Indian Railway system.

1.4 For any kind of development, money is the most important but limited resources. An organization like Indian Railways may also provide a good financial support for its development, if good financial discipline can be practiced and expenditure due to man, materials & overheads can be managed optimally & economically.

1.5 In view of the above, Rly. Board issued nos. of circulars, orders, etc. The Zonal Railways also implement various measures for financial discipline.

1.6 At this juncture, the role of Railway Efficiency & Research Directorate is also very important in connection with 'Benchmarking', 'Rationalizing of Man-Power', etc.

1.7 Indian Railway is facing tremendous financial crunch after implementation of 6th Pay Commission. Operating ratio is gradually increasing. Though Indian Railway is not a business organization but to survive, it is always essential to make the organization in profit i.e. operating ratio should be less than 100. Performance Efficiency Index shown in the corporate plan booklet published by the Eastern Railway is given below.

Year	Operating Ratio
2016-2017	165.25
2017-2018	181.15
2018-2019	185.98
2019-2020	169.75
2020-2021	153.45 (Proposed)

1.8 In view of the above, Eastern Railway has taken serious consideration to make the operating ratio within limit (below 100%) by decreasing the Working Expense and increasing the Earnings. For this purpose, Rly Board issued nos. of circulars, orders etc to minimize Expenses and increase Earnings. The Zonal Railway also implements various measures for financial discipline.

1.9 Considering the above, the railway authority has suggested for conducting the subject study in order to provide **need based requirement of artisan staff at Heat Treatment Shop in LLH workshop** consequent upon the changed scenario. The subject work-study has been undertaken by GM's Efficiency Cell/E.Rly during the current financial year 2020-21 to improve the productivity index of the railway. As per terms of reference, the study team has thoroughly observed the activities and deployment of Artisan staff at Heat Treatment Shop and critically analyzed the involvement of staff to ascertain their optimum utilization and to find out the need based requirement. In the analysis, the effective utilization of human resource is considered keeping in mind of the present working pattern. The main objective of the study team is to increase the efficiency of the Railways by maximum utilization of its resources.

CHAPTER-II

2.0 Existing Scenario:

In Eastern Railway, there are three major Workshops for POH/ROH/IOH/NPOH of repair of different kinds of Wagons, coaches *(both AC & Non-AC)* and Locomotives *(both Diesel & Electric)*. These Workshops are as follows-

(I) Liluah Carriage & Wagon Workshop/Liluah/E.Rly.

(II) Kanchrapara Carriage & Wagon Workshop & Kanchrapara Locomotive Workshop/ Kanchrapara/E.Rly.

(III) Jamalpur Locomotive Workshop/Jamalpur/E.Rly.

2.1 Liluah Carriage & Wagon Workshop *(An ISO-9001:2008 & ISO-14001-2004 Certified Organization)* is one of the IR's oldest & biggest Railway Carriage & repair Workshop in India. The Liluah Workshop is functioning under Chief Workshop Manager.

2.2 The Workshop is engaged in Periodical Overhauling of all kinds of coaches & wagons. It also facilitates repair and overhauling of coach & wagon components. The above mentioned activities are performed in different shops.

2.2.1 Different shops or work points along with their respective activities of LLH Workshop are as under:

S.No.	***Shops***	***Activities catered by the shops***
1	M	Coaching Repair Shops
2	CR	
3	MR	
4	N	Paint Shop
5	T	Trimming Shop
6	L	Wagon Repair Shop
7	J	Sheet metal works, shearing, bending, drilling, punching, pressing work, etc
8	A	Blacksmith & Heat Treatment
9	C	Tin smith
10	E	Spring shop
11	G	Machine shop
12	HT	Heat treatment
13	K	Wheel shop
14	TR	Tool room
15	H	Mill Wright

2.3 The subject study of Heat Treatment Shop under "A" Shop is conducted to ascertain the optimum utilization of Technician by observing their outturn in last 3 years.

2.3.1 The regular vital items and their activities including sequence of operation performed by Heat Treatment shop is tabulated below.

Section 50210:

For	Activities	Shift wise activities vis a vis shift wise deployment of staff		Work Load
		G Shift (8-00 to16-00)	A shift (6-00to 14-00)	
ICF	Proof load testing and Magnaflux testing of Screw coupling, Draw Hook, Draw bar, BSS Hanger Anchor link, Pin for BSS Pin etc.	Proof load testing and Magnaflux testing of Screw coupling, Draw Hook, Draw bar, BSS Hanger Anchor link, Pin for BSS Pin etc.	Magnaflux testing of Pin for BSS. Proof load testing of BSS hanger	As Target laid Time to time by coaching shops
LHB	Magna flux testing of Traction Leaver	Magna flux testing of Traction Leaver		
Wagon	Nil	Nil		

Section 50211:

For	Activities	Shift wise activities vis a vis shift wise deployment of staff	Work Load
		Only G Shift	
ICF	Furnace loading operating. Bosh tank cleaning. Drawing of materials from Liluah Depot. Supplying of materials to different Shops.	Furnace loading operating for Stress relieving, normalizing, hardening and tempering etc. Bosh tank cleaning. Drawing of materials from Liluah Depot. Supplying of materials to different Shops.	As Target laid and supplied by user shops Time to time.
LHB	Bosch tank cleaning of traction lever	Bosch tank cleaning of traction lever	
Wagon	Normalizing	Normalizing of CBC head	

