

Government of India
Ministry of Railways
(Railway Board)

RBE No. 34/2010

No. E(MPP)/2009/3/17

New Delhi, dated 23.2.2010

The General Managers,
All Indian Railways
including Production Units

The Director
Indian Railways Institute of
Civil Engineering (IRICEN), Pune.

Subject: - Revised Training Modules for Civil Engineering (Permanent Way) Supervisors
(SEs, JEs and Sr. PWSs)

The Task Force constituted under the Human Resource Reforms Committee for reviewing the Training Modules for Civil Engineering Department has submitted its reports in respect of Permanent Way Supervisors. The Board (ME & MS) have approved the training modules contained in these reports. Accordingly, the recommendations of these reports are being circulated herewith in two parts (Part A- Induction Training and Part B- Promotional and Refresher Training).

2. For better management of training, the following decisions/inputs are also communicated.

- (a) Distinct Training Objectives have been identified for the Induction Training, Promotional Training and Refresher Training, keeping in view the different profiles of the trainees attending these training programmes.
- (b) Specific strategies have been proposed for improving the efficacy of practical and field training.
- (c) A new concept of 'Experiential Learning' by way of 'On the Job Attachment' of two months has been introduced. During this period, the trainees will get the experience of actual hands on working in the units where they are eventually to be posted. Permanent Way Supervisors being a safety category, they will not take independent safety, operational and financial decisions but will act under the mentorship and guidance of the concerned In-charges.
- (d) Management, supervision and evaluation of entire training including the component of field training will vest with the Zonal Level training centre under overall supervision of respective Zonal Training Manager of Civil Engineering department viz. CE/G.

- (e) Multiple strategies like specifying critical activities for mandatory coverage, innovative training methodologies and improvements in model rooms and model yards have been proposed and implementation of these should be ensured.

3. At a glance structure of Induction, Promotional and Refresher training programmes for the Permanent Way Supervisor categories is as under: -

Induction Training (PART 'A')

Category	Duration of Training (in months)					Total
	Phase- I		Phase-II		Phase III	
	Zonal Level Training Institute	Field	Zonal Level Training Institute	Field	Attachment Phase	
SE/ P.Way	4	2	2	2	2	12
JE/ P.Way	4	2	2	2	2	12
Senior PWS	2	1	2	1	2	08

Promotional and Refresher Training (PART 'B')

Category	Duration of Training	
	Promotional	Refresher
SE/P.Way	1 ½ months	12 days
JE/ P.WAY	2 months	12 days
Senior PWS	1 ½ months	12 days

4. Detailed Course contents and Lesson Plans for these training programmes are at Annexure-I to III of Part- A (Induction Training) and Annexures- VII to XII of Part- B (Promotional and Refresher Training).

Please acknowledge receipt.

Hindi version will follow.

(K. Harikrishnan)
Director(MPP)
Railway Board

No. E(MPP)/2009/3/17

New Delhi, dated 23.2.2010

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PART- A

**REVISED TRAINING MODULES
(INDUCTION TRAINING)
FOR
PERMANENT WAY SUPERVISORS
(SE/P WAY, JE/ P WAY & SR. PWS)**

SALIENT RECOMMENDATIONS

1. Training Objectives:

The following are the main objectives of Induction Training, in the case of Permanent Way Supervisors:

- (a) Imparting of knowledge about Track engineering and methods of its maintenance, as this is an entirely new area for any fresher with degree or diploma qualification;
- (b) Building Skill base of trainees as the subject matter is basically in the nature of an 'Applied Science';
- (c) Exposing them to critical operational and safety procedures and practices which they would be expected to encounter routinely during the course of their duties;
- (d) Focused capsules on specialized areas like Track Machines, Welding, General and Subsidiary Rules and other safety and operational aspects;
- (e) Familiarizing the trainees with organization, structure and working of Indian Railways;
- (f) Imparting basic knowledge and skills in various areas of Management, viz.- Human Resource Management, Railway Finance and Budgeting, Contract Management and Materials Management etc.

2. Greater Emphasis should be on Learning of Practical Aspects:

- (a) Knowledge of current and future track structure, safety and operational rules, familiarization with essential modern tools, plants and machinery used in track maintenance and first hand exposure to various track maintenance activities are the targeted inputs in this training.
- (b) Most of these are direct inputs in practical day to day working. Emphasis therefore has to be obviously more on practical learning than on theoretical inputs.
- (c) As such, besides classroom lectures for theoretical knowledge, visit to Model Rooms and actual field for witnessing maintenance practices and major activities would be critical ingredients for achieving the desired training objectives. Current over dependence on classroom lectures would need to change to more emphasis on improving Model Room and field exposure segments.
- (d) For this, list of minimum exhibits to be commonly available in the model rooms and model yards of all training centres has been prepared and is placed at **Annexure-VI**.

3. Field Training:

- (a) The task force has, drawn a specific list of critical activities in which the trainees should necessarily be trained during field training capsule.
- (b) In case any of these critical activities is not taking place in a particular sub division/ division at the time of their field training schedule, then the trainees should be sent to other nearby units where such activities may be in progress at that point of time.
- (c) The list of these specified critical field activities is placed at **Annexure-IV**.

4. Visits to Specialized Institutes:

- (a) Existing provision of visits to IRTMTC for track machines, TPP/LKO, TWTC/ BZA for welding and to ZRTIs for learning of safety and operational aspects must be adhered scrupulously as it is noted that in few railways, trainees are not being sent to ZRTI, for Transportation capsule.

5. Modification in Training Structure: Introduction of Experiential Learning 'On the Job Attachment':

- (a) A new phase of 'Experiential Learning' i.e. 'On the Job Attachment' will be imparted towards the end of training.
- (b) In this phase a trainee would be sent to the unit where he is eventually to be posted. There he will be attached to the outgoing sectional in-charge. This would require

decision regarding posting in advance. In exceptional circumstances, the trainee can be posted as 'PWI Special' under overall in-charge supervisor.

- (c) Task Force has identified few tasks/ activities which the trainee can handle during this phase (list at **Annexure-V**).
- (d) This phase of actual working and hands on exposure, albeit under supervision, called 'On the Job Attachment' phase will be of 2 months towards the end of training period. After this the trainee will come back to the training centre for final presentation and examination.

6. Management and Coordination of Induction Training:-

- (a) Zonal level training centres should be made as the single nodal agency for managing and coordinating the induction training in its entirety. This will result in manifold improvements few of which are listed below:-
 - i. The big disconnect between what is taught in the training centre in 1st and 2nd phase of institutional training and what trainees actually get to see in field training, in present scheme of things, would be taken care of to a great extent. There will be a greater convergence in the institutional and field training inputs.
 - ii. Training centres are exclusively devoted towards the responsibility of training and over time acquire fair degree of professionalism and specialization in various critical aspects of training and learning. They are better equipped to handle the training of apprentices than randomly selected field officers who are hard pressed by burden of daily exigencies and for whom training remains an activity of secondary importance.
 - iii. Apprentices also, joining Railway organization for the first time, are more attached to training centres and obviously rely on them for their various needs and problems. Unauthorized absence, if any can also be handled.
 - iv. Control by training institute will ensure that in the changed scenario of advanced and sophisticated track maintenance, all the trainees necessarily receive essential inputs in specified critical activities and do not lose out on any one or more of these. It can easily be managed by only two point coordination between the training centre and the training nodal officer in the headquarters, where information regarding location and timing of all major activities is readily available.
 - v. This will also improve the level of uniformity in learning within same batch of apprentices.
 - vi. Monitoring and assessment of learning imbibed during field training would also improve greatly.
 - vii. Single point processing and coordination, though would require some strengthening of training centre setup, would still, in ultimate analysis, save on lot of duplicate and redundant efforts for same work for same batch of apprentices in various units and would also save wastage of precious trainee days significantly.

7. Up-dation of Course Content:

- (a) The Task Force has gone deeply into detailed course content and has revised it thoroughly.
- (b) Many obsolete items have been struck off and whichever are required to be retained have been assigned properly reduced weightage.
- (c) Conversely many essential items, which are now an integral, part of modern track structure and maintenance methods viz- USFD testing and mechanized maintenance etc. have been duly incorporated and elaborated.
- (d) Task Force has also added '**Surveying**' and '**Disaster Management**' as topics of institutional training.

8. Restructuring of Course content:

- (a) Narrative format of existing training modules has been restructured in the user friendly format with proper classification into major areas, topics, sub topics etc. and detailed lesson plans for the same have been drawn accordingly.

- (b) Significant reshuffling of topics has been done between two phases of institutional training. To name a few major ones- SWR, LWR, welding and mechanized maintenance which are presently scheduled in 2nd phase of existing modules have now been brought to 1st phase, as these are the major items to be encountered by the trainees when they go out for field training and non exposure to such important aspects of modern track maintenance even after spending sizable time in 1st phase of institutional training is quite incongruous.
- (c) Similarly within the each phase a number of topics have been reshuffled to ensure proper grouping and logical sequencing for easier learning and better retention and recall.

9. Training Methodology:-

- (a) Present training is overly dependent on old patterned classroom lecture methodology. It needs to be more interactive and audio visual in the form of group discussions, case studies, presentation, films etc. There have been varying degrees of advances in several training centres in this area. Few centres are using audio-visual aids, overhead projectors and computer presentations to impart training. But there is a lot of scope of further improvement and innovation in this area.
- (b) Tremendous advancements in IT, convergence of device formats and reducing cost of storing and sharing information in multiple forms of text, visuals, videos etc opens up an exciting world of possibilities for transforming our instruction models. It is much easier now to opt for highly effective multi-sensory teaching techniques which would not be limited by the confines of classrooms or pre-fixed, inflexible time schedules. Training centres would need to be equipped with broadband internet connections and their websites could act as hub of sharing knowledge on demand.

10. Training Infrastructure:

- (a) It is very important to equip the training centres with required infrastructure in terms of adequate class rooms, properly equipped model rooms, modern teaching aids and other required resources.
- (b) With the proposed enlargement of training centres' role and responsibilities, provision of commensurate resources in terms of office assistance and communication facilities including broadband internet connections etc. would be essential.
- (c) Similarly hostels, messing and recreational facilities also need to be augmented to ensure reasonable level of comfort to the trainees.
- (d) Senior officers from zonal/ divisional headquarters should regularly inspect the Training Centre. A schedule of annual inspection by PCE, for example, could be introduced for this purpose. Such inspections should not only focus on physical infrastructure, upkeep and maintenance, but should also assess the quality of training being imparted and the learning actually being imbibed by the trainees.

11. Model for Academic Excellence and Continuous Improvement:

- (a) Task Force proposes a 'Two Pronged 3 Tier' strategy for academic excellence-involving Indian Railway Institute of Civil Engineering (IRICEN), Zonal Training Centres and Divisional Training Centres.
- (b) While different zonal headquarters and divisions may continue to look after the zonal and divisional training centres administratively and functionally, in academic matters like standardization of training inputs, development of new capsules (special courses) on introduction of new technologies, dissemination of valuable project work and case studies, up-gradation of course content and teaching methodologies or any other innovations IRICEN should be guiding zonal centres on programmed basis.
- (c) A formal mechanism of Annual Seminar of Zonal training centre- Principals and Faculty at IRICEN may be put in place for it. Zonal training centres in turn should play similar guiding role for divisional training centres.
- (d) Further the Principals should get more active support from the nodal zonal training managers (Chief Engineer/ General) for scheduling field training, attachments and expeditious evaluation etc.

Annexure- I(a)			
MODULES FOR SE/ P WAY- INDUCTION (PHASE-I)			
Module No.	Lesson Content	Class Room	Model Room
PSEIN101	ORGANIZATION OF RAILWAYS , DUTIES OF P.WAY STAFF	19	0
1	Overview of organization of Railways	3	0
2	Brief introduction to Track and its components particularly related with inspection	4	0
3	Duties of Key man,	2	0
4	Duties of Mate,	2	0
5	Duties of PWS,	2	0
6	Duties of JE/P. Way,	4	0
7	Duties of SSE/P.Way,	2	0
PSEIN102	RAILS & JOINTS	46	10
1	Rail, Evaluation of Weight and its relation to axle loads,	2	0
2	Standard sections, grade, UTS & service life, classification, Rolling marks,	3	2
3	Careful loading, unloading, stacking & handling of rails, special precautions for high UTS/ HH rails.	2	0
4	Straightening of kinks by Jim crow	1	0
5	Corrosion, Anticorrosion treatment	4	0
6	Wear & its causes,	2	0
7	Joints, Types, fish-plate, fish-bolts, anti-sabotage fishbolts, Combination fish-plates, Skimmed fish-plates, Chamfering of bolt holes, expansion/contraction of rails, requirement and provision of gap at joints, gapless/machined joints, Relation to rail temperature,	4	2
8	Insulated, Expansion joints for bridges & long welded rails,	2	2
9	General quantities for 1 km of track,	1	0
10	Fracture, codification, Restoration of traffic, how to report,	4	0
11	Preservation and testing of fractured rails,	2	0
12	Rail flaws/ defects	4	1
13	USFD: Ultrasonic flaw detection, fundamentals of ultrasonic waves, defect detection, need based concept of USFD, components tested, frequency of testing, marking of defects, action to be taken, brief description of various types of USFD machines and probes used, calibration and sensitivity checking, defect codification, limitations of USFD, SPURT Car	10	2
14	Glued joints (in situ/ prefab), ordinary & one meter long insulated joints	3	1
15	Rail grinding	2	0
PSEIN103	SLEEPERS & FASTENINGS	29	7
1	Sleepers and functions, Types used in India, Obsolete, Current and future	1	0
2	Study of CST-9: ordinary jaw, reverse jaw, Steel Trough: Loose jaw, Pad plated and turnouts, Wooden: Approved species, Durable and non-durable, Sizes for plain track, Bridges & turnouts for various gauges	3	2
3	Need to use wooden sleepers on track circuited sections and on weak arch bridges, Treated and untreated sleepers, Creosoting, handling & stacking, Protection from fire hazard, End binding, Adzing & boring, Size of augers from different spikes, Rail & plate screws, Bolts, Elastic fastenings.	2	0
	Fastenings for Wooden, ST, CST-9 sleepers: Two way keys, Oversize keys and loose jaws, Spikes dog and round, Rail and Plate screw, Bolt, hook and fang, special bearing pad for steel sleepers,	2	2

	Spacing of sleepers of joints on metal sleepers road. Pattern of driving keys. Quantities per km.	1	0
	Comparison between types, Advantages, Dis-advantages, Criteria for determining unserviceable sleepers, Fastenings Tie bars & cotters, MS bearing plates, Flat canted CI bearing plates, Ordinary canted & anti creep,	2	0
4	Number & pattern of driving spikes or screws on straight, Curves, Turnouts & bridges, Instructions for use of bearing plates, Dating of wooden sleepers, Composite sleepers.	2	0
5	Concrete sleepers, Twin block RCC, Mono-block pre-stressed, General aspects, Instructions for usability of different sleepers on different routes, main lines and long welded rails, Special sleepers for L xings, turnout, SEJ, bridges approach and sharp curves	6	1
6	Precaution for handling of PSC sleepers.	2	0
7	PSC SLEEPERS: Density of sleepers on different routes	2	0
8	Fastenings for PSC sleepers: Malleable cast iron inserts, Elastic Rail Clips, various types, toe load and its measurement, criteria for fastening renewal, Rubber pads, Liners, Anti sabotage arrangements for various sleepers, Creep anchors, method for fixing, Box anchoring.	4	2
9	Sleepers at joints & their spacing for concrete sleeper track	2	0
PSEIN104	FORMATION & BALLAST	27	0
1	Formation, Function	2	0
2	Typical sections of track on banks and cuttings for single/double lines on all gauges,	3	0
3	Drainage, Slope on top of formation, side and catch water drains,	2	0
4	Bearing Capacity of soil in relation to cable ducting	2	0
5	Causes for formation failure (Rehabilitation of weak formation).	8	0
6	Ballast Functions & types,	2	0
7	Ballast sections on different routes for straights and curves on single/double lines, On different gauges for fish plated track, SWR and LWR, Sections for branch lines, Loop and sidings.	4	0
8	Quantities for different sections.	2	0
9	Specification for track ballast	2	0
PSEIN105	Railway track & track Structure-I	8	0
1	Different Gauges,	4	0
2	Classification of Routes	4	0
PSEIN106	TRACK STRCUTURE IN YARDS	8	2
1	Track Structure (yards) Simple layouts, loops, gathering neck , overrun line, shunting neck, hot axle/fuel/stabling siding,	2	1
2	Isolation derailing switch, Scotch block, Hay's derail, Sand hump, dead ends, Catch & slip siding, Fouling marks, Restriction in use of 1 in 8½ turnouts on passenger lines,	2	1
3	Distance pieces to platform lines:	1	0
4	Restrictions regarding change of grade on approaches of turnout	2	0
5	Basic knowledge of S & T equipments	1	0
PSEIN107	TURNOUTS - INTRODUCTION	8	1
1	Turnouts, Definition and description of components and terms,	2	0
2	Standard types, Ordinary built-up and high manganese crossings straight switches, Curved switches, Thick web switches, Derailing switches, Spring points, other crossing types	4	1
3	Permissible speeds, Restriction on use of 1 in 8½ T/out on passenger	2	0

	running lines, symmetrical split		
PSEIN108	TURNOUTS - ASSEMBLY & LAYING	57	2
1	Method of assembling all turnout, Main dimensions and off sets of lead curve for setting out,	10	0
2	Contrary and similar flexure turnouts: Definition, Calculations for lead & radius,	15	0
3	Diamond crossings, scissors crossovers with single and double slips, Definitions and description of components and terms, Switch diamonds, advantage of raising inside check rail of obtuse xings,	10	0
4	Methods of assembly,	10	0
5	Main dimensions for setting out, Laying & Maintenance of fan shaped turnouts, Maintenance of Turn /outs with reference to CMS crossing.	12	2
PSEIN109	CROSSOVERS	45	3
1	Calculation for laying cross over, Cross over between straight parallel tracks with same & different no. of crossings	8	0
2	Cross over between curved parallel tracks, Cross over between inclined tracks.	8	0
3	Scissors X-over, Definition and description of components and parts, Standard layouts, Methods of assembly, Main dimensions for setting out,	6	0
4	Gathering lines, Xing angles and limiting angle layouts,	6	0
5	Calculations for different turnouts and spacing, Miscellaneous layouts: (1) Triangle (2) Three throw. (3) Double junctions (4) Gauntleted track (Brief description)	16	0
6	Hands on to Computer software for layout calculation	1	3
PSEIN110	DIVERSIONS	14	0
1	Definition, Types of diversions,	2	0
2	Standard for laying diversions,	6	0
3	Calculating length of diversions	6	0
	TRACK STRUCTURE -II		
PSEIN111	LEVEL CROSSINGS	24	5
1	Level crossings: Classification, types	2	0
2	Normal Position of Gates, Locking arrangement,	2	1
3	Equipments	1	1
4	Features of track at and in approaches of level crossings, Annual overhauling, Maintenance of road surface and approach track, Check rails-types, correct clearances, Visibility	4	0
5	Requirement Checking of equipments and knowledge of rules of gatemen,	2	1
6	Census at L- xing,	2	0
7	Inspection of L-xing, Duties of gatekeeper, Hot axle train parting,	3	1
8	Speed breakers, Road sign Boards, Provision of new LC, Manning, De-manning, interlocking and replacement with ROB, closure, shifting and replacement with limited height subways/ RUBs , Elimination Specification	8	1
PSEIN112	BRIDGES & TRACK STRUCTURE ON BRIDGES	24	2
1	Bridges: Classification, Types, Track Structure on girder Bridges, ballasted decks, arch bridges, tunnels, provision of guard rails, re-railing ramps	8	2
2	Importance of maintaining correct gauge, Alignment and tight fastenings, Preparation, Renewal bridge timber & Steel channel sleeper,	8	0
3	Attention to approach track & strengthening, Cleaning of waterway, Checking guard rails.	8	0

PSEIN113	TUNNELS	8	0
PSEIN114	Ballast Depot, Training out ballast, DMT operation	6	0
PSEIN115	ASH PITS	2	0
	WELDED RAILS		
PSEIN116	SHORT WELDED RAILS (SWR)	10	2
1	Definition, Track Structure for SWR,	2	2
2	Conditions of laying, Maintenance of SWR,	4	0
3	Gap survey & adjustment of gap.	4	0
PSEIN117	LONG WELDED RAILS (LWR)	44	8
1	Definitions,	4	0
2	Various types of Rail thermometers,	2	0
3	Permitted locations for laying, Track Structure, Laying of LWR,	8	0
4	De-stressing - with and without rail tensors	6	8
5	Repairs of Rail fracture,	4	0
6	Repairs of buckling,	4	0
7	Maintenance precautions, Overhauling, Deep screening, Renewal,	5	0
8	cold & hot weather patrolling,	3	0
9	Determination of stress free temperature.	2	0
10	Inspection of LWR and remedial actions for correction of gaps at SEJ, Hysteresis loop	4	0
11	Competency level to carry out various works in LWR track, Dos & Don'ts	2	0
PSEIN118	WELDING OF RAILS	14	8
1	Necessity of welding rail joints,	2	0
2	SPW, Wider gap Welding, compressed air preheating, 3 piece mould AT welding technique	4	0
3	Precautions to be observed during AT weld for good quality,	2	6
4	Tolerances for finished A.T. welds & FB Welds,	2	2
5	Brief idea about FB welds, Testing of welds, Mobile flash-butt welding	4	0
PSEIN119	RAIL FLAWS & TESTING	4	0
1	Visuals examination (key man's)	2	0
2	USFD Testing	2	0
PSEIN120	MAINTENANCE	21	4
	Introduction	1	0
1	Object of good maintenance,	4	0
2	Service, Maintenance tolerances and Approved methods, Beater packing, Off-track machines and 'On track' machines,	6	0
3	Approved systems, Systematic Maintenance conventional through packing, directed track maintenance and 3-tier system of maintenance	2	0
4	Pre-monsoon, during monsoon and post monsoon attention.	2	2
5	Record of Gang work, Gang chart/diary, Keyman's diary, Mate's diary, Record of work of Artisans and other workmen.	4	2
6	Half yearly reports on conditions of permanent way, PWI's Section Register, P. Way plans and diagrams	2	0
PSEIN121	REGULAR MAINTENANCE OPERATIONS	70	2
1	Regular works: Through packing,	6	0
2	Picking of slacks,	2	0
	Maintenance of concrete sleeper track	8	0
3	Overhauling,	4	0

4	Deep screening	6	0
5	Cleaning of drains and water ways,	2	0
6	Lubrication of joints and lubrication of rails in straight and on curves, maintenance of rail joints,	2	0
7	Incidental works: Creep, Importance of joint gaps, Gap surveys,	4	0
8	Buckling,	2	0
9	Prevention of creep, Creep anchors, Anti-creep fastenings, Measurement of creep, Markers, Creep register; Creep adjustment, Adjusting joint sleepers.	4	2
10	Lifting and lowering of track: Undesirability of lowering maximum lifting/lowering at one time, Provision of ramps at ends, Adequate ballast cushion and drainage after lowering.	4	0
11	Sample of standard section of track:	2	0
12	Maintenance of special layout : Points & Crossings, SE/P. Way's register,	6	0
13	Periodic inspection and programmed attention, Importance of correct gauge, Alignment packing, Tight fastenings and clearances,	4	0
14	Overhauling, Coordination with signal and operating departments, Maximum wear of xing making up wear by welding, Welding of joints on turnouts, gapless joints for crossing joints.	4	0
15	Special attention to maintenance of platform lines and drainage, corrosion of rails, metal sleepers, fastening of concrete sleepers and problem of groove formation, maintenance of turn in curves,	4	0
16	Basic knowledge of OHE, Maintenance in electrified territories, maintenance of track circuited sections, use of insulated trolleys, Gauges and other tools, maintenance of insulated joints, glued joints. Felling/Cutting/pruning of trees obstructing view or very close to OHE	4	0
17	Maintenance technique on suburban routes wherever applicable	2	0
PSEIN122	PROTECTION, RESTRICTIONS & INDICATIONS	13	2
1	Hand signals in day and night, Hand flags, Hand lamps, Banner flags, Detonators & fusee, life of detonators, testing, fog signals/fusee	3	2
2	Engineering, Indicators, Temporary and permanent,	4	0
3	Works of short and long duration, Protection during emergency Caution order.	6	0
PSEIN123	PATROLLING	14	0
1	Necessity of patrolling,	1	0
2	Kinds of patrolling i.e. Key men's daily patrol, Gang patrol, Monsoon security, Hot and cold weather patrolling, Watch at vulnerable points, Weather warnings, Single and double frequency patrolling,	6	0
3	Patrol charts, Patrol books and equipments, Selection and duties of patrolmen,	4	0
4	Night checks & Inspections	2	0
5	Felling/Cutting/pruning of trees obstructing view, very close to OHE	1	0
PSEIN124	MECHANIZED MAINTENANCE	40	6
1	Need for mechanization, model of mechanized maintenance,	2	0
2	3 tiers system of track maintenance, Working of MMUs	8	0
3	Small track machines: types, use in maintenance, spot attention with off track tampers , Troubleshooting and system of repairs & maintenance	12	4
4	Pre-requisites to tamping and other machine working, Pre & Post and during attentions for tamping and other machine working,	12	0
5	Design mode tamping : survey and procedure of tamping	6	2

