IRIMEE ANNUAL DAY LECTURE SERIES 2021

MARCH 12TH 2021

RITES
THE INFRASTRUCTURE PEOPLE

TECHNOLOGY DRIVEN EXAMINATION & MAINTENANCE OF FREIGHT STOCKS

THE SMART YARD

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OUTLINE

- The Preset State of Affairs in Freight Examination & Maintenance.
- Attempts made till now towards technology infusion in Rolling Stock Maintenance Systems .
- Scale of Freight Maintenance on IR: Brief Overview.
- What has changed now ?
- Smart Yard Frame Work.
- RITES DPR on Smart Yards.
- ICT based Integration with Legacy Systems
- Present Status.
- Why not Smart Coaching Depot too ??.

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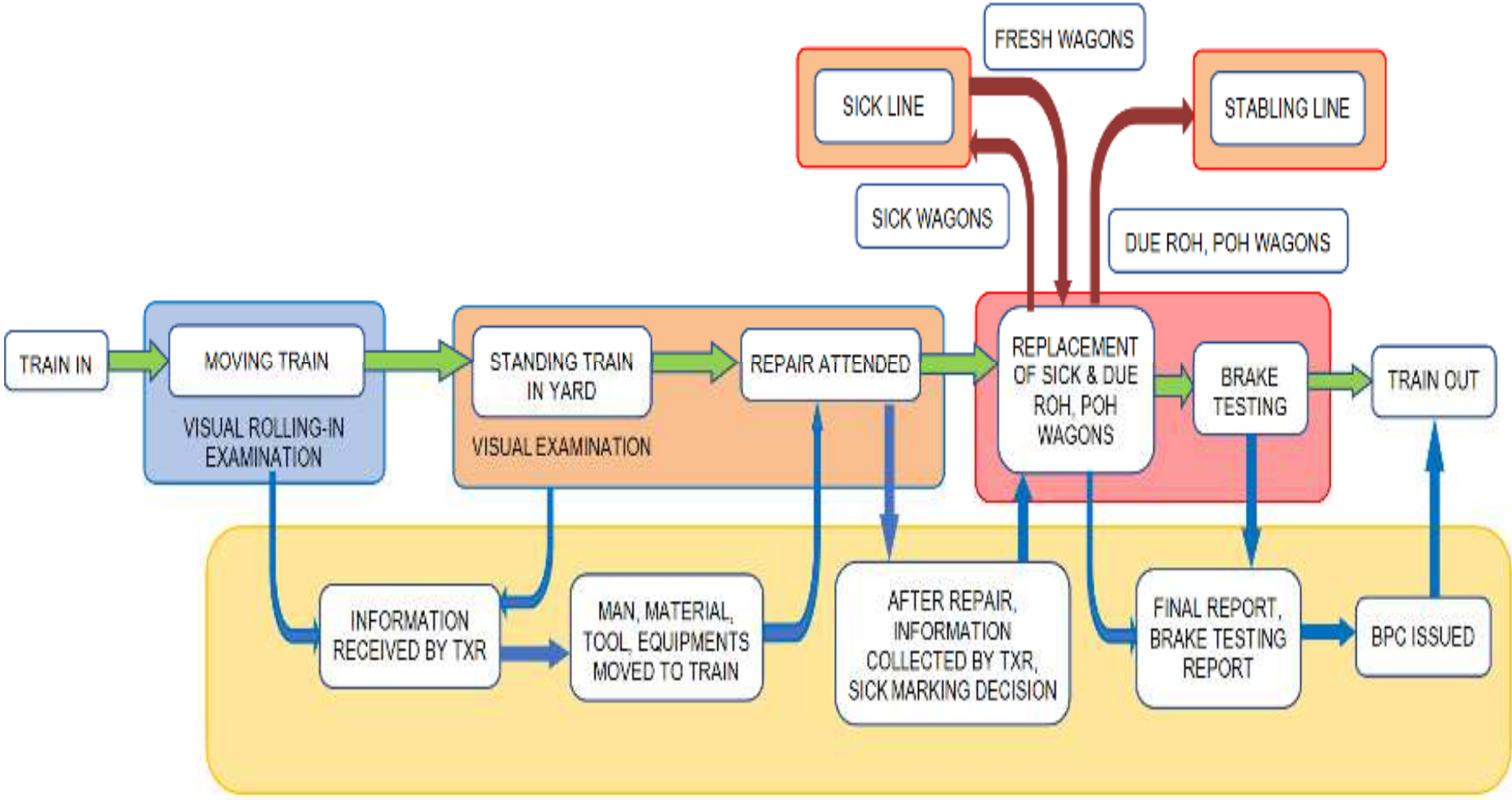
FREIGHT TRAIN EXAMINATION : THE PRESENT SYSTEM



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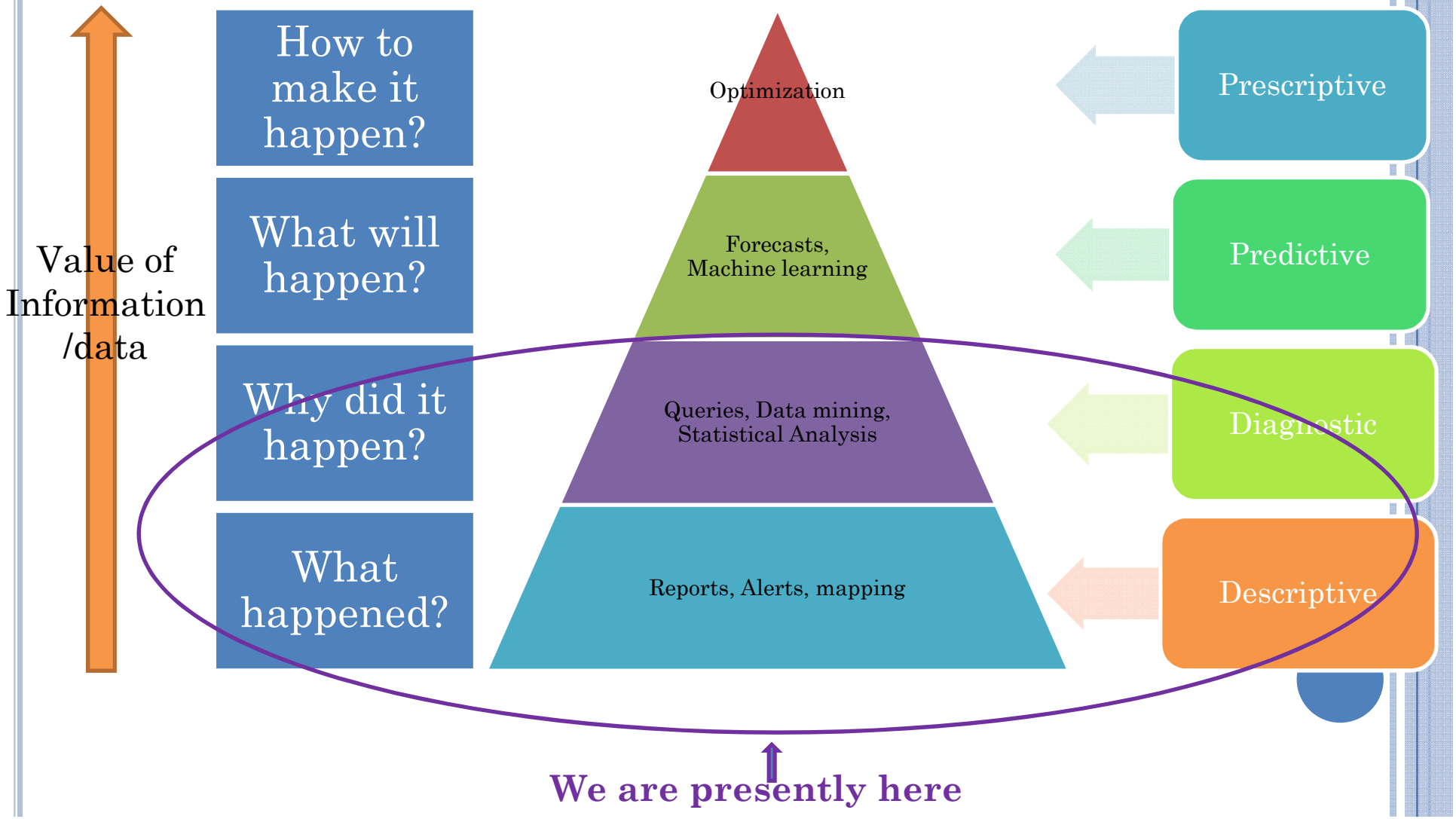
FREIGHT TRAIN EXAMINATION : THE PRESENT SYSTEM

- Limited use of technology right from rolling in inspection to yard examination & subsequent attention.
- Total reliance on human checks for identification of defects.
- Possibility of Human error in locating defects during maintenance.
- Standard infrastructure requirements not available in most of the yards. A recent survey showed that most of the yards suffer from:
  - Non-availability of sufficiently wide pathways
  - In sufficient lighting in yard for night examination/yard working.
  - Poor welding facilities in yard making it difficult to do even small body repair work.

FREIGHT TRAIN EXAMINATION : THE PRESENT SYSTEM

- In adequate M&P and tooling that limits possibility of on-rake attention.
- Poor infrastructure facilities and neglected maintenance resulting in poor quality of maintenance.
- Avoidable sick marking due to absence of basic infrastructure
- Detachments/formation of rake requiring multiple shunting.

