The Science and Art of Railway Accidents Prevention, Investigation and Management

(Reading Material for Training of Safety Management for Safety Officers (SFMO), Safety Management for Safety Counsellors (SFMC), Safety Management Programme for Railway Officers (SFMP), Traffic Safety for Traffic Supervisors (TSTS), IRMS Probationary Officers and other Railway Courses)

VOLUME II
(Accident Investigation)

by

Hari Shankar Verma, IRTS
Director General, IRITM



भारतीय रेल परिवहन प्रबंधन संस्थान
INDIAN RAILWAYS INSTITUTE OF TRANSPORT MANAGEMENT

THE SCIENCE AND ART of

INDIAN RAILWAY SAFETY MANAGEMENT

THE SCIENCE AND ART of

RAILWAY ACCIDENTS PREVENTION, INVESTIGATION AND MANAGEMENT

(Reading Material for Training of Safety Management for Safety Officers (SFMO), Safety Management for Safety Counsellors (SFMC), Safety Management Programme for Railway Officers (SFMP), Traffic Safety for Traffic Supervisors (TSTS), IRMS Probationary Officers and other Railway Courses)

VOLUME II

(Accident Investigation)

Hari Shankar Verma,

Indian Railways Traffic Service

Director General,

Indian Railways Institute of Transport Management

वयं राष्ट्रे जागृयाम

INDIAN RAILWAYS INSTITUTE OF TRANSPORT MANAGEMENT

(Hardoi By-Pass Road, P.O. Manak Nagar, LUCKNOW-226011, Uttar Pradesh, India.)

ISBN 978-81-973123-0-4

First Published 2024

© Copyright Reserved by the Author (Shri Hari Shankar Verma), Author is also reserved the right as author of present work.

No part of this publication can be reproduced or transmitted in any form or by any means, without prior permission of the Author. Although every care has been taken to avoid errors or omissions in this publication, despite this, inadvertently, errors may creep in. This publication is for use as on the condition and understanding that information given herein is merely for guidance and reference. Disclaimer has already been given in this book. It must not be taken as having authority of, or binding in any way on, the author, and publisher who do not owe any responsibility for any damage or loss to any person, who may or may not be a purchaser of this publication, on account of any action taken based on this publication. For authoritative text information, please contact the department concerned or refer to the Government publication, office memorandum or the gazette notification. The publishers shall be obliged if any mistake, error, or discrepancy is brought to their notice for carrying out correction in the next edition. In case of sale of publication, binding mistake, misprint, or missing pages etc., the publisher's liability is limited to replacement within one month of the purchase by similar edition/reprint. All disputes are subject to Lucknow Jurisdiction only.

The cost is free for Trainees undergoing training at Indian Railways Institute of Transport Management (IRITM), if Director General, desired so in the interest of learning or requisitioned by Railway Authorities for Internal use. However, for public use, the publication can also be sold, subject to the price fixed by the Director General, IRITM, and money be deposited in Railway Cash.

Printed by Maheshwari Printing Press, 289/214 Moti Nagar Chauraha, Lucknow-226004 & Bound by Rais Ahmad & Sons. 151 Phool Bagh Hussain Ganj Lucknow.

Published by
Director General,
Indian Railways Institute of Transport Management,
(Hardoi By-Pass Road, P.O. Manak Nagar, LUCKNOW-226011, Uttar Pradesh, India.)

The work of this volume is
dedicated to the
hard work of all categories of railway staff,
who keeps the wheel of rail moving
round the clock and since 1853.

DISCLAIMER

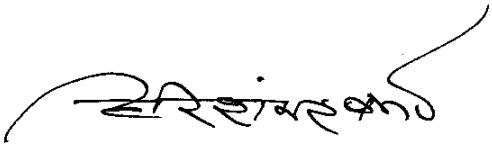
"The Science and Art of Railway Accidents Prevention, Investigation and Management" (Volume I, II & III) is the reading material to the trainee officers and faculty, who are undergoing training in the safety related courses at IRITM. The style of the book has been kept simple and the language is also lucid and easy to understand. A detail index is given to find out the concerned topics with page number. The purpose of this publication is to train the officers and supervisors about the Railway Accidents, their Prevention, Investigation and Management related subjects often occurring in railway working, especially while discharging duties by an official. This multi volume book covers most of the aspects of Safety, Disaster Management, the basics about the track, rolling stocks i.e., coaches, wagons, locomotives, and signal gears. The human element in safety has been discussed in detail. Most of the information has been taken from government publications like Manual, various Safety Bulletins, Publication of RDSO, CAMTEC and other institutions. However, efforts have been made to keep the content as original as possible. However, there may be some variance as the content of the chapters has been taken from different authentic sources in books, government websites, and links. The views expressed in those chapters and content of report are not the views of Central Government, IRITM and Authors of the reading material. This Volume is to be used for learning and academic purposes only and not to be taken as an authentic document. While, reading the book, the reader must keep in mind as under:

1. This book is printed as reading material for the purpose of training and learning by trainee officers.
2. The reading material is always prepared after reading several codes, manuals, and other relevant information from authentic Railway sources. It's for training purposes and nothing to do with the actual

working of Railways in the field.

3. In case, is any contradiction in writing, readers are advised to follow the codes, manuals and other extent instructions of Ministry of Railway and Zonal Railway.
4. I have tried to remain to the point, but it is the responsibility of the trainer to prepare the digital content, especially PowerPoint presentations, etc. as per the latest guidelines.
5. The various subjects, especially the Acts and Rules referred to in the book, keep changing due to need of the time. Therefore, trainee officers need to update the same.
6. All railway officials are subject to following the rules and instructions given time-to-time to them and those must be followed and not to adhere to the contents written in this reading material.
7. As far as the latest amendments to the rules are concerned, the trainee officers are advised to keep them updated. In case, in any deviation, the Railway publication to be relied upon.

The reading material is for internal use and not for any commercial use and cannot be quoted as an authority or in any legal matter.



Hari Shankar Verma, IRTS
Director General, IRITM
Author of
"The Science and Art of Railway Accidents Prevention, Investigation and Management"
Volume I, II, and III

हरि शंकर वर्मा
भारतीय रेल यातायात सेवा
महानिदेशक

Hari Shankar Verma
Indian Railway Traffic Service
Director General

सत्यमेव जयते

IRITM
वयं राष्ट्रे जागृयाम

PREFACE

For the railway officers and staff, there is a dearth of reading materials on accident prevention, investigation and disaster management in a single format. However, individuals' booklets are available on most of the topics but there is no compilation to address safety as a subject. Most of these books are technical in nature andsometimes quite difficult for the other than the engineering discipline and most particularly the officers occupying general management post like Safety officers, Traffic Officers, ADRMs and DRMs to understand the subject, it is also a fact that these technical books are written for keeping in mind of staff in technical and maintenance discipline.

All Accidents Investigations, whether at Supervisory Level or Officers Level required Traffic Officer or Traffic Inspector or Safety Counsellors to be part of Joint Note Making, Measurements, and Accidents sketch preparation. It is also observed that generally all of the officers and staff are not trained in basic knowledge of all discipline railways i.e., Track, Rolling Stock, Locomotives, and Signalling Gears. Even, most of the direct Officers have few lessons in these technical subjects. To improve the safety in

railways, the railway official needs to learn the primary knowledge about most of the technical disciplines but it is not happening due to non-availability of reading material. The field staff is also not aware about knowledge of technical subjects at different training centers, whatever, knowledge they pick up from the field working alongside of technical staff. There is an urgent need to fill up this gap by way of special training, workshops, and publication of reading material like this book. To emphasize the safety especially work safety, there cannot be better words than the following poem on work safety:

Work Safety

By *Alyssa Grocutt* ©

When you go to work in the morning
Don't just think of yourself
Whether you have a family or not
Other people do
Safety meetings go on and on don't they
At the time they don't seem important
But they are
Don't disregard them
Listen
One day the information may be important
It may even save a life and a family's despair

You may feel you know your job well
You don't want to waste your time
You go for a shortcut
The shortest isn't always the safest
What if a life is lost?
Could you live with yourself?
Knowing it was your decision

Maybe you don't even think about the consequences

You don't think about everyone affected
By one mistake
Or maybe it's even many mistakes

Safety isn't a joke
But there will always be that one guy
The guy that tries to say the safety meetings are pointless

You can't go back in time
You can't undo mistakes
You can't take away an injury
And you definitely can't give back a life

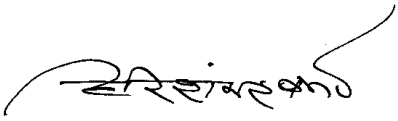
The book is divided into three volumes and 96 chapters in total. Volume I deal with basic knowledge about accidents, infrastructure and focus on prevention of accidents.

Volume II deals with the art of accident investigations including the recommendations of various safety review committees. The proforma of joint measurement and schedule of dimensions has also been appended to this volume to make it a handy volume for accident investigators and joint note signatories.

Volume III deals with accident management and a good portion is covered with disaster management including crisis management plan. The various case studies of different kind of accident on Indian Railways have also been given for better appreciation to learners. I personally feel that prevention, investigation and management of accident is the art as well as science therefore the learner must investigate every aspect of accidents happening on Indian Railways scientifically and device the mechanism for prevention of the same. The basic

purpose of this multi-volume book is for accident prevention and achieve a target of zero accident on Indian Railways.

I would like to thank Mrs. Neha Ratnakar, Professor Commercial, Training and Vigilance and Mr. Vikramaditya N.B., Professor Traffic Planning and Costing for helping me in proof-reading and Mr. Rohit Yadav for typing and formatting the contents into printable format. I am also grateful to Shri Rajesh Kumar, IRTS, Sr. Professor (Admin.) and Miss Krishna Tiwari, IRTS, Professor Administration and OSD to Undersigned for getting it published. Shri Kishore Mehta and Mr. Mohd. Mohsin Quadir also deserves to be appreciated for arranging the printing of this book in a shorter time.



Hari Shankar Verma, IRTS
Director General
Author of
"The Science and Art of Railway Accidents Prevention, Investigation and Management" Volume I, II, and III
Sunday, 05.09.2024, Teacher's Day.

भारतीय रेल परिवहन प्रबन्धन संस्थान
हरदोई बाई-पास रोड, पोस्ट ऑफिस-मानक नगर, लखनऊ 226011
दूरभाष: 0522-2451942, फैक्स: 0522-2451964, मोबाईल 9794862000, ई-मेल: directorgeneral.iritm@gmail.com
Indian Railways Institute of Transport Management
Hardoi by-pass Road, P.O. Manak Nagar, Lucknow-226011
Telephone: 0522-2451942, Fax: 0522-2451964, Mobile: 9794862000, E-mail: directorgeneral.iritm@gmail.com

CONTENTS

Chapter	Name	Page No.
	Dedication	
	Disclaimer	**I-II**
	Preface	**III-VI**
	Contents	**VII-XVIII**
VOLUME II (Accident Investigation)		
Part E: Railway Safety Committee and their Recommendations		
28	**The Railway Accidents Enquiry Committee, 1954** (Shahnawaz Committee, 1954)	**629-648**
28.1	Term of Reference	632
28.2	Constitution of Committee	632
28.3	Methodology and Interaction	633
28.4	Recommendations	634
29	**The Railway Accidents Committee, 1962 Part I & II** (Shri H. N. Kunzru Committee 1962)	**649-684**
29.1	Constitution of the Committee	649
29.2	Terms of Reference	650
29.3	Preparatory Work	650
29.4	Scope of Enquiry	651
29.5	Summary of Observations and Recommendations	653
30	**The Railway Accidents Enquiry Committee, 1968 Part I & II** (Shri K. N. Wanchoo Committee 1968)	**685-750**
30.1	Terms of Reference	686
30.2	Summary of Observations and Recommendations	689
31	**The Railway Accidents Enquiry Committee, 1978 Part I & II** (Shri S. M. Sikri Committee 1978)	**751-798**
31.1	Terms of Reference	752
31.2	Methodology	754
31.3	Summary of Recommendations	757
32	**The Railway Safety Review Committee, 1998 Part I & II** (Shri H. R. Khanna Committee 1998)	**799-826**
32.1	Constitution of Committee	799
32.2	Terms of Reference	800
32.3	Summary of Recommendations	800
33	**Corporate Safety Plan 2003-2013**	**827-856**
33.1	Corporate Safety Objectives in CSP 2003-2013	829
33.2	Safety Policy Issues in CSP 2003-2013	834
33.3	The Role of Technology in CSP 2003-2013	837

Chapter	Name	Page No.
33.4	Strategies for targets for reduction in accidents in CSP 2003-2013	840
34	**High Level Safety Review Committee (Kakodkar Committee) 2012**	**857-874**
34.1	Constitution of Committee	857
34.2	Term of reference	858
34.3	Approach and Methodology	859
34.4	Recommendations	860
35	**Report of Task Force on Safety, 2017**	**875-916**
35.1	Maintenance of Coaches in the field	875
35.1.1	Rolling-in Examination	877
35.1.2	Empowerment of Sr. DMEs and CDOs (K 2.9)	878
35.2	Coach Design and Deployment	879
35.3	A Completely ICF-Design-Free Regime	881
35.4	Fire in Passenger Trains	882
35.5	Freight Trains and Safety Issues	883
35.6	Wagon Design	884
35.7	Workshops	885
35.8	Ancillarisation of Workshops	885
35.9	Locomotives	886
35.10	Testing of Rail Vehicles	886
35.11	Derailments	887
35.12	Rail Weld Technology	888
35.13	Ultrasonic Flaw Detection	889
35.14	Bridges	890
35.15	Maintenance of Engineering Assets	891
35.15.1	Empowerment of Sr. DENs/DENs (K 2.9)	892
35.16	Encroachments	892
35.17	Protection of Road Users	893
35.18	Signalling	893
35.19	Maintenance of Signalling Assets	894
35.20	Automatic Train Protection	895
35.21	Communication Backbone	895
35.22	Signal Passing at Danger (SPAD)	896
35.23	Train Operations	897
35.23.1	Distributed Power (DP) or Locotrol	898
35.24	Realtime Safety Monitoring of Rolling Stock	898
35.24.1	Weigh Bridges	899
35.25	Material Procurement System	899
35.26	Procurement of Safety, Vital and Must-Change Items	900
35.27	Complex Products	901

Chapter	Name	Page No.
35.28	Procurement of Hardware	902
35.29	Delegation of Purchase Powers to Purchase Officers in the Field	902
35.30	Vendor Approval	902
35.31	Role of RDSO in Vendor Approval:	903
35.32	Grading of Vendors	904
35.33	Manpower Planning and Training	904
35.33.1	Training of Station Masters	906
35.34	Protection of Worksites	906
35.35	Protection of Workmen at Worksite	906
35.36	Organizational Reorientation	907
35.36.1	Safety Organization	908
35.36.2	Quality Systems in Procurement of Material and Services	908
35.36.3	Relationship of Finance and Executive	909
35.36.4	Innovative Financing	909
35.36.5	Relocate Sectional Sr. DENs/DENs:	909
35.37	State of Railway's Finances and Impact on Safety	910
35.38	Application of IT for Asset Management	910
35.38.1	Chief Information Officer	912
35.39	FOG Operations	912
35.40	Accident Reporting and Enquiry	913
35.41	Disaster Management	914
35.42	Safety Cadre Vacancies, Yardsticks and Staff Surrender	914
35.43	Vacancies in Safety Category	915
PART F: Accident Enquiries and Their Types		
36	**The Principals of Accident Investigation**	**917-930**
36.1	Objective of Accident Investigation	920
36.2	Investigative Procedures	922
36.3	Collection of evidence from varying sources	924
36.4	Establish immediate and underlying causes	925
36.5	Fact-Finding	926
36.6	Taking statement of the witnesses	927
36.7	Problem Solving Techniques	928
36.7.1	The Scientific Method	928
36.7.2	Change Analysis	929
36.7.3	Sequence Diagrams	930
36.7.4	Failure Mode and Effect	930
36.7.5	Fault Tree Analysis	930
37	**Introduction of Accident Enquiry**	**931-950**
37.1	Classification of accident inquiries	951
37.2	Accident Inquiry by the Railways	932
37.3	Acceptance of responsibility by departments concerned	934

Chapter	Name	Page No.
37.4	Special report	934
37.5	Joint and inter-departmental inquiries	936
37.6	Joint inquiry when dispensed with	937
37.7	Departmental inquiry	941
37.7.1	Requirements in a departmental, interdepartmental and joint inquiry	941
37.8	Proforma of Accident Inquiry Report	942
37.9	Signing of joint or interdepartmental Inquiry proceedings	945
37.10	Sub: Definition and Re-classification of Accidents on Indian Railways.	945
37.11	Sub: Definition and Re-classification of Accidents on Indian Railways.	947
37.12	Sub: Procedure for completion of Departmental accident inquiries.	948
37.13	Sub: Procedure for completion of Departmental accident inquiries.	949
37.14	Sub: Definition and Re-classification of Accidents on Indian Railways.	949
38	**The Statutory investigation into Railway Accident by CRS**	**951-966**
38.1	The inquiries to be conducted by CRS	951
38.2	The Function of the Commission of Railway Safety	952
38.3	Rules for Inquiries by Commissioners (CRS)	953
38.4	When should a Statutory Inquiry be held?	953
38.5	The type of accidents excluded from CRS inquiry	953
38.6	When shall the Commissioner stop or discontinue his inquiry?	954
38.7	Procedure when Commissioner is unable to hold an inquiry	954
38.8	Procedure for conducting a Statutory Inquiry	955
38.9	The Scope of Commissioner of Railway Safety Inquiry	955
38.10	Telephonic advice to the Commissioner of Railway Safety	956
38.11	Accidents to be reported to the Commissioner of Railway Safety by Post	957
38.12	All concerned' telephonic message to the CRS	957
38.13	Non-reporting of accidents to the CRS	957
38.14	Attendance of Railway employees to attend Inquiries.	960
38.15	Officers to assist Commissioner of Railway Safety	961
38.16	A brief Preliminary Narrative Report	961
38.17	Final Report	961
38.18	Action on the report by Railway Administration	962
38.19	Railways Remarks on the Suggestions	963
38.20	Publication of Reports	963

Chapter	Name	Page No.
38.21	District Magistrate to attend CRS inquiry	964
38.22	District Superintendent of Police to attend CRS inquiry	964
38.23	Technical matters	964
38.24	Powers of the Commissioner of Railway Safety	964
38.25	Target for completion of CRS Inquiries	965
39	**Magisterial and Judicial Inquiry**	**967-972**
39.1	Magisterial inquiry	967
39.2	Notice of Magisterial inquiry	968
39.3	Judicial Inquiry	968
39.4	The result of magisterial inquiry to be communicated to the Head of the Railway Administration	968
39.5	Communication of the decision of judicial inquiry to the Railway Administration, Commissioner of Railway Safety, and the State Government	969
39.6	Communication of the result of police investigation	971
39.7	District Police to discharge duties of Railway Police	971
39.8	Repeal and saving	972
Part G: Important Legislature about Accident and Enquiry		
40	**Important section of Railway Act 1989 regarding accidents**	**973-990**
40.1	Sections Relating to Commissioner of Railway Safety	975
40.2	Sections Relating to Construction and Maintenance of Works	977
40.3	Sections Relating to Opening of Railways	978
40.4	Sections Relating to Accidents	978
40.5	Sections Relating to Liability of Railway Administration for Death and Injury toPassengers Due to Accidents	982
40.6	Sections Relating to Penalties and Offences	986
41	**The Statutory Investigation into Railway Accidents Rules, 1998 (CRS Inquiry)**	**991-996**
42	**Railway (Notices of and Inquiries into Accidents) Rules 1998**	**997-1008**
42.1	Section 113 of the Railways Act, 1989	997
42.2	The Railway (Notices of and Inquiries into Accidents) Rules, 1989	998
42.3	Mode of sending notices to the State Government	999
42.4	Railway servants to report accidents	1000
42.5	Station Master or railway servant in charge of the section report accidents	1000
42.6	Railway Administration to report serious accidents	1000

Chapter	Name	Page No.
42.7	Facility for reaching the site of the accident	1002
42.8	Medical aid to the persons grievously hurt in accidents	1002
42.9	Arranging attendance of railway servants at the place of judicial inquiries or inquiries conducted by CRS or a Magistrate	1003
42.10	Action to be taken by Head of the Railway Administration on receipt of the report of CRS	1004
42.11	Head of the Railway Administration to offer remarks on the suggestions made in the report of CRS.	1004
42.12	Joint inquiry when dispensed with	1005
42.13	Provided that such an inquiry may be dispensed with	1005
42.14	Note of joint inquiry	1005
42.15	Report of joint inquiry or department inquiry to be sent to the Head of the Railway Administration and the action to be taken thereon	1006
42.16	Reports of inquiries into accidents not covered by Section 113 to be forwarded to CRS	1008
43	**The enquiry conducted under The Commission of Inquiry Act, 1952**	**1009-1022**
43.1	History and Background	1010
43.2	Salient features of The Commission of Enquiry Act, 1952	1010
43.3	Main provisions of The Commission of Enquiry Act, 1952	1011
43.4	Amendments	1013
43.5	Status and relevance	1014
43.6	The Commissions of Inquiry Act, 1952 Act no.60 of 1952	1014
PART H: Measurement, Joint Note and Accident Sketch		
44	**Proforma for joint measurement during Accident (2019)**	**1023-1068**
44.1	General Guidelines	1023
44.2	Proforma for Motive Power (Diesel & Electric Locomotives)	1034
44.3	Proforma for Wagon	1040
44.4	Proforma for Carriage (LHB Coach Measurement)	1046
44.5	Proforma for Carriage **(**LHB Coach Bogie Parameters)	1051
44.6	Proforma for Carriage (ICF Design Coach Measurement)	1053
44.7	Proforma for Track Measurement (PART-A)	1057
44.8	Proforma for Track Measurement (PART-B)	1060
44.9	Accident Sketch	1066
44.10	Important Information about filling the Joint Format	1067
44.11	Calculation of Gauge slackness which may cause	1068

Chapter	Name	Page No.
	derailments.	
	Part I: Accident Investigation	
45	**Accident Site Investigation**	**1069-1086**
45.1	Initial Observation	1072
45.2	Visit of Panel SM room and Relay Room	1073
45.3	Preparation of rough Site sketch	1077
45.4	Finding Vital Clues	1078
45.5	Probable Operational and Other Failures	1079
45.6	Examination of Track Geometry, Site Survey, and track measurement	1080
45.7	Rolling Stock (Carriage or Wagon) measurement	1081
45.8	Examination of Locomotive	1083
45.9	Taking statement of Railway staff	1086
45.10	Collecting other information and statement of private witness if any	1086
46	**Supervisors Joint Note and Preparation of accident Sketch**	**1087-1090**
46.1	Special Points for Examining the Site and for Preparation of Note and Drawings	1087
46.2	Accident Sketch	1088
46.3	Typical Sketch of Accident Site	1090
47	**Accident Investigation with Data Logger**	**1091-1096**
47.1	Advantages of Dataloggers	1092
47.2	Reports from Data logger for accident investigation	1093
47.3	Instruction of Data loggers for signalling	1095
48	**Ishikawa Way (Fishbone) of Accident Investigation**	**1097-1106**
48.1	Understanding Ishikawa Diagrams	1098
48.2	When to Use	1098
48.3	Advantages	1099
48.4	Disadvantages	1099
48.5	What are the 6Ms in the Ishikawa Diagram?	1099
48.6	The Process to Make an Ishikawa Diagram	1100
48.7	Why-Why analysis?	1103
48.8	Why is problem analysis required?	1103
48.9	What is the problem, cause, root cause, and countermeasure?	1103
48.10	Key Points of Why-why Analysis	1104
48.11	How to perform a Why-why analysis?	1105

Chapter	Names	Page No.
49	**Collisions of trains: Causes, investigation, and prevention**	**1107-1122**
49.1	The human failure as principal cause of collision	1108
49.2	Failure of station staff	1108
49.3	Failure of Loco pilot	1109
49.4	Failure of Equipments and Signal Staff	1109
49.5	Collisions in Absolute Block Working	1110
49.6	Collisions in Automatic Block Signalling	1114
49.7	Remedial Measures	1119
49.8	Prevention of Collision	1120
49.9	Investigation of Collision and Averted Collision	1122
50	**Derailments Investigation**	**1123-1132**
50.1	Prevention of derailment	1124
50.1.1	Track Renewals	1124
50.1.2	Rail/Weld fractures	1124
50.1.3	Way-Side Detection of overloaded rolling stock by in-motion weigh bridges	1126
50.1.4	Lubrication of Gauge Face and Friction Modifier o-n top of Rail	1127
50.1.5	In-situ Rail Stress Measurement	1127
50.1.6	Track Safety Tolerances	1127
50.1.7	Trespass on Track and sabotage.	1127
50.1.8	Modern Bridge Inspection and Management System	1128
50.1.9	Provision of microprocessor-based speed recorders	1129
50.1.10	Flasher lights on locomotives	1129
50.1.11	High intensity Twin - beam Head light for locomotives	1129
50.1.12	Provision of Air Dryers on locomotives	1129
50.1.13	Microprocessor-based Electronic Brake System with resetting VCD, Event Recorder	1130
50.1.14	Better and Safer Coaches	1130
50.1.15	Use of high-capacity buffer packs	1130
50.1.16	Bogie-Mounted Brake System in place of under-floor mounted	1130
50.1.17	Use of disc brakes; 30% reduction in emergency braking distance	1130
50.1.18	Use of Composition Brake Blocks	1131
50.1.19	Improved crash worthiness of interior of coaches	1131
50.1.20	Improving the external crash worthiness of coaches.	1131
50.1.21	Introduction of tight lock couplers and anti-climbing features	1131
50.1.22	Hot box detectors on existing wagon fleet are proposed to be provided	1132

Chapter	Names	Page No.
51	**Derailment on Curve**	**1133-1140**
51.1	Derailment On Curves	1134
51.2	Adverse Factors on A Curve	1134
51.3	Cant or Superelevation	1135
51.4	Cant Deficiency	1137
51.5	Transition Curve	1138
51.6	Versine	1139
52	**Derailment on Points and Crossings**	**1141-1156**
52.1	Important Aspects in Points And crossing Maintenance	1144
52.2	Derailments On Points and Crossings	1145
52.3	High Wing Rail at the Crossing	1147
52.4	Joint Inspection of Point and Crossing	1148
52.5	Joint Inspection of Points- Thick Web Switch (TWS)	1150
52.6	TWS-Thick Webbed Switch (BY SSE/JE Signal and SSE/JE P-WAY)	1152
52.7	TWS-Thick Webbed Switch (By SSE/JE P-Way & SSE/JE Signal)	1154
53	**Accident on Level Crossing**	**1157-1172**
53.1	Classification of Level Crossings	1157
53.2	Categories of Level Crossing Gates	1158
53.3	Type of Gates	1158
53.4	Normal Position of Gates	1159
53.5	Warning board	1160
53.6	Guard Rails	1161
53.7	Telephone communication	1161
53.8	Electrified Territory	1161
53.9	Whistle Indicators	1161
53.10	Working rules for gates	1162
53.11	Maintenance and Inspection of Level Crossing	1164
53.12	Level Crossing indicators	1166
53.13	Speed breakers on the approaches of level crossing	1167
53.14	Protection of level crossings gate in an emergency	1169
53.15	On Double Line	1169
53.16	Important points must be kept in mind while investigating level crossings accidents	1171
54	**Signal Passing at Danger (SPAD) by Loco Pilot**	**1173-1186**
54.1	Signal passing at Danger (SPAD)	1174
54.2	Loco Pilot passing signals at danger	1175
54.3	Action plan for preventing Signal Passing at Danger (SPAD)	1176

Chapter	Names	Page No.
54.4	Conclusions of the Analysis of SPAD Cases	1182
54.5	Recommendations	1183
54.6	Braking Distance (as per IRISET S-1)	1185
54.7	Service Braking Distance	1185
54.8	Emergency Braking Distance	1185
54	**Punishment Norms in Accident Cases**	**1187-1196**
55.1	Collision involving a train	1188
55.2	Over speeding by Loco Pilot	1188
55.3	Station derailments while shunting	1190
55.4	Accident at unmanned level crossings	1191
55.5	Carriage & Wagon defects or improper securing	1191
55.6	Locomotive defects	1191
55.7	Traffic staff failure other than collisions	1192
55.8	Signal & interlocking failures	1192
55.9	Civil Engineering Department	1193
55.9.1	Major track defect such as buckling, worn out switches	1194
55.9.2	Other track defects like cross levels or low joints	1195
55.10	For Staff of Electrical Department	1196
	PART J: Schedule of Dimension (SOD)	
56	**Schedule of Dimension in Civil Engineering**	**1197-1242**
56.1	Chapter I – General	1197
56.2	Spacing of Tracks	1206
56.3	Curves	1206
56.4	Bridges	1206
56.5	Rails	1207
56.6	Buildings and structures	1207
56.7	Interlocking and signal gear	1213
56.8	Tunnels, Through Girder Bridges and Semi-Through Girder Bridges	1214
56.9	Safety Refuges	1217
56.10	Formation width	1217
56.11	Gauge on straight and curves	1218
56.12	Existing infringements of schedule I which may be permitted to continue on existing 1676 mm gauge Railways	1218
56.13	The minimum permissible clearances in existing tunnels and girder	1220
56.14	Minimum height above rail level for overhead structure	1221
56.15	Minimum distance center to center of tracks	1221
56.16	Minimum horizontal distance from center of track	1221
56.17	Minimum height above rail level in a passenger station	1221

Chapter	Names	Page No.
56.18	Minimum horizontal distance from center of track to any structure	1222
56.19	Minimum height above rail level to overhead tie bars, girders etc. in workshops and running sheds	1222
56.20	Minimum height above rail level of doorways for a width of 1370mm on either side of center of track, in both workshops and running sheds	1222
56.21	A.C Traction 25 K.V. 50 cycles	1222
57	**Schedule of Dimension in Station Yards**	**1243-1256**
57.1	Chapter II- Station Yards	1243
57.2	Spacing of tracks	1243
57.3	Platforms	1247
57.4	Buildings and structures	1248
57.5	Points and crossings	1253
57.6	Turnouts	1255
58	**Schedule of Dimension in Workshops and Station Machinery**	**1257-1258**
58.1	Water tanks and water cranes	1257
58.2	Workshops and running sheds	1258
58.3	Ashpits etc.	1258
59	**Schedule of Dimension in Rolling Stock (C&W)**	**1259-1272**
59.1	Wheels & Axles	1259
59.2	Height of Floors	1260
59.3	Buffers & Couplings	1260
59.4	Wheelbase & Length of Vehicles	1261
59.5	Maximum Moving Dimensions (See diagram 1D)	1261
59.6	Chapter IV(B)- Rolling stock, 3660 mm wide stock	1264
59.7	Maximum future moving dimensions	1264
59.8	Loading gauge for goods	1264
59.9	Chapter IV(C)- Rolling Stock (Locomotive)	1265
59.10	Wheel and axles	1265
59.11	Buffers & Couplings	1266
59.12	Maximum Moving Dimensions	1266
59.13	Maximum Moving Dimensions for X-Class locomotives	1267
59.14	Rolling Stock (Track Machines)	1268
59.15	Wheels & Axles	1268
59.16	Height of Floors	1268
59.17	Buffers & Couplings	1268
59.18	Wheelbase & Length of Vehicles	1269
59.19	Maximum Moving Dimensions (See diagram 1D)	1270
60	**Schedule of Dimension in Electric Traction**	**1273-1278**
60.1	Electric Traction (Direct Current)	

Chapter	Names	Page No.
60.2	Chapter V(A)- Electric Traction 25 kV A.C. 50 Cycles	1273
60.3	Electrical clearances	1274
60.4	Chapter V(B) - 25 kV A.C. Electric Traction with High Rise OHE	1276
61	**About the Author**	**1279-1286**

PART E:
DISASTER MANAGEMENT

THE RAILWAY ACCIDENTS ENQUIRY COMMITTEE, 1954 (SHAHNAWAZ COMMITTEE, 1954)

28

In the few days before the close of the year 1953 and after the commencement of the year 1954 there was a series of serious accidents on Indian Railways involving heavy casualties and much damage to public property. These disasters following closely on the heels of one another and being interspersed on all Railways in the country the public mind was greatly agitated, and the feeling appeared to grow that there was something wrong with the working of the Railways. The view was expressed in the Press that in spite of the Railways' preoccupation with rehabilitation programmes the time had arrived for the railway authorities to devote "some attention to the safety of the travelling public." The Government of India were naturally seized of the situation and on 10th January 1954 made the following announcement through the Press:

> "It has been decided to set up a committee to study and analyze the causes of accidents on Indian Railways so that the attention is focused on all factors contributing to their occurrence and remedial action is ensured.