2.4 The category-wise Sanctioned strength vis-à-vis On-roll position of Supervisor, Artisan and Erstwhile Gr. D staff of Heat Treatment shop /LLH Workshop is tabulated underneath:

Section	Category	S/S	MOR	Vacancy
Supervisor	SSE	3	3	0
	JEE	2	0	2
Total		**5**	**3**	**2**

Staff position of Heat treatment Shop of Section 50210 as on Oct'20				
Section	Category	S/S	MOR	Vacancy
Artisan/DW	Sr. Tech	10	14	-4
	Tech-I	19	4	15
	Tech-II	3	0	3
	Tech-III	5	5	0
Total		**37**	**23**	14

Staff position of Heat treatment Shop of Section 50211 as on Oct'20				
Section	Category	S/S	MOR	Vacancy
Artisan/EIW	Sr. Tech	7	2	5
	Tech-I	13	1	12
	Tech-II	2	3	-1
	Tech-III	4	2	2
Total		**26**	**8**	**18**

Summarizing position of Heat treatment Shop as on Oct'20				
Section	Category	S/S	MOR	Vacancy
Supervisor	SSE	3	3	0
	JEE	2	0	2
Sub Total		**5**	**3**	**2**
Artisan	Sr. Tech	17	16	1
	Tech-I	32	5	27
	Tech-II	5	3	2
	Tech-III	9	7	2
Total (Ex. Supervisor)		**63**	**31**	**32**

2.5 The subject study is carried out to review the manpower of Heat Treatment shop directly or indirectly involve with the workload of Heat Treatment shop. The category-wise position of Supervisors, Artisan and Erstwhile Group-D staff are shown in para 2.4.

From the total position, Supervisory category is not considered in the assessment as their work is to supervise the sectional staff and they did not directly carry out the sectional work.

2.5.1 So, from above discussion, the category-wise position of DW staff (directly or indirectly involve with the workload of Heat Treatment shop) i.e. section 50210 is considered during the assessment as under:

S. No.	**Category**	**Sanctioned Strength**	**On-Roll Strength**	**Vacancy**
Artisan Category Staff				
1	Sr. Tech.	10	14	-4
2	Technician I	19	4	15
3	Technician II	3	0	3
4	Technician III	5	5	0
Total		***37***	***23***	***14***

2.8 The study team has collected the item wise outturn of Black smith shop from 2017-18 to 2019-20. Month-wise vis-à-vis item wise outturn is tabulated below.

OUTTURN OF REGULAR VITAL ITEMS OF HT SHOP DURING 2017-18															
Sl No	Item	Component	APR 2017	MAY	JUN	JULY	AUG	SEPT	OCT	NOV	DEC	JAN 2018	FEB	MAR	TOTAL
1	Magna flux Testing	For bent link (part of Sc. Coupling)	289	336	322	318	359	287	249	308	285	251	254	294	3552
2		For straight link (part of Sc. Coupling)	514	667	612	663	778	607	557	624	379	522	584	505	7012
3		For Trunnion Nut (part of Sc. Coupling)	240	370	263	322	421	303	334	304	182	217	343	253	3552
4		For Screw rod (part of Sc. Coupling)	257	377	275	357	369	331	297	309	245	271	298	255	3641
5		For Draw Hook	285	366	354	376	381	333	293	361	296	323	318	344	4030
6		For Draw Bar	684	669	697	701	710	623	598	691	569	627	565	591	7725
7		For Anchor Link	781	795	673	708	707	603	503	779	822	648	606	657	8282
8		For Traction Lever	68	84	126	148	77	121	77	88	0	105	72	125	1091
9		For BSS Hanger	3528	3392	4202	4231	3518	3554	3387	3986	3929	4216	3827	3956	45726
10		For BSS Pin													0
11	Proof Load Testing	Screw coupling	376	396	396	381	425	343	331	362	352	328	317	335	4342
12		Draw Hook	385	414	389	408	430	365	338	386	373	342	318	349	4497
13		Draw Bar	783	809	800	797	876	718	656	784	650	711	650	708	8942
14		BSS Hanger	5073	5937	5824	5132	5018	4817	4566	5212	5065	5629	5253	5860	63386
15		Painting of BSS Hanger	3526	3389	4194	4115	3362	3612	3219	4045	3929	4215	3827	3956	45389