PSEIN125	TOOLS & EQUIPMENTS	12	3
1	Measuring tools	4	1
2	MSP Tool kit	4	1
3	Regular Maintenance Tools	4	1
PSEIN126	TROLLEY/LORRY/DOLLY WORKING	14	0
1	Distinction between Trolley, Lorry & motor Trolley,	1	0
2	Competency Certificate,	1	0
3	Working of Push Trolley, Lorry & motor Trolley, Its equipment,	6	0
4	Protection, Working of rail dolly and its protection	4	0
5	Trolley Refuges	2	0
PSEIN127	RECONDITIONING OF MATERIALS AND TOOLS	18	0
1	Reconditioning of tools by forging, Forge -welding and riveting of new sections,	2	0
2	Reconditioning of P. Way materials, Rails, Welding of scabbed rails, cropping of rail ends, hole drilling and chamfering of bolt hole in rails	4	0
3	Wooden sleepers, Plugging spikes, Shifting rail seat, End binding, Steel sleepers, Welding special pads for pandrol clips and use of moon washers/ Mota singh liner for elongated holes, Repressing of fishplates, Use of shims, Beaters etc.	6	0
4	Reconditioning of worn out crossings and switches, type of electrodes used, RDSO approved vendor and welder system	6	0
	SAFETY		
PSEIN128	CRS SANCTION & SCHEDULE OF DIMENSIONS	14	0
1	Works requiring CRS sanction	2	0
2	Various schedules of dimensions related to P. Way	8	0
3	Infringements, Register of infringements	2	0
4	Movement of ODC	2	0
	Total(16 weeks)	613	67

Annexure- I(b)			
MODULES FOR SE/ P WAY- INDUCTION (PHASE-II)			
Module No.	Lesson Content	Class Room	Model Room
PSEIN129	SURVEYING	20	16
1	General purpose of Surveying, introduction to common survey terms and principles of surveying & Levelling.	10	0
2	Exposure to commonly used instruments/tools that measure angles & distances i.e. Theodolite, Dumpy Levels, Total stations etc., Firsthand experience of carrying out topographic surveys at various scales, Interpretation and presentation/ reporting of survey data	10	16
PSEIN130	TRANSPORTATION-I	16	6
1	Various systems of working, Essentials of absolute & automatic block system,	8	2
2	Classification of stations, Simple layouts & condition for granting permission to approach, single line working on double line, Reception of train on blocked line and starting from non-signaled line, TFC, Interlocking, Recovery Time	8	4
	CURVES		
PSEIN131	HORIZONTAL CURVES	36	0
1	Degree of curve, Types of curves, Relation between degree, Radius, Chord and versine, Standard chords to be used for stringing,	4	0
2	Record in SE/P.Way's curve register checking of alignment after derailments and for turn in and turnout curves,	4	0
3	Super elevation / equilibrium cant, Maximum cant for normal and high speed trains, Cant deficiency and cant excess, Formula for safe speed on curves, Equilibrium speed, Calculation of cant to be provided and permissible speed, Transition length, Maximum cant gradient, Rates of running out of cant and cant deficiency.	8	0
4	Types of curves, Setting out of curves, Cubic parabola off sets for setting out transition curve, Shift calculations for setting out complete curve with theodolite.	4	0
5	Miscellaneous - Running out cant on transitioned curves, Gradient rail, Laying of rails on curves, Mid stagger joints and on sharp curves, Curve markers and cant boards, Lubrication on curves,	6	0
6	Widening of gauge on curves, Extra clearance on curves, Minimum length of straight between reverse curves,	4	0
7	Curves with similar and contrary flexure, Calculation of cant to be provided and permissible speed, Curve with X-over and diamonds	6	0
PSEIN132	VERTICAL CURVES	12	0
1	Need for vertical curve, Grades, Equivalent radius,	2	0
2	Calculations and setting out a vertical curve, Level pegs for accurate maintenance,	8	0
3	Vertical curves on LWR	2	0
PSEIN133	REALIGNMENT OF CURVES	32	12
1	Re-alignment of curves, String lining of curves, Need for curve adjustment,	2	0
2	Criteria for realignment, Curve register, Versine survey,	4	0
3	Calculations of slews by double summation method,	8	0

4	Slewing to revised versine, Local adjustment,	4	2
5	Optimization method of curve realignment,	6	2
6	Curve indication boards & curve posts.	2	0
7	Hands on to Computer software for curve realignment calculations	6	8
PSEIN134	TRACK RENEWALS	38	0
1	Casual renewals, Complete track renewals, Through rail renewals, Through Sleeper renewals, Through fitting renewal and through ballast renewal,	6	0
2	Criteria for un-serviceability for casual renewals,	2	0
3	Criteria for TRR, TSR,	4	
4	Methods of renewals, Preparation, Labour Organisation, Tools, Ballast,	10	0
5	Careful handling of materials, Speed restrictions and post relaying attention,	4	0
6	Picking of released materials, Classification & disposal, Relaying with PQRS equipment, Record of relaying, Track relaying train, Relaying of turnout with T-28, New track laying standards, Handing over/Taking over of new track.	12	0
PSEIN135	INSPECTIONS, TRACK RECORDING & MONITORING	38	8
1	Object of inspection,	2	0
2	Riding quality, TGI, Track geometry, Condition of track structure, Correct methods of work, Testing knowledge of rules,	8	0
3	Method of Inspection: Push trolley, Motor trolley, Foot inspection, Engine & Rear van Inspection, Amsler car, TRRC, Oscillograph car, OMS, TFMS, Mobile USFD (Spurt Car)	10	4
4	Frequency of inspection: Inspection register, Repetitive defects and their Rectification, Permissible accelerations as recorded by oscillograph car,	6	0
5	Inspection of track geometry, inspection of Gang's work: quality, methods, progress, tools and equipments, knowledge of rules, attendance, Gang chart and diary, inspection of finished work, Inspection of bad riding spots, spots identified by TRC for urgent maintenance, Systematic measurement and investigation of defect	12	4
PSEIN136	ACCIDENTS & DISASTER MANAGEMENT	30	2
1	Duties of JE-II/P. Way in disaster management	2	0
2	Sounding of hooters & classification of accidents,	2	0
3	Action to be taken on reaching site, First aid, preservation of clues, Assessment of men and materials for restoration, Recording site and track particulars, Preparation of a sketch, Expeditious restoration,	6	0
4	Drivers report on bad riding, Breaches & its types, Prevention & action during breach, Vigilance on Railway Affecting tanks	4	0
5	Enquiries - General ideas about procedure and composition of Accident Committee,	4	0
6	Classification of enquiries & time schedule, Accidents at work spots, Engineering ART materials	4	0
7	Mechanism of derailment, Various defects of rolling stocks and IRCA's rejection limits, Disaster Management	8	2
	CE-MIS (TMS)		
PSEIN137	TMS	10	0
1	Track Management System: Introduction to TMS, purpose, advantages, main features	10	0
PSEIN138	CONTRACT MANAGEMENT	41	0

1	Definition of agreement /contract, Types & forms of contract	4	0
2	Tenders, Tender committee, GCC & SCC, SOR for P. Way works, Quality control measures at site,	6	0
3	Various registers to be maintained for progress, Quality, safety of contractors persons, Safety measures at work site,	4	0
4	Accountal of new and Released material, Issue and receipt from contractors, Important points from vigilance angle,	4	0
5	Awarding of contract, Earnest money, Security deposit	4	0
6	Preparation of Contractor's On-Account/Running & Final Bills, Material Statements, Maintenance Period, Warranty/guarantee clauses, release of security deposit	3	0
7	Time extensions to date of completion of contract,	2	0
8	Hiring of tools and plants to Contractors	3	0
9	Supervision of contractual works, Safety at work-site, Common ignorance. Dos & Don'ts for contract matters	4	0
10	Termination, Disputes, redressal, arbitration	3	0
11	Duties towards payment to contractor's labour and maintenance of records as per labour laws	4	0
PSEIN139	LAND MANAGEMENT	20	0
1	Land acquisition,	4	0
2	Demarcation of land boundaries,	2	0
3	Licensing/leasing,	4	0
4	Relinquishment of railway land,	2	0
5	Type of encroachments and PPE Act.	8	0
PSEIN140	COMPUTER & THEIR USAGE	24	18
1	Various languages suitable for Civil Engineering applications,	2	0
2	Windows,	6	6
3	MS- Office: Word, Excel, Access, PowerPoint	10	6
4	Use of Internet, Latest advancement in Information Technology & e-mail.	6	6
PSEIN141	TRANSPORTATION	37	10
1	Knowledge of GR & SR, Various systems of working, Essentials of absolute & automatic block system,	10	2
2	Classification of stations, Simple layouts & condition for granting permission to approach, single line working on double line, Reception of train on blocked line and starting from non-signaled line, TFC, Interlocking, Recovery Time	11	4
3	Important definitions, General rules applying to Railway servants,	6	0
4	Signals, General provisions, Description of fixed signals, Hand signals, Detonating signal flare signal, Defective fixed signal, Rules for passing defective signals,	10	4
PSEIN142	OFFICE & STORES	13	0
1	Procuring of office stationary and stores, Procuring of P. Way stores for maintenance and for special works, Classification of stores, Accountal of stores, Stock verification reports, Disposal of scrap & surplus stores, Overhauling of stores, Numerical ledgers & inventory control, Section register of SE/P. Way	4	0
2	Classification of stores, Stock verification, Stock sheet, Submission of returns, Inventory control, Maintenance of DMTR and ledgers, Submission of store returns in time, Materials at site register, Imprest Store, T&P Store	6	0

3	Functioning of divisional Stores Depots and Track Depot, Requirement of materials for casual renewal and sanctioned renewals, Working out list for track materials, Proper care & upkeep of store.	3	0
PSEIN143	PERSONNEL	24	0
1	Muster, Pay sheet, Pay Bands, Grade Pay; Allowances,	1	0
2	Wage period, Bill preparation, Filling up of TA & OT Journals, Witnessing of payment, unpaid wages,	1	0
3	Passes and leave	3	0
4	Medical Assistance and Medical Examination Rules	1	0
5	Establishment Records in SSE/ JE P Way office	1	0
6	Trade Test; Other channels of promotions	2	0
7	Settlement:- PF, Pension, Gratuity, Leave Encashment; Filling up of Pension Booklet	2	0
8	Welfare Schemes & SBF	2	0
9	Industrial Relations:-Unions & Associations, PNM, JCM	2	0
10	Railway Services (Conduct) Rules, D&A Rules	3	0
11	Categories of staff under Hours of Employment Regulations	1	0
12	Labour Laws- overview; Display of Statutory Notices, Inspection by Labour Enforcement Officer	1	0
13	Payment of Wages Act, Minimum Wages Act, Contract Labour Act	2	0
14	Workmen's Compensation Act, Action in case of injury on duty, Ex-Gratia Payment-	2	0
PSEIN144	RAJBHASHA	12	0
1	Directives in use of Raj Bhasha in day-to-day working.	12	0
	Total (10 weeks)	374	66
	Grand Total	1120	
Note:- Periods suggested for Class Room and Model Room against the topics above are indicative. Minor modifications may be made with the approval of PCE, in case local circumstances so warrant.			

Annexure- II(a)			
MODULES FOR JE/ P WAY- INDUCTION (PHASE-I)			
Module No.	Lesson Content	Class Room	Model Room
PJEIN101	ORGANIZATION OF RAILWAYS , DUTIES OF P.WAY STAFF	19	0
1	Overview of organization of Railways	3	0
2	Brief introduction to Track and its components particularly related with inspection	4	0
3	Duties of Key man,	2	0
4	Duties of Mate,	2	0
5	Duties of PWS,	2	0
6	Duties of JE/P. Way,	4	0
7	Duties of SSE/P.Way,	2	0
PJEIN102	RAILS & JOINTS	46	10
1	Rail, Evaluation of Weight and its relation to axle loads,	2	0
2	Standard sections, grade, UTS & service life, classification, Rolling marks,	3	2
3	Careful loading, unloading, stacking & handling of rails, special precautions for high UTS/ HH rails.	2	0
4	Straightening of kinks by Jim crow	1	0
5	Corrosion, Anticorrosion treatment	4	0
6	Wear & its causes,	2	0
7	Joints, Types, fish-plate, fish-bolts, anti-sabotage fish bolts, Combination fish-plates, Skimmed fish-plates, Chamfering of bolt holes, expansion/contraction of rails, requirement and provision of gap at joints, gapless/machined joints, Relation to rail temperature,	4	2
8	Insulated, Expansion joints for bridges & long welded rails,	2	2
9	General quantities for 1 km of track,	1	0
10	Fracture, codification, Restoration of traffic, how to report,	4	0
11	Preservation and testing of fractured rails,	2	0
12	Rail flaws/ defects	4	1
13	USFD: Ultrasonic flaw detection, fundamentals of ultrasonic waves, defect detection, need based concept of USFD, components tested, frequency of testing, marking of defects, action to be taken, brief description of various types of USFD machines and probes used, calibration and sensitivity checking, defect codification, limitations of USFD, SPURT Car	10	2
14	Glued joints (in situ/ prefab), ordinary & one meter long insulated joints	3	1
15	Rail grinding	2	0
PJEIN103	SLEEPERS & FASTENINGS	29	7
1	Sleepers and functions, Types used in India, Obsolete, Current and future	1	0
2	Study of CST-9: ordinary jaw, reverse jaw, Steel Trough: Loose jaw, Pad plated and turnouts, Wooden: Approved species, Durable and non-durable, Sizes for plain track, Bridges & turnouts for various gauges	3	2

3	Need to use wooden sleepers on track circuited sections and on weak arch bridges, Treated and untreated sleepers, Creosoting, handling & stacking, Protection from fire hazard, End binding, Adzing & boring, Size of augers from different spikes, Rail & plate screws, Bolts, Elastic fastenings.	2	0
	Fastenings for Wooden, ST, CST-9 sleepers: Two way keys, Oversize keys and loose jaws, Spikes dog and round, Rail and Plate screw, Bolt, hook and fang, special bearing pad for steel sleepers,	2	2
	Spacing of sleepers of joints on metal sleepers road. Pattern of driving keys. Quantities per km.	1	0
	Comparison between types, Advantages, Disadvantages, Criteria for determining unserviceable sleepers, Fastenings Tie bars & cotters, MS bearing plates, Flat canted CI bearing plates, Ordinary canted & anti creep,	2	0
4	Number & pattern of driving spikes or screws on straight, Curves, Turnouts & bridges, Instructions for use of bearing plates, Dating of wooden sleepers, Composite sleepers.	2	0
5	Concrete sleepers, Twin block RCC, Mono-block pre-stressed, General aspects, Instructions for usability of different sleepers on different routes, main lines and long welded rails, Special sleepers for L kinks, turnout, SEJ, bridges approach and sharp curves	6	1
6	Precaution for handling of PSC sleepers.	2	0
7	PSC SLEEPERS: Density of sleepers on different routes	2	0
8	Fastenings for PSC sleepers: Malleable cast iron inserts, Elastic Rail Clips, various types, toe load and its measurement, criteria for fastening renewal, Rubber pads, Liners, Anti sabotage arrangements for various sleepers, Creep anchors, method for fixing, Box anchoring.	4	2
9	Sleepers at joints & their spacing for concrete sleeper track	2	0
PJEIN104	FORMATION & BALLAST	27	0
1	Formation, Function	2	0
2	Typical sections of track on banks and cuttings for single/double lines on all gauges,	3	0
3	Drainage, Slope on top of formation, side and catch water drains,	2	0
4	Bearing Capacity of soil in relation to cable ducting	2	0
5	Causes for formation failure (Rehabilitation of weak formation).	8	0
6	Ballast Functions & types,	2	0
7	Ballast sections on different routes for straights and curves on single/double lines, On different gauges for fish plated track, SWR and LWR, Sections for branch lines, Loop and sidings.	4	0
8	Quantities for different sections.	2	0
9	Specification for track ballast	2	0
PJEIN105	Railway track & track Structure-I	8	0
1	Different Gauges,	4	0
2	Classification of Routes	4	0
PJEIN106	TRACK STRCUTURE IN YARDS	8	2
1	Track Structure (yards) Simple layouts, loops, gathering neck , overrun line, shunting neck, hot axle/fuel/stabling siding,	2	1
2	Isolation derailing switch, Scotch block, Hay's derail, Sand hump, dead ends, Catch & slip siding, Fouling marks, Restriction in use of 1 in 8½ turnouts on passenger lines,	2	1
3	Distance pieces to platform lines:	1	0
4	Restrictions regarding change of grade on approaches of turnout	2	0

5	Basic knowledge of S & T equipments	1	0
PJEIN107	TURNOUTS - INTRODUCTION	8	1
1	Turnouts, Definition and description of components and terms,	2	0
2	Standard types, Ordinary built-up and high manganese crossings straight switches, Curved switches, Thick web switches, Derailing switches, Spring points, other crossing types	4	1
3	Permissible speeds, Restriction on use of 1 in 8½ T/out on passenger running lines, symmetrical split	2	0
PJEIN108	TURNOUTS - ASSEMBLY & LAYING	57	2
1	Method of assembling all turnouts, Main dimensions and off sets of lead curve for setting out,	10	0
2	Contrary and similar flexure turnouts: Definition, Calculations for lead & radius,	15	0
3	Diamond crossings, scissors crossovers with single and double slips, Definitions and description of components and terms, Switch diamonds, advantage of raising inside check rail of obtuse xings,	10	0
4	Methods of assembly,	10	0
5	Main dimensions for setting out, Laying & Maintenance of fan shaped turnouts, Maintenance of Turn /outs with reference to CMS crossing.	12	2
PJEIN109	CROSSOVERS	45	3
1	Calculation for laying cross over, Cross over between straight parallel tracks with same & different no. of crossings	8	0
2	Cross over between curved parallel tracks, Cross over between inclined tracks.	8	0
3	Scissors X-over, Definition and description of components and parts, Standard layouts, Methods of assembly, Main dimensions for setting out,	6	0
4	Gathering lines, Xing angles and limiting angle layouts,	6	0
5	Calculations for different turnouts and spacing, Miscellaneous layouts: (1) Triangle (2) Three throw. (3) Double junctions (4) Gauntleted track (Brief description)	16	0
6	Hands on to Computer software for layout calculation	1	3
PJEIN110	DIVERSIONS	14	0
1	Definition, Types of diversions,	2	0
2	Standard for laying diversions,	6	0
3	Calculating length of diversions	6	0
	TRACK STRUCTURE -II		
PJEIN111	LEVEL CROSSINGS	24	5
1	Level crossings: Classification, types	2	0
2	Normal Position of Gates, Locking arrangement,	2	1
3	Equipments	1	1
4	Features of track at and in approaches of level crossings, Annual overhauling, Maintenance of road surface and approach track, Check rails-types, correct clearances, Visibility	4	0
5	Requirement Checking of equipments and knowledge of rules of gatemen,	2	1
6	Census at L- xing,	2	0
7	Inspection of L-xing, Duties of gatekeeper, Hot axle train parting,	3	1

8	Speed breakers, Road sign Boards, Provision of new LC, Manning, De-manning, interlocking and replacement with ROB, closure, shifting and replacement with limited height subways/ RUBs , Elimination Specification	8	1
PJEIN112	BRIDGES & TRACK STRUCTURE ON BRIDGES	24	2
1	Bridges: Classification, Types, Track Structure on girder Bridges, ballasted decks, arch bridges, tunnels, provision of guard rails, re-railing ramps	8	2
2	Importance of maintaining correct gauge, Alignment and tight fastenings, Preparation, Renewal bridge timber & Steel channel sleeper,	8	0
3	Attention to approach track & strengthening, Cleaning of waterway, Checking guard rails.	8	0
PJEIN113	TUNNELS	8	0
PJEIN114	Ballast Depot, Training out ballast, DMT operation	6	0
PJEIN115	ASH PITS	2	0
	WELDED RAILS		
PJEIN116	SHORT WELDED RAILS (SWR)	10	2
1	Definition, Track Structure for SWR,	2	2
2	Conditions of laying, Maintenance of SWR,	4	0
3	Gap survey & adjustment of gap.	4	0
PJEIN117	LONG WELDED RAILS (LWR)	44	8
1	Definitions,	4	0
2	Various types of Rail thermometers,	2	0
3	Permitted locations for laying, Track Structure, Laying of LWR,	8	0
4	De-stressing - with and without rail tensors	6	8
5	Repairs of Rail fracture,	4	0
6	Repairs of buckling,	4	0
7	Maintenance precautions, Overhauling, Deep screening, Renewal,	5	0
8	cold & hot weather patrolling,	3	0
9	Determination of stress free temperature.	2	0
10	Inspection of LWR and remedial actions for correction of gaps at SEJ, Hysteresis loop	4	0
11	Competency level to carry out various works in LWR track, Dos & Don'ts	2	0
PJEIN118	WELDING OF RAILS	14	8
1	Necessity of welding rail joints,	2	0
2	SPW, Wider gap Welding, compressed air preheating, 3 piece mould AT welding technique	4	0
3	Precautions to be observed during AT weld for good quality,	2	6
4	Tolerances for finished A.T. welds & FB Welds,	2	2
5	Brief idea about FB welds, Testing of welds, Mobile flash-butt welding	4	0
PJEIN119	RAIL FLAWS & TESTING	4	0
1	Visuals examination (Keyman's)	2	0
2	USFD Testing	2	0
PJEIN120	MAINTENANCE	21	4
	Introduction	1	0
1	Object of good maintenance,	4	0