28.1 Term of Reference

"The terms of reference of the Committee will be as under:

(1) to study the reports of enquiries into all train accidents on all Indian Railways which have taken place since January 1st, 1953, and to analyze their causes.

(2) to examine how recommendations made by the investigating officers have been dealt with and those accepted by the Railway Board or the Railway Administrations have been implemented; and

(3) to make recommendations with a view to reducing the incidence of such accidents.

28.2 Constitution of Committee

"The Committee will consist of the following:

a) **Mr. Shah Nawaz Khan**, Parliamentary Secretary to the Minister for Railways and Transport …… **Chairman**

b) **Mr. P. N. Mobayi**, Chief Government Inspector of Railways …… **Member**

c) **Mr. N. S. Sen** retired General Manager of the ex- B.B. & C.I. Railway…….. **Member.**

"The Committee is expected to start work immediately and submit its report by the end of April, 1954".

The Chairman and the Members designate of this Committee which was called as **"The Railway Accidents Enquiry Committee".** The Committee, during the course of investigation interviewed with one District Officer from each of the four railway departments concerned with the working of trains namely Transportation, Civil Engineering, Mechanical Engineering and Signalling and Interlocking.

28.3 Methodology and Interaction

The Committee held two meetings at New Delhi on 28th January 1954 and 29th January 1954 to chalk out their plan of approach to the problems before them. As a result of these deliberations, it was decided to review only those cases of train accidents which occurred on Indian Government Railways from 1st January 1973 to 10th January 1954. A precise interpretation for the term ‘train accident' was also adopted and this will be explained in the next chapter.

On 30th January 1954, a communication was issued to all Railways asking for comprehensive details: of all accidents which occurred during the period adopted by the Committee for study. On 5th February 1954 a set of questionnaires was issued to all Railways, covering all aspects of railway working having born on train operation.

To make the enquiry broad-based it was decided to issue a notification in the Press inviting members of the public to give evidence before the Committee if they so desired. It was also decided to address the members (non-official only) of the National Railway Users' Consultative Committee and the six Zonal Railway Users' Consultative Committee requesting them to either send their views and suggestions about the subject before the Committee in writing or to tender oral evidence before the Committee. Lastly, it was decided to address some of the Unions of Railway workers so that they might have an opportunity to convey their views and suggestions to the Committee.

In view of the extremely limited time available with the Committee for the completion of their labours it was planned that the Committee would visit only the Headquarters Offices of the six Zonal Railways besides a couple of Divisional and Regional Headquarters Offices to obtain the evidence of the Administrative Officers concerned with the operation of trains. In order, however, to acquaint themselves

with the actual working conditions at stations, the Committee also decided to inspect a few medium and small stations on different Railways, besides visiting one or two workshops.

The Committee left on its first tour on the 7th of February 1954, returning on the 13th of February 1954. During the course of this tour visits, were paid to Agra Cantt, Agra City, Agra Fort, Agra Idgah, Raja-Ki Mandi, Agra-East Bank, Jumna Bridge, Tundla, Moradabad and Kashipur. The second tour started on 8th March 1954 and concluded on 30th March 1954, during the course of which visits were paid to Bombay, Madras, Bangalore, Calcutta, Chittaranjan, Lucknow and Gorakhpur.

28.4 Recommendations

The observations that we have made in the various Chapters of this Report and the several conclusions that we have arrived at are, for convenience of reference, summarized below. The number given in brackets against each item is the relevant paragraph of the Report: —

1. Train accidents are mainly contributed by the failure of the station and train staff to follow the rules and by flaws in metal or design of rolling stock. A majority of accidents attributed to flaws in metal of rolling stock are really due either to faulty workmanship in Workshops or neglect in running maintenance (Para no. 15 of Report).
2. The number of train accidents due to negligence or ignorance of outsiders is a very small proportion of the whole (Para no. 20 of Report).
3. Adequate school facilities should be provided for the proper training of Class IV traffic staff concerned with the operation of trains as such facilities do not exist at present (Para no. 30 of Report)
4. Training Schools for Class IV traffic staff should be opened at every large station with a definite area of the Railway allotted to each school (Para no. 31 of Report).
5. The selection of Instructors for Training Schools for Class IV traffic staff should be very judiciously made. (Para no. 32 of Report).
6. Adequate arrangements should exist for ensuring that every traffic staff connected with the running of trains receives a Refresher Course, once every five years. (Para no. 33 of Report).

7. Investigation should be made to see that the most intensive use of existing Training Schools is being made (Para no. 34 of Report)
8. On all Railways a comprehensive plait of facilities required for a proper initial training and periodic revision courses for all categories of staff of the Mechanical Department concerned with the operation of trains should be prepared and should be given top priority for execution. (Para no. 38 of Report).
9. The desirability of introducing training and Refresher Course facilities for Permanent Way Staff should be considered on all Railways. (Para no. 40 of Report).
10. Mobile school arrangements for giving Refresher Courses to staff are recommended (Para no. 42 of Report).
11. A Committee of Administrative Officers of different Railways should be set up to draw up courses of training to ensure uniformity on all Railways (Para no. 43 of Report).
12. Suitable retired employees should be engaged as Instructors for training schools by offering them sufficiently attractive terms (Para no. 44 of Report).
13. The standard of supervision at all levels is poor and in particular about the aspect of safety of operation there appears to be practically no inspection (Para no. 51 of Report).
14. Everyone is so involved in his files and so pre-occupied with routine meetings that inspections are rare and perfunctory (Para no. 52 of Report).
15. The Railway Board's decision in abolishing inspections by Government Inspector of Railways was improper and regrettable (Para no. 53 of Report).
16. Inspections of Railways by Government Inspectors of Railways should not only be restored but should be made more intensive than they were before their complete abolition (Para no. 54 of Report).
17. If for intensive inspection of Railways by Government Inspectors of Railways an increase in the cadre of the Inspectorate becomes necessary, the increase should get allowed (Para no. 55 of Report).
18. Extreme inadequacy and infructousness of outdoor inspections by officer's hag brought down the standard of work at stations to a very low ebb (Para no. 58 of Report).
19. An immediate Departmental Committee should be set up to

thoroughly analyze the routine office work with a view to weeding out what is unnecessary (Para no. 59 of Report).

20. This Departmental Committee should also make an assessment of the number of officers required for satisfactory discharge of work after the unnecessary portion is cut out and if on the basis of this assessment additional officers are required, they must be provided (Para no. 59 of Report).
21. After it is ensured that adequate time would be available with all officers for outdoor supervision no hard and fast timetable of inspections should be laid down for them, but it should be impressed on them that the Administration would expect the state of highest efficiency in their jurisdiction and if they fail in this matter very serious notice of their failure should be taken (Para no. 61 of Report).
22. A hard and fast timetable of inspections should be laid down for Inspectors (Para no. 62 of Report).
23. Night and surprise inspections must be conducted by officers and Inspectors (Para no. 63 of Report).
24. A method is suggested for ensuring that the quality of inspections is up to the mark (Para no. 64 of Report).
25. An inspection report about an inspection should be written out immediately and should be submitted to higher authorities within a specified number of days (Para no. 65 of Report).
26. Follow-up action on inspection reports must be prompt and must not be neglected under any circumstances (Para no. 66 of Report).
27. Inspections must not merely be fault finding but should also be educational for staff (Para no. 67 of Report).
28. Inspections, among other things, must also include in their ambit the aspect of safety of operation (Para no. 68 of Report).
29. Inspection Registers should be maintained at all stations in which inspecting officials should note down the fundamental results of their inspection apart from the drawing up of detailed inspection notes (Para no. 69 of Report).
30. Punishments in accident cases are in many instances inadequate and though Railways appear to be cognizant of this fact they have not been able to remedy the situation (Para no. 71 of Report).
31. Discipline and Appeal Rules have become cumbersome and to avoid

the heavy work involved in awarding any major punishment officers have begun to shirk imposition of heavy penalties and resort to comparatively minor punishments even though they might be incommensurate to the gravity of the offence (Para no. 72 of Report).

32. A modification of the Payment of Wages Act at least in so far as punishments arising out of accident cases are concerned is suggested (Para no. 74 of Report).
33. The procedure for award of punishments of reduction in grade and removal from service should be simplified (Para no. 75 of Report).
34. If officers are suffering from Trade Union phobia in the matter of award of heavy punishments where they deserve railways should take steps to restore confidence among officers (Para no. 76 of Report).
35. The suggestion is made that if the same staff is held responsible in accident cases four times he should be removed from service after following the prescribed formalities (Para no. 77 of Report).
36. No modification in the procedure for holding enquiries should be made (Para no. 78 of Report).
37. On all Railways the General and Subsidiary Rule Book should be printed in all the regional languages current in the area of each Railway and a copy thereof should be supplied to all staff who have to observe these rules in the language the staff can read (Para no. 79 of Report).
38. On each Railway separate brochures for different categories of staff should be got out which should contain all the General and Subsidiary Rules applicable to that category in addition to all the other rules which that particular category of staff has to observe (Para no. 80 of Report).
39. Since there is no immediate prospect about a decision regarding the Revised General Rules, we suggest that each Regrouped Railway should take immediate steps to unify the Subsidiary Rules on the basis of the existing General Rules (Para no. 82 of Report).
40. A uniform standard for Station Working Rules should be prescribed on all Railways, and these rules should fully describe the normal method of reception and dispatch of trains and in addition should provide detailed directions for abnormal working (Para no. 85 of Report).
41. A routine revision of the Station Working Rules once every 5 years

should be prescribed (Para no. 86 of Report).

42. Every Assistant Traffic Officer and every District Traffic Officer in a District or a Division must monthly inspect one station reviewing the Station Working Rules and all other safety provisions at the station (Para no. 87 of Report).
43. The Railway Board should prescribe uniform rules for the working of traffic when there is total failure of communications or when on a double line section one line of track becomes unavailable for traffic. (Para no. 88 of Report).
44. Care should be taken to see that all rules prescribed are practicable. (Para no. 89 of Report).
45. On sections of heavy traffic, a high standard of interlocking should be provided and on sections on which traffic is light some sort of rudimentary interlocking must be made available (Para no. 90 of Report).
46. On the main trunk routes no station should be left un-interlocked and the standard of interlocking at all stations on a section should be the same. Further at large stations track-circuiting should be provided (Para no. 92 of Report).
47. Complete lock and block should be planned for all double line sections (Para no. 93 of Report).
48. Where on single line sections traffic is in excess of three trains each way token instruments must be provided and where token instruments are installed the last stops signal should be interlocked with the token instrument (Para no. 94 of Report).
49. When the paper line clear system is in force, a Train Signal Register should also be maintained (Para no. 95 of Report).
50. No section of the double line should be worked on paper line clear system (Para no. 96 of Report).
51. We suggest colouring of tokens to avoid mis-delivery of tokens at the time of crossing of trains (Para no. 97 of Report).
52. We suggest the adoption of modified un-interlocking as a first step towards safety with provision for gradual raising of standards of interlocking (Para no. 99 of Report),
53. At un-interlocked stations the facility of point indicators should not be denied (Para no. 100 of Report).
54. We noticed wide variations on Railways in the incidence of signal

and interlocking failures and block instrument failures and in the time taken for rectification of these failures. We suggest investigation of the reasons for this variation and the bringing to bear of efforts to reduce incidence of failures and the time taken in rectifying them. We also recommend that figures of failures of signals and block instruments should be published in the Railway Board's Annual Reports (Para no. 101 of Report).

55. When interlocking fails at a station the badge exchange system must be enforced (Para no. 102 of Report).
56. On some railways the badge exchange system does not exist even at un-interlocked stations. This must be introduced (Para no. 102 of Report).
57. Speedometers should be provided on all engines working trains carrying passengers. (Para no. 103 of Report).
58. Improvement of the standard of lighting in yards is suggested. Ensuring of proper lighting of platforms is also suggested (Para no. 104 Report).
59. Double-wiring of outermost signals at stations on any other anti-droop device is suggested to prevent drooping of signals (Para no. 105 of Report).
60. The incidence of long hours on duty is found on Railways (Para no. 108 of Report).
61. Urgent action should be taken by Railways to recruit and train additional staff required for eliminating the performance of overtime by staff (Para no. 109 of Report).
62. Attention is drawn to the reported delays in recruitment of staff through Subordinate Railway Service Commissions (Para no. 110 of Report).
63. Efforts for ensuring housing for essential railway staff should be redoubled (Para no. 111 of Report).
64. A solution should be investigated for avoiding continuous night duty by Assistant Station Masters (Para no. 112 of Report).
65. We suggest investigation of the idea of broken shifts for train passing staff (Para no. 113 of Report).
66. The hands of officers should be strengthened in the matter of resistance to outside interference in the day-to-day administration (Para no. 116 of Report).

67. Greater contact between officers and staff can reduce the tendency towards indiscipline (Para no. 118 of Report).
68. Reasonably good conditions of work, sympathetic but firm treatment by officers and promotions only on considerations of merit are steps which can conquer indiscipline (Para no. 119 of Report).
69. Co-operation of Trade Unions should be sought to fight indiscipline (Para no. 120 of Report).
70. From 1939-40 there has been a progressive increase in the number of accidents and the increase is almost exclusively due to an increase in the number of minor accidents (Paras no. 123 and 124 of Report).
71. Insufficient notice is taken by Railways of minor accidents (Para no. 125 of Report).
72. The neglect of minor accidents by Railway Authorities has created a psychological feeling among staff that minor accidents do not matter (Para no. 126 of Report).
73. So long as a rule is provided for in the Rule Book its disregard should not be countenanced (Para no. 129 of Report).
74. Even minor accidents and minor breaches of rules should receive proper notice (Para no. 130 of Report).
75. The system of promotions prevailing on Railways should be properly examined to ensure that merit alone will be the basis of promotions (Para no. 131 of Report).
76. The percentage of overage stock on railways is heavy but this should be no cause for alarm if maintenance standards are satisfactory (Par no. 132 of Report).
77. Figures furnished by Neutral Control Officer reveal a great deterioration in maintenance standards (Para no. 133 of Report).
78. On Railways today's train examination is being treated as a matter of sufferance and not as a matter of importance necessity and adequate time for train examination is not being allowed (Para no. 137 of Report).
79. On all Railways an adequate time 'allowance for train examination should not only be fixed but should, in actual practice, be ensured, Judicious increase in the strength of (rain examining gangs should be made so that a train would get intensive examination within a reasonable time (Para no. 141 of Report).
80. On each Railway certain stations, taking their location and facilities

into account should be declared as Key Train Examination stations at which all trains must receive a very thorough overhaul. At other train examining stations a very much shorter time for the examination should be fixed where only the most obvious defects should be looked for (Para no. 142 of Report).

81. We recommend working on sick lines for all the 24 hours of the day (Para no. 143 of Report).
82. We recommend flood lighting of the area of a yard in which train examination is done as also flood lighting of the sick line area (Para no. 144 of Report).
83. If supply of torches or lanterns with reflectors to train examining staff instead of ordinary hurricane lanterns will facilitate train examination work, the supply of torches or lanterns with reflectors should be made (Para no. 145 of Report).
84. On the meter gauge pit lines should be provided at stations where intensive train examination is done (Para no. 146 of Report).
85. On certain Railways sick line facilities are inadequate and where this is so suitable facilities with adequate equipment should be provided (Para no. 147 of Report).
86. Attention is drawn to the serious shortage of stores for maintenance work (Para no. 148 of Report).
87. A list of items which Train Examiners should check at Key Train Examination Stations and at other Train Examination stations should be laid down and the list should be uniform for all railways (Para no. 149 of Report).
88. Neutral Train Examiners should be provided at all key Train Examination stations (Para no. 150 of Report).
89. Magnaflux test equipment should be provided in the sick lines at all Key Train Examination stations (Para no. 151 of Report).
90. We suggest that the Mechanical Section Committee of the Indian Railways Conference Association should be revived (Para no. 152 of Report).
91. Attention is drawn to poor quality of men provided for train examination work (Para no. 153 of Report).
92. Stress is laid on training of Train Examiners and Train Examining Fitters and their period of training should be a prolonged one (Para no. 154 of Report).

93. We suggest an examination of the scales of pay of Train Examiners (Para no. 155 of Report).
94. Suitable organizational changes should be made so as to prescribe that it will be the chief responsibility of one officer of the Mechanical Department on each District or Division to supervise carriage and wagon maintenance and this officer should preferably have no other duties (Para no. 157 of Report).
95. The system where the running maintenance is under the Chief Operating Superintendent should be abolished (Para no. 158 of Report).
96. The highest possible priority should be assigned to the question of improvement of Railway Workshops by providing modern equipment in them (Para no. 161 of Report).
97. Supersonic crack detectors should be provided in all Railway workshops (Para no. 163 of Report).
98. At the time of periodical overhaul all spring assemblies should be dismantled, and all spring plates thoroughly examined for cracks. Load deflection tests should be carried out as a regular measure at the time of periodical overhaul (Para no. 165 of Report).
99. The life of springs should be fixed and definite tolerance limits for spring plates should be prescribed (Para no. 166 of Report).
100. Checks should be introduced to see that in the manufacture of parts poorer quality of metal than prescribed in specifications should not be used (Para no. 167 of Report).
101. The question of increasing workshop capacity on Railways where it is at present inadequate should receive urgent consideration, the ultimate object being to see that periodical overhaul for wagons can be arranged once every 2 years (Para no. 168 of Report).
102. The system of providing Neutral Train Examiners for inspecting and passing the work turned out by shops should be extended, to all Railway carriage and wagon workshops (Para no. 169 of Report).
103. The most efficient and senior officers available should be provided as Works Managers in Railway workshops (Para no. 170 of Report).
104. We suggest the setting up of an Inspection Wing of the Central Standards Office (Para no. 171 of Report).
105. Draw-bar breakage accounts for a large proportion of train accidents (Para no. 172 of Report).

106. The causes of heavy incidents of draw-bar failures on the Dinapore Division of the Eastern Railway need investigation (Para no. 173 of Report)
107. Railways must ensure that only class IV steel is used for the manufacture of drawbars (Para no. 175 of Report).
108. A proper and well-defined technique for welding should be prescribed in all workshops and proper welding equipment should also be provided. Supervision on welding work should be effective and courses of training for welders should be introduced (Para no. 176 of Report).
109. Arrangements for annealing should be provided in all workshops and an organization should be set up to ensure annealing of all welds (Para no. 177 of Report).
110. Snatch test arrangements for drawbars should be provided in all workshops and it should be ensured that every single drawbar is given a snatch test before it is brought into use on rolling stock (Para no. 178 of Report).
111. Friction liners should be used between the floor of the Wagon and the neck of its drawbar (Para no. 179 of Report).
112. At the time of periodic overhaul each wagon drawbar should be annealed and given a snatch test (Para no. 180 of Report).
113. Train Examiners during their routine examination should particularly examine the neck of the drawbar with the help of a suitable gauge which should be provided (Para no. 181 of Report).
114. Mechanical officers and inspectors should watch the working of drivers and suitably instruct them so that breakages of draw-bars consequent upon heavy jerks caused by drivers may be reduced. (Para no. 182 of Report).
115. Railways should properly educate their staff in order to eliminate the incidence of slack couplings (Para no. 183 of Report).
116. The number of accidents attributable to the behaviour and condition of engines is very small (Para no. 184 of Report).
117. Vigorous steps are necessary to improve the standard of maintenance of engines. (Para no. 185 of Report)
118. We commend universal adoption of ex.-E.P. Railway system of watching running repairs on engines (Para no. 186 of Report).

119. Buffer lights on shunting engines must be ensured at night (Para no. 187 of Report).
120. The deficiency of gauge glass protectors on engines must be removed (Para no. 187 of Report).
121. The number of train accidents attributable to defects in permanent way is appreciable (Para no. 188 of Report).
122. Facts are given to show that maintenance of track is being neglected (Para no. 189 of Report)
123. Allotment of funds to Railways for track renewal work should be liberal (Para no. 190 of Report).
124. An investigation should be made of reasons for the inadequate availability of wooden sleepers and if it is found impossible to improve the supply position, greater availability of steel and cast-iron sleepers should be arranged (Para no. 191 of Report).
125. Urgent steps are needed to improve the supply of bridge and crossing sleepers (Para no. 192 of Report).
126. A systematic organization should be set up to ensure the flow of track renewal material in accordance with requirements (Para no. 193 of Report).
127. The system of spot renewal of sleepers should be discarded. (Para no. 194 Report).
128. A uniform procedure for inspection of wooden sleepers should be enforced on all Railways and the procedure should be such as would ensure a thorough inspection of sleepers (Para no. 195 of Report).
129. Steps should be taken, if necessary, by increasing clerical assistance to relieve Permanent Way Inspectors of clerical work (Para no. 196 of Report).
130. Permanent Way Inspectors should be relieved of the burden of surplus stores (Para no. 197 of Report).
131. We caution against the raising of maximum permissible speed and recommend more intensive use of Hallade Track Recorder cars (Para no. 198 of Report).
132. Arrangements for Refresher Courses for Permanent Way Inspectors, A.P.W.Is. and Head Mistries should be provided (Para no. 199 of Report).
133. Before an Inspector of Works is promoted as an Assistant Engineer, he should undergo a practical and theoretical course in Permanent

Way work in a Training School (Para no. 199 of Report).

134. Vigorous action is called for, for the elimination of points worked by tumbler levers (Para no. 200 of Report).
135. Urgent action is necessary for elimination of 1 in 8½ turnouts (Para no. 200 of Report).
136. A programme should be drawn up for removal of infringements of standard moving dimensions to be completed within a specified period (Para no. 200 of Report).
137. Particular care should be taken about the maintenance of fouling. marks (Para no. 200 of Report).
138. The risk of derailments on curved track at speeds considerably lower than the equilibrium speed is ever present and we suggest expert investigation of the problem (Para no. 200 of Report).
139. The investigation in connection with the laying down of maximum permissible limits for variation in cross levels according to speed should be expedited (Para no. 200 of Report).
140. Routine arrangements should be laid on for a census of road and rail traffic at every level crossing whether manned or unmanned once every 3 years and on the basis of this census the classification of level crossings should be reviewed (Para no. 202 of Report).
141. An investigation should be made as to which of the C class level crossings can be kept permanently closed to road traffic at night without causing serious public discomfort and at the rest of the C class level crossings a minimum of two gatemen each performing 12 hours duty should be provided (Para no. 203 of Report).
142. Where level crossings arc not protected by signals the gatemen should be treated as continuous workers (Para no. 204 of Report).
143. It should be one of the routine duties of Permanent Way Inspectors and Assistant Engineers and Executive Engineers to conduct periodic inspections of unmanned level crossings with the object of satisfying themselves that a clear view is available at such crossings (Para no. 205 of Report).
144. Proper rosters indicating the name of the man who should be on duty at any time should be exhibited in all gate lodges and inspections of level crossings should be regularly held (Para no. 206 of Report).
145. It should be ensured that all essential equipment is - always. available

at level crossing gate (Para no. 207 of Report).

146. Arrangements for provision of road signs and their proper maintenance should tie made at all level crossings. An additional warning board reading "Stop Dead, look out for trains and then proceed" should be provided at the immediate approach to all unmanned level crossings. The device of flashing lights and simultaneous ringing of bells at level crossings should be kept in view for future adoption (Para no. 208 of Report).
147. At level crossings where road traffic is intense over-bridges or under-bridges should be provided (Para no. 209 of Report).
148. The carriage of passengers in non-vacuumed trains should be prohibited by law (Para no. 211 of Report)
149. It should be laid as a firm target that within io years all trains on the meter gauge. and narrow gauge should run vacuumed (Para no. 212 of Report).
150. Railways should undertake propaganda through the medium of the Press and the screen about the hazards of fires on trains through careless acts of passengers (Para no. 213 of Report).
151. Fitting of spark arrestors to all engine's needs being expedited (Para no. 214 of Report).
152. Steps should be taken to bring up the wiring on all old carriages to modern standards (Para no. 216 of Report).
153. Every passenger train should have four fire extinguishers on it (Para no. 217 of Report).
154. It is necessary that every case of fire, howsoever small, should be properly investigated (Para no. 218 of Report).
155. The position regarding the supply of stores on Railways is most unsatisfactory (Para no. 279 of Report).
156. Where Railway workshops are not working on all the three shifts, they should do so to increase the manufacture of components (Para no. 225 of Report).
157. For items of stores which are a regular feature of consumption on Railways the Director General of Supplies and Disposals should not wait for indents but should place orders in anticipation of indents (Para no. 225 of Report).
158. Means should be devised to coordinate the position of supplies on

different Railways and in different depots of the same Railway to cut out chances of maldistribution (Para no. 225 of Report).

159. Greater freedom of stores purchase should be allowed to Railway Administrations (Para no. 225 of Report).
160. At each station an accident register should be maintained (Para no. 226 of Report).
161. At each station a monthly meeting should be held by the Station Master with his staff to discuss the accidents of the previous month (Para no. 227 of Report).
162. On each Division or District, a quarterly bulletin about accidents should be issued (Para no. 228 of Report).
163. The Headquarters office of each Railway should similarly issue a bulletin for accidents (Para no. 229 of Report).
164. On each Railway a system of making an overall monthly appreciation of accidents should be introduced and if for the purpose extra officers are required, they should be provided (Para no. 230 of Report).
165. The use of carriages with outward opening doors should not be allowed on fast trains (Para no. 237 of Report).
166. The Government Inspectorate of Railways should be the ultimate Safety Controlling Authority on Railways (Para no. 232 of Report).
167. Whatever the magnitude of an accident, if an enquiry about it is necessary, it should be started and completed promptly (Para no. 238 of Report)
168. Greater attention is necessary to be paid to the issue of the quality of enquiries about accident cases than is being paid at present and the officers who finally accept enquiry reports heed being more critical (Para no. 237 of Report).
169. If there is any tendency on the part of officers who enquire into accident cases to be on the defensive to shield their own department the tendency needs to be effectively curbed (Para no. 238 of Report).
170. When enquiries are arranged about accidents in which there have been deaths or injuries representatives of the public may be associated as observers (Para no. 239 of Report).
171. Reports of enquiries by Government Inspectors of Railways together with the recommendations as accepted by the Government should be promptly published except in cases where prosecution of railway staff

is apprehended when reports should be published after close of prosecution (Para no. 240 of Report).

172. Reference is made to the public suggestion that all expenditure on passenger amenities should be stopped, and money thus found for safety works on Railways (Para no. 242 of Report).
173. Adoption of costly safety devices is not recommended yet (Para no. 243 of Report).
174. There are many cases on all Railways in which attention paid to recommendations made by enquiry committees about individual accidents is scant (Para no. 263 of Report).
175. We refer to some recommendations repeatedly made by Government Inspectors of Railways but not effectively implemented (Para no. 264 of Report).
176. The provision of Mechanical aid to check staff from making mistakes should not be deferred lightly (Para no. 265 of Report).
177. Greater respect should be given to recommendations made by experts who held enquiries into accident cases (Para no. 266 of Report).

THE RAILWAY ACCIDENTS COMMITTEE, 1962 PART I & II (SHRI H. N. KUNZRU COMMITTEE 1962)

29

The appointment of this Committee was the outcome of discussions on the three serious railway accidents that took place within a period of 20 days in October and November 1961 at Ghatsila on the South-Eastern Railway, at Mainpuri on the Northern Railway, and at Kosgi on the Southern Railway Resulting in 76 deaths and injuries to 266 persons. These accidents aroused considerable public concern, which was expressed in Parliament and was voiced in the Press all over the country. In the course of the discussions on these accidents in Parliament, it was suggested that, besides the statutory enquiries to determine the cause of each accident, held by the Additional Commissioners of Railway Safety functioning under the Ministry of Transport and Communications, a general enquiry into the question of accidents on Railways should be conducted with a view to suggesting ways and means for further minimizing their occurrence. Hence the Committee was appointed.

29.1 Constitution of the Committee

The appointment of the Railway Accidents Committee was announced by the Government of India vide their Gazette

Notification No E62CO1/2/RB1 dated 15th January 1962. It comprised the following:

Chairman

1. Pandit Hriday Nath Kunzru

Members

2. Shri Satyacharan Shastri, Member, Rajya Sabha
3. Shri Jaipal Singh. Member, Lok Sabha
4. Shri T. B. Vittal Rao.
5. Shri N R M Swamy

Technical Experts

6. Shri J. N. Nanda, Retd General Manager, ex. Nizam State Railway
   Shri K. L. Ganguli, Retd Chief Government Inspector of Railways.
   Shri Ganguli, for personal reasons, expressed his inability to serve on the Committee, and therefore **Shri Dev Datt**, Retired Chief Government Inspector of Railways, was appointed in his place as a Technical Expert on the Committee.

Secretary

7. Shri P. C Shukla, Deputy Director, Traffic, Railway Board.

29.2 Terms of Reference

The terms of reference of the Committee are-

(1) To consider the question of train accidents on Indian Railways, and

(2) To suggest measures by which they can be further minimized.

A copy of the Gazette Notification is given in Annexure 'A'.

29.3 Preparatory Work

Soon after the appointment of the Committee the country was in the throes of a General Election which kept the Parliamentary Members of the Committee fully engaged. At that time, the Chairman of the Committee was out on a foreign tour The first meeting of the Committee, therefore, was held on the 8th June 1962 During the intervening period, useful data on the railway accidents and related matters was collected from the Railway Administrations in India and abroad. Background studies of the various aspects of accidents were also undertaken. Therefore, when the Committee formally

met, it had sufficient material at its disposal to start its investigations.

29.4 Scope of Enquiry

In order to alloy public anxiety at the occurrence of serious railway accidents, we felt the need for a comprehensive enquiry, with a wider scope, not only to ascertain the causes of accidents, but also to go into other ancillary matters having relevance to the problem of safety on the Railways. This interpretation on the scope of the Committee's work was placed by the Chairman before the Government, which assured him that they did not like to impose limits on the scope of the enquiry and left it to the Committee to sort out the accidents and details thereof Believing that repetitive minor accidents to trains are indicative of unsafe conditions of working and carry with them the seeds which may off-shoot into serious accidents we have thought it necessary to bring within the purview of our enquiry a study of accidents to passenger as well as goods trains. While doing so, we also propose to look into other matters having a bearing on the problem of safety in train operation on Railways.

For statistical purposes, the committee had decided to study the figures for accidents on the Government Railways over a period of five years from 1st April 1957 to 31st March 1962. In doing so they have excluded the figures of accidents on the privately-owned Narrow-Gauge lines consisting of 445 route miles which are operated by ten private Companies and District Boards etc. as against a total route mileage of 34.950 of the Government Railways. Apart from the fact that these Narrow-Gauge lines constitute only 1.26 per cent of the route mileage of the Government Railways, the accidents occurring on them do not lend themselves to the same detailed analysis and study as the accidents on the Government Railways. We have, therefore, decided to exclude the problem of accidents on the private railways. We have selected a period of five years for our study of the accidents with a view to getting a coverage wide enough to detect the main trends, but not too wide to vitiate comparisons by the altered conditions of railway operation in a

fast-moving economy like ours. The incidence of the main categories of train accidents on the Government Railways during the last five years, based on figures received from the Railways, is given in the following table. The correlation of the total number of accidents with the density of traffic, as expressed in train miles i.e. the distance travelled by all trains in a year, has also been worked out for each year and shown against items 13 and 14 of the table.

TABLE- 1

All Train Accidents on Government Railway

	Category	1957-1958	1958-1959	1959-1960	1960-1961	1961-1962
1	Collisions	125	108	111	129	123
2	Derailments	1163	1378	1445	1392	1427
3	Failures of engines	2807	3056	3177	3068	3355
4	Failures of rolling stock	1888	1738	1616	1504	1749
5	Failures of permanent way	130	188	260	282	262
6	Fires in trains	302	36	303	402	235
7	Trains running over cattle on the lines		1421	1380	1332	1270
8	Train Wrecking	1	11	11	10	5
9	Attempted Train Wrecking					
10	Trains ramming into road traffic at level crossing	138	151	127	182	161
11	Miscellaneous	726	519			495
12	Total	9011	9071	8916	8808	9184
13	Train miles (In millions)	232.0	235.2	243.1	247.5	253.6
14	Accidents per million train miles	38.8	38.6	36.7	35.6	36.0

A large number of accidents given in the preceding table does not affect the safety of trains except on rare occasions. For instance, more than 3,000 cases of engine failures in a year do not affect the safety of train running, although they indicate defective maintenance or faulty management of engines. Another about 1,300 cases of trains running over cattle on the lines do not normally endanger the safety of trains, they only result in their detention. The failures of permanent way not leading to an

accident and attempted train wrecking are cases detected in advance of a possible mishap as such, they are important sources of potential danger. With all passenger and goods trains running fully vacuumed on Broad Gauge, and 97 per cent of passenger trains and 84 per cent of goods trains running fully vacuumed on Meter Gauge, the risk attendant on train partings is mostly confined to non-vacuumed trains. Train partings constitute 99 per cent of the cases included under failures of rolling stock given against item 4 of table 1.