OUTTURN OF REGULAR VITAL ITEMS OF HT SHOP DURING 2018-19															
Sl No	**Item**	Component	**APR 2018**	**MAY**	**JUN**	**JULY**	**AUG**	**SEPT**	**OCT**	**NOV**	**DEC**	**JAN 2019**	**FEB**	**MAR**	**TOTAL**
1	Magna flux Testing	For bent link (part of Sc. Coupling)	296	276	260	263	345	292	250	303	300	307	270	260	3422
2		For straight link (part of Sc. Coupling)	546	657	554	513	593	593	505	584	631	605	446	492	6719
3		For Trunion Nut (part of Sc. Coupling)	235	282	279	258	313	308	262	269	305	284	225	237	3257
4		For Screw rod (part of Sc. Coupling)	262	281	300	297	315	276	248	284	306	296	237	258	3360
5		For Draw Hook	354	341	259	306	399	330	298	303	354	362	323	294	3923
6		For Draw Bar	639	609	433	558	740	564	543	606	663	615	569	730	7269
7		For Anchor Link	630	668	677	705	662	594	579	707	885	723	640	487	7957
8		For Traction Lever	90	87	111	130	128	145	79	127	112	145	141	157	1452
9		For BSS Hanger	4359	3522	3651	3603	1542	5170	2623	3612	3166	3840	3597	3465	42150
10		For BSS Pin													0
11	Proof Load Testing	Screw coupling	378	331	296	330	440	344	313	347	369	363	327	354	4192
12		Draw Hook	404	343	297	366	439	362	298	367	404	360	384	336	4360
13		Draw Bar	756	687	598	669	912	690	631	704	750	738	665	761	8561
14		BSS Hanger	5660	5429	5359	5643	4554	5371	3614	4443	4971	5898	5216	4279	60437
15		Painting of BSS Hanger	4359	3520	3651	3401	1542	5169	2622	3611	3165	3839	3595	3465	41939

OUTTURN OF REGULAR VITAL ITEMS OF HT SHOP DURING 2019-20															
Sl No	Item	Component	APR 2019	MAY	JUN	JULY	AUG	SEPT	OCT	NOV	DEC	JAN 2020	FEB	MAR	**TOTAL**
1	Magna flux Testing	For bent link (part of Sc. Coupling)	285	296	373	288	307	262	235	249	269	268	268	162	3262
2		For straight link (part of Sc. Coupling)	515	516	703	602	591	545	455	473	516	487	557	352	6312
3		For Trunnion Nut (part of Sc. Coupling)	236	276	354	299	273	292	214	233	270	256	277	182	3162
4		For Screw rod (part of Sc. Coupling)	237	279	349	272	292	266	231	263	283	290	266	180	3208
5		For Draw Hook	314	280	318	391	265	314	278	275	266	324	236	151	3412
6		For Draw Bar	597	538	651	641	619	584	517	481	498	575	597	324	6622
7		For Anchor Link	587	607	755	751	657	516	451	609	663	605	575	407	7183
8		For Traction Lever	155	119	157	158	154	194	137	147	163	178	175	95	1832
9		For BSS Hanger	3611	3277	3595	4115	3529	3980	2691	3444	3565	3369	4208	2783	42167
10		For BSS Pin													0
11	Proof Load Testing	Screw coupling	336	336	343	350	353	310	288	263	341	346	287	170	3723
12		Draw Hook	314	332	350	376	349	314	278	317	308	366	278	179	3761
13		Draw Bar	658	684	692	731	695	641	613	556	591	669	689	388	7607
14		BSS Hanger	4946	4393	4453	6104	5937	5356	4176	5380	5169	4869	5809	3243	59835
15		Painting of BSS Hanger	3609	3277	3595	4115	3279								17875

2.8.1 Summarizing the monthly outturn, the following table indicates the yearly total outturn of regular vital items performed by Heat Treatment shop in 2017-18, 2018-19 & 2019-20.

TOTAL OUTTURN (Year wise) of Heat treatment Shop in financial year 2017-18, 2018-19 & 2019-20						
SL NO	**ITEM**	**Component**	**2017-18**	**2018-19**	**2019-20**	**Components of**
1	Magna flux Testing	For bent link (part of Sc. Coupling)	3552	3422	3262	ICF coaches
2		For straight link (part of Sc. Coupling)	7012	6719	6312	
3		For Trunnion Nut (part of Sc. Coupling)	3552	3257	3162	
4		For Screw rod (part of Sc. Coupling)	3641	3360	3208	
5		For Draw Hook	4030	3923	3412	
6		For Draw Bar	7725	7269	6622	
7		For Anchor Link	8282	7957	7183	
8		For BSS Hanger	45726	42150	42167	
9		For BSS Pin	0	0	0	
10	Magna flux Testing	For Traction Lever	1091	1452	1832	LHB coaches
11	Proof Load Testing	Screw coupling	4342	4192	3723	ICF coaches
12		Draw Hook	4497	4360	3761	
13		Draw Bar	8942	8561	7607	
14		BSS Hanger	63386	60437	59835	
15		Painting of BSS Hanger	45389	41939	17875	

2.9 The month-wise Allowed Time (AT) and Time Taken of Heat treatment shop for the Year 2017-18, 2018-19, and 2019-20 are shown in tables below.