2	Service, Maintenance tolerances and Approved methods, Beater packing, Off-track machines and 'On track' machines,	6	0
3	Approved systems, Systematic Maintenance conventional through packing, directed track maintenance and 3-tier system of maintenance	2	0
4	Pre-monsoon, during monsoon and post monsoon attention.	2	2
5	Record of Gang work, Gang chart/diary, Keyman's diary, Mate's diary, Record of work of Artisans and other workmen.	4	2
6	Half yearly reports on conditions of permanent way, PWI's Section Register, P. Way plans and diagrams	2	0
PJEIN121	REGULAR MAINTENANCE OPERATIONS	70	2
1	Regular works: Through packing,	6	0
2	Picking of slacks,	2	0
	Maintenance of concrete sleeper track	8	0
3	Overhauling,	4	0
4	Deep screening	6	0
5	Cleaning of drains and water ways,	2	0
6	Lubrication of joints and lubrication of rails in straight and on curves, maintenance of rail joints,	2	0
7	Incidental works: Creep, Importance of joint gaps, Gap surveys,	4	0
8	Buckling,	2	0
9	Prevention of creep, Creep anchors, Anti-creep fastenings, Measurement of creep, Markers, Creep register; Creep adjustment, Adjusting joint sleepers.	4	2
10	Lifting and lowering of track: Undesirability of lowering maximum lifting/lowering at one time, Provision of ramps at ends, Adequate ballast cushion and drainage after lowering.	4	0
11	Sample of standard section of track:	2	0
12	Maintenance of special layout : Points & Crossings, SE/P. Way's register,	6	0
13	Periodic inspection and programmed attention, Importance of correct gauge, Alignment packing, Tight fastenings and clearances,	4	0
14	Overhauling, Coordination with signal and operating departments, Maximum wear of xing making up wear by welding, Welding of joints on turnouts, gapless joints for crossing joints.	4	0
15	Special attention to maintenance of platform lines and drainage, corrosion of rails, metal sleepers, fastening of concrete sleepers and problem of groove formation, maintenance of turn in curves	4	0
16	Basic knowledge of OHE, Maintenance in electrified territories, maintenance of track circuited sections, use of insulated trolleys, Gauges and other tools, maintenance of insulated joints, glued joints. Felling/Cutting/pruning of trees obstructing view or very close to OHE	5	0
17	Maintenance technique on suburban routes wherever applicable	1	0
PJEIN122	PROTECTION, RESTRICTIONS & INDICATIONS	13	2
1	Hand signals in day and night, Hand flags, Hand lamps, Banner flags, Detonators & fusee, life of detonators, testing, fog signals/fusee	3	2
2	Engineering, Indicators, Temporary and permanent,	4	0
3	Works of short and long duration, Protection during emergency Caution order.	6	0
PJEIN123	PATROLLING	14	0
1	Necessity of patrolling,	1	0

2	Kinds of patrolling i.e. Key men's daily patrol, Gang patrol, Monsoon security, Hot and cold weather patrolling, Watch at vulnerable points, Weather warnings, Single and double frequency patrolling,	6	0
3	Patrol charts, Patrol books and equipments, Selection and duties of patrolmen,	4	0
4	Night checks & Inspections	2	0
5	Felling/Cutting/pruning of trees obstructing view, very close to OHE	1	0
PJEIN124	MECHANIZED MAINTENANCE	40	6
1	Need for mechanization, model of mechanized maintenance,	2	0
2	3 tiers system of track maintenance, Working of MMUs	8	0
3	Small track machines: types, use in maintenance, spot attention with off track tampers , Troubleshooting and system of repairs & maintenance	12	4
4	Pre-requisites to tamping and other machine working, Pre & Post and during attentions for tamping and other machine working,	12	0
5	Design mode tamping : survey and procedure of tamping	6	2
PJEIN125	TOOLS & EQUIPMENTS	12	3
1	Measuring tools	4	1
2	MSP Tool kit	4	1
3	Regular Maintenance Tools	4	1
PJEIN126	TROLLEY/LORRY/DOLLY WORKING	14	0
1	Distinction between Trolley, Lorry & motor Trolley,	1	0
2	Competency Certificate,	1	0
3	Working of Push Trolley, Lorry & motor Trolley, Its equipment,	6	0
4	Protection, Working of rail dolly and its protection	4	0
5	Trolley Refuges	2	0
PJEIN127	RECONDITIONING OF MATERIALS AND TOOLS	18	0
1	Reconditioning of tools by forging, Forge -welding and riveting of new sections,	2	0
2	Reconditioning of P. Way materials, Rails, Welding of scabbed rails, cropping of rail ends, hole drilling and chamfering of bolt hole in rails	4	0
3	Wooden sleepers, Plugging spikes, Shifting rail seat, End binding, Steel sleepers, Welding special pads for pandrol clips and use of moon washers/ Mota singh liner for elongated holes, Repressing of fishplates, Use of shims, Beaters etc.	6	0
4	Reconditioning of worn out crossings and switches, type of electrodes used, RDSO approved vendor and welder system	6	0
	SAFETY		
PJEIN128	CRS SANCTION & SCHEDULE OF DIMENSIONS	14	0
1	Works requiring CRS sanction	2	0
2	Various schedules of dimensions related to P. Way	8	0
3	Infringements, Register of infringements	2	0
4	Movement of ODC	2	0
	Total(16 weeks)	613	67

Annexure- II(b)			
MODULES FOR JE/ P WAY- INDUCTION (PHASE-II)			
Module No.	Lesson Content	Class Room	Model Room
PJEIN129	SURVEYING	20	16
1	General purpose of Surveying, introduction to common survey terms and principles of surveying & Levelling.	10	0
2	Exposure to commonly used instruments/tools that measure angles & distances i.e. Theodolite, Dumpy Levels, Total stations etc., Firsthand experience of carrying out topographic surveys at various scales, Interpretation and presentation/ reporting of survey data	10	16
PJEIN130	TRANSPORTATION-I	16	6
1	Various systems of working, Essentials of absolute & automatic block system,	8	2
2	Classification of stations, Simple layouts & condition for granting permission to approach, single line working on double line, Reception of train on blocked line and starting from non-signaled line, TFC, Interlocking, Recovery Time	8	4
	CURVES		
PJEIN131	HORIZONTAL CURVES	36	0
1	Degree of curve, Types of curves, Relation between degree, Radius, Chord and versine, Standard chords to be used for stringing,	4	0
2	Record in SE/P.Way's curve register checking of alignment after derailments and for turn in and turnout curves,	4	0
3	Super elevation / equilibrium cant, Maximum cant for normal and high speed trains, Cant deficiency and cant excess, Formula for safe speed on curves, Equilibrium speed, Calculation of cant to be provided and permissible speed, Transition length, Maximum cant gradient, Rates of running out of cant and cant deficiency.	8	0
4	Types of curves, Setting out of curves, Cubic parabola off sets for setting out transition curve, Shift calculations for setting out complete curve with theodolite.	4	0
5	Miscellaneous - Running out cant on transitioned curves, Gradient rail, Laying of rails on curves, Mid stagger joints and on sharp curves, Curve markers and cant boards, Lubrication on curves,	6	0
6	Widening of gauge on curves, Extra clearance on curves, Minimum length of straight between reverse curves,	4	0
7	Curves with similar and contrary flexure, Calculation of cant to be provided and permissible speed, Curve with X-over and diamonds	6	0
PJEIN132	VERTICAL CURVES	12	0
1	Need for vertical curve, Grades, Equivalent radius,	2	0
2	Calculations and setting out a vertical curve, Level pegs for accurate maintenance,	8	0
3	Vertical curves on LWR	2	0
PJEIN133	REALIGNMENT OF CURVES	32	12
1	Re-alignment of curves, String lining of curves, Need for curve adjustment,	2	0
2	Criteria for realignment, Curve register, Versine survey,	4	0
3	Calculations of slews by double summation method,	8	0
4	Slewing to revised versine, Local adjustment,	4	2
5	Optimization method of curve realignment,	6	2

6	Curve indication boards & curve posts.	2	0
7	Hands on to Computer software for curve realignment calculations	6	8
PJEIN134	TRACK RENEWALS	38	0
1	Casual renewals, Complete track renewals, Through rail renewals, Through Sleeper renewals, Through fitting renewal and through ballast renewal,	6	0
2	Criteria for unserviceability for casual renewals,	2	0
3	Criteria for TRR, TSR,	4	
4	Methods of renewals, Preparation, Labour Organisation, Tools, Ballast,	10	0
5	Careful handling of materials, Speed restrictions and post relaying attention,	4	0
6	Picking of released materials, Classification & disposal, Relaying with PQRS equipment, Record of relaying, Track relaying train, Relaying of turnout with T-28, New track laying standards, Handing over/Taking over of new track.	12	0
PJEIN135	INSPECTIONS, TRACK RECORDING & MONITORING	38	8
1	Object of inspection,	2	0
2	Riding quality, TGI, Track geometry, Condition of track structure, Correct methods of work, Testing knowledge of rules,	8	0
3	Method of Inspection: Push trolley, Motor trolley, Foot inspection, Engine & Rear van Inspection, Amsler car, TRRC, Oscillograph car, OMS, TFMS, Mobile USFD (Spurt Car)	10	4
4	Frequency of inspection: Inspection register, Repetitive defects and their Rectification, Permissible accelerations as recorded by oscillograph car,	6	0
5	Inspection of track geometry, inspection of Gang's work: quality, methods, progress, tools and equipments, knowledge of rules, attendance, Gang chart and diary, inspection of finished work, Inspection of bad riding spots, spots identified by TRC for urgent maintenance, Systematic measurement and investigation of defect	12	4
PJEIN136	ACCIDENTS & DISASTER MANAGEMENT	30	2
1	Duties of JE-II/P. Way in disaster management	2	0
2	Sounding of hooters & classification of accidents,	2	0
3	Action to be taken on reaching site, First aid, preservation of clues, Assessment of men and materials for restoration, Recording site and track particulars, Preparation of a sketch, Expeditious restoration,	6	0
4	Drivers report on bad riding, Breaches & its types, Prevention & action during breach, Vigilance on Railway Affecting tanks	4	0
5	Enquiries - General ideas about procedure and composition of Accident Committee,	4	0
6	Classification of enquiries & time schedule, Accidents at work spots, Engineering ART materials	4	0
7	Mechanism of derailment, Various defects of rolling stocks and IRCA's rejection limits, Disaster Management	8	2
	CE-MIS (TMS)		
PJEIN137	TMS	10	0
1	Track Management System: Introduction to TMS, purpose, advantages, main features	10	0
PJEIN138	CONTRACT MANAGEMENT	41	0
1	Definition of agreement /contract, Types & forms of contract	4	0
2	Tenders, Tender committee, GCC & SCC, SOR for P. Way works, Quality control measures at site,	6	0

3	Various registers to be maintained for progress, Quality, safety of contractors persons, Safety measures at work site,	4	0
4	Accountal of new and Released material, Issue and receipt from contractors, Important points from vigilance angle,	4	0
5	Awarding of contract, Earnest money, SEM, Security deposit	4	0
6	Preparation of Contractor's On-Account/Running & Final Bills, Material Statements, Maintenance Period, Warranty/guarantee clauses, release of security deposit	3	0
7	Time extensions to date of completion of contract,	2	0
8	Hiring of tools and plants to Contractors	3	0
9	Supervision of contractual works, Safety at work-site, Common ignorance. Dos & Don'ts for contract matters	4	0
10	Termination, Disputes, redressal, arbitration	3	0
11	Duties towards payment to contractor's labour and maintenance of records as per labour laws	4	0
PJEIN139	LAND MANAGEMENT	20	0
1	Land acquisition,	4	0
2	Demarcation of land boundaries,	2	0
3	Licensing/leasing,	4	0
4	Relinquishment of railway land,	2	0
5	Type of encroachments and PPE Act.	8	0
PJEIN140	COMPUTER & THEIR USAGE	24	18
1	Various languages suitable for Civil Engineering applications,	2	0
2	Windows,	6	6
3	MS- Office: Word, Excel, Access, PowerPoint	10	6
4	Use of Internet, Latest advancement in Information Technology & e-mail.	6	6
PJEIN141	TRANSPORTATION	37	10
1	Knowledge of GR& SR, Various systems of working, Essentials of absolute & automatic block system,	10	2
2	Classification of stations, Simple layouts & condition for granting permission to approach, single line working on double line, Reception of train on blocked line and starting from non-signaled line, TFC, Interlocking, Recovery Time	11	4
3	Important definitions, General rules applying to Railway servants,	6	0
4	Signals, General provisions, Description of fixed signals, Hand signals, Detonating signal flare signal, Defective fixed signal, Rules for passing defective signals,	10	4
PJEIN142	OFFICE & STORES	13	0
1	Procuring of office stationary and stores, Procuring of P. Way stores for maintenance and for special works, Classification of stores, Accountal of stores, Stock verification reports, Disposal of scrap & surplus stores, Overhauling of stores, Numerical ledgers & inventory control, Section register of SE/P. Way	4	0
2	Classification of stores, Stock verification, Stock sheet, Submission of returns, Inventory control, Maintenance of DMTR and ledgers, Submission of store returns in time, Materials at site register, Imprest Store, T&P Store	6	0
3	Functioning of divisional Stores Depots and Track Depot, Requirement of materials for casual renewal and sanctioned renewals, Working out list for track materials, Proper care & upkeep of store.	3	0

PJEIN143	PERSSONEL	24	0
1	Muster, Pay sheet, Pay Bands, Grade Pay; Allowances,	1	0
2	Wage period, Bill preparation, Filling up of TA & OT Journals, Witnessing of payment, unpaid wages.	1	0
3	Passes and leave-	3	0
4	Medical Assistance and Medical Examination Rules	1	0
5	Establishment Records in SSE/ JE P Way office	1	0
6	Trade Test; Other channels of promotions	2	0
7	Settlement:- PF, Pension, Gratuity, Leave Encashment; Filling up of Pension Booklet	2	0
8	Welfare Schemes & SBF	2	0
9	Industrial Relations:-Unions & Associations, PNM, JCM	2	0
10	Railway Services (Conduct) Rules, D&A Rules	3	0
11	Categories of staff under Hours of Employment Regulations	1	0
12	Labour Laws- overview; Display of Statutory Notices, Inspection by Labour Enforcement Officer	1	0
13	Payment of Wages Act, Minimum Wages Act, Contract Labour Act	2	0
14	Workmen's Compensation Act, Action in case of injury on duty, Ex-Gratia Payment.	2	0
PJEIN144	RAJBHASHA	12	0
1	Directives in use of Raj Bhasha in day-to-day working.	12	0
	Total (10 weeks)	374	66
	Grand Total	1120	
Note:- Periods suggested for Class Room and Model Room against the topics above are indicative. Minor modifications may be made with the approval of PCE, in case local circumstances so warrant.			

Annexure- III(a)			
MODULES FOR SENOR PWS- INDUCTION (PHASE-I)			
Module No.	Lesson Content	Class Room	Model Room
PSUIN101	ORGANIZATION OF RAILWAYS , DUTIES OF P.WAY STAFF	13	0
1	Overview of organization of Railways	3	0
2	Brief introduction to Track and its components particularly related with inspection	4	0
3	Duties of Key man,	2	0
4	Duties of Mate,	2	0
5	Duties of PWS,	2	0
PSUIN102	RAILS & JOINTS	40	10
1	Rail, Evaluation of Weight and its relation to axle loads,	2	0
2	Standard sections, grade, UTS & service life, classification, Rolling marks,	3	2
3	Careful loading, unloading, stacking & handling of rails, special precautions for high UTS/ HH rails.	2	0
4	Straightening of kinks by Jim crow	1	0
5	Corrosion, Anticorrosion treatment	4	0
6	Wear & its causes,	2	0
7	Joints, Types, fish-plate, fish-bolts, anti-sabotage fishbolts, Combination fish-plates, Skimmed fish-plates, Chamfering of bolt holes, expansion/contraction of rails, requirement and provision of gap at joints, gapless/machined joints, Relation to rail temperature,	4	2
8	Insulated, Expansion joints for bridges & long welded rails,	2	2
9	General quantities for 1 km of track,	1	0
10	Fracture, codification, Restoration of traffic, how to report,	4	0
11	Preservation and testing of fractured rails,	2	0
12	Rail flaws/ defects	4	1
13	USFD: Ultrasonic flaw detection, fundamentals of ultrasonic waves, defect detection, need based concept of USFD, components tested, frequency of testing, marking of defects, action to be taken, brief description of various types of USFD machines and probes used, calibration and sensitivity checking, defect codification, limitations of USFD, SPURT Car	4	2
14	Glued joints (in situ/ prefab), ordinary & one meter long insulated joints	3	1
15	Rail grinding	2	0
PSUIN103	SLEEPERS & FASTENINGS	40	7
1	Sleepers and functions, Types used in India, Obsolete, Current and future	4	0
2	Study of CST-9: ordinary jaw, reverse jaw, Steel Trough: Loose jaw, Pad plated and turnouts, Wooden: Approved species, Durable and non-durable, Sizes for plain track, Bridges & turnouts for various gauges	4	2
3	Need to use wooden sleepers on track circuited sections and on weak arch bridges, Treated and untreated sleepers, Creosoting, handling & stacking, Protection from fire hazard, End binding, Adzing & boring, Size of augers from different spikes, Rail & plate screws, Bolts, Elastic fastenings.	4	0
4	Fastenings for Wooden, ST, CST-9 sleepers: Two way keys,	4	2

	Oversize keys and loose jaws, Spikes dog and round, Rail and Plate screw, Bolt, hook and fang, special bearing pad for steel sleepers,		
5	Spacing of sleepers of joints on metal sleepers road. Pattern of driving keys. Quantities per km.	2	0
6	Comparison between types, Advantages, Dis-advantages, Criteria for determining unserviceable sleepers, Fastenings Tie bars & cotters, MS bearing plates, Flat canted CI bearing plates, Ordinary canted & anti creep,	2	0
7	Number & pattern of driving spikes or screws on straight, Curves, Turnouts & bridges, Instructions for use of bearing plates, Dating of wooden sleepers, Composite sleepers.	2	0
8	Concrete sleepers, Twin block RCC, Mono-block pre-stressed, General aspects, Instructions for usability of different sleepers on different routes, main lines and long welded rails, Spl sleepers for L xings, turnout, SEJ, bridges approach and sharp curves	8	1
9	Precaution for handling of PSC sleepers.	2	0
10	PSC SLEEPERS: Density of sleepers on different routes	2	0
11	Fastenings for PSC sleepers: Malleable cast iron inserts, Elastic Rail Clips, various types, toe load and its measurement, criteria for fastening renewal, Rubber pads, Liners, Anti sabotage arrangements for various sleepers, Creep anchors, method for fixing, Box anchoring.	4	2
12	Sleepers at joints & their spacing for concrete sleeper track	2	0
PSUIN104	FORMATION, BALLAST & DRAINAGE	28	0
1	Formation, Function	2	0
2	Typical sections of track on banks and cuttings for single/double lines on all gauges,	4	0
3	Drainage, Slope on top of formation, side and catch water drains, Drainage in mid section, yards and platforms, especially in monsoon	2	0
4	Causes for formation failure (Rehabilitation of weak formation).	10	0
5	Ballast Functions & types,	2	0
6	Ballast sections on different routes for straights and curves on single/double lines, On different gauges for fish plated track, SWR and LWR, Sections for branch lines, Loop and sidings.	4	0
7	Quantities for different sections.	2	0
8	Specification for track ballast	2	0
PSUIN105	Railway track & track Structure-I	4	0
1	Different Gauges,	2	0
2	Classification of Routes	2	0
PSUIN106	TRACK STRCUTURE IN YARDS	14	2
1	Track Structure (yards) Simple layouts, loops, gathering neck , overrun line, shunting neck, hot axle/fuel/stabling siding,	6	1
2	Isolation derailing switch, Scotch block, Hay's derail, Sand hump, dead ends, Catch & slip siding, Fouling marks, Restriction in use of 1 in 8½ turnouts on passenger lines,	4	1
3	Distance pieces to platform lines:	2	0
4	Restrictions regarding change of grade on approaches of turnout	2	0
PSUIN107	TRACK MAINTENANCE	21	4
1	Introduction	1	0
2	Object of good maintenance,	4	0
3	Service, Maintenance tolerances and Approved methods, Beater packing, Off-track machines and 'On track' machines,	6	0

4	Approved systems, Systematic Maintenance conventional through packing, directed track maintenance and 3-tier system of maintenance	2	0
5	Pre-monsoon, during monsoon and post monsoon attention.	2	2
6	Record of Gang work, Gang chart/diary, Keyman's diary, Mate's diary, Record of work of Artisans and other workmen.	4	2
7	Half yearly reports on conditions of permanent way, PWI's Section Register, P. Way plans and diagrams	2	0
PSUIN108	REGULAR MAINTENANCE OPERATIONS	72	12
1	Regular works: Through packing,	6	0
2	Picking of slacks,	2	0
3	Maintenance of concrete sleeper track	8	0
4	Overhauling,	4	0
5	Deep screening	6	0
6	Cleaning of drains and water ways,	2	0
7	Lubrication of joints and lubrication of rails in straight and on curves, maintenance of rail joints,	2	0
8	Incidental works: Creep, Importance of joint gaps, Gap surveys,	6	0
9	Buckling,	2	0
10	Prevention of creep, Creep anchors, Anti-creep fastenings, Measurement of creep, Markers, Creep register; Creep adjustment, Adjusting joint sleepers.	4	12
11	Lifting and lowering of track: Undesirability of lowering maximum lifting/lowering at one time, Provision of ramps at ends, Adequate ballast cushion and drainage after lowering.	4	0
12	Sample of standard section of track:	2	0
13	Maintenance of special layout : Points & Crossings, SE/P. Way's register,	8	0
14	Periodic inspection and programmed attention, Importance of correct gauge, Alignment packing, Tight fastenings and clearances,	4	0
15	Overhauling, Coordination with signal and operating departments, Maximum wear of xing making up wear by welding, Welding of joints on turnouts, gapless joints for crossing joints.	4	0
16	Special attention to maintenance of platform lines and drainage, corrosion of rails, metal sleepers, fastening of concrete sleepers and problem of groove formation, maintenance of turn in curves,	4	0
17	Maintenance in electrified territories, maintenance of track circuited sections, use of insulated trolleys, Gauges and other tools, maintenance of insulated joints, glued joints. Felling/Cutting/pruning of trees obstructing view or very close to OHE	4	0
PSUIN109	INCIDENTAL WORKS	16	0
1	Annual overhauling of Level Crossing	2	0
2	Maintenance of Track circuited area, platform Lines, fouling Mark	4	0
3	Survey of curves	6	0
4	Railway affecting Works	4	0
PSUIN110	DIRECTED MAINTENANCE	8	4
1	Basic principle	2	0
2	Grouping of Gangmen	2	1
3	Directed supervision	2	1
4	Investigation of site	2	2
PSUIN111	PROTECTION, RESTRICTIONS & INDICATIONS	14	4

1	Hand signals in day and night, Hand flags, Hand lamps, Banner flags, Detonators & fusee, life of detonators, testing, fog signals/fusee	4	2
2	Engineering, Indicators, Temporary and permanent,	4	2
3	Works of short and long duration, Protection during emergency Caution order.	6	0
PSUIN112	PATROLLING	16	0
1	Necessity of patrolling,	2	0
2	Kinds of patrolling i.e. Key men's daily patrol, Gang patrol, Monsoon security, Hot and cold weather patrolling, Watch at vulnerable points, Weather warnings, Single and double frequency patrolling,	6	0
3	Patrol charts, Patrol books and equipments, Selection and duties of patrolmen,	4	0
4	Night checks & Inspections	2	0
5	Felling/Cutting/pruning of trees obstructing view, very close to OHE	2	0
PSUIN113	TOOLS & EQUIPMENTS	12	3
1	Measuring tools	4	1
2	MSP Tool kit	4	1
3	Regular Maintenance Tools	4	1
PSUIN114	TROLLEY/LORRY/DOLLY WORKING	14	0
1	Distinction between Trolley, Lorry & motor Trolley,	1	0
2	Competency Certificate,	1	0
3	Working of Push Trolley, Lorry & motor Trolley, Its equipment,	6	0
4	Protection, Working of rail dolly and its protection	4	0
5	Trolley Refuges	2	0
PSUIN115	RECONDITIONING OF MATERIALS AND TOOLS	18	0
1	Reconditioning of tools by forging, Forge -welding and riveting of new sections,	2	0
2	Reconditioning of P. Way materials, Rails, Welding of scabbed rails, cropping of rail ends, hole drilling and chamfering of bolt hole in rails	4	0
3	Wooden sleepers, Plugging spikes, Shifting rail seat, End binding, Steel sleepers, Welding special pads for pandrol clips and use of moon washers/ Mota singh liner for elongated holes, Repressing of fishplates, Use of shims, Beaters etc.	6	0
4	Reconditioning of worn out crossings and switches, type of electrodes used, RDSO approved vendor and welder system	6	0
	Total(16 weeks)	334	46