29.5 Summary of Observations and Recommendations

Committee had summarized in the following paragraphs the observations and recommendations made by them in the various Chapters of this Report. Most of the recommendations were railway specific and time specific thus not considered to be of present use. However, the recommendations, which are still relevant for working or academic in nature included as under:

The Human Factor

1. Our analysis of accidents during the last six years has shown that a majority of them can be attributed to human failure. [Paragraph 98]
2. We find that there have been persistent shortages in several categories of staff on many of the Railways, mainly on account of inadequate and defective planning to meet the requirements. We suggest the setting up of a Man-power Committee on each Railway for assessing in advance the staff requirements. We also suggest the creation of some supernumerary posts to meet unforeseen shortages of staff. [Paragraphs 90 and 92]
3. In order to reduce delays in recruitment by the Railway Service Commissions, we make the following suggestions in respect of non-technical categories:
   - **(i)** Separate recruitment for posts in the Operating categories and for office and Commercial Clerks
   - **(ii)** Only people with Second Division in the lowest qualifying examination should be called for the test. No one should be permitted to apply more than three times.
   - **(iii)** The examinations should be held according to a fixed schedule and the results finalized within three to four months' time. [Paragraph 93]

4. We suggest that the minimum strength of the Members of the Railway Service Commissions should be fixed at two which may be increased according to the workload. At least one of the Members should a serving or retired Railway officer. The Commissions should have permanent ministerial staff recruited either from the Railways or from the open market. [Paragraph 94]
5. We reiterate our previous recommendation that the General Managers should be empowered to fill in 25 per cent of the vacancies, from amongst the sons of Railway employees, in order to meet the short ages and to boost the morale of the staff. [Paragraph 95]
6. We suggest that: -
   (i) The leave reserves should not only be adequate but should also be a little on the liberal side. Whenever there is any surplus in the leave reserves, the staff can be sent more frequently for refresher courses, training and seminars etc., than at present.
   (ii) There should not be any glaring disparity in the leave reserve provided for class iii and for class iv staff respectively.
   (iii) The leave reserve should be provided to the maximum extent possible separately for each category; and
   (iv) The headquarters of the leave reserve staff should be decentralized and control over their movements entrusted to the senior subordinates in charge as far as feasible. [(Paragraph 96)]
7. We attach great importance to training throughout the service of an employee and consider that expenditure on training will increase safety and efficiency and result in economy in the long run. Training facilities for Class IV staff on the Divisions and in the Zonal School of the Southern Railway need to be developed. [Paragraphs 97(1) and (ii)]
8. We find that the existing training facilities on the Railways have not been fully utilized on account of the difficulties in sparing staff and suggest that a certain percentage of the relieving strength should be reserved for this purpose. We deprecate the move on a few Railways to drastically curtail the period of training. [Paragraphs 97(iii) and (iv)]
9. We make some suggestions for improving the quality of Instructors in training schools and for the selection and training of Instructors. We propose the establishment of a Central Institute for the training of Instructors from all the Railways. In view of the dearth of

Instructors, we suggest that the services of, experienced Instructors should be utilized beyond 58 years if physically fit. [Paragraph 99]

10. We recommend the posting of experienced and competent officers as heads of Zonal Training Schools where they should remain for at least three years. [Paragraph 99]
11. We find that rapid promotions have diluted the standard of experience and quality of supervisors and suggest larger direct recruitment for certain initial and intermediate grades. [Paragraphs 100(i) and (ii)]
12. We suggest the following modifications in the percentages of direct recruitment to certain initial and intermediate grades of Class III service: -
    - **(i)** Fifty per cent of the Train Examiners should be recruited directly.
    - **(ii)** Direct recruitment of Grade 1 Firemen, to the extent of 75 per cent of their strength should be adhered to on all Railways. It should, however, be ensured that these Firemen are not promoted as Shunters or Drivers unless they have put in a specified minimum number of hours on the footplate.
    - **(iii)** Eighty per cent of the posts of Mechanical Chargemen should be filled by direct recruits on all the Railways.
    - **(iv)** The percentage of direct recruits as Assistant Block and Signal Inspectors should be restored to 66 6 as laid down earlier.
    - **(v)** Seventy-five per cent of the posts of Assistant Permanent Way Inspectors should be filled from either Civil Engineering Diploma-holders or Intermediates in Science and the existing shortfalls should be made good.
    - **(vi)** The quota of direct recruits as Traffic Apprentices should be raised temporarily to 33 per cent. Another ten per cent of these posts should be thrown open to serving employees who have put in not less than five years of service.
    - **(vii)** The General Managers should be authorized to increase temporarily from 20 to 25 per cent, the quota for direct recruitment of Engineering Graduates in the grade of Rs. 335-425/335-485 (A.S.). [Paragraph 100 (iii)]
13. We suggest modifications in the existing rules of selection to Supervisory posts which confer triple weightage on seniority. [Paragraphs 101 (ii) and (iii)]
14. We suggest that after selecting the right type of persons as

Supervisors, it is essential to equip them with the technical knowledge required for their job and to give them training to develop their skill in management. [Paragraph 102(i)]

15. We propose the opening of a Central Institute at Baroda for training Senior Supervisors of the different Railways and the creation of similar facilities for junior supervisors. We also suggest that junior supervisors in the Zonal Training of Schools Railways should derive benefit from the various supervisor training courses run in India and abroad. [(Paragraph 102 (ii)]
16. We suggest steps to restore the prestige of a supervisor in the eyes of the staff by defining his duties clearly by treating him as part of the administration and by giving him higher status and greater disciplinary powers. [Paragraph 103(1)]
17. We are of the view that Senior Supervisors should not be permit ted to become members of the staff Unions, for which, if necessary, the Indian Trade Union Act may be suitably amended. They may, however, form a Union of their own to represent their interests. Shri T. B. Vittal Rao dissents from this recommendation. [(Paragraph 103(1)]
18. We suggest uniformity on the Railways in the actual delegation of powers to Supervisors. [(Paragraph 104(i)]
19. We find that a large number of Senior Supervisors on different Railways are either not aware of the disciplinary powers delegated to them or are reluctant to exercise them. We suggest that wide publicity should be made amongst the staff regarding the delegation of these powers. [Paragraph 104]
20. We find the procedure laid down for the imposition in major penalties is cumbersome and dilatory. We suggest the adoption of an abbreviated procedure for the imposition of the penalty of reduction in rank or grade. We propose that the General Managers should be permitted to exercise powers to terminate the services of the staff responsible for causing accidents, under the terms of their service agreement and suggest the delegation of these powers to Heads of Departments also. [Paragraph 105]
21. We recommend a system of accelerated promotions or advance increments to Supervisors and Officers as a reward for excellent performance or sustained outstanding work. For those in lower

grades of Class III service and in Class IV service, we consider that the best reward will be to provide for their children's education by opening polytechnics and the grant of scholarships. We also suggest the employment of sons of railway men with creditable record of service. [Paragraph 106]

22. Several Senior Scale Officers with insufficient experience are working as Divisional or District officers. This is due to inadequate planning and the erratic rate of recruitment and promotion to Class I service during the Second Five Year Plan. We suggest that the requirements of the Fourth Plan should be worked out in time. We recommend that no officer should be promoted to the Senior Scale, unless he has completed at least six years of service in the Junior Scale and also suggest certain measures for overcoming the interim shortages. [Paragraphs 107-109]

23. We were impressed by the training facilities developed in the Railway Staff College, Baroda, the Institute of Signal and Telecommunication Engineering, Secunderabad and the Advanced Permanent Way Training School, Poona. But the number of officers trained in them during the last three years has been much below the number that should have passed through a refresher course. The existing courses in these institutes do not adequately cover the problems of man-management and art of supervision and we suggest their inclusion. We suggest the holding of regular seminars for administrative officers and recommend that larger number of officers should be sent for training in Institutes of Management and Administration in India and abroad. In view of the small number of people receiving training at the Poona Institute, we suggest considerations of its being made a part of the Baroda College. [Paragraphs 110(i) (ii) and (iv)]

24. We strongly recommend that the principle of selecting for administrative posts the best man available and not the senior man if suitable, should be restored. We propose the constitution of a Screening Committee of Senior Officers to recommend the names of officers for filling posts of Heads of Departments and Divisional Superintendents who should be hand-picked person. [Paragraphs 111(i) and (iii))]

25. We are of the view that the confidential report of officers should be precise and explicit and be invariably scrutinized by the next senior officers. They should also provide for a general assessment in the narrative form. [Paragraph 111(ii)]
26. We deprecate frequent transfers of officers from one Railway to another and suggest that an officer in the administrative grade should normally be retained on the same Railway and on the same post for at least three to four years. [Paragraph 112]
27. We consider that intervention from outsiders, whether Members of Parliament or others, on behalf of individuals, at the different levels of the administration, creates a disproportionately adverse reaction on the discipline and the morale of the organization. We understand that the officers of the Railway Administrations, on getting a reference from the Members of Parliament on staff matters, have been directed to request the latter to address the Minister. We bring this to the notice of the person referred to above and earnestly hope that they will bear this in mind and do whatever they can to promote discipline which contributes largely to safety in operation. [Paragraph 113]
28. We make the following suggestions for reducing the paperwork in order to enable officers to exercise sufficient checks on the working of the staff and maintain personal touch with them:
    - **(i)** Codes and procedures should be simplified.
    - **(ii)** Periodical reviews should be made to eliminate or modify some of the statements and statistics. The first review should be immediately undertaken by the Efficiency Officers on the Railways,
    - **(iii)** The administrative levels at which specific problems should be dealt with should be laid down and rigidly adhered to.
    - **(iv)** The number of Officers and Supervisors should be suitably increased, and organizational changes introduced to reduce their jurisdiction to a manageable charge from the viewpoint of safety and efficiency.
    - **(v)** Personal Assistants should be provided to the important Head of Departments, the Divisional Superintendents in charge of large Divisions and in special cases, to Divisional officers. We suggest that officers should be provided with stenographers on a more liberal scale than at present. steno

(vi) Senior Scale officers and above should be authorized to incur expenditure up to certain limits without prior concurrence of Accounts Officers.

(vii) Officers should be discouraged to seek in matters within their competence. [(Paragraph 114(ii)]

29. We are convinced that the workload on certain Divisions has exceeded the optimum capacity of the existing Divisional organizations and therefore reiterate our earlier recommendation and urge an expeditious examination of the workload on certain Divisions of the Railways. [(Paragraph 115 (i)]
30. We suggest the introduction of the Divisional organization on the North-Eastern and Northeast Frontier Railways which are at present working on the district pattern, in order to provide mature and on-the spot guidance to inexperienced District officers. [Paragraph 115 (ii)]
31. We consider the workload on the three Railway Zones to be heavy and recommend a future projection expert study to examine the present workload, it's with its impact on different zones. [Paragraph 115 (iii)]
32. We suggest that there should be only one recognized Trade Union on each Railway Zone and its office bearers should be drawn from the serving Railway employees. We expect the Unions to bring only well-authenticated grievances of individuals to the notice of the Railway Administrations at appropriate levels, after normal channels of appeal have been exhausted. They should also refrain from sponsoring cases of staff punished for causing accidents and should help in an expeditious finalization of accident enquiries. [(Paragraph 116 (ii)]
33. The medical facilities, both in scale and in quality are second to those of no other organization in India. [(Paragraph 117 (i)]
34. We are glad to note that, as a result of our discussion with the Railway Board, instructions have been issued to calculate the overtime on a two-weekly instead of the present monthly basis. [Paragraph 117 (ii)]
35. We recommend that the present allocation for the provision of staff quarters needs to be raised from Rupees seven crores to Rupees twelve crores per year during the remaining years of the Third Plan We suggest certain priorities in the provision of quarters. We also

suggest Improvements in the old type quarters and conversion of some of them into bachelors' dormitories. [Paragraph 117 (iii)]

36. We attach great importance to the provision of suitable running rooms and early completion of standard facilities in all of them. We make suggestions for improving the services available in the Running Rooms. [Paragraph 117 (iv)]

Signalling

37. We consider signalling to be the essential instrument of safety as minimizes the impact of human error on the safety of train operation. [Paragraph 118]

38. We find that the various signalling and interlocking works sanctioned during the Second Five-Year Plan have been only partially completed even by the end of the first two years of the Third Plan. Their implementation, especially on some Railways, has been inadequate. We also note that the sanctioned programmes did not include modern electrical signalling. We recommend that: many items of
    - **(i)** Morse telegraph instruments should be progressively replaced by token instruments on all single line sections of Broad gauge and Meter gauge. [(Paragraph 119)]
    - **(ii)** Lock and block instruments should be provided on all double line sections in about a year's time. [(Paragraph 121)]
    - **(iii)** Rudimentary interlocking should be provided at all non-interlocked stations on the Broad gauge and Meter gauge in a year's time. [Paragraph 122 (i)]
    - **(iv)** A more progressive policy of extending Multiple Aspect Upper Quadrant signalling on all the main line sections should be carried out on a programmed basis; and [Paragraph 125]
    - **(v)** All signalling and interlocking works sanctioned in the Second and Third Five-Year Plans should be completed by the end of the Third Plan. [Paragraph 126]

39. We consider the adoption of modern electrical signalling in India essential and inescapable in the interests of safety and efficiency, and make the following suggestions:
    - **(i)** Track circuiting should be provided extensively. The difficulties due to lack of wooden or concrete sleepers should be overcome by research and experiment. [Paragraph 127 (i)]

(ii) Colour Light Signalling should be programmed for all electrified sections during the current Plan and for all suburban sections by the end of the Fourth Plan. [(Paragraph 127 (ii))]

(iii) Where the anticipated increase in the intensity of train services on a double line section is proposed to be met by the provision of additional lines, the comparative advantages of providing automatic block signalling on existing lines should be considered, in the light of us providing, a higher standard of safety and capacity. [Paragraph 127 (iii)]

(iv) At large stations and yards, where the operation of points signals from a number of cabins involves considerable ordination, the provision of route relay interlocking should be considered as an essential measure. [Paragraph 127 (iv)]

40. We suggest that Automatic Train Control should be introduced on some suburban sections and especially selected trunk routes. For this purpose, we strongly recommend the early initiation of research not only for adapting Automatic Train Control in use on Railways in advanced countries to Indian conditions but also for introducing Cab. Signalling as an experimental measure. [Paragraph 127 (v)]

41. The failure of signalling and interlocking gears generally on all Railways and particularly on a few Railways have been increasing during the last three years. We find substantial shortfalls in the overhauling of lever frames and the replacement of worn-out block instruments on some Railways and consider that unless these are done according to the schedules, signalling failures will continue to increase, thereby reducing the factor of safety in Railway operation. [(Paragraphs 128 and 129)]

42. We consider that the jurisdiction of the Signalling officers needs to be rationalized and the frequency and quality of their inspections improved: also, that the Senior Officers should watch the frequency and quality of inspections by junior officers who should in their turn watch those of the Inspectors. [(Paragraph 130)]

43. We recommend for adoption on all the Railways, the special register in use in the loco sheds on same Railways, in which the incoming drivers record defects, about signals, noticed by them en route. [(Paragraph 131)]

44. We strongly urge the early establishment of a Central Electrical Signal Workshop for manufacturing electrical signalling equipment.

[(Paragraph 133)]

45. We consider that a revised set of General Rules, consistent with the conditions obtained at present and likely to be obtained in the foreseeable future, is overdue and should be issued without undue delay. [(Paragraph 134)]
46. We are of the view that the multiplicity of rules contained in the various books and manuals on the Railways leads to confusion in the minds of the staff and consider that standardization of working practices is desirable, to achieve a higher standard of safety on the Railways. We also suggest that the alterations to the rules should be few and far between. [(Paragraph 135)]
47. In order to keep the Rule Book tidy and susceptible of easy reference, we suggest the adoption of the American practice of having a Rule Book loosely bound in a folder so that whenever a rule is amended, the whole page is replaced. [(Paragraph 136)]

Track

48. About 13 per cent of the derailments were caused by track defects, this indicates that the maintenance of the permanent way has not been keeping pace with the increasing traffic demands, not to speak of the requirements of very heavy traffic in future. [(Paragraph 137)]
49. We welcome the new track standards laid down by the Railway Board and suggest that the economics of a larger use of 132 lbs. rails on some of the trunk routes should be considered. [(Paragraph 138)]
50. We suggest suitable improvements in the design of steel trough and cast-iron CST-9 sleepers. [(Paragraph 138)]
51. We find that at the end of 1962-63, the overall shortfall in the implementation of the programme of rail renewal, was 41-4 per cent and of sleeper renewal 23 3 per cent and the position was particularly unsatisfactory on the Southern, Western and Northeast Frontier Railways. [(Paragraph 140)]
52. The Railway Board should watch the position about the availability of track materials from indigenous sources and arrange to secure their import when it is essential. [(Paragraph 140)]
53. We urge the Railway Board to keep in touch with the progress regarding the extraction and availability of wooden sleepers at

contractor's depots to be able to take appropriate action to enforce the fulfilment of contracts. [Paragraph 141]

54. We suggest that track renewals should be completed early to reduce the length of the track under speed restrictions on the Railways. The renewal work should be so undertaken that continuous sections of the line are not subjected to varying speed restrictions. [Paragraph 142]

55. We suggest certain measures to expedite the slow progress of welding. [Paragraph 143]

56. We find that the recoupment of ballast has been extremely unsatisfactory and suggest the following special steps for overtaking arrears and for working up to the increased cushion of 10 on important routes: -

(i) Adequate supply of hopper or other suitable types of wagons to meet the needs of the Railways,

(ii) Traffic Inspectors or Ballast Controllers to watch the working of ballast trains,

(iii) Using motor trucks for the collection of ballast on the cess,

(iv) Rapid acquisition of land for quarrying purposes, and

(v) Installation of mechanical crushers at suitable places and examination of the feasibility of installing mobile crushers. [Paragraph 144]

57. We suggest that a systematic programme should be drawn up by each Railway, in consultation with the Research Centre, for the stabilization of formations made of black cotton or unstable clayey soils. We suggest a special watch on and proper maintenance of the newly made banks in station yards and the use of coal ash on new banks in the midsection. [Paragraphs 145-146]

58. We hope that the strengthening of the permanent way gangs, as a result of the Railway Board's latest order, would considerably help to raise the standard of maintenance of permanent way track. [Paragraph 148]

59. We make the following observations in regard to maintenance of track: -

(i) We prefer the practice followed on the Central Railway in regard to through packing being carried out for as long a period as possible during the monsoon and the two months of the pre-

monsoon period on sections of the line where the climatic conditions permit. [Paragraph 149]

(ii) Our observations make us doubt if the prescribed procedure for picking up slacks is effectively followed as a general practice. [Paragraph 150]

(iii) The time required for each of the operations involved in through parking should be standardized to the extent possible. [Paragraph 151]

(iv) We emphasize the importance of the opening of the road by the removal of ballast, to an adequate extent, prior to manual tamping. [Paragraph 152]

(v) Special stress needs to be laid on ensuring the correct alignment of the track in the daily work of the gangs engaged on through packing. [Paragraph 153]

60. **(i)** We suggest a time and work study of the various operations of packing and a critical study of the implements of packing. [Paragraph 154]

(ii) We hope that the introduction of mechanical tamping operations on the Railways will be expedited. We also hope that action will be taken for the procurement of spare parts and the setting up of adequate repair facilities for the tampers approved for use. [Paragraph 165]

61. We found variations in the method of manual packing, and we give instances of defective practices on some Railways. [Paragraph 155]

62. We suggest that the Central Railway's practice of checking once a quarter the versines and super-elevation on each curve by the Permanent Way Inspector etc., may be adopted by other Railways, and the observations recorded in a special curve register. [Paragraph 156]

63. We suggest that the mate's diary, which should be standardized for all Railways, should contain the detailed results of the suggested checks by the Permanent Way Inspectors. It is for consideration whether the mate's diary, like gang charts, should not be reviewed periodically. [Paragraph 157]

64. We emphasize the necessity for refresher courses for gang mates at regular intervals. [Paragraph 158]

65. We feel that the Permanent Way Inspectors should take detailed notes regarding the work of the gangs in their own notebooks in

addition to the recordings in the mate's diary. [Paragraph 159]

66. We suggest that the Permanent Way Inspectors should be properly instructed about the importance of making observations about track variations, sleeper by sleeper, over a short test length of the track. [Paragraph 159]

67. The Apprentice Permanent Way Inspectors should stay and actually work with the gangs over an appreciable period to learn thoroughly the duties of the gangs including the use of tools and implements. [Paragraph 160]

68. We suggest early implementation of the proposal made at the Chief Engineers Conference in 1962 that the Permanent Way Inspector's beat should be about 40 miles and that he should have two Assistant Permanent Way Inspectors under him. [Paragraph 161]

69. We suggest that a special officer be appointed on each Railway to evaluate the burden of the responsibility for the custody and accounting of the stores on each Permanent Way Inspector and recommend the relief needed. [Paragraph 162]

70. We suggest that the Assistant and District or Divisional Engineers' notebooks should be properly maintained with a detailed record of the results of the inspections, and these should be periodically examined by the higher officers. We suggest the issue of suitable instructions and incorporating them in the Way and Works Manual. [Paragraph 163 and 164]

71. We suggest that Railways should start implementing the proposal to limit the jurisdiction of Assistant Engineers to about 120 miles, subject to exceptions under special circumstances. [Paragraph 163]

72. We were struck with the consequences of the rapid promotions of young officers with short service and suggest that ad hoc arrangements should be made to give them guidance and instructions. [Paragraph 164]

73. The Permanent Way Inspectors and the Assistant and Divisional Engineers should profitably correlate the observations during their inspections by footplate and brake van, with those made by actual measurements of defects. [Paragraph 165]

74. We suggest that a minimum number of tests of the track by the Hallade Track Recording Car should be uniformly prescribed for

the trunk routes, main lines and branch lines, the Railways being free to decide the number above this minimum to meet special conditions. [Paragraph 166]

75. We consider that the Operator-in-Charge of the Hallade Car should be fully tested before he is given the responsibility of operating it. His interpretation of the records should also be subject to competent check periodically. [Paragraph 166]

76. We understand that a modern improved type of special test car is under erection by the Research, Designs and Standards Organization. We recommend that one such car should be allotted to each Railway. [Paragraph 166]

77. Our conclusions in this Chapter are based on limited observations and the data supplied to us. Their general applicability is a matter for further investigation by the Railways. [Paragraph 166]

Rolling Stock

I. Locomotives

78. We find that 51 per cent of the derailments due to engine defects were on account of bad maintenance, 38 per cent were due to the failure of the material and the balance of 11 per cent was due to miscellaneous causes**.** [Paragraph 169]

79. We suggest that the wear on tyres should be checked with a condemning gauge and the flat and root wear should be checked and recorded. All the major sheds should be equipped with wheel lathes and the tyres may be machined to the prescribed Intermediate profile gauges. [Paragraph 170]

80. Derailments caused by the failure of the material point to the need for improved workshop production, better quality control and closer supervision. In this connection, we suggest that: -

(i) There should be cent per cent load deflection tests of springs on all Railways.

(ii) All workshops should be equipped with pyrometers, modern scrag and load deflection testing equipment.

(iii) in all workshops, axles should be tested by ultrasonic equipment and this facility should be progressively available in loco sheds also.

(iv) The loco sheds should have an adequate number of deep drop pits

and proper hoisting arrangements.

(v) All the journals running hot should be stamped with a star so that they may be given closer examination while passing through loco sheds and shops.

(vi) the practice followed on some Railways of providing pyrometer sticks to the drivers of mail, passenger and through goods trains should be extended to all Railways. [Paragraph 171]

81. We suggest that the Railways with a bad record of engine failures should endeavour not only to reach the targets laid down by the Railway Board but should also try to do better. In this connection, we make the following suggestions: -

(i) Maintenance practices in sheds and shops should appreciably Improve.

(ii) The drivers should be provided with a handbook containing Information about defects likely to develop in engines on the run.

(iii) Each case of engine failure should be properly analyzed, and appropriate remedial action should be taken. [Paragraphs 172-173]

82. In order to ensure satisfactory repairs and the roadworthiness of a locomotive, we make the following suggestions: -

(i) Rules and regulations pertaining to the inspection, repair and testing of engines coming in and going out of sheds should be scrupulously observed.

(ii) The examining fitters at the incoming pits should be literate, competent, and experienced in order to be capable of exercising a check on the bookings of drivers and making a thorough examination of the engines.

(iii) The schedules for the examination of incoming engines in loco sheds should be kept up-to-date and the facilities for the examination of engines should be sufficient.

(iv) Inspecting officers should regularly test check the work of the examining staff at the incoming inspection pits and the results should be recorded in the inspection register in the sheds.

(v) Adequate facilities like a sufficient number of examination pits, adequate lighting arrangements etc. should be provided in loco sheds. The chargemen at the outgoing pits should record the defects noticed, besides pointing out the quality and thoroughness of the repairs to the engines. [Paragraphs 176-178]

(vi) An engine repair book with details of scheduled dates, etc., should

be maintained on all locomotives. In this book observations by Inspecting officers about the mechanical condition of the locomotives and their operational performance should also be recorded. [Paragraph 179]

(vii) The Repeated Booking Register should be maintained on a uniform basis. The basic causes of such bookings should be analyzed, and a record kept of the remedial measures adopted. [Paragraph 180]

83. Railways which are in heavy arrears in respect of the major maintenance schedules should study their causes in each shed and Division. We suggest-

(i) the adoption of the principle of centralized maintenance overhaul on a Divisional or District basis.

(ii) the provision of proper machines, equipment, and other facilities for undertaking the maintenance schedules.

(iii) translation of scheduled items in the regional language and their exhibition on notice board for the guidance of the maintenance staff.

(iv) manufacturing a few non-ferrous items in a small foundry attached to the big loco sheds where justified; and

(v) an early study of the staff required in sheds to carry out scheduled repairs and its early provision and the adoption of adequate measures to improve the quality of fitters. [Paragraphs 182-183]

84. Special attention should be given to overaged locomotives for which suitable instructions should be issued by the Railway Board. [Paragraph 184]

85. We find that the Northern and Northeast Frontier Railways required expansion of workshop capacities for doing the periodical overhaul of their locomotives. [Paragraph 185]

86. We emphasize the importance of a careful examination of the material and the manufacturing processes of spare parts, which should conform to strict specifications.

87. To strengthen the organization in the workshops, we suggest that-

(i) The quality control organization should be adequate and competent and should function independently of the production side in each workshop.

(ii) Vital items should receive adequate tests: for this purpose, a sample test of vital items under quality control should be rationalized and made effective.
(iii) An engine, after periodical overhaul, should be tested early in the day for the rectification of minor defects.
(iv) An engine should be sent on preliminary trial with the driver from a shop to enable repairs being carried out before it is sent on full trial.
(v) The inspector or the officer carrying out trial tests of a locomotive after its periodical overhaul should be independent of the shop organization; and
(vi) Defects in engines coming out of the periodical overhaul should be recorded and the shops informed of them. [(Paragraph 186)]

II. Carriages and wagons

88. As the incidence of the derailments due to carriage defects on the Meter gauge was five times more than on the Broad gauge, there is need for more attention to the maintenance of passenger stock, especially on the Northeast Frontier Railway. [(Paragraph 187)]

89. We find that 25 per cent of derailments due to carriage and wagon defects on the Broad gauge and 35 per cent on the Meter gauge were caused by defective springs. For this, we suggest the following measures to be adopted in the workshops: -
(i) A uniform practice should be adopted to ensure that each plate of a spring is closely examined.
(ii) pyrometers and circulating quenching medium, at controlled temperature should be provided.
(iii) adequate capacity and equipment should be made available for subjecting springs to cent per cent, scrag tests:
(iv) the practice of giving the load deflection test should be standardized for all the Railways: and
(v) The present specifications in respect of the manufacture of springs should be made more comprehensive and precise. [Paragraph 189 (a)]

90. In order to obviate derailments caused by broken axles, cold or hot, we suggest that: -
(i) chalk tests of hot axle journals should be given in sick lines.
(ii) ultrasonic flaw detectors should be provided in all carriage and wagon workshops as also in the sick lines dealing with large

number of hot axles, and

(iii) A uniform practice for the thorough examination of journals should be introduced. [(Paragraph 189(b)]

91. We find that 56 per cent of the derailments due to carriage and wagon defects on the Broad gauge and 58 per cent on the Meter gauge were caused by bad maintenance, thereby indicating the need for a more thorough examination and proper repairs to rolling stock in station yards and sick lines. [(Paragraph 190)]

92. We find that in 1962-63, goods train partings increased appreciably, while the passenger train partings came down on both the gauges, we consider that the results of a close analysis of the methods adopted and the precautions taken by the Central Railway, where the incidence of train partings is the lowest, should serve as a guide for action on other Railways. [Paragraph 191(i) and (ii)]

93. We suggest the early replacement of Class II steel by Class IV steel and the standardization of the procedure for electric welding, proper heat treatment and control testing on non-standard drawbars in order to reduce train partings. [Paragraph 191 (iii)]

94. The Research, Designs and Standards Organization should make early recommendations to ward off train partings and to lay down tolerances in respect of buffer projections and wear on individual draw bar components to reduce the possibility of slack coupling. [Paragraph 191(iii)]

95. The incidence of hot boxes in coaches is two-and-a-half times higher on the Meter gauge, but their incidence in wagons is three times higher on the Broad gauge, there were wide variations in their occurrence on different Railways. We emphasize the need for a critical and comparative study of the causes of these variations to derive helpful conclusions. [Paragraph 192(i) and (ii)]

96. We suggest the following measures for improving train examination and repairs:

(i) A concerted drive should be made by the Security Department in cooperation with the Mechanical Department in order to prevent frequent and extensive theft of materials and parts of wagons. [(Paragraph 193 (ii)]

(ii) The time allowed for train examination appears to be inadequate in the case of originating trains and varies from Railway to

Railway. We propose a time and work study in this matter with a view to introducing a uniform schedule on all Railways. [(Paragraph 193 (iii)]

(iii) The programmes for increasing the capacities of sick lines, with adequate equipments in keeping with the needs of the present-day conditions of work and traffic, should be implemented. [(Paragraph 193 (iv)]

(iv) A review of the practice of repairing wagons in traffic yards should be undertaken so as to prescribe the nature of repairs that can be properly done there, and the facilities required for the purpose. [Paragraph 193 (iv)]

(v) A yardstick should be laid down to determine the strength of train examining staff. [Paragraph 193 (v)]

97. We suggest the adoption of the following measures in respect of Railway Workshops: -

(i) Workshop capacities should be expanded adequately to cope with the increase in the fleet of rolling stock. [(Paragraph 194(ii)]

(ii) The undesirable practice of giving periodical overhauls to wagons in sick lines, lines, as we found at Vijayawada on the Southern Railway, should be discontinued. [(Paragraph 194(ii)]

(iii) Manufacture of wagons should be centralized in a separate workshop so that the repair workshops may give undivided attention to the periodical overhaul of wagons. [Paragraph 194 (iii)]

(iv) The unsatisfactory practice of cannibalizing spare parts should be eliminated.

(v) Wagons with incomplete repairs should not be offered for acceptance to Neutral Control Examiners. [Paragraph 194 (iii)]

98. The percentage of overaged stock on certain Railways is high and we consider that the utilization of overaged stock should be limited, as far as possible, to local trains and shuttle services pending their gradual withdrawal from service. Such stock should receive special attention in workshops and on sick lines and the possibility of giving them more frequent periodical overhauls should be considered. [(Paragraph 195)]

99. We found that the work of the Neutral Control staff was effective in ensuring a high standard in the maintenance of rolling stock and suggest that the Neutral Control Officer should submit a review containing broad conclusions drawn from the reports of Neutral

Control staff about the condition of the stock and the quality of work done in workshops and sick lines. [(Paragraph 196)]

100. We recommend that the system of neutral control examination should be extended on the Broad gauge and introduced on the Meter gauge. [(Paragraph 196)]

III. Supply of Stores

101. To improve the position about the availability of stores and spare parts for the maintenance of the rolling stock, we recommend that one or more central workshops should be started at suitable places for the manufacture of those essential parts that are generally in short supply. [(Paragraph 197)]

102. We recommend consideration of the following suggestions put forward in evidence before us: -

(i) The time-consuming process of bulk procurement through the Director-General, Supplies and Disposals to be simplified.

(ii) There should be no over-emphasis on accepting the lowest tender regardless of the standing or reliability of firms.

(iii) Import of special types of steel, such as Class III and Class IV to get higher priority in the interests of safety of operation on the Railways.

(iv) The Divisional Mechanical Engineers to be given powers to purchase stores up to Rs. 500 and the Divisional Superintendents up to Rs. 5,000.