2.9.1 **For the Year 2017-18:**

Shop	Sec. Name	WH=162.5		WH=187.5		WH=177.5		WH=182.5	
		Apr.2017		May.2017		June.2017		July.2017	
		DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken
Heat treatment	50210	5463	3693	6491	4388	6767	4574	6917	4675

WH=187.5		WH=155.0		WH=160.0		WH=180.0	
Aug.2017		Sept.2017		Oct.2017		Nov.2017	
DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken
6828	4723	5499	4033	5352	3735	5357	3656

WH=177.5		WH=177.5		WH=170.0		WH=170.0	
Dec.2017		Jan.20178		Feb.2018		Mar.2018	
DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken
5693	3848	5305	3585	5971	4036	6801	4604

2.9.2 **For the Year 2018-19:**

Shop	Sec. Name	WH=162.5		WH=187.5		WH=177.5		WH=182.5	
		Apr.2017		May.2017		June.2017		July.2017	
		DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken
Heat treatment	50210	5762	3895	6142	4151	6072	4218	6247	4300

WH=187.5		WH=155.0		WH=160.0		WH=180.0	
Aug.2017		Sept.2017		Oct.2017		Nov.2017	
DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken
5972	4090	5771	3929	5067	3425	5435	3675

WH=177.5		WH=177.5		WH=170.0		WH=170.0	
Dec.2017		Jan.20178		Feb.2018		Mar.2018	
DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken
5625	3805	5997	4180	5473	3776	5314	3668

2.9.3 **For the Year 2019-20:**

Shop	Sec. Name	WH=162.5		WH=187.5		WH=177.5		WH=182.5	
		Apr.2017		May.2017		June.2017		July.2017	
		DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken
Heat treatment	50210	5646	3929	5358	3775	5004	3455	6195	4340

WH=187.5		WH=155.0		WH=160.0		WH=180.0	
Aug.2017		Sept.2017		Oct.2017		Nov.2017	
DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken
6027	4219	5104	3540	4737	3315	4850	3348

WH=177.5		WH=177.5		WH=170.0		WH=170.0	
Dec.2017		Jan.20178		Feb.2018		Mar.2018	
DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken	DW-Allowed Time	DW-Time Taken
4509	3119	5682	4157	5453	3917	5682	4157

CHAPTER-III

3.0 CRITICAL ANALYSIS

The subject work study has been conducted to review the manpower deployed in Heat treatment Shop of Liluah Workshop against the existing workload i.e. outturn performed.

3.1 Keeping in view of the present financial condition of Railways and the increasing trend of operating ratio of Eastern Railway, the subject study is conducted with the objective to explore the ways to attain financial savings of the Railways by right sizing human resources along with the motive to improve the effective utilization of staff.

3.2 It has been mentioned in para 2.5.1, that study team is considering only Artisan and Helper Category staff for assessment. So, from para 2.5.1, the category-wise position of Artisan staff who are directly or indirectly involved in the outturn of HT shop (DW staff of section 25010) are tabulated underneath.

S. No.	Category	Sanctioned Strength	On-Roll Strength	Vacancy
Artisan Category Staff				
1	Sr. Tech.	10	14	-4
2	Technician I	19	4	15
3	Technician II	3	0	3
4	Technician III	5	5	0
Total		***37***	***23***	***14***

3.3 The revised requirement of staff for Heat treatment Shop has been assessed in ongoing paragraphs through analysis of various data in regards to shop's workload and outturn mentioned in details in Chapter II.

For assessment, study team takes reference from *Chapter IV of 'Indian Railway Mechanical Code'* regarding various aspects of "**Production Control Organization"** keeping the infrastructural setup of concerned shop of Liluah Workshop in view. The related aspects considered in the present work study are:

Originally, this scheme was introduced in the Railway Repair Workshops of the Mechanical Department and the same is extended to Signal & Telecommunication workshops, Civil Engineering Workshops and the Electrical Sections attached to the Mechanical Workshops. This incentive scheme is also known as "the system of payment by results." The incentive workers are classified as Direct, Essential Indirect and Indirect Workers:

(a) ***Direct workers (DW)*** *are those engaged in work which can be assessed through time studies.*

(b) ***Essential Indirect workers (EIW)*** *are those who contributed to the continuity of the work and whose services are essential but whose work cannot be assessed through time studies.*

(c) ***Indirect Workers (IW)*** *are those who are provided for cleaning etc. do not contribute directly or indirectly to production and do not earn any incentive bonus.*

Allowed Time: *The total of the normalized time arrived from time study and all the allowances stated is termed as "allowed time"'. The allowed time as issued by the Rate Fixing Department with the approval of Production Engineer, is the time within which a worker shall complete an operation and earn bonus. It is expected that the average worker will complete an operation in 75% of the allowed time when he will earn 33 ⅓ % bonus.*

3.3.1 During analysis, study team also takes the reference of *percentage of EIW staff* for different activities as per *IR Mechanical code* as tabulated below, for calculating EIW staff:

Name of the sub-shop	***Strength of unskilled workers engaged as indirect workers including essential indirect worker***
Erecting	15% of the total strength of the erecting/shop.
Boiler	10% of the total strength of the Boiler shop.
Tender	15% of the total strength of the Tender shop.
Fitting	15% of the total strength of the Fitting shop.
Copper & Tin	15% of the total strength of the Copper & Tin shop.
Welding	12% of the total strength of the Welding shop.
Motion	10% of the total strength of the Motion shop.
Saw Mill	30% of the total strength of the Saw Mill shop.
Carriage Building	10% of the total strength of the Carriage Building shop.
Carriage Repair	10% of the total strength of the Carriage Repair/Shop.
Paint	10% of the total strength of the Paint shop.
Trimming	10% of the total strength of the Trimming shop.
Wagon building	12% of the total strength of the Wagon Repair shop.
Wagon repair	15% of the total strength of the Wagon repair shop.
General Iron Foundry	20% of the total strength of the General Iron Foundry.
Brass Foundry	25% of the total strength of the Brass Foundry.
Smith & Forge	10% of the total strength of the Smith & Forge shop.
Machine	10% of the total strength of the Machine shop.
Wheel	10% of the total strength of the Wheel shop.
Tool Room	10% of the total strength of the Tool Room.
Mill Wright	25% of the total strength of the Mill Wright.