Maintenance Systems



Attempts made till now towards technology infusion in Rolling Stock Maintenance Systems

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REMMLOT

Equipment on Loco

Wireless data including location on GPRS

Antenna

LRMS
(Locomotive Remote Monitoring System)

Processed data through Internet on Web based Application

LTMS (Locomotives and Train Management System)

Control Office Equipment

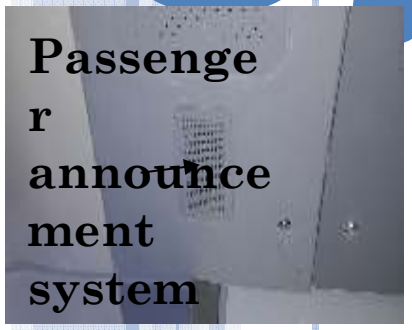
SMART COACH


Digital destinatio n LED Board


PA SYSTE M


Wi-Fi system (With preloade d media content)


CCTV FOOTA GE


Passenge r announce ment system


Po wer sup ply
Data Concen trator
Collib ri Box
Main mo dul e
Proces sing Unit


AC Packaged un

Water level indicator fitted near water tank

Antenna for wireless wheel node sensor

wireless wheel node sensor

Water level indicator (Display) (Inside of coach)

Emergency Talk back

Passenger information system

SMART COACH

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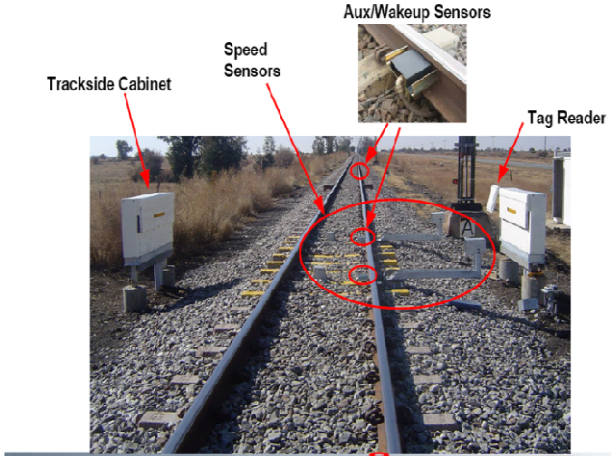
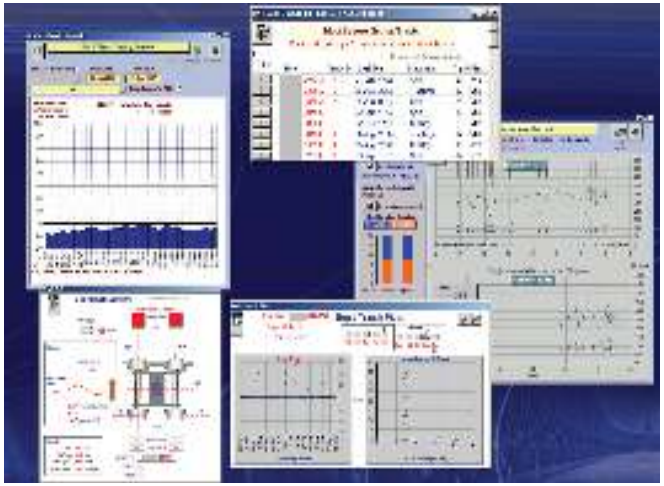
FREIGHT STOCKS

- IR has been conducting pilot projects for effective use of available rolling stock defect technologies for some time now.
- Wheel Impact Load Detector (WILD) system was developed by RDSO with IIT, Kanpur and industry partnership and has been installed at more than 18 strategic locations over IR network.
- TBMS (Track Side Bogie Monitoring System) has been installed at at Bakkas (Near Lucknow). The system consists of RAILBAM(Rail Bearing Acoustic Monitor), TBOGI (Truck Bogie Optical Geometry Inspection) & L/V (Lateral/Vertical) force measurement System with a central supervisory software.
- ATES (Automated Train Examination System – developed by KRCL) has been installed at Nagpur Division of Central Railway.

IR INITIATIVE – TBMS SITE AT LUCKNOW





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ATES Installation at NGP

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FREIGHT TRAIN EXAMINATION : THE SCENERIO

- Diesel Locomotives (EMD and ALCo) : ~ 5500
- Coaches (LHB and ICF) : ~ 60000
- Wagons ??
- **More than 3,25000 (52 Designs in 15 Broad Categories)**
  - 16 POH Workshops doing POH of ~ 4500 Wagons/Month
  - 58 ROH Depots doing ROH of ~10000 Wagons/Month
  - 127 Freight Yards doing examination of around 10000 Wagons/Month (~ 2000 CC, ~ 4000 End to End, ~ 4000 Premium)
  - 101 Sick Lines attending to defects noticed during the examinations.

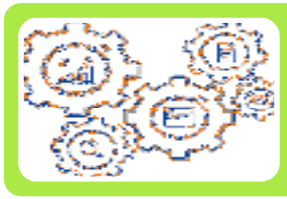
So, what has changed in recent few years?

Massive Digitization

- More Data (Structured, Unstructured), Lower Data Storage Costs

Easy Access Analytics

- New Techniques in Predictive & Prescriptive, faster computing

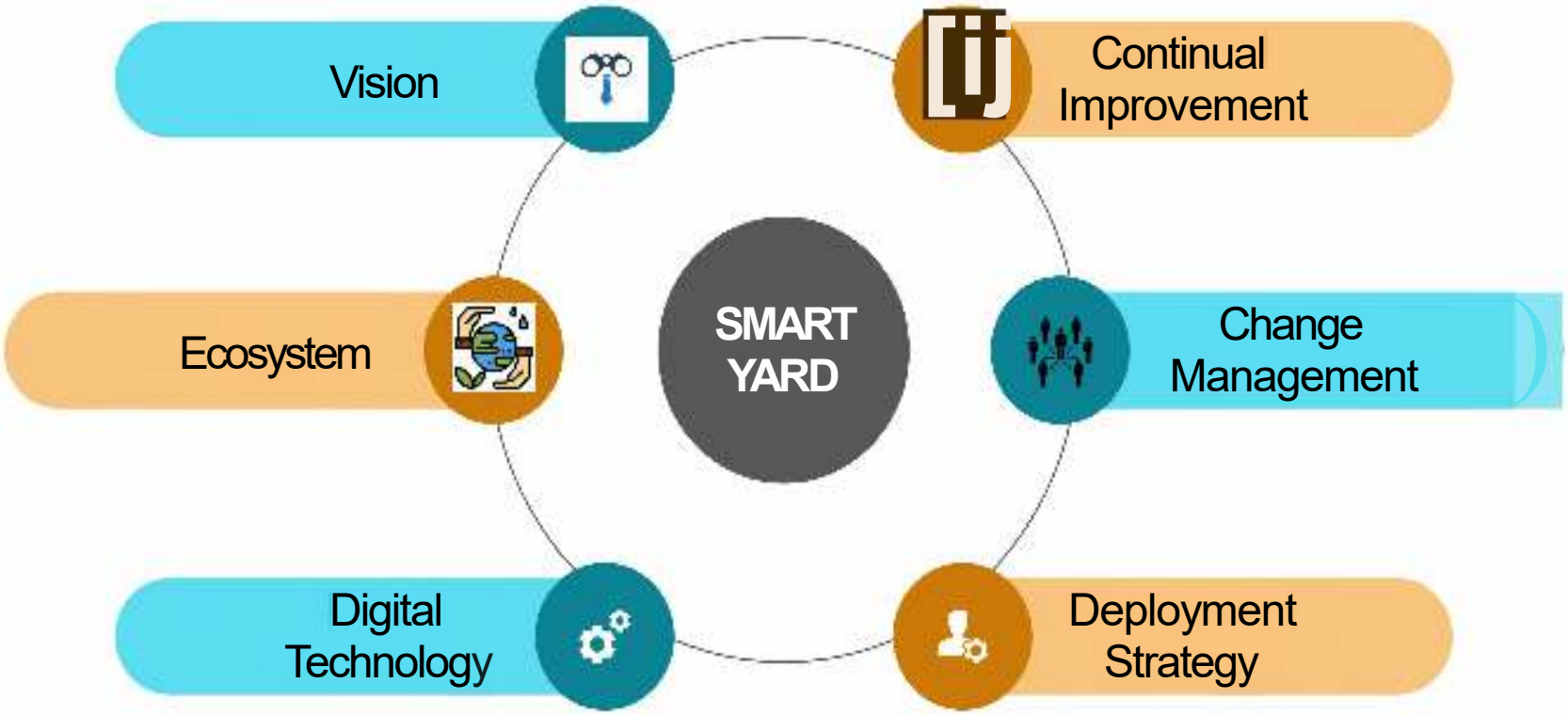


Automation

- Cloud-driven Scalability, Advanced Business Automation

RFID based Vehicle Identification System

Frame Work



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Vision

SMART YARD PROJECT AIMS AT UPGRADING THE SYSTEM OF FREIGHT STOCK EXAMINATION AND MAINTENANCE ON INDIAN RAILWAYS BY LEVERAGING MODERN INDUSTRIAL AND DIGITAL TECHNOLOGIES, IMPROVING INFRASTRUCTURE AND WORKING CONDITIONS, MULTI SKILLING TO IMPROVE OPERATIONAL AVAILABILITY & PERFORMANCE WHILE SIMULTANEOUSLY REDUCING COST OF MAINTENANCE OF ROLLING STOCK.

- **Intended Outcomes**
  - Improved quality of maintenance (improved MTTR & MTBF)
  - Improved efficiency of the maintenance processes
  - Reducing unplanned setouts
  - Reducing failures

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ECOSYSTEM

- **Digital Systems Implementation**
  - Asset management system for rolling stock: FMM, FOIS, COA, RFID, GIS integration.
  - Online Condition Monitoring Systems (Wayside Systems)
  - Data Collation Platform
  - Data Analysis Systems capable of stream and batch analytics
  - Development of rolling stock health management system

- **Conventional Systems Upgradation**
  - Layout improvements
  - Machinery Plant and Infrastructure improvements
  - Improved material (spares) management systems
  - Improved office working systems
  - ICT Infrastructure improvements
  - Training inputs for operational technology improvements