(v) Energetic action to be taken to ensure the ready availability of safety items of stores. [(Paragraph 197)]

IV. Supervision

103. We emphasize the need for improvement in the quality of supervision on the maintenance and repair of rolling stock and adequate follow-up action to remove defects. [(Paragraph 198)]

Research

104. We note the extreme inadequacy of the Railway Research and Testing Centre in regard to its equipment and personnel and also the limited range of its work and achievement against the vast background of the requirements of a large organization like the Railways. [(Paragraph 199)]

105. We strongly support the proposals under consideration for the

creation of two separate Research Directorates. [Paragraph 200]

106. We suggest a systematic periodical review of the results of research to see if they have kept pace with the needs of safety and efficiency in railway operation and with the developments in advanced countries. [(Paragraph 202)]

107. We find that only a few problems have been referred to various research and technical bodies and universities etc. and consider that these have not been commensurate with the problems facing the Railways. [(Paragraph 203)]

108. We note that the Central Board of Railway Research has met only once each in 1960 and 1962 and consider that it should strictly adhere to the programme of meeting twice a year and the tenure of its membership should be three years instead of two as at present. [(Paragraph 204)]

109. We feel that the three Sub-Committees set up by the Central Board of Railway Research should hold meetings more frequently. We whole-heartedly endorse the broad principles enunciated by them and the observations of the Civil Engineering and Building Research Sub-Committees. [(Paragraph 204)]

110. We refer to the following problems, the delays in finding whose solutions are going to create difficulties in the implementation of some of our recommendations. [(Paragraph 205)]

(i) The trials on the Railways with different types of mechanical tampers for the maintenance of track have been carried out without close cooperation with the Research Wing which, in our view, should have been given the exclusive responsibility for developing a suitable type of tamper. [Paragraph 205 (i)]

(ii) The Research Organization has not succeeded in introducing a satisfactory track recording car. [Paragraph 205 (II)]

(iii) We suggest further research to improve the Hallade Track Recorder so as to obtain a more faithful record of the defects in the track. [Paragraph 205 (ii)]

(iv) Priority should have been given to the development of a suitable design for concrete sleepers to enable track circuiting to be introduced on heavy density sections. We consider that the special Directorate set up in the Railway Board for completing research and preparing a project report on concrete sleepers should have

been under the control of the Research Organization. [Paragraph 205 (iii)]

(v) We note that the Research Organization is not fully associated with, and is not in control of, the new investigation for finding out a packing suitable for reducing the incidence of It boxes. [Paragraph 205 (iv)]

(vi) There appears to have been no coordination either in the development of different types of automatic lifting barrier gates at level crossings in use on various Railways or in incorporating the best features in the design of such gates. [(Paragraph 205 (v)]

(vii) We are of the view that the research for developing a system of automatic train control should have been brought to a satisfactory conclusion. [(Paragraph 205 (vi)]

(viii) With a view to modernizing our methods of maintenance of the permanent way track, the Research Organization should have undertaken studies of (a) various methods of consolidation of track in relation to the stability and strengthening of the track and safety of operation and (b) measurement of the pressure under sleepers in different formation under varying thicknesses of ballast and sleeper density by of pressure cells and electric strain gauges. Means. [Paragraph 205 (vii)]

(ix) In order to develop equipment for expediting the welding of the track, which would be a safeguard against sabotage on vulnerable sections of the Railways, investigation of the flux used in thermit welding should have been undertaken. [Paragraph 205 (viii)]

111. We make the following suggestions for the better working of the Research, Designs and Standards Organizations: -

(i) The basic requisite for the effective functioning of this Organization is its adequate expansion and development, both in equipment and in personnel.

(ii) No research should be undertaken unless the Organization is fully equipped to complete it successfully.

(iii) Research items should be taken to successful conclusions and not left incomplete over a large number of years.

(iv) All research items, including those which are partly undertaken by the Railway Administrations, should be strictly under the control of this Organization.

(v) The laboratory results of research should not be applied to the Railways without adequate field trials under the control of the Research Organization. [Paragraph 205(viii)]

112. We consider that there is scope for increased activity in the Bridges and Floods Directorate for modernizing the technique regarding the design and building of bridges. [Paragraph 206]

(i) We strongly recommend that a nucleus organization should be set up, for the present, for conducting research into certain urgent problems of signalling and telecommunication and that it should be developed into a full-fledged wing of the Research Organization as soon as competent men and proper equipment become available. [(Paragraph 207)]

(ii) We suggest that we may enter into technical collaboration with appropriate foreign firms for the design and manufacture of electrical signalling equipment. [(Paragraph 208)]

(iii) We suggest the creation of a full-fledged Signalling Directorate, working in close coordination with a first-class signalling workshop for making prototypes of equipment adapted to Indian conditions, and for the planning and processing of big signalling schemes. We emphasize the need for concentrated efforts to recruit suitable personnel, who should be properly trained. [(Paragraph 209)]

113. We consider that the proposals for strengthening the Research Organization under consideration of the Railway Board are quite in adequate when compared with the corresponding organization on the Japanese National Railways. We suggest that, to start with, the Rail- ways should initially aim at spending on this organization at least one per cent of their total working expenses, per year. [(Paragraphs 210-212)]

114. We suggest that the Research Council should fix a definite percentage of the funds allocated to research for development work, ranging from 30 to 50 per cent, which should not be permitted to be encroached on by testing work. [(Paragraph 213)]

115. We recommend that Railway officers, with special aptitude for designing and research, should be transferred to this organization. We also recommend that the age of retirement for experienced officers, having notable achievements to their credit, should be five years more than the normal age of superannuation. [Paragraph 214(a)

(i)]

116. We suggest that young officers should be encouraged to join the Research Organization permanently, and if they come on a tenure basis, the minimum period of their stay in the organization should not be less than five years. The rules should provide for their longer retention, if necessary, in the interests of research. [(Paragraph 214(a) (ii))]

117. The recruitment policy of the Railways for technical officers should make allowance for the requirements of the Research Organization It should be obligatory for Railway Administrations to spare officers selected by this organization and only in the most exceptional cases, should the transfer of such officers be refused, preferably after bringing this to the notice of the Railway Minister. [(Paragraph 214(a) (ii)]

118. We suggest the recruitment of eminent scientists and engineers, for which contacts should be maintained with universities, technical institutions and research centers and any procedural hurdles in the selection and appointment of suitable persons should be removed. In order to attract and retain such persons, the terms of their employment and their prospects should be made sufficiently attractive. [Paragraph 214 (b)]

119. We suggest for consideration the question of converting a certain percentage of posts of Senior Design Assistants into Class II posts, or placing them in a special class which, in due course, may take them to Class Il and, in exceptional cases, even to Class I service. [(Paragraph 215)]

120. We indicate the broad contents and duration of training to be given to technical officers and staff, both in India and abroad and suggest that tests should be held to see that trainees have properly utilized their opportunities. [(Paragraph 216)]

121. We suggest that post-graduate courses in Railway engineering be provided at one or two Universities and technical institutes where students may be awarded scholarships and fellowships for the investigation of some of the Railway problems of a fundamental nature. [(Paragraph 217)]

122. We suggest the creation of an adequate and effective liaison

organization, headed ed by a Deputy Director, who should be assisted by Inspectors, as necessary. This organization, in addition to its other duties, can be profitably employed for carrying out test checks on the quality of maintenance and the standards of manufacture of railway equipment on the Railways. This will make the Research Organization more fully aware of the problems of the Railways and thus lead to their quicker and more realistic solution. [(Paragraph 218)]

123. We suggest that the documentation section of the Research Organization should be suitably expanded. [(Paragraph 219)]
124. In order to develop, process and improve the designing and manufacture of equipment, we recommend progressive collaboration with private firms in India and in foreign countries which are supplying equipment to the Railways. [(Paragraph 220)]
125. We suggest that the Research Organization should also undertake research into various operations, like time and work studies of maintenance practices regarding the permanent way and in sheds and shops, as also on the effect of the environment on the efficiency of the staff etc. [(Paragraph 221)]
126. We suggest that there should be a precise works programme and an adequate complement of staff and equipment for its effective implementation, in order to enable the organization to deal with a reasonable number of problems successfully. [(Paragraph 222)]
127. We point out the need for planning discriminatingly to import occasionally modern equipment from advanced countries, with a view to keeping in touch with up-to-date ideas and techniques. [(Paragraph 222)]
128. We suggest that a review covering a period of three years should be submitted to the Central Board of Railway Research who should forward it, with their comments, for being placed before both Houses of Parliament. [(Paragraph 224)]
129. We recommend that an expert from one of the advanced countries may be associated with the Research Organization, and that the services of one or more experts from abroad should be obtained for association with the Research Council for the periodical review of the progress made by the Research organization. [(Paragraph 224)]

130. We consider that the greatest care and discrimination should be exercised in the selection of the head of the Research, Designs and Standards Organization; this should have precedence over other requirements of the Railways and suggest that the incumbent of this post should continue to hold office for a sufficiently long period to enable him to carry out in a satisfactory manner the programmes approved by the Research Council. [(Paragraph 225)]

131. We suggest that the Director-General of the Research, Designs and Standards Organization should be given the status and powers of an Additional Member of the Railway Board. [(Paragraph 225)]

132. We note the creditable performance of the Research, Designs and Standards Organization; and feel that the shortcomings pointed out by us are chiefly due to the limited facilities at its disposal. We recommend that those who show an exceptional flair and aptitude for this work should receive every encouragement and recognition from the Government. [(Paragraph 225)]

Safety Organisation on The Railways

133. We have examined the inspection notes of the Heads of Departments and consider that despite their heavy work, they should be able to devote more attention to the safety aspects of the working of the Rail ways and thus guide and instruct the Divisional officers in the technique of inspection and in drawing useful conclusions from inspections. [Paragraphs 227(i) and (ii)]

134. We consider the present machinery dealing with safety at the headquarters of each zone, inadequate in the context of the increased functions proposed by us and suggest its strengthening by putting it under a Deputy Chief Operating Superintendent who should exclusively deal with the problems of safety, detailed by us. This organization should carry out a periodical analysis of accidents with a view inter alia to locating any persistent trends or pattern of the causes of accidents, bringing out their relative position on the various Divisions etc. The results of the studies should be presented in an easily assimilable form and circulated widely up to the supervisors' level. [Paragraph 227 (iii)]

135. We suggest the formation, on every Railway, of a Safety Committee consisting of the Heads of Departments, with the

Deputy Chief Operating Superintendent (Safety) as er-officio Secretary, to review the accidents and the measures for their prevention. [Paragraph 227(iii)]

136. We consider it essential to provide an effective machinery at the Railway Board's level for coordinating the activities of the Zonal Safety Organizations, maintaining liaison with the Commissioner of Railway Safety and dealing with the problems of safety, as suggested by us. For this purpose, we recommend the creation of a Safety Organization, under an Additional Member, assisted by a Joint Director, in the Transportation Branch of the Railway Board. [(Paragraph 228)]

137. We also consider that the Member, Transportation, should be responsible for the working of the Efficiency Bureau in the Railway Board's office. [Paragraph 228]

138. We find that the Divisional Safety Officers have been saddled with certain miscellaneous duties which do not relate to safety. We suggest that they should be relieved of them. [Paragraph 229(i)]

139. We consider that inspecting officials themselves need training and instruction and should be provided, on all Railways, with manuals of station inspections. [Paragraph 229 (ii)]

140. We suggest that the results of the analysis of accidents, their causes, and types, for a sufficiently long period, and the conclusions reached, should be made available to the supervisors and even the staff online. [Paragraph 229 (ii)]

141. We find that the Traffic Inspectors are burdened with extensive jurisdictions and suggest that they should not normally be given charge of more than 20 to 25 stations, depending on local conditions, we also suggest rationalization of the categories of Inspectors, by a suitable amalgamation of their duties. [(Paragraph 229 (iv)]

142. We consider that the strength of Loco and Carriage & Wagon Inspectors should be determined on a rational basis. [Paragraph 229(iv)]

143. We suggest that the number of Signal Inspectors should be determined on the basis of the number of lever units to be maintained by them. [Paragraph 229 (iv)]

144. We consider that it is the immediate supervisor who should normally impart safety instructions to staff under him; the Safety Supervisors engaged in in the short-term programme, suggested by us in Part I of our Report, should be eventually absorbed in the permanent cadres. [Paragraph 229 (iv)]

145. There should be suitable machinery in each Division to watch and rectify the quality, quantity and the type of inspections carried out by the Inspectors. [Paragraph 229 (v)]

146. We suggest certain alterations and additions to the form and content of accident statistics, published by the Railway Board in its Annual Report. [Paragraph 230 (i)]

147. We suggest that the Railway Administrations should keep a special watch on, and maintain statistics of, technical accidents and also compile additional information regarding accidents at level crossings, as indicated by us. [Paragraph 230 (ii)]

148. We consider that all four-wheeler medical relief vans should be progressively replaced by bogie vehicles. [Paragraph 231 (ii)]

149. We suggest the completion of the provision of sidings with double ends for stabling the medical vans, within a year's time. [Paragraph 231 (ii)]

150. We suggest that detailed road maps should be kept in all control offices and in railway hospitals which should also be equipped with ambulance vans, on a programmed basis, to rush, whenever possible, medical aid by road. [Paragraph 231 (iii)]

151. We suggest that there should be ample provision of dehydrated and tinned foodstuff in relief trains. As on the British Railways, a kitchen car, with cooks, should also be provided on relief trains. [Paragraph 231 (iv)]

152. We suggest the provision of emergency lighting equipment in all passenger trains running at night and of searchlights with portable generators in relief trains which should also be equipped with portable telephones, a public address system, a push trolley, two dip lorries and overhead tanks to carry drinking water on all its bogles. [Paragraph 231 (v)]

153. We feel that the preservation of clues should not take precedence over mitigation of human suffering and suggest that the State

Governments should be approached to issue clear instructions to the police authorities in this respect. [Paragraph 231 (vi)]

154. We suggest consideration of the methods used on foreign Railways for the expeditious restoration of through communication after accidents, particularly on electrified sections. [Paragraph 231 (vi)]

155. We suggest that the Railway Board should devise a procedure to help ad hoc Claims Commissioners in making, within a period of six months, payments against claims for compensation to the victims of railway accidents or their dependents. [Paragraph 232]

Railway Inspectorate (now Commissioner Railway Safety)

156. We trace the evolution of the Railway Inspectorate, its constitution, and functions. [Paragraphs 233-234]

157. We find that most of the Government Inspectors did not attach much importance to their periodical and tour inspections of open lines and did not carry out their inspections even up to the prescribed limits during 1961-62 and 1962-63. We suggest that the importance of these Inspections, which lies principally in presenting a correct and independent appraisal of the state of safety on the Railways, should be effectively impressed on them. [Paragraph 235 (ii) (b)]

158. We find from a study of their inspection reports that, with a few exceptions, they were of a routine nature. Contrary to instructions, the observations recorded by them were not specific and seldom covered safety aspects. We consider that the Commissioner of Railway Safety should exercise checks on the quality and adequacy of the inspections carried out by the Government Inspectors. [Paragraph 235 (ii) (c)]

159. In order to allay public apprehension, we recommend that the Railway Inspectorate, as an independent body, should carry out thorough checks of track, rolling stock, and methods of operation, and also make inspections of the nature of 'Audit checks' of safety aspects of railway working. [Paragraph 235 (ii) (d)]

160. We recommend the creation of a Technical Wing, attached to the Commissioner of Railway Safety and consisting of four officers in the Junior Administrative grade, on deputation, on a tenure, from the Mechanical, Electrical (Traction. Signalling and

Telecommunications and Operating Departments the Railways. These officers will assist in carrying out inspections and Audit checks and help with the enquiries into accidents etc. [(Paragraph 235 (ii) (c)]

161. We suggest that members of the public should be normally permitted to be present at the enquiry to watch the proceedings and that representatives of the Railway Unions may be invited to give information on any point strictly relevant to the purpose of the enquiry. [Paragraph 235(iii) (b)]

162. We recommend that a statutory provision should be made to the effect that the evidence tendered by witnesses at the enquiry will not be admissible as evidence in a court of law. [Paragraph 235 (iii) (e)]

163. We recommend that reports of departmental enquiries held by the Railway officers into train accidents should be scrutinized by the Government Inspectors and that further action should be taken as indicated by us. [Paragraph 235 (iii) (d)]

164. We recommend that the Government Inspectors should also hold enquiries into some important train accidents, not resulting in casualties to passengers, especially in cases of derailment where the cause is reported to be obscure. [Paragraph 235 (iii) (d)]

165. The Commissioner of Railway Safety should also hold enquiries, at his discretion, into one or two major accidents. [(Paragraph 235 (iii) (d)]

166. We suggest that the recommendations of the Commissioner of Railway Safety should be incorporated in the published reports of the Government Inspectors' enquiries into railway accidents. [(Paragraph 235 (iii)(e)]

167. We consider that brief reports should be published for all accidents enquired into by the Railway Inspectorate and made available to the public. [Paragraph 235(iii)(e)]

168. We consider that the Railway Board is the most competent authority to certify the fitness of new types of locomotives and rolling stock for being placed on the line The Government in Inspectors should, therefore, be relieved of this function Similarly they should not require to sanction the movement of over dimensional consignments. for which the Railway Administrations should be made responsible. [(Paragraph 235 (iv)]

169. We suggest that the Annual Report of the Commissioner of Railway Safety should contain additional information, as detailed by us. It should be laid on the table of both the Houses of Parliament. [(Paragraph 236)]

170. We do not consider it either necessary or desirable, to transfer the powers relating to safety, vested by the Indian Railways Act, in the Railway Board, to another Ministry. [(Paragraph 237)]

171. Although there is a great deal to be said in favour of the Railway Inspectorate working under the railway minister but independent of the Railway Board, yet in view of public opinion in favour of its being under the Ministry of Transport and Communications, we refrain from making a positive recommendation and hope that the matter will be further considered by Parliament on the basis of our observations. [(Paragraph 238)]

172. We recommend that the Railway Inspectorate should be designated as "Commission of Railway Safety" The "Commissioner of Railway Safety" should continue to be known as such, but the "Additional Commissioner of Railway Safety" should be designated as "Joint Commissioner of Railway Safety". The four officers of the proposed Technical Wing should be designated as "Assistant Commissioners of Railway Safety." [(Paragraph 240)]

173. We recommend that the headquarters of the Commission of Railway Safety should be shifted to Lucknow, where the Research, Designs and Standards Organization is proposed to be located and which we consider to be the best alternative to New Delhi. [Paragraph 239 (ii)]

174. We consider that, when the Inspectorate is reorganized as recommended by us, the first incumbents of all the posts of Joint Commissioner of Railway Safety should be selected from among Chief Engineers or other specified Heads of Departments on the Railways. Their age of superannuation should be raised to 62 years. In case of shortage of such officers on the Railways, we suggest that retired officers may be employed on a tenure basis. We also suggest that the Leave Reserve Officer should be recruited from amongst the Senior Divisional Superintendents. [Paragraph 239 (iv)]

175. We consider that the powers and functions of the Commissioner of Railway Safety should be clearly defined and augmented, if necessary, he should have the same status and rank as those of a General

Manager, with an appropriate Secretarial rank. [Paragraph 239 (v)]

176. We urge the need for frequent consultations and contacts between the Commission of Railway Safety and the Railways with a view to achieving their common objective of ensuring continuous improvement in the standard of safety in railway operation We are of the view that. in respect of its recommendations, the Commission should rely on the thoroughness of its investigations and settle differences of opinion in personal discussions with Railway officials. [Paragraph 240]

177. We are of the view that unsettled differences of opinion on vital Issues between the Commission and the Railway Board should be settled at the Minister's level. [(Paragraph 240)]

178. We recommend that facilities should be provided by the Railway Board to the Commission to obtain from the Research, Designs and Standards Organization information on technical matters. Requests for the opinion of the Organization on any data should, however, continue to be channelled through the Railway Board. [Paragraph 240]

179. We have considered the suggestion for the constitution of an "Institute for Railway Safety Research" and a "Railway Safety Research Council", put forward by the Commissioner of Railway Safety and, for the reasons given by us, we find them impracticable. [Paragraph 241]

THE RAILWAY ACCIDENTS ENQUIRY COMMITTEE, 1968 PART I & II (SHRI K. N. WANCHOO COMMITTEE 1968)

30

In the later half of March 1968, two unfortunate railway accidents—one at Yalvigi on the Southern Railway on 19-03-1968 and the second at Bharwari on the Northern Railway on 30-03-1968—involving heavy casualties and damage to railway property took place in quick succession. The close sequence in which they followed each other greatly agitated the public mind. Immediately after the Yalvigi accident, the Press and Parliament had shown considerable concern and in response to it, a Commission of Inquiry presided over by a Judge of a High Court had been appointed under the Commission of Inquiry Act (1952) to determine the cause of the accident. The view was also expressed in Parliament that some radical measures were required to ensure a reasonable measure of safety in rail travel.

It was against this background that on 01-04-1968, while making a statement on the accident at Bharwari in Parliament, the Minister for Railways, Shri C. M. Poonacha, announced the setting up of a Committee under the Chairmanship of Shri K. N. Wanchoo, retired Chief Justice of India, to go into the question of railway accidents.

Two days later, through their Notification No. ERB-I/68CO1/46 dated 03-04-1968, the Government of India made the following announcement: —

"Following the two Railway accidents at Yalvigi and Bharwari on the 19th and 30th March 1968, the Minister for Railways announced in Parliament that a High-Power Committee would be appointed to look into the causes leading to accidents on the Indian Railways, with particular reference to the implementation of the recommendations of the Railway Accidents Committee of 1962, headed by Shri H. N. Kunzru.

1. The Government of India have accordingly decided to constitute a committee, to be known as the Railway Accidents Inquiry Committee 1968, consisting of the following: —
    a) Shri K. N. Wanchoo, retired Chief Justice of India-**Chairman**.
    b) Shri M. R. Masani, Member of Parliament-**Member**.
    c) Shri S.R. Vasavada, President pf National Federation of Indian Railwaymen-**Member**.
    d) Shri F.C. Badhwar, retired Chairman, Railway Board-**Member**.
    e) Shri P.B. Aibara, Commissioner of Railway Safety-**Member**.

30.1 Terms of Reference

2. The terms of reference of the Committee will be: —
    a) To review the position of accidents on the Indian Railways since the appointment of Railway Accidents Committee—**1962,** in the light of recommendations made by it and the implementation thereof.
    b) To suggest measures for further minimizing the accidents.
3. The Committee will endeavour to complete their work as early as possible.

2. On 11-04-1968, Shri K. D. Madan, an officer of the Operating Department of the Northern Railway, was appointed to function as the Secretary of the Committee. The necessary provision of ministerial and other staff for the Committee was made shortly thereafter.
3. **Line of approach**: The Railway Accidents Inquiry Committee (1968) (hereinafter referred to as the Committee) held their first

meeting on 29-04-1968 to chalk out their line of approach. It was decided that for the purpose of review of the position of accidents as required in item (i) of the Committee's terms of reference, a period of 5 years commencing from 1st April 1963 and ending on 31st March 1968 be taken. This, the Committee considered, would not only facilitate discernment of any patterns or trends in the incidence of railway accidents but would also show whether as a result of the impact of the implementation of the recommendations made by the Railway Accidents Committee, 1962 (hereinafter referred to as the Kunzru Committee), the curve or curves reflecting the incidence of accidents had been deflected in any way. It was also decided that notwithstanding the broader definition given by the Railway administration to the term 'railway accident' which includes a wide variety of occurrences including failures of engines, rolling stock, permanent way etc., not necessarily resulting in mishaps, the Committee, for the purpose of their study would confine their analysis mainly to the four principal categories of accidents, namely, collisions, derailments (including those caused by train wrecking), fires in trains and accidents at level crossings. Some other categories of accidents like averted collisions, breach of block rules and drivers passing signals at danger which though accidents only in a technical sense carry potential hazard would also be studied.

4. Since the terms of reference laid down in the Notification required of the Committee, in particular, to review the position of accidents in the light of recommendations made by the Kunzru Committee and their implementation, the Committee were also called upon to examine closely the action taken on the recommendations made by the Kunzru Committee so as to be able to render an appreciation of the implementation of these recommendations.
5. With this end in view, as a first step, statistical and analytical data on accidents in various categories and information on other cognate matters were called for from the Railway Administrations. For this purpose, about 70 proformas were prescribed by the Committee. Simultaneously, questionnaires were addressed to the Railway Administrations, the Commissioner and the Additional Commissioners of Railway Safety and the Research, Designs and

Standards Organization for furnishing information on specific issues. Communications were also addressed to the two organized bodies of railway men's trade unions, namely, the National Federation of Indian Railway men and the All-India Railwaymen's Federation, to the two associate bodies of Chambers of Commerce and Industry, namely, the Associated Chambers of Commerce and Industry, Calcutta, and the Federation of Indian Chambers of Commerce and Industry, New Delhi, to the Zonal Railway Users' Consultative Committees (which have among others, passengers' interests represented on them) requesting them to give to the Committee the benefit of any observations which they may like to make having a bearing on the terms of reference of the Committee. A public notice was also published in about 30 newspapers—both English and regional languages—having a wide circulation and given countrywide publicity requesting the general public to come forward and send their observations or suggestions on matters connected with the terms of reference of the Committee. The public notice evoked a good response, and a large number of letters were received reflecting wide-spread public concern in the matter of railway safety. In addition, a detailed appreciation was called for from the Railway Board of the action taken on each of the recommendations contained in the Kunzru Committee's Report. On the information furnished by the Railway Board in this behalf, further elucidation was sought and obtained.

6. **Decision to submit Part I of the Report**: The Committee, after due deliberation, considered that the two terms of reference set down for them were distinct from each other in character. The first of these terms, broadly speaking, required (a) a statistical appreciation of the trend of accidents since the setting up of the Kunzru Committee and (b) an appreciation of the action taken by the Government on the Kunzru Committee's recommendations and the Committee's evaluation in regard to these. The second term of reference, which is broader in character, required of the Committee to suggest further ways and means for minimizing the accidents. The Committee decided that the first term of reference may be covered in Part I of their Report.

7. The second part of the Committee's Report would be devoted to suggestions to minimize accidents further. These-suggestions would be crystallized in the light of discussions with senior railway officers—working and retired—visits to railway installations during the course of the tours of the Committee and their talks with railway men of different categories and with outsiders, and in the light of other ideas which may be thrown up in the course of their deliberations. It is possible that the Committee may find it necessary to amplify, in the second part of their Report, some, of the observations made here, in the light of further information and elucidation.

30.2 Summary of Observations and Recommendations

For the reader's convenience, we have summarised in the following paragraphs the observations and recommendations made by us in the various chapters of this Report. We would, however, reiterate that for a proper appreciation of what is given in the summary, it is necessary to go back to the observations in the main paragraphs which set out the background, the evidence and facts and figures on which these observations are based.

Introductory

1. Part I of our Report was devoted mainly to a review of the position of accidents on the Indian Railways since the appointment of the Kunzru Committee in the light of recommendations made by it and their implementation.
2. In this part of our Report, we have addressed ourselves to suggesting measures for further minimising accidents. (Para 1)
3. We consider that the record of safety of rail travel on the Indian Railways must be judged in the context of the task that the Railways are called upon to perform. Any sweeping generalisations which may be drawn from our observations on specific issues, itemised for the sake of clarity in the first, part of our Report or in this part, would be un-justified. (Para 2)
4. We do not wish our remarks to be taken to mean that nothing remains to be done to promote safety in rail travel. We feel that with increased axle loads, speeds and more intensive operation, the need for attention to the maintenance of track and rolling stock would be greater. The future may, therefore, necessitate a higher degree of safety precautions and consciousness than at present. The quest for safety in rail travel will, thus. have to be an unending one. (Para 3)
5. Notwithstanding the use of modern technological safety devices, we

believe that the steps which the Railway administration may take not only to instill a higher degree of safety consciousness in its men but also to raise the general level of morale and keep the sense of duty pitched at a high level will pay rich dividends. (Para 4)

6. Apart from direct causes of accidents as brought out in the accident inquiry reports, we have addressed ourselves to the more deep-rooted factors which even though largely latent do, in course of time, give rise to conditions which cumulatively have the effect of eroding whatever makes for organisational and individual efficiency; any drop in one or both of these assuredly makes an impact on the safety of rail travel. (Para 6)
7. We have gone into matters whose link with train operations though seemingly indirect is, nevertheless, in our view of a basic character, particularly the aspects concerning the human element as viewed from a wider perspective. (Para 6)
8. We are convinced that the extent to which the Railway administration is able to locate and remedy the factors,--whether latent or apparent, remote or direct—which give rise to failure of the human element, to that extent a greater measure of safety in rail travel would follow. (Para 6)
9. We wish to strike a note of caution against exaggerated notions of economy which on occasions are apt to assail the railways as accidents result not only in direct costs but in indirect costs also, and to these costs get added the sufferings of the victims of accidents and the loss of the fair name of the railways which cannot be reckoned in terms of money. (Para 7)

The human element

10. We have, in Part 1 of our Report, shown that a huge number of accidents is caused directly by failure of the human element, Even out of the remaining, a good number can be traced indirectly to the failure of staff to carry out properly their duties related to maintenance of track, engines, rolling stock or signals. The mechanical devices and safeguards which may be employed by the Railway administration in its various fields of operation have still to rely for their operation or maintenance on the human mind and hand. (Para 9)
11. We are of the view that unless the standards of service discipline are of a high order, the eventual result of corporate effort would be indifferent and in a field of work like railway operation it would be attended with hazard. (Para 10)
12. We are convinced that while the Railway administrations and their core of dedicated workers have striven hard to increase the measure of safety and to improve their performance generally, the position would have been

better and the level of safety and efficiency even higher but for the factors which have affected discipline adversely. (Para 13)

13. We think that the factors which generate indiscipline among the staff have also an effect on the morale of executives; in fact, whatever engenders one makes for erosion of the other. (Para 13)
14. While we recognise that the main function of trade unions is to protect the interests of the staff and strive for better working conditions for them, we feel that the unions have an equally vital role to play in inculcating duty-consciousness and a sense of discipline in the rank and file of the staff. We consider it necessary to emphasise the importance of the dual role which the trade unions are expected to perform and express the hope that this would receive due attention of the office bearers and members of the unions. (Para 18)
15. We consider that not only from the point of view of discipline among staff and the functioning of the administration but also of the workers themselves, it is advantageous that there should be only one recognised employees union on each Railway with a recognised federation at the apex. (Para 22)
16. We recommend to the Ministry of Railways to explore ways and means whereby recognition is given to only one trade union on each of the Railways. (Para 22)
17. We feel convinced that the present system of allowing outsiders as union office-bearers leaves scope for non-railwaymen with political leanings and alignments with different political parties to gain control over the trade unions and direct the movement more with the aim of furthering their political ends than in the interest of the trade union movement. (Para 25)
18. We wonder if the time has not come when the railwaymen themselves can competently manage the affairs of the unions and effectively represent their case in negotiations. If necessary, they can take the help of salaried persons on their staff and of paid advisers and consultants. But actual leadership including all office bearers should come from the railwaymen themselves. This process would be facilitated and accelerated if the Railway administrations create a sense of security among their employees who function as office-bearers or enter into negotiations with them. (Para 25)
19. We understand that the problem of outsiders as union office-bearers is under consideration in a wider context by the National Commission on Labour and we, therefore, desist from making any concrete

recommendations on this point. (Para 25)

20. We welcome the policy adopted both by the Railway administrations and the recognised unions on the Railways of not favouring recognition of sectional (category-wise) unions. (Para 26)

21.
   i. It is our view that staff in senior supervisory posts drawing gross emoluments of Rs. 500 per month or above should not be allowed to become members of recognised unions of rail-way workers.
   ii. For all such supervisory categories we favour one separate association on each Railway with a federation at the apex which should receive due recognition of the Railway administration.
   iii. It is desirable that some machinery in the nature of arbitration should be, instituted by which collective problems concerning such supervisory staff which cannot otherwise be resolved should he dealt with. (Paras 30 and 31)

22. We find that of the grievances which figured most among the cases of individuals sponsored by the trade unions in respect of station staff and of driving staff-the top three places are taken by
   i. payment of arrears of pay, allowances, etc.,
   ii. sanctioning of increments, and
   iii. confirmation or fixing of pay or seniority or promotion, in the order shown. We consider it doubly unfortunate since a properly managed Personnel Branch, even if it were not welfare oriented, ought certainly to be able to take care of these matters so that the staff do not have occasion to complain, much less feel the need of channelising these matters through the trade unions. (Para 36)

23. We are of the view that the role played by the Welfare Organisation in the matter of removal of genuine grievances of staff has evidently been ineffective. The Welfare Organisation has not succeeded in bringing contentment to the employees insofar as the redress of their individual grievances is concerned. (Para 38)

