

Page 1 of 9	File no. EL7.2.2/Bellow Duct/main	Specification No. RDSO/PE/SPEC/0197-2020 (Rev-1)
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सत्यमेव जयते

भारत सरकार
रेल मंत्रालय

**GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS**

**अनुसंधान अभिकल्प एवं मानक संगठन
RESEARCH DESIGNS AND STANDARDS ORGANISATION**

एल.एच.बी. डिजाइन वातानुकूलित यानों के आर.एम.पी.यू. में लगने वाले फ्रेश, सप्लाइ एवं रिटर्न एअर बेलो डक्ट के लिये दोनो ओर सिलीकान रबर की कोटिंग के साथ मेटा अरमाईड/ पेरा अरमाईड फेब्रिक्स की विशिष्टि

**SPECIFICATION FOR FRESH, SUPPLY AND RETURN BELLOW DUCT MADE OF
META ARAMID/ PARA ARAMID FABRIC WITH SILICON RUBBER COATING ON
BOTH SIDES FOR RMPU FOR LHB EOG/HOG TYPE AC COACHES OF INDIAN
RAILWAYS**

आर०डी०एस०ओ०धपी०ई०धस्पेकधए०सी०ध०१९७०२०२०(परिशोधन.1)
RDSO/PE/SPEC/AC/0197- 2020(Rev. 1)

S. No.	Date of amendment	Revision	Reason
1	Dec-2024	01	1) 2000/Elect (G)/113/4/Safety dated 24.09.2024 and DG/RDSO Note No. DG/Gen/2023 dated 05.06.2023. 2) As per Table -1 of EN-45545 Hazard level classification, Design Category S: Sleeping and couchette vehicles, operational category 3 and 4 , HL-3 hazard level is required for rolling stock. The subject item is common for both sleeper and chair car type rolling stock and IR is planning to run the trains in tough terrain of country like USBRL section passing through tunnels, elevated structure etc

अनुमोदित
APPROVED

प्रमुख कार्यकारी निदेशक/ ई म
PED/PS&EMU

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Page 2 of 9	File no. EL7.2.2/Bellow Duct/main	Specification No. RDSO/PE/SPEC/0197-2020 (Rev-1)
-------------	--------------------------------------	---

INDEX

S. No.	Clause no.	Description	Page No.
1	1.0	Foreword	3
2	2.0	Scope of supply	3
3	3.0	Operating and service conditions	3-4
4	4.0	Governing specifications	4
5	5.0	Technical & Constructional Requirements& Tests	4-5
6	6.0	Other Requirements	5-6
7	7.0	Fitment	6
8	8.0	Supplier's Responsibility	6
9	9.0	Marking and packing	6
10	10.0	Guarantee/Warranty	7
11	11.0	Infringement of patent right	7
12	12.0	Cartel Formation	7
13	13.0	Annexure	7
14	Annexure A	Undertaking against Cartel Formation.	8
15	Annexure B	RDSO drawing no. RDSO/PE/SK/AC/0069-2004 (Rev.3)	9
16	Annexure C	Format for feedback given by user railways regarding performance of finished meta/ para aramid fabric with silicon rubber coating on both sides.	10

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Page 3 of 9	File no. EL7.2.2/Bellow Duct/main	Specification No. RDSO/PE/SPEC/0197-2020 (Rev-1)
-------------	--------------------------------------	---

