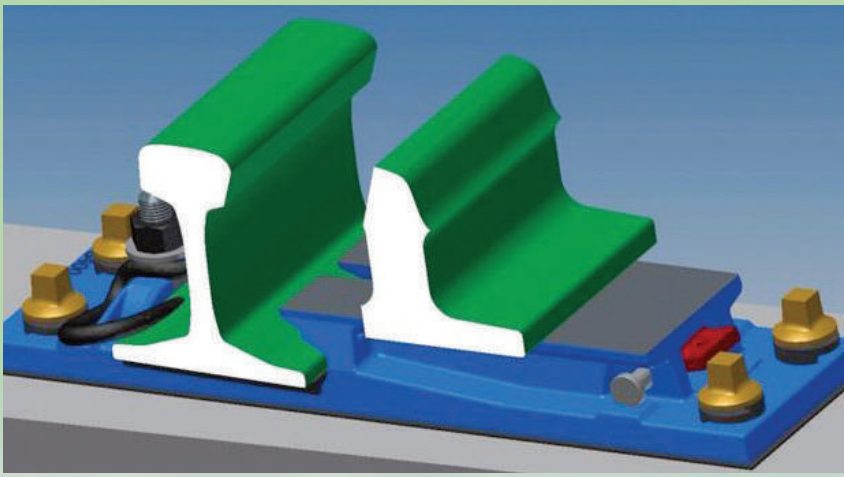
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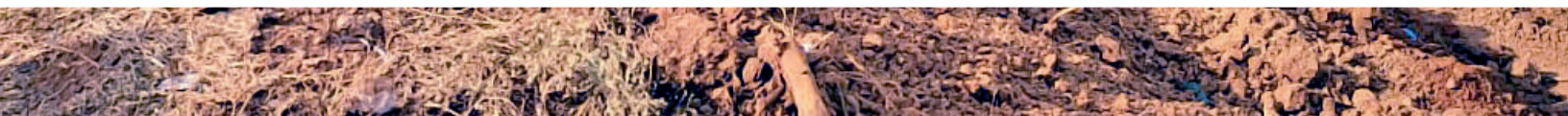
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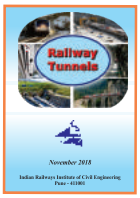




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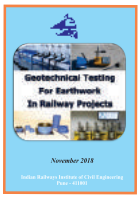
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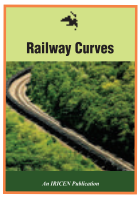
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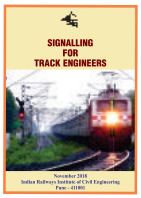
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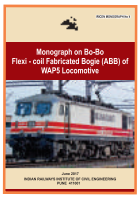
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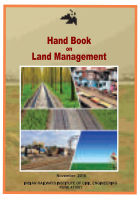
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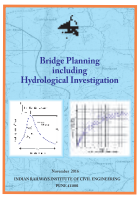
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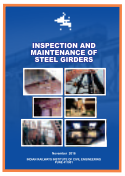
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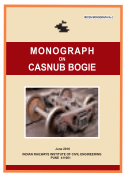
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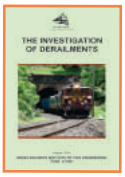
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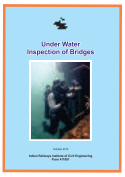
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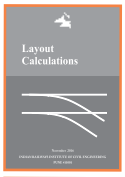
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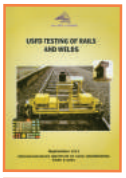
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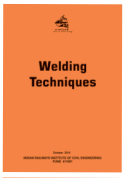
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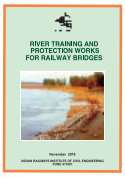
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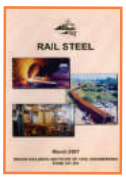
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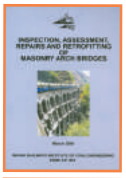
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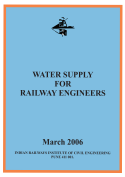
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From Director's Desk

Dear Readers,

The edition of journal includes technical papers on Renewal of Thick Web Switches on High Speed Routes, Destressing of Long Welded Rails : a rational approach, Failure of PSC sleepers in Track. The papers deliberate on technical aspects relevant to field applications.

An attempt has been made in a paper on implementation of Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) of Government of India with railways. The paper has been included here for spreading the awareness to all Railway Engineers.

I hope that the readers would find the papers and other articles contained in this edition relevant and useful. The suggestions and contributions of technical papers, news items, articles, etc are welcome and to be sent by field engineers, for inclusion in the forthcoming issues of this journal and sharing of knowledge and experience with engineering fraternity.

(Ajay Goyal)
Director

Pune
April 2019

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Suggestion for improvement of **IRICEN JOURNAL OF CIVIL ENGINEERING** are welcome from the readers. Suggestions may be sent to mail@iricen.gov.in

Guidelines to contributors

Articles on the Railway Civil Engineering are welcome from the authors. The authors who are willing to contribute articles in the IRICEN Journal of Civil Engineering are requested to please go through the following guidelines :

1. The paper may be a review of conventional technology, possibilities of improvement in the technology or any other item which may be of interest to the readers. The paper should be reasonably detailed so that it could help the reader to understand the topic. The paper may contain analysis, design, construction, maintenance of railway civil engineering assets. The paper should be concise.
2. The journal is likely to be printed in a paper of size 215 mm X 280 mm. While sending the articles the author should write in 2 columns. Sketches, tables and figures should be accommodated in a 2 column set up only.
3. Author should send the original printout of photograph along with the digital copy of the photograph.
4. Soft copy as well as hard copy of article must be invariably sent to the editors of concerned subject.
5. Only selected articles will be included in the IRICEN Journal of Civil Engineering.

Indian Railways-RailTel Sign MoU to Implement e-Office System

An MoU was signed on March 8 between Indian Railways and public sector telecom firm RailTel for implementing the e-office system aimed at digitising the work of the national transporter.

RailTel, a Miniratna PSU under the Ministry of Railways, has taken up the work of implementing the e-office system for Indian Railways, an official statement said.

E-Office project is a Mission Mode Project (MMP) under the national e-governance programme of the government.

The project aims to usher in more efficient, effective and transparent inter-government and intra-government transactions and processes, the statement said.

Ref: http://www.railnews.co.in

Indian Railways Sets New Make in India Record! Over 6,000 Coaches Manufactured in FY:18-19

Big 'Make in India' achievement by Indian Railways! All the three coach factories of Indian Railways namely, Integral Coach Factory (ICF), Modern Coach Factory (MCF) and Rail Coach Factory (RCF) have ended the financial year 2018-2019 on a high note. Making a new record, Piyush Goyal led-Indian Railways manufactured a total of 6037 coaches this financial year against the production of 4,470 coaches (previous record) last year. The growth in coach production this year is 35 per cent more than the last financial year.

The record in coach production has been achieved despite compelling all units to diversify to all variants, frequent changes throughout the year, interrupting production to produce power, pantry, other cars and many new products in train-set, LHB (Linke Hofmann Busch), EMU (Electric Multiple Unit), MEMU (Mainline Electric Multiple Unit), special category including Vande Bharat Express.

Recently, the ICF in Chennai secured itself among the largest railcar builders in the world. It also surpassed China's top manufacturers who manufacture around 2,600 coaches a year.

Meanwhile, by flagging off a rake of 22 coaches recently, the MCF in Raebareli, Uttar Pradesh registered a record production of as many as 1425 coaches in the financial year 2018-2019, beating the given target. In the year 2017-2018, the target of 710 coaches was surpassed by the production of 711 coaches. This year as well, the MCF surpassed the target of 1422 coaches by manufacturing a total of 1425 coaches which is more than double of last financial year. Interestingly, in this financial year, the MCF has also manufactured new types of coaches namely- AC Pantry (Hot Buffet) Car, Under Slung Power Car, Non Air-Conditioned Chair Car and Track Recording Car for RDSO (Research Design and Standards Organisation). With an increase in coach production and also by increasing variety of coaches manufactured, the MCF is achieving new heights nationally as well as internationally.

Also, earlier this year it was reported that the MCF has manufactured as many as 152 LHB coaches in the month of January 2019, its highest ever. With new heights being achieved in coach production, all three coach factories are poised to perform even much better in the financial year 2019-2020.

Ref: http://www.railnews.co.in

2000 Meter Long Train Ran on ECOR First Time on Experimental Basis

With a view to providing less manpower and economic path utilisation, East Coast Railway has run 3 train rakes at a time on an experimental basis for the first time. The length of complete train was about 2000 meter long.

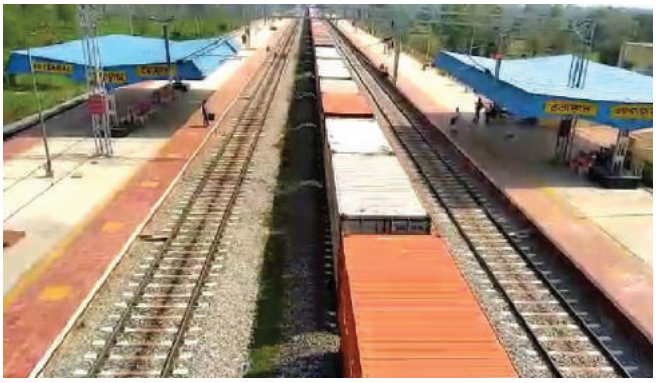
The train consisting of 147 Wagons, 03 Brake/ Guard Vans and 04 Engines was planned to run on experimental basis between Godbhaga and Balangir Stations in Sambalpur Railway Division. The first rake of 45 Flat Wagons loaded with Containers and the second & third empty rakes of 51 Alumina Containers each are going towards Visakhapatnam Port.

Running of this train on experimental basis has utilised less manpower, run on a single Signal and Single Closure of Level Crossings.

Ref: http://www.railnews.co.in

Indian Railways is Leveraging Technology to Achieve Speed of 160 kmph for Passenger Trains

Indian Railways is leveraging technology for reducing the reliance on human interface and efficient allocation of resources to improve safety, said Shri Vishwesh Chaube, Member Engineering, Railway Board. He also stated that higher speed of 160kmph would warrant a situation where manual inspections and patrolling of track will not be possible without controlling traffic. Shri Vishwesh Chaube delivered key note address at the International Technical Seminar on "Challenges in



introducing speed of 160 kmph for passenger trains and 100 kmph for High Axle Load Freight Traffic and Innovative Technologies for fast paced construction on Indian Railways" today i.e., 22nd February, 2019 at Hyderabad International Convention Centre, Hyderabad. Sri S.N.Agrawal, Member Staff, Railway Board was the Guest of Honour and Sri Gajanan Mallya, General Manager, South Central Railway attended as Special Invitee. Around 600 delegates from all over the Indian Railways and production units and foreign countries have participated in the seminar.

Speaking on the occasion he stated that the present day track structure on Indian Railways requires mechanized maintenance. Indian Railways is having a fleet of 916 track machines at present and it will be doubled in the next three years and it is being planned for complete mechanization with about 2850 machines by the year 2024. Track component monitoring system with machine vision fitted on LHB OMS coaches, automated ballast unloading hoppers, long rail panel unloading systems etc are under process of induction. For running 160kmph speed trains, isolation of track from surrounding is mandatory and construction of boundary wall/fencing is essential. During 2018-19 FY works worth more that Rs.3000 crore has been sanctioned for the purpose.

Speaking on the occasion Shri Gajanan Mallya General Manager stated that, the rail net work in the country is highly congested and up gradation of infrastructure facilities to meet the expectations of the travelling passengers and freight customers is the need of the hour. He also stated that technical seminars on challenges being faced will certainly help in innovations and contributes to the might of the Indian Railways.

Speaking on the occasion Shri S.N.Agrawal stated that, running of semi speed and high speed trains is very essential to meet the expectations of present day generation and running of higher axle load freight trains is essential for the organization. Assent maintenance and protection of track shall be given priority.

During the daylong session on the 1st day, Technical Papers presentation and deliberations are carried out on the subject topics on introduction of higher speeds for passenger and goods trains.

A Technical Exhibition has also been inaugurated by the Chief Guest Sri Vishwesh Chaube where innovative, modern equipments and track components etc., developed by various industries and SC Railway departmentally were exhibited. The exhibition will contribute for exchange of innovative ideas for implementation.

The Chief Guest has released various web apps and items like IPWE Souvenir, Technical Diary, Work site safety pamphlet, e-learning website of IPWE, e-release of Technical Proceedings of IPWE & Knowledge Bank App.

The Chief Guest also presented Best Paper IPWE 2018 Awards to Shri Naveen Chopra, PCE/NR & Shri Ashish Bansal, CE/TM/NR, Shri Anurag Kumar Sachan, Shri R.P.Tiwari, Director/TM/RDSO & Shri Rahul Singh, Joint Director/TM/RDSO. VCA Padmanabhan Memorial Cash Award IPWE exam 2017-18 to Shri Pradipta Chokraborty & Shri Rajroop Ghosh.

Important presentations were made on topics like:

- Challenges in introducing speed of 160 kmph for passenger trains and 100 kmph for high axle freight on IR.
- Design & Development of New Track Components including wider & heavier PSC Sleeper and Fastening System suitable for Semi-high speed and heavy Axle Load.
- Innovative approaches / method adopted in fast pace construction of RUBs to achieve huge target elimination of UMLCs on SCRly.
- Fast Track construction in dedicated freight corridor.
- IT enablement of Engineering Department on IR-status & Road map ahead.

The Seminar is being organized under the guidance of Sri K.V.Siva Prasad, Principal Chief Engineer, South Central Railway & Chairman, IPWE(I), South Central Railway Center.

Ref: http://www.railnews.co.in

Railway Minister Launches the IEA's Report "The Future of Rail"

Minister of Railways & Coal, Shri Piyush Goyal launched the report "The Future of Rail" of International Energy Agency (IEA) at an event here today. Chairman, Railway Board, Shri Vinod Kumar Yadav, Executive Director, International Energy Agency (IEA), Dr. Fatih Birol, Director General, International Union of Railways, Shri Jean-Pierre Loubinoux, Members of Railway Board and other Dignitaries from Ministry of Railways and IEA were present on the occasion.

Speaking on the occasion, Shri Piyush Goyal said,

today is the death anniversary of Mahatma Gandhi Ji and Railways played a very important role in the his life, and his journey from Mohan to Mahatma was captured in a tableau during the Republic Day Parade this year. He added that, what Mahatma Gandhi Ji said is still relevant for the entire world. One of his writings quotes: "The Day the Power of Love overrules the Love of Power, the World will know Peace" continues to guide us even today.

He said that this Government led by Hon'ble Prime Minister, Shri Narendra Modi is committed to providing a better future for the country's youth by combatting climate change and bringing down our emission levels. The huge investment Railways has achieved in the last 5 years has helped us improve safety, complete long-delayed projects and introduce modern & unprecedented technology in services.

Shri Goyal further said that the indigenously produced Vande Bharat Express is an engineering marvel that will change our approach to train manufacturing as well as revolutionise train travel in India. He also highlighted Indian Railway's successful effort to convert diesel locomotives to electric locomotives as truly innovative and added that it will be a game-changer in the way forward as we move towards 100% electrification for the Indian Railways. He informed that 5 years ago, Railways had electrified about 600 km of tracks across the country. Last year alone, we electrified over 4,000 km, and in the coming year we aim to electrify over 6,000 Km. He reiterated that there is a rising demand for better quality, safer, more comfortable, efficient, reliable and cheap transport and added that no other form of transport can provide this other than railways.

In his introductory remarks, Chairman, Railway Board, Shri Vinod Kumar Yadav said that Railways can play an important role in the sustainable development of the world economy. He added that rail transport is superior to any other form of transport in terms of energy efficiency and being environment friendly. He highlighted the focus on capacity augmentation and infrastructural development by Indian Railways in recent years to make it an engine of growth for the nation.

"The Future of Rail" the first-of-a-kind report analyses the current and future importance of rail around the world through the perspective of its energy and environmental implications. The report reviews the impact of existing plans and regulations on the future of rail, and explores the key policies that could help to realise an enhanced future rail.

This first ever global report has a focus on India, elaborating on the unique social and economic role of rail in India, together with its great enduring potential, to show how India can extend and update its networks to harness rail at a scope and scale that is unparalleled.

Backgrounder:

The IEA is an inter-governmental organisation that works to ensure reliable, affordable and clean energy for its 30 member countries and 8 association countries. Its mission is guided by four main areas of focus: energy security, economic development, environmental awareness and engagement worldwide.

India and the International Energy Agency (IEA) have benefited from a long, on-going bilateral relationship and cooperation in a broad range of area including energy security, statistics, energy efficiency, market analysis for oil, gas, electricity, renewables, system integration and implementation agreements for enhanced technologies.

India has been the focus of many recent IEA analyses and reports for instance through the special focus chapter on the Indian Power sector of the Energy Technology Perspectives (ETP) publication and the World Energy Outlook (WEO). High level policy dialogues have been further intensified over the last few years including a statement of intent on data and research cooperation, and a memorandum of understanding on clean energy research and development tracking. IEA has also held workshops and training programmes in India on energy data training, energy efficiency, strategic petroleum reserves, and the integration of renewables into the grid.

Ref: http://www.railnews.co.in

Nepal Starts Janakpur-Jayanagar Railway Procurement Process, Approaches Indian Companies

Nepal has started the procurement process to launch railway services from Janakpur in Nepal to Jayanagar Railway Station on the Samathipur Division of East Central Railway of Indian Railways in India, for which Indian companies have been approached.

The Government of Nepal had, on January 13, gave a go-ahead for the procurement process following which the Department of Railways, under the Ministry of Physical Infrastructure and Transport, started preparations for the purchase of rails.

"The Department has sent proposals to Indian government companies towards that end, and some of them have responded to the proposals," the state news agency RSS reported.

Though the Government of Nepal allocated NRs 500 million for the purchase of two trains for the service, the Department has stated that at least NRs 1.5 billion would be required for the purchase of rails.

The newly upgraded railway line between Nepal and

India would cover a total distance of 35 kilometres in the first phase, for which the trial has already been carried out. The total length of the Bardibas-Janakpur-Jayanagar-Kurtha-Bijayapura is 69 kilometres.

Ref: http://www.railnews.co.in

Maharashtra Metro Rail Focusing on Generating 50% Revenues through Non-Fare Services, says Managing Director

The Nagpur Metro Project which is set to go on stream in the first week of March has many firsts to its credit — from solar-powered coaches to targeted 50%-plus non-fare revenues. Brijesh Dixit, managing director of Maharashtra Metro Rail Corporation, in an interview with Vikas Srivastava said, the company will likely break-even by 2021. Edited Excerpts:

Which are the routes you are planning to launch in the first phase?

The stretch starting from Khapri Metro Station to Sitabuldi Interchange which is part of the north-south corridor along with Lokmanya Nagar and Subhash Nagar on the east-west corridor are proposed to be launched in the first phase. These routes will provide connectivity between industrial areas on the outskirts of the city (SEZ, cargo hub) to the Central Business District of Sitabuldi. It will also provide an easy transportation for the workforce employed in the industrial area of Hingna. The proposed work on these two routes would cover a distance of 18.5 km and will be over by February 26.

What are the sizes of rakes that we are looking at?

The Metro train would comprise three coaches against four coaches elsewhere. However, these coaches would have higher powering capacity, which allows faster pick-up between stations. The other major highlight of the train would be a special coach for women called 'Nari Shakti'. The special coach would not just ensure safety for women, but also promise a hassle-free journey.

By when can we expect both the corridors (east-west and north-south) to be ready?

The entire Nagpur Metro project which covers a distance of 38.215 km and includes 38 stations is expected to be ready by the end of 2019. While the north-south corridor of this project stretches to a distance of 19.985 km and covers 18 stations, the east-west corridor covers a distance of 18.23 km and 20 stations. Sitabuldi Interchange would serve to be the meeting point for train coming from all the four directions.



According to DPR, what is the ridership projected this year. And in the next five years?