24. We welcome the working of some revitalised Welfare Bureaux in some of the divisions of the Railways. (Para 39)

25. We hope that the time will soon come when the staff all along the line feel that if they have some grievance or difficulty, it is the Welfare Inspector to whom they should address it. (Para 40)

26. We recommend to the authorities the imparting of such orientation training to the Welfare Inspectors as will enable them to accomplish what their functional designation implies. (Para 41)

27. We appeal to the Ministers that they should do all they can to insulate the officers within their charge from outside influence. We hope that the Minister of Railways would be equally anxious to sustain the morale of his officers and would set. precedents whereby outside intercessions are eliminated. (Para 46)
28. We consider it would be a healthy practice if the Minister of Railways were to lay on the table of both Houses of Parliament every quarter a statement giving the details about letters and representations received by him from Members of Parliament in the nature of intercessions on behalf of individual members of staff and indicating what, if any, action has been taken on them. (Para 47)
29. A more radical and fundamental method of eliminating political influence in such matters may be to convert the Railway Board into an autonomous statutory corporation as is the case in the United Kingdom. It is not, however, within the purview of this Committee to investigate into the pros and cons of this proposal and to pronounce on its desirability. (Para 48)
30. The functioning of the Vigilance Organisation and its role in its present form has engaged our attention. We cannot help observing that without any further loss of time, steps should be taken by the Government to undo the damage which has been done by the functioning of this organisation which it might have once been thought, would root out corruption but which instead is throttling the healthy organism of the Railways, we would suggest action along the following lines: -
    i. While nothing must be left undone to root out corruption in whichever quarter it may exist, it should be understood that this duty devolves squarely on the Railway administration itself and not on any organisation which has the semblance of an outside policing organisation. It equally devolves on the administration to protect honest and innocent officials from allegations by unscrupulous persons who may be nurturing grievances against their superiors or fellow workers.
    ii. No investigation should be taken in hand against any railway official, including a gazetted officer, without the concurrence of the Head of the branch or of the organisation corresponding to the status of the official against whom there is a complaint. While we would like to leave the procedure in this behalf to be settled by the Railway administration, we would as a broad guideline, suggest that for a class III employee other than a senior supervisor, the concurrence of

the Divisional Superintendent or an authority of an equivalent rank in the case of other than the divisional employees should be obtained. For investigations against a senior supervisor, the prior concurrence of the Head of the department concerned should ordinarily be taken. In respect of an officer working on a Railway. administration, the General Manager should be taken into confidence besides the concurrence of the Member concerned of the Railway Board. In seeking such concurrence, all the material available on the basis of which the case for investigation is sought to be made. It should be placed before the competent authority and if the latter after considering the material finds that there is no case for investigation, the matter should not be pursued further and the discretion so exercised should not ordinarily be questioned.

iii. While we, commend the directive that no notice must be taken of anonymous or pseudonymous complaints, we are of the view that the purpose behind this directive is set at naught by initiating investigations on 'source' information. We deprecate the practice of accepting such information. Such information should, except in extraordinary circumstances, not be given any credence. Only in very exceptional circumstances and that too when the authority competent to give concurrence for initiating investigation has personally satisfied himself as to the antecedents and motives of the informer may notice he taken of such information.

iv. In the Railway Board, the Directorate of Vigilance should be headed by a railwayman of considerable experience and proved integrity who should have the rank of a Director functioning directly under the Member Staff. We do not consider that there is any justification for the post of the Director General (Vigilance).

v. In the Vigilance organisation, both in the Railway-Board's office and in the Railway administrations, the lower officers and inspectors should all be railwaymen having excellent record and reputation for integrity and a flair for investigation. In our view, the police inspectors and officers who have little knowledge of railway working and who, in an organisation like the Railways would have problems of adjustment, do not have any utility in the Vigilance organisation.

vi. We welcome the assurance given to us by the representative of the Special Police Establishment that preventive checks not based on any specific complaints have been discontinued. We wish to record

that such checks do not serve any purpose and if these have been discontinued, these should not be revived. (Para 68)

31. We would suggest a self-imposed ordinance by the Central Vigilance Commission that only cases of officers in the Senior Administrative grade and above should be scrutinised by the Central Vigilance Commission. Cases of other officers should be left to be dealt with by the Ministry of Railways themselves. (Para 69)
32. In our view what is provided for in Article 311 of the Constitution is a time-honoured protection. We would, therefore, abstain from recommending that Article 311 of the Constitution be amended. (Para 91)
33. We do not see any reason why the penalties not provided for in Article 311 of the Constitution should be so treated in the Railway Servants Discipline and Appeal Rules. We would urge the Railway Board to take immediate action so that for the imposition of penalties other than those provided for in the Constitution, a summary and simplified procedure is adopted.
34. We reiterate that wherever there is scope for eliminating delays in the processing of cases of disciplinary action in departmental offices, such delays should be eliminated and the procedure for watching the progress of such cases in departmental offices streamlined. (Para 93)
35. It occurs to us that the disciplinary inquiry can, with advantage, be conducted by special inquiry officers trained and deputed exclusively for this purpose. These officers should form a part of the Personnel Branch and should be chosen with great care so that they have a good knowledge of the Discipline and Appeal Rules and where possible also some knowledge of law as well as legal procedures. (Para 95)
36. We are of the view that senior supervisors should be recognised as junior members of management. With a view to restoring the position and authority of senior supervisors and strengthening the measure and quality of their supervision over the working of staff, we offer the following suggestions: -
    i. It is desirable that senior supervisors are always consulted in regard to the promotions and transfers of staff in their charge.
    ii. The number of grades of senior supervisors should be reduced. As far as possible, most of the grades of senior supervisors should be selection grades. They should be so devised that the top of one grade is well below the starting point of the next grade so that when a .person is promoted to the next grade, there is a substantial rise in emoluments. The present grades were last considered by the Second

Pay Commission a decade ago. Though a wholesale review of the grades of senior supervisors is a matter to be dealt with by a future pay commission, as an interim measure, we would like to suggest that the topmost grade of senior supervisors should be appropriately raised keeping in view the present-day conditions as also the scales of senior supervisors in comparable posts elsewhere.

iii. Wherever there is a large concentration of staff working under a senior supervisor, the post should be upgraded to gazetted status, Class II. We would leave it to the Railway Board to work out the implications of this scheme in consultation with the Railway administrations. As a broad guideline, we suggest that wherever there is a concentration of say 300 to 500 men, the status of supervisors should be raised to Class II. We would, however, stress that special care should be taken in selecting the right type of men whenever it is decided to upgrade the posts of senior supervisors to Class II category. It would in our view be advisable to retain the present designations. If at all any modification is called for, we recommend that for the sake of uniformity the upgrading posts may be redesignated as Yard Superintendent, Shop Superintendent, Loco Superintendent, Station Superintendent, etc.

iv. The most constructive step, in fortifying the self-confidence of senior supervisors and discipline among staff would, in our view, be to create conditions whereby it becomes known right down the line that the action taken by the supervisors. on the spot will ordinarily receive the support of the administration. (Para 105)

37.

i. It must be appreciated that reservation of posts in favour of a community or a group of people must not be at the cost of overall efficiency of the administration.

ii. At the stage of initial recruitment there is no objection to reservation of quotas for scheduled castes and scheduled tribes. At the promotion stage, however, such reservation can give rise to a feeling of inequity among the staff who have already put in several years of service.

iii. We consider that the Government should now review the question of reservation of quotas for, and the weightage given to, scheduled castes and scheduled tribes at the promotion stage in the context of the present-day conditions and in the light of the evidence referred to by us in this matter. (Para 109 & 110)

38. We recognise that if a vast organisation like the Railways is to function efficiently, it must have in its superior cadres' men of the best calibre available. Obviously, the objective is unlikely to be achieved unless service conditions are such as to attract talented voting persons. (Para 118)

39.

i. We realise that it is not our function to spell out the details of the proposals for improving the pay stiles and prospects of officers, but we are anxious that the general feeling of discontent should be cleared up and the cadre structure of railway officers should he so recast that from the point of view of prospects, the best talent is attracted to the Railway services.

ii. We understand that the Administrative Reforms Commission went into this matter in considerable detail and have made certain recommendations. We have no doubt that the Government will consider these recommendations closely, appreciating the need for urgent action, we would, on our part, urge them to devote their attention to this problem without loss of time. (Para 119)

40. We find that there is a general awareness in the Railways of the problem of officer-staff and supervisor-staff ratios and the inadequacy of the present ratios. We would like to leave it to the Railway Board and the Railway administrations to work out after proper scientific study the appropriate ratios between officers and the staff. We think that to improve the ratio, the matter would have to be tackled from both ends, that is, to strengthen the number of officers and supervisors wherever required on the one hand and to make suitable adjustment in the number of men in the various wings on the other. (Para 123)

41. The present set-up on the Railways has no doubt stood the test of time but in the present situation with the increasing tempo of traffic, increase in manpower and complexity of management problems, a time has come when serious thought should be given to streamline the command structure on the Railways to deal with the challenges of the present and the future. One way in which this may be accomplished is for the organisational structure to be subjected to an expert study. (Para 124)

42. We refer to the various reasons adduced for increase in unproductive paperwork. We are aware that this state of affairs is not peculiar to the Railways and also that the reasons are hardly likely to lend themselves to an easy solution. But we consider that consultancy in the matter of office procedures as also in other fields may open up the management to fresh

and useful ideas. (Paras 125 and 127)

43. We suggest that the Railway Board and the Railway administrations should investigate whether any further devolution of authority and delegation of powers would not be conducive to a reduction in the volume of correspondence and paperwork. We would, however, strike a note of caution that any delegation of powers can have utility only if the authority to whom the power is delegated is allowed to exercise the power and obviously it will be rendered ineffective if distrust in the man on the spot continues to prevail. (Para 128)

44.

i. We consider that in a vast organisation like the Railways which employs more than a million workers, labour science research would not be a mere refinement or a needless sophistry but an organ of considerable practical utility.

ii. We find that even with the highly limited objectives which the Psycho-technical Cell in the Railway Board has set for itself, the progress which it has made so far has been insignificant.

iii. We consider that the scope of such studies should be enlarged so that it is not confined merely to building up of some aptitude tests but encompasses the broader problems of the socio-psychological make-up of the railway worker and of human engineering which have particular reference to rational safe working on the railways.

iv. We commend for the consideration of the Railway Board that they ascertain from the Railway Labour Science Research Institute on the Japanese National Railways and from similar institutes which the railway systems in other advanced countries may have established, the fields of investigation which they undertake, and the techniques adopted and there-after drawing up an integrated programme of socio-psychological study and research.

v. It occurs to us that the Universities and other institutes and foundations in the country engaged in pursuits of this nature may be in a position to aid the railways in such studies. (Para 131)

Training of staff

45. We found the arrangements for general-purpose training of staff generally adequate except for a few isolated instances of shortcomings in the facilities for training like inadequacy of hostel accommodation at the Zonal Training Schools at Alipurduar and Tiruchchirapalli, and non-supply of accident enquiry reports of the Additional Commissioners of Railway Safety to Zonal Training Schools. It was also indicated to us that

there was ample scope for intensifying the training of drivers, train examiners, trade apprentices, etc. at Jamalpur.

46. We were struck by the absence of a Zonal Training School on the South-Central Railway. We consider it essential that the setting up of a Zonal Training School and the creation of training facilities on the South-Central Railway is not delayed further. (Para 135)
47. We consider that with the introduction of modern highly sophisticated equipment in various fields of railway operation, it has become imperative that the staff entrusted with the responsibility of handling, operation and maintenance of the equipment are imparted adequate and intensive training. (Para 136)
48. We are of the view that an approach to training which aims at leaving the trainee to his own resources is neither systematic nor scientific and we hope that the Railways would shed their complacency regarding the present practice of imparting indifferent training to electrical signal maintainers. (Para 139)
49. We strongly urge the setting up of a well-equipped training centre on each Railway for the training of electrical signal maintainers needed for the maintenance of modern signalling equipment. These centres should be adequately equipped with the working models of modern signalling installations and lessons should be given on basic techniques, installation and maintenance. Curricula should be framed for both initial and refresher training. `
50. We consider that the question of recruitment, training and grades of signalling staff calls for an urgent decision and would be in the interest of safety in operation which modern signalling equipment aims at providing. (Para 141)
51. We suggest that the panel operators to be employed for operating route relay installations, centralised traffic control etc. should be trained in the centres set up for training of signal engineering staff. (Para 142)
52. We feel that before panel operators are employed on the operation of modern signalling equipment, competency certificates should be issued to them by authorised officers of operating and signalling departments jointly after proper test. (Para 142)
53. It is suggested that mechanical and electrical cadres of signalling staff should be combined and integrated into a single cadre, this step would, in our view, result in closer inspection and better maintenance of signalling equipment.
54. We consider that the implementation of the following suggestions made

to us would be a step in the right direction:

i. A centralised training school should be set up to train supervisory staff of all Railways in inspection and maintenance of electric rolling stock and traction equipment on the lines of the Signal and Telecommunication School at Secunderabad.

ii. Each Railway having electric traction should have a school for training of artisan staff and for giving them refresher training. This school should also cater for the training of staff employed for the maintenance of General Electric and train lighting services. (Para 145)

55. We suggest that the Railways should create adequate facilities in their System Technical, Schools or alternatively in schools attached to the diesel locomotive sheds for imparting proper training to the staff employed on the maintenance of diesel locomotives. (Para 146)

56.

i. Though several Railways have introduced the pattern of training of diesel and electric drivers through training in simulation cabs, we feel that a greater degree of uniformity in this important 'conversion training' is necessary. Detailed curricula of training under Indian conditions should, in our view, be drawn up after a careful study.

ii. We commend to the Railways the suggestion that the techniques adopted for training the drivers for diesel and electric locomotives should be on lines similar to those employed for training of aircraft pilots. in our view, simulation training should be organised with great care if a crash programme of converting steam locomotive drivers into diesel, or electric locomotive drivers is to be gone through.

iii. We consider that the driving staff for diesel and electric locomotives should have an adequate educational and technical background. Where they have to be selected from amongst steam locomotive drivers, they must be screened carefully and considerations of seniority etc. should not allowed to come in the proper selection of men. (Paras 147 to 150)

57. We suggest that the Railways should keep a special watch on the nature of lapses on the part of the diesel and electric locomotive drivers which result in accidents as these may be useful pointers to the shortcomings in their training. (Para 151)

58. We are of the view that the aptitude tests which have been evolved or are in the process of being evolved by the Psycho-Technical Cell should, in the first instance, be applied to the categories of electric and diesel

locomotive drivers before selection or recruitment. (Para 151)

59. We stress that the success of mechanised inspection and maintenance of track would depend on the availability of suitable personnel for maintaining and handling the equipment no less than on the equipment itself. (Para 152)

60. It would, in our view, be advantageous if an integrated programme which provides intensive training to the staff in mechanised maintenance and inspection of track both in the works of the firm manufacturing the machines as also in the field is evolved. (Para 153)

61.

i. We agree that a scientific approach should he inculcated in staff dealing with long-welded rails through initial training and frequent refresher course. This, in our view, should also hold true in case of staff deputed for maintenance of track by measured shovel packing.

ii. We suggest that necessary facilities should be built up on each Railway and, as a first step, instructors for these jobs should he trained by the RDSO or at a suitable centralised training centre. (Para 154)

62. We feel that the setting up of a school for the training of staff in the use of ultrasonic flaw detectors should receive high priority. (Para 155)

63.

i. We feel that necessary facilities for imparting training in scientific methods of materials management will have to he created on the Railways or in a centralised institution.

ii. We suggest that the possibility of making use of the Indian Railways School of Electrical and Mechanical Engineering, Jamalpur or other similar institutions or of developing alternative facilities for training of stores personnel he examined.

64. We consider it essential that training in service should be intensive, regular and should be more job-oriented than theoretical as is the case at present. (Para 158)

65. We emphasise the need for the proper training of inspectors and other supervisors since ultimately the interpretation of what the administration requires its workers to do rests in the hands of these men who are in direct contact with the workers. On the quality of these men depends not only the image of the administration in the eyes of the workers but also the quality of output which would ultimately emerge. (Para 160)

66. It is of vital importance that specialised courses are arranged for inspectors and supervisors both to develop their outlook and to make

them professionally more competent. Indeed, this matter is so important in our view that it should receive the attention of, and may be watched by, the General Managers themselves. We have no doubt that those who undergo such specialised courses would emerge as better inspectors and better supervisors. (Para 160)

67. We understand that arrangements were made for conducting a centralised course in supervision and management in the Zonal Training School at Chandausi. Judging from the fact that in the last four or five years only four courses were held, it is doubtful if the matter is receiving the attention which it deserves. We are also doubtful if the facilities and the calibre of instructors at Chandausi are such as to make it possible to orient the course with an all-India outlook. (Para 161)

68. We suggest that refresher training of senior supervisors belonging to civil engineering, transportation and mechanical engineering departments should, like those of the signal engineering department, be arranged at the respective all-India training centres at Poona, Baroda and Jamalpur. Specialised courses of three to four weeks duration organised at regular intervals should make it possible for all inspectors and supervisors to be trained and oriented reasonably adequately within a short span of time. If the existing facilities at these institutions are inadequate, it would be well to augment them suitably. (Para 162)

69. The following suggestions were put forward in evidence which merit consideration: -

i. An experienced officer should be specially selected and put in-charge of the probationary officers when they come on the open line to pick up the actual work, they have to do so that they are not left to their own resources to pick up what they can. There should be a whole-time training officer deputed for the purpose. We understand that a scheme has been started for probationary transportation officers at Asansol where young trainee officers receive field training under the guidance of an experienced whole-time officer. We welcome this step and urge that similar steps should be taken for trainee officers of other departments.

ii. Senior seasoned officers should be deputed to go as roving instructors. They should spend some time with the officers, even up to the Divisional Superintendent's level, and guide them in their problems as friends rather than as critics.

iii. The officers and supervisors of technical departments should be so trained as to receive specialised training in particular trades while

acquiring a broad knowledge of railway working in other fields. (Para 163)

70. We consider that a young officer is an asset on whom no investment is too heavy to make him professionally competent and a good manager of men. (Para 164)

Other staff matters

71.

i. We are of the view that the conditions which brought about the setting up of the Railway Service Commissions do not exist any longer.

ii. We suggest that recruitment of staff in all mass categories and semi-mass categories should be left to the Railway administration and the recruitment should be decentralised to be made at the divisional level.

iii. We consider that it will be adequate if a committee of two officers is appointed by the Divisional Superintendent to make the recruitment of staff in various categories at suitable intervals,

iv. We further suggest that categories of staff other than mass categories and those for which either the minimum qualification is a university degree or a technical degree or diploma or which are otherwise specialised as for example, nurses, schoolteachers, printing press staff, etc. may continue to he recruited through the Railway Service Commissions. (Para 170)

72.

i. We consider that for staff engaged in the operation and maintenance of diesel and electric locomotives, modern signalling equipment, tie-tamping machines, complicated hydro-electric and electrical equipment in the workshops etc. a good basic education and certain minimum technical qualifications are essential so that the staff who are entrusted with the responsibility of operation and maintenance of modern equipment are not raw and uninitiated hands but have an intelligent and effective grasp of the equipment they handle.

ii. We suggest to the Railway Board and Railway administrations to evolve the minimum basic qualifications for each of these categories. We have no doubt that in the present conditions, there would be no dearth of men having the requisite qualifications. (Paras 172 to 174)

73.

i. In our view, the essential staff who should receive preference in the allotment of houses should be such personnel as are liable to be

called for duty at any time at short 'notice or at odd hours and but for whom train running would be immediately hampered.

ii. Considering that the available accommodation is inadequate to house even the more essential categories of staff and that it would obviously take a long time to build new quarters in significant number, we would, first and foremost, suggest that the Railway Board should bring about uniformity in the classification of staff as essential and non-essential.

iii. Since even among the essential categories, priorities may be different and since it may not be politic to deprive non-essential categories of housing accommodation altogether, we suggest that a priority schedule may be prescribed in more or less the same manner as a priority schedule for allotment of wagons.

iv. The first priority in housing should go to the running staff and the second priority to train passing staff like station masters, switchmen, cabinmen, shunting jamadars etc. Signal maintainers who are likely to be called at night may also be included in the latter group. The policy in regard to building of new quarters and their allotment should be based on the priority schedule.

v. Of the existing accommodation, as a rule, all quarters allocated for essential staff should, on vacation, be allotted to essential staff keeping in view the priority schedule. Of the other quarters falling vacant, 50 per cent should be allotted to the essential staff so that a progressively higher percentage of essential staff is housed in accordance with the priority schedule laid down. (Paras 179 and 183)

74. It has been suggested that to the extent money is spent on housing of staff, the Railway administration should get relief from, payment, of interest on capital. In this manner, it may be possible to accelerate the rate of building of quarters substantially and house the staff within a few years. In our view, there is considerable strength in this plea, and we would urge the Government to give this matter their closest consideration. (Para 184)

75.

i. We would suggest that the work of signal maintainers should be properly job-analysed and if the nature and quantum of work is such that- they should be put on rosters of 8 hours or 12 hours, steps may be taken. accordingly.

ii. Wherever the position is such that a signal maintainer who may have

been working during the day is often required to attend to failures during night also, a more permanent solution of the problem would have to he found since we have no doubt that in days to come, demands on the time of signal maintainers would increase. (Para 187)

76. We urge that vigorous steps should be taken to ensure that 12 hours running duty is ordinarily the limit and that cases of running duty exceeding 12 hours are brought down further and are an exception rather than a rule. (Para 191)

77. It was observed by the National Federation of Indian Railwaymen that under the hours of employment regulations, a continuous worker was required to perform 8 hours duty a day, but for payment of overtime the basis of 54 hours a week and 231 hours in a month was adopted. We think that the trade unions would already have brought up this matter before the Railway administrations and the Railway Board. We, therefore, leave it to the Railway Board to examine the contention of the Federation. (Para 193)

77a

i. We are unable to see the merit of the arrangement under which the assistant station master at stations manned by one station master and one assistant station master is continually on night duty for months and sometimes years. We urge the Railway administrations to go into this matter closely and find a satisfactory solution.

ii. In the absence of any other alternative, we are of the view that it may be possible to re-roster the duty shifts of the assistant station master and the station master so that the shifts change at midnight and 12.00 hours noon, the assistant station masters coming on duty at midnight.

iii. On sections where traffic is very light and where there are such stations, the Railway administrations may also examine the possibility of scheduling the trains in a manner that the station is closed during the period say from 22.00 to 04.00 hours so that the assistant station master is not on duty right through the night as a permanent measure. (Para 200)

78.

i. We urge that the yardsticks prescribed for the provision of amenities in the running rooms should be rigidly applied in order to ensure that adequate facilities are available for the comfort of the running staff.

ii. It is important from the point of view of safety of train operation that running staff in the categories of drivers, firemen and guards should

not in any circumstance he deprived of adequate rest at the end of their journey. The practice of travelling ticket examiners occupying beds in the running rooms, either singly or in squads, should be stopped. We would urge that wherever a complaint of this nature exists there should be separate arrangements for accommodation of travelling ticket examiners, conductors, etc. (Paras 202 and 203)

79.

i. We emphasise that when a decision is taken to provide uniforms to certain categories of staff, non-supply or irregular supply of uniforms thereafter is a source of needless discontent and frustration in the staff.
ii. There were several complaints to the effect that the uniforms supplied were ill-fitting. An ill-fitting uniform is a stigma on the management. We have a feeling that not much thought is given to this matter. We do not see why the railway or its suppliers, should. not find it possible to supply to each employee a uniform which fits him more or less to size.
iii. We are also of the view that categories of staff whose work is entirely outdoor may be provided with raincoats. Overcoats may also be provided to staff in the categories of shunting jamadars and gangmen where the need for providing these seems justified. (Paras 206 and 207)

Rules, Rule Books and Manuals

80.

i. We would welcome a revised set of rules which provide for the technological changes that have taken place in recent years and suit the requirements of the growing system and from which all the outdated rules have been weeded out.
ii. We recognise that with the weeding out of superfluous and redundant rules and cutting out of deadwood, renumbering of rules would he inescapable to maintain continuity. If, however, some way can be found to retain the old numbers for at least the more important rules like those pertaining to giving permission to approach, taking off of signals, etc. it would certainly impose a much lighter burden and the staff than if they are faced with a set of rules in which there is no shred of similarity.
iii. We realise that the work of revision of rules has already gone sufficiently ahead. We, therefore, leave it to the Railway Board to see to what extent the general arrangement of this basic vocabulary of staff concerned with train running can be retained. (Paras 210 to 213)

81.

i. In our view, the justification for publication of the statutory rules and codes in bilingual form exists only when they are required for reference

but when a rule book is required to form the personal equipment of the staff, insistence on its being bilingual is ill-conceived.

ii. We suggest that Rule Books intended to be for the personal use of staff should be printed in English, Hindi or in the regional language as separate editions and the staff may be supplied these books according to their requirements. (Para 215)

82.

i. We recommend that arrangements may be made for the compilation of unified manuals on mechanical engineering and electrical engineering applicable to all the Railways.

ii. We consider it necessary that efforts are made to see that there is as wide a ground of agreement among the Railways as possible in regard to the practices and procedures proposed to be unified and incorporated into the manuals. (Para 216)

83.

i. We have seen the handbooks brought out by the Railway Board in recent years for different categories of staff, viz., station master's and assistant station masters, guards, switchmen and cabinmen, levermen and pointsmen, gatemen, yard staff and permanent way staff. These hand-books appear to us useful and interesting.

ii. We recommend that similar handbooks should be brought out for the use of drivers, train examiners, route relay interlocking maintainers and panel operators, centralised traffic control maintainers and panel operators, staff concerned with maintenance and operation of diesel and electric locomotives, train lighting staff, etc. (Paras 217 and 218)

Permanent Way

84. We consider that for providing a modernised track structure 60 Kg. rails should be laid not only on sections carrying more than 20 gross million tonnes traffic but also on other trunk routes where the density of traffic may not have reached that level but may be rapidly increasing. (Para 221)

85. The length of track so far laid with long welded rails on the Indian Railways is not a significant achievement. We hope that adequate and timely action will be taken so that the Indian Railways go in for long welded rails extensively. (Paras 226 and 228)

86. We reiterate the need. for a firm and long-term integrated plan for the procurement of concrete sleepers as well as matching elastic fastenings so that the plan for Modernisation-of track-does not suffer on this account. (Para 229)

87. We consider it important to stress that unless adequate steps are taken to

ensure that the manufacturers of elastic fastenings fulfil their commitment, it may not be possible to put the prestressed concrete sleepers to use. A situation in which elastic fastenings lag behind the supply of concrete sleepers or vice-versa would be indicative of inadequate planning and may result in infructuous expenditure. (Para 231)

88. During the course of inspections carried out on short lengths of track on some of the Railways, we found that-
    i. Often sleepers were out of square, keys of steel-trough sleepers were driven rather indiscriminately, sleeper spacings were not according to drawings, some rail joints had nearly run on to joint sleepers due to creep, and correct templates had not been used, the spiking being anything but trapezoidal.
    ii. the work of providing guard rails on, girder bridges on some small spans of prestressed cement concrete girders had yet to be completed. Instead, guard rails had been provided on earth cushioned arch and flattop bridges and culverts which, in our view, serve no purpose. Nor were the guard rails fixed according to the instructions issued by the Railway Board. Walk-ways made out of unserviceable sheets had not been provided on all the girder bridges; and
    iii. Gate lamps were without making arrangements. The road approaches were steeper than the limiting grade of 1 in 20 at 'C' Class level crossings. The discs fixed to gate shutters were not painted bright red and the catches and stops for, gate shutters were ineffective. (Paras 238 to 241)

89. Even though these observations are limited in character, it is evident that a lot needs to be done to improve the general standard of maintenance of track. (Para 242)

90. It is necessary that the staff entrusted with the maintenance of the track are enjoined to adhere to the instructions laid down if the state of the track is to improve. We also consider that conditions have to he created to cope with the present and future trends of heavier train loads and heavier rolling stock running at higher speeds. (Para 242)

91. In our view, the programme of track maintenance round the rear should aim at the following: —
    i. The sequence of track maintenance operations should be arranged according to the climatic periods so as to obtain the best results.
    ii. A reasonable turn-over per unit labour for each specific track maintenance operation should be ensured. Scientific work studies of

the various operations would, in our opinion, yield useful results. (Para 242)

92. We suggest that the mechanics of 'renaissance' in track maintenance as enunciated by the South-Eastern Railway be tried over some sections in order to get a correct appraisal of its value and the results placed before the Track Standards Committee. (Para 244)

93.

i. We consider that the screening of ballast between two sleepers should be done at every quarter of a kilometre taking care that the cores tinder the sleepers are not disturbed. The results should then he plotted on a diagram showing the clean stone ballast content in the track.
ii. The ballast diagrams should be revised one in five years or so.
iii. The engineers should test check the requirements of ballast by permanent way' inspectors on the basis of ballast. diagrams. (Para 245)

94. We suggest that wherever the content of clean ballast falls below 5 per cent in the track complete re-ballasting should he carried out. (Para 246)

95. We suggest that the percentage of unserviceable sleepers in the track should be reduced to the barest minimum. Eventually, any sleeper that is considered spike-killed or otherwise unserviceable should be promptly renewed. (Para 247)

96. There appears to be need for having a uniform conception of when a bridge is to be treated as distressed on condition basis or on hydrological considerations. (Para 248)

97. We urge that bridges considered distressed should be speedily rehabilitated on a programmed basis, a higher priority being given to structures which require to be rebuilt on age-cum-condition basis. (Para 249)

98. We reiterate the factors which should be the basis for determining gang strengths:—

i. Optimum standard of maintenance for each classification of track based on the maximum speed and traffic density.
ii. schedule of work 'round-the-year' for the required optimum standard of track maintenance.
iii. assessment of the number of man-days, based on average out-turn of work for each operation per man-day, to conform to the specified 'round-the-year' schedule.
iv. additional strength required to cover such factors as require extra attention over and above the normal; and
v. the optimum length over which a given gang strength. can carry out

effectively and without default every track maintenance operation. (Para 250)

99. We suggest that the Track Standards Committee should go into the matter of gang strengths and evolve a system of basic strength units according to track classification. These basic strength units may be augmented by co-efficient based on local characteristics of various sections of the Railways. The Railway Board should be guided by advice of the Track Standards Committee. We suggest that while evolving the basic strength of a gang, the working and living conditions of gangmen should not be ignored. (Paras 251 and 252)

100. We suggest that the Railway Board may consider the question of procurement of an adequate number of curve correctors so that an instrument is available for each division on the Railways. (Para 256)

101. After accurate reconditioning of each curve with special emphasis on the transitional approaches, curve alignment registers should be maintained showing therein the versine and superelevation at each station. (Para 257)

102. The 'stations' should be marked in white paint on the inner side of the outer rail and the superelevation on the inner web of the inner rail. (Para 257)

103. General Rule 90 prescribes a speed restriction of 16 kmph. on turnouts. The Rule, as it stands, makes no distinction between the various gauges nor does it make any reference to the angle of crossing. the track structure or the type of locomotive. These are matters which require considerable study and research to ascertain the stage at which dangerous conditions are liable to occur and to lay down limits of safe speed. We consider that General Rule 90 should be more specific and should be revised in the light of such study and research. (Paras 258 and 259)

104. We consider that small and inexpensive devices like a magnifying glass as well as a mirror can be provided for the use of gangs for detecting flaws in. rails wherever rail failures are frequent. (Para 264)

105. We consider that ultrasonic rail flaw detectors are essential for detecting rail flaws and would urge that an adequate number of these are made available for use on Railways. Annual testing by ultrasonic rail Raw detectors would, in our view, provide an effective practical check though more frequent testing should be carried out where track conditions so warrant. (Para 268)

106. We suggest that from now on research and development of a self-propelled ultrasonic rail inspection car should be taken in hand so that before long each zonal Railway has one for use on its system. (Para 269)

107. We suggest that each case of rail failure, as it occurs, should receive close attention of the administration by way of chemical analysis, investigation of the previous history of failures of rails of the same type and age and other cognate factors. (Para 271)

108. We note the decision of the Railway Board to extend the method of measured shovel packing in the light of experience gained but would like to point out that if a section of the track is subjected to mechanised maintenance in the first instance, its subsequent maintenance by measured shovel packing is more satisfactory and lasts longer. We would like the Railway Board to bear this in mind while planning for extending the use of measured shovel packing. (Para 275)

109. In regard to the general adoption of directed track maintenance, we consider that: —

i. It is an essential prerequisite of directed track maintenance that suitable means of transport should be available to convey gang-men and their equipment to and from the site of work.