1.0 FOREWORD

- 1.1 At present, the Cotton Canvas Bellow Duct for connecting fresh, return & supply air from RMPU to the coach shell is being provided as per RDSO specification No. RDSO/PE/SPEC/AC/0136-2009 (Rev.0).
- 1.2 As per specification, canvas cloth should have service life of 18 months whereas POH periodicity of LHB AC coaches is 36 months. Moreover, of late, number of premature failures of cotton canvas on account of getting torn/perished etc. have been reported by Railways resulting into less cooling, water ingress into the coach etc. besides requiring un-scheduled attention/replacement.
- 1.3 The issue of pre-mature failures of Cotton Canvas has been discussed in the various forum/platform of Indian Railways. It has been the unanimous consensus that duct should last POH to POH (36 months) under prevalent service conditions.
- 1.4 Bellow air duct made of material which is strong enough to survive POH to POH in difficult service conditions and complying other essential requirements viz. water proof, fire-retardant etc. thus appear to be need of hour. **In this regard RDSO has issued RDSO/PE/SPEC/AC/0197 (Rev-0)**
- 1.5 **The Bellow duct are used in Chair car and sleeper coaches, the fire safety for items used in the sleeper coaches are as per EN -45545. So this specification RDSO/PE/SPEC/0197(rev 0) is being revised.**

2.0 SCOPE OF SUPPLY

- 2.1 Unless otherwise specified in tender the manufacturer shall supply the coated fabric complete with metallic frames at both the ends of the duct i.e. RMPU side & coach shell side as per RDSO drawing No. RDSO/PE/SK/AC/0069-2004 (Rev.3), 2 nos. each for fresh air & return air and one no. for supply air per RMPU. EPDM (Fire retardant) gasket for both RMPU and coach shell sides should also be supplied.

3.0 OPERATING AND SERVICE CONDITIONS

- 3.1 The material of the bellow duct shall be sturdy and suitable for the following service conditions, which are normally to be met in Railway rolling stock service:
- (i). Ambient: -10 to +55 deg Celsius
 - (ii). Relative Humidity: Up to 98% during rainy season
 - (iii). Atmosphere: Extremely dusty, foggy, and desert terrain in certain areas. The dust concentration in air may reach at high value of 1.6mg/cubic meter.
 - (iv). Rainfall: Very heavy in certain areas.

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Page 4 of 9	File no. EL7.2.2/Bellow Duct/main	Specification No. RDSO/PE/SPEC/0197-2020 (Rev-1)
-------------	--------------------------------------	---

(v). Coastal area:

The equipment shall be designed to work in humid salt laden and corrosive atmosphere. The maximum values of the condition shall be as under:

- a) Maximum Ph value : 8.5
- b) Sulphate : 7 mg/litre
- c) Max. concentration : 6 mg/litre of chlorine
- d) Max. conductivity : 130 micro Siemens/cm

4.0 GOVERNING SPECIFICATIONS

Referenced Specification/Document	Description
IS:13501	Determination of flammability by oxygen index
IS:7941	Method for determining the water repellency of fabrics by cone test
IS:391	Method for determining resistance to penetration by water of fabrics by hydrostatic head test
IS:1390	Methods for determination of pH value of aqueous extracts of textile materials
IS: 6911	Stainless steel plate, sheet and strip
ASTM D751	Standard test methods for coated fabrics.
UIC 564-2 OR	Regulations relating to fire fighting measures in passenger carrying Railway vehicles or assimilated vehicles used on international services.
EN 45545-2	European Railway standard for fire safety

Note: Latest version of the above specification / standards shall apply and should be available with the firm before commencement of the prototype testing.

5.0 TECHNICAL & CONSTRUCTIONAL REQUIREMENTS & TESTS

5.1 Fabric of the bellow duct shall be of Meta Aramid/ Para aramid with silicon rubber coating on both sides.

5.2 Finished meta aramid/ para aramid fabric with silicon rubber coating on both sides shall have the following properties/parameters –

S. No.	Parameters	Unit	Test method/ Instrument/ Standards/ Specification	Acceptable limit/grade
1.	Flame retardant	Grade	EN 45545-2	R1/HL-1;R7/HL-2 R1/HL-3
2.	Thickness (min)-(max)	mm	ASTM D751	4.2 1.75
3.	Breaking Strength (max)	N	ASTM D751	X-Direction ≥800 -X Direction =3000 Y-Direction ≥800 Y-Direction =3000
4.	Working temperature range	Deg C	-	From -20 to +180