3.4 For assessment of revised requirement of manpower (*Artisan and Helpers*) for Heat treatment Shop, effective utilization of manpower is kept in consideration. The study team has mainly given attention to the out-turn of the Heat treatment Shop for assessment of DW staff of the shop

3.5 The total Allowed time of Heat treatment Shop for a month is the summation of Allowed time of all the sections of Heat treatment Shop for the corresponding month.

3.5.1 It can be seen from the data collected from Heat treatment shop (*para 2.9.1, 2.9.2 and 2.9.3*), the outturn varies every month, so study team considers the average outturn for the year 2017-18, 2018-19 2019-20 to get a more realistic and accurate assessment. The month-wise out-turn, Allowed time and Time Taken is depicted in the Chapter II.

3.5.2 From paras 2.9.1, 2.9.2 and 2.9.3, the month-wise Outturn and corresponding Allowed time, Time Taken and Efficiency Percentage of DW staff *(Direct worker)* of Heat treatment Shop for the year 2017-18, 2018-19 and 2019-20 are tabulated under:

For the Year 2017-18:

Month	Available Hrs	Allowed Time (a)	Time Taken (b)	Time saved c=(a-b)	Efficiency d=c/bx100
April	162.5	5463	3693	1770	0.4793
May	187.5	6491	4388	2103	0.4793
June	177.5	6767	4574	2193	0.4794
July	182.5	6917	4675	2242	0.4796
August	187.5	6828	4723	2105	0.4457
September	155.0	5499	4033	1466	0.3635
October	160.0	5352	3735	1617	0.4329
November	180.0	5357	3656	1701	0.4653
December	177.5	5693	3848	1845	0.4795
January	177.5	5305	3585	1720	0.4798
February	170.0	5971	4036	1935	0.4794
March	170.0	6801	4604	2197	0.4772

For the Year 2018-19:

Month	Available Hrs	Allowed Time (a)	Time Taken (b)	Time saved c=(a-b)	Efficiency d=c/bx100
April	165.0	5762	3895	1867	0.4793
May	187.5	6142	4151	1991	0.4796
June	177.5	6072	4218	1854	0.4395
July	185.0	6247	4300	1947	0.4528
August	185.0	5972	4090	1882	0.4601
September	170.0	5771	3929	1842	0.4688
October	152.5	5067	3425	1642	0.4794
November	167.5	5435	3675	1760	0.4789
December	177.5	5625	3805	1820	0.4783
January	180.0	5997	4180	1817	0.4347
February	170.0	5473	3776	1697	0.4494
March	170.0	5314	3668	1646	0.4487

For the Year 2019-20:

Month	Available Hrs	Allowed Time (a)	Time Taken (b)	Time saved c=(a-b)	Efficiency d=c/bx100
April	180.0	5646	3929	1717	0.4370
May	180.0	5358	3775	1583	0.4193
June	167.5	5004	3455	1549	0.4483
July	192.5	6195	4340	1855	0.4274
August	182.5	6027	4219	1808	0.4285
September	170.0	5104	3540	1564	0.4418
October	155.0	4737	3315	1422	0.4290
November	172.5	4850	3348	1502	0.4486
December	180.0	4509	3119	1390	0.4457
January	177.5	5682	4157	1525	0.3669
February	177.5	5453	3917	1536	0.3921
March	115.0	5682	4157	1525	0.3669

3.6 It can be seen that the outturn in terms of Allowed Time varies in every month. Therefore, for assessment, study team considers the Average value.

So, from the outturn figure for the year 2017-18, 2018-19 and 2019-20, the average value of available working hours/month, Allowed time/month, Time taken/month is shown below:

Out Turn of Heat Treatment Shop			
Year	Total Available Hrs	Total Allowed time (AT)	Total Time taken
2017-18	2087.5	72444.0	49550
2018-19	2087.5	68877.0	47112
2019-20	2050.0	64247.0	45271.0
Grand Total	6225.0	205568.00	141933.0
Avg.	**2075.00**	**68522.67**	**47311.00**

In table above, the average value of Allowed time (AT) reflects the timing for average outturn in terms of man-hours.

Average Time Taken denotes the utilized man-hours to get the corresponding average outturn. It actually resembles the input factor of manpower and time i.e duty hours to get the outturn.

Therefore, the requirement of DW *(Direct Worker)* staff to achieve the average outturn (*i.e average AT 68522.67 man-hours*) is calculated below.