As per DPR, the proposed daily ridership in 2021 is expected to be 3.83 lakh. The ridership for the north-south corridor is expected to be 1.85 lakh, while the figure for east-west corridor would be 1.97 lakh. Similarly, the ridership figures, as proposed in the DPR, would increase exponentially, and by 2041, the ridership is expected to be 5.63 lakh (north-south corridor — 2.77 lakh and east-west corridor — 2.86 lakh). The Detail Project Report (DPR) lists ridership figures for every five years.

How much of the total power requirement for the Metro will be met through solar energy?

Solar power has been integrated right from the inception to meet 65% of total requirement of the project. In Phase-I, 14 MW solar power was installed which will be upgraded to 25 MW later. The rooftops, depot boundary walls and depot sheds will be mounted with solar PV panels which will be grid connected and net-metered.

What is the kind of investments we have seen till date for the Metro and what is the total project cost?

The total project cost for the Nagpur Metro is Rs 8,680 crore. Till date, over Rs 5,000 crore have been invested in the project and 77 % of the total work has also been completed. Apart from the continuous financial support by the central and state governments, foreign funding agencies such as Kfw of Germany and Afd of France have also provided 630 million euros for the project.

In terms of revenues, what are your expectations and how soon can we expect the Nagpur Metro to break-even?

Maha Metro has focussed on generating more than 50% of revenue through non-fare box sources. It will be highest-ever in the metro rail segment across the world. We aim to overtake Hong Kong Metro service which is around 42%. We have not waited for launch of services but our earnings have already started. Maha Metro has already earned almost Rs 140 crore

through property development initiatives. Metro has earned from the 1% additional surcharge on stamp duty levied by the state government and the earnings through transit-oriented development (TOD) policy. We expect the break-even to happen by 2021 when our traffic reaches 3.83 lakh.

Ref: http://www.railnews.co.in

SAIL's Durgapur Steel Plant Despatches its First Batch of Made in India Wheel Sets for High Speed Trains

Wheel & Axle Plant of Durgapur Steel Plant (DSP) on Monday dispatched its first consignment of indegenously developed wheels for LHB (Linke Hofmann Busch) coaches used in high speed trains like, the Rajdhani and Satabdi Express.

The Railways have been gradually converting its traditional coaches made by Integral Coach Factory to LHB coaches, mainly due to its high safety features. However, wheels for these coaches have so far been imported by Indian Railways. Indigenous manufacturing of LHB wheels had thus became extremely important for the railways.

DSP's Wheel and Axle Plant, which has been making wheels for railway coaches, took up the latest challenge and managed to successfully develop LHB



coach wheels as per the Railways' stringent norms and standards. The consignment consisting of 30 wheels was flagged off by Anirban Dasgupta, CEO of ISP, who holds additional charge as CEO, DSP & ASP, in presence senior officials and Wheel & Axle collective.

The design of LHB wheel is unique due to its web profile. Moreover metallurgical property of LHB wheels are also of very stringent, a DSP statement said. For achieving the complex dimension of LHB wheels, the new design of dies and rolls were done in Wheel Design Center of Wheel & Axle plant. With the use of simulation software, the profiles of Dies and Rolls required for manufacturing of LHB wheel was optimized.

After finalization of Forging Dies & Roll design, they were manufactured in house and production trials were undertaken. The heat treatment process for LHB wheels to achieve the stringent metallurgical property was standardized at Wheel & Axle Plant with the help of RCL, RDCIS and RDSO /IR.

Ref: http://www.railnews.co.in



Glorious View of CST Station Building on the eve of Republic Day

Training Tracks Ready for Mumbai-Ahmedabad Bullet Train! Check Details



It seems like work for Mumbai-Ahmedabad bullet train project is in full swing! Two 50-m training tracks for India's first bullet train project are ready. The tracks slabs are made from high strength concrete using Japan's Shinkansen (Japanese bullet train) technology.

As per the reports, the tracks include one 50-metre straight line and another same length for a curved line. The tracks are developed at High-Speed Rail Training Institute (HSRTI) and are being set up by National High-Speed Rail Corporation Limited (NHSRCL).

It may be noted that NHSRCL is implementing the high-speed train corridor project between Ahmedabad and Mumbai. The total length of the proposed corridor works is 508.17 km. The route of Mumbai Ahmedabad High-Speed Rail will be passing through two states, Maharashtra and Gujarat and one Union Territory, Dadra and Nagar Haveli.

NHSRCL is also setting up HSRTI at an estimated cost of Rs 600 crore on the campus of National Academy of Indian Railways, Vadodara. The institute will train manpower in high-speed rails. Of the total Rs 600 budget, Rs 38 crore will be spent on the 1st phase of the project, the report added.

The first consignment containing Japanese goods like 20 track slabs, 200-metre rails and 13 mm diameter reinforcement bars have already reached HSRTI. The 508 Km-long corridor requires more than one lakh such track slabs to lay the tracks for the bullet train.

In another report, ToI mentioned that India's first bullet train will have about 28 seismometers installed along the route especially in earthquake-prone regions like Konya, Latur and Kutch. These seismometers will ensure that the train can be stopped immediately in case of earthquake tremors.

The report quoted NHRCL saying, "This system detects earthquake-induced tremors which determine the expected effect of the earthquake and sends out warning signals to the operation command control and triggers emergency brake to the bullet trains if required. Critical damage and human casualties will be averted due to installation of such a system."

In December last year, a team of Japanese experts came to India to study and select six locations for installation of these devices. They examined 10m x 12m plot for installing seismometer, the report further added.

It is worth mentioning that NHSRCL has announced a nationwide competition to name the bullet train which will run from Mumbai to Ahmedabad by 2022. According to NHSRCL, the name and mascot should represent the true nature of high-speed rail and all the socio-economic benefits that will come with the introduction of this technology in India.

There will be two separate entries for train name and mascot design. The selected entry will be awarded a cash prize and five consolation entries. For mascot design, the winning prize is Rs 1,00,000 and five consolation prize of Rs 10,000 each will be awarded as well. For the train set name, the winning prize amount is Rs 50,000 and five consolation prize of Rs 5,000 each also be given.

Ref: http://www.railnews.co.in

Criteria for Renewal of Thick Web Switches on High Speed Routes : A Practical Approach

By
*B.Venkata Rao**
K. Durga Sai Krishna#

ABSTRACT:
Thick web switches(TWS) are being laid in IR on large scale to improve Structural stability, Safety and Riding comfort. In Guntakal (GTL) division TWS were laid in the year 2009-10 on Renigunta(RU)- Gooty(GY) section during doubling work. At present Curved switches are being replaced after 200 GMT for 60kg rail section and 150 GMT for 52kg rail section. So far GMT criterion for renewal of TWS is not stipulated. However, the TWS laid in RU- GY section is functioning well up to 300 GMT. Various details of performance of the TWS and problems encountered in the TWS Maintenance are detailed in this paper.

1.0 Introduction

Turnout is the most complicated component of track structure that permits movement from one track to the other. The speed on turnout is restricted because of its complexity and maintenance issues. With the introduction of curved switches on PSC layout, the speed potential has been increased to 30kmph and the maintenance is reduced. With increase in axle loads, the stresses transferred to various components of P&C increases drastically and to increase traffic potential, speed on turnout has also to be raised. Introduction of TWS is essentially required for introduction of 50 kmph on loop line and 160 mph speed on main line. On Renigunta-Gooty section of SCR, 100 Nos. of TWSs were laid on Main line in 2009-10. The performance of the Switches has been satisfactory and most of them are still on track. This Paper details the performance, experience and indicates what could be the life of TWS in terms of GMT.

2.0 Thick Web Switches (TWS)

Thick web switch consists of rail of asymmetric section with end of tongue rail forged to match lead rail with web thickness of 44mm. Whereas the present curved switches are overriding switches.

2. 1 Advantages of TWS :

i) Increased lateral strength and are sturdier due to increased thickness of web of tongue rail.

ii) Chipping of tongue is avoided and jerk at entry is reduced as the tip of tongue rail is housed in recess.

iii) In curved switches, tongue rail is raised 6mm with reference to stock rail at JOH **(see Fig1)** which causes slight twist. This is avoided in TWS as stock & tongue rail are at same level (see Fig2).

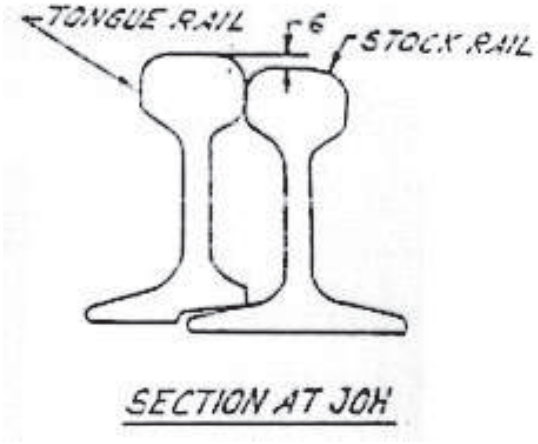


Fig1. Overriding Curved switch

iv) TWS has higher speed potential of 50Kmph.

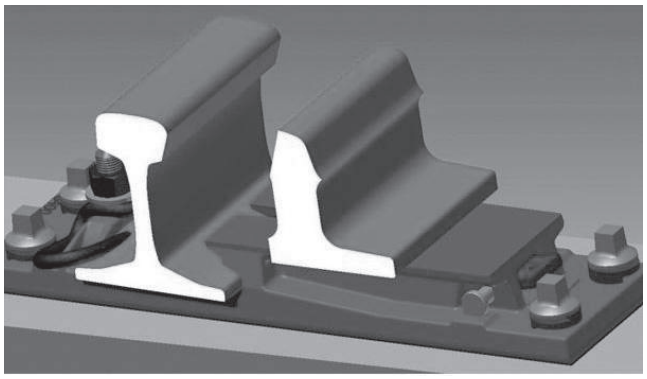


Fig 2. TWS with Asymmetrical section

3.0 Study of Performance of TWS in RJP yard

TWS were laid in Rajampet yard in 2009 during doubling work by RVNL. RJP yard is on straight track with express train stoppings in morning & evening

** Sr.DEN/Co-ordination/Guntakal/ S.C.Rly*
 # ADEN/Rajampet/Guntakal/S.C.Rly

hours. In July 2018, 5 numbers of switches that carried 300-400 GMT traffic were renewed as per the site condition and the same detailed in Table-1.

Table 1 Details of Switches Renewed in Rajampet Yard.

Pt.No	Laid	Renewal	GMT	Remarks
11A	Jul-09	Jul-18	401.04	Pt 19B & 20B are on DN line where predominant traffic is loaded goods.
13B	Jul-09	Jul-18	401.04	
20A	Jul-09	Jul-18	401.04	
19B	Jun-09	Jul-18	303.42	
20B	Jun-09	Jul-18	303.42	

The contributing factors that are limiting life of Thick Web Switches laid, are normally observed to be the following either in isolation or in combination.

1. Corrosion at foot of the tongue rail due to toilet droppings.



Fig 3. Corrosion on rail foot

Description : This problem is dependent on the time & number of passenger trains dealt on P&C. Better maintenance practices helps in controlling adverse conditions.

2. Lateral wear on the tongue rail particularly from 3.80m onwards and Vertical wear on tongue rail up to 4mm to 5mm.

Description: Wear is commonly observed in curved switches also. Ensuring standard sleeper spacing with fittings intact and avoiding kinky welds at approaches, reduces later wear to some extent.

3. **Formation of Burr.**

Description: This is mainly observed on switches laid on curves and on turnout side due to low speed. Excessive burr formation in normal curved switches affects the housing but in TWS it doesn't pose a problem for housing, as tongue rail is housed into stock rail at lower level.

4. Liner contact area biting at slide chair portion in particular.

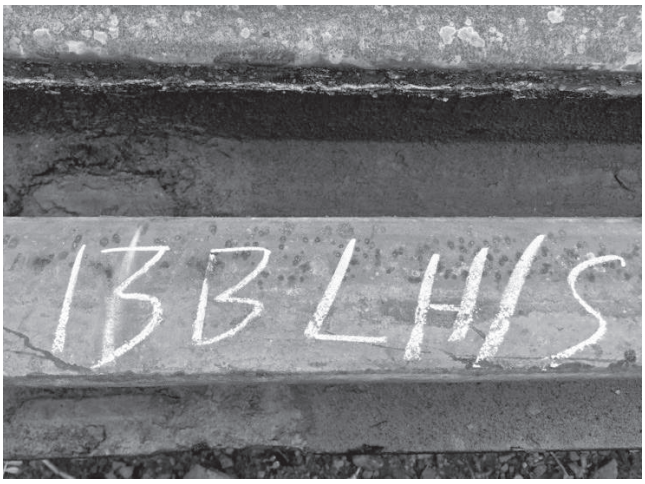


Fig 4. Liner contact biting

Description: Good maintenance practices like sealing or painting helps in reducing this problem. This is also dependent on the number of passenger trains dealt.

5. In Special bearing plate, cracks and shearing of plate is observed particularly at sleeper number 23, 24, 25 & 26.

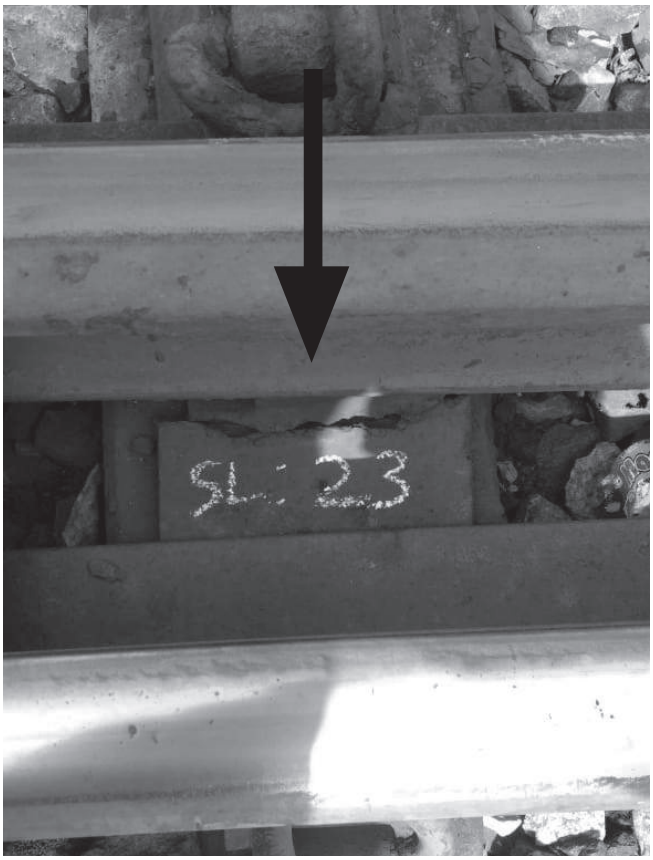


Fig 5(a). Cracks on Shear Plates



Fig 5(b) Cracks on Shear Plates

Description: One of the main reasons for shearing/ cracking of bearing plates is corrosion caused by droppings. But shearing is frequently observed at sleeper numbers 24, 25, 26 and these are the only plates having same design as that of normal curved switches rest all plates design is different. Hence this aspect of design has to be studied in detail so as to know whether this has any affect on shearing of plates.

3.0 Conclusion:

TWS as compared to Normal Curved Switches are much safer and sturdier with increase in riding quality. The renewal criterion for normal curved switches is taken as passage of 200GMT. These curved switches are also affected by above discussed problems like Corrosion, Wear & Burr formation and Liner contact area biting. All these problems are time bound, area specific and also depend on nature of traffic. Apart from all these, the major failure of Normal Curved Switch is attributed to tongue rail of switch where chipping takes place and is a major safety concern. In many cases full set/ half set of curved switches is renewed prematurely because of failure of tongue rail. With introduction of TWS, this major problem is avoided thus increasing the life of switch. But the other environmental, traffic and loading conditions to which it is exposed remains same and this becomes the governing criteria for renewal of TWS. The other thing to note is that the condition of stock, lead and approach rails of crossing remains same in TWS as compared to normal curved switches.

From the observations in RJP Yard, it is concluded that TWS laid in main line straight track can perform better up to 300 GMT of traffic and even more, subject to different conditions. Better maintenance practices help in increasing the life of switches. Hence in terms of GMT, renewal criteria for TWS laid on straight track may be taken as passage of 300 GMT, but a comprehensive approach for renewal criteria would help in efficient utilization of asset.

Piyush Goel lays Foundation Stone for 240 km-long Railway Track from Khalilabad to Bahraich

Railway Minister Piyush Goel Saturday laid the foundation stone for a 240 km-long railway track from Khalilabad to Bahraich. The railway track will be constructed at a cost of Rs 5,000 crore. The new track will connect remote areas of five districts - Sant Kabirnagar, Siddarthnagar, Balrampur, Shrawasti and Bahraich - and will be completed by 2024-25.

Addressing the public after laying the foundation stone, Goel said with the formation of Yogi Adityanath government in Uttar Pradesh, the state is seeing “double-engine development”. He said that no farmers’ agitation took place for fertilisers in the past five years and several development projects were undertaken in the interest of people.

“So, I hope that the BJP and its allies will win all seats in Uttar Pradesh in the coming elections,” he said. Earlier, Minister of State for Railways Manoj Sinha said Purvanchal has now become a centre of development work and this has been made possible because of Prime Minister Narendra Modi. Scheduled to be completed between 2024–25, the line will pass through five districts in Uttar Pradesh, including four aspirational districts of Bahraich, Balrampur, Shravasti and Siddharth Nagar, as well as Sant Kabirnagar.

Forming part of India’s North Eastern Railway, the Bahraich-Khalilabad line is expected to generate employment during construction. The line will provide basic infrastructure support for industrial development with socio-economic outputs, offer an alternative route to Bahraich-Khalilabad and connect border districts.

In a statement, the Indian Government said: “The approved line is passing through the district Shravasti (Bhinga), which is an important tourist place and closely associated with the life of Gautam Buddha.

“Shravasti is also an important tourist centre for Jains as the Sobhanath temple is believed to be the birthplace of the Tirthankara Sambhavanath.

“The Devi Patan temple in Tulsipur, which is close to Balrampurtown, is one of the famous 51 Shakti Peethas of MaaDurga. The line will promote tourism in the region.”

Last month, the Government of India approved a Rs59.51bn ($820m) railway electrified line project in the state of Chhattisgarh. The project will see the construction of railway connectivity on a 294.53km route from Katghora to Dongargarh.

Ref: http://www.railnews.co.in

Failure of PSC Sleepers in Track - A Case Study

By
A.V. Rama Rayalu*

Synopsis:

- *Recently, in one of the Divisions of ECoR, it was reported that during sleeper renewal by PQRS, some of 60 kg PSC sleepers to RDSO's drg no. T-2496 have developed cracks after passage of first goods train.*
- *During joint inspection by Sectional ADEN & XEN/CSP, it was observed that the cracks in these sleepers were originated from bottom and extended vertically up to rail seat across the section .*
- *The subject sleepers were produced by one CSP and condition of sleepers produced by other CSPs are good.*

- Photographs of some of the subject sleepers are as follows :



* Dy CE/CSP/ECoR/BBS

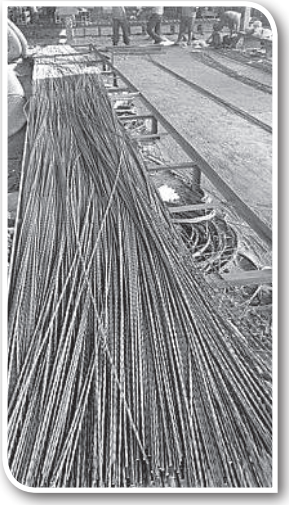
General discussion on extant instructions available for production of 60 kg BG line PSC sleepers by Concrete Sleeper Plants :

The production of PSC sleepers are based on the following documents

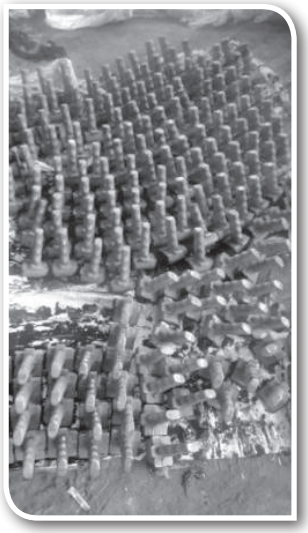
- IRS for Pre tensioned PSC sleepers No. T-39 -85 (Fifth Revision- Feb'16).
- IRS Conditions of Contract.
- Special Conditions of Contract.
- Schedule of Technical Requirements (STR) for PSC sleepers.
- Quality Assurance Programme (QAP) for production of PSC sleepers.
- Lay Out Plan of CSP.
- Bd's letter dtd 19.11.2014

Gist of various specifications laid down in the above documents :

1) High Tensile Steel (HTS) wire :



- Plain wire or strand to IS: 1785 Pt I & IS: 6006 -2014 resp.
- To be procured only from BIS approved manufacturers.
- 18 nos 3x3 mm dia.
- To be passed by AIE/XEN/CSP at manufacturers premises before dispatch.