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Page 5 of 9	File no. EL7.2.2/Bellow Duct/main	Specification No. RDSO/PE/SPEC/0197-2020 (Rev-1)
-------------	-----------------------------------	---

5.	Resistance to spread of flame	-	Appendix-5 of UIC 564-2 OR	Class - A
6.	Limiting oxygen index (min.)	-	IS:13501	28
7.	Toxicity, (CIT) Conventional index of Toxicity (at 50 kW/m ² heat flux)	-	EN 45545-2	≤0.1
8.	Deterioration of visibility due to smoke	-	Appendix-15 of UIC 564-2 OR	Class - A
9.	Water proofness i) Cone test ii) Hydrostatic head test	-	i) IS:7941 ii) IS:391	i) Water should not leak through cloth. ii) Resistance of water fabrics, water head in cm special proofed 23.
10.	Weight (min) -(max)	g/m ²	ASTM D751	1300 2000
11.	pH value	-	IS: 1390 (cold method)	6.0-8.5

- 5.3 The testing shall be got done from any of the NABL /Govt. recognized/ ILAC (International Laboratory Accreditation Co-operation) laboratory on finished coated fabric and the test report complying with the above properties/parameters shall be submitted to Production unit/RDSO.
- 5.4 Some of the test mentioned in clause no 5.1 may be carried out at RDSO/Lab, for which supplier has to submit the sample of suitable size to RDSO free of cost.
- 5.5 The service life of the above bellow duct material under actual prevailing conditions on IR in open environment shall not to be less than 60 months.
- 5.6 Supplier/ Manufacturer have to declare the OEM of Meta Aramid/ Para Aramid fabric with silicon rubber coating along with documents submitted to RDSO/PUs.
- 5.7 The Metallic frames at both ends of the duct i.e. RMPU side & coach shell side shall be as per RDSO drawing No. RDSO/PE/SK/AC/0069-2004 (Rev.3) or latest, **and grade should be of SS304 L.**
- 5.8 During, acceptance test, inspecting authority may ask for previous test reports of above carried out tests from NABL /Govt. recognized/ ILAC (International Laboratory Accreditation Co-operation) accredited lab at expenses of firm. All tests on fabric shall be repeated afresh after every 3 years. However, test may be asked to be got done in between the specified period in case of major warranty failures reported by Zonal Railways/ PUs.
- 5.9 Mounting arrangements of Meta Aramid /Para Aramid fabric should be through sealant, Rivet/nut bolt arrangement only.

6.0 OTHER REQUIREMENTS

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Page 6 of 9	File no. EL7.2.2/Bellow Duct/main	Specification No. RDSO/PE/SPEC/0197-2020 (Rev-1)
-------------	--------------------------------------	---

- 6.1 This document is being issued keeping in view the long service life of the bellow material to be used for fresh, supply & return air duct in LHB RMPU.
- 6.2 Manufacturer/ Supplier's request for registration shall be accompanied by following documents:
- (i). Satisfactory Test report of the material from any of the NABL /Govt. recognized/ILAC (International Laboratory Accreditation Co-operation) laboratory, complying the parameters as mentioned in clause No. 5.2.
 - (ii). Declaration that duct will have service life of 60 months (min.). In the event of pre mature failure, complete set of ducts of full coach (2 RMPUs) shall be replaced free of cost.
 - (iii). Maintenance instructions, if any.
- 6.3 Past supply performance for same applications, needs to be furnished to RDSO.
- 6.4 **The firm using any imported material should submit their indianisation plan.**

7.0 FITMENT:

- 7.1 The manufacturer/supplier in coordination with RMPU manufacturers & PU/ Zonal Railway shall arrange for fitment of bellow duct on few RMPUs. After fitment Railway/PUs shall provide feedback as per format in Annexure-C.