Annexure- III(b)			
MODULES FOR SENOR PWS- INDUCTION (PHASE-II)			
Module No.	Lesson Content	Class Room	Model Room
	WELDED RAILS		
PSUIN116	SHORT WELDED RAILS (SWR)	16	0
1	Definition, Track Structure for SWR,	4	2
2	Conditions of laying, Maintenance of SWR,	6	0
3	Gap survey & adjustment of gap.	6	0
PSUIN117	LONG WELDED RAILS (LWR)	43	8
1	Definitions,	4	0
2	Various types of Rail thermometers,	2	0
3	Permitted locations for laying, Track Structure, Laying of LWR,	4	0
4	De-stressing - with and without rail tensors	8	8
5	Repairs of Rail fracture,	6	0
6	Repairs of buckling,	6	0
7	Maintenance precautions, Overhauling, Deep screening, Renewal,	4	0
8	cold & hot weather patrolling,	3	0
9	Determination of stress free temperature.	2	0
11	Inspection of LWR and remedial actions for correction of gaps at SEJ, Hysteresis loop	2	0
11	Competency level to carry out various works in LWR track, Dos & Don'ts	2	0
PSUIN118	WELDING OF RAILS	16	6
1	Necessity of welding rail joints,	2	0
2	SPW, Wider gap Welding, compressed air preheating, 3 piece mould AT welding technique	4	0
3	Precautions to be observed during AT weld for good quality,	4	4
4	Tolerances for finished A.T. welds & FB Welds,	2	2
5	Brief idea about FB welds, Testing of welds, Mobile flash-butt welding	4	0
PSUIN119	RAIL FLAWS & TESTING	4	0
1	Visuals examination (keyman's)	2	0
2	USFD Testing	2	0
PSUIN120	TURNOUTS - INTRODUCTION	8	2
1	Turnouts, Definition and description of components and terms,	2	0
2	Standard types, Ordinary built-up and high manganese crossings straight switches, Curved switches, Thick web switches, Derailing switches, Spring points, other crossing types	4	2
3	Permissible speeds, Restriction on use of 1 in 8½ T/out on passenger running lines, symmetrical split	2	0
PSUIN121	TURNOUTS - ASSEMBLY & LAYING	6	0
1	Method of assembling all turnouts, Main dimensions and off sets of lead curve for setting out,	2	0
2	Diamond crossings, scissors crossovers with single and double slips, Definitions and description of components and terms, Switch diamonds, advantage of raising inside check rail of obtuse xings,	2	0
3	Methods of assembly,	2	0
	TRACK STRUCTURE -II		

PSUIN122	LEVEL CROSSINGS	13	5
1	Level crossings: Classification, types	2	0
2	Normal Position of Gates, Locking arrangement,	2	1
3	Equipments	1	1
4	Features of track at and in approaches of level crossings, Annual overhauling, Maintenance of road surface and approach track, Check rails-types, correct clearances, Visibility	4	0
5	Requirement Checking of equipments and knowledge of rules of gatemen,	0	1
7	Inspection of L-xing, Duties of gatekeeper, Hot axle train parting,	2	1
8	Speed breakers, Road sign Boards, Provision of new LC, Manning, De-manning, interlocking and replacement with ROB, closure, shifting and replacement with limited height subways/ RUBs , Elimination Specification	2	1
PSUIN123	BRIDGES & TRACK STRUCTURE ON BRIDGES	6	2
1	Bridges: Classification, Types, Track Structure on girder Bridges, ballasted decks, arch bridges, tunnels, provision of guard rails, re-railing ramps	2	2
2	Importance of maintaining correct gauge, Alignment and tight fastenings, Preparation, Renewal bridge timber & Steel channel sleeper,	2	0
3	Attention to approach track & strengthening, Cleaning of waterway, Checking guard rails.	2	0
PSUIN124	TUNNELS	2	0
PSUIN125	Ballast Depot, Training out ballast, DMT operation	2	0
PSUIN126	ASH PITS	2	0
PSUIN127	MECHANIZED MAINTENANCE	24	4
1	Need for mechanization, model of mechanized maintenance,	2	0
2	3 tiers system of track maintenance, Working of MMUs	6	0
3	Small track machines: types, use in maintenance, spot attention with off track tampers , Troubleshooting and system of repairs & maintenance	8	4
4	Pre-requisites to tamping and other machine working, Pre & Post and during attentions for tamping and other machine working,	8	0
PSUIN128	SURVEYING	8	4
1	General purpose of Surveying, introduction to common survey terms and principles of surveying & Levelling.	4	0
2	Exposure to commonly used instruments/tools that measure angles & distances i.e. Theodolite, Dumpy Levels, Total stations etc., Firsthand experience of carrying out topographic surveys at various scales, Interpretation and presentation/ reporting of survey data	4	4
	CURVES		
PSUIN129	HORIZONTAL CURVES	6	0
1	Degree of curve, Types of curves, Relation between degree, Radius, Chord and versine, Standard chords to be used for stringing,	2	0
2	Record in SE/P.Way's curve register checking of alignment after derailments and for turn in and turnout curves,	0	0
3	Super elevation / equilibrium cant, Maximum cant for normal and high speed trains, Cant deficiency and cant excess, Formula for safe speed on curves, Equilibrium speed, Calculation of cant to be provided and permissible speed, Transition length, Maximum cant gradient, Rates of running out of cant and cant deficiency.	4	0
PSUIN130	VERTICAL CURVES	6	0

1	Need for vertical curve, Grades, Equivalent radius,	2	0
2	Calculations and setting out a vertical curve, Level pegs for accurate maintenance,	2	0
3	Vertical curves on LWR	2	0
PSUIN131	REALIGNMENT OF CURVES	6	0
1	Re-alignment of curves, String lining of curves, Need for curve adjustment,	2	0
2	Criteria for realignment, Curve register, Versine survey,	2	0
3	Curve indication boards & curve posts.	2	0
PSUIN132	TRACK RENEWALS	16	0
1	Casual renewals, Complete track renewals, Through rail renewals, Through Sleeper renewals, Through fitting renewal and through ballast renewal,	4	0
2	Criteria for un-serviceability for casual renewals,	2	0
3	Criteria for TRR, TSR,	2	
4	Methods of renewals, Preparation, Labour Organisation, Tools, Ballast,	4	0
5	Careful handling of materials, Speed restrictions and post relaying attention,	2	0
6	Picking of released materials, Classification & disposal, Relaying with PQRS equipment, Record of relaying, Track relaying train, Relaying of turnout with T-28, New track laying standards, Handing over/Taking over of new track.	2	0
PSUIN133	INSPECTIONS, TRACK RECORDING & MONITORING	12	0
1	Object of inspection,	2	0
2	Riding quality, TGI, Track geometry, Condition of track structure, Correct methods of work, Testing knowledge of rules,	2	0
3	Method of Inspection: Push trolley, Motor trolley, Foot inspection, Engine & Rear van Inspection, Amsler car, TRRC, Oscillograph car, OMS, TFMS, Mobile USFD (Spurt Car)	2	0
4	Frequency of inspection: Inspection register, Repetitive defects and their Rectification, Permissible accelerations as recorded by oscillograph car,	2	0
5	Inspection of track geometry, inspection of Gang's work: quality, methods, progress, tools and equipments, knowledge of rules, attendance, Gang chart and diary, inspection of finished work, Inspection of bad riding spots, spots identified by TRC for urgent maintenance, Systematic measurement and investigation of defect	4	0
PSUIN134	ACCIDENTS & DISASTER MANAGEMENT	16	2
1	Duties of JE-II/P. Way in disaster management	2	0
2	Sounding of hooters & classification of accidents,	2	0
3	Action to be taken on reaching site, First aid, preservation of clues, Assessment of men and materials for restoration, Recording site and track particulars, Preparation of a sketch, Expeditious restoration,	4	0
4	Drivers report on bad riding, Breaches & its types, Prevention & action during breach, Vigilance on Railway Affecting tanks	4	0
5	Enquiries - General ideas about procedure and composition of Accident Committee,	0	0
6	Classification of enquiries & time schedule, Accidents at work spots, Engineering ART materials	0	0
7	Mechanism of derailment, Various defects of rolling stocks and IRCA's rejection limits, Disaster Management	4	2
	CE-MIS (TMS)		

PSUIN135	TMS	4	0
1	Track Management System: Introduction to TMS, purpose, advantages, main features	4	0
PSUIN136	CONTRACT MANAGEMENT	18	0
1	Definition of agreement /contract, Types & forms of contract	2	0
2	Various registers to be maintained for progress, Quality, safety of contractors persons, Safety measures at work site,	6	0
3	Accountal of new and Released material, Issue and receipt from contractors, Important points from vigilance angle,	4	0
4	Hiring of tools and plants to Contractors	2	0
5	Supervision of contractual works, Safety at work-site, Common ignorance. Dos & Don'ts for contract matters	4	0
PSUIN137	LAND MANAGEMENT	6	0
1	Demarcation of land boundaries,	2	0
2	Relinquishment of railway land,	2	0
3	Type of encroachments and PPE Act.	2	0
PSUIN138	COMPUTER & THEIR USAGE	16	12
1	Various languages suitable for Civil Engineering applications,	4	0
2	Windows,	4	4
3	MS- Office: Word, Excel, Access, PowerPoint	4	4
4	Use of Internet, Latest advancement in Information Technology & e-mail.	4	4
	SAFETY		
PSUIN139	CRS SANCTION & SCHEDULE OF DIMENSIONS	18	0
1	Works requiring CRS sanction	2	0
2	Various schedules of dimensions related to P. Way	8	0
3	Infringements, Register of infringements	2	0
4	Movement of ODC	2	0
5	Knowledge of GR & SR	4	0
PSUIN140	TRANSPORTATION	16	10
1	Knowledge of G R& SR, Various systems of working, Essentials of absolute & automatic block system,	4	2
2	Classification of stations, Simple layouts & condition for granting permission to approach, single line working on double line, Reception of train on blocked line and starting from non-signaled line, TFC, Interlocking, Recovery Time	4	4
3	Important definitions, General rules applying to Railway servants,	6	0
4	Signals, General provisions, Description of fixed signals, Hand signals, Detonating signal flare signal, Defective fixed signal, Rules for passing defective signals,	2	4
PSUIN141	OFFICE & STORES	6	0
1	Procuring of office stationary and stores, Procuring of P. Way stores for maintenance and for special works, Classification of stores, Accountal of stores, Stock verification reports, Disposal of scrap & surplus stores, Overhauling of stores, Numerical ledgers & inventory control, Section register of SE/P. Way	2	0
2	Classification of stores, Stock verification, Stock sheet, Submission of returns, Inventory control, Maintenance of DMTR and ledgers, Submission of store returns in time, Materials at site register, Imprest Store, T&P Store	2	0

3	Functioning of divisional Stores Depots and Track Depot, Requirement of materials for casual renewal and sanctioned renewals, Working out list for track materials, Proper care & upkeep of store.	2	0
PSUIN142	PERSONNEL	14	0
1	Muster, Pay sheet, Pay Bands, Grade Pay; Allowances,	1	0
2	Wage period, Bill preparation, Filling up of TA & OT Journals, Witnessing of payment, unpaid wages.	1	0
3	Passes (PTOs) and leave.	3	0
4	Welfare Schemes & SBF	2	0
5	Railway Services (Conduct) Rules, D&A Rules	3	0
6	Categories of staff under Hours of Employment Regulations	1	0
7	Labour Laws- overview; Display of Statutory Notices, Inspection by Labour Enforcement Officer	1	0
8	Payment of Wages Act, Minimum Wages Act, Contract Labour Act	2	0
9	Workmen's Compensation Act, Action in case of injury on duty, Ex-Gratia Payment-	2	0
PSUIN143	FIRST AID	7	4
1	Introduction-Safety first principles	2	0
2	First Aid Box & Application	2	4
3	Precautions	3	0
PSUIN144	RAJBHASHA	4	0
1	Directives regarding use of Raj Bhasha in day-to-day working.	4	0
	Total (10 weeks)	321	59
	Total	655	105
	Grand Total	760	
Note:- Periods suggested for Class Room and Model Room against the topics above are indicative. Minor modifications may be made with the approval of PCE, in case local circumstances so warrant.			

LIST OF SPECIFIED ACTIVITIES FOR FIELD TRAINING
(AFTER PHASE-I)

Sl. No.	Activity
1	Welding Operation and post welding tolerance measurement.
2	Measurement of gaps for gap survey in short welded Panel SWP.
3	Measurement of gaps at SEJ.
4	Inspection of Level Crossing and testing knowledge of safety rules of gate keeper including protection etc.
6	Measurement of toe load of the pandrol clips.
7	Checking of pre tamping & post tamping parameters
8	Deep screening work. Measurement of cushion after deep screening. Verification of levels.
9	With PWI USFD: Calibration of the USFD machine. Interpretation of the results of the scanning. Restoration of traffic, repair of buckling
10	De-stressing of the LWR.
11	Handling, Laying and Maintenance of Concrete Sleepers
12	Maintenance in Electrified and Track circuited areas.
13	Maintenance and laying of curved track.
14	Measurement of Rail temperature.
15	Visit to SE(Works) office: Records, registers and MBs
16	Visit to SE(Bridge) office, Inspection of bridge.
17	Visit to SE(TRD) office: Records, registers for engineering works
18	Visit to Divisional Control including Engineering control
19	Inspection of gang work, gang chart/diary, keyman's diary.
20	Inspection of T.outs, LWR, bridges etc.
21.	Measurement of ballast
22	Unloading of Ballast DMT
23.	Handling of rails.
24.	Overhauling of track
25.	Working of push trolley, dip lorry and motor trolley

**LIST OF SPECIFIED ACTIVITIES FOR FIELD TRAINING
(AFTER PHASE-II)**

Sl. No.	Activity
1	Measurement of curves i.e. versine survey, Super Elevation & other details of the curves.
2	Calculation of slews for the realignment of curves manually or by using software & design of curves thereby.
3	Survey for vertical profile correction by taking levels, Survey for Alignment Correction by Theodolite/ Auto setting level/Total Station for Operation of Tamping Machine in design Mode.
4	Inventory of material lying in the field.
5	Loading, unloading & stacking of material.
6	Working of stores.
7	Points and crossings and Layouts-Maintenance and laying
8	Reconditioning of points and crossing.
9	Understanding store working – indenting, procurement, storage, issuance, disposal, verification.
10	Visit to SE(C&W) office - Introductory
11	Visit to SE(Signal) office - Introductory
12	Maintenance and laying of curved track.
13	Surveying (use of Theodolite and leveling instrument)
14	Visit of Engineering ART
15	Attending TMS
16	Witnessing payment to staff
17	Supervision of contractual works/various records
18	Visit to AEN's office – set-up, information/record linked with P.way

Annexure- IV(c)**LIST OF SPECIFIED ACTIVITIES FOR FIELD TRAINING
(AS AND WHEN SCHEDULED)**

Sl. No.	Activity
1	Track Renewal works, CTR, TRR, TSR, TWR, TFR etc.
2	Accident, derailment, breaches etc. at any site.
3	Rail/weld fracture and its restoration.
4	Buckling of track and restoration.
5	Working of Rails/sleepers DMT controlled by HQ.
6	Stock verification in stores and at site.
7	Lubrication of rail joints and examination of rail ends.
8	Accompanying track recording/OMS Car.
9	PQRS Depot yard

Annexure- IV(d)**VISITS TO OTHER INSTITUTIONS
(AS AND WHEN SCHEDULED)**

<u>Subject</u>	<u>Institution</u>	<u>DURATION</u>
Track Machines	IRTMTC	2 WEEKS
Welding	TPP/LKO or TWTC/BZA	1 WEEKS
Transportation	ZRTI	2 WEEKS

ACTIVITY LIST FOR 'ON THE JOB ATTACHMENTS'

Sl. No.	Activity
1	Survey for longitudinal level and alignment of track.
2	Inspection of turnouts, level crossings, LWR/CWR, curves etc.
3	Measurement of toe load of the ERCs.
4	Associating as co-supervisor in working of Ballast DMT
5	Dealing of routine stores materials (Issue slips)
6	To associate in divisional Engineering. Control.
7	Associating as co-supervisor at any track renewal site.
8	Handling of routine stores materials (Issue slips)
9	Associating in divisional Engineering Control.
10	Associating as co-supervisor at any track renewal site.
11	Inspection of yard from SEJ to SEJ.
12	TMS work (both on office computer and on field data collection).
13	Measurement of P Way materials in line (New/SH/Serviceable/Unserviceable).
14	Cess Repair & cleaning
15	Boxing, Dressing & Ballasting
16	Stacking of Material (New, SH, U/S)
17	Fabricating of Glued joint in Depot
18	Replacement of broken/US fitting

List of Exhibits in Model Room**1. Rails , Joints & Defects****(A) Rails**

- 1) 60 kg
- 2) 52 kg
- 3) FF
- 4) BH
- 5) DH
- 6) 90 UTS
- 7) 72 UTS
- 8) Head Hardened

(B) Joints

- 1) Supported joints
- 2) Suspended joints
- 3) Fish plates – Ordinary
 - i. --for glued joints, 52 kg, 62 kg
- 4) Material for glued joint & insulated joints
- 5) SEJ Material – 60 kg/PSC, 52 kg (for glued and insulated joints)
- 6) 1 m long FPT 2186 with screw clamp T 2188
- 7) Joggles fish plate T5551 with 'c' clamp T 552, joggle fish plate with rail holes.
- 8) 1 m long Insulated glued joints
- 9) Ordinary insulated joints
- 10) Fish bolts
- 11) Rail screw

(C) Defects

- 1) Fractured rail pieces
- 2) Rail flaws
- 3) corrugation
- 4) Hogging
- 5) Fractured thick web switch
- 6) Damaged tongue rail

2. Sleepers , Fittings & Fastenings**(A) Sleepers**

- 1) Wooden
- 2) ST with mills close Jaw/steel key & ST with ERC
- 3) CST 9
- 4) Mono block pre-stressed concrete ERC
- 5) DSC 12
- 6) PSC sleepers for T/outs
- 7) PSC sleeper for fan shaped T/outs
- 8) Mono block with check rail provision
- 9) Mono block with IRN 304
- 10) POT sleepers
- 11) Polythene Dowel T3002
- 12) Template for augering & Edging Wooden Sleeper

(B) Fittings & Fastenings

- 1) GR pads (all types)
- 2) Metal liners (all types)
- 3) GFN liners (all types)
- 4) Composite liners (all types)
- 5) MCI inserts (all types)

Fittings for Wooden Sleepers

- 1) Dog spike
- 2) Round spike
- 3) Fang bolts
- 4) Screw spikes
- 5) Bearing plates
- 6) Mild steel canted bearing plate
- 7) Flat MS bearing plate
- 8) CI Anti creep bearing plate
- 9) special CI bearing plate for BH rail

Fittings for ST sleepers

- 1) Loose Jaw
- 2) Two way key
- 3) Rubber coated & Epoxy coated fish plates
- 4) Steel key T866

Fittings for CI sleepers

- 1) Cotters
- 2) MS Tie Bar
- 3) Spring washer – Single Coil, double coil

Elastic Fastenings

- 1) ERC – Mark I, II, III, IV
- 2) IRN 202, IRN304
- 3) Double sank elastic spike
- 4) Lock spike
- 5) spring steel clip
- 6) Sigma clip for II sleeper
- 7) RB-2 for ST sleeper
- 8) RB-3
- 9) RD 6

3. Welding**(A) Instruments for Thermit welding**

- 1) Thermit mixture
- 2) Crucible
- 3) Seal
- 4) Closing pin
- 5) Mould
- 6) Sand
- 7) Oxygen & LPG cylinder with regulator
- 8) Tapping & cleaning rod
- 9) Mould box with shoes for 25 mm & 75 mm welding
- 10) Filler gauge
- 11) 3 Piece AT welding mould & mould shoe.

(C) Safety gears for welding

- (1) Goggles
- (2) Hand gloves
- (3) Protective shoes

(D) Grinding

- (1) Portable Disc Grinder

(4) T/outs

- (1) Crossings
- (2) Crossing Bolts
- (3) Stud Bolts

(4) Heat Treated Crossing

(5) Level Crossing

- (1) Check rail on PRC sleeper
- (2) Equipments required on L-xing (gate)

(6) Bridge

- 1) Turn table spanner
- 2) Deck Type Girder
- 3) Semi through Girder
- 4) Under slung girder
- 5) Triangulated Through girder
- 6) Sunshine recorder
- 7) Nautical sextant
- 8) Rain gauge
- 9) Current meter
- 10) Fish weight
- 11) FRP sleeper
- 12) Channel steel sleeper
- 13) Thermo Hydrograph
- 14) Automatic Level Recorder
- 15) Bridge Plaques
- 16) Elastomeric bearings
- 17) Rocker bearings
- 18) Terfer
- 19) Winch
- 20) Pully Block
- 21) Screw clamps for CC Cribs
- 22) Sill clamps

6) N.D.T. Equipment

- (1) Rebound hammer
- (2) Ultrasonic pulse velocity tester
- (3) Pull off tester
- (4) Pull out tester

(7) C & W

- (1) Truss Bar (air brake)
- (2) Shackle Pin
- (3) Shackle link
- (4) Tyre defect gauge
- (5) BTM Brake block
- (6) Draw bar & coupling set
- (7) Buffer
- (8) Axle box
- (9) Axle guard
- (10) Buffer height gauge
- (11) Wheel diameter gauge
- (12) Spring chamber gauge
- (13) Buffer projection gauge
- (14) Wheel distance measuring gauge

(8) T & P

A. Measuring Devices

- (1) Rail gauge cum level
- (2) Rail gauge
- (3) Grip gauge
- (4) Rail dolly

- (5) P. way square
- (6) Cotter splitting machine
- (7) Travelling gauge
- (8) Spirit level
- (9) Gap gauge
- (10) P&C gauge
- (11) Magnifying glass
- (12) Speed recorder
- (13) Creep anchors
- (14) Rail clip applicator
- (15) Torque wrench
- (16) Flange way clearance gauge
- (17) Rollers for distressing
- (18) T/out offset gauge
- (19) Pneumatic drilling machine
- (20) PWI kit
- (21) Embedded Thermometer
- (22) Continuous temperature recorder
- (23) Check rail clearance scraper
- (24) Point locking clamp
- (25) Rail lifting hook
- (26) Hook bolts
- (27) Alignment clamp
- (28) Mono rail wheel barrow
- (29) Matisa curve corrector
- (30) CTR Tensor
- (31) Sleeper tong
- (32) Rail tong
- (33) P & M Lubricator
- (34) Rollers for de-stressing
- (35) Saddle plate
- (36) Slide chair
- (37) Switch anchor
- (38) Rail Wear Measuring gauge

B. MSP Kit

- (1) Canneaboule
- (2) Packing pieces
- (3) Visur & Mire
- (4) Special beater
- (5) Plain shovel
- (6) Dosing shovel
- (7) Packing shovel
- (8) Grating shovel
- (9) Densometer
- (10) Fleximeter
- (11) Non-infringing track jack
- (12) Measuring cane

C. Tools for Regular Maintenance Operations

- 1) Pick Axe
- 2) Beater
- 3) Phowrah
- 4) Round nose shovel
- 5) Rake ballast
- 6) Crow bar
- 7) Tommy bar
- 8) Ratchet with drill bit

- 9) Rail tong
- 10) Ballast compactor
- 11) Pan motor
- 12) Wire basket
- 13) Double ended spanner
- 14) Brush for ERC cleaning
- 15) Keying hammer
- 16) Box spanner
- 17) Auger carpenter

(9) Small Track Machines

- (1) Hydraulic Weld trimmer
- (2) Rail drilling machine
- (3) Abrasive rail cutter
- (4) Bosch tamper
- (5) Hydraulic Track lifting & slewing device
- (6) Hydraulic Jack
- (7) Mechanical Jack
- (8) Hydraulic Rail Tensor
- (9) Chamfering kit
- (10) Saw type rail cutting machine
- (11) Mechanical Jim crow
- (12) Hydraulic Rail joint straightener
- (13) Rail creep adjuster
- (14) Hydraulic Sleeper spacer
- (15) Concrete sleeper breaker with angle grinder
- (16) PRC sleeper drilling machine
- (17) Portable DC welding generator
- (18) Double action weld trimmer for AT welding (power pack version)
- (19) Rail profile weld grinder
- (20) Hydraulic Extractor
- (21) Toe load measuring device mechanical & electronic
- (22) Self propelled light weight trolley
- (23) Powered material trolley
- (24) Light weight rail (mono) cum road trolley
- (25) Attachment for rail dolly for PRC sleeper
- (26) Portable shoulder ballast compactor
- (27) Hydraulic Tralis slewing device