2) SGCI inserts :

- IRSS No. T-46-1996
- To be procured only from RDSO approved manufacturers.
- To be passed by M/S RITES at manufacturers premises before dispatch

3) Cement :

- OPC 53 S grade to IS:269-2015 .
- Upper limit of initial setting time - 120 min. preferably but ≤150 min.
- Cement content of the mix > 350 Kg/cu.m and < 450 kg/cu.m.
- To be procured from the nominated Primary/ Secondary source and as per the rate, terms & conditions fixed by RB with Cement suppliers.

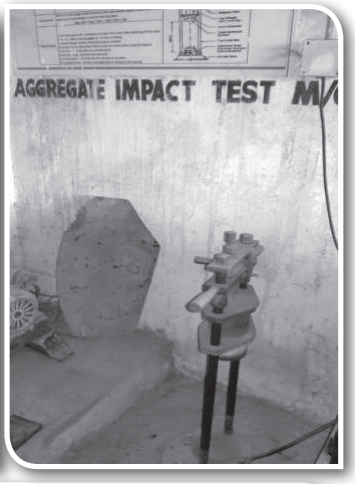


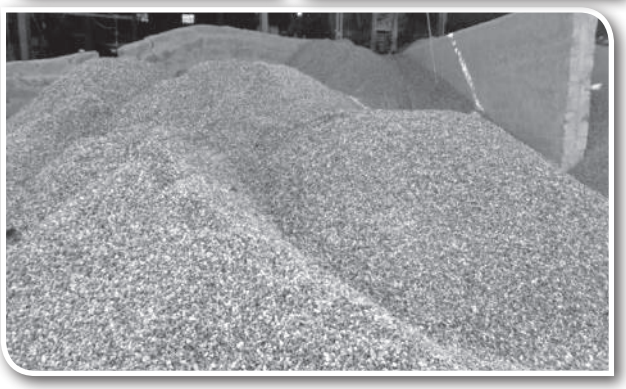
4) Admixture :

- Super Plasticizer confirming to IS:9103 with the approval of RDSO in the design mix.

5) Aggregates :







- IS: 383-2016.
- Abrasion & impact values < 30 %
- Flakiness index & elongation index shall < 30 %.
- Different sizes of aggregates shall be stacked in different storage bins or stock piles on proper hard floor surface under a covered shed near batching plant.

- To be procured from the sources approved by RDSO in the design mix.

6) Water :

- IS:456-1978 for making and curing concrete .

7) Concrete :

- Controlled quality with the nominal max.size of aggregates < 20 mm, can be 25 mm.
- Min. release strength after steam curing - 40 N/sq .mm .
- 15 days characteristic strength after water curing - 55 N/sq .mm .
- % of cubes with strength less than characteristic strength - ≤2.5 %.
- Co-efficient of variation : <7 %.

8) Concrete mix design:

- IS: 10262-2009.
- To be checked by Zonal Rlys and approved by RDSO.
- RDSO will check and verify the new mix design at the sleeper plant by testing of trial cubes of 80 nos in 10 batches of 8 cubes each 4 for steam curing and 4 for water curing.





9) Steel Stress Benches :

- To be made of channel and with Jack Anchoring Pockets for holding 4 sleeper moulds.
- Design to be such so as to have min. distortion on account of service stresses.



10) Steel Sleeper Moulds :

- Steel with min. plate thickness of 10 mm in rail seat area as well as for end plates.
- For other locations, min. plate thickness 6 to 8mm.



- The holes in the end plates shall be accurately drilled for correct placement of pre stressing wires.

11) Pre stressing of wires :









- The stretching force shall not exceed 70 % of min. specified UTS of the wire.
- Min. two sets of hydraulically operated Pre stress equipment with motorised unit, for 500 KN jacks along with Pressure gauges/ Pressure transducers.
- Digital display and auto cut arrangement shall be available.
- The data should be displayed on monitor and should be stored for future analysis of past 6 months data.

12) Mixing & Consolidation of Concrete :





- Manufacture of sleepers shall be done under a shed.
- Batching of different ingredients shall be done by weight only.
- A modern, mechanised or automatic weigh batcher shall be used for weighing aggregates and cement.
- Modern high speed mixer,pan, turbine shall be used for mixing concrete.
- Concreting shall commence within 2 hrs. of stressing of wires.
- Concrete shall be thoroughly mixed and consolidated by means of vibrators of at least 9000±4% rev/min.
- Vibrator should normally be fixed at the bottom of the mould, at least at two different locations per sleeper.
- RPM of vibrator to be digitally displaced at the location.
- Vibration to be done for 2-4 min.
- Records of vibration to be maintained in digital form.

13) Steam Curing :

- Initial curing shall be done by steam at atmospheric pressure till the concrete attains a compressive strength of 40 N/sq. mm.







- The benches shall be placed in steam chambers with hoist duly taking utmost care to ensure no damage to sleeper which is cast recently.
- Cubes shall be cast for each batch and placed in steam chamber along with bench @ one per chamber
- Steam curing chambers shall be of adequate size and capacity to hold not more than 8 benches containing 4 moulds each.
- Steam curing should be with servo controlled valve with steam regulation with auto cut off arrangement duly following steam curing cycle.
- The data of time vs temperature in each chamber should be digitally displayed and stored and system should have sufficient memory to store at least one year's data with facility to take out print shift wise.
- The steam curing cycle as approved by RDSO along with design mix :

Pre steaming	: 2 ½ hrs or min. Initial setting time of cement.
Rise in temperature	: 2 ½ hrs.
Constant temperature	: 4.0 hrs at 70 °C.
Cooling time	: 3.0 hrs
Total	**: 12.0 hrs.**

- However, extra one hour cooling of sleepers at ambient temperature before de-moulding is desirable/recommended.

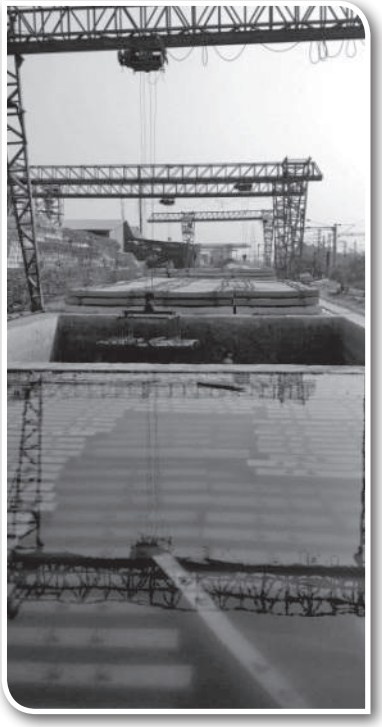
14) De-moulding and transfer of pre stress :

- After steam curing cycle, cubes from each chamber shall be tested for compressive strength.
- If the strength comes to 40 N/sq.mm, sleepers are assumed to be ready for pre stress.





- Benches are removed from steam chambers for de moulding operation.
- De stressing of bench is carried out by diagonally loosening of stress bolts.
- De moulding of sleeper is done by de moulding tackle to avoid damage to sleeper.
- The ends of the pre stressing wires shall be cut close to the surface of the sleeper in such away that there is min. damage to end plate .
- The HTS wire , in no case shall project more than 3 mm from concrete surface.



15) Water Curing :

- After de-stressing, the sleepers shall be cured for a further period of not less than 14 days by submerging in water.

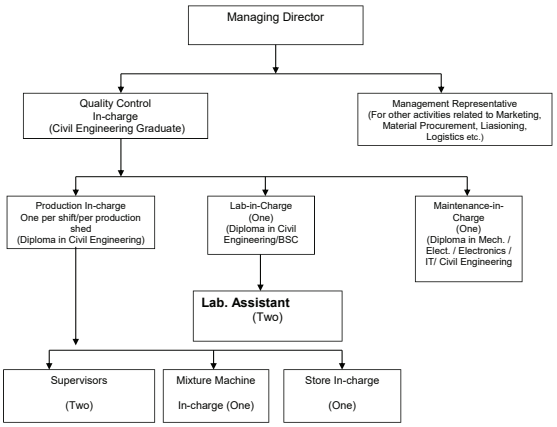
16) Finish :

- All sleepers shall be free from surface defects such as water retaining pockets, air holes or honey combed formations.
- The underside of the sleepers coming in contact with the ballast shall be left rough but the unevenness shall not exceed 5 mm.
- Two coats of suitable ISI mark anti corrosive pant shall be applied at the ends of the sleepers, first coat just after de-moulding from sleepers mould and the second coat after taking out from water curing tank.

17) Supervision :

5.0 ORGANISATION STRUCTURE

Typical organization structure chart of a Concrete Sleeper Plant is as given below -



5.1 Minimum Level of Technical Supervision

1. Overall Quality Control In-charge: At least One Graduate Engineer with Civil Engineering degree.
2. Shift In-charge for Production:
   (a) Minimum one supervisors with diploma in civil engineering for each shift per each casting shed.
   (b) Minimum one diploma engineer of mechanical/ electrical / electronic / IT /civil for maintenance of equipments.
3. Quality Control Supervisor for Laboratory and testing: Minimum one supervisor with Diploma in Civil Engg./ BSc .
4. Supervisors & Mixture Machine In-charge should be suitably qualified and their competency shall be certified by the overall Quality Control In-charge of the plant.

18) Inspection Schedule for Rly Officials :

Zonal Railway :

SSE/Works (posted in the plant) – Daily on every shift.

ADEN/AXEN - Once in a week (Preferably to be synchronised with the sleeper testing & passing)

XEN (HQ) **-** Each plant to be inspected at least once in 3 months.

Dy CE (HQ) **-** At least once in a year

RDSO **-** Once in two years

19) Checks & Tests :

a) Visual check :

- Every sleeper shall be visually inspected for surface finish such as water retaining pockets, air holes or honey combed formations.
- Such sleepers which are found acceptable due to surface defects, shall be accepted to a ceiling of 1% of supplies made any time during currency of the contract provided such sleepers are adequately treated with epoxy compounds .
- These sleepers shall be marked suitably before dispatch and shall be paid at 92.5 % of rates.

b) Cube testing :



- After curing period of 14 days, 3 cubes for a particular batch are taken out for testing compressive strength.
- Test result of a sample shall be the average of the strength of three cubes.
- If the individual variation in cube strength in a sample is more than ± 15 % of the average, the lot shall be rejected.
- Further, if mean of two test results of two samples is < fck and/or min. of two test results of two samples is < fck – 5 N/sq.mm, the lot shall also be rejected.
- Fck is characteristic compressive strength of concrete ie 55 N/sq.mm for M-55.

c) Test for 15 day modulus of rupture of concrete :

- The test shall be carried out on concrete beams of 10 x 10 x 50 cm size.
- The testing frequency is once a week after stabilisation of technique.
- If any value falls below 5.2 N/sq.mm for M -55 , the mix design shall be reviewed.

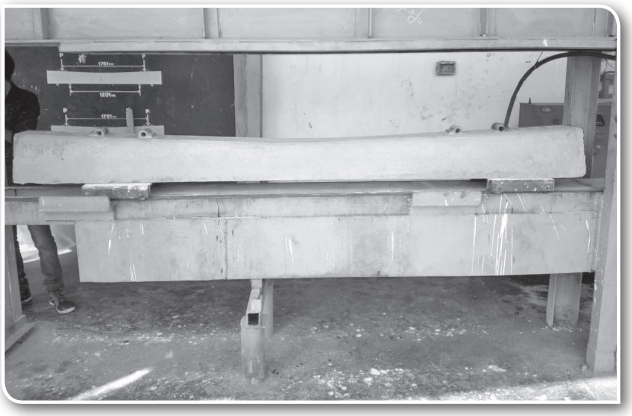
d) Test for Static Bending Strength (SBT) of sleepers :

- The tests shall be carried out in accordance with the arrangement shown in annexure-I.
- The sleepers shall be loaded gradually (30-40 KN/min) up to the specified load, which shall be retained at this level for 3 minutes for observing crack if any viz one which is barely visible to the naked eye and is at least 15 mm long from tension edge of the sleeper.

Moment of Resistance (MR) test :

- The sleeper shall be deemed to have passed the test if it sustains the loads specified in Annexure-1 without cracking.
- While loading, load can be applied up to 5 KN in excess of specified load.

Moment of Failure (MF) test :



ANNEXURE-III

TESTING AARRANGEMENT FOR STATIC BENDING STRENGTH TEST FOR PRESTRESSED MONOBLOCK CONCRETE SLEEPERS FOR B.G. & M.G.

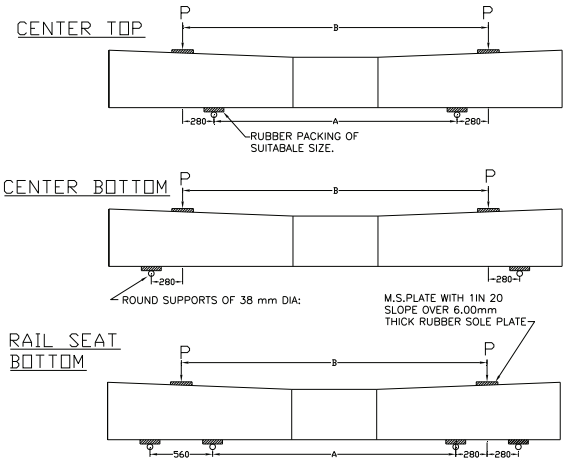


TABLE-1

DIMENSION	52 Kg.(BG)	60 Kg.(BG)	90R(MG)
A	1195	1201	520
B	1755	1761	1080

TEST LOAD FOR ACCEPTANCE("P" IN kN)

TABLE-2

CENTER TOP		CENTER BOTTOM	RAIL SEAT-BOTTOM	
			CRACKING	FAILURE
1	2	3	4	5
BG	60.00	52.50	230.00	370.00
M.G.	25.00	40.00	150.00	250.00

NOTE:- THE VALUES MENTIONED IN ABOVE TESTING ARRANGEMENT,TABLE-1 & TABLE-2 ARE FOR DRAWING NO.RDSO/T-2495 & 2496 ONLY FOR OTHER DRGS. CORRESPONDING DRAWING SHALL BE REFFERED.

- The sleeper shall be deemed to have passed the test, if it is able to take load beyond the specified test load.
- The initial cracking loads shall also be recorded for rail seat bottom, centre top and/ centre bottom.
- The flow chart for SBT of sleepers is given as annexure-IV.

ii) Wherever mean of two samples is <fck + 3 N/mm^2 or fck + 0.825 x established standard deviation whichever is greater but ≥ fck or minimum of the of the two test results is < fck - 5 N/mm^2 but z fat - 5 N/mm2 or both and the lot is not rejected as per the criteria given in para 5.3.5 - two sleeper per lot

iii) In case, mean of two test results of two samples is < fck and /or minimum of the two test results of two samples is < fck - 5 N/mm^2, the lot shall be rejected and no testing for moment of resistance or moment of failure will be conducted.

Note :

a) Prior to stabilization of production technique: Sleeper to be tested shall be subjected to rail seat bottom, centre top and centre bottom tests. b) After stabilization of production technique: Sleeper to be tested shall be subjected to rail seat bottom and centre top tests only.

ANNEXURE-IV

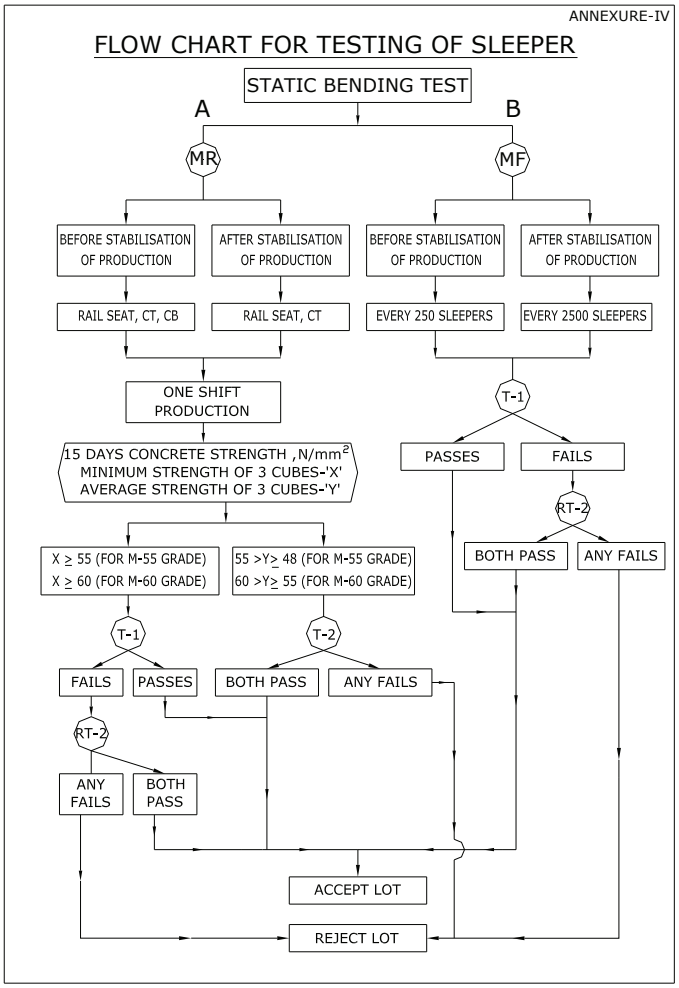
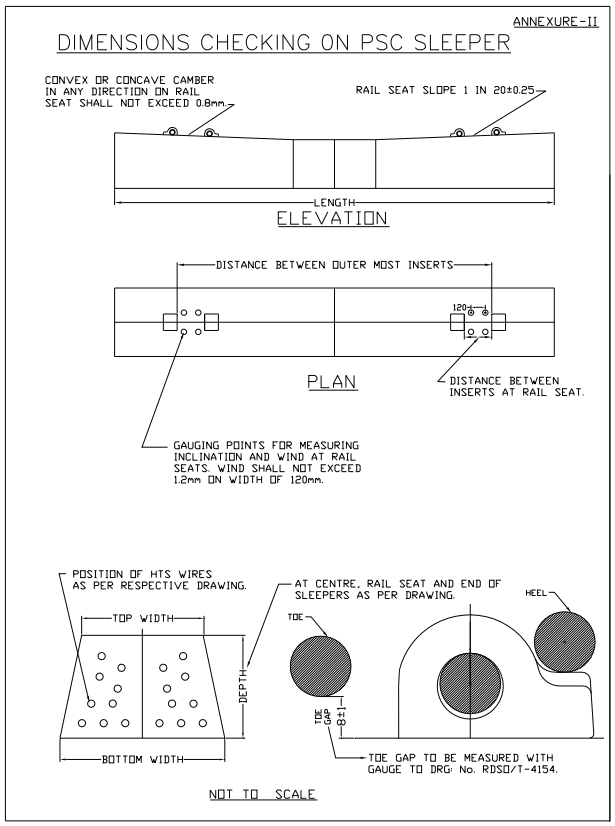


Table 1: Acceptance / Rejection Criteria of Concrete and No. of Sleepers for SBT Test per Lot

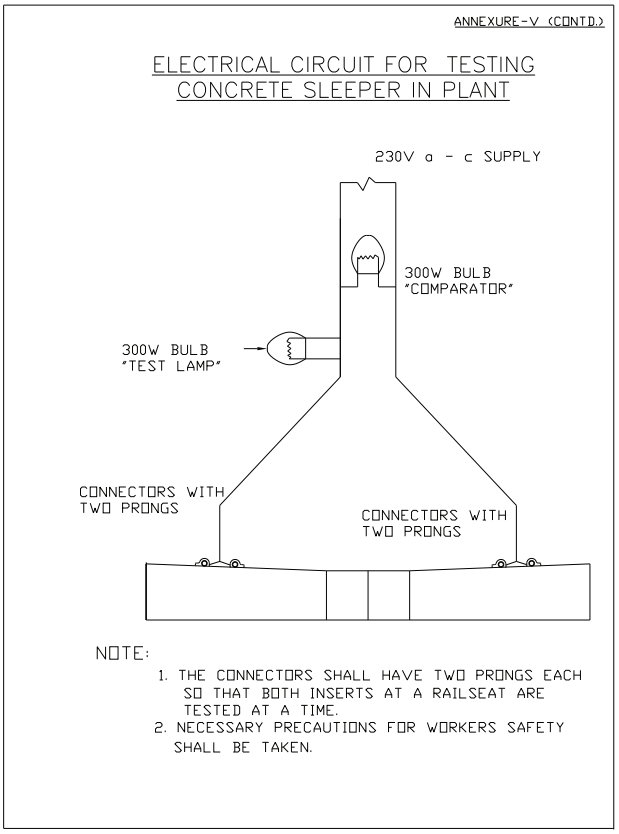
SN	First condition	Second Condition	Conditions to be complied	No. of sleeper per lot for test
Case 1	If average of test results of two samples is > fck+ 3 N/mm^2 or ≥ fck + 0.825 x established standard dmiation, N/mm^2 whichever is greater	If minimum of test results of two samples is ≥ fck + 3 N/mm^2	Both conditions are to be fulfilled and the lot is not rejected as per the criteria given in para 5.3.5.	Concrete is accepted and one sleeper will tested for SBT from the lot.
Case 2	If average of test results of two samples is < fck + 3 N/mm^2 or < fck + 0.825 x established standard deviation, N/mm^2 whichever is greater but ≥ fck N/mm^2	If minimum of test results of two samples is < fck - 3 N/mm^2 but ≥ fck - 5 N/mm^2	Any one of them or both conditions are fulfilled and the lot is not rejected as per the criteria given in para 5.3.5	Concrete is accepted but two sleepers will be tested for SBT from the lot.
Case 3	If average of test results of the two samples is < fck N/mm^2	If minimum of test results of two samples is < fck - 5N/mm^2	Any one of them or both condition are fulfilled	Lot rejected without any further testing on sleepers of the lot.