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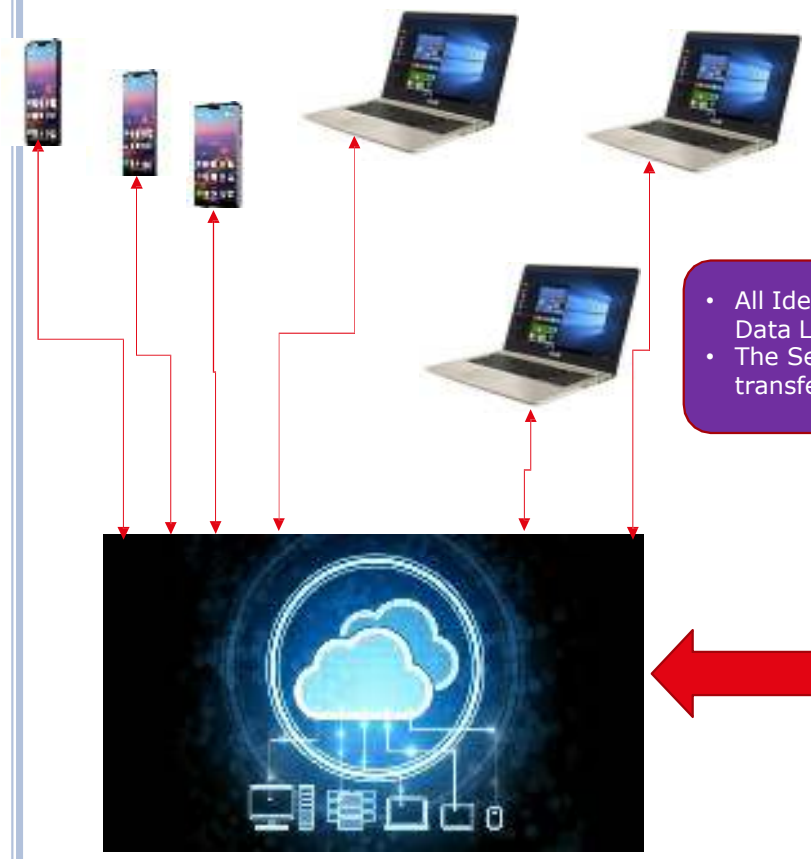

Methods of Data Integration Proposed
1. API based
2. Change Data Capture
3. XML based data exchange

- All Identified Data is copied to a Common Data Lake
- The Selection of Interface for data transfer shall be specific to the vendor

FleetOne Platform of TrackIQ
- Site 1
- Site 2
- …
- Site N

Web Data Platform of Apnatech
- Site 1
- Site 2
- …
- Site N

- Cloud Computing
  - SaaS / PaaS / IaaS Options
- Provide
  - Data as a Service
  - Information as a Service

CRIS
- FOIS / FMM
- COIS / CMM
- COA / RFID

Data Platform of Other Vendors
- Site 1
- Site 2
- …
- Site N

Technology (Simplified)

- Enduser interaction on a simplified Mobile App
- Continually Improved UI / UX
- Data/ Reports/ Forms all to be provided as a subscribed service
- Scalable servers to cater for indefinite numbers of users while retaining UX
- Google Maps (app design) can be considered as a Benchmark

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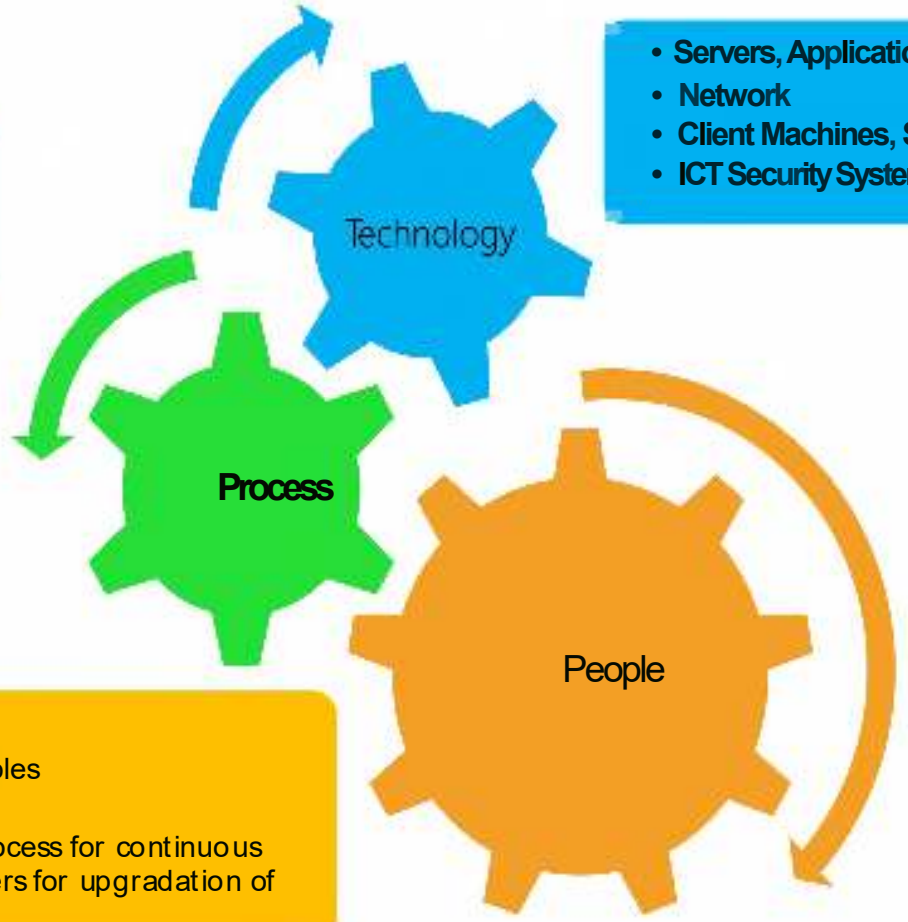
Manage the PPT Triad

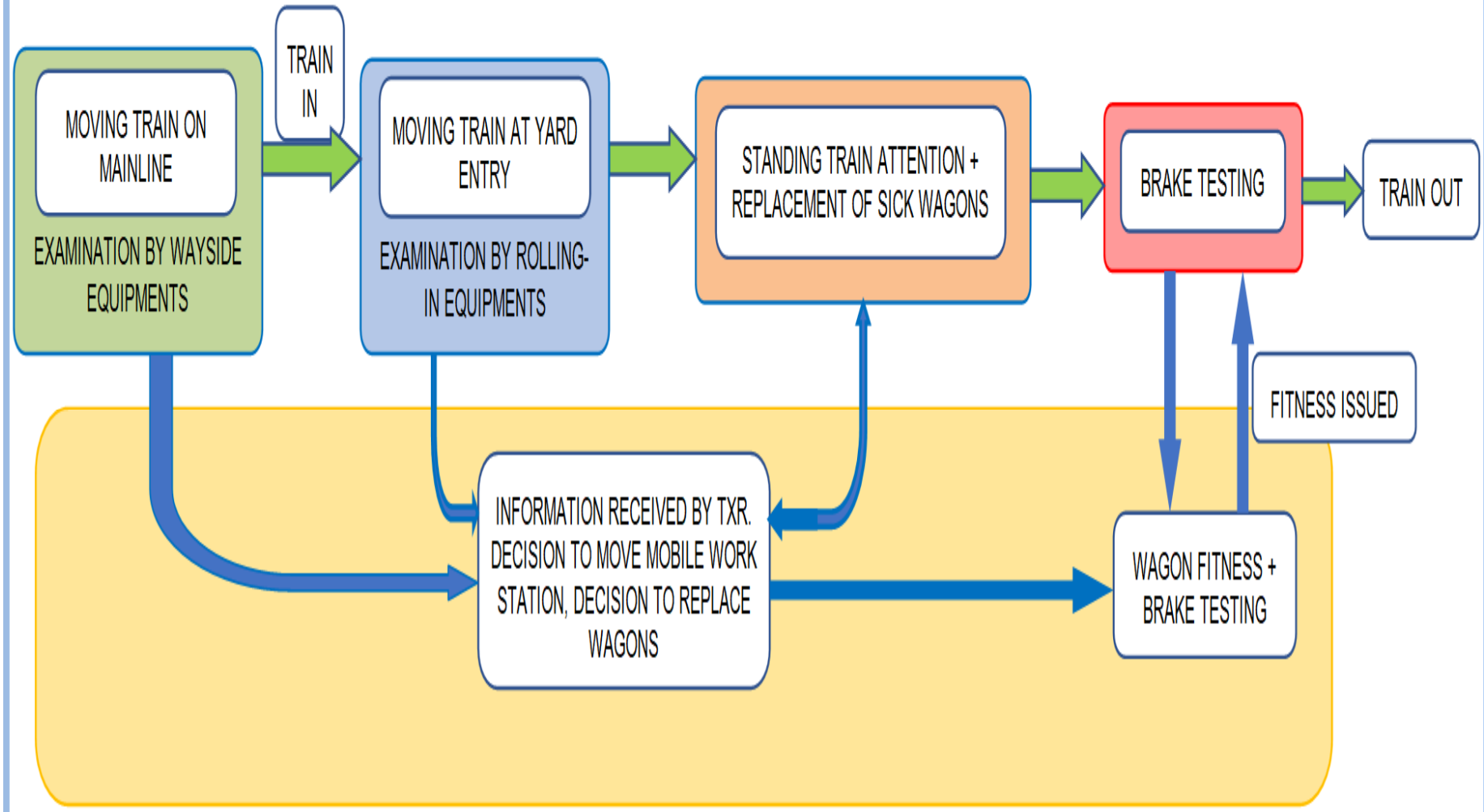
- Processes need to be re-engineered for handling new insights provided by digital technologies.