10) Safety Equipments

- (1) HS flag red & green
- (2) Banner flag with stand
- (3) Gate lamp
- (4) Tri colour HS lamp
- (5) Battery operated HS lamp
- (6) Detonators
- (7) Fuse
- (8) Caution indicator
- (9) Speed indicator
- (10) stop indicator
- (11) Termination board
- (12) W/L board
- (13) Hooter
- (14) Reflective clotting for night patrolman
- (15) Uniform for trackman

11) Other Structures

1. Model for works for short duration
2. Model for works for long duration
3. Model for automatic signal system
4. Catch siding
5. Slip siding
6. Sand hump from main line
7. Sand hump from loop line

List of Exhibits in Model Yard

1. Model for LC gate with protection
2. ISRT 1297 colour code
 - (a) Grade wise colour code
 - (b) Lengthwise colour code
3. Class II & III Rails colour coding as per IRPWM
4. Causeway of dip indication post
5. Rumble strip and speed breaker
6. Track Markers
 - (a) Detonator placing post
 - (b) Gradient post
 - (c) KM Post
 - (d) Fouling Mark
 - (e) Jurisdiction post
 - (f) Curve Board
 - (g) Material under Trial Board
 - (h) LWR Panel board
 - (i) Bounding Pillar
 - (j) Bridge Tablet
 - (k) Major river/Bridge indication post
7. Guard rails
8. Ballast Stack Markers
9. 1 in 12 fan shaped 60 kg switch
10. Combination joints 60 kg/52 kg/90R
11. RDSO/T84 check rail 1.85 m long ahead of switch
12. LC track structure with banner flag
13. Ballast less track
14. 52 kg Rail or sleeper track structure with speed board in Yard/Multiple line territory
15. Position of Engineering Indicators in Multispeed restrictions
16. Trolley refuge with Indicator Marker
17. Engineering Indicators
 - (a) T/G Indication Board
 - (b) T/P Indication Board
 - (c) Stop Indication board
 - (d) Speed Indication Board
 - (e) Caution Indication board
 - (f) FSP
 - (g) VTO
 - (h) Stop board on Gate boom/leaf
 - (i) W/L board
 - (j) 'G' Marker Indicator board
 - (k) U/M LC indicator Board
 - (l) Speed Breaker Indicator Board
 - (m) 'S' Marker Indicator Board
 - (n) Sag Clearance Indicator board
 - (o) Sag Approach Indicator Board
 - (p) 'T' Marker Indicator Board at Vulnerable Locations
 - (q) 'C' Marker Indicator board at Vulnerable Locations
 - (r) SEJ (all type)

PART- B

**REVISED TRAINING MODULES
(PROMOTIONAL & REFRESHER TRAINING)**

FOR

**PERMANENT WAY SUPERVISORS
(SE/P WAY, JE/ P WAY & SR. PWS)**

SALIENT RECOMMENDATIONS

1. Training Objectives:

The following are the main objectives for Promotional and Refresher Training, in the case of Permanent Way Supervisors:

- (a) Assessing the participants' level of knowledge;
- (b) Brainstorming about common problems and issues faced by them in the field working;
- (c) Re emphasizing priority areas, critical activities and safety instructions;
- (d) Refreshing theoretical concepts behind day to day working practices;
- (e) Focused capsules on specialized areas like Track Machines, Welding, General and Subsidiary Rules and other safety and operational aspects;
- (f) Updating participants regarding latest changes in technology, maintenance methods and revised instructions (viz. correction slips in codes and manuals, PCE circulars etc.) if any;
- (g) Sharing of knowledge, experience, best practices, indigenous solutions and innovations among participants;
- (h) Special focus on inter departmental coordination;
- (i) Imparting knowledge and skills in various areas of Management, viz.- Human Resource Management, Railway Finance and Budgeting, Contract Management and Materials Management etc.

2. Restructuring of Course content:

- (a) Narrative format of existing training modules has been restructured in the user friendly format of proper classification into major areas, topics, sub topics etc. and detailed lesson plans for the same have been drawn accordingly.
- (b) Topics have been reshuffled to ensure proper grouping and logical sequencing for easier learning and better retention and recall. To name a few major ones- SWR, LWR, welding and mechanized maintenance which are presently scheduled in quite later stage of existing course contents have been moved up the sequence in the proposed modules.

3. Greater Emphasis on Practical Aspects:

- (a) Refreshing the knowledge of track structure, maintenance practices, safety and operational rules, details of essential modern tools, plants and machinery used in track maintenance and apprising latest changes in technology, working practices and instructions are the targeted inputs in this training.
- (b) Most of these are direct inputs in practical day to day working.
- (c) Emphasis therefore has to be more on practical learning than on theoretical inputs.
- (d) As such, besides classroom lectures for theoretical knowledge, group discussions, brain storming sessions, visits to Model Rooms and actual field, as per requirement would be critical ingredients for achieving the desired training objectives.

4. Emphasis on Inter departmental coordination and joint works:

- (a) Recent advances in Signaling and Electrification, especially the gears around the track, have increased the requirement of close interaction of P Way supervisors with the supervisors of other departments involved in train operations. This has now become an important area of their day to day working.
- (b) Greater emphasize should be given to this area of joint works and Inter departmental coordination at the level of first line supervisors of various departments in promotional and refresher courses.

5. Apprising of Latest Instructions:

- (a) Various instructions are issued in the form of correction slips in various Manuals and PCE (Principal Chief Engineer's) circulars. Many of these do not get connected at the level of P Way supervisors working in the field.
- (b) Promotional and Refresher courses should provide ideal opportunity of updating the participants with the latest instructions and this should become an integral part of the Promotion and refresher training.

6. Training Methodology:-

- (a) Present training is overly dependent on old patterned classroom lecture methodology. Instructors generally come to the classrooms with their pre prepared notes and start dictating the same. This is not the appropriate method to address the trainees of promotion and refresher courses. These courses have a much shorter duration as compared to the induction courses and the participants are also not freshers but are already having fair experience of field working.
- (b) The teaching methodology need to be not so much instructor driven as driven by the specific needs of such experienced trainees.
- (c) Sessions need to be more interactive with lot of brainstorming and group discussions.
- (d) Courses should begin with a 'Diagnostic Session' wherein participants should be encouraged to share their field experiences and identify main technical/ managerial issues encountered frequently. This should define the focus of the training.
- (e) Lectures should be supplemented with actual case studies, group discussions and role plays etc.
- (f) Small projects should be made on common problems faced in the field and the groups of trainees should be encouraged to come- up with the suggestions to solve them.
- (g) These courses should also provide platform for sharing experiences, indigenous solutions and innovations.
- (h) Audio visual methods should be used extensively. Many films and animations have been developed by IRICEN and other institutions.
- (i) Instruction manuals provided by Original Equipment Manufacturers (OEMs) are also important and handy source of critical knowledge in respect of sophisticated equipments deployed in the field. These should be stocked in the training centre and can even be handed over to the participants in CDs or pen drives.
- (j) The training institutes themselves can involve trainee batches in taking photographs of important structures, tools and plants, modern machinery and making short video films of critical field activities.
- (k) It is necessary to opt for highly effective multi-sensory teaching techniques which would not be limited by the confines of classrooms or pre-fixed inflexible time schedules.

Annexure-VII			
MODULES FOR SE/ P WAY-PROMOTION			
Module No.	Lesson Content	Class Room	Model Room
PSEPR101	ORGANIZATION OF RAILWAYS , DUTIES OF P.WAY STAFF	2	0
1	Overview of organization of Railways	1	0
2	Duties of SSE/P.Way,	1	0
PSEPR102	RAILS & JOINTS	10	0
1	Careful loading, unloading, stacking & handling of rails, special precautions for high UTS/ HH rails.	2	0
2	Corrosion, Anticorrosion treatment	1	0
3	Wear & its causes	1	0
4	Joints, Types, fish-plate, fish-bolts, anti-sabotage fishbolts, Combination fish-plates, Skimmed fish-plates, Chamfering of bolt holes, expansion/contraction of rails, requirement and provision of gap at joints, gapless/machined joints, Relation to rail temperature,	2	0
5	Rail grinding	4	0
PSEPR103	SLEEPERS & FASTENINGS	12	0
1	Concrete sleepers , Twin block RCC, Mono-block pre-stressed, General aspects, Instructions for usability of different sleepers on different routes, main lines and long welded rails, Spl sleepers for L xings, turnout, SEJ, bridges approach and sharp curves	2	0
2	Precaution for handling of PSC sleepers.	1	0
3	PSC SLEEPERS: Density of sleepers on on different routes	2	0
4	Fastenings for PSC sleepers: Malleable cast iron inserts, Elastic Rail Clips, various types, toe load and its measurement, criteria for fastening renewal, Rubber pads, Liners, Anti sabotage arrangements for various sleepers, Creep anchors, method for fixing, Box anchoring ,Greasing and anti-corrosive measures	5	0
5	Sleepers at joints & their spacing for concrete sleeper track	2	0
PSEPR104	FORMATION & BALLAST	5	0
1	Sections of Track on Banks & Cuttings, Causes and remedy of Formation failure, Drainage	2	0
2	Ballast sections on different routes for straights and curves on single/double lines, On different gauges for fish plated track, SWR and LWR, Sections for branch lines, Loop and sidings.	2	0
3	Quantities for different sections, Specifications for track ballast.	1	0
PSEPR105	Railway track & track Structure-I	3	0
PSEPR106	Different Gauges,	1	0
PSEPR107	Classification of Routes	2	0
PSEPR108	TRACK STRCUTURE IN YARDS	6	0
1	Track Structure (yards) Simple layouts, loops, gathering neck , overrun line, shunting neck, hot axle/fuel/stabling siding,	2	0
2	Isolation derailing switch, Scotch block, Hay's derail, Sand hump, dead ends, Catch & slip siding, Fouling marks, Restriction in use of 1 in 8½ turnouts on passenger lines,	2	0
3	Restrictions regarding change of grade on approaches of turnout	2	0
PSEPR109	TURNOUTS - INTRODUCTION	6	0
1	Standard types, Ordinary built-up and high manganese crossings	2	0

	straight switches, Curved switches, Thick web switches, Derailing switches, Spring points, other crossing types		
2	Permissible speeds, Restriction on use of 1 in 8½ T/out on passenger running lines, symmetrical split	4	0
PSEPR110	TURNOUTS - ASSEMBLY & LAYING	14	0
1	Method of assembling all turnout, Main dimensions and off sets of lead curve for setting out,	4	0
2	Contrary and similar flexure turnouts: Definition, Calculations for lead & radius	2	0
3	Diamond crossings, scissors crossovers with single and double slips, Definitions and description of components and terms, Switch diamonds, advantage of raising inside check rail of obtuse xings,	4	0
4	Main dimensions for setting out, Laying & Maintenance of fan shaped turnouts, Maintenance of Turn /outs with reference to CMS crossing.	4	0
PSEPR111	CROSSOVERS	12	4
1	Calculation for laying cross over, Cross over between straight parallel tracks with same & different no. of crossings	2	0
2	Cross over between curved parallel tracks, Cross over between inclined tracks.	2	0
3	Scissors X-over, Definition and description of components and parts, Standard layouts, Methods of assembly, Main dimensions for setting out,	2	0
4	Calculations for different turnouts and spacing, Miscellaneous layouts: (1) Triangle (2) Three throw. (3) Double junctions (4) Gauntleted track (Brief description)	4	0
5	Hands on to Computer software for layout calculation	2	4
PSEPR112	DIVERSIONS	3	0
1	Standard for laying diversions,	1	0
2	Calculating length of diversions	2	0
	TRACK STRUCTURE -II		
PSEPR113	LEVEL CROSSINGS	7	0
1	Equipments	1	0
2	Features of track at and in approaches of level crossings, Annual overhauling, Maintenance of road surface and approach track, Check rails-types, correct clearances, Visibility	2	0
3	Requirement Checking of equipments and knowledge of rules of gatemen,	1	0
4	Inspection of L-xing, Duties of gatekeeper, Hot axle train parting,	1	0
5	Speed breakers, Road sign Boards, Provision of new LC, Manning, De-manning, interlocking and replacement with ROB, closure, shifting and replacement with limited height subways/ RUBs , Elimination Specification	2	0
PSEPR114	BRIDGES & TRACK STRUCTURE ON BRIDGES	6	0
1	Bridges: Classification, Types, Track Structure on girder Bridges, ballasted decks, arch bridges, tunnels, provision of guard rails, re-railing ramps	2	0
2	Importance of maintaining correct gauge, Alignment and tight fastenings, Preparation, Renewal bridge timber & Steel channel sleeper,	2	0
3	Attention to approach track & strengthening, Cleaning of waterway, Checking guard rails.	2	0
PSEPR115	TUNNELS	2	0
PSEPR116	Ballast Depot, Training out ballast, DMT operation	2	0

PSEPR117	ASH PITS	2	0
	WELDED RAILS		
PSEPR118	SHORT WELDED RAILS (SWR)	4	0
1	Conditions of laying, Maintenance of SWR,	2	0
2	Gap survey & adjustment of gap.	2	0
PSEPR119	LONG WELDED RAILS (LWR)	14	0
1	Permitted locations for laying, Track Structure, Laying of LWR,	1	0
2	De-stressing - with and without rail tensors	2	0
3	Repairs of Rail fracture,	2	0
4	Repairs of buckling,	2	0
5	Maintenance precautions, Overhauling, Deep screening, Renewal,	2	0
6	Determination of stress free temperature.	1	0
7	Inspection of LWR and remedial actions for correction of gaps at SEJ, Hysteresis loop	3	0
8	Competency level to carry out various works in LWR track, Dos & Don'ts	1	0
PSEPR120	WELDING OF RAILS	6	0
1	SPW, Wider gap Welding, compressed air pre-heating, 3 piece mould AT welding technique	2	0
2	Precautions to be observed during AT weld for good quality,	1	0
3	Tolerances for finished A.T. welds & FB Welds,	1	0
4	Brief idea about FB welds, Testing of welds, Mobile flash-butt welding	2	0
PSEPR121	RAIL FLAWS & TESTING	2	2
1	USFD Testing	2	2
PSEPR122	MAINTENANCE	6	0
1	Service, Maintenance tolerances and Approved methods, Beater packing, Off-track machines and 'On track' machines,	2	0
2	Approved systems, Systematic Maintenance conventional through packing, directed track maintenance and 3-tier system of maintenance	2	0
3	Record of Gang work, Gang chart/diary, Keyman's diary, Mate's diary, Record of work of Artisans and other workmen.	1	0
4	Half yearly reports on conditions of permanent way, PWI's Section Register, P. Way plans and diagrams	1	0
PSEPR123	REGULAR MAINTENANCE OPERATIONS	12	0
1	Overhauling,	1	0
2	Deep screening	2	0
3	Lubrication of joints and lubrication of rails in straight and on curves, maintenance of rail joints,	2	0
4	Buckling,	2	0
5	Overhauling, Coordination with signal and operating departments, Maximum wear of xing making up wear by welding, Welding of joints on turnouts, gapless joints for crossing joints.	2	0
6	Maintenance in electrified territories, maintenance of track circuited sections, use of insulated trolleys, Gauges and other tools, maintenance of insulated joints, glued joints. Felling/Cutting/pruning of trees obstructing view or very close to OHE	3	0
PSEPR124	PROTECTION, RESTRICTIONS & INDICATIONS	2	0
1	Hand signals in day and night, Hand flags, Hand lamps, Banner flags, Detonators & fusee, life of detonators, testing, fog signals/fusee	1	0
3	Works of short and long duration, Protection during emergency Caution order.	1	0

PSEPR125	MECHANIZED MAINTENANCE	12	0
1	3 tiers system of track maintenance, Working of MMUs	2	0
2	Small track machines: types, use in maintenance, spot attention with off track tampers , Troubleshooting and system of repairs & maintenance	3	0
3	Pre-requisites to tamping and other machine working, Pre & Post and during attentions for tamping and other machine working,	3	0
4	Design mode tamping : survey and procedure of tamping	4	0
PSEPR126	TROLLEY/LORRY/DOLLY WORKING	2	0
1	Working of Push Trolley, Lorry & motor Trolley, Its equipment,	1	0
2	Protection, Working of rail dolly and its protection	1	0
PSEPR127	RECONDITIONING OF MATERIALS AND TOOLS	4	0
1	Reconditioning of P. Way materials, Rails, Welding of scabbed rails, cropping of rail ends, hole drilling and chamfering of bolt hole in rails	2	0
2	Reconditioning of worn out crossings and switches, type of electrodes used, RDSO approved vendor and welder system	2	0
	SAFETY		
PSEPR128	CRS SANCTION & SCHEDULE OF DIMENSIONS	4	0
1	Works requiring CRS sanction	1	0
2	Various schedules of dimensions related to P. Way	1	0
3	Infringements, Register of infringements	1	0
4	Movement of ODC	1	0
PSEPR129	SURVEYING	6	2
1	General purpose of Surveying, introduction to common survey terms and principles of surveying & Levelling.	2	0
2	Exposure to commonly used instruments/tools that measure angles & distances i.e. Theodolite, Dumpy Levels, Total stations etc., Firsthand experience of carrying out topographic surveys at various scales, Interpretation and presentation/ reporting of survey data	4	2
	CURVES		
PSEPR130	HORIZONTAL CURVES	11	0
1	Super elevation / equilibrium cant, Maximum cant for normal and high speed trains, Cant deficiency and cant excess, Formula for safe speed on curves, Equilibrium speed, Calculation of cant to be provided and permissible speed, Transition length, Maximum cant gradient, Rates of running out of cant and cant deficiency.	4	0
2	Types of curves, Setting out of curves, Cubic parabola off sets for setting out transition curve, Shift calculations for setting out complete curve with theodolite.	2	0
3	Miscellaneous - Running out cant on transitioned curves, Gradient rail, Laying of rails on curves, Mid stagger joints and on sharp curves, Curve markers and cant boards, Lubrication on curves,	2	0
4	Widening of gauge on curves, Extra clearance on curves, Minimum length of straight between reverse curves,	1	0
5	Curves with similar and contrary flexure, Calculation of cant to be provided and permissible speed, Curve with X-over and diamonds	2	0
PSEPR131	VERTICAL CURVES	4	0
1	Calculations and setting out a vertical curve, Level pegs for accurate maintenance,	2	0
2	Vertical curves on LWR	2	0
PSEPR132	REALIGNMENT OF CURVES	12	2

1	Re-alignment of curves, String lining of curves, Need for curve adjustment,	2	0
2	Criteria for realignment, Curve register, Versine survey,	2	0
3	Calculations of slews by double summation method,	2	0
4	Slewing to revised versine, Local adjustment,	2	0
5	Optimization method of curve realignment,	2	0
6	Hands on to Computer software for curve realignment calculations	2	2
PSEPR133	TRACK RENEWALS	6	0
1	Methods of renewals, Preparation, Labour Organization, Tools, Ballast, Criteria for various track renewal works	2	0
2	Careful handling of materials, Speed restrictions and post relaying attention,	1	0
3	Picking of released materials, Classification & disposal, Relaying with PQRS equipment, Record of relaying, Track relaying train, Relaying of turnout with T-28, New track laying standards, Handing over/Taking over of new track.	3	0
PSEPR134	INSPECTIONS, TRACK RECORDING & MONITORING	8	0
1	Riding quality, TGI, Track geometry, Condition of track structure, Correct methods of work, Testing knowledge of rules,	2	0
2	Inspection of Points & Crossings, Curves & other special Structure and their frequency of inspection	2	0
3	Method of Inspection: Push trolley, Motor trolley, Foot inspection, Engine & Rear van Inspection, Amsler car, TRRC, Oscillograph car, OMS, TFMS, Mobile USFD (Spurt Car)	2	0
4	Inspection of track geometry, inspection of Gang's work: quality, methods, progress, tools and equipments, knowledge of rules, attendance, Gang chart and diary, inspection of finished work, Inspection of bad riding spots, spots identified by TRC for urgent maintenance, Systematic measurement and investigation of defect	2	0
PSEPR135	ACCIDENTS & DISASTER MANAGEMENT	10	0
1	Duties of SE/P. Way in disaster management	1	0
2	Action to be taken on reaching site, First aid, preservation of clues, Assessment of men and materials for restoration, Recording site and track particulars, Preparation of a sketch, Expeditious restoration,	2	0
3	Drivers report on bad riding, Breaches & its types, Prevention & action during breach, Vigilance on Railway Affecting tanks	1	0
4	Enquiries - General ideas about procedure and composition of Accident Committee,	2	0
5	Classification of enquiries & time schedule, Accidents at work spots, Engineering ART materials	2	0
6	Mechanism of derailment, Various defects of rolling stocks and IRCA's rejection limits, Disaster Management	2	0
	CE-MIS (TMS)		
PSEPR136	TMS	2	0
1	Track Management System: Introduction to TMS, purpose, advantages, main features	2	0
PSEPR137	CONTRACT MANAGEMENT	10	0
1	Tenders, Tender committee, GCC & SCC, SOR for P. Way works, Quality control measures at site,	1	0
2	Various registers to be maintained for progress, Quality, safety of contractors persons, Safety measures at work site,	1	0
3	Accountal of new and Released material, Issue and receipt from	2	0

	contractors, Important points from vigilance angle,		
4	Preparation of Contractor's On-Account/Running & Final Bills, Material Statements, Maintenance Period, Warranty/guarantee clauses, release of security deposit	2	0
5	Hiring of tools and plants to Contractors	1	0
6	Supervision of contractual works, Safety at work-site, Common ignorance. Dos & Don'ts for contract matters	2	0
7	Duties towards payment to contractor's labour and maintenance of records as per labour laws	1	0
PSEPR138	LAND MANAGEMENT	3	0
1	Demarcation of land boundaries.	1	0
2	Relinquishment of railway land.	1	0
3	Type of encroachments and PPE Act.	1	0
PSEPR139	COMPUTER & THEIR USAGE	6	10
1	Various languages suitable for Civil Engineering applications.	2	4
2	MS- Office: Word, Excel, Access, PowerPoint	3	4
3	Use of Internet, Latest advancement in Information Technology & e-mail.	1	2
PSEPR140	TRANSPORTATION	6	0
1	Various systems of working, Essentials of absolute & automatic block system, ODC, single line working on double lines, Working of Track Machines	3	0
2	Classification of stations, Simple layouts & condition for granting permission to approach, Reception of train on blocked line and starting from non-signaled line, TFC, Interlocking, Recovery Time	2	0
3	Signals, General provisions, Description of fixed signals, Hand signals, Detonating signal flare signal, Defective fixed signal, Rules for passing defective signals,	1	0
PSEPR141	OFFICE & STORES	3	0
1	Procuring of office stationary and stores, Procuring of P. Way stores for maintenance and for special works, Classification of stores, Accountal of stores, Stock verification reports, Disposal of scrap & surplus stores, Overhauling of stores, Numerical ledgers & inventory control, Section register of SE/P. Way	1	0
2	Classification of stores, Stock verification, Stock sheet, Submission of returns, Inventory control, Maintenance of DMTR and ledgers, Submission of store returns in time, Materials at site register, Imprest Store, T&P Store	1	0
3	Functioning of divisional Stores Depots and Track Depot, Requirement of materials for casual renewal and sanctioned renewals, Working out list for track materials, Proper care & upkeep of store.	1	0
PSEPR142	PERSONNEL	14	0
1	Wage period, Bill preparation, Filling up of TA & OT Journals, Witnessing of payment, unpaid wages	1	0
2	Passes and leave	1	0
3	Establishment Records in SSE/ JE P Way office	1	0
4	Trade Test; Other channels of promotions	1	0
5	Settlement:- PF, Pension, Gratuity, Leave Encashment; Filling up of Pension Booklet	1	0
6	Welfare Schemes & SBF	1	0
7	Industrial Relations:-Unions & Associations, PNM, JCM	1	0

8	Railway Services (Conduct) Rules, D&A Rules	1	0
9	Categories of staff under Hours of Employment Regulations	1	0
10	Labour Laws- overview; Display of Statutory Notices, Inspection by Labour Enforcement Officer	2	0
11	Payment of Wages Act, Minimum Wages Act, Contract Labour Act	2	0
12	Workmen's Compensation Act, Action in case of injury on duty, Ex-Gratia Payment	1	0
PSEPR143	RAJBHASHA	2	0
1	Directives in use of Raj Bhasha in day-to-day working.	2	0
	TOTAL	260	20
	GRAND TOTAL	280	

Note:- Periods suggested for Class Room and Model Room against the topics above are indicative. Minor modifications may be made with the approval of PCE, in case local circumstances so warrant.