5. The existing Annexure-IV on 'Flow chart for testing of Sleeper shall be replaced as above

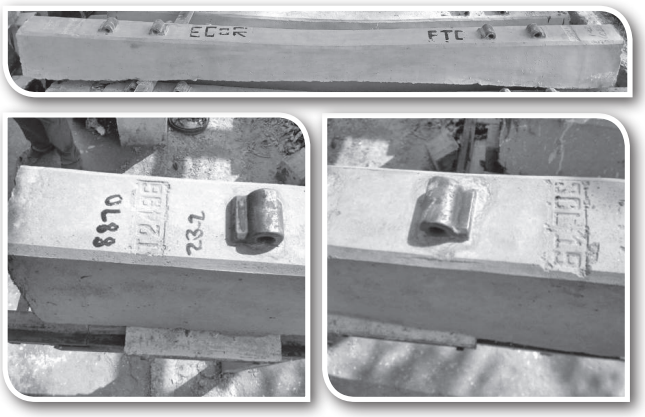
e) Dimensional check :



- After passing of SBT, all the sleepers of the particular batch are taken out for offering for dimension check.
- The dimensions of sleepers shall be checked by means of approved gauges .
- The dimensions at toe gap, location of inserts, distance between inserts at rail seat, distance between outer most inserts and slope at rail seat are termed as Critical dimensions, while, depth of sleeper at centre, rail seat and end of sleeper, width at top, bottom & length of sleeper, camber and wind at rail seat and position of HTS wires at the ends are termed as General dimensions.
- The scale of check per lot for Critical dimensions is 10% and for General dimensions 1 %, but, the dimensions between outer inserts shall be checked 100 % where stabilisation of production technique is stabilised.
- The rejection rate is 2% at the end of every 30,000 nos sleeper production and if it is found beyond 2%, then the testing has to be done as per the frequency prescribed for pre- stabilised production.
- **Measurement of electrical resistance :** After dimension test, each and every sleeper shall be tested for electrical resistance for their fitness for use in track circuited area.



20) Sampling and marking :



- All the sleepers shall have legible permanently inscribed and painted markings on top as per Drg no. RDSO/T-2466.
- The accepted sleepers shall bear the passing marks of the inspecting officer in indelible paints.
- Sleepers which have been subjected to SBT upto cracking and accepted, shall in addition be marked on the top with the letter ‘T’.
- MF tested and accepted sleepers shall bear the marking ‘MF’ with yellow bands at ends.
- All sleepers fit for use in track circuited area shall bear the mark ‘FTC ‘ at the centre of the sleeper.
- All the rejected sleepers shall be marked in the way specified in drawing no. RDSO/T-2466.

21) Rejected Sleepers:

- Rejected sleepers shall be stacked separately by the manufacturer so as to avoid their mixing with the accepted sleepers.
- The rejected sleepers shall be permanently damaged so as to render them un-usable and a certification that all rejected sleepers of previous batches have been permanently damaged shall be given by manufacturer before offering next batch for inspection.
- The same shall be verified and ensured by inspecting officials/SSE's and AIE before issuing the IC.

22) Stacking :



- After the sleepers have been checked dimensionally , visually and passed, they shall be stacked at convenient place in lots.
- The stacking of sleepers shall be done on levelled and consolidated ground, one over another upto 25 layers.
- Each layer shall be separated by wooden/concrete battens of 50x 50 mm size of suitable lengths to avoid any damage.



23) Loading and despatch:

- Only those sleepers which have been passed, properly marked and accepted by the Inspecting Officer shall be loaded for despatch.
- The loading of the passed sleepers in wagon shall be done by the manufacturer at his cost.
- The sleepers shall be properly secured to avoid movement and displacement during transit.
- The manufacturer shall be responsible to replace, free of cost, all the sleepers which are found damaged in transit on account of defective loading.

24) Guarantee :

- The sleepers shall be guaranteed by the manufacturer for a period of five years from the date of the manufacturing/three years from the date of placement in service (whichever is earlier).
- If during the guarantee period, sleepers in general are found to develop defects attributable to bad material and workmanship as established during investigation, leading to large scale withdrawal from service, the cost of sleepers and their replacement shall be borne by the manufacturer.
- The defective sleepers withdrawn from service, can be taken over at site by the manufacturer for their disposal.
- The manufacturer shall make good the cost due within 60 days of advice of defects.

25) Temporary suspension of production:

- During the course of execution, the production of the sleepers may be temporarily suspended by PCE of the Zonal Railway on the advise of its Inspecting Officials or RDSO in serious cases of non adherence to STR or large scale rejection of sleeper (>2%) or premature failure of sleepers in track.
- During the period of suspension, the manufacturer has to identify the defects in the manufacturing process and rectify the same within a reasonable period.
- Production will be resumed once the manufacturer identifies and removes the defects and the same is verified by Zonal Railway and/ or RDSO as the case may be.

Action taken report on the defective sleepers:

- At the first instance, the concerned CSP has been advised to replace all the subject sleepers at their cost as per the conditions of Contract .
- The production of sleepers was stopped for a period of 10 days and a special drive was made for counselling of Contractor's labour & supervisors, Railway's supervisors and thorough inspection , screening and testing of all raw materials viz coarse aggregate, fine aggregate and cement including

HTS wire, repairing of defective benches and moulds , inspection, overhauling and calibration of all equipments, machinery viz Concrete batching plant, vibrators, tensioning machine, steam chambers, Cube testing machine, SBT machine, beam testing machine. But, no fault could be found.

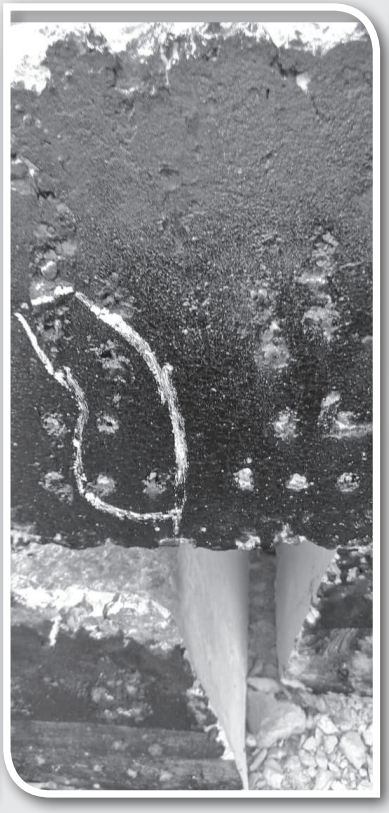
- Further, during the above spl drive, SBT test on 80 sleepers were done @ one sleeper for every steam chamber, but no noticeable clue was found.
- However, it was noticed that HTS wire of some of the sleepers have gone inside of the sleeper end, which indicated due to relaxation of HTS wire due to loss of pre stress .
- Accordingly, two different SBT tests were conducted by demoulding of sleepers without releasing stress bolts and by releasing stress bolts gradually.
- All the sleepers tested without releasing stress bolts have failed in SBT and those of second type have passed.
- The Plant Authorities, Plant's Supervisors, labour and Rly Supervisors were accordingly counselled as to be very vigilant as to ensure non repetition of such bad practices.



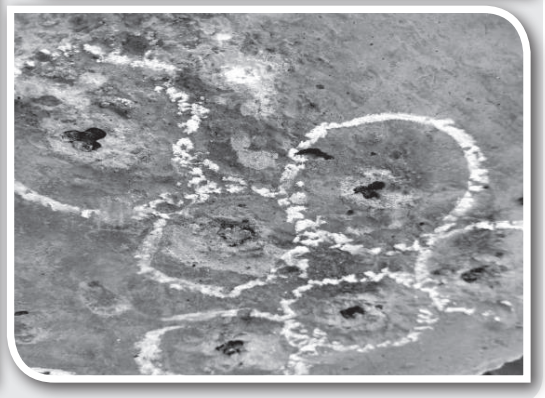


Some of the photographs showing indication of loss of pre tensioning in the sleepers are as follows :









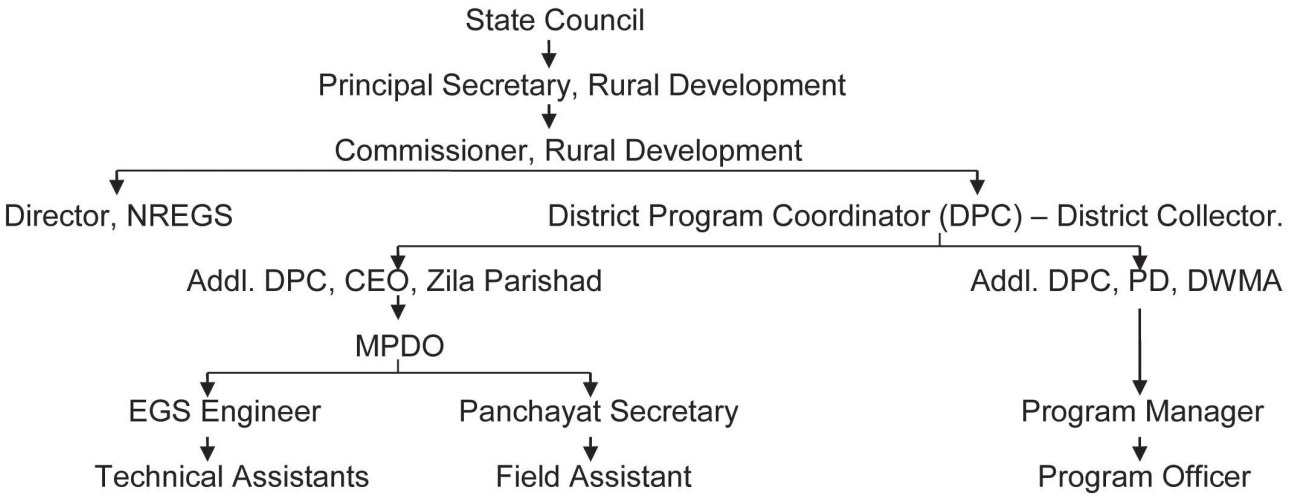
26) Conclusion :

So, it is concluded that the failure of subject sleepers is due to de moulding of sleepers by some of labour in certain batches without releasing stress bolts diagonally, thereby loss of pretension in HTS wire.

Convergence of MGNREGS with Railways

By
Pratham Agrawal*

Synopsis :
I like to begin this paper with a quote I read somewhere – Nothing is more powerful than an idea whose time has come.
MGNREGS is an Indian labour law and social security measure that aims to guarantee the 'right to work'. It aims to enhance livelihood security in rural areas by providing at least 100 days of wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work.
Policy formulation for Converging MGNREGS with Railways has been under process for the past 5 years (2013 to 2018) (Annexure 1-contains letters exchanged between Ministry of Panchayati Raj and Rural Development and Railway Board). The first tangible step towards convergence began with the Memo no. 28028 dated 10.09.18 which was issued by Government of Andhra Pradesh (Annexure 2). The memo listed 6 works which could be taken up. Though it was a state government issued circular, there was no awareness regarding the same to the state field staff. Initially not much help came from any quarter and hence to understand the working of this scheme, I visited many MGNREGS sites. It took multiple visits to various offices to finally get a sense of their structure.



I met practically each and everyone listed above. In the course of my interactions with various officials, I began to understand their system of working. I was fortunate enough to develop a good rapport with all, in particular, Mr Jameel Ullah who was working as Mandal Parishad Development Officer (MPDO), Singarayakonda.



* *Sr. ADEN/OGL, Vijayawada Division, SCR*

I have also represented Railways in Gram Panchayat meetings. In my understanding, the railway station and bus stop are two most important interface of villagers with the government.

I also became aware through MPDO, SKM and various newspaper articles that SKM has been identified as one of the mandals to be supplemented with Rs 100 crore under the Rurban scheme. I then discussed with him the possibility of works which could be taken up in the vicinity of Singarayakonda railway station. After many deliberations, 3 works were narrowed down upon for which sanction was accorded. They were –

1. **Construction of Public Wash Room in the circulating area of Singarayakonda Station area –** This work is sanctioned at a cost of Rs. 10 lakhs.
2. **Construction of Approach Road to Singarayankonda Railway Station -** This work is sanctioned at a cost of Rs. 39 lakhs.
3. **Construction of Central median and approach road street lighting – Rs. 5 lakhs.**

The progress of the above works can be checked up upon website : http://rurban.gov.in/

The Work ID are : 087045611001080255, 087045611001080256, 087045611001080257 and 087045611001080258.

The photos of work -



The entire works barring the construction of public wash toilet has been completed.

It is important to understand here that the above said works are financed partly by NREGA and partly RURBAN.

Now I focused on works identified by the Memo 28028 i.e. purely NREGA works. I wanted to discover the practical problems which will be faced during such works before I expand it to my entire section and







hence I began as a pilot project in one of the villages as MPDO, SKM agreed to take up works in railway land for a period of one week at my request. The said works were executed at km. 265/8-18 between block section of Singarayakonda (SKM) – Tangturu (TNR). A snap of the work which was executed.

::Work Details::

Not secure | www.nrega.ap.gov.in/Nregs/FrontServlet?requestType=Details_engRH&actionVal=Details&workid=081195603003170334&chkdistrict=08&ch...

Paused

Work Estimate

State	Andhra Pradesh	**District**	Prakasam	**Mandal**	Singarayakonda
Panchayat	Mulagunta Padu	**Work Code**	081195603003170334	**Survey No.**	34/1
Type of Work	Desilting of Cattle Ponds				
Work Name	Desilting of Cattle Ponds				
Work Comm Date	03-Apr-2017	**Start Date**	-	**Completed Date**	-

Task Name	Quantity	Units	Labour Cost Unskilled(Rs.)	Labour Cost Skilled(Rs.)	Material Cost(Rs.)	Total Cost(Rs.)	Person Days
Name board	1	Nos.	0	0	700	700	0
Provision for Dewatering with 5hp motor	50	Hours	0	0	5655	5655	0
Skilled wages towards cost of Technical Assistants/Barefoot Engineers @ 1.25% of the total cost	1	LS	0	0	22111	22111	0
Provision For Work Wise File	1	Nos.	0	0	100	100	0
Engaging Unskilled Labour for Light Bush Cleareance	250	Sq.m	1281	0	0	1281	6
Engaging Unskilled Labour for Excavation of silt and disposal on bund / away from bund with lead of 10 m and lift of 2 m	1200	Cu.m	216678	0	0	216678	1057
Engaging Unskilled Labour for Excavation of silt and disposal on bund / away from bund with lead of 20 m and lift of 2 m	2000	Cu.m	412361	0	0	412361	2012
Engaging Unskilled Labour for Excavation of silt and disposal on bund / away from bund with lead of 30 m and lift of 3 m	2000	Cu.m	514819	0	0	514819	2511
Engaging Unskilled Labour for Excavation of silt and disposal on bund / away from bund with lead of 40 m and lift of 4 m	2000	Cu.m	617279	0	0	617279	3011

Work Progress (Period Wise)

Before commencing such works, I held a safety seminar wherein all workers were lined up and were counseled on safe working beside the track.





In all, 168 workers were lined up.





A scrutiny of musters.

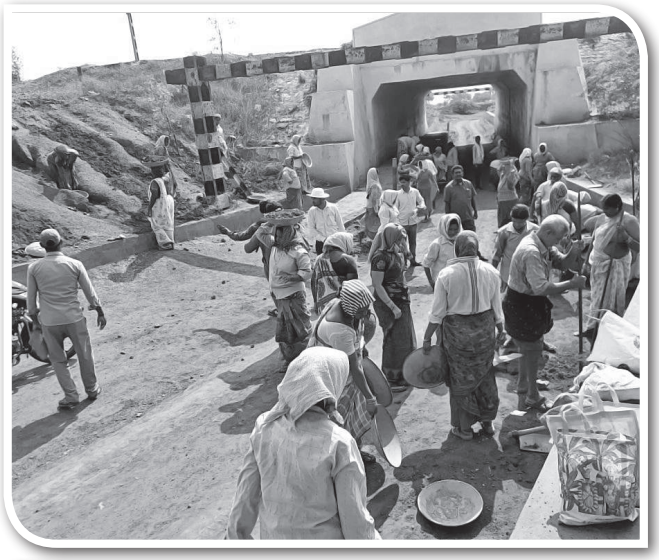
They were also split into 3 groups –

1. 50 nos. were deployed for desilting of Bridge no 525A which is an RUB located at km. 265/6-8.
2. 18 nos. were directed for jungle clearance.
3. 100 nos. were instructed to conduct cess repair work.





Before Taking Up Work Photos





During Execution of Work Photos













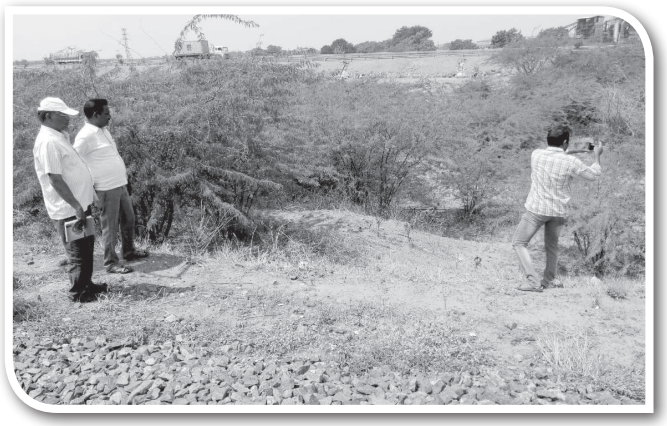


The challenges during conducting such works are as follows –

1. This is a voluntary and untrained work force whose work ethics and discipline are very different from the Railway working. They need to be not only counseled but trained a great deal which will involve practical demonstrations before they can be put to work for safety related works.
2. They are generally illiterate and are in tremendously large numbers and hence lot of supervision is required to manage them during their work.
3. They are not at all aware of any safety rules and I found them to be resting/sitting on the track as it is on an elevation and enjoying the panoramic view of the area.