- Servers, Applications
- Network
- Client Machines, Supporting applications
- ICT Security Systems

- Creation of Governance Structure
- Clear Definition and Delegation of Roles
- Training of all stakeholders
- Development and deployment of process for continuous training for new comers and refreshers for upgradation of skills

SMART YARD WORKING



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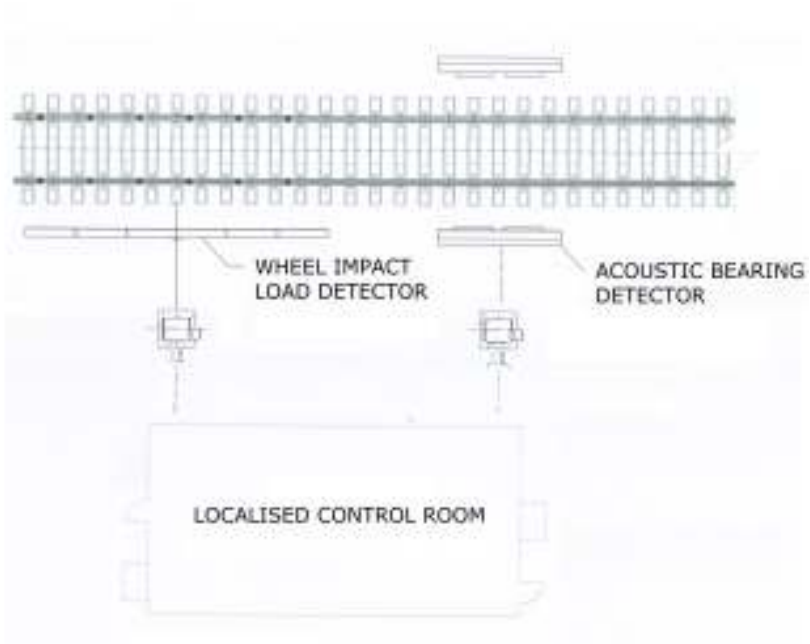
SMART YARD

- Smart yard is a paradigm shift in freight yard examination & maintenance.
- Replacement of human based visual examination regimes with technology driven way side detection & trending systems.
- Wi – Fi Enabled Yard
- Effective advance planning of maintenance (men, materials, machines & tools) of rake on the basis of report generated by the way side installed systems.
- Provision of state of art infrastructure facilities in line with best available global practices.
- Mobile deployment of maintenance equipments for maximizing on rake attention in the yard.
- All weather working in covered/open yard with provisions of EOT/Goliath crane & concept of unit exchange.
- Minimizing sick marking to reduce post examination detention.
- Skill Updation Centre for deployed personnels

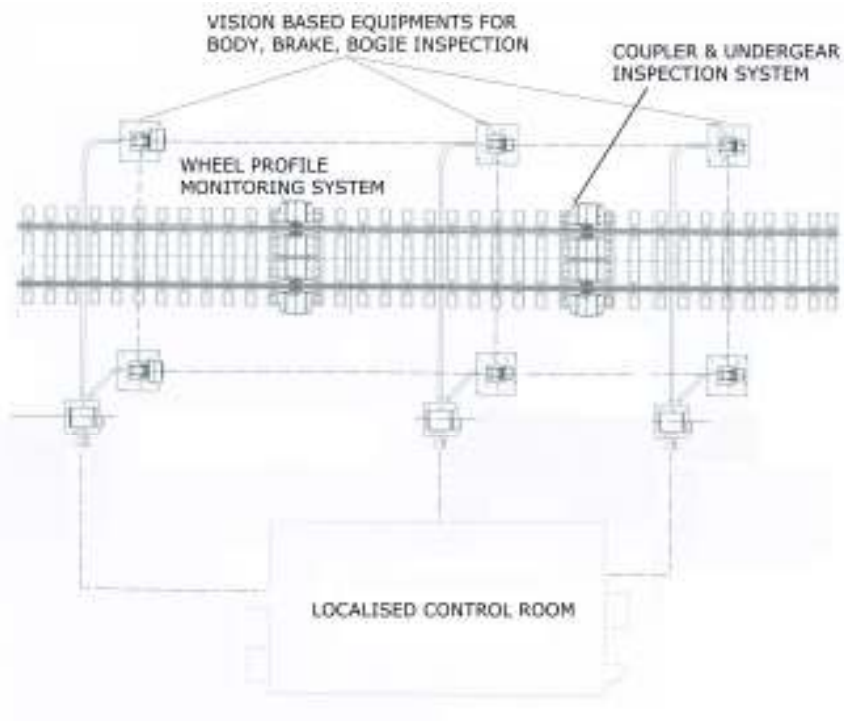
DIGITAL FAULT DETECTION

- **First Stage: Wayside Detection System capturing discrete data**
  - Hot bearing / Hot wheel detectors
  - Acoustic bearing detectors
  - Wheel impact load/wheel condition detectors
- **Second Stage: Measurement based/Detection based Machine Vision System**
  - Coupler View
  - Brake View
  - Wheel Profile Detector
  - Wagon Body Inspection System
  - Bogie View

SMART YARD DETECTION EQUIPMENTS LAYOUT



WAYSIDE EQUIPMENTS



ROLLING-IN EQUIPMENTS

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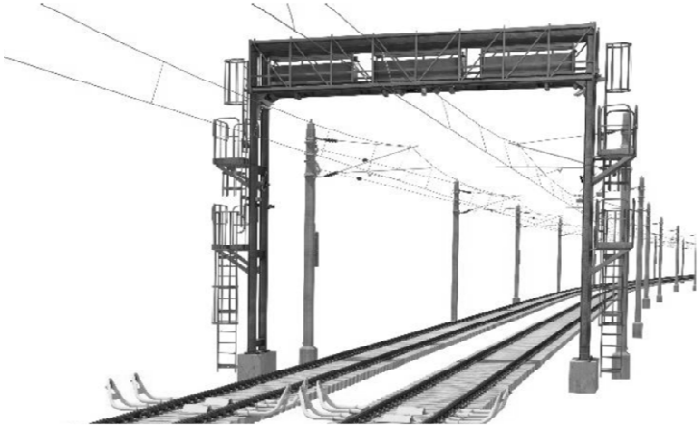
Defects detection Equipments for Smart Yard

Acoustic Bearing Detector for bearing

WILD for wheel flats



Body Inspection system for body defects/ hanging part

Hot Box detector for hot bearing

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DEFECTS DETECTION EQUIPMENTS FOR SMART YARD

Brake Inspection System brake gears and Shoes

Wheel Profile Measuring System for wheel defects like sharp flange root wear etc

Coupler & undergear inspection for missing pins, broken knuckle etc

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DEFECTS DETECTION EQUIPMENTS FOR SMART YARD

Wheel view for wheel defects like shelling , hollow tyre etc

Bogie inspection system for defective casting & suspension items

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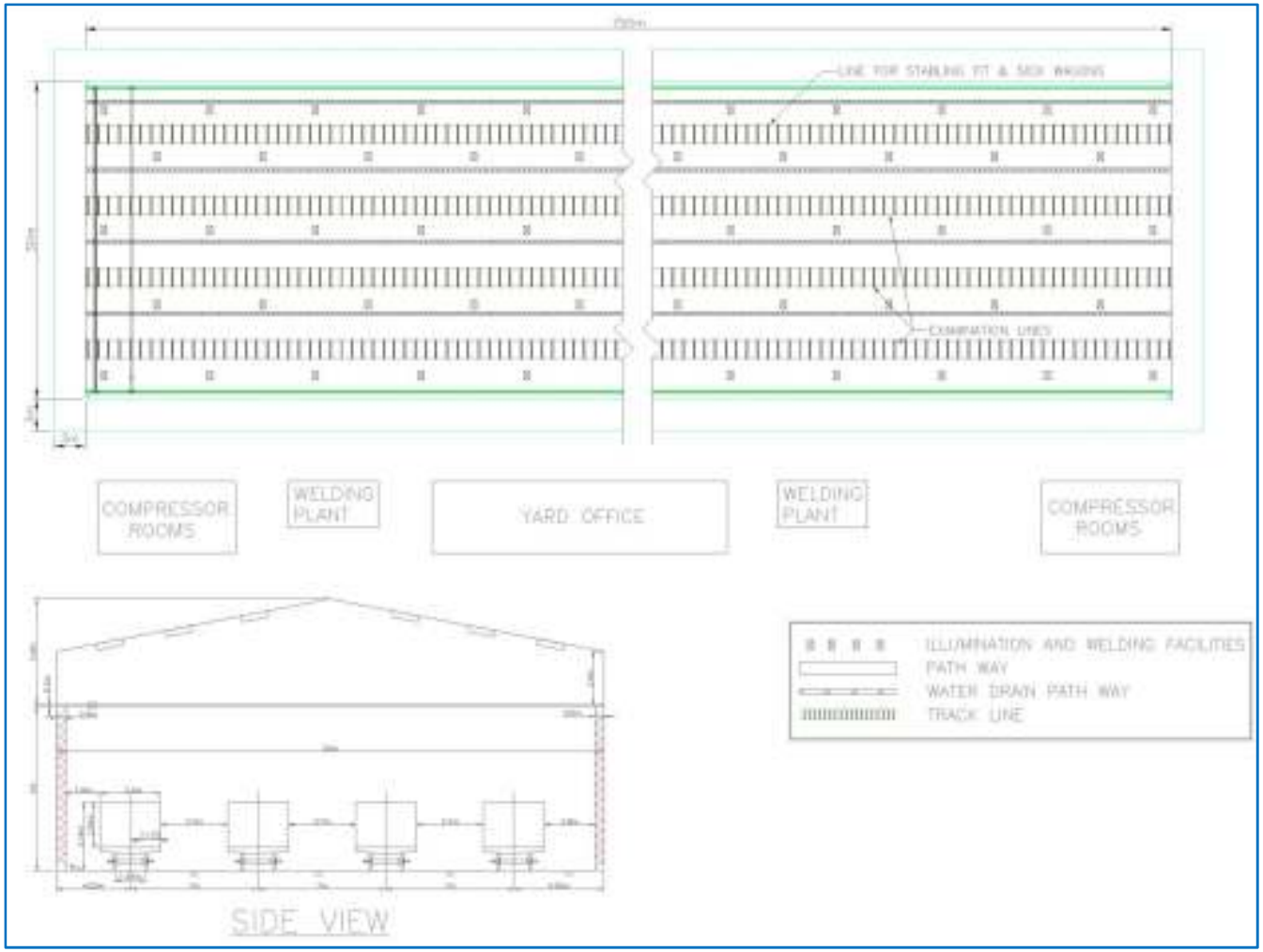
SMART YARD: BEYOND DETECTION

- Provision of wider proper path ways.

- Provision of sufficient lighting masts to illuminate the entire yards to facilitate night shift working.
- Provision of poles / pillars carrying lights, power terminal ports for providing connections between all along the examination lines.
- Provision of suitable air compressor with provision throughout supply connectivity all along the examination lines.