Annexure-VIII			
MODULES FOR JE/ P WAY-PROMOTION			
Module No.	Lesson Content	Class Room	Model Room
PJEPR101	ORGANIZATION OF RAILWAYS , DUTIES OF P.WAY STAFF	3	0
1	Overview of organization of Railways	1	0
2	Brief introduction to Track and its components particularly related with inspection	1	0
3	Duties of JE/P. Way,	1	0
PJEPR102	RAILS & JOINTS	30	4
1	Rail, Evaluation of Weight and its relation to axle loads,	2	0
2	Standard sections, grade, UTS & service life, classification, Rolling marks,	2	0
3	Careful loading, unloading, stacking & handling of rails, special precautions for high UTS/ HH rails.	2	0
4	Corrosion, Anticorrosion treatment	2	0
5	Wear & its causes	2	0
6	Joints, Types, fish-plate, fish-bolts, anti-sabotage fishbolts, Combination fish-plates, Skimmed fish-plates, Chamfering of bolt holes, expansion/contraction of rails, requirement and provision of gap at joints, gapless/machined joints, Relation to rail temperature,	4	0
7	Insulated, Expansion joints for bridges & long welded rails,	2	0
8	Fracture, codification, Restoration of traffic, how to report	2	0
9	Preservation and testing of fractured rails,	2	0
10	USFD: Ultrasonic flaw detection, fundamentals of ultrasonic waves, defect detection, need based concept of USFD, components tested, frequency of testing, marking of defects, action to be taken, brief description of various types of USFD machines and probes used, calibration and sensitivity checking, defect codification, limitations of USFD, SPURT Car	6	4
11	Rail grinding	4	0
PJEPR103	SLEEPERS & FASTENINGS	14	0
1	Number & pattern of driving spikes or screws on straight, Curves, Turnouts & bridges, Instructions for use of bearing plates, Dating of wooden sleepers, Composite sleepers.	2	0
2	Concrete sleepers , Twin block RCC, Mono-block pre-stressed, General aspects, Instructions for usability of different sleepers on different routes, main lines and long welded rails, Spl sleepers for L xings, turnout, SEJ, bridges approach and sharp curves	2	0
3	Precaution for handling of PSC sleepers.	2	0
4	Fastenings for PSC sleepers: Malleable cast iron inserts, Elastic Rail Clips, various types, toe load and its measurement, criteria for fastening renewal, Rubber pads, Liners, Anti sabotage arrangements for various sleepers, Creep anchors, method for fixing, Box anchoring, Greasing and anti-corrosive measures	4	0
5	Sleepers at joints & their spacing for concrete sleeper track	4	0
PJEPR104	FORMATION & BALLAST	10	0
1	Typical sections of track on banks and cuttings for single/double lines on all gauges,	2	0
2	Drainage, Slope on top of formation, side and catch water drains,	2	0

3	Causes for formation failure (Rehabilitation of weak formation).	2	0
4	Ballast sections on different routes for straights and curves on single/double lines, On different gauges for fish plated track, SWR and LWR, Sections for branch lines, Loop and sidings.	2	0
5	Quantities for different sections.	1	0
6	Specification for track ballast	1	0
PJEPR105	Railway track & track Structure-I	4	0
PJEPR106	Different Gauges,	2	0
PJEPR107	Classification of Routes	2	0
PJEPR108	TRACK STRCUTURE IN YARDS	6	2
1	Track Structure (yards) Simple layouts, loops, gathering neck , overrun line, shunting neck, hot axle/fuel/stabling siding,	2	1
2	Isolation derailing switch, Scotch block, Hay's derail, Sand hump, dead ends, Catch & slip siding, Fouling marks, Restriction in use of 1 in 8½ turnouts on passenger lines,	2	1
3	Restrictions regarding change of grade on approaches of turnout	2	0
PJEPR109	TURNOUTS - INTRODUCTION	6	0
1	Standard types, Ordinary built-up and high manganese crossings straight switches, Curved switches, Thick web switches, Derailing switches, Spring points, other crossing types	2	0
2	Permissible speeds, Restriction on use of 1 in 8½ T/out on passenger running lines, symmetrical split	4	0
PJEPR110	TURNOUTS - ASSEMBLY & LAYING	18	0
1	Method of assembling all turnouts, Main dimensions and off sets of lead curve for setting out,	4	0
2	Contrary and similar flexure turnouts: Definition, Calculations for lead & radius	4	0
3	Diamond crossings, scissors crossovers with single and double slips, Definitions and description of components and terms, Switch diamonds, advantage of raising inside check rail of obtuse xings,	4	0
4	Methods of assembly,	4	0
5	Main dimensions for setting out, Laying & Maintenance of fan shaped turnouts, Maintenance of Turn /outs with reference to CMS crossing.	2	0
PJEPR111	CROSSOVERS	14	4
1	Calculation for laying cross over, Cross over between straight parallel tracks with same & different no. of crossings	4	0
2	Cross over between curved parallel tracks, Cross over between inclined tracks.	2	0
3	Scissors X-over, Definition and description of components and parts, Standard layouts, Methods of assembly, Main dimensions for setting out,	2	0
4	Calculations for different turnouts and spacing, Miscellaneous layouts: (1) Triangle (2) Three throw. (3) Double junctions (4) Gauntleted track (Brief description)	2	0
5	Hands on to Computer software for layout calculation	4	4
PJEPR112	DIVERSIONS	6	0
1	Definition, Types of diversions,	2	0
2	Standard for laying diversions,	2	0
3	Calculating length of diversions	2	0
	TRACK STRUCTURE -II		
PJEPR113	LEVEL CROSSINGS	8	0

1	Features of track at and in approaches of level crossings, Annual overhauling, Maintenance of road surface and approach track, Check rails-types, correct clearances, Visibility	2	0
2	Requirement Checking of equipments and knowledge of rules of gatemen,	2	0
3	Inspection of L-xing, Duties of gatekeeper, Hot axle train parting,	2	0
4	Speed breakers, Road sign Boards, Provision of new LC, Manning, De-manning, interlocking and replacement with ROB, closure, shifting and replacement with limited height subways/ RUBs , Elimination Specification	2	0
PJEPR114	BRIDGES & TRACK STRUCTURE ON BRIDGES	6	0
1	Bridges: Classification, Types, Track Structure on girder Bridges, ballasted decks, arch bridges, tunnels, provision of guard rails, re-railing ramps	2	0
2	Importance of maintaining correct gauge, Alignment and tight fastenings, Preparation, Renewal bridge timber & Steel channel sleeper,	2	0
3	Attention to approach track & strengthening, Cleaning of waterway, Checking guard rails.	2	0
PJEPR115	TUNNELS	2	0
PJEPR116	Ballast Depot, Training out ballast, DMT operation	6	0
PJEPR117	ASH PITS	2	0
	WELDED RAILS		
PJEPR118	SHORT WELDED RAILS (SWR)	4	0
1	Conditions of laying, Maintenance of SWR,	2	0
2	Gap survey & adjustment of gap.	2	0
PJEPR119	LONG WELDED RAILS (LWR)	21	0
1	Permitted locations for laying, Track Structure, Laying of LWR,	2	0
2	De-stressing - with and without rail tensors	4	0
3	Repairs of Rail fracture,	4	0
4	Repairs of buckling,	4	0
5	Maintenance precautions, Overhauling, Deep screening, Renewal,	2	0
6	Determination of stress free temperature.	2	0
7	Inspection of LWR and remedial actions for correction of gaps at SEJ, Hysteresis loop	2	0
8	Competency level to carry out various works in LWR track, Dos & Don'ts	1	0
PJEPR120	WELDING OF RAILS	8	0
1	SPW, Wider gap Welding, compressed air preheating, 3 piece mould AT welding technique	2	0
2	Precautions to be observed during AT weld for good quality,	2	0
3	Tolerances for finished A.T. welds & FB Welds,	2	0
4	Brief idea about FB welds, Testing of welds, Mobile flash-butt welding	2	0
PJEPR121	RAIL FLAWS & TESTING	6	4
1	Visuals examination (Keyman's)	2	0
2	USFD Testing	4	4
PJEPR122	MAINTENANCE	6	0
1	Approved systems, Systematic Maintenance conventional through packing, directed track maintenance and 3-tier system of maintenance	2	0
2	Record of Gang work, Gang chart/diary, Keyman's diary, Mate's diary,	2	0

	Record of work of Artisans and other workmen.		
3	Half yearly reports on conditions of permanent way, PWI's Section Register, P. Way plans and diagrams	2	0
PJEPR123	REGULAR MAINTENANCE OPERATIONS	20	0
1	Maintenance of concrete sleeper track		
2	Deep screening	4	0
3	Lubrication of joints and lubrication of rails in straight and on curves, maintenance of rail joints,	2	0
4	Incidental works: Creep, Importance of joint gaps, Gap surveys,	2	0
5	Buckling,	2	0
6	Lifting and lowering of track: Undesirability of lowering maximum lifting/lowering at one time, Provision of ramps at ends, Adequate ballast cushion and drainage after lowering.	1	0
7	Maintenance of special layout : Points & Crossings, SE/P. Way's register,	4	0
8	Overhauling, Coordination with signal and operating departments, Maximum wear of xing making up wear by welding, Welding of joints on turnouts, gapless joints for crossing joints.	2	0
9	Special attention to maintenance of platform lines and drainage, corrosion of rails, metal sleepers, fastening of concrete sleepers and problem of groove formation, maintenance of turn in curves	1	0
10	Maintenance in electrified territories, maintenance of track circuited sections, use of insulated trolleys, Gauges and other tools, maintenance of insulated joints, glued joints. Felling/Cutting/pruning of trees obstructing view or very close to OHE	2	0
PJEPR124	PROTECTION, RESTRICTIONS & INDICATIONS	4	0
1	Hand signals in day and night, Hand flags, Hand lamps, Banner flags, Detonators & fusee, life of detonators, testing, fog signals/fusee	1	0
2	Engineering, Indicators, Temporary and permanent,	1	0
3	Works of short and long duration, Protection during emergency Caution order.	2	0
PJEPR125	PATROLLING	8	0
1	Necessity of patrolling,	1	0
2	Kinds of patrolling i.e. Key men's daily patrol, Gang patrol, Monsoon security, Hot and cold weather patrolling, Watch at vulnerable points, Weather warnings, Single and double frequency patrolling,	2	0
3	Patrol charts, Patrol books and equipments, Selection and duties of patrolmen,	2	0
4	Night checks & Inspections	2	0
5	Felling/Cutting/pruning of trees obstructing view, very close to OHE	1	0
PJEPR126	MECHANIZED MAINTENANCE	8	0
1	3 tiers system of track maintenance, Working of MMUs	2	0
2	Small track machines: types, use in maintenance, spot attention with off track tampers , Troubleshooting and system of repairs & maintenance	2	0
3	Pre-requisites to tamping and other machine working, Pre & Post and during attentions for tamping and other machine working,	2	0
4	Design mode tamping : survey and procedure of tamping	2	0
PJEPR127	TOOLS & EQUIPMENTS	3	0
1	Measuring tools	1	0
2	MSP Tool kit	1	0

3	Regular Maintenance Tools	1	0
PJEPR128	TROLLEY/LORRY/DOLLY WORKING	3	0
1	Distinction between Trolley, Lorry & motor Trolley,	1	0
2	Protection, Working of rail dolly and its protection	2	0
PJEPR129	RECONDITIONING OF MATERIALS AND TOOLS	2	0
1	Reconditioning of worn out crossings and switches, type of electrodes used, RDSO approved vendor and welder system	2	0
	SAFETY		
PJEPR130	CRS SANCTION & SCHEDULE OF DIMENSIONS	4	0
1	Works requiring CRS sanction	1	0
2	Various schedules of dimensions related to P. Way	2	0
3	Movement of ODC	1	0
PJEPR131	SURVEYING	6	0
1	General purpose of Surveying, introduction to common survey terms and principles of surveying & Levelling.	2	0
2	Exposure to commonly used instruments/tools that measure angles & distances i.e. Theodolite, Dumpy Levels, Total stations etc., Firsthand experience of carrying out topographic surveys at various scales, Interpretation and presentation/ reporting of survey data	4	0
	CURVES		
PJEPR132	HORIZONTAL CURVES	16	0
1	Degree of curve, Types of curves, Relation between degree, Radius, Chord and versine, Standard chords to be used for stringing,	2	0
2	Record in SE/P.Way's curve register checking of alignment after derailments and for turn in and turnout curves,	2	0
3	Super elevation / equilibrium cant, Maximum cant for normal and high speed trains, Cant deficiency and cant excess, Formula for safe speed on curves, Equilibrium speed, Calculation of cant to be provided and permissible speed, Transition length, Maximum cant gradient, Rates of running out of cant and cant deficiency.	2	0
4	Types of curves, Setting out of curves, Cubic parabola off sets for setting out transition curve, Shift calculations for setting out complete curve with theodolite.	2	0
5	Miscellaneous - Running out cant on transitioned curves, Gradient rail, Laying of rails on curves, Mid stagger joints and on sharp curves, Curve markers and cant boards, Lubrication on curves,	2	0
6	Widening of gauge on curves, Extra clearance on curves, Minimum length of straight between reverse curves,	2	0
7	Curves with similar and contrary flexure, Calculation of cant to be provided and permissible speed, Curve with X-over and diamonds	4	0
PJEPR133	VERTICAL CURVES	8	0
1	Calculations and setting out a vertical curve, Level pegs for accurate maintenance,	4	0
2	Vertical curves on LWR	4	0
PJEPR134	REALIGNMENT OF CURVES	18	4
1	Re-alignment of curves, String lining of curves, Need for curve adjustment,	2	0
2	Calculations of slews by double summation method,	4	0
3	Slewing to revised versine, Local adjustment,	2	0
4	Optimization method of curve realignment,	4	0
5	Hands on to Computer software for curve realignment calculations	6	4

PJEPR135	TRACK RENEWALS	9	0
1	Casual renewals, Complete track renewals, Through rail renewals, Through Sleeper renewals, Through fitting renewal and through ballast renewal,	2	0
2	Criteria for unserviceability for casual renewals,	1	0
3	Criteria for various track renewal works	1	
4	Methods of renewals, Preparation, Labour Organisation, Tools, Ballast,	2	0
5	Careful handling of materials, Speed restrictions and post relaying attention,	1	0
6	Picking of released materials, Classification & disposal, Relaying with PQRS equipment, Record of relaying, Track relaying train, Relaying of turnout with T-28, New track laying standards, Handing over/Taking over of new track.	2	0
PJEPR136	INSPECTIONS, TRACK RECORDING & MONITORING	7	0
1	Riding quality, TGI, Track geometry, Condition of track structure, Correct methods of work, Testing knowledge of rules,	1	0
2	Inspection of Points & Crossings, Curves & other special Structure and their frequency of inspection	2	0
2	Method of Inspection: Push trolley, Motor trolley, Foot inspection, Engine & Rear van Inspection, Amsler car, TRRC, Oscillograph car, OMS, TFMS, Mobile USFD (Spurt Car)	2	0
3	Inspection of track geometry, inspection of Gang's work: quality, methods, progress, tools and equipments, knowledge of rules, attendance, Gang chart and diary, inspection of finished work, Inspection of bad riding spots, spots identified by TRC for urgent maintenance, Systematic measurement and investigation of defect	2	0
PJEPR137	ACCIDENTS & DISASTER MANAGEMENT	8	0
1	Duties of JE-II/P. Way in disaster management	1	0
2	Sounding of hooters & classification of accidents,	1	0
3	Action to be taken on reaching site, First aid, preservation of clues, Assessment of men and materials for restoration, Recording site and track particulars, Preparation of a sketch, Expeditious restoration,	1	0
4	Drivers report on bad riding, Breaches & its types, Prevention & action during breach, Vigilance on Railway Affecting tanks	1	0
5	Enquiries - General ideas about procedure and composition of Accident Committee,	0	0
6	Classification of enquiries & time schedule, Accidents at work spots, Engineering ART materials	2	0
7	Mechanism of derailment, Various defects of rolling stocks and IRCA's rejection limits, Disaster Management	2	0
	CE-MIS (TMS)		
PJEPR138	TMS	4	0
1	Track Management System: Introduction to TMS, purpose, advantages, main features	4	0
PJEPR139	CONTRACT MANAGEMENT	12	0
1	Various registers to be maintained for progress, Quality, safety of contractors persons, Safety measures at work site,	2	0
2	Preparation of Contractor's On-Account/Running & Final Bills, Material Statements, Maintenance Period, Warranty/guarantee clauses, release of security deposit	2	0
3	Hiring of tools and plants to Contractors	2	0
4	Supervision of contractual works, Safety at work-site, Common	2	0

	ignorance. Dos & Don'ts for contract matters		
5	Termination, Disputes, redressal, arbitration	2	0
6	Duties towards payment to contractor's labour and maintenance of records as per labour laws	2	0
PJEPR140	LAND MANAGEMENT	6	0
1	Demarcation of land boundaries,	2	0
2	Relinquishment of railway land,	2	0
3	Type of encroachments and PPE Act.	2	0
PJEPR141	COMPUTER & THEIR USAGE	4	4
1	Windows,	2	2
2	Use of Internet, Latest advancement in Information Technology & e-mail.	2	2
PJEPR142	TRANSPORTATION	6	0
1	Classification of stations, Simple layouts & condition for granting permission to approach, single line working on double line, Reception of train on blocked line and starting from non-signaled line, TFC, Interlocking, Recovery Time	2	0
2	Important definitions, General rules applying to Railway servants, ODC, single line working on double lines, Working of Track Machines	2	0
3	Signals, General provisions, Description of fixed signals, Hand signals, Detonating signal flare signal, Defective fixed signal, Rules for passing defective signals,	2	0
PJEPR143	OFFICE & STORES	5	0
1	Procuring of office stationary and stores, Procuring of P. Way stores for maintenance and for special works, Classification of stores, Accountal of stores, Stock verification reports, Disposal of scrap & surplus stores, Overhauling of stores, Numerical ledgers & inventory control, Section register of SE/P. Way	2	0
2	Classification of stores, Stock verification, Stock sheet, Submission of returns, Inventory control, Maintenance of DMTR and ledgers, Submission of store returns in time, Materials at site register, Imprest Store, T&P Store	2	0
3	Functioning of divisional Stores Depots and Track Depot, Requirement of materials for casual renewal and sanctioned renewals, Working out list for track materials, Proper care & upkeep of store.	1	0
PJEPR144	PERSONNEL	9	0
1	Wage period, Bill preparation, Filling up of TA & OT Journals, Witnessing of payment, unpaid wages	1	0
2	Passes and leave	1	0
3	Establishment Records in SSE/ JE P Way office	1	0
4	Settlement:- PF, Pension, Gratuity, Leave Encashment; Filling up of Pension Booklet	1	0
5	Railway Services (Conduct) Rules, D&A Rules	1	0
6	Categories of staff under Hours of Employment Regulations	1	0
7	Labour Laws- overview; Display of Statutory Notices, Inspection by Labour Enforcement Officer	1	0
8	Payment of Wages Act, Minimum Wages Act, Contract Labour Act	1	0
9	Workmen's Compensation Act, Action in case of injury on duty, Ex-Gratia Payment	1	0
PJEPR145	RAJBHASHA	2	0
1	Directives in use of Raj Bhasha in day-to-day working.	2	0

	Total	338	22
	Grand Total	360	
Note:- Periods suggested for Class Room and Model Room against the topics above are indicative. Minor modifications may be made with the approval of PCE, in case local circumstances so warrant.			