Thereafter, I then undertook the exercise of inspecting the scope of work during foot by foot inspection with Program Officer of all mandals who were stationed at Mandal offices.





During such course of inspection, I realized that new type of works could be taken up which were also consistent with the Permissible List of Works under MGNREGS (Annexure 3).

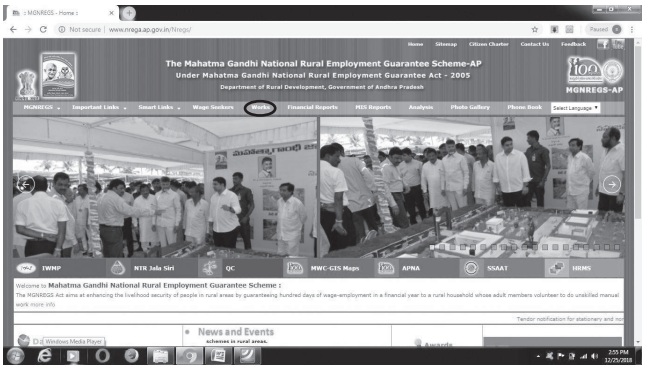
Upon realising this, I made contact with Director, Panchayati Raj and Rural Development Shri Ranjit Basha and Additional Commissioner, Panchayati Raj and Rural Development Shri Balasubramanium who are stationed at Vijayawada. I met with them along with their entire team of Program Officers and most importantly the TCS Officials. TCS is the agency which has developed and now maintaining the website for both Telangana and Andhra Pradesh Government.

I informed them about all the policy and circulars issued for convergence and also about the above said conducted exercise. We discussed at length about the safety measures which need to be undertaken while carrying out such works adjacent to track. They were very happy to note that all the ground work has been laid and they were ready to integrate in their main website. Thereafter I discussed with the TCS officials and instructed them to create the Convergence with Railways link.

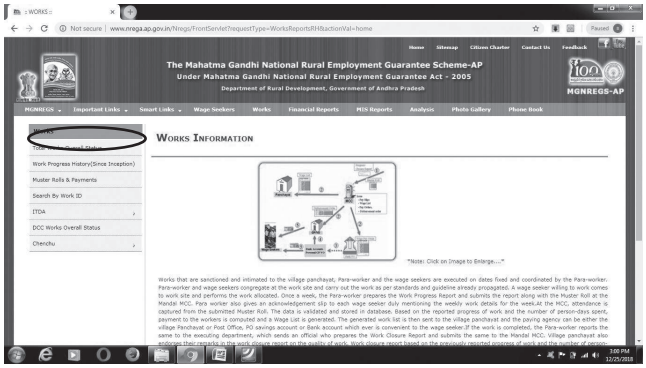
This has been the most significant milestone in this journey.

To reach the same –

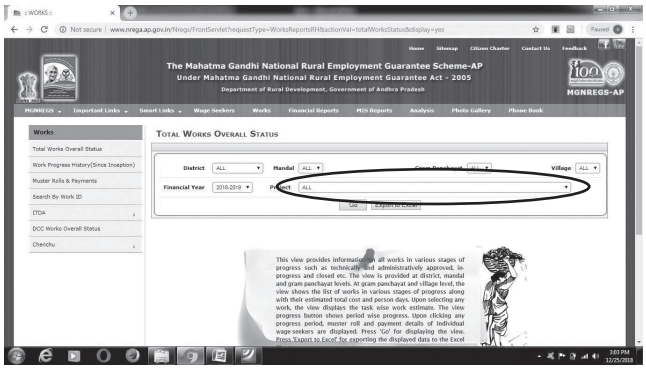
1. Go to **http://www.nrega.ap.gov.in/Nregs/** - The photo reflected below opens up. This is the official website of MGNREGA – Andhra Pradesh. It has been developed and managed by TCS.



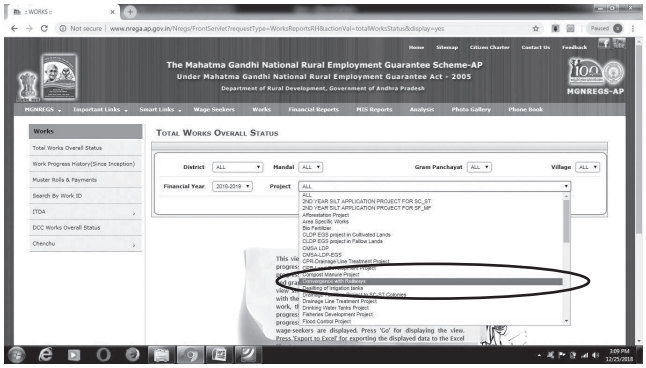
2. The 'Works' link highlighted in red in the above photo needs to be clicked. The bottom page opens up.



3. The 'Total Works Overall Status' link highlighted in red in the above photo needs to be clicked. The page below opens up.



4. As highlighted in the above photo, the Project Head has a drop down list. In that list, Convergence with Railways head has been created. This is reflected in the photo below.



It is pertinent to note here that their monitoring systems are excellently managed and transparent. Every work that gets sanctioned is allotted a unique numeric ID. All details pertaining to the work, that means, from estimate break up to weekly progress of work can be traced on this website.

Progress Monitoring is Open to All.

This integration has been done for MGNREGS - Telangana website also.



Now as discussed on Page 10, in order to explore the possibility of enlisting new works under MGNREGA, I took along, Additional Commissioner, MGNREGA, BZA, PD, DWMA, Prakasam District and Program Manager – Plantation, Horticulture, Program Officers and Technical Assistants for inspection of such locations, photos of which are attached below.



6 additional works were identified which were rationalised to 3 in consultation with their Technical Advisor making a total of 9. I do believe that many more works can be taken up which they also agreed too but a decision was made to take up these 9 works in the initial phase.

Uploading of estimates required generation of software patches which were developed in consultation with all the above. A meeting was conducted regarding this in my chamber with Program Managers and TCS officials.

The software patches were created and finally a new policy was framed.

This policy circular no. 2777/EGS/SPM(T)/2018 dated





24.11.2018 was mailed on 26.11.2018 to all concerned state and railway officials. Along with the policy, software patches have also been created. The photo of the policy is attached below.

GOVERNMENT OF ANDHRA PRADESH
Office of the Commissioner, Panchayat Raj & Rural Development
1st floor, Charita Sri Buildings, # 29-6-8/1, Nakkal Road, Suryaraopet, Vijayawada – 520002.

Circular No: 2777/EGS/SPM (T)/2018, Dated: 24.11.2018

Sub: MGNREGS – Convergence with Railway department – Permitted certain works-Guidelines issued-Reg.

Ref : 1. Lr.No. J-11017/42/2013-MGNREGS, dated 06.04.2018 of GoI, MoRD, New Delhi
2. Govt Memo No. 28028/152/RD.II/A1/2018, dated 10.09.2018 of Principal Secretary, PR & RD, GoAP
3. Lr.No. MGNREGS/Correspondence, dated 11.10.2018 of Sr.ADEN, SC Railway, Ongole

<<>>

Vide ref. 1st cited, the Ministry of Rural Development, GoI, New Delhi has issued directions to take up following works under MGNREGS in convergence with Railways as per the guidelines.

a. Construction & maintenance of approach roads for level crossings
b. Construction & maintenance of approach roads for Railway stations
c. Developing & cleaning silted water-ways, trenches & drains along the track
d. Repairs & widening of existing railways embankments/cuttings with clearing of vegetation growth
e. Plantation of trees at extreme boundary of railway land at such locations, where sufficient land is available
f. Protection work of existing railway embankments/cuttings/Bridges

Vide ref.2nd cited, the Government of AP has instructed to take up above feasible works in convergence with Railways as per guidelines issued time to time under MGNREGS.

In this regard, teams from State office have visited certain areas & works along with District Railway officials in Guntur, Anantapuram, Prakasam District, verified and identified certain feasible works to take up under MGRNEGS and are as follows.

1. Desilting of water ways of bridges/RUBs/Pipe culverts/Box culverts
2. Strengthening/widening of railways embankment
3. Trench cutting along railway boundary

Page 1

4. Recharge structures to functioning Bore wells/dried up bore wells
5. Desilting of open wells
6. Block plantation
7. Village Parks in Railway colonies
8. Linier plantation
9. Connecting roads to level crossings up to BT level (90 : 10)

To strengthen Railway embankments & to develop railway stations/areas, the above works are hereby permitted under Railways Project of MGNREGS under MCCs, subject to the following conditions.

- All the above works shall be executed in rural areas only.
- Works shall be identified by the concerned railway officials and to be got approved by the Gram sabhas & Gram Panchayats.
- The Technical officials of Railways shall assist the EGS field functionaries in giving layout of the works to be executed by the GP under MGNREGA and in preparing the input data sheets for the works identified.
- The administrative sanction of all these works will be issued by the concerned District Collector/DPC, MGNREGS and the technical sanction will be issued by the competent authorities.
- Safety measures/protection shall be taken up by the Railway department.
- Worksite beyond 5km, additional amount of Rs. 20/- shall be paid under MGNREGS towards transportation to wage seekers. If worksite is far away from the habitation, the Railway department may arrange transport to wage seekers for the worksite.
- Water source for the watering of plants shall be identified & provided by the Railway department.
- In certain works, only bush clearance will be taken up under MGNREGS and stumps removal may be taken up by the Railway department.
- Connecting roads to level crossings up to BT level work permitted with 90 (EGS) : 10 (Railway Dept) sharing pattern under DCC-PR. Execution of this work shall be taken up by the PR Engineering Department.

Page 2

- These works shall be executed strictly following MGNREGS Guidelines.

Therefore, all the District Collectors & DPCs, MGNREGS are requested to follow the above guidelines to ensure that the Railway works are executed accordingly under MGNREGS in convergence with Railway Department.

The Chief Engineer (Works), South Central Railways, Vijayawada is requested to issue suitable instructions to all your field functionaries.

The PM, TCS is requested to provide necessary software for the generation of estimates accordingly and will be deployed soon under MCC & under DCC-PR.

Encl: Works in detailed

Sd/- P. Ranjit Basha,
Director (PR&RD)

To:
All the District Collectors & DPCs, MGNREGS
All the Project Directors of DWMAs & Addl. DPCs, MGNREGS
All the Project Directors of ITDAs & Addl. DPCs, MGNREGS
Copy to
The Web Manager, RD to place in to website.
The Director, SSAAT
The Chief Vigilance Officer, RD
The Chief Quality Control Officer, MGNREGS
The Technical Advisor, RD
The Engineer-in-Chief, PRED, Vijayawada
The Chief Engineer (Works), South Central Railways, Vijayawada
All the Divisional Railway Managers, SCR in the state
The Commissioner, Tribal Welfare Department
Copy to the Special Secretary, RD
Copy submitted to the Principal Secretary, PR & RD, GoAP

// Attested //
24/11/06
Additional Commissioner, EGS

Page 3

Works under MGRNEGS in convergence with Railways

Name of the New project : Railways Project

Under MCC:

1. **Desilting of water ways of bridges/RUBs/Pipe culverts/Box culverts**

Inputs:
General Information
Location :
Sy.No. : TP No:
GPS Coordinates :
Land ownership : Government
Technical Information
Length :
Breadth :
Depth :

2. **Strengthening/widening of Railways embankment**

Inputs:
General Information
Location :
Sy.No. : TP No:
GPS Coordinates :
Land ownership : Government
Technical Information
Bush clearance

Chainage	TP No.	Type of bush(Thick/Thin)/Juliflora	Length of bush/juliflora	Breadth of bush/juliflora	Voids (%)
0-60			(Max 60m)	(Min 5m & Max 60m)	
61-120					

Excavation for track bund strengthening (Qty min 100 cum)

Chainage	TP No.	Soil type	Length	Breadth	Depth	Head lead (m)

Page 4

0-60						Up to 60m
61-120						

3. **Trench cutting along Railway boundary**

Inputs:
General Information
Location :
Sy.No. : TP No:
GPS Coordinates :
Land ownership : Government
Technical Information
Length : _____
Top width : Max. 2.00m
Depth : Max. 1.00m
Slope : 0.5 : 1

4. **Recharge structures to functioning Bore wells/dried up bore wells**
Template as per the existing estimate in MCCs

5. **Desilting of open wells**
Template as per the existing estimate in MCCs

6. **Block plantation**
(a) Residential areas : 50% Timber + 50% fruit bearing (Mango, sapota, guava)
(b) Mid section areas : i. High density plantation
ii. Normal block plantation

Inputs:
General Information
Location :
Sy.No. : TP No:
GPS Coordinates :
Land ownership : Government
Technical Information

Page 5

Extent	:	Min 0.25 Ac
Spacing	:	2' x 2', 3' x 3', 5' x 5'

7. **Village Parks in Railway colonies**
8. **Linier plantation**
   a. Station approach roads : one row plantation
   b. High density plantation : 3 row/6 row plantation

Under DCC-PR:

9. **Connecting roads to level crossings up to BT level (DCC-PR)**

Sharing pattern	:	90 (EGS) : 10 (Dept)
Inputs:		
General Information		
Location	:	
Sy.No.	:	TP No:
GPS Coordinates	:	
Land ownership	:	Government
Technical Information		
Length of road	:	
Width of road	:	3.75m to 7.50m (As per state standards)

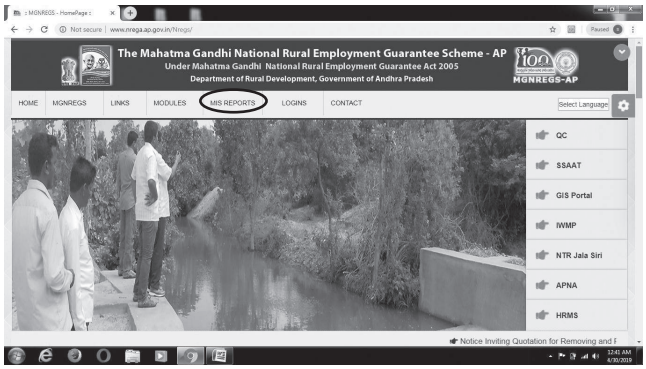
Template as per the existing estimates in DCC-PR

Page 6

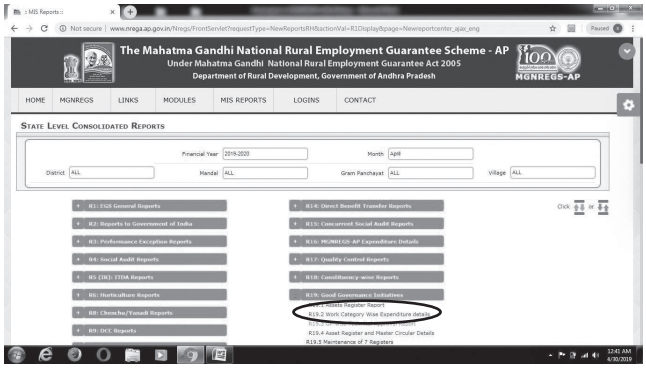
The creation of this policy has been another milestone.

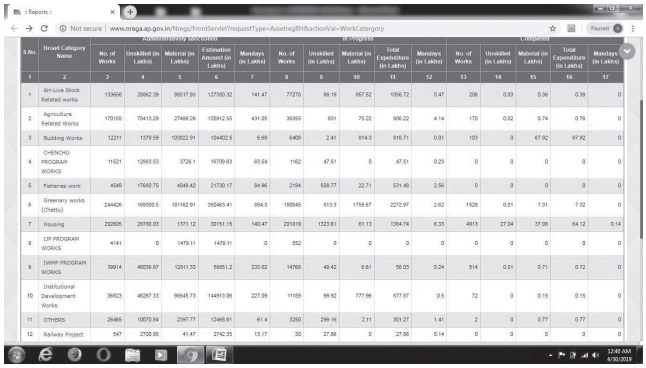
Post the formulation of the above policy, all EGS Engineers are now preparing estimates with my consultation. The process of generating estimates is quite simple. They have a mobile application named Planning 2019-20 which can be downloaded from the website - **http://emuster.in/ap/m/NregsApps.html.** The application is linked to the Engineers CUG number. All data has to be fed from site along with Geo tagged photos. This process is now under progress in my sub-division.

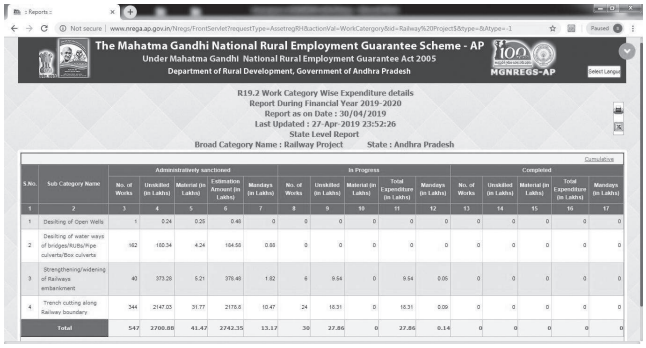
Another milestone in this journey has been the creation of a centralized dash board for monitoring all railway works which is elaborated below –



As can be seen from above, currently 4 type of works are being reflected with a sanction of Rs. 27.42 crores for the financial year 2018-19. My focus is now on executing the sanctioned works.







Few photos below reflect the works undergoing –









Potential –

1. I am looking at Rs. 20 Crores worth of work to get sanctioned in ADEN/OGL section and that too on the down line side of track only. Currently no works can be taken up on the up line side owing to 3rd line construction. This means potentially 40 crores worth of work can be taken up in approximately 90 km double line track.
2. The state administration takes up all the works listed above in a very different manner as the objectives are very different. Let me explain with an example. In case of plantation, in railways, the target is to achieve the number planted without much thought about their survival. Also it is not our core objective and hence gets sidelined. In case of state administration, they have a 3 year maintenance period wherein they will deploy a watcher to ensure that it is protected from grazing and also watered regularly. As per their policy, they are to ensure 80 % survival rate. The thought is to develop it as an asset.

   Now taking forward, one of the works identified was Linear Plantation in which I have asked MGNREGS officials to execute 50 % plantation with timber trees. Thereafter, I made contact with ITC Bhadrachalam and Delta Paper works for utilizing this wood after maturity. They have responded positively and we are working on developing an MoU for the same. This can be developed as a means to generate Non-fare Revenue.
3. Trench cutting along railway boundary is an item which was introduced as a means to mitigate cattle run over cases and to reduce trespassing incidents.
4. In case of bitumen road construction, the policy states that for every Rs. 100 spent, Rs. 90 will be sanctioned under MGNREGS and the rest Rs. 10 has to be financed by the converging department. I have now begun working on mixing crushed and granulated class 3 rubber pads and putting them as part replacement for bitumen i.e. the 10 % cost will be financed by utilizing class 3 rubber pads thereby enabling cost savings and better waste management.
5. My close liaisoning with state government has enabled me to get clearance for closure of 7 level crossing gates in my section.

Almost all works are of revenue nature and hence Railway funds can be freed up for executing capital works.

Way Forward -

1. Softwares are in place. The next step is to generate estimates with Technical Assistants. All ADEN's have to begin this process. One suggestion in this regard is to link one railway CUG number in each subdivision to the application discussed in the previous page.
2. It is my understanding that a person needs to be deployed in each sub-division who is well aware of local political scenario, well versed with local language and a resident of the area maybe a retired sarpanch. He/She should be under the administrative control of ADEN. He/She should represent Railways in Gram Sabha and other Mandal and District meetings.
3. Monthly meetings need to be conducted between MGNREGS and Railway officials. This also needs to begin immediately.