SMART YARD MODELS

Model A: All Weather Smart Yard as green field project



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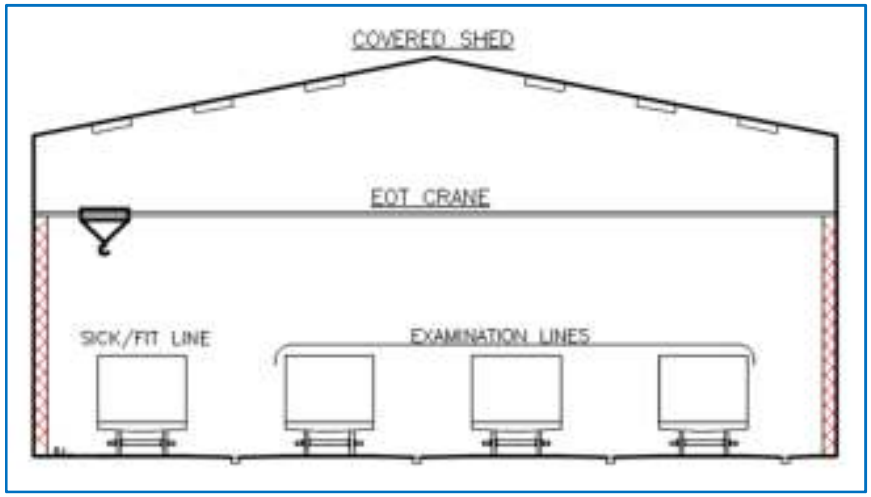
STANDARD YARD MODEL (MODEL-A) ALL WEATHER SMART YARD AS GREEN FIELD PROJECT

- Can be used for Small or big yards.
- All weather working conditions, hence no adverse effect of environment/ weather condition on quality of repair.
- Maximum repair in the yard itself. Hence sick marking limited to POH/ROH/NPOH only.
- Considerable reduction in total yard detention & traffic shunting requirements.
- Improved quality of repairs on wagons.



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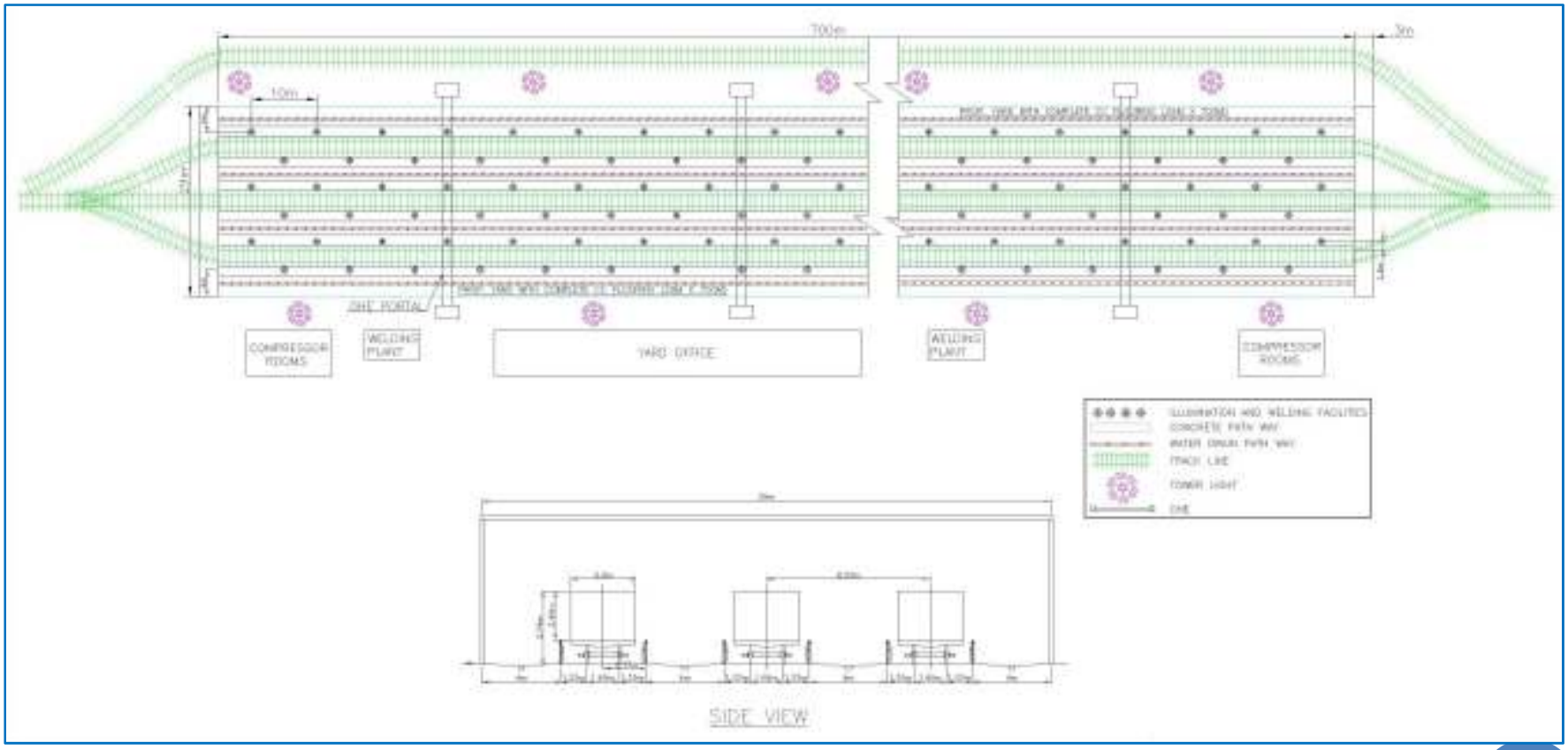
SMART YARD MODELS

Model B: Modification/Up-gradation of maintenance facilities in existing lines with OHE above maintenance line



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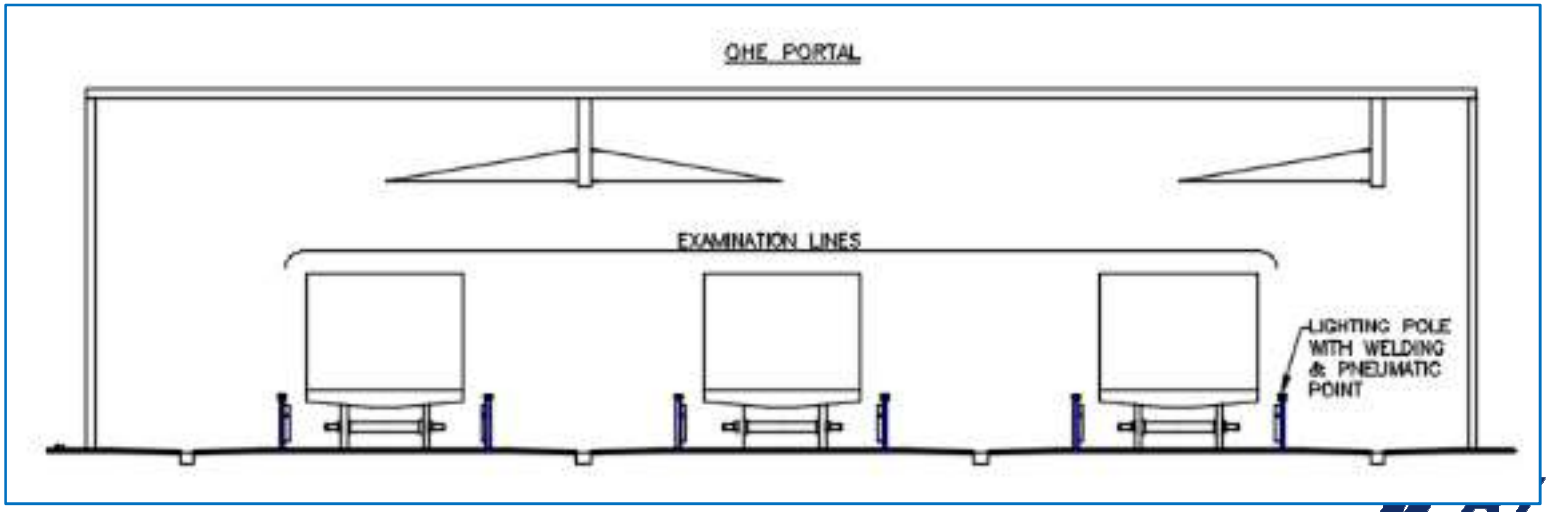
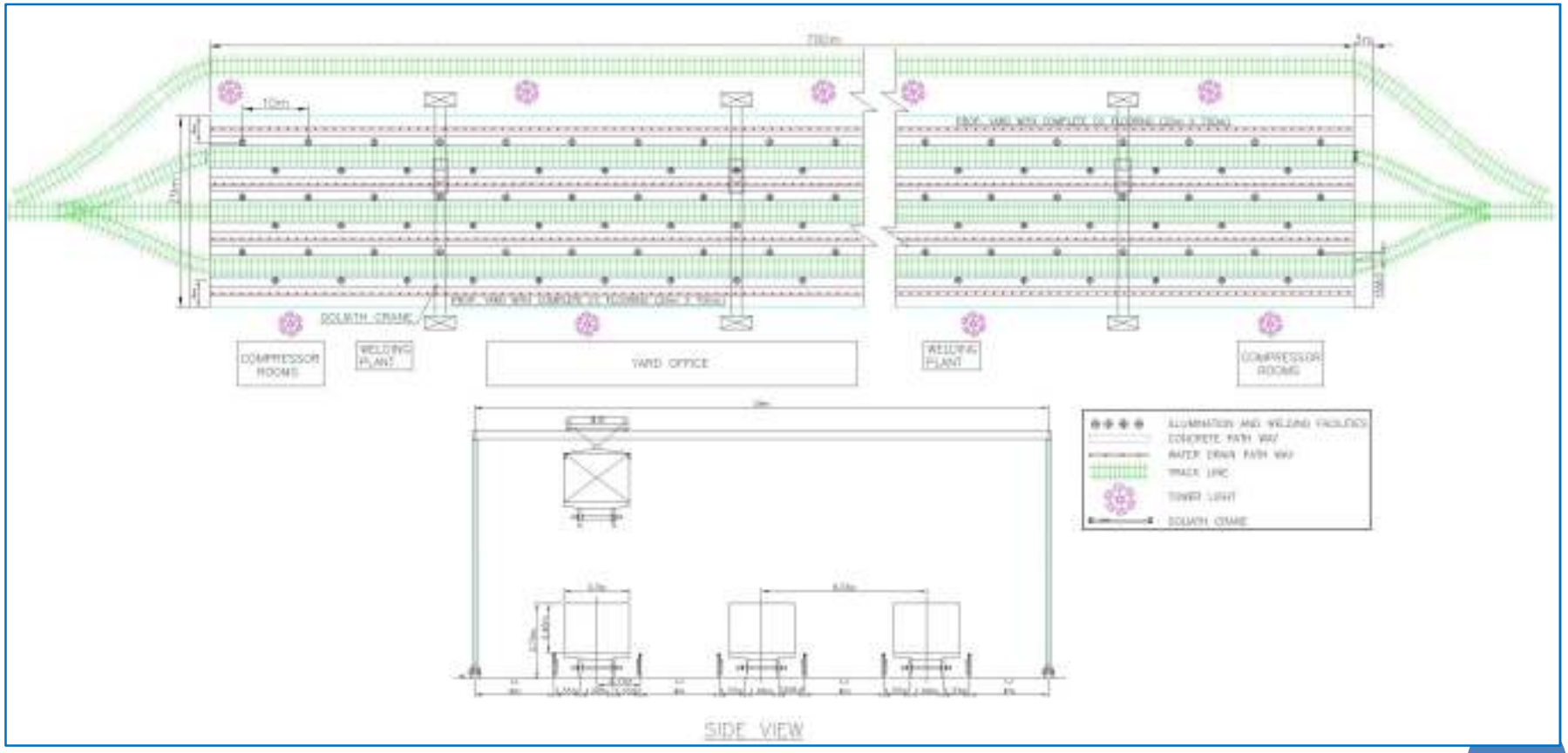
MODEL-B: MODIFICATION/UP-GRADATION OF EXISTING LINES WITH OHE

- Due to OHE not possible to provide all weather working condition as possible in model A
- Quality of repair & sick marking will be dependent on weather condition.
- With better infrastructure/ latest state of art equipments there will be substantial improvement in quality of repair & reduction in sick marking.
- Total yard detention will get reduced by not to the extent of model A & Model C.