From above table, Utilized Man-hours (i.e Time Taken) for average Outturn of AT 68522.67 man-hours	*47311*
Average no. of available hours	*2075*
Requirement of DW staff on the basis of assessment based on Average Outturn	*47311* / 2075 = *22.8*

So, the requirement of DW staff at Heat treatment Shop with incentive scheme based on assessment on the basis of Average Outturn is calculated as 22.8 ≈ 23

The requirement of EIW staff at Heat treatment Shop as per *percentage of EIW staff* for different activities as per *IR Mechanical code* tabulated in para 3.3.1 is assessed underneath:

Requirement of EIW staff on the basis of assessment based on average outturn	*= 10 % of DW staff of* Heat treatment Shop *= 10% X 23* *= 2.3* ≈ 3

So, the requirement of staff at EIW section based on assessment on the basis of Average Outturn is calculated as 3.

Hence, total requirement at section 25010 of Heat treatment shop = 23+3 = 26

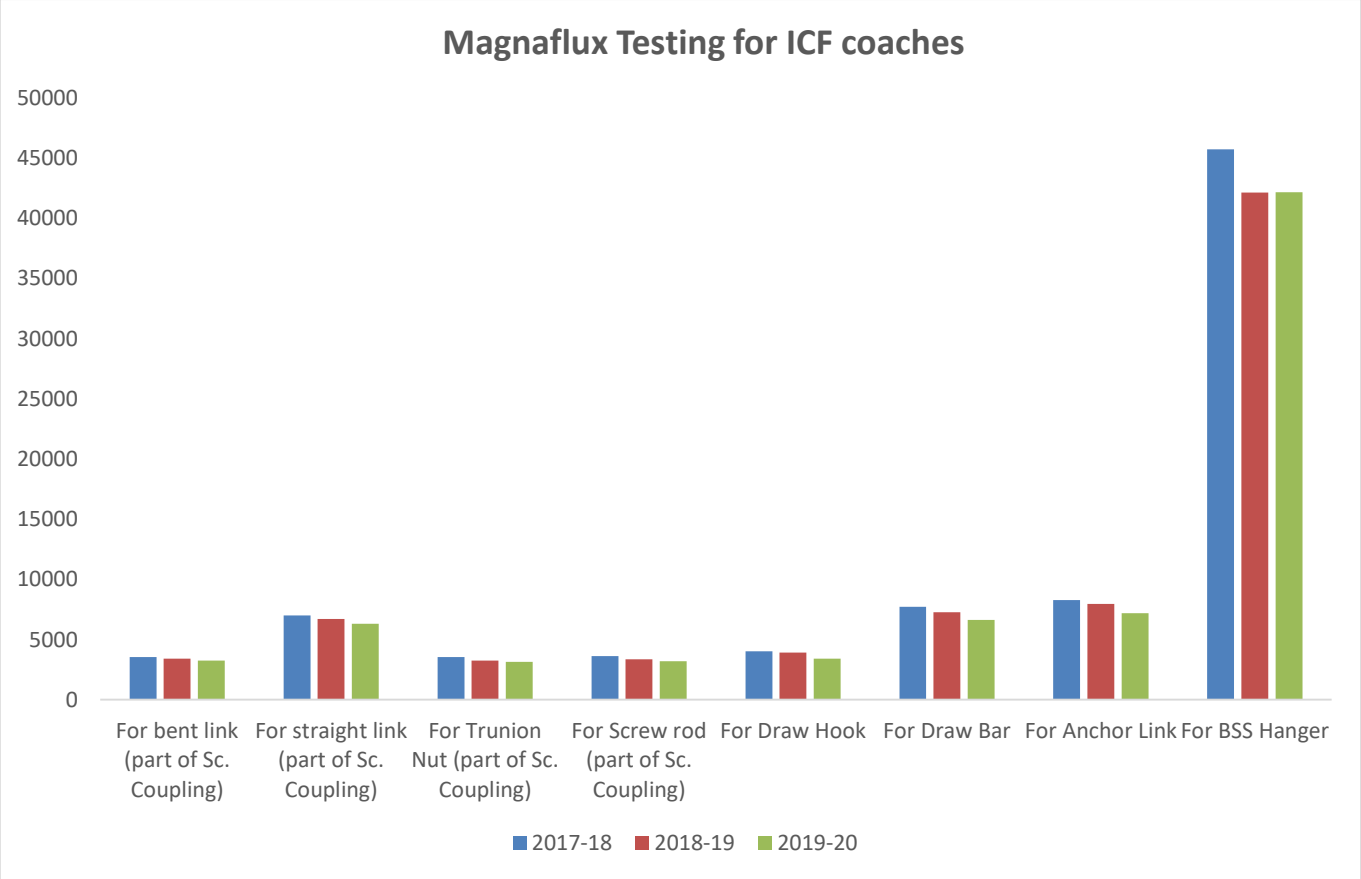
3.7 The existing deployment of staff and workload of Section 50211 are mentioned in details in para 2.3.1. It is observed that staff of the section are Non Incentive.

