दक्षिण रेलवे/**SOUTHERN RAILWAY**

No.P(R)673/Training/Vol.IV

प्रधानकार्यालय/ Headquarters Office
कार्मिक शाखा/ Personnel Branch
चेन्नै/Chennai - 600 003
दि./ Dated: 07-02-2018

आर बी ई सं/**RBE No.200 / 2017** पी बी सी सं/ **PBC No.9 / 2018**

All PHODs / DRMs / CWMs / CEWE / CAO / CPM / Dy.CPOs / Sr.DPOs / DPOs / SPOs / WPOs / APOs of HQ / Divisions / Workshops / other Units, etc.,

(As per mailing list –'A')

विषय/Sub: Revision of Training Programme for promote Junior Engineers of Electrical Departments keeping it at par with training of promote Junior Engineers of Mechanical Department.

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A copy of Railway Board's letter No.E(MPP) 2017/3/6 dated 20-12-2017 (RBE No.200 / 2017) alongwith its enclosures on the above subject is enclosed for information, guidance and necessary action.

(V.SRINIVASAN)
वरिष्ठ कार्मिक अधिकारी/नियम
Senior Personnel Officer/Rules
For Principal Chief Personnel Officer

सलग्न/Encl: as above

प्रतिलिपि/Copy to : The Genl Secy / SRMU
The Genl Secy / AISCSTREA
The Genl Secy / AIOBCREA

The Genl Secy / NFIR

Government of India (Bharat Sarkar)
Ministry of Railways (Rail Mantralaya)
(Railway Board)

RBE No. 300 /2017

No. E(MPP)2017/3/6 **New Delhi, Dated 20.12.2017**

The General Managers,
All Indian Railways/PUs,
Metro Railway/Kolkata
Railway Electrification/Allahabad
DG/RDSO/Lucknow
CAO/DMW/Patiala
CAO/COFMOW/New Delhi

The Directors,
IRITM/Lucknow
IRIEEN/Nasik
IRIMEE/Jamalpur
IRICEN/Pune
IRISET/Secunderabad
DG/NAIR/Vadodara
ED/CAMTECH/Gwalior

Sub: Revision of Training Programme for promotee Junior Engineers of Electrical Departments keeping it at par with training of promotee Junior Engineers of Mechanical Department.

Ministry of Railways (Railway Board) had constituted a Committee to review the revision of Training Programme/Training Modules for promotee Junior Engineers of Electrical Departments and with the approval of Board (MS), it has been decided to revise the existing training module.

2. Keeping in view the constant technological changes, emphasis on in-depth practical knowledge and skill to reflect in performance of Promotee Junior Engineers of Electrical Department, the training modules of Promote Junior Engineer of Electrical Department has now been reduced to 13 weeks i.e 78 days from existing training period of 52 weeks, keeping it at par with training of promotee Junior Engineers of Mechanical Department. Out of 13 weeks of training 4(four) weeks will for practical training and one week for Final Exam/Viva Voca at STC.

3. Detailed training Module is enclosed herewith. Kindly acknowledge receipt.

D A : As above

20/12/17

(Mahendra Kumar Gupta)
Director/MPP
Railway Board.

Revised Training Programme for Promotee JEs of Electrical Department

Session-I (Theory)

S.No.	Training Module	Subject Code	No of Days	Approx. No. of Weeks
1	Basic Orientation		1	
2.	Accident and Disaster Management		2	
3.	I E Rules, Permit to Work, Energy Conservation Act		2	
4.	Managerial Skills		2	
5.	Technical English		2	
6.	Computer Awareness		2	
7.	Establishment		2	
8.	Material Management and Inspection		3	
9	Contract Management		2	
10	Instrumentation		2	
11	Basics of Power Electronics		1	
12.	Manufacturing Technology, Engineering materials and metallurgy		2	
13.	Renewable Energy Sources		1	
	Sub Total (Theory General)		24	4
14	Specialized Streams (Theory)			
a	Coaching & General Services		9	
b	Traction Distribution		6	
c	Traction Rolling Stock & EMU		9	
	Sub Total (Theory Specialized Courses)		24	4
Session-II (Practical Training)				
15.	Training at TPC & OHE depot		6	
16.	Training at CLW & Loco POH shop		6	
17.	Training at PU & POH shop (Coach)		6	
18.	On the job Training (Streamwise)		6	
	Sub Total(Practical Training)		24	4
Session-III (Refreshing/Exam/Viva etc.				
19.	Final Exam/Viva Voce at STC		6	1
	Grand Total		78	13