ii. the benefit from concentration of effort over a selected length of a few miles of track which directed track maintenance involves has to be carefully weighed against the disadvantage due to the withdrawing of gangmen and their supervisors on many other sections of the track to form a part of the scheme and the resultant longer intervals between inspections and slackening of supervision; and

iii. in respect of optimum gang length, a four-mile length of single line has, for some years, been a limit; conditions today, if anything, indicate the necessity for shorter rather than longer lengths for inspection and supervision to be effective. (Paras 278 and 279)

110.

i. At present, the Indian Railways have only a limited number of 'on track' mechanical tamping machines and the indigenous capacity for their manufacture is unlikely to be adequate in the years to come to meet the requirements of Railways if they were to adopt mechanised maintenance of track extensively.

ii. We feel that the factor of foreign exchange component in the cost of mechanical tie tamping machines should not deter the Indian Railways front working out a programme for switching over to modern methods of track maintenance on its trunk routes and main lines.

iii. The programme should take into consideration the economics as well

as the safety aspect of mechanised maintenance and of other modern means of maintenance of track so that, an integrated plan is worked out and the actual effect of modernisation is felt in the next few years.

iv. Clean stone ballast for an adequate depth below the sleeper is a prerequisite for the working of an automotive tie tamper. This condition obtains on some sections of the trunk routes but, by and large on the main and branch lines the mixture of 'muck' with stone ballast is considerable. We feel that it will take some time before all sections are made fit for mechanised maintenance.

v. The use of automotive tie-tampers will also involve revised spacing of joint sleepers.

vi. A concomitant of mechanised maintenance is the availability of traffic blocks on busy sections so that automotive tie tamping machines can be put to optimum use. The train timetables on such sections should he framed in a manner that a block of time of about four hours can without difficulty be allotted for mechanised maintenance of track and for mailmen. lime of other equipment. (Paras 280 to 282)

111.

i. In our view, no less important than the maintenance of track is the inspection of the track by modern methods.

ii. We had, in Part I of our Report, expressed concern over the delay in the manufacture of track recording cars. We feel that if the Government are unable to manufacture these test cars within a reasonable time, they should not hesitate to obtain them from elsewhere.

iii. We consider it necessary that improvements should be affected to enable the track recording car to record all track irregularities at higher speeds accurately.

iv. We are of the view that Hallade track recorder is a useful instrument for testing the riding qualities of the track at high speeds.

v. We urge that steps should be taken to acquire track recorders in adequate number so that each division has one to itself.

vi. The divisional officers and staff should be encouraged to use these instruments intensively and should be trained in the evaluation of the results recorded by the instruments. (Paras 283 to 283)

112. We leave it to the Railway administrations to see if the special reports submitted by the permanent way inspectors to the divisional officers serve the purpose of giving the latter a fair idea of the section and of their difficulties; if not, it might be useful to revive the six-monthly report, if

necessary, in an abridged form. (Para 286)

113.

i. We are of the view that in all cases permanent way inspectors and signal inspectors should be relieved of their stores charge and should be held responsible only for the imprest issued to and required by them for their day-to-day work.

ii. Where a permanent way inspector and a signal inspector are both headquartered at the same station, the person entrusted with the maintenance of permanent way stores can be concurrently responsible for signalling stores. At other places, separate arrangements may be made. (Para 291)

Level Crossings

114. We reiterate what we had said in Part I of our Report that a census every five years is necessary to determine whether an unmanned level crossing is to be manned or a manned level crossing is to be upgraded. (Paras 292 and 293)

115.

i. We consider that norms should be laid down for the purpose of deciding whether a case exists for manning an unmanned level crossing or upgrading a manned level crossing.

ii. A rigid yardstick or standard is not necessary. The yardsticks may provide for deviations in the light of local conditions on the merits of each case after taking into consideration the need for safety.

iii. The existence of norms would firstly provide broad guidelines for the Railways to work upon and secondly would ensure uniformity of procedures at. level crossings on the same or contiguous sections having more or less the same quantum of road and rail traffic. (Paras 294 and 295)

116.

i. We are unable to see the merit of a system in which certain gates are manned by only one gateman.

ii. We suggest that at 'C' class manned level crossings with only one gateman, an appraisal of the traffic using the gate should be made speedily and depending on the result, the Railway administration should decide whether a case exists for having two men at such gates or whether the gate should be unmanned. In no case, in our view, should a gate remain with only one man on duty all the 24 hours. (Paras 297 and 298)

117. We had suggested in Part I of our Report that a part of the Railway Safety

Works Fund—to the extent of 10 per cent— should be made available to the Railways in case a decision is taken to man an unmanned level crossing or to upgrade an existing manned level crossing. We hope that a satisfactory solution has since been found which would enable the Railway administration to draw directly from this Fund up to the extent of 10 per cent for the above purpose. (Para 299)

118. We think that to save road traffic from long and irritating detention to the extent possible and at the same time to ensure safety, it is necessary to have some kind of reliable communication between the gateman at a mid-section level crossing and the station on one side or the other. (Para 300)

119. With a view to minimising detention to road traffic at level crossings within station limits, the station staff must be educated to see that signals are not taken off much in advance of the approaching or the departing train. (Para 301)

120. We suggest that whenever on sections equipped with multiple aspect signalling lower quadrant two aspect signals protect midsection level crossings, they should be replaced by multiple aspect signals. It is essential that there should be uniformity in the type of signalling provided on a section. (Para 302)

121. We are of the view that all important level crossings should be provided with sympathetic barriers of the lifting type equipped with eccentric wheels which actuate bells and flashing lights indicating to the road users when the harriers are being lowered or raised. (Para 303)

122.

i. It would, in our opinion, be worthwhile experimenting with automatic half-barriers to see if they can successfully take the place of manned level crossings with due measure of safety.
ii. We think that at least near about the cities where automatic light signals are in use at road crossings and the road users have got used to them, the Railways may with advantage and without undue risk experiment with automatic half-barriers.
iii. We stress that while installing automatic half-barriers, conditions should be created by which breaking the queues. and zigzagging by road users is rendered difficult if not impossible. It may be necessary to fix small raised and protruded blocks with a height of six to twelve inches in the centre on both approaches of the level crossing for an adequate distance. (Paras 305 to 308)

123. We suggest that provision may be made for the prosecution of those road drivers who disregard the automatic half-barriers in the same way as a

road driver is liable to prosecution if he ignores traffic lights. (Para 310)

124.

i. We stress that if the experiment with the automatic half-barrier is to be made a success, special care will have to be taken to guard against vandalism and theft of ground equipment.
ii. It is important that wherever such automatic half-barriers are installed and are actuated by approaching trains, the installation works in perfect order and safety is not endangered.
iii. We feel that should the installation fail far too often, the respect which the road user may have for the installation is likely to decline resulting in the experiment not proving a success. (Para 311)

125.

i. We are of the opinion that from now on the construction of level crossings should be avoided wherever possible and reduced to the barest minimum. A level crossing should be provided only when for some unavoidable reason, it is not possible to have an over-bridge or an under-bridge.
ii. We hope that the amount collected in the Railway Safety Works Fund would be available to be utilised in future to avoid the necessity of new level crossings particularly where such level crossings are expected to have heavy road traffic. (Para 312)

Signalling and Interlocking

126. The techniques of signalling have advanced today to an extent that it is possible to eliminate the chances of fallibility of the human element to a degree not conceived of a few decades ago. (Para 313)

127. We remarked in Part I of our Report that the progress in the introduction of modern signalling on the Railways had been slow. (Para 314)

128.

i. We find that of the total capital expenditure on the principal categories of developmental works undertaken by the Railways, about five per cent only fell to the share of development in signalling. This, in our view, is inadequate.
ii. We consider that the imbalance reflects not merely a lack of appreciation on the part of the Railway administrations of the role of modern signalling from the point of view of safety but also a lack of realisation of the fact that unless signalling keeps pace with developments in other fields, the Railway administrations would be unable to put to the fullest possible use their growing assets. (Paras 316 & 318)

129.

i. The hopes which the Railways entertained about the private sector, to whom they had turned somewhat belatedly, developing indigenous manufacture of sophisticated signalling and due to which they fore-went development of capacity in a Workshop of their own have not materialised. At the same time these expectations seem to have conditioned their thinking so as not to go in for imported equipment.

ii. We urge that without any further loss of time, a firm plan integrating the requirements of the Railways, the indigenous resources available and the Imports: needed should be drawn up with boldness and vision for the next five to ten years and the programme of each year should reflect the attention which modern signalling deserves but which it has not quite received in the past. (Para 319)

130. We recommend that on sections where electric power is available, colour light signalling should be provided as rapidly as possible. (Para 321)

131. We consider that a rigid check should be exercised on the quality of lenses and bulbs used in colour light signals. (Para 322)

132. We urge that the Railways explore the possibility of switching over to electric lighting of semaphore signals wherever it is feasible and that economic considerations should not be allowed to stand in the way where the question of improved lighting and visibility of signals is concerned. (Para 324)

133. We suggest that a more progressive policy of providing multiple aspect signalling at stations not only on trunk routes but also on main line routes should be followed. (Para 325)

134. As an interim measure, we consider the separation of the warner signal from the outer signal, on some sections and placing it at a distance outside the outer signal a step in the right direction but stress that the ultimate objective should be to go in for multi-aspect signalling on such sections. (Para 326)

135.

i. We hope that the results of braking distance trials are now available and would soon be reflected in the resiting of signals.

ii. The minimum sighting distance for the first stop signal without pre-warning in two-aspect lower quadrant territory should be. such that the driver is able to observe and obey the signal in time. For a long while now, the need to resite signals has been linked up with braking distance trials. We urge that this Matter which seems to have been long delayed should. receive the urgent, attention of the railway authorities.

(Paras 327 and 328)

136.

i. We understand that at cost of a small amount of foreign exchange it would ,be possible to import suitable reflective material like scotchlite for use on sighting boards. We consider that in matters which involve safety, considerations of foreign exchange should not be allowed to come in the way.

ii. We think that in addition to sighting boards, such reflective material may be used with advantage on whistle boards, road signs on the approaches to level crossings, speed and caution boards and other indication boards which ordinarily are not lit at night. (Paras 329 and 330)

137. We suggest that action should be taken to see that the types of block instruments in use on any one Railway should be reduced to the minimum. It would be advantageous to have one type of block instrument for use on double line and another on single line on each Railway. (Para 331)

138. We recommend that panel interlocking with colour light signals may be provided at stations on electrified sections and on such non-electrified sections where electricity is available. (Para 332)

139. We recommend that the pace of provision of route relay interlocking should be accelerated not only to speed up operation but also to enhance safety. (Para 334)

140. We suggest that in yards provided with large route relay installations, subsidiary signals which serve the purpose of calling-on signals may he provided below the relevant stop signals with post-type telephones to save detentions to trains. (Para 335)

141. We find that so far, the route relay installations provided at different stations have been of different types having been installed in collaboration with different firms. This arrangement poses serious problems of availability of spares and the need to stock a variety of equipment besides training of staff. In our view, the need for standardisation of designs, specifications and requirements for future installations of this type is paramount. (Para 336)

142. We consider that Centralised Traffic Control is an important development to meet the demands, of greater safety and efficiency and we hope that in future whenever due to an increase in the density of train service on a single line section the question of creating additional capacity is examined, the case for installation of centralised traffic control would be

duly considered keeping in view the additional safety factor which such installation provides. (Para 338)

143. We consider that 'train describers' which will simultaneously indicate the direction of movement should form a part of centralised traffic control wherever it is installed. (Para 339)

144.

i. We cannot help expressing our doubts whether the Railways are addressing themselves to the task of providing track circuiting with the necessary sense of urgency.

ii. It appears to us that too much is being made of the shortage of wooden sleepers and that this factor instead of being a source of anxiety has, in course of time, come to be a cause for complacency.

iii. We feel that the difficulty in regard to the suitability of concrete sleepers in the yards would only apply to a few places and, by and large, it should be possible to overcome such difficulty.

iv. We have no doubt that with more energetic research and experimentation, it should be possible to evolve suitable alternatives and overcome the hurdles in extending the use of track circuiting. (Para 344)

145. We suggest for the consideration of the Railway Board the following guidelines and targets in respect of provision of track circuiting:

i. First priority should be given to run through lines at wayside stations on the trunk routes and to all passenger lines at important junctions on both the trunk routes and the main Tines. This work should be completed during a period of four years.

ii. Thereafter run through lines at stations on main line routes and all passenger lines at stations on trunk routes should he track circuited. This should he accomplished in a further period of four years.

iii. In the last phase, all passenger lines at stations on main line routes and at important junctions on branch lines should be taken up for track circuiting. This work should be completed in another two years. (Para 358)

146. Track circuiting must, in our opinion, cater for prevention of side-collisions. With this end in view, in respect of track circuiting works on run through lines in progress at present as well as programmed for the future, the policy should be to track circuit the lines between the block-clearance points. As for the run through lines which have already been track circuited between fouling marks, the work of track circuiting between block-clearance points should be taken up as soon as possible.

(Para 350)

147. We suggest that the Railway Board should reconsider the question of use of Permali fish plates as insulated rail joints on tack circuited sections for his speeds in the light of the reported improvement in the design and strength of Permali fish plates.

148.

i. We feel that provision of Automatic Train Control is a matter on which there should be little diversity of opinion. As a means to prevent accidents, it is only second, if even second, in importance to track circuiting.

ii. We consider that the lines on which speeds of 100 kmph or over are permitted should be provided with Automatic Train Control and it should cover all trains including goods trains running on the section. A scheme of priorities should be worked out for trunk routes.

iii. We are conscious that owing to financial considerations, the installation of Automatic Train Control would have to be proceeded with on phased basis but the phasing too must be done with a sense of urgency. (Para 366)

149. We have been given to understand that the Automatic Train Control equipment being installed in the suburban sections in Howrah area ensures that a driver passing an automatic signal at 'on' must keep the speed of the train below 15 kmph up to the next automatic signal failing which a warning is sounded for five seconds and thereafter automatic application of brakes takes place. We consider that this type of Automatic Train Control should be extended to other automatic sections in the Bombay, Calcutta and Madras areas. (Para 368)

150. We feel that it is high time to undertake research and develop-merit in regard to continuous cab signalling, however elaborate or expensive this may be so that a greater degree of immunity from accidents can be achieved on sections on which high speed trains run. (Para 372)

151.

i. For items for which the Railways depend on the private sector for supply, the effort should be to encourage more than one reliable source so that not only are the benefits of competition obtained, but an eventuality does not arise where the Railway administration may be left high and dry.

ii. We understand that in countries like Germany, Japan and France, two or three firms of repute who are prepared to invest money in research and development and who have adequate quality control are given

assured orders for manufacture of sophisticated signalling equipment. We suggest that the Railway Board develop their thinking along these lines. (Para 371)

152. We understand that qualitatively, the indigenously manufactured conventional signalling equipment has not come up to the required standard. We suggest that the Railway administrations would be well advised to give orders to two or three selected firms of repute so that these firms get interested in maintaining the requisite standards in the manufacture of equipment. (Para 372)

153.

i. We were told that often when disconnection notices were presented to the operating staff for disconnecting the gear for maintenance purposes, such notices were not accepted on the plea of heavy train work and the possibility of detentions to trains. The problem assumes great importance at busy stations where the signalling gear is relatively more intricate and needs intensive maintenance.

ii. We suggest that the whole problem of maintenance of signalling gear should be thoroughly examined, and a practicable and safe procedure evolved so that the necessary time blocks are available for the maintenance of signalling gear without much difficulty. Provision for this should in our opinion be made at the time, the timetable of a section is being made.

iii. By making provision in the train timetable for an integrated maintenance programme, the maintenance not only of signalling gear but also of track by automotive machine wherever in use and of other overhead installations at stations and on sections could, with advantage, be undertaken in a coordinated manner. (Paras 373 & 374)

154. We consider that the inspections of signalling gear should he intensified and the periodicity of testing of signalling gear should be suitably modified. (Para 376)

155. We suggest that a copy of relevant notes on joint inspections of signals may be sent to the station for the reference and facility of inspecting officers visiting the station to enable them to see if the defects and deficiencies pointed out in the joint inspection notes have been rectified. (Para 377)

156. We understand that a system of radio-patching in conjunction with multi-channel VHF (very high frequency) and micro-wave system is being used in order to improve the efficiency of the control lines and to overcome the

difficulties created by the interruption of control circuits. We understand that the Railways have decided to run and man their own line wires instead of depending on the Post and Telegraphs Department. We consider these steps to be in the right direction and hope that these would produce the desired results. (Paras 380 & 381)

157. We hope that soon the Railways will be able to develop tele-communication facilities on their system commensurate with developments in other fields as we consider that the fullest use of the assets which the Railways have developed in recent years and are developing can be made only if adequate telecommunications are available. (Para 381)

158. In our view, it would be impossible to attain a high standard Of safety, efficiency and economy in working if those responsible for sanctioning the introduction of improved signalling methods, through ignorance or otherwise, fail to realise the true potentialities of modern signalling and continue to apply the conventional yardsticks of financial justifiability to safety works. To that extent, the present-day concept of financial viability of investment needs to be modified particularly in respect of signalling project. (Para 382)

Motive Power

159.

i. We would strongly recommend that the examining fitters at the incoming pit are chosen carefully after testing them in their proficiency and ability to read and write.
ii. Booking of repairs by the driver and the examining fitter must be spot-checked from time to time by visiting mechanical officers and inspectors and other supervisors.
iii. The loco foreman too should, in our opinion, be in a position to make spot-checks at least twice or thrice a week. (Para 385)

160. We suggest that whenever officers of the mechanical department inspect the incoming inspection pits, they must in particular check the deficiencies in respect of lighting, drainage, cleanliness, availability of tools, etc. (Para 386)

161. We recommend that test-checks at the outgoing inspection pit should be intensified. (Para 387)

162.

i. We consider it important that there should be no disparity in the concept of repeated bookings as understood by the different Railways. The definition of repeated bookings should be standardized.

ii. It would also, in our view, be useful if the form of the repeated booking register is standardised for, use on all the Railways. instead of each Railway following its own system. (Para 389)

163. The limited survey which we have made in respect of repeated bookings shows that there is slackness in the sheds in attending to booked repairs. There is considerable scope for improvement. (Para 391)

164. We consider that it would be salutory step if data in regard to repairs booked repeatedly in respect of certain selected parts of a locomotive are sent by the Divisional Mechanical Engineer periodically for the attention of the Chief Mechanical Engineer himself. (Para 392)

165. The fact that derailments take place due to defective wheels and tyres lends some weight to the assumption that checking and recording of the wear on the tyres is not always done with care. We would emphasise that greater, attention should be. paid to the gauging of wheels arid tyre profiles. (Para 394)

166. We suggest that the requirements of loco sheds for provision of wheel lathes should be speedily assessed, and such wheel lathes should be provided wherever justified without any loss of time. (Para 395)

167.

i. In our view, ultrasonic testing equipment is an essential requirement of each major locomotive shed.

ii. It is necessary that, the intervals at which the exles and journals of locomotives should be ultrasonically tested in the loco sheds is laid down. (Para 396)

168. We consider it essential that the training of drivers in the handling of steam locomotives should continue to be pursued with vigour so that steam drivers remain fully accomplished in their basic profession. (Para 397)

169. We suggest that a detailed survey of the facilities, equipment and machines, etc. available in and required for each loco shed on a Railway should be made by a senior mechanical engineer of the Railway and effective action should be taken thereafter to make good the deficiencies. (Para 398)

170. Since the method adopted by the Northern Railway of maintaining in each loco shed a graph which shows at a glance the position of schedule repairs to locomotives is yielding satisfactory results, we recommend that its adoption on other Railways be considered with such modifications as local conditions may require. (Para 399)

171.

i. We are disposed to think that the system of assigning engines, to inspectors of mechanical department, ensuring as it would personalise attention to the locomotives by a nominated inspector, would be conducive to better maintenance.

ii. We suggest that the Railways on which the system of assigning engines to inspectors of mechanical department does not exist should examine the merits of this system and adopt it if they consider it advantageous. (Para 400)

172. We consider it necessary to emphasise that replacements of worn-out machines should be affected as expeditiously as possible. (Para 402)

173. We suggest that, where workshops are not adequately equipped with modern scrag and load deflection testing machines. They should be equipped without further loss of time. (Para 404)

174. We strongly urge that all locomotive workshops should be equipped with proper weighbridges. (Para 405)

175. We strongly urge that adequate provision should be made in each of the workshops for ultrasonic equipment for the testing of axles. (Para 406)

176. We suggest that a periodic evaluation of the efficacy of quality control in the workshops should be done at the Chief Mechanical Engineer's level. (Para 408)

177. We emphasise the need for more detailed information being regularly supplied to the workshops concerned in respect of failures of locomotives arising from poor workmanship so that they can adopt proper remedial measures. (Para 408)

178. We consider that with a careful study of the present defects and a few minor improvements in the design of reflectors and dimmer switches, it should be possible to ensure that locomotives go out with proper headlights and dimmer switches in working order. (Para 409)

179. We urge the Railway Board to standardise the equipment and the facilities required for diesel loco sheds where they have not so far been standardised so that the Railways can thereafter take steps to equip the sheds to the required standard. (Para 412)

180. The facilities in the diesel sheds should be such as can compare favourably with the facilities available for maintaining similar assets in other advanced countries. (Para 412)

181. We emphasise the need for ensuring that electric loco sheds are equipped with all the necessary machines and plant from the beginning if maintenance of a high standard is to be attained. (Para 415)

182. We understand that a committee of senior officers has been appointed to

go into the question of standardising the machinery and plant to be provided in electric loco sheds. We consider it a step in the right direction. (Para 416)

183. We urge that energetic steps may be taken to see that a more suitable and reliable type of speedometer-cum-speed recorder is manufactured indigenously for use on locomotives. (Para 420)
184. We suggest that either the speedometer on metre gauge diesel locomotives should be repositioned on the control desk or alternatively another speedometer may be provided so that the driver can refer to it conveniently. (Para 421)
185. So long as the VDO type speedometers are in use on diesel locomotives, t is suggested that a direction corrector should be fitted. (Para 422)
186. We recommend that a detailed technical survey of defective speedometers and the intervals at which the components require attention in the workshops should be made and on the basis of this survey remedial measures evolved so that a target for servicing of speedometers not oftener than once a year can be achieved. (Para 423)
187. We suggest that within the shortest possible time, all diesel and electric locomotives should be equipped with the driver's vigilance device. (Para 430)
188. All new motive power units manufactured at Diesel Locomotive Works and Chittaranjan Locomotive Works should be fitted with this device before being sent out to the Railways. (Para 430)
189. We suggest that while the process of installation of the driver's vigilance device is continuing, the administration should take steps to carry the staff with them in regard to the utility of the device. (Para 431)
190. We recommend that anti-slip devices provided on diesel and electric locomotives should be frequently checked for their efficient functioning. (Para 436)
191. We suggest that both the indications, i.e. visual as well as audible, should be provided on diesel locomotives to give an indication of wheel slip. (Para 436)

Goods and Coaching Stock

192. The examination and maintenance of wagons and coaches has an important bearing upon the standard of safety in railway operation. (Para 437)
193. We have been advised that a uniform time schedule for different types of train examination is being laid down on the basis of which gang strengths in different yards will be determined by the Railways taking into account

the number of trains dealt with in these yards. We welcome this decision and hope that its early implementation will remove the complaints voiced by officers and staff about inadequate time allowance for examination, insufficient gang strengths, skipping of repairs, etc. (Para 438)

194. We are of the view that if the Andal pattern of train examination has proved efficient, economical and useful, it should be extended to other important train examining centres. We suggest that difficulties, if any, in its adoption at other places should be overcome. (Para 439)

195. We consider that the maintenance of goods rolling stock merits no less importance than yard operation and the occasions on, which, recourse should be had to the provision for curtailment of time for train examination in exceptional cases should be few and far between. (Para 440)

196.

i. Though some Railways have issued instructions book form for the train examining staff, it seems that some confusion still exists in the minds of staff, particularly about safe-to-run examination.

ii. We suggest that the scope of each type of train examination given to goods rolling stock should be clearly defined for the guidance of the staff and the components to be examined and checked spelt out and incorporated in the rules. (Para 441)

197. We suggest that apart from 'defect investigations' which are undertaken by the RDSO off and on in respect of components which are reported to fail frequently, the design of goods rolling stock, particularly IRS wagons, should be examined by the RDSO or by a "Committee of technical officers to see if there are any inherent defects and if any modifications are necessary in view of the higher speeds being planned. (Para 442)

198. We consider it essential that the staff concerned with the examination of wagons should be educated in respect of the incidence of derailments caused by the various defects and their consequences in order to provide motivation for a higher standard of workmanship. (Para 443).

199. It is also necessary to provide the essential gadgets for examining the various components and to train the examining staff in their use. (Para 443)

200. As regards the carrying out of traffic yards, we think that a satisfactory solution lies in identifying the repairs to be carried out on trains and in traffic yards, standardising the pre-requisites for the proper carrying out of such repairs and then ensuring that the pre-requisites are available. (Para 444)

201. We consider it important that taking into consideration the nature and extent of repairs to be done, the facilities and. equipment in each sicklines should be surveyed and the deficiencies made good. (Para 445)

202. The provision of wheel lathes, ultrasonic testing equipment and burnishing machines in the major sicklines will enhance the standard of maintenance of rolling stock in the sicklines. (Para 446)

203.

i. In our view, the stage at which each wagon goes for normal axle box repacking is the occasion. when the wagon should receive full attention and be turned out in as perfect a condition 'as possible, viz. with' ail the' defects rectified.

ii. Checks on the wagons coming out of the sicklines after repacking should be greatly intensified as, in our view, the standard of repairs given to the wagons would to the wagons would depend on the measure of supervision and inspection at this stage. (Para 447)

204.

i. We strongly urge that energetic steps should be taken to ensure the provision of adequate numbers of washing lines and pit lines with the necessary facilities so that each rake is properly examined and maintained on the washing line or pit line.

ii. We also consider it necessary that there should be timely placement of rakes on the pit lines to facilitate examination of wheels and undergear. (Para 451)

205.

i. We find that the percentage of coaches, marked sick and detached at stations enroute and at terminal stations other than primary or secondary maintenance stations to the total number of coaches marked sick was 6.2 on the broad gauge and 8.1 on the metre gauge from April 1967 to September 1968.

ii. We emphasise that attention to coaches at primary and secondary maintenance centres should be intensified in order to reduce the. overall percentage of sick coaches. (Para 454)

206.

i. Running gear defects, viz. hose relating to axle boxes, bogie frames, spring suspension and brake gear accounted for the highest percentage of the total number of defects on both the broad and the metre gauges. The incidence of damage-labelling on this account was higher on certain types of coaches than on others.

ii. The percentage of coaches damage-labelled due to wheel defects was

also on the high side on both the gauges, particularly in respect of ICF coaches on the broad gauge.

iii. We emphasise the need for greater attention to coaches at the maintenance depots. We also suggest that a broad analysis of defects which result in damage-labelling of coaches should be made at regular intervals and disseminated to the staff. (Para 455)

207.

i. We urge that a detailed analysis of the causes of electrical defects be made, and remedial measures taken to bring down the incidence of sick coaches on this account on all gauges.

ii. We consider that it would be useful if the staff are made aware of the results of the analysis with a view to improving the standard of examination and maintenance of electrical installations in coaches. (Para 456)

208. We suggest that fuses should be provided on both the positive and negative wiring in steel bodied coaches. (Para 458)

209.

i. We suggest that the checking of earth leakage with the help of test lamps should be intensified and carried out at the time of both primary and secondary maintenance of carriages.

ii. We suggest that the observance of these checks should be watched both at the divisional and headquarters' level.

iii. Spot checks by electrical engineers and supervisors to ensure that testing is carried out properly would, in our view, prove highly advantageous in toning up the quality of work done by staff. (Para 459)

210. We suggest that a system for investigation of failures of certain selected carriage and wagon components be evolved on lines comparable to the investigation which is done at present in case of engine failures. (Para 460)

211. We are glad to know that defect investigations in respect of the design of certain components are carried out by the RDSO and modifications are issued as and when necessary. While this is indeed a continuous process, we suggest that results of investigations and recommendations made by the RDSO should be uniformly disseminated to all Railways for appropriate action. (Para 463)

212.

i. It is the Railway Board who should issue instructions regarding modifications setting out the target dates for carrying them out and for periodical progress reports.

ii. We are strongly of the opinion that the whole process of issue of modifications by the Railway Board and thereafter the execution at the Railways level needs to be streamlined if the effort and thought which go in ordering such modifications for enhancing safety are to serve any useful purpose. (Paras 465 and 467)

213. It is suggested that equalizing beams which fail in service should be replaced by those manufactured to RDSO's drawing and specification from Class II steel and safety clamps should be provided as suggested by the RDSO. (Para 473)

214.

i. We find that at present if the bearing spring of a BOX wagon on train breaks, the train is permitted to proceed at a restricted speed to the next train examining station with the broken spring clamped. We consider that the appropriate course would be to detach the wagon with a broken spring at the station where this defect is detected and to summon the train examining staff for replacement of the spring.

ii. It is also suggested that the plates for the springs may be made from silico-manganese steel instead of the present specifications to reduce the incidence of breakage.

iii. It is essential that a satisfactory solution to the problem of over-loading of BOX wagons with minerals should be found to reduce the incidence of breakage of springs. (Paras 479 and 480)

215. We asked for information regarding progress of implementation of ten selected recommendations in the report of Director, Research (Hot Boxes). We do not feel heartened by the progress of the implementation of these recommendations and urge that energetic action may be taken to implement the recommendations. (Paras 482 and 483)

216. We recommend research and study to develop a hot box detector for use on the Indian Railways. (Para 484)

217. We strongly that whatever measures are needed to cause Jessops to fulfil the order placed on them in respect of EMU be adopted. (Para 485)

218. We hope that with the increase in the capacity for periodical overhaul the backlog in the periodical overhaul of EMU coaches on the Central Railway would be cleared. (Para 486)

219.

i. We are of the view that the directives in regard to the prescribed percentages of effective vacuum cylinders on trains must be observed uniformly on all the Railways.

ii. The number of effective cylinders on a train must be a special point of

check by the neutral control examiner.

iii. It is of the greatest importance that the staff who are actually to operate the train know the real position in regard to the brake power available on the train.

iv. It is essential that the requisite brake power should be available on all trains and difficulties arising either on account of defective material or other factors should be overcome. (Para 492)

220. We are of the view that endeavours should be made to improve the safety factor in respect of trains running on narrow gauge sections. Locomotives, carriages and wagons should be equipped to the extent possible with vacuum brake apparatus and where this is not possible, alternatives should be evolved as for instance introduction of rail cars, etc. Reliance upon hand brakes for the safety of trains is, in our view, not only out-moded but also hazardous. (Para 495)

In case of trains running on narrow gauge, Locomotives, carriages and wagons should be equipped to the extent possible with vacuum brake apparatus and where this is not possible, alternatives should be evolved as for instance introduction of rail cars, etc. Hand brakes are not to be relied on and sometime may turn out to be hazardous.

221. We hope that a satisfactory solution would be evolved in regard to the difficulty of stopping diesel hauled goods trains as the application of the vacuum brake in the brake van gives little or no indication to the driver. (Para 494)

It is difficult to stop diesel haul goods train as application of vaccum brake has no indication in the brakevan and further no indication back to driver.

222. We suggest that on all anti-telescopic coaches, an identifying mark or code should be inscribed for the guidance of the operating staff so that in the event of stock of both types being available, the staff marshal anti-telescopic coaches in preference of other steel bodied coaches. (Para 495)

There must be anti-telescopic identifying mark or code on the coaches so operating staff can club or marshal all anti-telescopic in preference to other body steel coaches.

223.

i. We suggest that the spring suspension system of the broad-gauge four-wheeler brake vans should be redesigned to provide comfortable riding at speeds of 75 km. ph. or more.

ii. We also suggest that the suspension arrangements of the metre gauge four-wheeler brake vans should be investigated with a view to in proving their riding. (Para 496)

Spring suspension system of BG four-wheeler brakevan be designed for comfortable riding at speed of 75 kmph or more and same to be done to meter gauge four-wheeler brakevan.