Destressing of Long Welded Rails - A Rational Approach

By
*G S Yadav**

Synopsis:

During service the pattern of longitudinal thermal stresses in LWR may undergo significant changes due to the effect of tractive and/or braking forces, change in vertical profile of track due to settlement of track or maintenance operations like lifting /lowering of track, repairs of rail fractures or replacement of defective rails etc. If the level of thermal stresses vary significantly from the theoretical profile of thermal stresses, the track may become vulnerable to buckling and/or fractures. Therefore, it becomes necessary to carry out the de-stressing of LWRs to restore the longitudinal thermal stresses to desirable level. Indian Railway's LWR manual prescribes certain situations the occurrence of which warrants the de-stressing of LWRs. The requirement of de-stressing due to SEJ gaps falling beyond permissible limits and due to repairs of rail fractures or replacement of defective rails has been critically examined in this paper and a rational approach has been suggested.

1.0 Introduction:

Destressing of LWR (as per para 6.4 of LWR manual) shall be undertaken when abnormal behaviour of LWR gets manifested in one or more of the following:

(i) When the gap observed at SEJ

  (a) Differs beyond specified limits

  (b) Exceeds the maximum designed gap at SEJ

  (c) When tip of tongue rail/corner of stock rail crosses the reference line

(ii) After specified special maintenance operations

(iii) After restoration of track following the unusual occurrences mentioned below

  (a) Rail fractures or replacement of defective rail/ glued joint

  (b) Damage to SEJ/buffer rails

  (c) Bucking or tendency towards buckling

  (d) Factors causing disturbance to LWR such as accidents, breaches etc.

(iv) If number of locations where temporary repairs have been done exceed three per km

some of the reasons for de-stressing like (i) gaps at SEJ, (ii) damage to SEJ/buffer rails and (iii) number of locations where temporary repairs have been done exceed three per km; appear to be technically arbitrary. A rational approach based on effect of incidents on the stability of LWRs need to be evolved.

The Stress pattern in central portion of LWR, sufficiently away from end of BL, has no bearing on the gaps at SEJ. Condition of ballast and its packing (which determines the longitudinal ballast resistance) and condition of fittings in BL determine the actual length of BL. The amount of expansion/contraction of Rail at SEJ will actually depend upon actual breathing length in field conditions.

The level of maximum thermal stresses in LWR depends upon variation of Rail temperature from the stress free temperature. The thermal force diagram in LWR is shown in figure 1

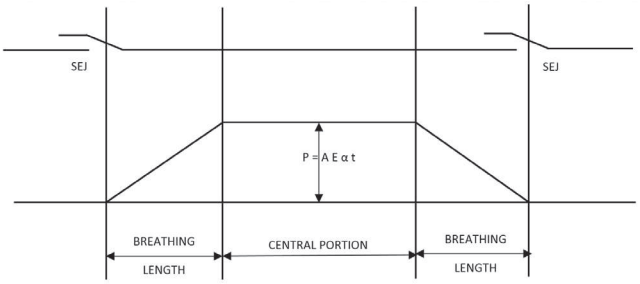


Fig. 1 : Thermal Force in LWR

Maximum movement m at the end of LWR is given by

$m = (L_b \alpha t)/2 = \left(\frac{AE\alpha t}{R}\right) x \frac{\alpha t}{2}$

The Breathing Length (BL) is given by $L_b = \left(\frac{AE\alpha t}{R}\right)$

Maximum force in Central portion of LWR **P=AEαt**

Where, A = cross sectional area of Rail

E = Modulus of elasticity of Rail steel

α =Coefficient of thermal expansion of Rail Steel

* *Professor, Bridge-2, IRICEN/Pune*

t = variation of rail temperature from stress free temperature

2.0 Behaviour of Breathing length and its impact on gap at SEJ:

Gap observed at SEJ forms the main reason for destressing of LWRs during maintenance. However, this doesn't stand in technical scrutiny.

SEJ gap basically reflects the behaviour of breathing length (BL) and /or creep of LWR. In a reasonably well maintained LWR with adequate toe load of fittings, there won't be any creep. In such a LWR the gap at SEJ will reflect only the behaviour of Breathing Length.

As shown in figure 2, the fittings in BL, especially GRPs, are subjected to not only wheel loads but also longitudinal shearing force (equal to ballast resistance of one sleeper which for 60 kg rail is = 13.74 X 60 = 824 kg (assuming sleeper spacing as 60 cm)). GRPs in central portion of LWR are not subjected to longitudinal shearing force as longitudinal ballast resistance is fully mobilised at end of BL.

This results in accelerated wear and tear of GRPs due to crushing and bulging. On heavy density routes the GRPs lose their efficacy within 2 to 3 years. The Toe load of ERCs is considerably reduced, resulting into ineffective clamping action between rail and sleeper. This leads to relative movement of rail with respect to sleeper, at least at some of the sleepers. A longer length of track comes in to play to develop full longitudinal ballast resistance thus increasing the BL. This resultant increase in BL leads to movement of Rail at SEJ more than the theoretically calculated values.

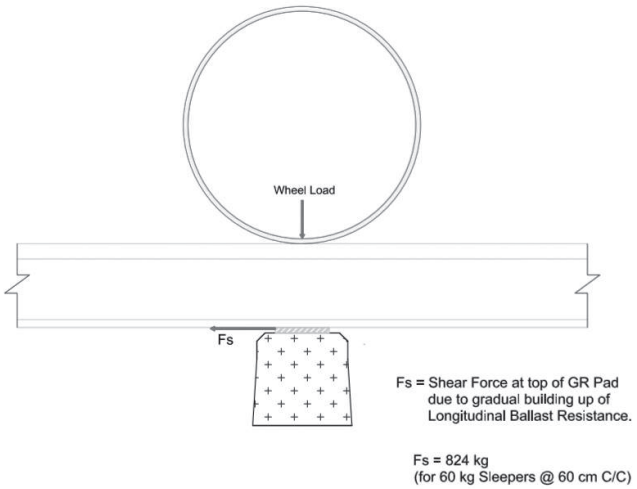


Fig2. Vertical load and longitudinal shearing force in GRP in Breathing Length of LWR

2.1 Effect of SEJ fittings on gap at SEJ:

The gap at SEJ is also influenced by the arrangement of fittings and fixtures at SEJ **(figure 3).** As per standard arrangement of sleepers and fittings for SEJ, two number of angles are fixed with SEJ sleepers (6 numbers in conventional design).



Fig3. Arrangement of fittings at SEJ

These angles are meant to ensure that SEJ sleepers do not move from their position to avoid loosening of ballast packing and to avoid sleepers becoming out of square. In such a situation the fittings on SEJ sleepers should be rail free fastenings. But standard drawing provides for normal ER clips. This makes relative movement between rail and SEJ sleepers impossible. In such a situation the SEJ sleepers (except two central sleepers) try to move with rail, but the tie angles fixed to sleepers resist this movement. Thus a rigid frame resisting longitudinal movement of Rail at SEJ is created. In such a situation the movement of Rail at SEJ will not take place as per LWR theory.

2.2 Effect of Change in Pattern of Thermal Stresses in the Central Portion of LWR:

If the pattern of thermal stresses in some part of central portion of LWR is changed due to maintenance operations like rail replacement etc., it will not in any way affect the movement of Rail at SEJ as the movement purely depends upon behaviour of BL (Creep in LWR is ignored presently, and will be dealt with separately in para 4.1)

For example if Rail renewal is done at a location 1 **(Figure 4),** it will affect the force in track for a length of two temporary BLs created due to discontinuity in track.

Therefore, as movement of Rail at SEJ depends on condition of track in BL, destressing of LWR on the basis of movement of Rail at SEJ is technically unnecessary.

3.0 Analysis of Effect of Repairs:

Now let us try to understand the effect on thermal stresses in LWR due to repairs to track by way of rail replacements in central portion of LWR.

If there is a fracture or rail replacement on any other account at location (1) in figure 4, the stresses for a length of 2 temporary BLs (corresponding to variation of temperature at the time of fracture) will be altered. If repairs are done in such a manner that the length of rail removed from track is exactly same as the length of rail inserted (including welding) and stresses after welding are equalised post repairs for a length of at least two temporary BLs (one temporary BL on either side of the affected location), then the forces in LWR will get restored to original level (effect of hysteresis is ignored in this analysis). However, in practice this is seldom achievable. We invariably end up either with longer or shorter rail inserted in track as compared to rail removed from track. This alters the pattern of thermal stresses in the affected portion of LWR permanently. The level of such stresses (forces) can be calculated from the basic theory of LWR.

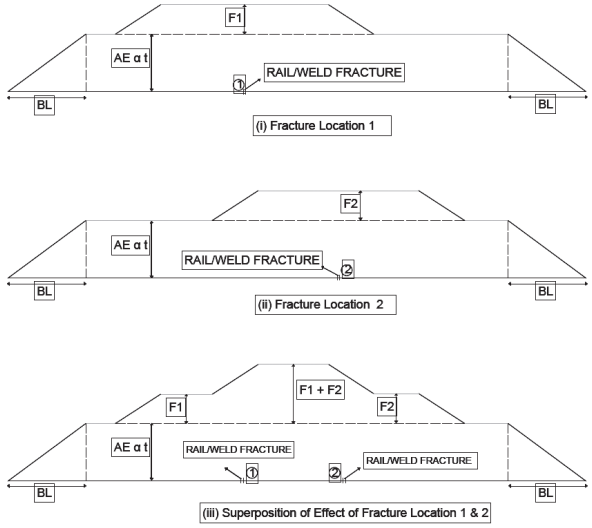


Fig. 4 Change is stress pattern in central portion due to repairs to fracture

If length of rail inserted in track varies by δL from the length of rail removed from track, and equalisation of stresses is done, say over 250 meters (125 metres on either side), then the force change in LWR would be

$$F = (\delta L / 250) * EA \qquad \text{(Hooke's Law)}$$

The equivalent temperature which would cause this change in force can be calculated by equating above value with AEαt

Thus, $\delta t = \delta L / (250 * \alpha)$

The δL can be calculated as under:

If repairs are done, say at Td – 30, then the length of rail inserted in track would be more than the length of rail removed by an amount of contraction of LWR over two temporary BLs corresponding to Td-30

$$\mathbf{L_b = AE\alpha t / R}$$

Using standard values for 60 kg rail and 60cm sleeper spacing,

$L_b = 76.86*2.15*10^6 * 1.152*10^{-5} * 30 / 13.74 = 4156$ cm = 41.56 m

Total contraction of rail (for both temporary BLs)

$\mathbf{\delta L} = 2 * \mathbf{(L_b \alpha t)/2}$

$= (2 * 41.56 *100 * 1.152*10^{-5} * 30) /2$

= 1.44 cm = 14.4 mm

Therefore, rail replaced at Td-30 will result in insertion of extra 14.4 mm rail in track. This extra length may slightly vary on either side due to effect of hysteresis effects. Now the equivalent temperature corresponding to 14.4 mm extra length of rail, assuming equalisation of stresses is done for 125 metre of track on either side of affected location, can be calculated by formula:

$\delta t = \delta L / (250 \text{ m} * \alpha)$

$= 14.4 / (250* 1000 * 1.152*10^{-5})$

$= 144 / (25 * 1.152) = 5$ degrees

So, if repairs are done at Td-30 then the effective stress free temperature will get lowered by **5 degrees**. If two such overlapping repairs are done, then the effective lowering of Td will be about **10 degrees in the overlapping portion**. Such situation makes track vulnerable to buckling. When repairs are done at higher temperature than Td, the corresponding stress free temperature in the affected portion of track would become higher in a similar fashion; and track would become vulnerable to fractures. If the effect of repairs do not overlap with each other, then excessive thermal forces will not build up in the LWR.

From above analysis it emerges that the affected portion of LWR should be destressed if two or more repairs are done over track length which makes the affected portions overlapping with each other. As the stresses are equalised over 250 meters (i.e. 125 meters on either side of location of repairs) any repairs within 250 metres of each other can be classified as overlapping repairs. Thus the maximum length of the affected portion of track would be 250 metres plus 2 * 125 metres = 500 meters. This length only requires de-stressing. This conclusion is on the basis of assumption that repairs are done at a temperature 30 degrees lower than destressing temperature.

4.0 Effect of Creep in LWR at SEJ gaps:

If LWR undergoes creep of rails in central portion, it indicates considerable weakening of fittings. The creep may take place in the entire LWR or in some particular portion. If creep occurs in the entire LWR then it may not pose immediate danger of buckling as sufficient compressive stresses are not building up in the rails. However, there will be excessive movement at SEJs.

Normally the gap at one SEJ will be reduced and GAP at other side SEJ will be increased. If the creep is only in part of central portion of LWR , then it poses serious danger of buckling as heavy build-up of compressive stresses will take place at junction of creeping portion and non-creeping portion. This type of behaviour will, however, not get captured by gap at SEJ.

Therefore, creep movement of LWRs in central portion should be monitored, say at every 500 meters, and any portion of track showing movement of more than 20mm should be thoroughly investigated for loss of toe load of ERCs. Such affected portion should be destressed along with rectification of cause of creep.

4.1 Damage to SEJ/buffer rails:

LWR manual also prescribes that destressing should be carried out if SEJ/buffer rails have been damaged. This is totally unnecessary as damage to SEJ /buffer rails has no bearing on the health of LWR. This provision should be done away with.

5.0 Conclusion:

The current stipulations in LWR manual regarding destressing on the basis of **(i) gaps at SEJs, (ii) temporary repairs to rail, and (iii) damage to SEJ/ buffer rails exceeding three per km** should be modified as below :

(i) If two or more repairs, by way of replacement of rails, have been done in the track within 125 meters of each other, the affected portion of LWR should be destressed along with 125 metres of track on either side.

(ii) Gap at SEJ should be monitored during routine inspections. If gap at SEJ goes beyond the permissible limit then the LWR should be investigated for misbehaviour of Breathing Lengths and Creep in the entire portion of LWR. If the problem is limited to BLs then the health of track should be restored in the Breathing Lengths. If there is a problem of creep in the entire LWR, then immediate corrective action such as TFR should be taken along with destressing of entire LWR.

(iii) The creep in the central portion should be monitored by erecting reference pegs at about every 500 metres or preferably by using OHE masts as reference. If creep exceeds 20mm in a portion of LWR then the affected portion of LWR should be destressed. The cause of creep should be investigated and corrective measures shall be undertaken along with destressing of the affected portion.



Panaromic View of Dudhsagar Waterfall

Literature Digest

The Role of Track Stiffness & Its Epatial Variability on Long Term Track Quality Deterioration

With rapid advances in sensor and condition monitoring technologies, railway infrastructure managers are turning their attention towards the promise that digital information and big data will help them understand and manage their assets more efficiently. In addition to the existing track geometry records, it is evident that track stiffness is a key physical quantity to help assess track quality and its long-term deterioration. The present paper analyses the role of track stiffness and its spatial variability through a set of computational experiments, varying other vehicle and track physical quantities such as vehicle unsprung mass, speed and track vertical irregularities. The support stiffness conditions are obtained using a sample procedure from an autoregressive integrated moving average model to generate a representative larger set of data from previously on-site measured data. A set of computational experiments is carefully designed, varying different physical variables, and a vehicle–track interaction model is used to estimate the track geometry deterioration rates. A series of log-linear regression models are then used to analyse the impact of the tested physical variables on the track deterioration. The main findings suggest that the spatial variability of track stiffness significantly contributes to the track deterioration rates, and thus it should be used in the future to better target the design and maintenance of railway track. Finally, a comparative study of some settlement models available in literature shows that they are very dependent on the test conditions under which they have been derived.

By : I Grossoni, AR Andrade, Y Bezin, S Neves

Ref. : Journal of Rail and Rapid Transit 1) Volume: 233 issue: 1, page(s): 16-32 : January 1, 2019

A New Methodology For the Estimation of Wheel–Rail Contact Forces at A High-Frequency Range

Online measurement of wheel–rail contact forces is nowadays in demand for evaluating safety and manoeuvring the condition in real time and in real operation. In this study, the wheel–rail contact forces are estimated using a novel indirect identification method based on the measured radial strain on the wheel web. Further, the strain response of the rolling wheel is derived using an analytical solution of the disk under a rotating load, and a scheme was prepared for the identification of the rolling wheel parameters and its corresponding characteristic matrix. An appropriate angular strain configuration is employed to eliminate the effect of wheel rotation. The Tikhonov regularization technique is employed to solve the ill-posed least square problem and to attenuate the effect of noisy measurement and numerical uncertainty during the estimation of the forces. A finite element model of the rotating load is then constructed to investigate the effectiveness and accuracy of the proposed methodology. The effects of the rotating speed, loading and measurement noise on the estimated normal force are studied. It is found that neglecting the effect of the rotating speed causes a notable error particularly in the high-speed range.

By : Vahid R Bagheri, Davood Younesian, Parisa H Tehrani

Ref. : Journal of Rail and Rapid Transit Volume 232, No. 10, Nov. 2018

Numerical Investigation of The Aerodynamic Characteristics of A Train Subjected to Different Ground Conditions

Due to the rapid development of high-speed railways and the increasing speed of trains, the aerodynamic phenomenon caused by moving trains could be affected. Therefore, the scaled model test has been widely used to simulate the aerodynamic performance of the stationary train in wind tunnel. However, it is difficult to disregard the influence of the ground effect on the aerodynamic performance of trains. In this study, the delayed detached eddy simulation based on the shear stress transport κ–ω turbulence model is used to investigate the aerodynamic performance of trains on three ground conditions (stationary floor + stationary ballast, stationary ground + stationary ballast, and stationary ballast). The numerical method used in this paper is verified by a wind tunnel test. The way the three ground conditions influence the flow field around the train is also analyzed. The results show that the ground condition affects the thickness of the ballast boundary layers without a train, thickness of the train boundary layers, train drag, distribution of pressure and velocity along the train, and the size of the wake region; however, the ground condition had a little effect on the flow structures around the train tail. These findings can help in designing

the wind tunnel experiment.

By : Ji-qiang Niu, Xi-feng Liang, Dan Zhou

Ref. : Journal of Rail and Rapid Transit Volume 232, No. 10, Nov. 2018

Bogie-Monitoring Technology: Extending the Detection of Derailments to Cover Applications with Slab Tracks

Detection of derailments based on the irregular pattern of motion of an axle, bogie, or even an entire vehicle is becoming increasingly important due to extensive track use and higher frequency of freight and passenger operations. The current technology detects the irregular oscillation of wheels, and is therefore limited to tracks with sleepers and ballast. During a derailment, the wheels begin to oscillate violently and the detection device is triggered. However, this system faces a challenge due to the increasing use of slab tracks that have no or only a minimal number of sleepers. Knorr-Bremse, in a joint project with the Technical University of Berlin, is currently testing a new electronic derailment detector for these types of tracks. The new, model-based validation process will focus on a detection algorithm that can be used for all vehicle types.

By : Ulf Friesen, Mark-Oliver Herden, Norman Kreisel

Ref. : Journal of Rail and Rapid Transit Volume 232, No. 10, Nov. 2018

Quantification of Rail Transit Wheel Loads and Development of Improved Dynamic and Impact Loading Factors for Design

An increase in the number of rail transit track construction and rehabilitation projects in North America has generated increased interest in optimizing the design of the track infrastructure and its components. Many rail transit track component design guidelines use historical wheel loads and loading factors that were derived from freight railroad design practices. These design factors may not be representative of the loading experienced on the rail transit networks today, leading to over-designed, sub-optimal infrastructure components. Therefore, researchers at the University of Illinois at Urbana–Champaign are conducting research to lay the groundwork for improved understanding of the loading environment entering the track structure using wheel loads data obtained from recently deployed field instrumentation and existing wheel impact load detectors. This paper evaluates the existing design impact factors and assesses their effectiveness when applied to the rail transit sector, using data from three representative rail transit agencies in the United States. New dynamic loading factors are also proposed to represent the rail transit loading environment more accurately. A quantitative approach to addressing design factors may provide economies in future designs and facilitate the use of probability of exceedance and other metrics that relate to factors of safety.