27/11/17

E(MPP)/2017/3/6

A proposal forwarded by Electrical Directorate on receipt of reference received from North Eastern Railway regarding revision of Training Programme for promotee Junior Engineers of Electrical Departments.

As per ERB's order dated 21.02.2017, a Committee has been constituted to review the Training Programme for promotee Junior Engineers of Electrical Department, consisting of the following members:

1. Director/ E(MPP) ..... Convener
2. Shri Md Manzar Hussain, Director (Electl. Dev)..... Member
3. Shri Himanshu Kumar Singh, Professor, IRIEEN ..... Member

The Committee have examined the Training Module of promotee Junior Engineers as per the Terms of Reference given below:

a) To review the training modules for Promotee Junior Engineers of Electrical Department.
b) To examine the efficacy of training modules in terms of actual working environment, current level of knowledge and experience of the target training group, taking into account the changes in the technology and working practices.
c) Orienting the training efforts to acquisition of more practical knowledge and skill so that its benefits could be equally realized in the actual performance; and
d) To suggest the methodology, evaluation and better utilization of training resources

In accordance to the term of reference and after interacting with the faculty/candidates undergoing training at the training centers, the Committee has recommended a revised Training Modules by reducing from 52 weeks (one year) to 13 weeks i.e 78 days, keeping it at par with trainings of promotee Junior Engineers of Mechanical Department (issued vide Board's letter No. F(MPP)/2013/3/2 dated 26.09.2014 RBE No.107/2014). The Committee has proposed that out of 13 weeks of training, 4(four) weeks will for practical training and one week for Final Exam/Viva Voca at STC.

The Committee hereby submits the detailed revised Training Module/programme (enclosed herewith) for promotee Junior Engineers of Electrical Department of Indian Railways.

27/11/17

Shri Mahendra Kr. Gupta
Director/ MPP
Railway Board

Md Manzar Hussain
Director/Elect.(Dev)
Railway Board

Shri Himanshu Kr. Singh
Professor/ IRIEEN
Nasik

Revised Training Programme for Promotee JEs of Electrical Department (Course content)

1. **Basic Orientation**: General introduction to Indian Railways – Brief History, salient features, freight & passenger business priorities, organizational structure. Introduction to Electrical Department- organizational structure, functions, salient features, role of electrical department in railway working, key priorities, challenges etc.

2 **Accident and Disaster Management**: Disaster Management, First-aid and fire fighting, Safety Rules, Electrical accidents - precaution & prevention.

3 **IE Rules, Permit to Work, Energy Conservation Act**: Presentation on important IE rules, procedure for obtaining Permit to Work. Salient features of the Energy conservation Act and understanding the importance of principles of energy conservation.

4. **Managerial Skills**: Aspects of leadership, leadership theory and evolution, leadership vs management, Role of supervisors in providing effective leadership Improving Communication, written and verbal, explain the purpose of communication, communication process, barriers to effective communication, ways to improve communication skills – writing, reading, speaking and listening. Basic in change management. Team work, Importance of team work in organisations particularly in Railways, how to become a better team player Interactive exercises in team work. Customer satisfaction Thinking from customer point of view – what are their needs/expectations and how can we best serve our customers. Innovation and quality management.

5. **Technical English**: Communication Vocabulary, Grammar – Important terms, Common errors, Official/Business correspondence, General Report writing, Technical Report writing.

6 **Computer Awareness**: How IT can be effectively deployed in improving design, planning, and monitoring of electrical systems. Theory and practical to gain proficiency in MS Office – Word, excel and power point, e-mail and web browsing. Introduction to Management Information Systems. Case studies on MIS developed for Loco sheds, TRD and crew management. Introduction to Decision Support Systems.