Annexure-IX			
MODULES FOR SENIOR PWS-PROMOTION			
Module No.	Lesson Content	Class Room	Model Room
PSUPR101	ORGANIZATION OF RAILWAYS , DUTIES OF P.WAY STAFF	3	0
1	Overview of organization of Railways	1	0
2	Brief introduction to Track and its components particularly related with inspection	1	0
3	Duties of PWS,	1	0
PSUPR102	RAILS & JOINTS	15	0
1	Standard sections, grade, UTS & service life, classification, Rolling marks,	2	0
2	Careful loading, unloading, stacking & handling of rails, special precautions for high UTS/ HH rails.	2	0
3	Corrosion, Anticorrosion treatment	2	0
4	Wear & its causes	2	0
5	Joints, Types, fish-plate, fish-bolts, anti-sabotage fishbolts, Combination fish-plates, Skimmed fish-plates, Chamfering of bolt holes, expansion/contraction of rails, requirement and provision of gap at joints, gapless/machined joints, Relation to rail temperature,	2	0
6	Insulated glued joints, Expansion joints for bridges & long welded rails,	1	0
7	Fracture, codification, Restoration of traffic, how to report	2	0
8	Rail grinding	2	0
PSUPR103	SLEEPERS & FASTENINGS	12	0
1	Number & pattern of driving spikes or screws on straight, Curves, Turnouts & bridges, Instructions for use of bearing plates, Dating of wooden sleepers, Composite sleepers.	2	0
2	Concrete sleepers , Twin block RCC, Mono-block pre-stressed, General aspects, Instructions for usability of different sleepers on different routes, main lines and long welded rails, Special sleepers for L xings, turnout, SEJ, bridges approach and sharp curves	4	0
3	Precaution for handling of PSC sleepers.	2	0
4	PSC SLEEPERS: Density of sleepers on different routes	1	0
5	Fastenings for PSC sleepers: Malleable cast iron inserts, Elastic Rail Clips, various types, toe load and its measurement, criteria for fastening renewal, Rubber pads, Liners, Anti sabotage arrangements for various sleepers, Creep anchors, method for fixing, Box anchoring. Greasing and anti-corrosive measures	2	0
6	Sleepers at joints & their spacing for concrete sleeper track	1	0
PSUPR104	FORMATION, BALLAST & DRAINAGE	7	0
1	Drainage, Slope on top of formation, side and catch water drains, Drainage in mid section, yards and platforms, especially in monsoon, maintenance of yard lines	2	0
2	Ballast sections on different routes for straights and curves on single/double lines, On different gauges for fish plated track, SWR and LWR, Sections for branch lines, Loop and sidings.	2	0
3	Quantities for different sections.	1	0
4	Specification for track ballast	2	0
PSUPR105	Railway track & track Structure-I	2	0
1	Different Gauges,	1	0

2	Classification of Routes	1	0
PSUPR106	TRACK STRCUTURE IN YARDS	4	0
1	Track Structure (yards) Simple layouts, loops, gathering neck , overrun line, shunting neck, hot axle/fuel/stabling siding,	2	0
2	Isolation derailing switch, Scotch block, Hay's derail, Sand hump, dead ends, Catch & slip siding, Fouling marks, Restriction in use of 1 in 8½ turnouts on passenger lines,	2	0
PSUPR107	TURNOUTS - INTRODUCTION	5	0
1	Turnouts, Definition and description of components and terms,	2	0
2	Standard types, Ordinary built-up and high manganese crossings straight switches, Curved switches, Thick web switches, Derailing switches, Spring points, other crossing types	2	0
3	Maintenance of points and crossings, wear and reconditioning of crossings, maintenance of modern turnouts	1	0
PSUPR108	TURNOUTS - ASSEMBLY & LAYING	6	0
1	Method of assembling all turnouts, Main dimensions and off sets of lead curve for setting out,	2	0
2	Diamond crossings, scissors crossovers with single and double slips, Definitions and description of components and terms, Switch diamonds, advantage of raising inside check rail of obtuse xings,	2	0
3	Methods of assembly,	2	0
	WELDED RAILS		
PSUPR109	SHORT WELDED RAILS (SWR)	6	0
1	Definition, Track Structure for SWR,	2	0
2	Conditions of laying, Maintenance of SWR,	2	0
3	Gap survey & adjustment of gap.	2	0
PSUPR110	LONG WELDED RAILS (LWR)	16	0
1	Permitted locations for laying, Track Structure, Laying of LWR,	2	0
2	De-stressing - with and without rail tensors	2	0
3	Repairs of Rail fracture,	2	0
4	Repairs of buckling,	2	0
5	Maintenance precautions, Overhauling, Deep screening, Renewal,	2	0
6	Determination of stress free temperature.	2	0
7	Inspection of LWR and remedial actions for correction of gaps at SEJ, Hysteresis loop	2	0
8	Competency level to carry out various works in LWR track, Dos & Don'ts	2	0
PSUPR111	WELDING OF RAILS	6	0
1	SPW, Wider gap Welding, compressed air preheating, 3 piece mould AT welding technique	2	0
2	Precautions to be observed during AT weld for good quality,	1	0
3	Tolerances for finished A.T. welds & FB Welds,	1	0
4	Brief idea about FB welds, Testing of welds, Mobile flash-butt welding	2	0
PSUPR112	RAIL FLAWS & TESTING	4	0
1	Visuals examination (Keyman's)	2	0
2	USFD Testing	2	0
PSUPR113	TRACK MAINTENANCE	6	0
1	Service, Maintenance tolerances and Approved methods, Beater packing, Off-track machines and 'On track' machines,	2	0

2	Approved systems, Systematic Maintenance conventional through packing, directed track maintenance and 3-tier system of maintenance	2	0
3	Pre-monsoon, during monsoon and post monsoon attention.	2	0
PSUPR114	REGULAR MAINTENANCE OPERATIONS	23	0
1	Maintenance of concrete sleeper track		
2	Overhauling,	2	0
3	Deep screening	4	0
4	Lubrication of joints and lubrication of rails in straight and on curves, maintenance of rail joints,	2	0
5	Incidental works: Creep, Importance of joint gaps, Gap surveys,	2	0
6	Buckling,	2	0
7	Lifting and lowering of track: Undesirability of lowering maximum lifting/lowering at one time, Provision of ramps at ends, Adequate ballast cushion and drainage after lowering.	4	0
8	Maintenance of special layout : Points & Crossings, SE/P. Way's register,	4	0
9	Overhauling, Coordination with signal and operating departments, Maximum wear of xing making up wear by welding, Welding of joints on turnouts, gapless joints for crossing joints.	2	0
10	Special attention to maintenance of platform lines and drainage, corrosion of rails, metal sleepers, fastening of concrete sleepers and problem of groove formation, maintenance of turn in curves	1	0
PSUPR115	INCIDENTAL WORKS	6	0
1	Annual overhauling of Level Crossing	1	0
2	Maintenance of Track circuited area, platform Lines, fouling Mark	1	0
3	Survey of curves	2	0
4	Railway affecting Works	2	0
PSUPR116	DIRECTED MAINTENANCE	4	0
1	Basic principle	1	0
2	Grouping of Gangmen	2	0
3	Directed supervision	1	0
PSUPR117	PROTECTION, RESTRICTIONS & INDICATIONS	6	0
1	Hand signals in day and night, Hand flags, Hand lamps, Banner flags, Detonators & fusee, life of detonators, testing, fog signals/fusee	2	0
2	Engineering, Indicators, Temporary and permanent,	2	0
3	Works of short and long duration, Protection during emergency Caution order.	2	0
PSUPR118	PATROLLING	10	0
1	Kinds of patrolling i.e. Key men's daily patrol, Gang patrol, Monsoon security, Hot and cold weather patrolling, Watch at vulnerable points, Weather warnings, Single and double frequency patrolling,	4	0
2	Patrol charts, Patrol books and equipments, Selection and duties of patrolmen,	2	0
3	Night checks & Inspections	2	0
4	Felling/Cutting/pruning of trees obstructing view, very close to OHE	2	0
PSUPR119	TOOLS & EQUIPMENTS	4	0
1	Measuring tools	1	0
2	MSP Tool kit	1	0
3	Regular Maintenance Tools	2	0
PSUPR120	TROLLEY/LORRY/DOLLY WORKING	4	0

1	Working of Push Trolley, Lorry & motor Trolley, Its equipment,	2	0
2	Protection, Working of rail dolly and its protection	2	0
PSUPR121	RECONDITIONING OF MATERIALS AND TOOLS	4	0
1	Reconditioning of P. Way materials, Rails, Welding of scabbed rails, cropping of rail ends, hole drilling and chamfering of bolt hole in rails	2	0
2	Reconditioning of worn out crossings and switches, type of electrodes used, RDSO approved vendor and welder system	2	0
PSUPR122	LEVEL CROSSINGS	6	0
1	Level crossings: Classification, types	2	0
2	Features of track at and in approaches of level crossings, Annual overhauling, Maintenance of road surface and approach track, Check rails-types, correct clearances, Visibility	1	0
3	Requirement Checking of equipments and knowledge of rules of gatemen,	1	0
4	Inspection of L-xing, Duties of gatekeeper, Hot axle train parting,	1	0
5	Speed breakers, Road sign Boards, Provision of new LC, Manning, De-manning, interlocking and replacement with ROB, closure, shifting and replacement with limited height subways/ RUBs , Elimination Specification	1	0
PSUPR123	BRIDGES & TRACK STRUCTURE ON BRIDGES	6	0
1	Bridges: Classification, Types, Track Structure on girder Bridges, ballasted decks, arch bridges, tunnels, provision of guard rails, re-railing ramps	2	0
2	Importance of maintaining correct gauge, Alignment and tight fastenings, Preparation, Renewal bridge timber & Steel channel sleeper,	2	0
3	Attention to approach track & strengthening, Cleaning of waterway, Checking guard rails.	2	0
PSUPR124	Ballast Depot, Training out ballast, DMT operation	2	0
PSUPR125	ASH PITS	2	0
PSUPR126	MECHANIZED MAINTENANCE	11	0
1	3 tiers system of track maintenance, Working of MMUs	3	0
2	Small track machines: types, use in maintenance, spot attention with off track tampers , Troubleshooting and system of repairs & maintenance	4	0
3	Pre-requisites to tamping and other machine working, Pre & Post and during attentions for tamping and other machine working,	2	0
4	Design mode tamping : survey and procedure of tamping	2	0
	CURVES		
PSUPR127	HORIZONTAL CURVES	11	0
1	Degree of curve, Types of curves, Relation between degree, Radius, Chord and versine, Standard chords to be used for stringing,	2	0
2	Record in SE/P.Way's curve register checking of alignment after derailments and for turn in and turnout curves,	2	0
3	Super elevation / equilibrium cant, Maximum cant for normal and high speed trains, Cant deficiency and cant excess, Formula for safe speed on curves, Equilibrium speed, Calculation of cant to be provided and permissible speed, Transition length, Maximum cant gradient, Rates of running out of cant and cant deficiency.	2	0
4	Types of curves, Setting out of curves, Cubic parabola off sets for setting out transition curve, Shift calculations for setting out complete curve with theodolite.	2	0
6	Widening of gauge on curves, Extra clearance on curves, Minimum length of straight between reverse curves,	1	0
7	Curves with similar and contrary flexure, Calculation of cant to be provided	2	0

	and permissible speed, Curve with X-over and diamonds		
PSUPR128	VERTICAL CURVES	3	0
1	Need for vertical curve, Grades, Equivalent radius,	1	0
2	Calculations and setting out a vertical curve, Level pegs for accurate maintenance,	1	0
3	Vertical curves on LWR	1	0
PSUPR129	REALIGNMENT OF CURVES	10	0
1	Re-alignment of curves, String lining of curves, Need for curve adjustment,	2	0
2	Criteria for realignment, Curve register, Versine survey,	2	0
3	Calculations of slews by double summation method,	2	0
4	Slewing to revised versine, Local adjustment,	2	0
5	Hands on to Computer software for curve realignment calculations	2	0
PSUPR130	TRACK RENEWALS	8	0
1	Casual renewals, Complete track renewals, Through rail renewals, Through Sleeper renewals, Through fitting renewal and through ballast renewal,	2	0
2	Criteria for unserviceability for casual renewals	1	0
3	Criteria for various track renewal works	1	
4	Methods of renewals, Preparation, Labour Organisation, Tools, Ballast,	2	0
5	Careful handling of materials, Speed restrictions and post relaying attention,	2	0
PSUPR131	INSPECTIONS, TRACK RECORDING & MONITORING	4	0
1	Method of Inspection: Push trolley, Motor trolley, Foot inspection, Engine & Rear van Inspection, Amsler car, TRRC, Oscillograph car, OMS, TFMS, Mobile USFD (Spurt Car)	1	0
2	Frequency of inspection: Inspection register, Repetitive defects and their Rectification, Permissible accelerations as recorded by oscillograph car,	1	0
3	Inspection of track geometry, inspection of Gang's work: quality, methods, progress, tools and equipments, knowledge of rules, attendance, Gang chart and diary, inspection of finished work, Inspection of bad riding spots, spots identified by TRC for urgent maintenance, Systematic measurement and investigation of defect	2	0
PSUPR132	ACCIDENTS & DISASTER MANAGEMENT	8	0
1	Duties of PWS/P. Way in disaster management	1	0
2	Sounding of hooters & classification of accidents,	1	0
3	Action to be taken on reaching site, First aid, preservation of clues, Assessment of men and materials for restoration, Recording site and track particulars, Preparation of a sketch, Expeditious restoration,	2	0
4	Drivers report on bad riding, Breaches & its types, Prevention & action during breach, Vigilance on Railway Affecting tanks	1	0
5	Enquiries - General ideas about procedure and composition of Accident Committee,	1	0
6	Mechanism of derailment, Various defects of rolling stocks and IRCA's rejection limits, Disaster Management	2	0
	CE-MIS (TMS)		
PSUPR133	TMS	2	0
1	Track Management System: Introduction to TMS, purpose, advantages, main features	2	0
PSUPR134	CONTRACT MANAGEMENT	12	0

1	Definition of agreement /contract, Types & forms of contract	2	0
2	Various registers to be maintained for progress, Quality, safety of contractors persons, Safety measures at work site,	2	0
3	Accountal of new and Released material, Issue and receipt from contractors, Important points from vigilance angle,	4	0
4	Hiring of tools and plants to Contractors	2	0
5	Supervision of contractual works, Safety at work-site, Common ignorance. Dos & Don'ts for contract matters	2	0
PSUPR135	LAND MANAGEMENT	6	0
1	Demarcation of land boundaries,	2	0
2	Relinquishment of railway land,	2	0
3	Type of encroachments and PPE Act.	2	0
PSUPR136	COMPUTER & THEIR USAGE	8	2
1	Various languages suitable for Civil Engineering applications,	2	0
2	Windows,	2	0
3	MS- Office: Word, Excel, Access, PowerPoint	2	0
4	Use of Internet, Latest advancement in Information Technology & e-mail.	2	2
	SAFETY		
PSUPR137	CRS SANCTION & SCHEDULE OF DIMENSIONS	7	0
1	Works requiring CRS sanction	1	0
2	Various schedules of dimensions related to P. Way	2	0
3	Infringements, Register of infringements	1	0
4	Movement of ODC	1	0
5	Knowledge of G & SR	2	0
PSUPR138	TRANSPORTATION	6	0
1	Knowledge of G & SR, Various systems of working, Essentials of absolute & automatic block system,	2	0
2	Classification of stations, Simple layouts & condition for granting permission to approach, single line working on double line, Reception of train on blocked line and starting from non-signaled line, TFC, Interlocking, Recovery Time	2	0
3	Important definitions, General rules applying to Railway servants,	1	0
4	Signals, General provisions, Description of fixed signals, Hand signals, Detonating signal flare signal, Defective fixed signal, Rules for passing defective signals,	1	0
PSUPR139	OFFICE & STORES	2	0
1	Procuring of office stationary and stores, Procuring of P. Way stores for maintenance and for special works, Classification of stores, Accountal of stores, Stock verification reports, Disposal of scrap & surplus stores, Overhauling of stores, Numerical ledgers & inventory control, Section register of SE/P. Way	1	0
2	Classification of stores, Stock verification, Stock sheet, Submission of returns, Inventory control, Maintenance of DMTR and ledgers, Submission of store returns in time, Materials at site register, Imprest Store, T&P Store	1	0
PSUPR140	PERSONNEL	6	0
1	Muster, Pay sheet, Pay Bands, Grade Pay; Allowances,	1	0
2	Wage period, Bill preparation, Filling up of TA & OT Journals, Witnessing of payment, unpaid wage	1	0
3	Passes (PTOs) and leave	1	0

4	Welfare Schemes & SBF	1	0
5	Railway Services (Conduct) Rules, D&A Rules	1	0
6	Categories of staff under Hours of Employment Regulations	1	0
8	Labour Laws- overview; Display of Statutory Notices, Inspection by Labour Enforcement Officer	1	0
PSUPR141	FIRST AID	3	0
1	Introduction-Safety first principles	1	0
2	First Aid Box & Application	1	0
3	Precautions	1	0
PSUPR142	RAJBHASHA	2	0
1	Directives in use of Raj Bhasha in day-to-day working.	2	0
	GRAND TOTAL	278	2

Note:- Periods suggested for Class Room and Model Room against the topics above are indicative. Minor modifications may be made with the approval of PCE, in case local circumstances so warrant.

Annexure X			
MODULES FOR SE/ P WAY-REFRESHER			
Module No.	Lesson Content	Class Room	Model Room
PSERE101	DUTIES OF P.WAY STAFF	1	0
1	Duties of SSE and SE/P.Way,	1	0
PSERE102	RAILS & JOINTS	5	0
1	Careful loading, unloading, stacking & handling of rails, special precautions for high UTS/ HH rails.	1	0
2	Fracture, codification, Restoration of traffic, how to report	1	0
3	USFD: Ultrasonic flaw detection, fundamentals of ultrasonic waves, defect detection, need based concept of USFD, components tested, frequency of testing, marking of defects, action to be taken, brief description of various types of USFD machines and probes used, calibration and sensitivity checking, defect codification, limitations of USFD, SPURT Car	2	0
4	Rail grinding	1	0
PSERE103	SLEEPERS & FASTENINGS	1	0
1	Fastenings for PSC sleepers: Malleable cast iron inserts, Elastic Rail Clips, various types, toe load and its measurement, criteria for fastening renewal, Rubber pads, Liners, Anti sabotage arrangements for various sleepers, Creep anchors, method for fixing, Box anchoring ,Greasing and anti-corrosive measures	1	0
PSERE104	FORMATION & BALLAST	3	0
1	Causes for formation failure (Rehabilitation of weak formation), drainage.	1	0
2	Ballast sections on different routes for straights and curves on single/double lines, On different gauges for fish plated track, SWR and LWR, Sections for branch lines, Loop and sidings.	1	0
3	Specification for track ballast	1	0
PSERE105	TRACK STRCUTURE IN YARDS	2	0
1	Isolation derailing switch, Scotch block, Hay's derail, Sand hump, dead ends, Catch & slip siding, Fouling marks, Restriction in use of 1 in 8½ turnouts on passenger lines,	1	0
2	Restrictions regarding change of grade on approaches of turnout	1	0
PSERE106	TURNOUTS - INTRODUCTION	3	0
1	Turnouts, Definition and description of components and terms, inspection of points and crossings and frequency of inspection	1	0
2	Standard types, Ordinary built-up and high manganese crossings straight switches, Curved switches, Thick web switches, Derailing switches, Spring points, other crossing types	1	0
3	Permissible speeds, Restriction on use of 1 in 8½ T/out on passenger running lines, symmetrical split	1	0
PSERE107	TURNOUTS - ASSEMBLY & LAYING	2	0
1	Contrary and similar flexure turnouts: Definition, Calculations for lead & radius	1	0
2	Main dimensions for setting out, Laying & Maintenance of fan shaped turnouts, Maintenance of Turn /outs with reference to CMS crossing.	1	0
PSERE108	CROSSOVERS	1	0

1	Calculations for different turnouts and spacing, Miscellaneous layouts: (1) Triangle (2) Three throw. (3) Double junctions (4) Gauntleted track (Brief description)	1	0
PSERE109	LEVEL CROSSINGS	1	0
1	Speed breakers, Road sign Boards, Provision of new LC, Manning, De-manning, interlocking and replacement with ROB, closure, shifting and replacement with limited height subways/ RUBs , Elimination Specification	1	0
PSERE110	TRACK STRUCTURE ON BRIDGES	2	0
1	Track Structure on girder Bridges, ballasted decks, arch bridges, tunnels, provision of guard rails, re-railing ramps	1	0
2	Importance of maintaining correct gauge, Alignment and tight fastenings, Preparation, Renewal bridge timber & Steel channel sleeper,	1	0
PSERE111	Ballast Depot, Training out ballast, DMT operation	1	0
	WELDED RAILS		
PSERE112	SHORT WELDED RAILS (SWR)	2	0
1	Conditions of laying, Maintenance of SWR,	1	0
2	Gap survey & adjustment of gap.	1	0
PSERE113	LONG WELDED RAILS (LWR)	8	0
1	Permitted locations for laying, Track Structure, Laying of LWR,	1	0
2	De-stressing - with and without rail tensors	1	0
3	Repairs of Rail fracture & buckling	1	0
4	Maintenance precautions, Overhauling, Deep screening, Renewal,	1	0
5	cold & hot weather patrolling,	1	0
6	Determination of stress free temperature.	1	0
7	Inspection of LWR and remedial actions for correction of gaps at SEJ, Hysteresis loop	1	0
8	Competency level to carry out various works in LWR track, Dos & Don'ts	1	0
PSERE114	WELDING OF RAILS	2	0
1	SPW, Wider gap Welding, compressed air preheating, 3 piece mould AT welding technique	1	0
2	Brief idea about FB welds, Testing of welds, Mobile flash-butt welding	1	0
PSERE115	MAINTENANCE	2	0
1	Service, Maintenance tolerances and Approved methods, Beater packing, Off-track machines and 'On track' machines,	2	0
PSERE116	REGULAR MAINTENANCE OPERATIONS	4	0
1	Deep screening	1	0
2	Buckling,	1	0
3	Overhauling, Coordination with signal and operating departments, Maximum wear of xing making up wear by welding, Welding of joints on turnouts, gapless joints for crossing joints.	1	0
4	Maintenance in electrified territories, maintenance of track circuited sections, use of insulated trolleys, Gauges and other tools, maintenance of insulated joints, glued joints. Felling/Cutting/pruning of trees obstructing view or very close to OHE	1	0
PSERE117	PROTECTION, RESTRICTIONS & INDICATIONS	1	0
1	Hand signals in day and night, Hand flags, Hand lamps, Banner flags, Detonators & fusee, life of detonators, testing, fog signals/fusee	1	0
PSERE118	PATROLLING	2	0
1	Necessity of Patrolling, types, Patrol charts, Patrol books and	1	0

	equipments, Selection and duties of patrolmen,		
2	Night checks & Inspections	1	0
PSERE119	MECHANIZED MAINTENANCE	4	0
1	3 tiers system of track maintenance, Working of MMUs	1	0
2	Small track machines: types, use in maintenance, spot attention with off track tampers , Troubleshooting and system of repairs & maintenance	1	0
3	Pre-requisites to tamping and other machine working, Pre & Post and during attentions for tamping and other machine working,	1	0
4	Design mode tamping : survey and procedure of tamping	1	0
PSERE120	TROLLEY/LORRY/DOLLY WORKING	1	0
1	Working of Push Trolley, Lorry & motor Trolley, its equipment, Working of rail dolly and its protection	1	0
PSERE121	RECONDITIONING OF MATERIALS AND TOOLS	1	0
1	Reconditioning of worn out crossings and switches, type of electrodes used, RDSO approved vendor and welder system	1	0
	SAFETY		
PSERE122	CRS SANCTION & SCHEDULE OF DIMENSIONS	2	0
1	Works requiring CRS sanction	1	0
2	Various schedules of dimensions related to P. Way	1	0
	CURVES		
PSERE123	HORIZONTAL CURVES	4	0
1	Super elevation / equilibrium cant, Maximum cant for normal and high speed trains, Cant deficiency and cant excess, Formula for safe speed on curves, Equilibrium speed, Calculation of cant to be provided and permissible speed, Transition length, Maximum cant gradient, Rates of running out of cant and cant deficiency.	1	0
2	Types of curves, Setting out of curves, Cubic parabola off sets for setting out transition curve, Shift calculations for setting out complete curve with theodolite.	1	0
3	Miscellaneous - Running out cant on transitioned curves, Gradient rail, Laying of rails on curves, Mid stagger joints and on sharp curves, Curve markers and cant boards, Lubrication on curves,	1	0
4	Curves with similar and contrary flexure, Calculation of cant to be provided and permissible speed, Curve with X-over and diamonds	1	0
PSERE124	VERTICAL CURVES	1	0
1	Vertical curves on LWR	1	0
PSERE125	REALIGNMENT OF CURVES	4	2
1	Re-alignment of curves, String lining of curves, Need for curve adjustment,	1	0
2	Criteria for realignment, Curve register, Versine survey,	1	0
3	Hands on to Computer software for curve realignment calculations	2	2
PSERE126	TRACK RENEWALS	2	0
1	Criteria for various track renewal works	1	
2	Methods of renewals, Preparation, Labour Organisation, Tools, Ballast,	1	0
PSERE127	INSPECTIONS, TRACK RECORDING & MONITORING	2	0
1	Method of Inspection: Push trolley, Motor trolley, Foot inspection, Engine & Rear van Inspection, Amsler car, TRRC, Oscillograph car, OMS, TFMS, Mobile USFD (Spurt Car)	1	0
2	Inspection of track geometry, inspection of Gang's work: quality, methods, progress, tools and equipments, knowledge of rules,	1	0

	attendance, Gang chart and diary, inspection of finished work, Inspection of bad riding spots, spots identified by TRC for urgent maintenance, Systematic measurement and investigation of defect		
PSERE128	ACCIDENTS & DISASTER MANAGEMENT	4	0
1	Action to be taken on reaching site, First aid, preservation of clues, Assessment of men and materials for restoration, Recording site and track particulars, Preparation of a sketch, Expeditious restoration,	1	0
2	Drivers report on bad riding, Breaches & its types, Prevention & action during breach, Vigilance on Railway Affecting tanks	1	0
3	Mechanism of derailment, Various defects of rolling stocks and IRCA's rejection limits, Disaster Management	2	0
	CE-MIS (TMS)		
PSERE129	TMS	2	0
1	Track Management System: Introduction to TMS, purpose, advantages, main features	2	0
PSERE130	CONTRACT MANAGEMENT	4	0
1	Accountal of new and Released material, Issue and receipt from contractors, Important points from vigilance angle,	1	0
2	Preparation of Contractor's On-Account/Running & Final Bills, Material Statements, Maintenance Period, Warranty/guarantee clauses, release of security deposit	1	0
3	Supervision of contractual works, Safety at work-site, Common ignorance. Dos & Don'ts for contract matters	1	0
4	Duties towards payment to contractor's labour and maintenance of records as per labour laws	1	0
PSERE131	LAND MANAGEMENT	1	0
1	Demarcation of land boundaries, Type of encroachments and PPE Act.	1	0
PSERE132	COMPUTER & THEIR USAGE	4	4
1	MS- Office: Word, Excel, Access, PowerPoint	3	2
2	Use of Internet, Latest advancement in Information Technology & e-mail.	1	2
PSERE133	TRANSPORTATION	4	0
1	Various systems of working, Essentials of absolute & automatic block system, engineering recovery time, working of ballast train, interlocking and track circuiting, ODC, Working of Track Machines	2	0
2	Classification of stations, Simple layouts & condition for granting permission to approach, single line working on double line, Reception of train on blocked line and starting from non-signaled line, TFC, Interlocking, Recovery Time	1	0
3	Signals, General provisions, Description of fixed signals, Hand signals, Detonating signal flare signal, Defective fixed signal, Rules for passing defective signals,	1	0
PSERE134	OFFICE & STORES	2	0
1	Procuring of office stationary and stores, Procuring of P. Way stores for maintenance and for special works, Classification of stores, Accountal of stores, Stock verification reports, Disposal of scrap & surplus stores, Overhauling of stores, Numerical ledgers & inventory control, Section register of SE/P. Way	1	0
2	Classification of stores, Stock verification, Stock sheet, Submission of returns, Inventory control, Maintenance of DMTR and ledgers, Submission of store returns in time, Materials at site register, Imprest Store, T&P Store	1	0

PSERE135	PERSONNEL	6	0
1	Muster, Pay sheet, Pay Bands, Grade Pay; Allowances, Establishment Records in SSE/ JE P Way office	1	0
2	Trade Test; Other channels of promotions	1	0
3	Settlement:- PF, Pension, Gratuity, Leave Encashment; Filling up of Pension Booklet	1	0
4	Industrial Relations:-Unions & Associations, PNM, JCM	1	0
5	Railway Services (Conduct) Rules, D&A Rules	1	0
6	Labour Laws- overview; Display of Statutory Notices, Inspection by Labour Enforcement Officer, Payment of Wages Act, Minimum Wages Act, Contract Labour Act	1	0
PSERE136	RAJBHASHA	1	0
1	Directives in use of Raj Bhasha in day-to-day working.	1	0
	GRAND TOTAL	90	6
Note:- Periods suggested for Class Room and Model Room against the topics above are indicative. Minor modifications may be made with the approval of PCE, in case local circumstances so warrant.			