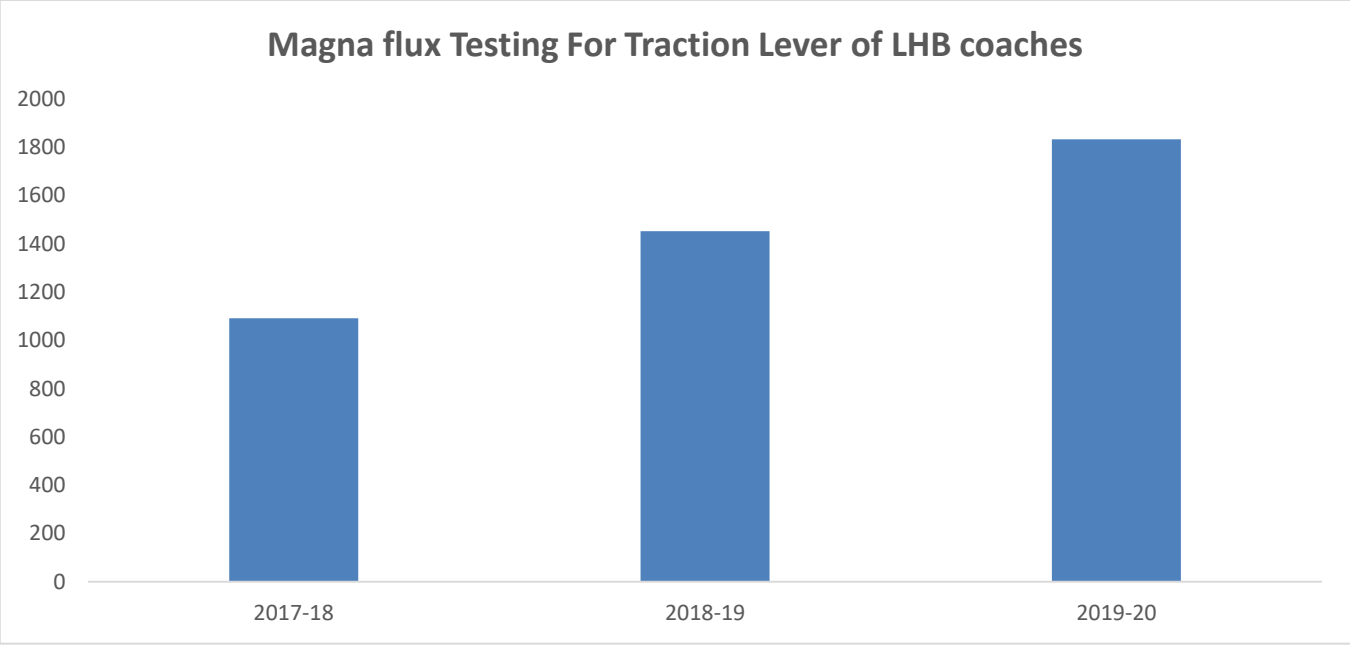
Therefore, after through discussion with concerned official it is concluded by study team that existing deployment of 8 staff should be retained and this results in un-alteration of the existing men-on-roll of staff of the section.

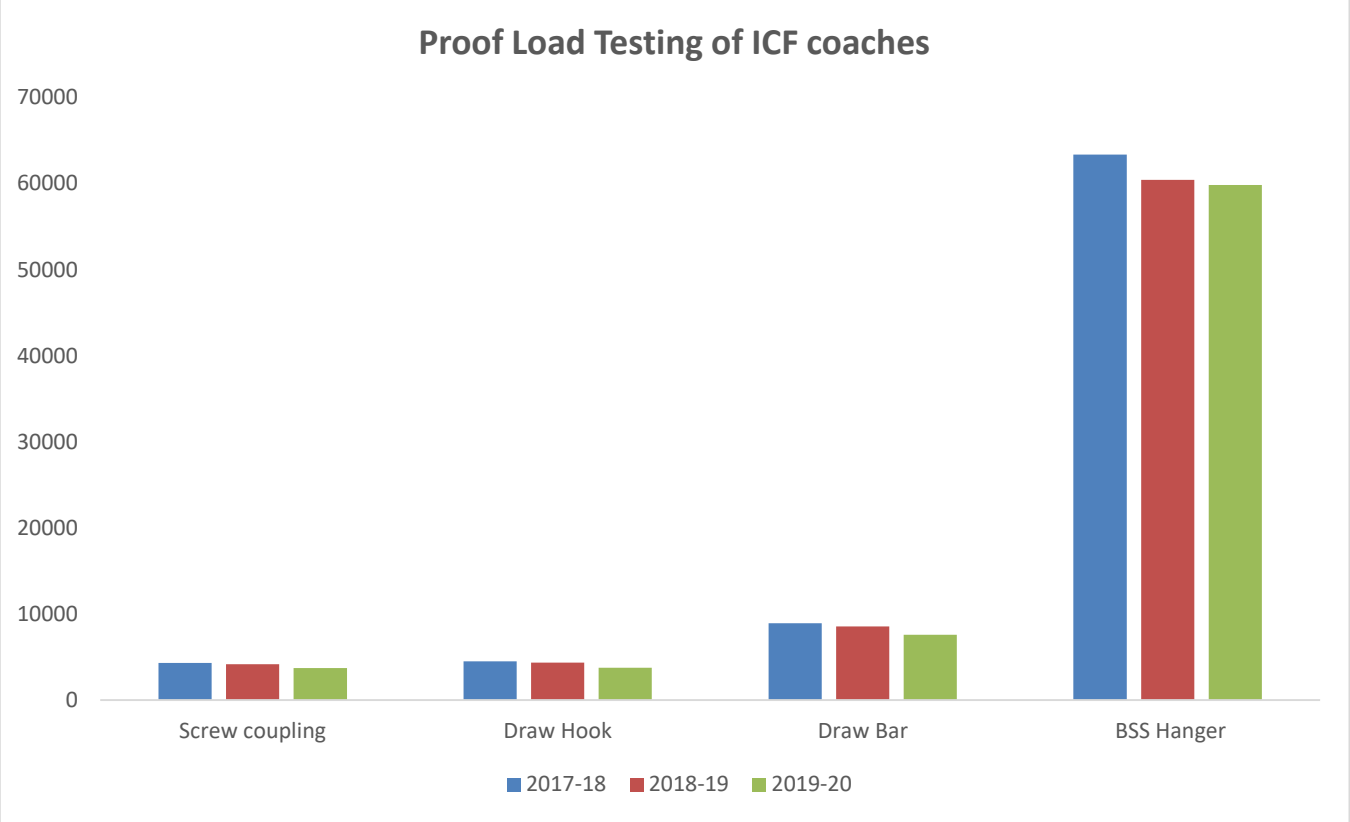
3.8 The study team also compared the trend of outturn (Items/Components) performed in the year 2017-18, 2018-19 7 2019-20. Year wise vis-à-vis item wise total outturn for ICF coaches & LHB coaches is tabulated below.