SMART YARD MODELS

MODEL C: Modification/Up-gradation of maintenance facilities in existing lines without OHE above maintenance line



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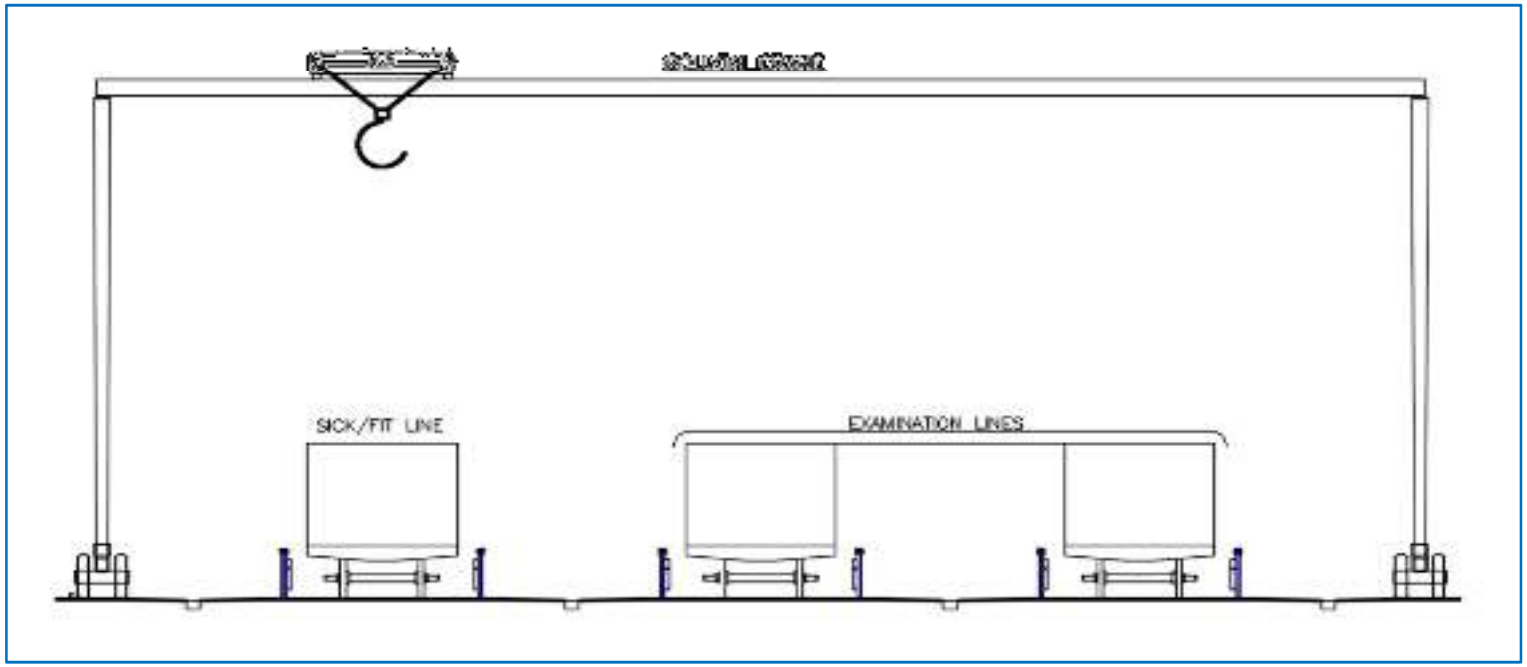
MODEL C: MODIFICATION/UP-GRADATION OF EXISTING YARD WITHOUT OHE

- Provision of Goliath cranes
- Improved from Model B and similar to Model- A, except all weather protection not possible/ given.
- Total yard detention will be reduced in comparison to model-B.



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SMART YARD: BEYOND DETECTION

- Skill development cum training centre.
- Provision of Supervisory Control and Data Acquisition (**SCADA**) a computer based rake test rigs for brake testing of rake & single car testing in the examination yards.

SMART YARD: BEYOND DETECTION

- Provision of sufficient portable welding transformers, gas/ plasma cutting, tools and equipments.
- Mechanised/Power tools and equipments.
- Provision of suitable battery operated materials handling equipments like e-riksha.

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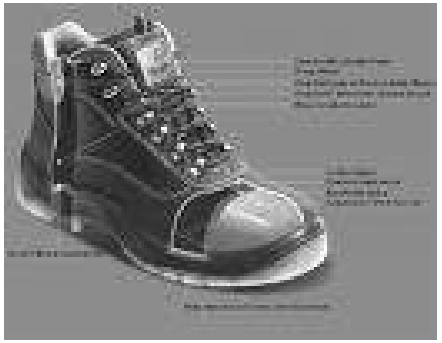
SMART YARD: BEYOND DETECTION

- Provision of personal protective clothing with helmet , shoes & other safety gears for all working & supervisory staffs of yard.
- Separate and distinct uniform for staff & supervisors



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PROVISION OF WI-FI CONNECTIVITY IN YARD

i) Provision for Wi-Fi tower through dish or towers from BSNL/Reliance/Railtel.

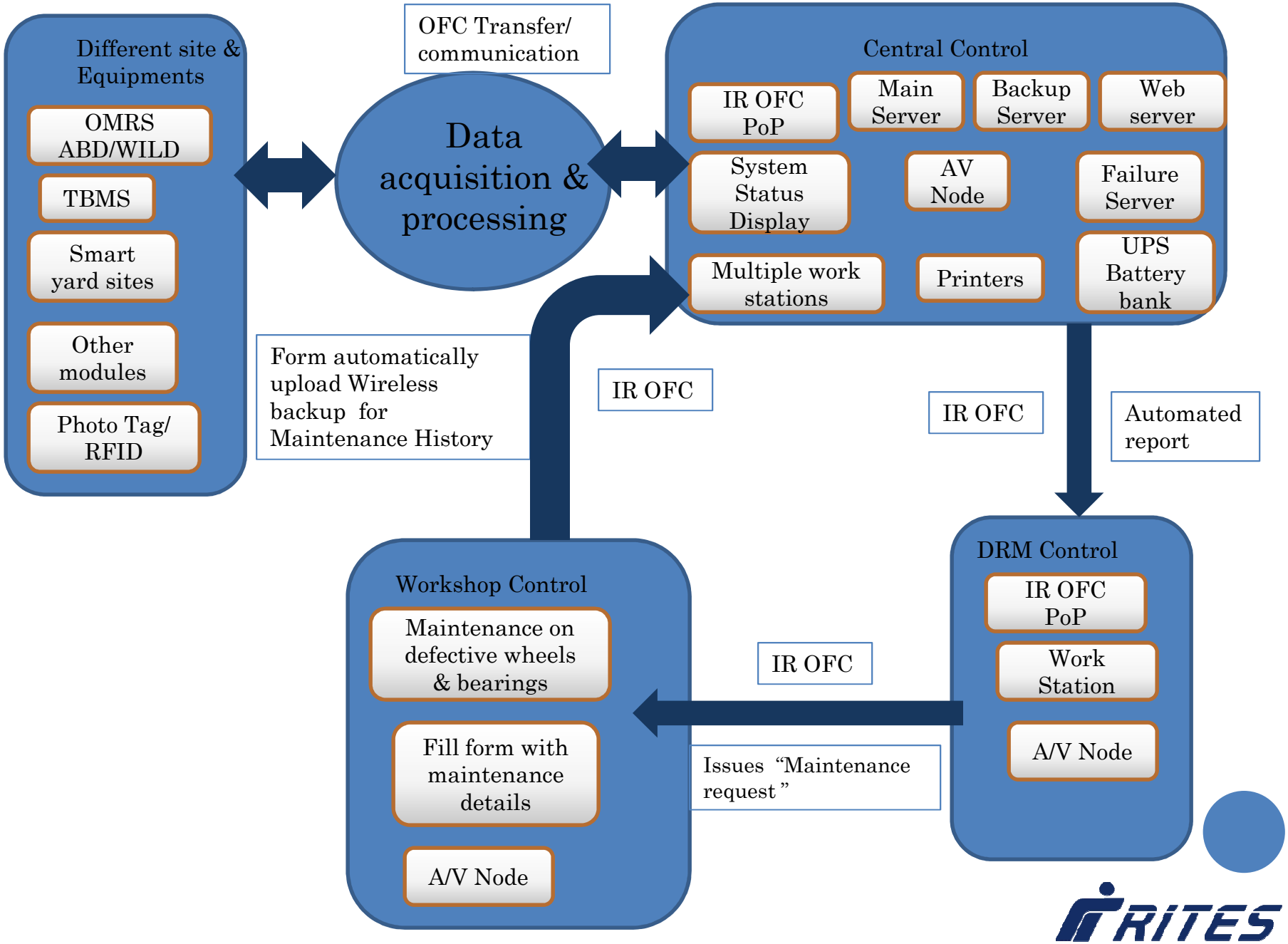
ii) Direct connectivity of each detection equipment to FMM for access to actionable parameter exception reports through the Wi-Fi network.

iii) Provision of sufficient hand held communication devices for identified yard officials.