Annexure-XI			
MODULES FOR JE/ P WAY-REFRESHER			
Module No.	Lesson Content	Class Room	Model Room
PJERE101	DUTIES OF P.WAY STAFF	1	0
1	Duties of JE/P. Way,	1	0
PJERE102	RAILS & JOINTS	12	0
1	Careful loading, unloading, stacking & handling of rails, special precautions for high UTS/ HH rails.	1	0
2	Corrosion, Anticorrosion treatment	1	0
3	Wear & its causes	1	0
4	Joints, Types, fish-plate, fish-bolts, anti-sabotage fishbolts, Combination fish-plates, Skimmed fish-plates, Chamfering of bolt holes, expansion/contraction of rails, requirement and provision of gap at joints, gapless/machined joints, Relation to rail temperature,	2	0
5	Insulated, Expansion joints for bridges & long welded rails,	1	0
6	Fracture, codification, Restoration of traffic, how to report	2	0
7	USFD: Ultrasonic flaw detection, fundamentals of ultrasonic waves, defect detection, need based concept of USFD, components tested, frequency of testing, marking of defects, action to be taken, brief description of various types of USFD machines and probes used, calibration and sensitivity checking, defect codification, limitations of USFD, SPURT Car	2	0
8	Rail grinding	2	0
PJERE103	SLEEPERS & FASTENINGS	4	0
1	Concrete sleepers , Twin block RCC, Mono-block pre-stressed, General aspects, Instructions for usability of different sleepers on different routes, main lines and long welded rails, Special sleepers for L xings, turnout, SEJ, bridges approach and sharp curves	2	0
2	Fastenings for PSC sleepers: Malleable cast iron inserts, Elastic Rail Clips, various types, toe load and its measurement, criteria for fastening renewal, Rubber pads, Liners, Anti sabotage arrangements for various sleepers, Creep anchors, method for fixing, Box anchoring, Recent developments in fittings, Greasing and anti-corrosive measures	2	0
PJERE104	FORMATION & BALLAST	1	0
1	Drainage in yards, maintenance of platform lines, anti corrosive treatment on gauge pace	1	0
2	Specification for track ballast, standards of ballast cushion, correct ballast profile and quantities for different track structures, Consolidation and compaction of ballast	1	0
PJERE105	POINTS & CROSSINGS	4	0
1	Turnouts, Definition and description of components and terms, inspection of points and crossings and frequency of inspection	1	0
2	Use of curved switches, Thick web switches, Fan shaped PSC sleeper layout, Maintenance of turn-in-curves, Inspection of points and crossings & records to be maintained, Maintenance of diamond crossings, Reconditioning of Xings and switches, Modern developments in switches & Xings, Concept of modern Turnouts, Laying & maintenance of fan shaped turnouts.	2	0
3	Permissible speeds, Restriction on use of 1 in 8½ T/out on passenger running lines, symmetrical split	1	0

PJERE106	TURNOUTS - ASSEMBLY & LAYING	3	0
1	Method of assembling all turnouts, Main dimensions and off sets of lead curve for setting out,	1	0
2	Contrary and similar flexure turnouts: Definition, Calculations for lead & radius	1	0
3	Main dimensions for setting out, Laying & Maintenance of fan shaped turnouts, Maintenance of Turn /outs with reference to CMS crossing.	1	0
PJERE107	LEVEL CROSSINGS	1	0
1	Speed breakers, Road sign Boards, Provision of new LC, Manning, De-manning, interlocking and replacement with ROB, closure, shifting and replacement with limited height subways/ RUBs , Elimination Specification	1	0
PJERE108	TRACK STRUCTURE ON BRIDGES	2	0
1	Track Structure on girder Bridges, ballasted decks, arch bridges, tunnels, provision of guard rails, re-railing ramps	1	0
2	Importance of maintaining correct gauge, Alignment and tight fastenings, Preparation, Renewal bridge timber & Steel channel sleeper,	1	0
PJERE110	TUNNELS	1	0
PJERE111	Ballast Depot, Training out ballast, DMT operation	1	0
PJERE112	SHORT WELDED RAILS (SWR)	2	0
1	Conditions of laying, Maintenance of SWR,	1	0
2	Gap survey & adjustment of gap.	1	0
PJERE113	LONG WELDED RAILS (LWR)	7	0
1	Permitted locations for laying, Track Structure, Laying of LWR,	1	0
2	De-stressing - with and without rail tensors	1	0
3	Repairs of Rail fracture & buckling	1	0
4	Maintenance precautions, Overhauling, Deep screening, Renewal,	1	0
5	cold & hot weather patrolling,	1	0
6	Inspection of LWR and remedial actions for correction of gaps at SEJ, Hysteresis loop	1	0
7	Competency level to carry out various works in LWR track, Dos & Don'ts	1	0
PJERE114	WELDING OF RAILS	2	0
1	SPW, Wider gap Welding, compressed air preheating, 3 piece mould AT welding technique	1	0
2	Brief idea about FB welds, Testing of welds, Mobile flash-butt welding	1	0
PJERE115	MAINTENANCE	2	0
1	Service, Maintenance tolerances and Approved methods, Beater packing, Off-track machines and 'On track' machines,	1	0
2	Approved systems, Systematic Maintenance conventional through packing, directed track maintenance and 3-tier system of maintenance	1	0
PJERE116	REGULAR MAINTENANCE OPERATIONS	4	0
1	Deep screening	1	0
2	Overhauling, Coordination with signal and operating departments, Maximum wear of xing making up wear by welding, Welding of joints on turnouts, gapless joints for crossing joints.	1	0
3	Special attention to maintenance of platform lines and drainage, corrosion of rails, metal sleepers, fastening of concrete sleepers and problem of groove formation, maintenance of turn in curves	1	0

4	Maintenance in electrified territories, maintenance of track circuited sections, use of insulated trolleys, Gauges and other tools, maintenance of insulated joints, glued joints. Felling/Cutting/pruning of trees obstructing view or very close to OHE	1	0
PJERE117	PROTECTION, RESTRICTIONS & INDICATIONS	2	0
1	Hand signals in day and night, Hand flags, Hand lamps, Banner flags, Detonators & fusee, life of detonators, testing, fog signals/fusee	1	0
2	Works of short and long duration, Protection during emergency Caution order.	1	0
PJERE118	PATROLLING	2	0
1	Necessity of Patrolling, types, Patrol charts, Patrol books and equipments, Selection and duties of patrolmen,	1	0
2	Night checks & Inspections	1	0
PJERE119	MECHANIZED MAINTENANCE	5	0
1	3 tiers system of track maintenance, Working of MMUs	1	0
2	Small track machines: types, use in maintenance, spot attention with off track tampers , Troubleshooting and system of repairs & maintenance	1	0
3	Pre-requisites to tamping and other machine working, Pre & Post and during attentions for tamping and other machine working,	1	0
4	Design mode tamping : survey and procedure of tamping	2	0
PJERE120	TROLLEY/LORRY/DOLLY WORKING	1	0
1	Working of Push Trolley, Lorry & motor Trolley, its equipment, Working of rail dolly and its protection	1	0
	SAFETY		
PJERE121	CRS SANCTION & SCHEDULE OF DIMENSIONS	3	0
1	Works requiring CRS sanction	1	0
2	Various schedules of dimensions related to P. Way, Infringements, Register of infringements	1	0
3	Movement of ODC	1	0
PJERE122	HORIZONTAL CURVES	3	0
1	Types of curves, Setting out of curves, Cubic parabola off sets for setting out transition curve, Shift calculations for setting out complete curve with theodolite.	2	0
2	Curves with similar and contrary flexure, Calculation of cant to be provided and permissible speed, Curve with X-over and diamonds	1	0
PJERE123	VERTICAL CURVES	1	0
1	Calculations and setting out a vertical curve, Level pegs for accurate maintenance, Vertical curves on LWR	1	0
PJERE124	REALIGNMENT OF CURVES	5	0
1	Criteria for realignment, Curve register, Versine survey,	1	0
2	Calculations of slews by double summation method,	2	0
3	Hands on to Computer software for curve realignment calculations	2	0
PJERE125	TRACK RENEWALS	2	0
1	Picking of released materials, Classification & disposal, Relaying with PQRS equipment, Record of relaying, Track relaying train, Relaying of turnout with T-28, New track laying standards, Handing over/Taking over of new track, Criteria for various track renewal works	2	0
PJERE125	INSPECTIONS, TRACK RECORDING & MONITORING	4	0
1	Riding quality,-TGI, Track geometry, Condition of track structure, Correct methods of work, Testing knowledge of rules,	1	0

3	Method of Inspection: Push trolley, Motor trolley, Foot inspection, Engine & Rear van Inspection, Amsler car, TRRC, Oscillograph car, OMS, TFMS, Mobile USFD (Spurt Car)	1	0
4	Frequency of inspection: Inspection register, Repetitive defects and their Rectification, Permissible accelerations as recorded by oscillograph car,	1	0
5	Inspection of track geometry, inspection of Gang's work: quality, methods, progress, tools and equipments, knowledge of rules, attendance, Gang chart and diary, inspection of finished work, Inspection of bad riding spots, spots identified by TRC for urgent maintenance, Systematic measurement and investigation of defect	1	0
PJERE126	ACCIDENTS & DISASTER MANAGEMENT	2	0
1	Duties of JE-II/P. Way in disaster management	1	0
2	Action to be taken on reaching site, First aid, preservation of clues, Assessment of men and materials for restoration, Recording site and track particulars, Preparation of a sketch, Expeditious restoration,	1	0
	CE-MIS (TMS)		
PJERE127	TMS	1	0
1	Track Management System: Introduction to TMS, purpose, advantages, main features	1	0
PJERE128	CONTRACT MANAGEMENT	2	0
1	Preparation of Contractor's On-Account/Running & Final Bills, Material Statements, Maintenance Period, Warranty/guarantee clauses, release of security deposit	1	0
2	Supervision of contractual works, Safety at work-site, Common ignorance. Dos & Don'ts for contract matters	1	0
PJERE129	COMPUTER & THEIR USAGE	2	6
1	MS- Office: Word, Excel, Access, PowerPoint	1	3
2	Use of Internet, Latest advancement in Information Technology & e-mail.	1	3
PJERE130	TRANSPORTATION	3	0
1	Signals, General provisions, Description of fixed signals, Hand signals, Detonating signal flare signal, Defective fixed signal, Rules for passing defective signals, Engineering Recovery time	2	0
2	working of ballast train, interlocking and track circuiting, ODC, Working of Track Machines	1	0
PJERE131	OFFICE & STORES	1	0
1	Classification of stores, Stock verification, Stock sheet, Submission of returns, Inventory control, Maintenance of DMTR and ledgers, Submission of store returns in time, Materials at site register, Imprest Store, T&P Store	1	0
PJERE132	PERSONNEL	3	0
1	Trade Test; Other channels of promotions	1	0
2	Labour Laws- overview; Display of Statutory Notices, Inspection by Labour Enforcement Officer	1	0
3	Payment of Wages Act, Minimum Wages Act, Contract Labour Act, Workmen's Compensation Act, Action in case of injury on duty, Ex-Gratia Payment	1	0
PJERE133	RAJBHASHA	1	0
1	Directives in use of Raj Bhasha in day-to-day working.	1	0
	Total	90	6
	Grand Total	96	

Note:- Periods suggested for Class Room and Model Room against the topics above are indicative. Minor modifications may be made with the approval of PCE, in case local circumstances so warrant.

Annexure-XII			
MODULES FOR SENIOR PWS-REFRESHER			
Module No.	Lesson Content	Class Room	Model Room
PSURE101	INTRODUCTION AND DUTIES OF P.WAY STAFF	2	0
1	Duties of PWS,	2	0
PSURE102	RAILS & JOINTS	7	2
1	Careful loading, unloading, stacking & handling of rails, special precautions for high UTS/ HH rails.	1	0
2	Corrosion, Anticorrosion treatment	1	0
3	Wear & its causes	1	0
4	Joints, Types, fish-plate, fish-bolts, anti-sabotage fishbolts, Combination fish-plates, Skimmed fish-plates, insulated glued joints, Chamfering of bolt holes, expansion/contraction of rails, requirement and provision of gap at joints, gapless/machined joints, Relation to rail temperature,	1	0
5	Fracture, codification, Restoration of traffic, how to report	1	0
6	USFD: Ultrasonic flaw detection, fundamentals of ultrasonic waves, defect detection, need based concept of USFD, components tested, frequency of testing, marking of defects, action to be taken, brief description of various types of USFD machines and probes used, calibration and sensitivity checking, defect codification, limitations of USFD, SPURT Car	1	2
7	Rail grinding	1	0
PSURE103	SLEEPERS & FASTENINGS	3	0
1	Number & pattern of driving spikes or screws on straight, Curves, Turnouts & bridges, Instructions for use of bearing plates, Dating of wooden sleepers, Composite sleepers.	2	0
2	Fastenings for PSC sleepers: Malleable cast iron inserts, Elastic Rail Clips, various types, toe load and its measurement, criteria for fastening renewal, Rubber pads, Liners, Anti sabotage arrangements for various sleepers, Creep anchors, method for fixing, Box anchoring ,Greasing and anti-corrosive measures	1	0
PSURE104	FORMATION, BALLAST & DRAINAGE	3	0
1	Causes for formation failure (Rehabilitation of weak formation).	1	0
2	Ballast sections on different routes for straights and curves on single/double lines, On different gauges for fish plated track, SWR and LWR, Sections for branch lines, Loop and sidings.	1	0
3	Specification for track ballast, drainage in yards and main lines	1	0
PSURE105	Railway track & track Structure-I	2	0
1	Different Gauges,	1	0
2	Classification of Routes	1	0
PSURE106	TRACK STRCUTURE IN YARDS	2	0
1	Track Structure (yards) Simple layouts, loops, gathering neck , overrun line, shunting neck, hot axle/fuel/stabling siding, maintenance of yard lines	2	0
PSURE107	TURNOUTS - ASSEMBLY & LAYING	3	0
1	Maintenance of points & crossings (including fan shaped and modern turnouts), measurement of wear and reconditioning of crossings	1	0

2	Method of assembling all turnouts, Main dimensions and off sets of lead curve for setting out,	2	0
	WELDED RAILS		
PSURE108	SHORT WELDED RAILS (SWR)	1	0
1	Conditions of laying, Maintenance of SWR,	1	0
PSURE109	LONG WELDED RAILS (LWR)	5	0
1	De-stressing - with and without rail tensors	1	0
2	Repairs of Rail fracture,	1	0
3	Repairs of buckling,	1	0
4	Hot weather and cold weather patrolling	1	0
5	Do's and Don'ts of LWR	1	0
PSURE110	WELDING OF RAILS	4	0
1	SPW, Wider gap Welding, compressed air preheating, 3 piece mould AT welding technique	2	0
2	Brief idea about FB welds, Testing of welds, Mobile flash-butt welding	2	0
PSURE111	RAIL FLAWS & TESTING	2	0
1	Visuals examination (Keyman's)	1	0
2	USFD Testing	1	0
PSURE112	TRACK MAINTENANCE	2	0
1	Approved systems, Systematic Maintenance conventional through packing, directed track maintenance and 3-tier system of maintenance	2	0
PSURE113	REGULAR MAINTENANCE OPERATIONS	3	0
1	Maintenance of concrete sleeper track	1	0
2	Deep screening	1	0
3	Lubrication of joints and lubrication of rails in straight and on curves, maintenance of rail joints,	1	0
PSURE114	INCIDENTAL WORKS	1	0
1	Maintenance of Track circuited area, platform Lines, fouling Mark	1	0
PSURE115	PROTECTION, RESTRICTIONS & INDICATIONS	1	0
1	Works of short and long duration, Protection during emergency Caution order.	1	0
PSURE116	TROLLEY/LORRY/DOLLY WORKING	1	0
1	Protection, Working of rail dolly and its protection	1	0
PSURE117	RECONDITIONING OF MATERIALS AND TOOLS	1	0
1	Reconditioning of P. Way materials, Rails, Welding of scabbed rails, cropping of rail ends, hole drilling and chamfering of bolt hole in rails	1	0
2	Mechanism of derailment, Various defects of rolling stocks and IRCA's rejection limits, Disaster Management	0	2
PSURE118	LEVEL CROSSINGS	2	0
1	Features of track at and in approaches of level crossings, Annual overhauling, Maintenance of road surface and approach track, Check rails-types, correct clearances, Visibility	1	0
2	Inspection of L-xing, Duties of gatekeeper, Hot axle train parting,	1	0
PSURE119	BRIDGES & TRACK STRUCTURE ON BRIDGES	2	0
1	Bridges: Classification, Types, Track Structure on girder Bridges, ballasted decks, arch bridges, tunnels, provision of guard rails, re-railing ramps	2	0
PSURE120	Ballast Depot, Training out ballast, DMT operation	1	0
PSURE121	MECHANIZED MAINTENANCE	4	0

1	3 tiers system of track maintenance, Working of MMUs	1	0
2	Small track machines: types, use in maintenance, spot attention with off track tampers , Troubleshooting and system of repairs & maintenance	2	0
3	Pre-requisites to tamping and other machine working, Pre & Post and during attentions for tamping and other machine working,	1	0
	CURVES		
PSURE123	HORIZONTAL CURVES	5	0
1	Degree of curve, Types of curves, Relation between degree, Radius, Chord and versine, Standard chords to be used for stringing,	1	0
2	Super elevation / equilibrium cant, Maximum cant for normal and high speed trains, Cant deficiency and cant excess, Formula for safe speed on curves, Equilibrium speed, Calculation of cant to be provided and permissible speed, Transition length, Maximum cant gradient, Rates of running out of cant and cant deficiency.	1	0
3	Types of curves, Setting out of curves, Cubic parabola off sets for setting out transition curve, Shift calculations for setting out complete curve with theodolite.	2	0
4	Curves with similar and contrary flexure, Calculation of cant to be provided and permissible speed, Curve with X-over and diamonds	1	0
PSURE124	VERTICAL CURVES	2	0
1	Calculations and setting out a vertical curve, Level pegs for accurate maintenance,	1	0
2	Vertical curves on LWR	1	0
PSURE125	REALIGNMENT OF CURVES	3	0
1	Re-alignment of curves, String lining of curves, Need for curve adjustment,	2	0
2	Criteria for realignment, Curve register, Versine survey,	1	0
PSURE126	TRACK RENEWALS	4	0
1	Casual renewals, Complete track renewals, Through rail renewals, Through Sleeper renewals, Through fitting renewal and through ballast renewal, Criteria for various track renewal works	2	0
2	Methods of renewals, Preparation, Labour Organisation, Tools, Ballast,	2	0
PSURE127	INSPECTIONS, TRACK RECORDING & MONITORING	5	0
1	Method of Inspection: Push trolley, Motor trolley, Foot inspection, Engine & Rear van Inspection, Amsler car, TRRC, Oscillograph car, OMS, TFMS, Mobile USFD (Spurt Car)	1	0
2	Frequency of inspection: Inspection register, Repetitive defects and their Rectification, Permissible accelerations as recorded by oscillograph car,	1	0
3	Patrolling of track, duties of patrolman, patrol book and patrol chart	1	0
4	Inspection of track geometry, inspection of Gang's work: quality, methods, progress, tools and equipments, knowledge of rules, attendance, Gang chart and diary, inspection of finished work, Inspection of bad riding spots, spots identified by TRC for urgent maintenance, Systematic measurement and investigation of defect	2	0
PSURE128	ACCIDENTS & DISASTER MANAGEMENT	2	0
1	Action to be taken on reaching site, First aid, preservation of clues, Assessment of men and materials for restoration, Recording site and track particulars, Preparation of a sketch, Expeditious restoration,	1	0
2	Mechanism of derailment, Various defetcs of rolling stocks and IRCA's rejection limits, Disaster Management	1	0
	CE-MIS (TMS)		

PSURE129	TMS	1	0
1	Track Management System: Introduction to TMS, purpose, advantages, main features	1	0
PSURE130	CONTRACT MANAGEMENT	2	0
1	Hiring of tools and plants to Contractors	1	0
2	Supervision of contractual works, Safety at work-site, Common ignorance. Dos & Don'ts for contract matters	1	0
PSURE131	LAND MANAGEMENT	1	0
1	Demarcation of land boundaries,	1	0
PSURE132	COMPUTER & THEIR USAGE	4	2
1	Windows,	1	0
2	MS- Office: Word, Excel, Access, PowerPoint	2	0
3	Use of Internet, Latest advancement in Information Technology & e-mail.	1	2
	SAFETY		
PSURE133	CRS SANCTION & SCHEDULE OF DIMENSIONS	1	0
1	Various schedules of dimensions related to P. Way	1	0
PSURE134	TRANSPORTATION	4	0
1	Knowledge of G & SR, Various systems of working, Essentials of absolute & automatic block system,	1	0
2	Classification of stations, Simple layouts & condition for granting permission to approach, single line working on double line, Reception of train on blocked line and starting from non-signaled line, TFC, Interlocking, Recovery Time	1	0
3	Signals, General provisions, Description of fixed signals, Hand signals, Detonating signal flare signal, Defective fixed signal, Rules for passing defective signals,	2	0
PSURE135	OFFICE & STORES	1	0
1	Classification of stores, Stock verification, Stock sheet, Submission of returns, Inventory control, Maintenance of DMTR and ledgers, Submission of store returns in time, Materials at site register, Imprest Store, T&P Store	1	0
PSURE136	PERSONNEL	3	0
1	Muster, Pay sheet, Pay Bands, Grade Pay; Allowances,	1	0
2	Passes (PTOs) and leave	1	0
3	Railway Services (Conduct) Rules, D&A Rules	1	0
PSURE137	FIRST AID	1	0
1	Introduction-Safety first principles, First Aid Box & Application, Precautions	1	0
PSURE138	RAJBHASHA	1	0
1	Directives in use of Raj Bhasha in day-to-day working.	1	0
	GRAND TOTAL	92	4
Note:- Periods suggested for Class Room and Model Room against the topics above are indicative. Minor modifications may be made with the approval of PCE, in case local circumstances so warrant.			