By : J Riley Edwards, Aaron Cook, Marcus S Dersch

Ref. : Journal of Rail and Rapid Transit Volume 232, No. 10, Nov. 2018

Analysis of Vertical Vibration Characteristics of the Vehicle-Flexible Track Coupling System Under Wind Load and Track Irregularity

In this study, to overcome the inherent problem caused by simulating infinite rail using finite rail, a method that combines flexible rail embedded in SIMPACK and a flexible track board imported from ANSYS on a SIMPACK platform is first proposed, by which vehicle-flexible track coupling is effectively realized. The method takes into account the simulation precision and computational efficiency. Using the proposed method, and comprehensively considering wind load, track irregularity, and minor track elasticity, the dynamic characteristics of high-speed train are solved conveniently and quickly. They are simulated under the conditions close to the objective reality. On this basis, the influences of many factors on the vibration characteristics of the train are analyzed, which include car body state, track state, mode numbers of the car body, wind load, track irregularity, and vehicle speed. In addition, the simulation results are basically consistent with the test results. This work lays a solid foundation for subsequent research on noise, fatigue, and the reliability of the train.

By : Zhanling Ji, Guowei Yang, Yubiao Liu

Ref. : Journal of Rail and Rapid Transit Volume 232, No. 10, Nov. 2018

Development of Superconducting Magnetic Bearing Capable of Supporting Large Loads in Flywheel] Energy Storage System for Railway Applications

A superconducting magnetic bearing (SMB) has been developed with high temperature superconducting (HTS) coils and bulks for a flywheel energy storage

system (FESS). The FESS equipped with the SMB was tested at the mega photovoltaic power plant test site in Yamanashi Prefecture. The SMB with both rotor and stator made of superconducting material, was capable of supporting the flywheel weighing 4000 kg without any contact and has so far remained in stable operation for 5000 hours. A further increase in storage capacity is required for the FESS to be applicable to railways as a system for preventing cancellation of regenerative braking. This paper describes the development of a SMB capable of supporting large 147 kN loads using a new type coil structure for the improvement of FESS storage capacity.

By : Yoshiki MIYAZAKI, Katsutoshi MIZUNO, Tomohisa YAMASHITA, Kengo NAKAO, Shinichi MUKOYAMA, Taro MATSUOKA

Ref. : Journal of Quarterly Report of RTRI Vol. 59, No. 4 Nov. 2018

Evaluation of Deformation and Failure Behavior of Mountain Tunnels on Lining Material

This paper presents conclusions drawn from model tests of mountain tunnel linings consisting of various materials. Plain concrete linings did not show any decrease in load, indicating good deformability, whereas compressive cracks and spalling occurred. Brick linings demonstrated lower structural stiffness and bearing capacity than plain concrete linings, and interlayer cracks occurred. Short-fiber-reinforced concrete linings showed good anti-spalling performance, whereas structural stiffness and bearing capacity were almost the same as in plain concrete linings. Reinforced concrete linings had the highest structural stiffness and bearing capacity, but displayed frequent shear failures.

By : Kazuhide YASHIRO, Noriyuki OKANO

Ref. : Journal of Quarterly Report of RTRI Vol. 59, No. 4 Nov. 2018

Seismic Design for Improvement Construction Method of Ceiling of Existing Stations

The type of structural supports used for ceilings in stations differ from those used in other buildings. In order to evaluate the seismic performance of station ceilings, it is therefore necessary to understand the function of supporting parts in the structure, and to evaluate loads acting on the ceiling during earthquakes. Shaking table tests and analytical studies of existing suspended station ceilings were conducted, focusing on the function of supporting parts in the structure. Seismic design to be applied to the method of improving the ceiling of the existing stations so as to make it safer during earthquakes is proposed.

By : Katsuyuki SHIMIZU, Hiroshi MIKI, Seiji YAMADA

Ref. : Journal of Quarterly Report of RTRI Vol. 59, No. 4 Nov. 2018

Tunnel Lining Crack Detection Method by Means of Deep Learning

Existing image processing programs for detecting structural damage such as cracks have required the fine-tuning of numerous parameters and experience-based expertise. A method for distinguishing different types of cracks applying deep learning has been developed using tunnel lining images. A classifier was created after learning from a large volume of images in two groups - either with “presence of a crack” or “absence of a crack.” The classifier successfully recognized the presence or absence of cracks in images at a rate of more than 90%. Using a color-coded pixelated image to show the position of probable cracks, this paper proposes a hybrid detection method for analyzing cracks with a focus on their location and direction of progress.

By : Masato UKAI

Ref. : Journal of Quarterly Report of RTRI Vol. 60, No. 1 Feb 2019

Structure Gauge Measuring Equipment Using Laser Range Scanners and Structure Gauge Management System

Periodic measurement of the structure gauge is essential to ensure safe train operation. Measuring the clearance gauge however, is time and labor intensive given the vast number of trackside facilities. An inexpensive and efficient measuring device using laser range scanners was therefore developed. A management system is also being developed, which maps measured three-dimensional point cloud data to facility data. This paper describes the problems and solutions related to applying the laser range scanners for structural gauging, and presents results obtained from experiments. This paper also describes progress achieved in the development of the management system.

By : Takashi TOYAMA, Nozomi NAGAMINE, Tatsuya OMORI, Kenichi KITAO, Ryuta NAKASONE

Ref. : Journal of Quarterly Report of RTRI Vol. 60, No. 1 Feb 2019

Basic Study on a Train Control System Integrating Operational and Safety Control

We propose a train operation control system for drawing up operation curves composed of pairs of precise train position and precise operation time, and controlling trains and ground facilities according to the plan. This system realizes more flexible control than that of the conventional system by controlling the on-board device and the ground device according to the train performance curve from the central device, where the management of operations function and the safety control function are integrated. In this report, we describe the control method based on “band” with a margin for safety added to the operation curve, and the requirements for securing safety. In addition, we have confirmed by the simulator that there is no bottleneck in the transmission path, even though the information concentrates on the central device.

By : Yoichi SUGIYAMA, Koji IWATA, Haruo YAMAMOTO

Ref. : Journal of Quarterly Report of RTRI Vol. 60, No. 1 Feb 2019

Improvement of Method for Locating Position of Wheel / Rail Contact by Means of Thermal Imaging

Estimation of vehicle dynamic characteristics depends on sufficiently accurate locating of the wheel/rail contact point. However, since it is not possible to place a camera on a truck close enough to the rail head level, locating the wheel/rail contact point while a vehicle is running was not possible in previous studies. To solve this problem, this study proposes a new method for digitalizing the contact point based on the method presented in the study by Burstow et al., which uses thermal imaging. An experiment to locate the contact position was carried out using an actual vehicle on the RTRI test line. The test results confirmed that the contact position between the wheel and the rail could be identified accurately while the vehicle was running in conditions suitable for using a thermography camera. In addition, this paper describes how this proposal could be applied to a derailment experiment.

By : Daisuke YAMAMOTO

Ref. : Journal of Quarterly Report of RTRI Vol. 60, No. 1 Feb 2019



Darjeeling Himalayan Railway, West Bengal

Updates Of Codes & Manuals

S.NO.	ACS NO.	DT OF ISSUE	REMARKS
			TRACK
1. Indian Railways P-Way Manual			
01.	94	01.06.2004	Para No 410(3) and 410(4) replaced
02.	95	30.06.2004	Para No 826 replaced
03.	96	22.07.2004	New para 607(3) added
04.	97	19.10.2004	Note of Annex. 8/3 (para 807 & 808) replaced
05.	98	17.05.2005	Para No 202(1) replaced
06.	99	14.12.2005	Para No 107(1) replaced
07.	100	21.06.2006	Para No 902(1), 907(2)(a), 919(1), 924(b)(i) replaced. Addition to sub-para 916(1)(i), 924(b)(ii), 924(c)
08.	101	21.12.2006	Para No 107(1) replaced
09.	102	30.05.2007	Para No 244(2)(e), 273(1), 275(3), 276, 506(3), 716(2), 1404 replaced
10.	103	01.06.2007	Para No 237(6) replaced
11.	104	19.07.2007	Para No 1504 replaced
12.	105	22.08.2007	Para No 277(a)(3) replaced
13.	106	14.09.2007	Para No 124(2)(a) replaced
14.	107	12.11.2007	Para No 615(3) replaced
15.	108	18.12.2007	Para No 1302(2)(h) replaced
16.	109	15.02.2008	Para No 202(1) replaced
17.	110	04.03.2008	Annexure 8/1 – Para 806(1), 8/2 – Para 806(2), 11/4- Para 1118(5) and 11/5-1120(4)(C) replaced
18.	111	23.04.2008	Para No 222, 701(2), 1301(1), 1302(1), (1) (i), (2) (g), 1307(1)(g), 1309(1), 1309(2), 1309(4) and Annexures 13/1 (2), (4), (5) & Annexure 13/6 (heading) replaced
19.	112	25.04.2008	Para No 726(3)(b) replaced
20.	113	03.06.2008	Para No 1504 replaced
21.	114	10.10.2008	Para No 206(3) and 317(3) replaced
22.	115	24.11.2008	Note given at the bottom of item No. 9(a) of Annexure-9/1 para 904 replaced
23.	116	23.04.2009	Para No 220 replaced
24.	117	19.05.2009	Para No 322, 248(1), 248(2)(a), 244(4), 263(2)(a) replaced
25.	118	30.07.2009	A new sub para 146(vii) added
26.	119	18.08.2009	Para No 220(3) replaced
27.	120	16.04.2010	Para No 151(1)(a) replaced
28.	121	12.07.2010	Para No 1302 (2)(h) replaced
29.	122	23.11.2010	Para No 238(2)(g)(iii) and 238(2)(g)(iv) added Para No 257(4), (6), (7) & Para 917 replaced
30.	123	27.01.2011	Para No 170(15) added
31.	124	14.02.2011	Para No 250(2) replaced

S.NO.	ACS NO.	DT OF ISSUE	REMARKS
32.	125	21.02.2011	New Para 272(4)(a) added. Para No 508, 510(3) replaced
33.	126	21.06.2011	Para No 263(2)(a)(i) replaced
34.	127	28.11.2011	Para No 1302(2)(g) replaced
35.	128	05.03.2012	Para No 234(5), 238(2)(d)(i) replaced. Annexure-2/11 Para 263 replaced, Para 273 renumbered as Para 273(a), New para added as Para 273(b), Para 904 replaced, Para 916 sentence deleted, Para 918(1), 924(b)(i), 924(c) replaced, Para 924(b) iii deleted
36.	129	28.06.2012	Para No 302(1)(a) and 248(2)(a) replaced
37.	130	16.11.2012	Para No 244(4), 1001(6), 302(1)(b)(ii), 224(2)(e)(v) and annexures-2/11 & 2/13 of para 263 replaced
38.	131	11.01.2013	Para No 277(a)(7), 429 and 502 replaced
39.	132	08.04.2013	Para No 238(1)(b)(5), Para 107, Para 108(2)(b), Para 123, 124, 127, 129, 136, 139, 144, 223, 237(5)(a) replaced. Added new para 108(2)(c), Para 124(A), 139(A) deleted
40.	133	04.06.2013	Para No 202(1) modified, New sub para (c) of para 1303(1) added
41.	134	18.07.2013	Annexure-2/6(B), (C) and (D) and Annexure-2/6/1of Par 237(5) added
42.	135	07.05.2014	Para No 151(1), 910(1)(g)(i), 1007(c), 1116(c), Annexure 9/7 of para 918(2), Annexue 2/11 & 2/13 of para 263, Annexure 2/6 of para 237(5), para 1014(1)(d) replaced, New note to para 107 added
43.	136	14.11.2014	Para No 237(8)(b), 279, 406(2)(a), 421, 427(2), 502(1), Annexure 7/2 part B of para 708(1), para 804, 824, 825, 910(y), 1007(1)(l) replaced, Para 708(1) modified
44.	137	18.06.2015	Para No 254, 257(4)(b), 317(3)(b), 814(1)(a), 1304(3) replaced, New para 255(6), 310(7) added
45.	138	25.08.2015	Para No 1302(2)(g) replaced
46.	139	08.02.2016	Para No 607(4) added, Para 248(2)(a), 910(1)(j) replaced
47.	140	28.11.2017	Para No 420(2), 502(1) replaced
48.	141	18.01.2018	Para No 152(2) replaced
49.	142	27.03.2018	Para No 169, 170(5), 170(6)(b) & 1408(3) Note (v) replaced
50.	143	19.04.2018	Para No 237 and Annexure 8/3, 8/3A & 8/4of Para No 807 & 808 replaced
51.	144	08.05.2018	Para No 302(1)(e), 919(1) & Annexure 9/5 Para 916(1) replaced
52.	145	23.07.2018	Para No 228(4), New Annexure 2/7 to para no. 228(4) added, Para No replaced
53.	146	15.18.2011	The existing 'Annexure 2/4 of para 211' shall be replaced.
54.	147	28.12.2018	The existing para 248(2)(a) replaced.
55.	148	08.01.2019	The existing paras 275(1) & 275(3) replaced.
56.	149	08.02.2019	The existing para 316(2) shall be replaced.
2. LWR Manual			
01.	02	1999	Para No 6.2, 6.2.1(i), 1.18 replaced
02.	03	1999	Heading of Para No 4.5.7 & sentence at para 4.5.7.1(1)(b)(i) replaced
03.	04	1999	Para No 6.3 modified, Para 6.3.1 added, Para 6.3.1 & 6.3.2 renumbered
04.	05	1999	New para 4.4.1(i) added
05.	06	1999	Text substituted to para No 2.2.1, Para No 5.2.1 reworded

S.NO.	ACS NO.	DT OF ISSUE	REMARKS
06.	07	2000	Changes made to Figs 4.2.1(a) to (d)
07.	08	2002	Para No 1.1 & 1.2 reworded, Text added to para 4.5.3
08.	09	2005	Para No 6.2.1(i), 4.4.1 replaced
09.	10	2006	Fig. 5.6 & Para No 6.4.1(i)(c) replaced
10.	11	2006	Text substituted to Para 3.2.1
11.	12	2009	Para No 1.16, introductory para of Annexure XA [Para-9.1.2(i)] replaced
12.	13	2010	Para No 1.11 replaced
13.	14	2011	Para No 3.4, 8.2.5, 9.1.8(i), 9.1.8(iv), Annexure-VI item 1(c)(i), Annexure-V, Table-I replaced
14.	15	2012	Para No 8.1.5(i) & Figs 4.2.1(a) to (d) replaced
15.	16	2014	Para No 4.3.3(i), Fig. 4.2.1(a) to (d) replaced
16.	17	2018	Para No 5.6.1, Fig. 5.6, Annexure XIII-A replaced. New Fig 8.2.1 added
17.	18	11.03.2019	Footnote to para 4.5.7.1 (iv) at page 12 shall be replaced
3. Track Machine Manual			
01.	01	Mar. 2000	Addition of text to the end of Preface.
02.	02	Mar. 2000	Annexure 8.1 para (A) & para (B) replaced
03.	03	May 2003	Para 4.6.8 added
04.	04		Para 4.6.8(iv) added
05.	05	Sept. 2003	Text added to para 5.6
06.	06	13.01.2004	Para No 4.3.3 & 8.3.2 replaced
07.	07	07.04.2004	Para No 4.3.1 modified
08.	08	25.10.2004	Para No 5.1.3 added & existing para 5.1.3 renumbered
09.	09	20.10.2006	Annexure 8.1 replaced
10.	10	12.12.2006	Para No 2 of Annexure 5.9 replaced
11.	11		
12.	12	22.08.2013	Annexure 8.2 replaced, New annexure 8.3 added, Table 6.2 in Para 6.3.5 modified, Text replaced in Para 8.4.5
13.	13	25.09.2012	Para 6.2.1 added
14.	14	14.06.2012	Para No 5.3.3 replaced
15.	15	14.06.2012	Para No 4.4.3 replaced
16.	16	12.11.2013	Para 9.6(ii) modified
17.	17		Para 6.2 modified
4. Manual For Ultrasonic Testing of Rails & Welds			
01.	01	Nov. 2014	Para No 8.15.1 replaced
02.	02	Dec. 2014	Para No 8.14, 8.15.1, Annexure IIA and IIB replaced
03.	03	Mar. 2016	Para No 4.1.1(c), 5.1.2, 8.6.4, 8.7.2, 8.10, 8.14, 8.15.1, Figs. 3 & 22 replaced. New clause b)(iii) below para 8.16 added, New para 6.3.1 & 6.3.2, 10.6 added
04.	04	Sept. 2018	Para 6.6, 8.14, 8.15, 8.15.1 & 8.15.2 modified,

S.NO.	ACS NO.	DT OF ISSUE	REMARKS
5. Indian Railways Code For The Engineering Department			
01.	50	21.09.2017	Introduction of measurement & recording of 'executed works' by the contractor' in Rly Construction Works.
02.	51	27.09.2017	Para Nos 701, 1102, 1209 should be amended
03.	52	23.10.2017	Existing para 1238 replaced
04.	53	06.11.2017	Para No 701 should be amended
05.	54	22.01.2018	Para No 1264 (e) & 1264 (f) should be amended
06.	56	05.03.2019	Para No 1264 should be amended
BRIDGE			
1. Indian Railways Bridge Manual			
01.	01	01.09.1999	Para No 1007 replaced, New para 1007(A) added.
02.	02	21.07.2000	New para 16 added
03.	03	21.07.2000	Deleted para 513(b)
04.	04	21.07.2000	Deleted para 515
05.	05	21.07.2000	Deleted para 603
06.	06	21.07.2000	Deleted para 222(1b), 222(2f)
07.	07	21.07.2000	Deleted para 618
08.	08	21.07.2000	Para No 504(4) replaced, Add new para 521, sub para 5 under para 616 and sub para 5 under para 210
09.	09	27.07.2000	Add new sub para 317 of Chapter III
10.	10	31.08.2000	Para No 604 replaced
11.	11	14.01.2003	Add para before chapter 1
12.	12	18.12.2007	Para No 217.2(a)(i) and para 217.2.(b)(i) replaced
13.	13	22.01.2008	Para No 317 replaced
14.	14	20.03.2008	Delete para 310, 312(4), 313(2) and 313(3) of chapter III,
15.	15	05.08.2008	Para No 410(2)(b), 418(5), 430 replaced, Para 3(ii) of 606 is proposed for deletion and Para 3(i) renumbered as 3
16.	16	13.08.2008	Para No 317(iii) replaced
17.	17	15.09.2008	Para 318 added
18.	18	17.12.2008	Para 224 added
19.	19	11.01.2010	Para 318 modified
20.	20	07.06.2010	Para No 1104(5) replaced
21.	21	02.07.2010	Para No 1107 (d) modified. Add para 1107(15)(i)
22.	22	28.03.2011	Para No 1107(15)(i) replaced & renumber as 1107(15)(b)(i), para 1107(15)(b) is renumbered as 1107(15)(b)(ii)
23.	23	23.08.2011	Replace existing Chapter-VIII by revised Chapter-VIII
24.	24	14.09.2011	Para 714(2), 1005(1), 1005(3), 1104, 1104(2), 1104(5), 1106(2), Page No xi (Index)1104 modified
25.	25	17.12.2012	New sub para 3 may be added to existing para 311