224. We hope that effective steps will be taken to provide adequate capacity in the New Bongaigaon workshop for periodical overhaul of coaches. (Para 497)

225.

i. It is essential that the percentage of goods stock overdue periodical overhaul on the Western Railway should be reduced con ably.
ii. The need for regulating the Blow of coaches into the workshops for periodical overhaul on the Central Railway is emphasized. (Paras 498 and 499)

226. The need to equip every carriage and wagon workshop with adequate ultrasonic testing equipment for resting axles and also equalizing beams of IRS metre gauge coaches cannot be over-emphasized. (Para 500)

227. We suggest that special efforts should be made to procure burnishing machines for the workshops. (Para 500)

228. We recommend that a periodical analysis of all cases of roller bearing failures on coaches and wagons indicating date, year and station of mounting, particulars of last attention given, cause and responsibility. etc. should be made so that remedial action, if required, can be taken. (Para 505)

229. We suggest that the Research Designs and Standards Organization should go into each case of failure of roller bearings and analyse every aspect including materials used and the manufacturing accuracies and suggest remedies. We attach utmost importance to this matter in view of the increasing use of roller bearings on Indian Railways. (Para 504)

230. We consider it important that all carriage and wagon work- shops are provided with suitable and adequate facilities for over-hauling of roller bearing axle boxes at the time of periodical overhaul or whenever such axle boxes are sent to the workshops. It is also essential that the workshops where roller bearing axle boxes are attended to have dust-proof facilities. (Para 505)

231. We invite the attention of the Railway Board to the type and manner of attention to roller bearings in workshops on the Japanese National Railways. It seems to us that the adoption of a similar system will be of advantage to the Indian Railways. (Para 506)

232. We suggest that a programme should be drawn up to replace the outdated or overaged machines in the workshops on a phased basis. (Para 507)

233. We urge that measures should be taken to see that coaches are in perfect condition when offered for examination after periodical overhaul. Steps should be taken to improve the standard of workmanship to minimize the percentage of rejections. (Para 508)

234.

i. We feel that neutral cord examination serves as a further check and has been generally useful in keeping wagons in good fettle and we consider that nothing should be done to weaken it in view of its independent character.

ii. We consider that in view of the changing pattern of traffic, neutral control examination need not necessarily exist at the boundary points of the Railways as used to be the case in the past. The Railway Board should examine the existing set-up of neutral control examination and decide upon the various points at which it should be located. (Para 509)

235.

i. We are of the view that there is need for revision of Conference Rules Part III. The rules contained in this publication should not only provide comprehensively for the examination and repair of all types of stock which have been introduced on the Indian Railways over the past-several years but the provisions having a direct bearing on safety in railway operation as distinct from those simply meant to keep the coaches and wagons in good fettle should be clearly specified. We understand that the Railway Board have under scrutiny draft prepared by the IRCA for the examination of all types of coaching stock.

ii. In order to reduce the incidence of derailments due to carriage and wagon defects, the neutral control examination should lay greater emphasis on the compliance of safety rules and regulations in the matter of maintenance of stock. (Para 510)

Conference Rule Part III be written having a direct bearing on safety in railway operation as distinct from those simply meant to keep the coaches and wagons in good fettle should be clearly specified. In order to maintain better condition of the stock.

236. The Indian Railways Conference Association publishes annually a "Report on the broad and metre gauge wagon pools and neutral control of wagon examination which includes the results of the surprise checks-conducted by the neutral control flying squads. We suggest that the report should clearly specify the percentage of wagons found unsafe-to-run to the total number of wagons checked. (Para 511)

237. In view of the large proportion of overaged locomotives, coaches and wagons which will have to be kept in use during the Fourth Five Year Plan due to smaller allocation of funds in the Plan, we think that special attention will have to be given to such stock during periodical overhaul as well as during day-to-day maintenance Periodical overhaul to such stock may have to be given are shorter intervals to keep them road-worthy and safe for operation. We urge the Railway Board to give serious consideration to this matter. (Paras 513 and 515)

Stores

238. We had, in Part 1 of our Report, referred to the fact that considerable time and energy of the executive officers is spent in chasing after the procurement of items of spare parts and stores which are in chronic short supply. The position as indicated by the evidence tendered before us in regard to the supply of such stores seems even worse than we had thought. (Para 516)

239. It is of vital importance that to maintain locomotives, rolling stock, signalling equipment and permanent way to prescribed standards. the supply lines that convey spare parts and stores from the supplier to the ultimate user keep moving with clockwork precision. (Para 516)

240. The policy in regard to imports of vital parts required for maintenance of valuable assets as also the procedure of release of foreign exchange needs to be thoroughly reviewed so that not only is the foreign change utilized to the best possible advantage but also the short-sighted bad policy of saving some little foreign exchange at the cost of keeping valuable assets idle is avoided. (Para 521)

241. The chimerical impression which the compliance percentages of 90 to 95 evoke is apt to prevent the focusing of the administration's attention on the need to streamline their supply lines apart from the smugness which these percentages induce in the Controllers of Stores of which we found a fair amount of evidence. (Para 521)

242.

i. Complaints were voiced constantly about the inferior quality of tools, stores and spare parts such as adjustable spanners, screw drivers, bulbs, battery material, rubber rolling rings and other rubber fittings, etc. We were shown certain spare parts and components which though brand new could not be put to use as they were either of the wrong size or they did not match with the components in conjunction with which they were supposed to be used.

ii. We have no doubt that the inferior quality of tools, stores and spare

parts, apart from turning out to be false economy in the end is highly frustrating in as much as it throws additional burden on the staff in the performance of their duties and renders the work of repairs and maintenance more onerous. In many instances where due to the unreliable quality of spare parts, shoddy repairs are affected, safety too would be at stake.

iii. It would be more prudent and economical to provide tools, stores and spare parts of the requisite quality readily identifiable and covered by adequate guarantees by paving a proper price in the beginning. (Para 527)

243. We had occasion, in Part 1 of our Report, to refer to over-emphasis in accepting the lowest tenders due to the fear in the purchasing authority of criticism which may be engineered by the rejected tenderers. We reiterate that the administration should endeavour to insulate its purchasing officers from such criticism if it is satisfied that the discretion was exercised for good and sufficient reasons. (Para 528)

244. We consider that as a rule all tools and spare parts must have the manufacturers markings on them. (Para 529)

245. We had, in Part 1 of our Report, referred briefly to difficulties which are being experienced in respect of items procurable through the Directorate General of Supplies and Disposals. We have examined in some detail the procedure for, and the position in regard to the procurement of stores through the agency of the Directorate General and Supplies and Disposals. We find that

i. Despite the enormous industrial advancement made in the country during the last two decades and the improved materials management methods which are being employed everywhere. the time intervals for processing of indents and procurement of stores have remained more or less unaltered. Their continuance in the present form is, in our view, unjustified.

ii. It is unrealistic to expect an organization as complex as the Railways which has been developing at a fast pace and undergoing modernization to assess its requirements of stores 24 months ahead. Furthermore factors like an ever increasing and yet changing pattern of traffic which is closely linked up with the growth of industrial activity in different parts of the com try, and the unpredictable law and order situation in the country which on the Railways is reflected in the wide spread incidence of thefts of railway material and cases of vandalism, make precise forecasting of requirements in any event

difficult but with a procedure which prescribes a lead time of two years make things impossible.

iii. The position is depressing both in respect of the coverage of indents and the materialization of supplies. Not only was a very low percentage of the indents covered in time, but the extent of delays in the supplies on the basis of originally prescribed delivery periods ranged from 1 to 20 months, in addition to these delays the supplies against several contracts for which the original delivery dates had expired, in some cases years ago, still remained outstanding. (Paras 531 to 541)

246. We express our keen disappointment over the delay in procurement of railway equipment and stores through the agency of the Directorate General of Supplies and Disposals. (Para 542)

247. We are of the view that the functions of purchase cannot be divorced from the allied functions of standardization, control on inventory, value analysis and control on consumption. Scientific materials management is possible only if the function of purchase is integrated with the other functions of materials management. (Para 544)

248. It appears to us that too much has been made of the benefits resulting from bulking and that too little attention has been paid to disadvantages inherent in the system of procurement of stores through an agency not involved in the running of the Railways. In our view, the disadvantages in the system clearly outweigh the advantages. (Para 545)

249.

i. We are clear in our minds that responsibility for the procurement of stores should rest squarely with the Railway Board and the Railway administrations without bringing into the picture the agency of the Directorate General of Supplies and Disposals.

ii. We think that this will lend stability, permanence and continuity to the procurement of railway equipment and stores and would impart a greater sense of urgency to the officers of the Railways entrusted with the responsibility of materials management. (Para 546)

250. We have been assured by the Railway Board that they have the basic organization to replace the agency of the Directorate General of Supplies and Disposals for procurement of their own stores and would be in a position to take this job over. We consider that this is a matter which can brook no further delay. (Para 548)

251. We think that with the transfer of the functions of the Directorate General of Supplies and Disposals to the Railway administration, some

reorganization of the existing system and streamlining and simplification of the procedure relating to procurement of stores will be necessary to meet the growing requirements of the Railways. (Para 547)

252. We find that over the years, while the levels of prices of materials of the one band and of the consumption of stores on other have been rising steadily, the powers of purchase vested in the Controllers of Stores have not kept pace. (Para 548)

253. We consider that the following suggestions made to us deserve most careful consideration-

i) The powers of purchase of Controllers of Stores should be raised to Rs. 50,000 or even Rs. 1,00,000 from the existing limit of Rs. 25,000 with suitable increase in the powers of other purchase officers. The limits of purchase through "single tender" and in case of cash purchase should be suitably enhanced.

ii) Finance need not be associated for purchase up to Rs. 10,000 and in case of purchases in which the value exceeds Rs. 10,000 the stages of consultation with Finance should be confined only to assessment of quantity, association on tender committee and issue of contract.

iii) There is need to develop a proper buyer-seller relationship in respect of safety items of stores so that the seller becomes more committed and has a greater stake in his dealings with Railways. For a tie-up of this nature, an assurance to one or two firms in respect of each important item that the requirements would be bought from them for a specified period may be necessary. (Para 549)

254. We feel that the powers of purchase of stores at all levels should be kept under constant review by the Railway Board so that they are adequate to cope with the ever-increasing needs. (Para 550)

255. We are of the view that it may be possible to decentralize the stores organization in a manner that the advantages of having stores depots contiguous to the consuming centres are derived without subjecting the system to disadvantages arising out of larger inventories. (Para 552)

256. We had, in Part 1 of our Report, stressed the need to adopt scientific methods of inventory control and modern materials management techniques. We consider that for effective and efficient materials management and the solution of various complicated problems the Railways would do well in seeking specialist guidance from quarters who have the requisite expertise in materials management. (Para 553)

257.

i. We consider that materials management today is a specialized job.

Over dependence on ill qualified ministerial staff would create problems for the stores organization rather than solve them.

ii. We have no doubt that the recommendations of the committee of the Controllers of Stores appointed to go into the reorganization of the stores department would go a long way in improving the stores organization. (Para 554)

Theft, Vandalism and Sabotage

258. Theft of railway equipment and vandalism on the Railways are a serious problem from all accounts. Not only is theft of copper wire widespread on the Railways but the evil extends to components of locomotives, coaches and wagons and electrical equipment having even a small copper or brass element. (Para 555)

259. We consider that the Railways should have a registered mark for railway materials and parts on which such mark can be imprinted as this would obviously make it possible to take effective action against persons in unlawful possession of railway property under the Railway Property (Unlawful Possession) Act. (Para 557)

260. We feel that cases of wilful tampering with track do not receive from the State police and the other authorities concerned with law and order the attention that they deserve. (Para 564)

261.

i. We find that accidents due to sabotage have been increasing during the last 15 years and the action taken to trace the culprits has been largely ineffective.

ii. We do not agree with the Ministry of Home Affairs that prevention of accidents due to sabotage is a matter which may be left to be tackled by the Railway Ministry themselves. It appears to us that if the problem were viewed only from the viewpoint of percentage of train accidents attributable to sabotage, it is apt not place the gravity of accidents resulting from sabotage in correct perspective.

iii. We urge the Ministry of Home Affairs to ask the State Governments to take adequate measures to apprehend and prosecute the culprits successfully. Prevention of sabotage fall wholly and solely in the jurisdiction of the State police. (Para 565)

262. The Additional Commissioner of Railway Safety is a technical and highly experienced officer independent of the Railway administration and when after due investigation he comes to the conclusion that an accident was due to wilful tampering with track, the State Police authorities should ordinarily be guided by the results of these investigations. (Para 566)

263. In the event of a difference of opinion between the State police and the Commission of Railway Safety in regard to whether the accident was due to sabotage, the Railway administration should not allow the matter to rest at that but should pursue this with the State Government at a higher level. (Para 566)

264. We feel that there is need for suitably amending Section 12 of the Railway Protection Force Act, 1957 and Section 126 of the Indian Railways Act, 1890 in order that a person indulging in theft or destruction of railway property or in wrecking or attempting to wreck a train can be arrested and proceeded against with a reasonable chance of success.(Para 570)

265. We stress that the menace of theft of and tampering with railway equipment is too serious to be treated merely as an ordinary law and order problem as it adversely affects safety in railway operation. (Para 570)

266.

i. It appears to us necessary that steps should be taken to educate public opinion and to rouse the social conscience of the people as to the heinous nature of the crime of sabotage and of activities like vandalism and theft of railway material which result or may result in serious disasters involving loss of life of innocent persons travelling on the railway.
ii. We make a special appeal to the public men, the educationists and the press who have the opportunity and responsibility of moulding public opinion to their duty in this connection.
iii. We feel that the Railway Ministry and the State Governments should keep in mind the necessity of such an approach all the time. (Para 571)

The Commission of Railway Safety

267. Under the law, the Railway Board are the Safety Controlling Authority. The responsibility for safe operation of railways, thus, rests with the Railway administration. That responsibility cannot be shared by officers of the Commission of Railway Safety. (Para 576)

268. We have been assured by the Commissioner of Railway Safety that full cooperation and assistance of every kind is given by the Railway administration to the Commission of Railway Safety. (Para 581)

269. We consider that in cases in which the Additional Commissioner of Railway Safety is unable, due to preoccupation or otherwise, to hold an inquiry into a serious accident and requests the Railway administration to arrange for a departmental inquiry, it should be sufficient if he expresses his views on the findings and the recommendations made where he agrees with the findings of the departmental inquiry, instead of preparing his own

report. (Para 588)

270.

i. We are of the view that the Additional Commissioner of Railway Safety should inquire into certain types of accidents which are not at present provided for under the rules. We have in mind, in particular, two types, namely, (a) accidents at manned level crossings involving collisions between trains whether goods or passenger and road vehicles in which there is loss of life or grievous injury to passengers in the road vehicles and (b) collisions and derailments of goods trains in which there is loss of life or grievous injury to any person.

ii. The Additional Commissioner of Railway Safety must also make such other inquiries into serious accidents as the Commissioner of Railway Safety considers necessary for him to inquire into.

iii. The Commissioner of Railway Safety himself may, if he considers fit or if his Minister so requires him make inquiries into accidents of a very serious nature. (Paras 594 and 595)

271.

i. We consider that the recommendations made by the Additional Commissioners of Railway Safety should be incorporated as an integral part of the accident inquiry report under the heading Remarks and Recommendations instead of being an annexure to the Report.

ii. We suggest that line plans showing essential features and photographs, where necessary, should he have appended to such accident inquiry reports. (Para 596)

272. In our view, a period of 60 days from the date of accident should ordinarily suffice for the final report to be sent by the Commissioner of Railway Safety to the Railway Board and the Railway administration. (Para 597)

273.

i. From the safety point of view, inspections by Additional Commissioners of Railway Safety are no doubt advantageous.

ii. The reports of inspections by Additional Commissioners of Railway Safety should be forwarded directly to the Railways concerned and copies may be sent the Commissioner of Railway Safety and the Railway Board. (Paras 602 to 604)

274. It seems to us definitely advantageous that the Commission of Railway Safety remains attached to another Ministry so that its position as a body independent of the Railway Board would be, and remains, quite clear to the public. (Para 608)

275. We have noted that during the past nearly three decades the Commission of Railway Safety has been attached to different Ministries from time to time depending upon the reshuffling of portfolios and jurisdiction of various Ministries. We recommend that from now on the Commission of Railway Safety should find a permanent anchorage, and that this should be with the Ministry of Home Affairs. (Para 609)

276. We feel that the manner in which the draft report is at present dealt with robs it of objectivity and independence and, furthermore, results in unnecessary delays in finalizing the report. (Para 610)

277.

i. We are of the opinion that the responsibility for compiling the report of an accident inquiry should be placed squarely on the Additional Commissioner of Railway Safety concerned.

ii. It is the final report which should be sent by the Commissioner of Railway Safety to the controlling Ministry, the Railway Board and the Railway administration concerned. (Para 610)

278. In case there is any difference of opinion between the Commissioner of Railway Safety and the Railway Board or the Railway administration with respect to the conclusions or the recommendations in the report, the difference would have to be ironed out in a conference between the Commissioner of Railway Safety and the Railway Board in such manner as they think fit. (Para 610)

279.

i. We do not see the merit of an arrangement whereby the rules for conducting of inquiries by the Additional Commissioners of Railway Safety are made by the Ministry of Railways.

ii. We suggest that from now on whenever any changes in the present rules are required these should be considered and issued by the Ministry controlling the Commission of Railway Safety. This Ministry may, when necessary, consult the Railway Board while framing such rules. (Para 612)

280. We are of the opinion that it would inspire public confidence in the independence of the Additional Commissioners of Railway Safety if the public including trade unions and the press are admitted to the inquiries They would, of course have no say in the inquiry itself but may present only as observers at the stage when the Additional Commissioner of Railway Safety takes oral evidence of witnesses. (Para 613)

281.

i. The accident inquiry report intended for publication should be available to the Press soon after its finalization.
ii. If prosecution is decided upon in a particular case the publication of the report may be withheld. (Para 614)

282. It is necessary that the entrants to the Commission of Railway Safety should understand clearly that once they opt for the Commission and are selected, they would not revert to Railway service. The Ministry of Railways should have no further say in regard to their career. (Para 616)

283. We expect that if the steps that we have suggested. for securing the independence of the Commission of Railway Safety are taken, an inquiry by the Additional Commissioner of Railway Safety will inspire sufficient public confidence and a judicial' inquiry on the Indian Railways would, in course of time, become a rare thing. (Para 617)

284. We suggest that the present strength of Additional Commissioners of Railway Safety may be increased from five to seven. The jurisdiction of the various circles is a matter to be determined by the Commissioner of Railway Safety in consultation with the Ministries concerned. Meanwhile the fifth circle referred to in Para 586 of Chapter XIII, which has hitherto been continuing as temporary, may be made permanent. (Para 619)

285. It seems to us that the field for recruitment to the Commission of Railway Safety should be widened and there should be no bar to officers of the Railways from departments other than the Civil Engineering. namely, mechanical, operating and signal engineering being selected. We would like to add that the selection of officers should be in consultation with and on the recommendation of the Commissioner of Railway Safety. (Para 620)

286. We suggest a pyramid structure of grades for officers of the Commission. In our view, volunteers should be invited from among officers in the Junior Administrative Grade. (Para 621)

287.

i. The seniority of officers in the Commission of Railway Safety should be counted from the date of service in the Commission itself.
ii. After an officer has joined the Commission of Railway Safety, there should be no question of any further selection as far as grades up to Rs. 2,000 2,500 are concerned.
iii. The selection for the post of Commissioner of Railway Safety should be confined to the officers of the Commission of Railway Safety and no outside railway officer should be imported for this purpose. (Para

622)

288. We are convinced that the Commissioner of Railway Safety should have the appropriate secretariat status which in this case would be that of an Additional Secretary to the Government of India. (Para 625)
289. It is matter of regret that when the salary of General Manager raised in September 1965, the salary of the Commissioner of Railway safety was not correspondingly raised as it should have been at the time. We recommend that this matter should be rectified without delay. (Para 624)
290. While we appreciate the considerations that led the Commissioner of Railway Safety to suggest a shift of the office of the Commission to Secunderabad, it appears to as desirable that the office of the Commissioner of Railway Safety should be located at New Delhi. (Para 629)
291. The Headquarters of the Additional Commissioners of Railway Safety should be at the headquarters of the zonal Railways except where the jurisdiction of the Additional Commissioner of Railway Safety extends to more than one Railway in which case it should be at the headquarters of one or the other zonal Railway. (Para 630)
292. The annual report on the working of the Railway Inspectorate should continue to be placed on the tables of both Houses of Parliament. (Para 631)

The Research, Designs and Standards Organization and its future role

293. We set out the role and the various facets of activities of the RDSO, as we visualize them. (Para 636)
294. We were told that efforts of the Organization in farming out problems of basic research to the National laboratories, Institutes of Technology or research institutions had not met with much success. (Para 640)
295. We suggest that with a view to obtaining better coordination with the fundamental research institutions, laboratories and institutes of technology, the Director General, RDSO, or his representative should be, in an ex-officio capacity, on the governing councils of those of the National laboratories and institutes on whom the RDSO has to lean heavily for the solution of its basic research problems. (Para 642)
296.
    i. The RDSO should concentrate on problems of applied research which may refer to the evolving of ways and means to improve the existing equipment and services or developing of new forms or systems.
    ii. We consider that in the matter of applied research, priority should. for some time to come. be given to problems which are susceptible of at

least a partial solution within a period of two to three years over the relatively long-term research projects. (Para 643)

297.

i. A conspicuous example of a problem needing immediate solution is the designing and standardization of signalling relays on which modern signalling depends so much and which are essential for progressing such works.

ii. We understand that a beginning has been made by setting up a Relays Cell in the RDSO, but we consider is necessary to accelerate the pace considerably so that relays suitable for our purpose and using indigenous materials to the maximum extent can be developed. (Para 644)

298. It would, in our opinion, be useful to make a quantitative assessment of where and what safety facilities should be provided on the various Railways and to what extent safety could be improved by doing 80. (Para 646)

299. We think that greater reliance will have, in future, to be placed on methods of Operations Research if the ultimate objective of the research organization is to maximize efficiency, safety and long-term economy. (Para 646)

300. We are of view that designing and development of machines for special purposes which cannot be purchased as off-the-shelf items from the trade should be a continuous activity of the RDSO. (Para 648)

301. In our view, adequately equipped sections of the RDSO should be located at the manufacturing units like the Locomotive Works at Chittaranjan, the Integral Coach Factory at Perambur and the Diesel Locomotive Works at Varanasi. (Para 649)

302.

i. We suggest that efforts should also be made to attract the best Indian talent for design work from all sources and to encourage the designing of improved jigs and tools for railway workshops and better planning of equipment and plant layout for workshops, loco sheds, sicklines, stations, etc.

ii. We have in view the specialist consultancy service which the RDSO should provide in the designing and equipment of such depots. It is not our intention that the Design Wing of the RDSO should function as a general-purpose drawing office at the beck and call of the Railways and we would like the RDSO to guard against this. (Para 649)

303. We consider it useful that some sections of the standards wing of the

RDSO should be located in the Railway Board so that complete sets of standard specifications and drawings can be readily available on demand and references regarding these can be disposed of speedily. (Para 650)

304. We suggest that the expert technical Standards Committees should invite representatives of the Commission of Railway Safety and some manufacturers of railway equipment on a selective basis to participate in their deliberations. (Para 650)

305.

i. We would like to bring into sharp focus the rapid progress being made by advanced countries in the development of signalling and tele-communication, particularly the use of such items as axle counters. train describers, hot axle detectors, electronic track circuits, and automation in marshalling yards, improved communication methods like message dialling and microwave.

ii. It has been represented to us that adequate attention has not been paid to investigating problems concerned with signalling and telecommunication peculiar to the Railways or to strengthening the telecommunication network on the railway system. We feel that there is great scope and urgent need for work of this nature in the RDSO and we would urge that this receives its due share of attention. (Para 651)

306.

i. We are in favour of tests and inspections which are made by the RDSO at the specific request of the zonal Railways, the Railway Board or the Commission of Railway Safety. We would suggest that a suitable organization may be created in the RDSO so that such requests can be dealt with without causing interference and interruption in the other regular approved programmes of the RDSO.

ii. The inspection of material manufactured in the signal and telecommunication workshops should, in order to ensure uniform quality, be entrusted to the RDSO.

iii. We understand that inspection of electrical signalling equipment manufactured by the various firms is already undertaken by the RDSO but only a small percentage of production is inspected as a test check. In the present state of development when a number of firms are entering the field and when those already in the field are taking to new items, it is essential that a much larger proportion of electrical signalling equipment is inspected both at the manufacturing stage and at the assembly stage.

iv. The inspection organization of the RDSO should, if required, be

suitably strengthened to perform these essential functions.

v. It appears to us that the inspection units could with advantage be located at Calcutta, Bombay, Madras etc. (Para 652)

307.

i. We understand that the RDSO have been acting as consultants to the State Trading Corporation and the wagon building industry. We would like to commend the RDSO on this expanding role and would urge that technical consultations should be provided in full measure to these important clients.

ii. We suggest that such consultation as may be asked for by the Commission of Railway Safety should be made readily available. (Para 653)

308. We consider that with the expanding hand of competent officers and staff and with the growing knowledge and expertise which the RDSO is steadily acquiring, rendering of consultancy services by the RDSO would progressively increase and more and more confidence will be placed in its technical advice. (Para 654)

309. We consider that the details of projects to which the RDSO should apply itself in future is a matter which would have to be left to the RDSO under the guidance of the Railway Board and the Central Board of Railway Research keeping in view the requirements and priori- ties which may arise from time to time. (Para 655)

310. We mention a few subjects whose urgency strikes us as pressing :

i. With the increased speeds of rolling stock and the introduction of fast non-stop trains the subject of vehicle dynamics has assumed great importance. Research on the various aspects of riding quality of rolling stock from the viewpoint of both safety and comfort as also stress analysis on vehicle structures and important components would have to be pursued, and if necessary, expanded. This research must be suitably dovetailed into a wide-range study of derailments to establish guidelines for designs and maintenance practices which are conducive to greater safety.

ii. The problem of seizure of roller bearings in fast non-stop trains particularly when the conventional method of station staff watching out for an overheated axle box from the station plat- form is no longer applicable appears to call for an urgent study and solution.

iii. It is necessary that research and development of a self-propelled ultrasonic rail inspection car is taken in hand.

iv. research and study are necessary to ascertain the limits of safe

speed on turnouts of varying degrees. (Para 655)

311. We have no doubt that expansion of the RDSO would be necessary so that the RDSO is able to play the role assigned to it. (Para 656)
312. We understand that the RDSO is in need of some very important equipment. We see no reason why the work in the RDSO should suffer for want of necessary equipment and would suggest that procurement of equipment should be planned so as to meet effectively the needs of the RDSO. (Para 658)
313. The increase in expenditure in the course of the next few years consequent on the expansion of the RDSO, would, in our view, be amply justified and would be repaid in the form of higher standard of earnings. efficiency, and safety in railway operation. (Para 659)
314. We strongly urge that foreign exchange needed for the expansion of the RDSO should be released as and when required. (Para 660)
315. It is our opinion that the reorganization of the RDSO required to fulfil the role suggested in the foregoing paragraphs should be carried out within one year. (Para 661)
316.
    i. For an organization like the RDSO to be successful, there should be excellence not only at the top but at each echelon of the hierarchy and the effort should be to induct the most suitable officers and staff at all levels with suitable motivating environment.
    ii. It is obvious that the RDSO's rules of business and the yard- sticks in respect of its staff, equipment and materials, financial powers, etc. may have to be different from those which are applicable ordinarily to the Railway administrations. (Para 661)
317. To ensure that there are no hold-ups or handicaps to progress anywhere in the organization, the overall head of the RDSO should be the Chairman of the Railway Board to whom the Director General should report directly. (Para 661)
318. The Director General, who is the functional head should appropriately be selected from amongst the experienced General Managers with flair for research. (Para 661)
319. We had suggested in Part I of our Report that the head of the RDSO should have a long enough tenure to make an impact on the organization. If this involves a still higher grade for the post temporarily to enable the incumbent to continue, the upgrading would, in our view, be justified. (Para 661)

Accident Statistics

320. The purpose of train accident statistics to identify the primary cause of accident for getting attention or administration. (Para 663)

321.

i. We find that the statistics of train accidents as compiled in Statement 41 of the Supplement to the Annual Report on Indian Railways at present are oriented only towards their number and consequences.

ii. A small pamphlet A Review of Accidents on Indian Railways published annually attempts an elementary analysis of causes under certain broad heads in respect of collisions and derailments. (Paras 665 and 665)

322. While even broad heads of causes may have some value, the statistics of train accidents to be of intrinsic value should, in our opinion itemize these broad heads further so as to be of value to the administration. (Para 666)

323. We suggest that the accident statistics under different heads should be compiled on all the Railways on a uniform basis and instructions which leave no room for ambiguity should be issued to all the zonal Railways. (Para 667)

324. We suggest streamlining of the classification of accidents. For Instance-

i. Fires in diesel or electric engines are more in the nature of engine failures than accidents to trains, and a more accurate indication of the nature of such occurrence could be given if they were to be brought under the broad head ‘failure of railway equipment’.

ii. Fires in trains should, in our view, encompass cases of fires in vehicles and wagons only.

iii. If necessary, fires in electric and diesel locomotives may be brown brought under a separate sub-head under the general head 'engine failures to isolate them from the mass of figures included under engine failures.

iv. Time failures of engines under the broad bead 'failure of rail- way equipment is reckoned on the basis of delays of one hour or more caused to trains due to malfunctioning of train engines. While such standards may have been all right for steam traction years ago, we consider them inapt in the present-day conditions, particularly in case of diesel and electric locomotives whose efficiency index must be very different, and for which a much shorter duration should, in our view, be prescribed.

v. We notice that at present failure of railway equipment includes only failures of rolling stock, permanent way and overhead electric wires.

Failures of signalling apparatus are not included under this head. A breakdown of signalling installations can cause heavy delays in train running if not a complete stoppage of movement. We therefore suggest that a breakdown of modern signalling installations or means of communication may also be classified under the head failure of railway equipment. (Paras 668 and 670)

325. We consider that accident statistics compiled at any time should be examined periodically to assess their value. (Para 671)

Safety Organization

326. The four important departments concerned with safety of rail travel are the operating, the mechanical engineering, the civil engineering and the signal engineering departments. In order that rail travel may be safe, it is necessary that each department should do its bit in the best possible manner. (Para 674)

327. Committee had noted that accident had come down not only to the safety organization but to all categories of railway staff including officers, supervisors and railwaymen of all departments as well as the technological aids introduced. But safety organisation plays important role in instilling safety consciousness amongst staff and eradicating shortcut methods which jeopardize safety. (Para 682)

328.

i. We are of the view that the Directorate of Safety has a useful function to perform in as much as it focuses attention at the highest level on matters having a bearing on safety.

ii. Analyses of long-term trends of accidents, examination of various suggestions and recommendations to promote safety and following up the implementation of the recommendations coupled with on-the-spot checks to see whether shortcut methods are being adopted and how these can be eschewed are, indeed, highly useful functions. We, therefore, consider that the Directorate of Safety should continue to perform these functions as a permanent measure.

iii. We are disappointed to note that the post of Joint Director in Directorate of Safety was abolished some time ago for reasons of economy. The main objective of having a Joint Director in addition to a Director that at all times the Director or the Joint Director could go out on inspection and be able to see through field inspections that safety work is carried on by the Railways on the right lines.

iv. We consider this objective unexceptionable and would strongly recommend that the post of the Joint Director in the Safety Directorate

should be revived. Considerations of economy should not, in our opinion, stand in the way where safety is concerned. (Para 684)

329. The Transportation Superintendent (Safety) should spend a good deal of his time in inspection from a safety angle. At the same time, we think that to keep in touch with the actual trend in accidents and other safety measures which evolved from time to time either on the basis of accident inquiries or of other sources, he should not be isolated from case work dealing with accident. (Para 685)

330. We suggest that the headquarters safety organization which is headed by a Transportation Superintendent (Safety) may be strengthened by the appointment, where required, of an officer in the senior scale who would help the Transportation Superintendent (Safety) both in inspections as also-in routine case work dealing with accidents. (Para 685)

331. We are of the opinion that the Divisional Safety Officer in each of the Divisions should be in the senior scale. Wherever the post is held at present by an assistant officer, it should be upgraded. (Para 687)

332.

i. As safety must be built into the various departments of the organization itself and particularly in the departments mainly concerned with movement of trains, we are of the view that Safety Counsellor of departments other than transportation should be sent back to their parent departments. On being sent back to their parent departments, these Counsellors should continue to carry on their present functions though under the supervision of their respective divisional officers. (Para 690)

333. Committee had suggested for the consideration of the Railway administrations that when Safety Counsellors are reverted to their parent departments, posts of Chief Permanent Way Inspector, Chief Loco Inspector, Chief Carriage and Wagon Inspector and Chief Transportation Inspector should be created in lieu of the existing posts of Safety Counsellors on each Division, and these staff must educate for safety consciousness. It would be better that Chief Inspectors be in class II and the selection must be on the basis of their aptitude, sense of mission and dedication to the cause of safety should be the primary considerations and they should be hand-picked men. (Para 691)

334. Safety camps are useful, and these must be revived and not to be done in due of regular refreshers courses of safety category staff but purpose of these camps must be invigorate the safety consciousness among staff. (Para 694)

335. Committee had appreciated a safety model car made by Divisional Superintendent and his officers at Lucknow and same to be adopted on other divisions. (Para 695)
336. Raising concerned over fatalities of railway staff while working on track, committee had strongly recommended that high-visibility clothing as in United Kingdom to be given to the staff. These clothing should be worn over the normal clothing with highly visibility jackets while working on track and easily be seen by drivers of approaching train. (Para 697)
337. The committee had expressed concern over routine inspection by supervisor and officer of safety organization and stress that inspection must high-light unsafe methods of working and how they can be eschewed without undue detriment to speedy movement of traffic. (Para 698)

THE RAILWAY ACCIDENTS ENQUIRY COMMITTEE, 1978 PART I & II (SHRI S. M. SIKRI COMMITTEE 1978)

31

The later part of the second half of 1977 saw two serious railway accidents in quick succession, involving heavy casualties and damage to railway property. The first was the collision between Howrah-Amritsar Deluxe Express and a goods train at Naini station on Mughal Sarai-Allahabad broad gauge section of the Northern Railway on October 10, 1977, and the second was the derailment of Ahmedabad-Delhi Mail between Ajarka and Bawal stations on Bandikui-Rewari meter gauge section of the Western Railway on November 11, 1977. These accidents had greatly agitated the public and deep concern was voiced in the Parliament and the Press. It was against this background that the Minister of Railways, Prof. Madhu Dandavate, while making a statement in the Rajya Sabha on December 19, 1977, announced the Government's decision to constitute a committee to go into the whole question of accidents. Subsequently, the following announcement was made by the Government of India through their Notification No. ERBI/77/21/86 dated January 3, 1978:

"Having regard to the views expressed by the Members of Parliament and others on the recent rail accidents, the Minister of

Railways announced in Parliament on December 19, 1977, the Government's decision to appoint a High-Power Accidents Enquiry Committee to go into the whole question of accidents.