8.0 SUPPLIER'S RESPONSIBILITY

- 8.1 The supplier shall be fully responsible for ensuring that product is entirely fit for the purpose and no part of this specification shall, in any way remove or reduce his obligation in this respect.
- 8.2 The supplier shall supply any purpose built or special tools or equipment that may be necessary for the correct fitment & servicing of the product.
- 8.3 If supplied item fails to achieve any of the stipulated requirements, the same shall be modified/ replaced at the supplier's expense and within a time line to be agreed with purchaser/consignee/RDSO.

9.0 MARKING AND PACKING

- 9.1 Frame shall be provided with following information preferably in embossed pattern:
- a) Name and Address of the manufacturer.
 - b) Month of the manufacture.
 - c) Serial number (The first two digits shall indicate the year of manufacture and next two digits shall indicate month. Further next four digits shall indicate manufacturing serial number.)
 - d) Specification number.

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Page 7 of 9	File no. EL7.2.2/Bellow Duct/main	Specification No. RDSO/PE/SPEC/0197-2020 (Rev-1)
-------------	--------------------------------------	---

- 9.2 Item shall be packed in suitable packing material such as suitable sheets/bubble sheet and filling material as suited to protect it to prevent damage in transport/storage.

10.0 GUARANTEE/WARRANTY

Guarantee/Warranty obligation of the complete item shall be 60 months from date of supply.

11.0 INFRINGEMENT OF PATENT RIGHT

- 11.1 Indian Railway shall not be responsible for infringement of patent rights arising due to similarity in design, manufacturing process, use of similar components in design & development of this item and any other factor not mentioned herein which may cause such a dispute. The entire responsibility to settle any dispute/matters lies with the manufacturer/supplier.
- 11.2 It shall be responsibility of firm to ensure that details/design/documents given by them are not infringing any IPR and they are responsible in absolute and full measure instead of Railways for any such violations. Data, specifications and other IP as generated out of interaction with Railways shall not be unilaterally used without the consent of RDSO and right of Railways/RDSO on such IP is acceptable to them.

12.0 CARTEL FORMATION

The firm will not engage in cartel formation with other firms and will also submit a declaration in this regard as per attached Annexure –A.

13.0 ANNEXURES

SN	Annexure	Description
1	Annexure A	Undertaking against Cartel Formation.
2	Annexure B	RDSO drawing no. RDSO/PE/SK/AC/0069-2004 (Rev.3)
3	Annexure C	Format for feedback given by user railways regarding performance of finished meta/ para aramid fabric with silicon rubber coating on both sides.

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Page 8 of 9	File no. EL7.2.2/Bellow Duct/main	Specification No. RDSO/PE/SPEC/0197-2020 (Rev-1)
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Annexure- A