INTEGRATION OF LEGACY SYSTEMS & UPCOMING SYSTEMS IN SMART YARDS

- Existing systems installed over IR have OEM specific protocols/ API & do the processing to generate different reports customized by them.
- At present these systems do not interact with each other.
- Need for benchmarking of same level of defects along same systems of different make.
- Trending of defects for passing trains through series of such systems is difficult.
- Common platform / interface for all legacy systems and proposed new systems are essentially required.
- A detailed plan for integration of ICT system for these detection systems including as-is, to be state, solution design & implementation plan is being worked out.

System Overview – Data Flow



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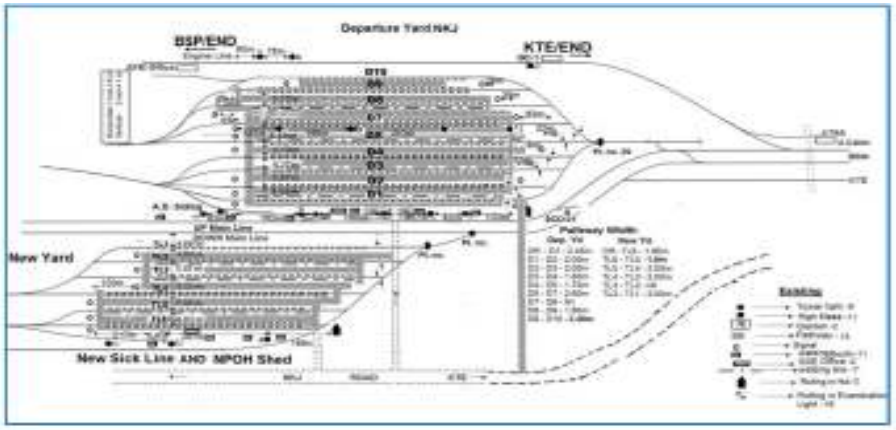
RITES DPR FOR CONVERSION OF FREIGHT YARDS INTO SMART YARDS

RITES DPR

- RITES was tasked by Railway Board to do a detailed study of freight examination and maintenance in three representative yards:
  - Major Yard (NKJ)
  - Medium (ADTP)
  - Small (BSP)
- Detailed on Site and Off Site Interaction was done with the Officers, Supervisors and Staff of these Yards to gather information in respect of pattern of examination and traffic flow, types of stock, failure trends etc., yard layouts, proposed expansion plans, sick marking analysis, available infrastructure, available M&Ps & T&Ps, Training Facilities etc.

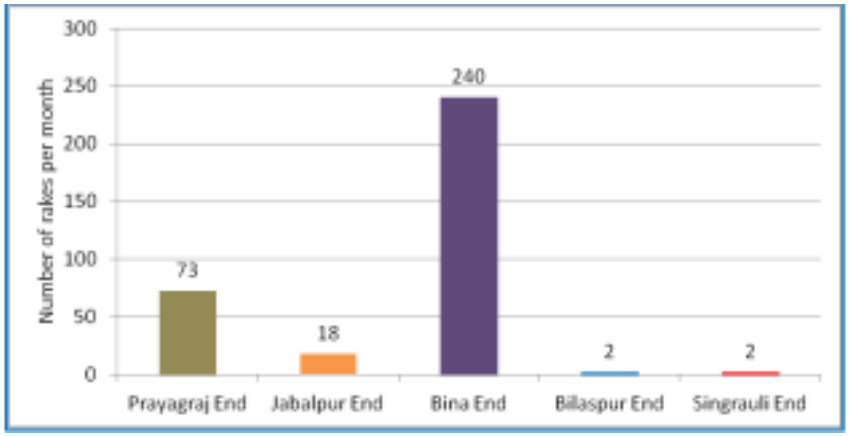
RITES DPR

- **Study of NKJ/WCR**

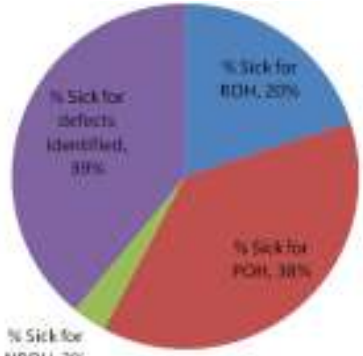


Existing layout (Departure & New yard)

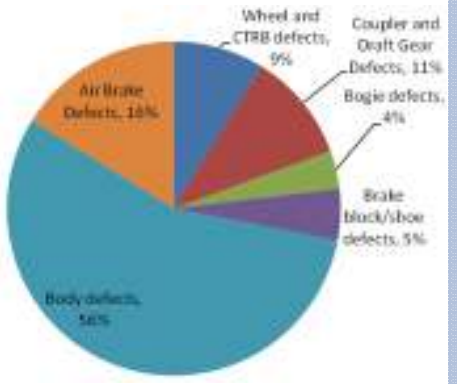
Traffic Pattern



Defects and condition of yard observed



Detail of sick markings



Defect wise sick marking

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RITES DPR

- **EOI for Smart Yard Equipment:** RITES floated a global EOI to assess the available diagnostic/ mechanized defect detection equipment for Rolling Stock used by other railroads in the world and their likely suppliers & cost etc.
- **Visits to Existing Sites (OMRS & ATES)**

  RITES team visited OMRS site at Panipat & Central Command Centre of OMRS at Kishanganj, New Delhi created by IR for all the proposed sites and also visited Nagpur to see the ATES site developed & installed by KRCL.

RITES DPR

- **Engagement of ICT Consultant for Integration of Defect Monitoring Equipment**

  For system integration of project for identified detection equipment, an independent ICT consultant was engaged. The ICT consultant spelled out the detailed road map for integration of such detection technologies proposed in the project with existing modules of detection equipment and other IT related modules already installed over IR with the objective to create a common platform for logical communication & trending of output results/ actionable alarms to all nominated officials over IR.

RITES DPR

- **Meetings with Zonal Railways & Railway Board**

  RITES held meetings with Railway Board, Zonal Railway HQs and Divisions (Operating and Mechanical to understand the complete system of freight train examination, field realities and constraints, Works already under execution and at planning stage, and to discuss the proposed locations for setting up of detection equipments, Yard Upgradation etc.

- **PCMEs Conference at Secunderabad**

  Draft Report was presented at PCMEs conference held at Secunderabad (SCR) between 26/04/2019 to 28/04/2019 and reactions and observations incorporated/dovetailed.

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DPR SUBMISSION

- **Detailed Report of Three Nominated Yards (NKJ, BSP & ADTP)**
  - Detail Project Reports of the three Yards was formulated based on these inputs and analysis.
  - The DPR proposals include:
  - Suitable model for upgraded infrastructure
  - Work Station Assessments (M&Ps/T&Ps) and indicative specifications
  - Workplace Safety Assessments
  - Detection equipment & their locations
  - Training Facilities Assessments
  - Project indicative estimates with justification of proposed facilities & Rate of Returns

    for each of the three yards.

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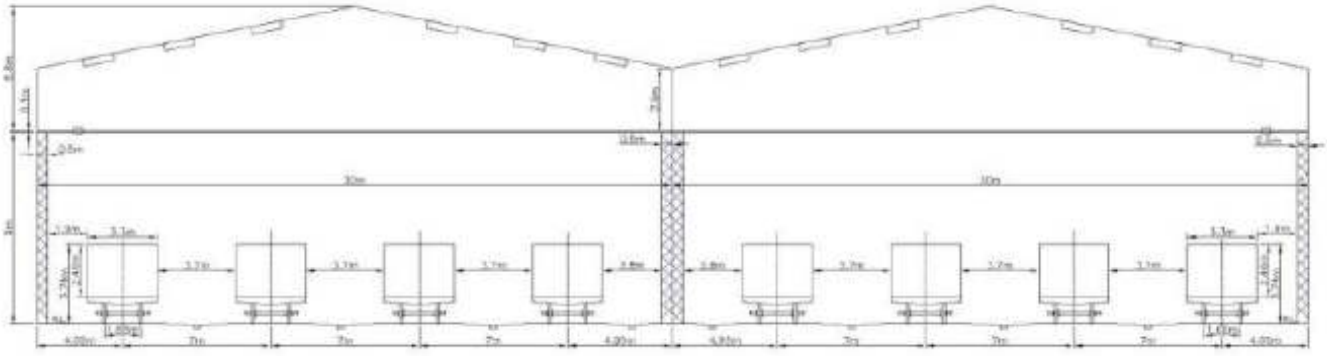
REPRESENTATIVE PROPOSAL

- **Proposal for NKJ Yard**

Phase-I - All Weather Working Smart Yard as Green Field Project (Non-OHE Lines in Complete Covered/Open Facility with Provision of EOT Cranes)

Proposed modification in Marshalling yard



Proposed covered shed yard layout

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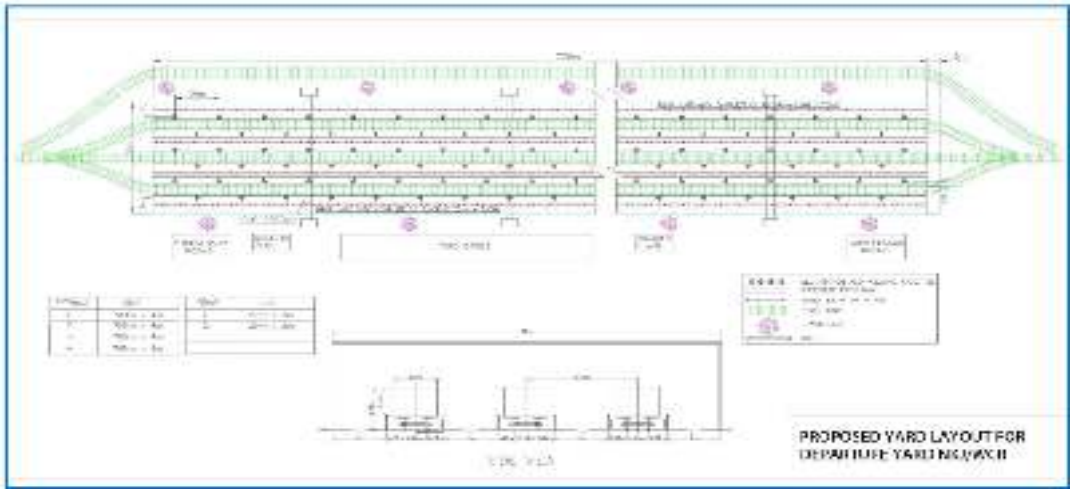
REPRESENTATIVE PROPOSAL

- **Proposal for NKJ Yard**

Phase-II: Modification in the Existing Departure Yard of NKJ Yard to meet Future Requirements

Proposed modification in Departure yard



Proposed yard layout for Departure yard

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ADDITIONAL TOR

- **Identification of Detection Equipment for 40 Nominated Yards**

As a part of the DPR, RITES was also directed to identify the suitable track side equipments for the identified Class "A" 40 yards.