S.NO.	ACS NO.	DT OF ISSUE	REMARKS
26.	26	23.08.2013	Para No 217.2(a)(ii), 217.2(c), 217.4(c), 217.4(d), 217.4(e), 217.4(l), 615 to be replaced
27.	27	03.01.2014	New para 1107 5 i), 215 A added
28.	28	20.03.2014	Chapter-X, Part B – Title of Deep Cuttings replaced and para 1010 to 1015 & Annexure 10/2 replaced by Para 1010 to 1017 and Annexure 10/2 attached.
29.	29	15.04.2014	Para No 312(2), 312(4) replaced. Add new para 313(4)
30.	30	25.11.2014	Para 102(b), 504, 505, 506, 507, 508, 509 & Annexure 5/1 deleted
31.	31	09.02.2015	Para No 617 replaced.
32.	32	12.03.2015	Para No 222 2(f) replaced.
33.	33	21.03.2016	Para No 107(1) (a) is amended and 107 (1)(f) added. Para 222 (3) is amended by adding sub para (c), (d) and (e)
34.	34	04.10.2016	Added para 224
35.	35	31.07.2017	Para No 313(2) & 313(3) replaced.
36.	36	27.03.2018	Para No 317 & 318 replaced.
2. Indian Railways Bridge Rule			
01.	47	22.06.2017	Add new para 2.8.1.2
02.	48	22.06.2017	Add new clauses
03.	49	26.12.2017	Para 2.12 deleted. New para 2.12 inserted
3. Indian Railways Bridge Substructure & Foundation Code			
01.	01	17.04.2014	Para 4.8.1, 4.9.3 replaced
02.	02	20.10.2016	Modify description & heading of contents at S.No. 7.5, Delete para 7.5.3
03.	03	22.06.2017	Modified para 4.5.9
04.	04	11.08.2017	Modified para 4.9.2 & 4.9.3
4. Indian Railways Concrete Bridge Code			
01.	01	16.12.2014	Replace table 10 of para 10.2.1
02.	02	14.01.2015	Insert para 5.4.7 & 5.4.7.2
03.	03	20.01.2015	Insert note under para 4.5.1, delete para 14.9 & replace, delete para 15.9.4.1 & replace, delete para 15.9.4.2 & replace, delete para 15.9.9 & replace
04.	04	15.11.2016	Para 14.9, 14.9.1 & 15.9.9 deleted
05.	05	13.06.2017	Para 16.4.4.4.5 modified
06.	06	27.07.2017	Para 7.1.5 modified
07.	07	26.06.2018	New para 4.5.1 added
5. Indian Railways Arch Bridge Code			
01.	07	25.09.2000	Replace para 1.1
02.	08	28.01.2015	Replace para 5.3.3
6. Indian Railways Welded Bridge Code			
01.	01	16.02.2015	Para 27.1 replaced
02.	02	11.07.2018	Para 27.1 replaced

IRICEN Calendar of Courses -2019

COURSE NO	COURSE NAME	FROM	TO	DURATION	ELIGIBILITY
APRIL					
19409	Basics of Track Maintenance	01/04/2019	12/04/2019	2 Weeks	JS/SS Officers
19509	MES	01/04/2019	06/04/2019	6 Days	MES Probationers
19304	CE TMC Seminar	04/04/2019	05/04/2019	2 Days	CEs/TMc of All Zonal Rly
19321	W/S DyCE/BL	08/04/2019	09/04/2019	2 Days	DyCE/Bridge Line
19324	W/S on Indian Railway Heritage	11/04/2019	12/04/2019	2 Days	Chief Heritage Officers of Zones & Pus
19410	GeoTech Inv. & Survey	08/04/2019	18/04/2019	2 Weeks	JS/SS/JAG/SG Officers
19510	MES	08/04/2019	13/04/2019	6 Days	
19203	Sr Prof PWay	15/04/2019	10/05/2019	4 Weeks	SS/JAG/SG Officers with min. 6 years of service in Gr. A
19411	Advanced Track Maintenance with mechanized maintenance	15/04/2019	26/04/2019	2 Weeks	SS/JAG/JS who have completed Basic track maintenance/ Track Module-1
19412	Derailment investigation and advance track technology	29/04/2019	10/05/2019	2 Weeks	SS/JAG/SG/JS who have attended Adv. Tr. Mntn with mechanized maintenance
19305	SJV	29/04/2019	30/04/2019	2 Days	Officers of Rly & other Govt. Dept.
MAY					
19306	CBE Seminar	23/05/2019	24/05/2019	2 Days	CBEs of All Zonal Rly
19413	CONST. ENGRS	06/05/2019	17/05/2019	2 Weeks	SS/JAG/SG Officers
19007	Posting Exam for. IRSE Prob	06/05/2019	10/05/2019	1 Week	Remaining Prob. 2015 &16 Batch
19414	Basics of Track Maintenance	13/05/2019	24/05/2019	2 Weeks	JS/SS Officers
19505	PSU	13/05/2019	17/05/2019	1 Weeks	Sr Level Officers of PSU
19322	WS/TMS	20/05/2019	21/05/2019	2 Days	Sr DENs/DENs
19002	Phase-2	20/05/2019	12/07/2019	8 Weeks	IRSE Probationers -'2017Batch
	Spare Slot	27/05/2019	31/05/2019	1 Week	
19307	CTE Seminar	30/05/2019	31/05/2019	2 Days	CTEs of All Zonal Rly
JUNE					
19102	Integrated	03/06/2019	22/08/2019	12 Weeks	Gr. B Officers
19415	BDA	03/06/2019	21/06/2019	3 Weeks	SSE/ABEs
19416	Advanced Track Maintenance with mechanized maintenance	17/06/2019	28/06/2019	2 Weeks	SS/JAG/JS who have attended Basic track maintenance/ Tr. Module-1
JULY					
19308	EPC & PPP	01/07/2019	02/07/2019	2 Days	JAG/SG Officers
19309	CAO/C Seminar	04/07/2019	05/07/2019	2 Days	CAO/Cs of all rlys.
19204	Sr Prof Bridges	08/07/2019	02/08/2019	4 Weeks	SS/JAG/SG Officers with min. 6 years of service in Gr. A

COURSE NO	COURSE NAME	FROM	TO	DURATION	ELIGIBILITY
19417	Bridge planning	08/07/2019	19/07/2019	2 Weeks	JS/SS
19701	G6 Prob. awarness course	15/07/2019	26/07/2019	2 Weeks	Probationers of Other Deptt.
	Spare Slot	15/07/2019	19/07/2019	1 Week	
19418	Construction & Maintenance of Steel & Concrete Bridges	22/07/2019	02/08/2019	2 Weeks	JS/SS
19702	G1 Prob. awarness course	29/07/2019	09/08/2019	2 Weeks	Probationers of Other Deptt.
AUGUST					
19003	IRSE 2018 Joining	05/08/2019	09/08/2018	1 Week	IRSE Prob. - 2018 Batch
19703	G2 Prob. awarness course	13/08/2019	23/08/2019	2 Weeks	Probationers of Other Deptt.
19310	PCE Seminar	16/08/2019	17/08/2019	2 Days	PCEs of All Rlys.
19419	Tunneling	19/08/2019	23/08/2019	1 Week	JS/SS/JAG/SG Officers
19704	G3 Prob. awarness course	26/08/2019	06/09/2019	2 Weeks	Probationers of Other Deptt.
19421	CA & PM	26/08/2019	06/09/2019	2 Weeks	JS/SS/JAG/SG Officers
19420	GeoTech Inv. & Survey	26/08/2019	06/09/2019	2 Weeks	JS/SS/JAG/SG Officers
SEPTEMBER					
19705	G4 Prob. awarness course	09/09/2019	20/09/2019	2 Weeks	Probationers of Other Deptt.
19422	Basics of Track Maintenance	09/09/2019	20/09/2019	2 Weeks	JS/SS
19311	SJV	09/09/2019	10/09/2019	2 Days	Officers of Rly & other Govt. Dept.
19312	CGE Seminar	12/09/2019	13/09/2019	2 Days	CGEs/Trg. Managers of All Rlys.
19103	Integrated	16/09/2019	05/12/2019	12 Weeks	Gr. B Officers
19706	G5 Prob. awarness course	23/09/2019	04/10/2019	2 Weeks	Probationers of Other Deptt.
19205	Sr Prof PWay	23/09/2019	18/10/2019	4 Weeks	SS/JAG/SG Officers with min. 6 years of service in Gr. A
19423	Advanced Track Maintenance with mechanized maintenance	23/09/2019	04/10/2019	2 Weeks	SS/JAG/JS who have attended Basic track maintenance/ Tr. Module-1
OCTOBER					
19424	Derailment investigation and advance track technology	07/10/2019	18/10/2019	2 Weeks	SS/JAG/SG/JS who have attended Adv. Tr. Mntn with mechanized maintenance
19425	MIDAS	07/10/2019	18/10/2019	2 Weeks	SSE/ABEs
NOVEMBER					
19313	IRICEN Day	01/11/2019	02/11/2019	2 Days	IRSE Officers of 1993 Batch
	Spare Slot	04/11/2019	08/11/2019	1 Week	
19313	Seminar CE/TP	07/11/2019	08/11/2019	2 Days	CE/TPs of All Rilys.
19004	PHASE-1	11/11/2019	03/01/2020	8 Weeks	IRSE Prob. '2018 Batch
19506	PSU	11/11/2019	16/11/2019	1 Week	Sr Level Officers of PSU
19323	Work Shop DY/CE	18/11/2019	19/11/2019	2 Days	Dy CE/Ds of All Rlys.
19507	PSU	25/11/2019	29/11/2019	1 Week	Sr Level Officers of PSU

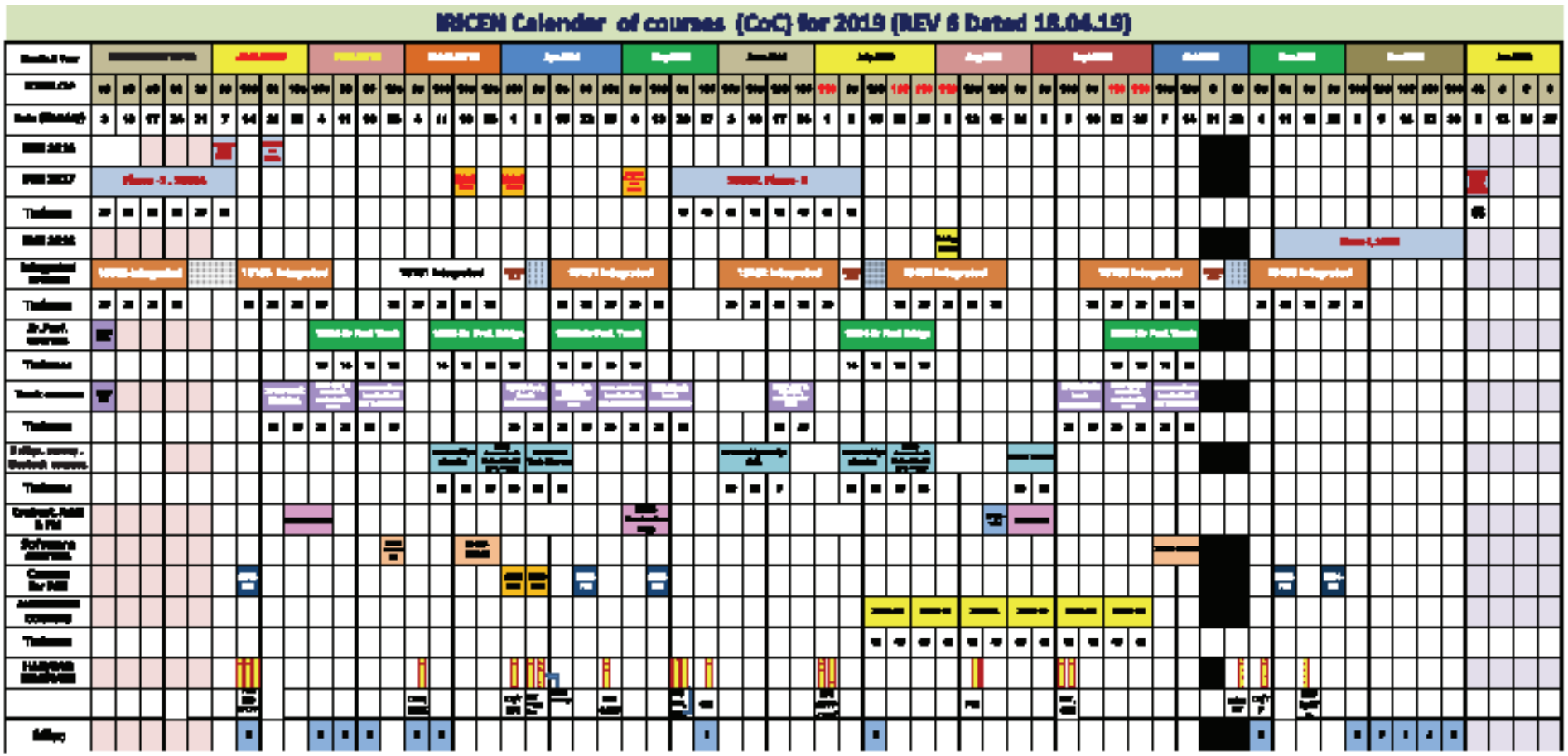
SSTW Calendar of Courses -2019

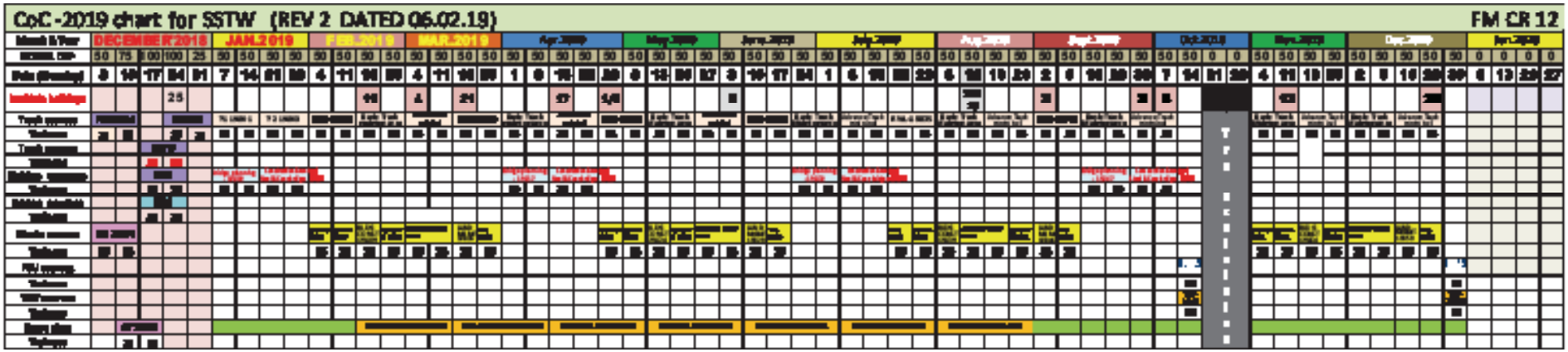
COURSE NO	COURSE NAME	FROM	TO	DURATION	ELIGIBILITY
APRIL					
19816	Basics of Track	01/04/2019	12/04/2019	2 Weeks	JE/SSE/P.Way
19817	Bridge planning	01/04/2019	12/04/2019	2 Weeks	JE/SSE/Bridge
19818	Advanced Track maintenance including mechanized maintenance	15/04/2019	26/04/2019	2 Weeks	JE/SSE/P.Way
19819	Construction & Maintenance of Steel & Concrete bridges	15/04/2019	26/04/2019	2 Weeks	JE/SSE/Bridge
19907	PSU DFCCIL TCB1	15/4/2019	05/10/2019	4 Weeks	
19820	RWI (Rail Wheel Interaction)	29/04/2019	10/05/2019	2 Weeks	JE/SSE/P.Way
19821	Geo-tech	29/04/2019	04/05/2019	1 Week	JE/SSE/Works
MAY					
19822	Survey	06/05/2019	10/05/2019	1 Week	JE/SSE/Works
19823	Basics of Track Maintenance	13/05/2019	24/05/2019	2 Weeks	JE/SSE/P.Way
19824	Bldg Const	13/05/2019	17/05/2019	1 Week	JE/SSE/Works
19908	PSU DFCCIL TCB2	13/5/2019	06/07/2019	4 Weeks	
19825	Conc-Tech	20/05/2019	24/05/2019	1 Week	JE/SSE/Works
19826	Advanced Track maintenance including mechanized maintenance	27/05/2019	07/06/2019	2 Weeks	JE/SSE/P.Way
19827	Contract Mgmt	27/05/2019	07/06/2019	2 Weeks	JE/SSE/Works-P.Way
JUNE					
19828	RWI (Rail Wheel Interaction)	10/06/2019	21/06/2019	2 Weeks	JE/SSE/P.Way
19829	Land Mgmt	10/06/2019	14/06/2019	1 Week	JE/SSE/Works
19909	PSU RVNL TCB1	06/10/2019	07/05/2019	4 Weeks	
19830	TMS	17/06/2019	21/06/2019	1 Week	JE/SSE/P.Way
19831	Basics of Track Maintenance	24/06/2019	05/07/2019	2 Weeks	JE/SSE/P.Way
19832	Bridge planning	24/06/2019	05/07/2019	2 Weeks	JE/SSE/Bridge
JULY					
19833	Advanced Track maintenance including mechanized maintenance	08/07/2019	19/07/2019	2 Weeks	JE/SSE/P.Way
19834	Construction & Maintenance of Steel & Concrete bridges	08/07/2019	19/07/2019	2 Weeks	JE/SSE/Bridge
19910	PSU RVNL TCB2	07/08/2019	08/02/2019	4 Weeks	
19835	RWI (Rail Wheel Interaction)	22/07/2019	02/08/2019	2 Weeks	JE/SSE/P.Way
19836	Tunneling	22/07/2019	26/07/2019	1 Week	JE/SSE/Works
19837	Survey	29/07/2019	02/08/2019	1 Week	JE/SSE/Works
AUGUST					
19838	Basics of Track Maintenance	05/08/2019	16/08/2019	2 Weeks	JE/SSE/P.Way

COURSE NO	COURSE NAME	FROM	TO	DURATION	ELIGIBILITY
19839	Bldg Const	05/08/2019	09/08/2019	1 Week	JE/SSE/Works
19911	PSU RVNL TCB3	08/05/2019	30/8/2019	4 Weeks	
19840	Contract Mgmt	13/08/2019	23/08/2019	2 Weeks	JE/SSE/Works-P.Way
19841	Advanced Track maintenance including mechanized maintenance	19/08/2019	30/08/2019	2 Weeks	JE/SSE/P.Way
19842	Conc-Tech	26/08/2019	30/08/2019	1 Week	JE/SSE/Works
SEPTEMBER					
19843	RWI (Rail Wheel Interaction)	03/09/2019	13/09/2019	2 Weeks	JE/SSE/P.Way
19844	Land Mgmt	03/09/2019	07/09/2019	1 Week	JE/SSE/Works
19845	TMS	09/09/2019	13/09/2019	1 Week	JE/SSE/P.Way
19846	Basics of Track Maintenance	16/09/2019	27/09/2019	2 Weeks	JE/SSE/P.Way
19847	Bridge planning	16/09/2019	27/09/2019	2 Weeks	JE/SSE/Bridge
19848	Advanced Track maintenance including mechanized maintenance	30/09/2019	11/10/2019	2 Weeks	JE/SSE/P.Way
19849	Construction & Maintenance of Steel & Concrete bridges	30/09/2019	11/10/2019	2 Weeks	JE/SSE/Bridge
OCTOBER					
19901	PSU	14/10/2019	18/10/2019	1 Week	PSU ENGGS.
19902	TOT	14/10/2019	18/10/2019	1 Week	Instructor ZRTI
NOVEMBER					
19850	Basics of Track Maintenance	04/11/2019	15/11/2019	2 Weeks	JE/SSE/P.Way
19851	Geo-tech	04/11/2019	08/11/2019	1 Week	JE/SSE/Works
19852	Survey	11/11/2019	16/11/2019	1 Week	JE/SSE/Works
19853	Advanced Track maintenance including mechanized maintenance	18/11/2019	29/11/2019	2 Weeks	JE/SSE/P.Way
19854	Bldg Const	18/11/2019	22/11/2019	1 Week	JE/SSE/Works
19855	Conc-Tech	25/11/2019	29/11/2019	1 Week	JE/SSE/Works
DECEMBER					
19856	Basics of Track Maintenance	02/12/2019	13/12/2019	2 Weeks	JE/SSE/P.Way
19857	Contract Mgmt	02/12/2019	13/12/2019	2 Weeks	JE/SSE/Works-P.Way
19858	Advanced Track maintenance including mechanized maintenance	16/12/2019	27/12/2019	2 Weeks	JE/SSE/P.Way
19859	Land Mgmt	16/12/2019	20/12/2019	1 Week	JE/SSE/Works
19860	TMS	23/12/2019	28/12/2019	1 Week	JE/SSE/P.Way
19903	PSU	30/12/2019	03/01/2020	1 Week	PSU ENGGS.
19904	TOT	30/12/2019	03/01/2020	1 Week	Instructor ZRTI



Group Photograph of IRSE Probationer's (2016 batch) with Hon'ble President of India at Rashtrapati Bhavan, New Delhi.





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