UNDERTAKING AGAINST CARTEL FORMATION

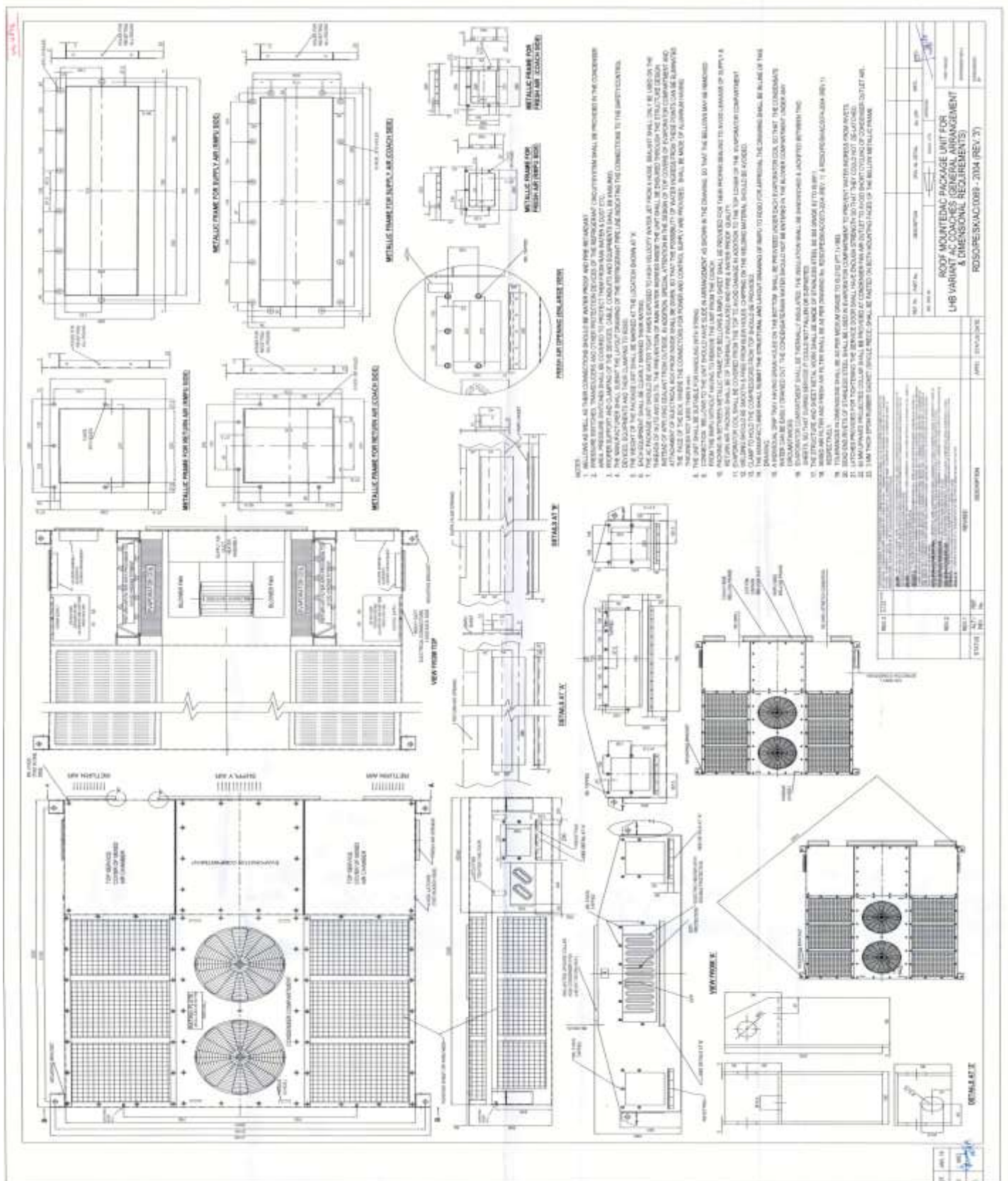
We, hereby, give an undertaking that as a Registered Vendor for manufacture and supply of will not be a part of a cartel with other vendors and will be quoting competitive rates in the tenders invited by the Indian Railway/Production Units.

We are aware of the fact that the Registering Authority i.e. RDSO may de-list the name of our firm from the Master List of Approved Vendors, if complaint is received about such cartel formation from any of the Railways/Production Units.

Seal and Signature
(Authorized signatory of the firm)

Date:
Place:
Seal

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Page 10 of 9	File no. EL7.2.2/Bellow Duct/main	Specification No. RDSO/PE/SPEC/0197-2020 (Rev-1)
--------------	--------------------------------------	---

Annexure- C

**FORMAT FOR FEEDBACK GIVEN BY USER RAILWAYS REGARDING
PERFORMANCE OF FINISHED META ARAMID/ PARA ARAMID FABRIC
WITH SILICON RUBBER COATING ON BOTH SIDES**

S. No.	Parameter Check/ Test to be Done	Remarks
1.	a) Date & Place of fitment b) RMPU S. No. & make c) Coach no. d) No. of days completed after fitment.	
2.	Physical degradation of the item from environmental exposure.	Yes/No
3.	Intactness of the fabric with the metallic frame.	Yes/No
4.	Any other remarks (other than those prescribed).	