Accordingly, the data was collected from all 40 yards for flow of traffic, pattern of examination, yard layouts etc.

ADDITIONAL TOR

- **Identification of Detection Equipment for 40 Nominated Yards**

  Based on the information, proposals were framed for:

  - quantity of equipment (s)
  - Their location
  - Indicative Cost Estimates

  An indicative estimate of the proposed detection equipment eco system for nominated 40 freight yards of Indian Railways along with cost of ICT platform and connectivity to each yard was framed and submitted.

CONCLUSION

- The existing maintenance facilities on IR are outcome of piece meal up-gradation in different stages, of facilities once created for 4 wheeler / vacuum braked wagons.
- Total yard detention and presence of embedded empties on the rakes is very high, resulting in reduced utilization of rolling stocks. Hence concept of working in the examination yard needs major changes so that effective utilization of wagons can be done.

CONCLUSION

- Most of the nominated existing yards have space limitations to create Green field Smart yard facilities. Three detailed representative models were been developed as part of this study to cover various scenarios which can be up scaled/down scaled considering the scale and intensity of examination patterns.
- Accordingly, the best possible solution of these three representative models needs to be explored after due scaling, considering the local conditions, space availability and operational feasibility.

CONCLUSION

- The mechanized defect detection which are vision based & proposed to be provided at yard entry can identify all defects as being noticed at present (repair attended in yard and for which wagon marked sick) **except for**: air brake pneumatic system leakages, internal defects of DV & BC, cracks on centre pivot/bogie bolster/bottom/top surface etc., inside springs of bogie and cracks on top surface of draft gear etc.

CONCLUSION

- The directions receiving less than 10 rakes per month for examination have not been considered for Rolling-In visual type detection equipment. However, all direction catering fright movement to yard for examination have been considered for main line detection equipment (OMRS) **considering the fact that these are the equipment to be installed on mainline block section not only for yard but also for trending of defects in wagons /stocks passing through these lines for effective monitoring health of all rolling stocks**.
- Only one set of Rolling-In equipment has been considered where train from two directions are merging before arrival in yard to examination lines.

CONCLUSION

- Indian Railway has gathered insights (over last 10-15 years) on condition monitoring from bearing acoustic detection system, wheel impact load detector and detection of impending bearing failure by monitoring of bearing temperature.
- *The same cannot be said for vision based detection systems for condition monitoring of rolling stocks for components/ area like coupler, wheel contact geometry, bogie, springs, brake system and body defects etc.*
- **Technologies available & being used worldwide are attuned and calibrated to rolling stocks being used on the respective railroads.**

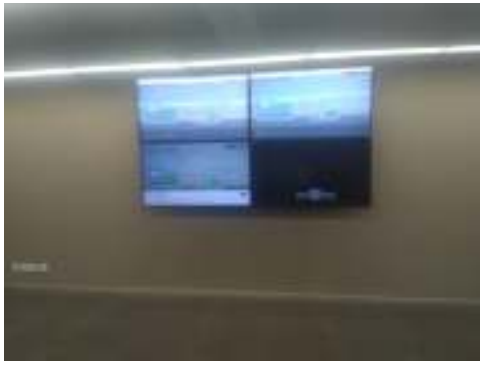
CONCLUSION

- Development, proving out and subsequent validation of such vision based detection equipment for IR rolling stock would require extensive industry consultation continuous collaboration & handholding of reputed standard organization like RDSO.. Subsequently, general roll out. **Such an approach shall entail limited installation of such equipments in first phase through which validation of such vision based detection equipments shall be done**t of such equipments across IR can be considered.
- The use of mechanised defect detection to replace visual examination will be done first time for IR design of wagons. Hence a nominated team of experienced officials of IR needs to be deputed with equipment suppliers during the period of commissioning, so that the changes required in equipments software are done properly.

ADOPTION OF TECHNOLOGY FOR FAULT/DEFECT DETECTION ROLLING STOCKS

- Now, Indian Railways is expanding the footprints of detection cum condition monitoring devices on it's network in a planned manner.
- 25 OMRS (Online Monitoring of Rolling Stocks - consisting of ABD and WILD) are planned over 20 different identified locations.
- The system is already commissioned at Panipat & Ballabhgarh (Delhi division), Kanchausi (Allahabad Division), Bandhra (Moradabad Division), Borkhedi (Nagpur Division) and Malkapur (Bhusaval division).
- In addition, OMRS is under commissioning at 9 locations and under installation at 8 more locations across Indian Railways at present.
- A total of 11 OMRS are also planned on the DFCs for which tender is under process at RITES.
- The National Command Centre for Data Collection, Analysis and targeted dissemination of information has been established at Kishanganj, Delhi

IR INITIATIVE - OMRS AT PANIPAT SITE



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OMRS: THE PROPOSED IR SITES

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OMRS: THE PROPOSED IR SITES

S.No.	Rly	Section	Division	Site
1	CR	WR–NGP	NGP	Borkhedi
2	CR	BSL – JL	BSL	Malkapur
3	ECoR	JJKR–BTV	KUR	Jajjpur Road
4	ECoR	VSKP– KTV	WAT	Pendurthi
5	ECoR	KTV – VSKP	WAT	Pendurthi
6	ER	SNT – RPH	HWH	Gadadharnagar
7	NCR	ALD– CNB	ALD	Kanchausi
8	NCR	CNB – TDL	ALD	Sarsaul
9	NER	BUW – GD	LJN	Ghanta Ghat
10	NR	DLI – UMB	DLI	Panipat
11	NR	UMB – DLI	DLI	Panipat
12	NR	BE – Roza	MB	Banthra

SMART YARD: STATUS

- RITES has submitted DPR for Conversion of 40 Class 'A' Freight Yards of Indian Railways to Smart Yards.
- DPR has been accepted by Railway Board.
- Smart Yard Conversion for 40 Yards has been sanctioned (**PB Item no. RB 328/21-22**) at a total cost of Rs 1580 Crore for 40 Class "A" Yards .
- Railway Board has assigned the various work elements of this sanctioned work to COFMOW, RITES, CRIS and Zonal Railways.
- Umbrella Works has been sanctioned for Upgradation of Freight Examination and Maintenance Facilities (**PB Item no. 1015/NR**).

OMRS: THE PROPOSED IR SITES

S.No.	Rly	Section	Division	Site
13	NR	DLI – PWL	DLI	Ballabhgarh
14	NR	PWL – DLI	DLI	Ballabhgarh
15	NWR	All – FL	JP	Kishangarh
16	SCR	BPQ – WL	SC	Sirpurkagaznagar
17	SECR	CPH – BSP	BSP	Jairamnagar
18	SECR	CPH – BSP	BSP	Jairamnagar
19	SECR	APR – NKJ	BSP	Umriya
20	SER	NYG – Tonka	CKP	Harichandanpur
21	SER	BNDM – JSG	CKP	Bondamunda
22	SR	KPD – JTJ	MAS	Ambur
23	WCR	SGRL – NKJ	JBP	Pipariya
24	WR	ST – BRC	BRC	Nabipur
25	WR	BRC – ST	BRC	Nabipur

THE PROPOSED IR SMART YARDS

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THE PROPOSED IR SMART YARDS

S.No.	Rly	Division	Yard/Depot
1	CR	BSL	Bhusaval
2	CR	NGP	Ajni
3	ECOR	WAT	Vishakhapatnam RMUY
4	ECOR	WAT	Vishakhapatnam RYD
5	ECOR	WAT	Vishakhapatnam OEC
6	ECOR	KUR	Paradip
7	ECR	MGS	Deen Dayal Upadhyay Jn
8	ECR	DHN	Barwadih
9	ECR	DHN	Pathardih
10	ER	UDL	Andal
11	NCR	ALD	Dadri
12	NCR	Agra	Baad
13	NCR	ALD	GMC, Kanpur

THE PROPOSED IR SMART YARDS (CONTD.)

S.No.	Rly	Division	Yard/Depot
14	NFR	KIR	New Jalpaiguri
15	NFR	TSK	New Tinsukia
16	NR	DLI	Tughlakabad
17	NR	UMB	Khan Alampura
18	NR	UMB	Ambala
19	NWR	JP	Phulera
20	SCR	BZA	Vijyawada
21	SCR	SC	Ramagundam
22	SCR	GTL	Gooty
23	SECR	BSP	Bhilai
24	SECR	BSP	Bilaspur
25	SER	KGP	Nimpura
26	SER	CKP	Bondamunda

THE PROPOSED IR SMART YARDS (CONTD.)

S.No.	Rly	Division	Yard/Depot
27	SER	CKP	Adityapur
28	SER	Adra	Bokaro
29	SER	CKP	Dangoaposi
30	SR	TVC	Irumpanam
31	SR	Chennai	Jolarpettai
32	SR	Chennai	Tondiarpet
33	SWR	UBL	Hospet
34	WCR	JBP	New Katni
35	WCR	JBP	Satna
36	WR	ADI	Gandhidham
37	WR	RJT	Hapa
38	WR	ADI	Sabarmati
39	WR	BRC	Karachiya
40	WR	RTM	Shambhupura

SMART COACHING DEPOTS (STAR DEPOTS)

- RITES has submitted another DPR for conversion of Coaching Depots of Indian Railways to Smart Depots (Christened as Star Depots).
- Umbrella Works has been sanctioned for Upgradation of Coach examination and Maintenance Facilities to Star Depots @ 40 Crores per depot (**PB Item no. 943/ER & 596/SR**).
- Pilot Project planned with SBC/SWR, NZM/NR, LTT/CR & BDTS/WR.

THANK YOU

(A Government of India Enterprise)
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