7 **Establishment**: Rules relating to leave, passes, travel on duty Railway accommodation and Staff Welfare. Industrial relations and role of trade unions. Discipline and Appear Rules, Conduct Rules. Basics of RTI and Disabilities Acts and our obligations and responsibilities. Labour Laws and hours of employment rules (HOER).

8 **Material Management**: Introduction to material management and concept of supply chain management, organisation structure of material management organisation of IR, functions of material management – Planning and inventory management, purchase, Receipt and Inspection, Procedure of Joint inspection, Stocking and preservation, distribution, scrap disposal Material Inspection procedure, Standards &

Specifications (IS, IEC, EN, RDSO, CLW, ICF specifications) and specifications for common items such as transformers, cables, circuit breakers etc. Quality Assurance Plan (QAP), Sampling plans for material testing, Type Test, Routine Test and Acceptance test, Measuring equipment calibration, Visual and Non Destructive Testing methods, Destructive tests, Acceptance/Rejection Criteria, Inspection/Rejection certificate, Stamping/Sealing of inspected material.

9. **Contract Management**: Tenders & Contracts, Works Contracts, Arbitration Financial Management (Railway Accounting and Financing Procedures).

10. **Instrumentation**: Basic concepts of Condition Monitoring of electrical and mechanical equipments, Insulation Resistance, Polarization Index, Capacitance measurement, tan delta testing, partial dischArge and surge comparison test, condition monitoring of transformers, Nondestructive testing techniques - visual testing, Dye penetrant testing, Magnetic Particle testing, eddy current testing and ultrasonic testing, NDT testing applications in various functions of electrical department, Theory and practice of Dissolved Gas Analysis (DGA)/Gas Chromatograph radiographic test.

11. **Basic & Power Electronics**: Classification of electronic components, theory of passive components - L,C,R, Active Components — semiconductor physics, construction and operating principle, specification and testing of Power Diodes, Zener Diodes, LEDs, BJTs, UJT, MOSFET, SCR, GTO and IGBT. Practical work on - oscilloscopes, testing of passive electronic components L,C,R Testing of active components — Diodes, Transistors, SCR, TRIAC, GTO, IGBT. Control of 3 phase drives - - Variable Voltage Variable Frequency (VVVF) drives, overview of power electronics in 3 phase locomotives, Static Inverter (SI Unit) and AC Coach Inverter Unit.

12. **Manufacturing Technology, Engineering materials and metallurgy**: Jigs and fixtures, specifications and selection of cutting tools and grinding wheels, welding techniques, checking of weld joints and defect prevention and classification, properties and selection of electrodes. Classification and specification of steels used in Railways, heat treatment processes, corrosion prevention and paints, theory of metal wear and lubrication, plain and roller bearings — theory, application, selection, maintenance and precautions, lubricants — specifications, properties and selection, rubber components specifications and storage, electrolytic copper, stress strain diagram.

13 **Renewable Energy Sources**: Wind energy, Wind turbine types: Horizontal axis and Vertical axis wind turbine, Turbine components, Turbine size and power ratings, Wind potential: Power coefficient & Betz limit, Usable speed range, Area-wise Wind potential in India, Wind turbine generator: Constant speed and variable types, Generator control scheme, Photoelectric effect, Photovoltaic (PV) cells: Mono and Poly Crystalline silicon, PV array components, PV system components, Stand alone and Grid connected PV systems, Net metering, Site selection: Panel direction and tilt angle, Solar hot water systems.