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Page 11 of 9	File no. EL7.2.2/Bellow Duct/main	Specification No. RDSO/PE/SPEC/0197-2020 (Rev-1)
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DISTRIBUTION LIST

PRINCIPAL CHIEF MECHANICAL ENGINEER:	
1	Northern Railway, Baroda House, New Delhi – 110 001.
2	Central Railway, II Floor, Parcel office, CST Mumbai – 400 001.
3	Eastern Railway, Fairlie Place, Kolkata – 700 001.
4	South Eastern Railway, Garden Reach, Kolkata – 700 043
5	Southern Railway, ParkTown, Chennai – 600 003.
6	Western Railway, Churchgate, Mumbai – 400 020.
7	South Central Railway, Rail Nilayam, Secunderabad – 500 371.
8	East Central Railway, DighiDistt. - Vaishali, Hajipur Bihar- 844 101.
9	North Central Railway, North Central Railway, Block A, Subedarganj, Allahabad-211033.
10	South Western Railway, 1 st Floor, DRM Office, Hubli 580 020
11	South East Central Railway, Bilaspur.495004
12	North East Frontier Railway, Maligaon, Guwahati - 781001
13	North Eastern Railway, Gorakhpur – 273001
14	North Western Railway, Jaipur – 302006
15	West Central Railway, Jabalpur - 482001
16	East Coast Railway, Bhuvneshwar, Orrisa – 751016
PRINCIPAL CHIEF ELECTRICAL ENGINEER:	
1	Konkan Railway, Belapur Bhavan, Sector-11, Belapur, Mumbai - 400614
2	Integral coach factory, Perambur, Chennai - 600038
3	Rail Coach Factory, Kapurthala (Punjab) – 144 602
4	Modern Rail Coach Factory, Lalganj, Raebareli (UP)-229120
CHIEF WORKS MANAGER:	
1	Matunga Workshop, Central Railway, Mumbai - 400 019.
2	Liluah Workshop, Eastern Railway, Howrah
3	C&W Workshop, Northern Railway, Alambagh, Lucknow-226 05
4	C&W Workshop, Rly., Jagdhari – 135 002
5	Mechanical Workshop, NER, Gorakhpur – 273 012
6	Carriage Workshop, Southern Railway, Perambur, Ayanavaram, Chennai – 600023.
7	SCR, Lallagudda Workshop, Lallaguda, Secunderabad - 500017
8	Carriage Workshop, Western Railway, Lower Parel, Mumbai-400013
9	CRWS, W. C. Railway, Nishatpura, Bhopal-462010
10	Carriage Workshop, NW Rly, Ajmer - 305001
11	Carriage Repair Workshop, Gadag Road, SWR, Hubli – 580 020
12	Carriage Workshop, S.W. Railway, MysoreVishwanath.
13	Carriage Workshop, SE Rly., Kharagpur - 721301
14	New Bongaigaon , Railway Workshop, Dangtal, Distt. Bongaigaon, Assam-783380
15	Carriage and Wagon Workshop, N. C. Rly., Jhansi – 248003
16	Carriage and Wagon Workshop, WC Rly., Kota - 324002
17	Carriage and Wagon Workshop, Eastern Rly., Liluha - 711204
18	Carriage and Wagon Workshop, W. Rly., Pratap Nagar, Vadodara - 390004
19	Carriage and Wagon Workshop, N Rly., Amritsar - 143001
20	Central Workshop, Goldenrock, S. Rly., Trichi - 620004
1	Director, IRIEEN, Nasik Road (Maharashtra). - 422101
2	Senior Professor (Elect.), RailwayStaffCollege, Lalbaug, Vadodara. - 390004
3	Director, IRCAMTECH, Maharajpur, Gwalior – 474 020.

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