TOTAL OUTTURN (Year wise) Heat treatment Shop in financial year 2017-18, 2018-19 & 2019-20						
SL NO	**ITEM**	**Component**	**2017-18**	**2018-19**	**2019-20**	**Components of**
1	Magna flux Testing	For bent link (part of Sc. Coupling)	3552	3422	3262	ICF coaches
2		For straight link (part of Sc. Coupling)	7012	6719	6312	
3		For Trunnion Nut (part of Sc. Coupling)	3552	3257	3162	
4		For Screw rod (part of Sc. Coupling)	3641	3360	3208	
5		For Draw Hook	4030	3923	3412	
6		For Draw Bar	7725	7269	6622	
7		For Anchor Link	8282	7957	7183	
8		For BSS Hanger	45726	42150	42167	
9		For BSS Pin	0	0	0	
10	Magna flux Testing	For Traction Lever	1091	1452	1832	LHB coaches
11	Proof Load Testing	Screw coupling	4342	4192	3723	ICF coaches
12		Draw Hook	4497	4360	3761	
13		Draw Bar	8942	8561	7607	
14		BSS Hanger	63386	60437	59835	
15		Painting of BSS Hanger	45389	41939	17875	

3.8.1 Outturn trends of ICF components and LHB components in 2017-18, 2018-19 & 2019-20 is depicted below in graphically.







3.8.2 The above figure indicates that the outturn for LHB coaches is gradually increasing whereas, the outturn for ICF coaches is decreasing. Hence, man-hrs saved for ICF components are utilized against workload of LHB coaches.

3.9 From para 3.6,

The Revised requirement of staff under section 50210 is tabulated underneath:

The actual requirement of Incentive staff = 26

The Revised requirement of staff under section 50211 is tabulated underneath:

The actual requirement of Non Incentive staff = 8

Hence, actual requirement of Incentive and Non Incentive staff at Heat Treatment shop at LLH against the existing workload will be as under:

Sections	*Sanctioned Strength* (Artisan & Helper Category staff)	*Existing* Deployment	*Proposed Requirement*
Requirement of staff for catering existing workload of Heat Treatment shop including Leave Reserve	63	31	*34*

3.9.1 Summarizing the Revised requirement *(including Leave Reserve)* of staff as discussed in above para, the posts to be rendered as surplus against the total existing sanctioned strength with the consideration of assessment made in the above paragraphs, may be seen from the following table.

Category	Sanctioned Strength	Men-On- Roll	Revised Requirement	Surplus
Artisan	**63**	**31**	**34**	**29**

3.10 **Recommendations**:

It is recommended that the revised total requirement of Artisan staff to carry out the entire departmental workload presently catered by Heat Treatment shop will be 34 which would result in surrender of 29 (63-34) posts as against the present total sanctioned strength of 63 posts.

CHAPTER-IV

4.0 FINANCIAL APPRAISAL:

4.1 As per recommendation made in para 3.10, the total surplus posts works out to ***25 posts***. For an easy and smooth means of calculation of financial appraisal, the study team considered the posts from lowest grades with lowest Pay scale and Grade Pay.

A statement showing the minimum annual financial savings on account of surrender of total ***25 posts*** is furnished below.

Pay Level	*Lowest Grade Pay (Rs.)*	*Mean pay (in Rs)*	*D.A (17%) (in Rs)*	*Total (in Rs)*	*No. of posts Recommended for Surrender*	*Monthly savings of total staff (in Rs)*	*Minimum Annual savings. (in Rs)*
1	1800/-	20750/-	3528/-	24278/-	29	704062/-	8448744/-

Thus, the minimum annual financial savings works out to **Rs. 84.48 lakhs**.