14. **Coaching & General Services**:

Train Lighting: Introduction to Train Lighting Systems, theory and practice MOG/EOG/HOG schemes, Alternators, Rectifier/Regulator, Batteries including VRLA, Coach wiring, lighting and fans, microprocessor based drives, Rake Links, maintenance schedules and activities. Relevant Codes and Manuals, RDSO, SMIs and Modification Sheets.
Air Conditioning: Air Conditioning systems on Coaches – Heat load calculations and basic theory and practice of air conditioning, air conditioning systems on coaches, LHB coaches, familianzation with major equipment and ratings, microprocessor based drives maintenance schedules and practices, Relevant Codes and Manuals, RDSO SMIs and Modification Sheets, Power Car - Theory and practice of diesel engines, maintenance schedules, microprocessor based control, spare parts.
General Services: BEE Codes, I.E. Rules, ECBC Code, Energy Conservation Act, Information on star rated products, clean development mechanism and carbon credits, practicing energy conservation and management, Metering and tariff structures. Theory and practice of earthing, substation design and maintenance, transformer, switchgear, Protection systems, transmission line maintenance power distribution systems, illumination engineering, design of illumination systems for various indoor and outdoor applications, energy efficient lamps, drives with microprocessor control and motor selection and maintenance, and safety at workplace. Condition monitoring of transformer, transformer oil, cables and lead acid batteries. Design of water supply pumping installations, types of pumps their specifications and selection for various applications, energy conservation measures in water pumping installations and maintenance of pumps. Relevant codes, RDSO SMIs and Modification.

15. **Traction Distribution**. Basic concepts on Design, Operation and maintenance interventions/activities related to Traction Power Supply Systems (25kv and 2X25 kv), Transmission Lines, Supervisory Control and Data Acquisition System (SCADA), Remote control system and Overhead Equipment (OHE). Familiarity with sectioning diagrams and Station Working Rules. ACTM to be followed. Design, selection, commissioning of foundation, structures, current collection system. Tower Wagon operation and maintenance issues. Safety issues related to TRD systems operation and maintenance. Precautions to be taken for working in electrified sections. Important actions to be taken during breakdowns and accidents – elaborate with interactive case studies Basic knowledge of interfaces – track, points and crossings, signalling systems. Bonds and earthing. Schedule of Dimensions. SEB/NTPC Tariff structures, energy conservation measures. Overview of Railway Electrification. Design operation, maintenance of Protection systems. Relay setting calculations. Microprocessor based solid state relays to be covered. Operation and maintenance of Circuit Breakers, Interruptors and manual switches.

16. **Traction Rolling Stock & EMU**:

Locomotive: Basic Design aspects of Electric Locomotives — tractive effort, haulage capacity, adhesion, weight transfer, axle load. Types of electric locos and their characteristics and haulage capabilities. Power and control circuit description, working and trouble shooting. Description

of mechanical systems and component — bogies, wheel sets, gears, gear cases, springs, snubbers, buffers, central buffer couplers, screw coupling etc. Pneumatic circuits and components including air dryers, Locomotive testing, maintenance and trouble shooting. Maintenance schedule of different types of locos. 3 phase locomotive — basic power and control circuit descriptions, Basic Operation and Maintenance of Power Converters, Auxiliary Converters, Transformers, Traction Motors, Vehicle electronics and diagnostics, brake equipments, motors, pantograph etc. Fault diagnostics. Working of regenerative feature.Basic of Crew management. and training, Road learning, classification of drivers,. systems of monitoring and counseling, trip shed and crew booking point management, statistical data preparation for loco operation (4 A Statement). Description of interface issues related to carriage and wagon and track: Evidence collection during accidents and enquiries. Relevant Codes, ACTMs, RDSO SMIs and Modification sheets.
EMU: General description, equipment lay out, power and control circuit, pneumatic circuits etc. Basic Design aspects of EMUs. Power and control circuit description, working and trouble shooting. Description of mechanical systems and component — bogies, wheel sets, gears, gear cases, springs, subbers, buffers, central buffer couplers, screw coupling etc. Pneumatic circuits and components including air dryers. Locomotives testing, maintenance and trouble shooting, Maintenance schedules in main shed and trip shed. Basic operation and Maintenance of Transformers, Rectifiers, Traction Motors, brake equipments, motors, pantograph, electronics etc and testing and troubleshooting. Description of interface issues related to carriage and wagon and track. Evidence collection during accident and enquiries. Relevant Codes, ACTMs, RDSO SMIs and Modification sheets.

27/11/18