The constitution of the Committee will be as follows: —

Chairman

1. Shri S. M. Sikri, former Chief Justice of Supreme Court of India.

Members

2. Dr. Murli Manohar Joshi, Member of Parliament (Lok Sabha).
3. Shri Khurshid Alam Khan, Member of Parliament (Rajya Sabha)
4. Shri Bagaram Tulpule, former General Manager, Durgapur Steel Plant and ex-Chairman, National Safety Council.
5. Shri P. Sahai. Ex-Member Railway Board.
6. Shri C.S. Parameswaran, Ex-General Manager, Railways.
7. Shri Arya Bhushan, Ex-Commissioner of Railway Safety.

Secretary

8. Shri V.K. Thapar, Joint Director (Safety), Railway Board.

31.1 Terms of Reference

The terms of reference of the Committee will be as Under. —

1. To review the position of accidents on the Indian Railways since the appointment of the Railway Accidents Inquiry Committee, 1968 and to review the implementation of their recommendations; and
2. To examine the adequacy of the existing organisation, equipment and practices for ensuring safe running of trains on the Indian Railways, and to suggest measures for prevention of accidents.

The Committee will submit its report within six months from the date it starts functioning.

(Sd.) B. MOHANTY,
Secretary, Railway Board
And Ex-Officio Jt. Secretary to the Govt. of India."

2. After completing the Preliminaries and staffing of the Secretariat, the Railway Accidents Enquiry Committee-1978 (hereinafter referred to as the Committee) held their first meeting on March 27, 1978, to chalk out their course of action. Discussions were also held with the Minister of Railways, the Minister of State for Railways and the

Chairman and Members of the Railway Board.

To advise the Committee on signal and tele-communication matters, the Government appointed Shri S. M. Gowri Shankar, Ex-Chief Administrative Officer, Railways and former Director, Signal and Telecommunications, Railway Board, as Consultant to the Committee.

Shri V. K. Thapar worked as Secretary November 25, 1978, and, on his proceeding abroad for training tinder the United Nations Development Programme, Shri R. S. Soin, Joint Director, Civil Engineering, (Track), Railway Board, took over as Secretary of the Committee from December 2, 1978.

Keeping in view the wide scope of investigations which have been entrusted to the Committee, the Government have extended its tenure Up to September 30, 1979.

3. The appointment of the Committee was given wide publicity through public notices in all important English and Hindi newspapers and also one leading newspaper commanding wide circulation in regional languages. A comprehensive questionnaire was issued to the Railway Administrations, the Commission of Railway Safety, the two recognized trade union Federations, the Federation of Railway Officers Associations and the Railway Service Commissions, soliciting information and their views on specific issues of railway working which have a bearing on the safe running of trains. Communications were also addressed to retired Chairmen/Members of the Railway Board, Senior Officers of the Railways and of the Commission of Railway Safety, requesting them for their views on such matters. Views and observations were also invited from the concerned Ministries of the Central Government, the State Governments and Chambers of Commerce.

4. The two terms of reference of the Committee are distinct from each other. We decided that the review of accidents on the Indian Railways since the appointment of the Railway Accidents Inquiry Committee, 1968 (hereinafter referred to as the Wanchoo Committee) and of the implementation of their recommendations would constitute our first report and the second term of reference of the Committee regarding examination of the adequacy of the existing organisation, equipment

and practices for ensuring safe running of trains on the Indian Railways and suggesting measures for prevention of accidents would be dealt with in our subsequent report.

31.2 Methodology

5. **Review of accidents on Indian Railways-** In the terminology of the Railways the term 'accident', which has been defined in Chapter II, envelopes a wide spectrum of occurrences or consequences thereof which not only affect safety but also ruse interference with normal working like failures of railway equipment, namely, engines, rolling stock and permanent way, etc., which may not necessarily mean a mishap. It is, however, the accidents which fall in the categories of collisions, derailments, accidents at level crossings and fires in trains, which ordinarily result in loss of life or limb or damage to property which agitate the public. We, therefore, decided to restrict the detailed review of accidents only to the main categories of accidents mentioned above as was done by the Wanchoo Committee. Beside Committee shall also review train accidents like averted collisions, breach of block rules, drivers passing signals at danger and train partings which carry a potential hazard to safety of train operations and in which cases it is only a fortuitous circumstance that actual mishap has been saved. Since the term of reference of the Committee requires them to review the accidents on the Indian Railways since the appointment of the Wanchoo Committee, the review of accidents covered in this report will be for the period from April 1, 1968, to March 31, 1978.
6. It was estimated that a review on the aforesaid lines would cover around 20,000 train accidents and, in view of the volume of work involved, it was initially proposed to do this analysis with the help of a computer. The Railway Board estimated that about 300 computer hours would be required for this work and, for writing the programme, a detailed systems study would be necessary. They, however, felt that the Railways would not be Able to spare so much manpower or computer time since the maintenance of computers was in a transition stage due to the winding up of M/s. International Business Machines. A preliminary survey with the Indian counter part of the above-mentioned firm also showed that the work involved'

was likely to take more than three months and a proper estimate of time could be had only after a systems study was undertaken. Such an analysis was estimated to cost Rs. 3 lakhs approximately. Enquiries made by us also revealed that the Indian Institute of Technology and the University Computers at Delhi were not in a position to handle the job of such a magnitude. In view of the above constraint, the Committee finally decided to compile and analyze the train accidents statistics without the use of a computer. Accordingly, 121 proforma were prepared and circulated to the Railways in October 1978 for compilation of the required statistics. This resulted in some setbacks to the schedule of work of the Committee.

7. We had asked the Railways to send the accident statistics, duly compiled, by 15th January 1979. However, till May 1979, part information in this respect had been received from only two Railways and nothing from the others. Since a detailed review of accidents would be possible only after accident statistics have been received from all the Railways and duly analyzed, we give in the first report only a brief statistical appreciation of important categories of train accidents during the 10-year period ending 1977-78. Information in this respect has been obtained from the 'Supplement to the Report by the Railway Board on Indian Railways—Statistical Statements' published annually up to 1969-70. 'Accident Statistics of Indian Railways' published annually since 1970-71 and 'A Review of Accidents on Indian Government Railways' issued annually by the Railway Board. This appreciation is given in Chapter II. The detailed cause wise review of accidents will be dealt with in our subsequent report. We also give in Chapter III a review of the serious accidents which were statutorily inquired into by the Additional Commissioners of Railway Safety in exercise of the powers conferred on them under the Indian Railways Act, 1890 (9 of 1890). Information in respect of these was obtained from the annual reports on the working, of the Commission of Railway Safety issued by the Ministry of Tourism and Civil Aviation.

8. **Review of implementation of the recommendations made by the Wanchoo committee.-** The terms of reference of the Committee required them to review the implementation of the recommendations

made by the Wanchoo Committee. The Wanchoo Committee had summarized their reports into recommendations and observations which aggregate to 729. However, since there is no clear-cut indication as to which item is a recommendation and which an observation, we have reviewed all these recommendations and observations. The more important of these have been dealt with in detail in Chapter V. In the case of recommendations which are merely observations or factual statements, or which have been fully or substantially implemented, or dealt with by the Railway Board by issuing appropriate instructions, we have not made any detailed comments. However, for convenience of reference, we have given in the Appendix to this report all these recommendations and observations together with the views of and action taken by the Railway Board.

9. **Assessment of adequacy of the existing organisation, equipment and practices for ensuring safe running of trains:—** The Committee' decided that, for making an assessment in this respect, they would visit important installations and centers of railway activity, collect evidence from railway officers and staff at different levels and hold discussions with various organizations. Our detailed comments and recommendations on this term of reference will be given in the subsequent report.
10. We may point out that while reviewing the recommendations of the Wanchoo Committee, besides relying on the information given by the Railway Board, the Zonal Railway Administrations, the Research, Designs and Standards Organisation (hereinafter referred to as RDSO) and the Commission of Railway Safety, the Committee have also made use of material available in the statistics of the Railway Board, the Indian Railway Conference Association and the Commission of Railway Safety. We would like to make it clear that, in the light of material and information which may become available later on, the Committee may find it necessary to amplify, elucidate, supplement or amend in their subsequent report some of the observations made and conclusions drawn in this report.
11. In our detailed review of the implementation of the important recommendations of the Wanchoo Committee, which has been made

in Chapter IV, we have at times been highly critical of the Railway Board and the Railway Administrations in respect of the action taken. This might convey the impression that safety on the Railways has deteriorated. This impression would not be correct. From the brief statistical review of the accidents given in Chapter II, was find that, broadly speaking, there has been a reduction in the incidence of important accidents, namely collisions, derailments, accidents at level crossings and fires in trains as compared to the position obtaining at the time when the Kunzru and Wanchoo Committees went into this question, Prima facie, this is an indication that there has been an improvement in the overall safety record of the Railways.

31.3 Summary of Recommendations

We summarise in the following paragraphs the recommendations made by us in Chapters III to XVII of this part of our Report.

The Human Element

1. The Railways should set up speedily an adequate personnel management Organization manned by persons with proper professional training and the right aptitude, and such Organization should reach all levels and points on the Railways at which administration has to deal with large number of employees. (Paras 119-121)
2. The departmental officers and supervisors who have to lead, take work from and look after the problems of workers, should be adequately exposed to the various subjects, concepts and skills in the area of management of people. (Paras 119-121)
3. An effective personnel management Organization backed up by an attitude of scrupulous fairness and a genuine concern for the workers as people should provide administration with the capability of dealing with the factors leading to erosion of discipline and decline in work standards. (Paras 122 & 123)
4. There should be only one recognised employee's union on such railway with a recognised federation at the apex.

   (Para 124)
5. The only way of discouraging category-wise unions seems to be for the administration to ignore them entirely, taking care at the same time to speedily resolve the problems of different categories of workers when these are brought up through the recognised unions. Administration must

consciously build up its capability to cope with the temporary dislocations in operations forced by the category-wise unions.

(Para 125)

6. Membership of supervisors in staff unions is not consistent with the position of supervisors as a part of the management. The exact modalities of how this is to be achieved requires consideration by the Government.

(Para 126)

7. Firmness is as important as fairness and sympathy in administration's style and strategy for dealing with its employees. It is the responsibility of the higher echelons of Railway Administration to create confidence among front line supervisors and officers that, so long as they act in good faith and are not high-handed or vindictive, they will be backed in ensuring discipline and proper work-standards. Equally, Government also must act in such a way that the hands of administration and its officers and supervisors are not weakened by extraneous political pressures.

(Paras 127 & 128)

8. Redressing grievance should be treated by the administration not as a welfare activity, but as extending to the employee his rightful due and the necessary sense of urgency brought to bear on this activity.

(Para 129)

9. The Railway Board must give serious thought to the question of adequately manning the Personnel Branch so that each employee is given his rightful due within a reasonable time before it shows up as a grievance.

(Para 130)

10. To remedy the situation created by sanction of awards concerning pay of staff which take retrospective effect, all awards should have prospective effect, In case of an award with retrospective effect, Government should indicate the lump-sum payments which should be made to staff, thus obviating the need to go into old records and detailed calculations.

(Para 131)

11. Measures to decentralise personnel functions to stations with a large strength of railway employees and major sheds should be adopted by zonal railways on the lines being tried out by the Southern Railway.

(Para 132)

12. Greater attention should be devoted to welfare in the real sense of the term and not confuse it with normal grievance redressal function of the

administration.

(Para 133)

13. Rational determination of the optimum workload of welfare inspectors should be undertaken.

(Para 134)

14.

(i) The Railways should consider expanding schooling facilities for employee's children greatly.

(ii) Large schools with residential facilities should be established in cooperation with the Central Schools Organization, at a fairly large number of suitable locations, distributed all over the country.

(Para 135 & 136)

15.

(i) It is important to see that no accident is liable to occur due to people not fully qualified being given posts which are concerned with the safety of the public.

(ii) While special provisions for promotion of Scheduled Castes/Scheduled led Tribes employees to safety categories, take some care of the efficiency of the promotee, they do not appear to consider the effect of such promotions on persons who have been superseded, and feel frustrated and disheartened. The depth and extent of frustration caused and its ill effects on safety of railway working should be studied further. (Para 138)

16. Psycho-technical testing should for the present, be used in the spirit of counselling procedure to help the employees to improve their performance. (Para 139)

17. All staff initially recruited in Class IV category, who by promotion may occupy positions vital for safety in train operation, should also be brought within the scope of psycho-technical testing right at the initial recruitment stage. (Para 139)

18. Directorate of Psycho-Technical Research should be set up in the RDSO which would pursue the various areas of testing of staff and research in applied psychology having relevance to safety in train operation. (Para 140)

19. Directorate of Psycho-Technical Research should have greater interaction with the departments of applied psychology in universities and other institutions. (Para 141)

20. In structuring the proposed Directorate of Psycho-Technical Research in the RDSO, the inadequacies of the present cell and the guaranteeing of

reasonable prospects for personnel in this Directorate, commensurate with those obtaining elsewhere, be kept in view.

(Para 142)

Recruitment Training and Promotion Policy

21. Arrangements must be made to streamline the recruitment procedures so as to make available candidates as soon as vacancies arise.

(Para 143)

22. Direct recruitment to the category of firemen grade 'A' should be reviewed with immediate effect. (Para 145)

23.

(i) The scheme of training apprentices in railway workshops should be revived forthwith.

(ii) 50 per cent of the vacancies in the skilled cadres in workshops should be filled from trained apprentices.

(iii) The remaining 50 per cent vacancies in the skilled cadres should be filled from amongst railway men in lower grades with minimum educational qualifications of 8th class. They should receive intensive training for an appropriate period and be subjected to a suitable trade test before being absorbed in skilled categories.

24. In order to meet the larger requirements of electrical signal maintainers in Grade I: -

(i) 50 per cent vacancies in Grade I, should be filled by direct recruitment from graduates in Physics and Mathematics or diplomas holders in Electrical/Electronic Engineering followed by one year training. The remaining 50 per cent should be filled up by promotion.

(ii) In Grade II, all vacancies should be filled by promotion from Grade III.

(iii) In Grade III, the existing practice of filling 50 per cent by direct recruitment should continue. (Para 150)

25. Direct recruitment for mechanical signal maintainers Grade III should be given up, as this category is being fast displaced by electrical signal maintainers. (Para 150)

26.

(i) Signal inspectors should maintain, in addition to signalling, common telecommunication equipment in their jurisdiction after some initial training Telecommunication inspectors should be entrusted with specialised communication installations like Microwave, VHF and other wireless equipment and large telephone exchanges.

(ii) Lateral recruitment in the cadres of signalling and telecommunication inspectors should take into account a minimum of three grades of promotion, for each level of recruitment.

(iii) The minimum educational qualification for signal and telecommunication inspectors Grade III (extent 40 to 50 per cent) should be a diploma in Electronics / Telecommunication Engineering and for inspectors in intermediate Grade II (extent 25 per cent) it should be a degree in Electronics / Telecommunication Engineering.

(iv) The requirements of signal inspectors and telecommunication inspectors for recruitment purposes should be combined.
Vacancies should take into account, both permanent and temporary cadres including the anticipated requirements for works, deputation to RITES, RDSO and countries abroad.

(v) All the Railway Service Commissions should synchronise their timetable for recruitment of apprentice's signal and telecommunication inspectors in the initial and intermediate grades. (Paras 151 to 153)

27. The field of selection of welfare inspectors should be enlarged to cover other departments also; persons with the required aptitude and qualifications in social work should be inducted into the welfare Organization and trained.

(Para 154)

28. In the lowest recruitment grades in Class IV category, including casual labour, only persons with minimum educational qualification should be recruited. (Para 155)

29. Officers' cadre planning must be taken up in all seriousness to mitigate the acute scarcity of Class I (Category A) officers and to correct the imbalances which have occurred in different departments and in the divisions.

(Para 156)

30. Ways and means should be found of injecting adequately qualified engineers at different levels in the workshops, production units and open line.

(Para 157)

31. All factors which stand in the way of full utilisation of the available training capacity should be identified and remedied at the earliest. (Para 161)

32. The subject of training of staff and officers should be placed under the charge of a senior officer of the Personnel Department in the headquarters

of each zonal railway. (Para 162)

33. Before the trainees proceed on training courses advance TA should be paid period of their course, to them for the whole. (Para 163)

34. Adequate capacity for the refresher training of signal inspectors should be generated and utilisation thereof also ensured in greater measure. (Para 164)

35. Training of signal artisan staff, and promotional and other special courses should be decentralised and conducted in the zonal training schools where teaching could be done in the local language. (Para165)

36. Feedback on failures of signalling and interlocking gear and reports of accident enquiries, where signalling was held to be a cause, should be sent to the signal training schools and institutes regularly. (Para 166)

37. The signal and zonal training schools/institutes should be fully equipped with models and equipment. Provision therefor should be made in the project estimates of all new installations. (Para 167)

38. Regular training courses should be conducted for loco maintenance staff. (Para 168)

39.

(i) The policy of selection of diesel and electric drivers should provide avenues for drafting surplus staff from the steam side and direct recruitment from the open market.

(ii) A minimum standard of education may be laid down for the selection of diesel and electric drivers from the steam side as well as for direct recruits.

(iii) Selected staff should be put through an intensive training course in the Diesel/Electric training schools. (Para 169)

40. Training in signalling matters covering especially signal aspects and failures thereof, should form a part of syllabi for refresher training to drivers, Lectures covering ill-effects of drugs, liquors and intoxicants on the reflexes of a person, especially drivers and other running staff, should also form a part of the syllabi. (Para 171)

41.

(i) All staff in the carriage and wagon department on first promotion to semi-skilled, skilled and highly skilled grades should be given intensive training for an appropriate period before they are placed in their new positions.

(ii) Safaiwalas of the carriage and wagon department who have been

promoted into semi-skilled skilled grade should be given special intensive courses at the earliest. The course content should take into account the educational background of such staff.

(iii) Refresher and vocational training courses must be planned for train examiners and other artisan staff at regular intervals. It should be ensured that the staff are regularly spared for these. (Para 172)

42. Train Examiners should be regularly sent for training at the Integral Coach, Factory, Perambur. (Para 173)

43. Artisan staff in workshops should be given regular refresher and vocational training. There should be a proper system for monitoring their training. Such staff should not suffer any monetary loss while they are away on training. (Para 174)

44. Regular training courses, including refresher training, should be given to operators and maintenance staff employed on ultrasonic rail flaw detectors. (Para 175)

45. Welfare inspectors should be given adequate and appropriate training to enable them to take up effectively the welfare activities of staff. (Para 176)

46. Persons of high calibre having aptitude for teaching, should be posted as instructors in the schools/institutes of training. Such persons should undergo instructors training course before taking over charge. (Para 177)

47. Instructors in training schools should be only in the highest grades of supervisory staff, namely, Rs. 840-1040 and Rs. 840-1200. (Para 178)

48. Heads of zonal training schools should be selected from one of the 5 major departments concerned with safety of train operation. They should ordinarily have a tenure of not less than 3 years. (Para 179)

49. The Railway Board should find ways and means of ensuring that staff who fail in refresher training course, are not employed on train passing duties till they pass such a course. (Para 180)

50. Before taking over charge, a Class II officer should be given adequate training. (Para 181)

51. The required number of trainee reserve posts for running staff as well as staff directly connected with safe working of trains should be created without any further delay and positions filled up at the earliest. It should also be ensured that staff connected with safe working of trains are sent

for refresher training at the prescribed intervals. (Para 182)

52. Deputing of officers to seminars and short-term courses should be left to the General Manager who should be given full powers in this matter. (Para 183)

53.

(i) The faculty at the Railway Staff College, Vadodara should be strengthened in the major disciplines.

(ii) Major disciplines should be provided with technical or research assistants to help the professors in developing studies and research programmes.

(iii) There is need to revise the scale of honorarium for visiting lecturers. (Para 185 to 187)

54. Some urgent steps will have to be taken to modify the promotion policy to mitigate the more glaring aspects of discontent amongst staff. (Para 190)

Other Staff Matters

55. Essential categories of staff should be allotted quarters on priority near the place of work. (Para 191)

56.

(i) Construction of new staff quarters should be taken up for specific categories of staff like drivers, guards, firemen, assistant station master's etc. to improve their position of housing.

(ii) The entitlement of railway accommodation to drivers, guards and such other essential categories of staff should be reviewed so as to enable them to take proper rest.

(iii) Railway staff at divisional and headquarters of zonal railways, workshops, etc. should be encouraged to build their own houses to ease the pressure on railway accommodation. Housing amongst railway workers should be incentives given by way of easy loans of spare railway land. cooperatives encouraged and allotment

57. Leave reserve percentages for different categories of staff should be reviewed in the light of present leave entitlements of staff. (Para 196)

58.

(i) Running rooms should be provided with individual cubicles in which staff can take rest undisturbed.

(ii) Provision of basic necessities like clean linen, mosquito nets, adequate water supply, electricity, etc., should be arranged and sanitary conditions improved.

(iii) Ways and means should be devised by the Railway Administrations to insulate running rooms against misuse by outsiders.

(iv) Running rooms should be located in close proximity to the place of duty.

(v) Trained cooks should be provided in running rooms to meet the needs of staff fully.

(vi) Railways should also consider establishing regular canteens in the larger running rooms. (Paras 197 & 198)

59.

(i) Crew rest vans should be provided with cushioned berths, lighting, fans, water, cooking facilities, bathrooms, etc.

(ii) Development of proper type of crew rest van in place of the existing 4-wheeler should be considered. (Para 199)

60. Assessment of the fatigue level in running/station staff in performing duty at night vis-a-vis day should be studied by the RDSO. This should form a rational basis for determining the limit of duty hours during nighttime. (Para 200)

61. The jurisdiction and workload of permanent way inspectors should be reviewed. (Para 201)

62.

(i) Permanent way inspectors must be relieved of the stores charge under them.

(ii) Permanent way stores depots each under the charge of a storekeeper, in appropriate grade, should be set up, one for each sub-division on the open line. (Para 202)

63. Some Adequate assistance should be given to permanent way inspectors to look after establishment maters properly.

(Para 203)

64. Yardsticks should be laid down for the workload of inspectors of works on the basis of which their jurisdiction should be rationalised. (Para 204)

65. The workload of assistant engineers on the open line should be studied and their jurisdictions rationalised. (Para 205)

66.

(i) The creation of a traction cadre consisting mechanical and electrical engineers, who would be responsible for the maintenance and running of diesel and electric locomotives, should be considered.

(ii) The workshop cadre should be separate from the traction cadre. (Para 206)

67. Encouragement should be given to all officers and supervisors to take up membership of technical and professional institutes and societies in this country as well as abroad. Membership fee and subscription paid by all officers to one national and one international institute/society and that paid by senior supervisors to one national institute/society should be reimbursed. (Para 208)

68. Encouragement should be given to officers and staff to acquire higher qualifications by providing them with facilities and granting incentives. (Para 209)

Permanent Way

69. Rail section 60 Kg per metre should be laid not only on sections carrying traffic more than 20 gross million tonnes but also on other routes where the density of traffic may not have reached that level but may be rapidly increasing.

(Para 212)

70. Use of rail section 41.61 Kg per metre (90 lb per yard) on selected metre gauge sections is a step in the right direction. This together with rail section 37.13 Kg per metre (75 lb per yard) priority should be given to tracks in important yards which handle large volumes of traffic. (Para 213)

71. The standard of track in yards should be upgraded in keeping with the standard prevailing elsewhere on the running lines. In doing so priority should be given to tracks in important yards which handle large volumes of traffic. (Para 214)

72. The requirement of funds for track renewals should be viewed by Government as an essential input for safety and should get commensurate priority. With escalating costs of renewals, unless much larger financial allocations are made, with immediate effect, the backlog will get totally out of hand.

(Para 215)

73. The condition of track from Gauhati to Furkating, on the Northeast Frontier Railway is far from satisfactory even from safety standards. Track renewals on this and other similarly 'distressed' sections should be taken up on an urgent basis and completed within the shortest possible time. (Para 216)

74. The Railway Board should draw up a time- bound programme for upgrading the track on branch lines, which should be completed prior to

the introduction of heavier axle locomotives on these lines. (Para 217)

75. Guidelines be laid down regarding the percentage of unserviceable sleepers that can be permitted in track and the extent of speed restriction which should be imposed with their progressive increase. (Para 218)
76. An all-India Organization under a separate General Manager should be set up for planning and execution of track renewals on the Railways. (Para 219)
77. The question of pricing of rails which is seriously affecting supplies to the Railways must be look- ed into by Government at the highest level. Conditions should be created so that the Steel Plants meet the requirements of the Railways in full. (Para 220)
78. Released rails should be reprofiled before being re-laid in frack. As a first step in this direction, 44.61 Kg per metre (90 lb per yard) rails released from broad gauge track must be reprofiled before these are re-laid in metre gauge track. (Para 221)
79. For monitoring of the rail wear, use should be made of the system of automatic rail wear inspection, with a self-propelled vehicle. (Para 222)
80. Arrangements for supply of wear-resistant rails by steel plants must be finalised early to meet the recurring requirements of the Railways. (Para 223)
81. Development and manufacture of thick web rails should be undertaken on a priority basis. (Para 224)
82. Production capacity for concrete sleepers, on both the broad and metre gauges, must be developed speedily for a long-term remedy of the problem of un-serviceable sleepers. (Para 225)
83. Necessary Organization must now be provided in the Civil Engineering Department to sustain the effort for procurement of permanent way fittings. (Para 226)
84. Ordering of permanent way materials required for track renewals and financial commitments therefor should be ensured well in advance, so that supplies are received in time to carry out the work during the fiscal year itself. (Para 227)
85. The Railways must make full use of the available concrete sleepers for track circuiting works. It should also be ensured that concrete sleepers are laid in continuous lengths to avoid discontinuity in track structure.

(Para 228)

86.

(i) The ballasting programme on the Railways must be speeded up to meet the requirements for recoupment of ballast on the basis of accepted norms Adequate funds for this purpose should be made available.

(ii) The functioning of ballast trains should be streamlined by providing adequate traffic blocks and suitable motive power.

(Para 229)

87. The serious problem created by miscreant activity on certain sections of the South-Eastern Railway in removing stone ballast from track and disturbing the packing under the sleepers, should be taken up by the Railway Administration with the' State Government at the highest level. (Para 230)

88.

(i) The strength of permanent way. gangs should be correlated to the maintenance practices in vogue and the track structure actually obtaining. Arbitrary cuts in the hope of introducing modem methods of track maintenance/track structure will not be rational.

(ii) Finalization of the gang strength formula should not be delayed any longer and the strength of gangs must be rationalised on its basis within the shortest possible time.

(Para 231)

89.

(i) 'Service' tolerances, indicating the limits beyond which track will need attention, must be laid down for various speeds and categories of tracks including branch and unimportant lines. These must be rigorously implemented through an effective system of monitoring.

(ii) The RDSO should examine the question of how much departure from the 'service' tolerances will be permissible without jeopardising safety. (Para 232)

90. The Railways must be equipped with an adequate number of portable accelerometers to supplement monitoring of track-by-track recording cars. (Para 233)

91. The RDSO should lay down guidelines for working out the track geometry rating, on the basis of the parameters of track which are monitored, for assessing the state of track maintenance. (Para 234)

92. Guidelines should be laid down regarding tolerances for gauge,

alignment, sleeper spacing, cross levels, unevenness, etc. to assist die permanent way staff to impose and progressively raise speed limits at engineering works. (Para 235)

93. Speed restrictions for engineering works should be planned in advance and within the overall limitations of time provided for engineering works in the timetable, these should become operative from a pre-determined hour. (Para 236)

94.

(i) Engineering restriction boards must be displayed at the maximum braking distance of trains-operating on the section.

(ii) It must be ensured that the speed restriction boards are displayed properly and those which require to be lit at night are done so affectively.

(iii) Development of electrically lit 'speed indicator lamps', to take the place of conventional speed restriction boards, should be undertaken for use on the Railways. (Paras 237 and 238)

95. Railways should make use of AWS system on track for protection of speed restrictions on sections where the AWS system is operative. (Paras 239 & 312)

96. More intensive use of the track recording-cum- research car must be planned. The projects assigned to this research car should be taken up with a sense of priority so that the benefits may flow to the field. (Para 240)

97.

(i) In major yards, tracks should be made ava HaWe for maintenance on the basis of a preplanned schedule.

(ii) Welding of rails in track, in major yards, should be undertaken.

(iii) Proper cleaning and maintenance of yards must be ensured so as to keep the interspaces between tracks clear and free from obstruction. Drainage in yards should be improved. (Paras-241 & 242)

98.

(i) Schedules for testing of rails with ultrasonic rail flaw detectors must be laid down for all types of tracks on the basis of importance of the line, traffic carried, speeds of trains, age of rails, trend of rail fractures, etc.

(ii) More determined and urgent steps should be taken to extend and intensify ultrasonic testing of rails in running lines.

(iii) Adequate number of rail flaw detectors must be provided on each

division of the Railways to enable regular testing of rails on running lines.

(iv) Rails found defective by ultrasonic testing must be removed from track, timely.

(v) Tile Railways must develop adequate facilities for repair and maintenance and periodic calibration of ultrasonic rail flaw detectors. (Paras 243 to 245)

99. An arrangement should be provided on ultrasonic railway detectors to record the flaws in rails detected during testing.

(Para 246)

100. The Railways should go in for ultrasonic rail inspection cars as early as possible, with a view to quicken the pace of testing of rails in running track.

(Para 247)

101. The RDSO should carry out studies on the relationship between defects or flaws in rails and their propagation under actual traffic conditions, so as to arrive at the precise limit of defects in rails, necessitating their removal from track.

(Para 248)

102.

(i) In view of the inherent weaknesses in the thermit welding process, flash butt-welding of rails should be done to the maximum extent possible.

(ii) All new thermit welded' joints must be ultrasonically tested. (Para 249)

103. Manufacturing defects in the rails caused 21 per cent of the reported rail failures during 1977-78. Some arrangement should be made whereby every new rail put in track is subject to ultrasonic testing in advance.

(Para 251)

104.

(i) The Railway Board should ensure that information required by the RDSO for numerical analysis of rail failures, is furnished by all zonal railways, timely.

(ii) The RDSO should ensure that the results of yearly numerical analysis of rail failures are published and circulated to zonal railways with the least delay. (Para 252)

105.

(i) In view of the deleterious effect of flat tyres on rails in track, its permissible limit should be reviewed by the RDSO.

(ii) Effective means should be developed for detection of flat tyres on rolling stock. These should, under no circumstances, be permitted on running trains. (Para 253)

106. Self-propelled access platforms must be progressively introduced to facilitate inspection and maintenance of bridges and overhead structures. (Para 254)

107. The serious problem created by widespread theft of permanent way fittings from running lines on certain sections of the Eastern and South-Eastern Railways passing through the States of Bihar and West Bengal, must be taken up by the Railway Board and Railway Administrations, with the State Government (s) at the highest level. (Para 255)

108. The RDSO should undertake development of track fittings with a view to make their pilferage difficult. (Para 250)

109. The Railways must ensure that the basic necessity of a telephone is provided at the residence or ait permanent way inspectors oh the open hue. (Para 257)

110.

(i) At important stations where trains stop on platform lines, washable aprons should be provided.

(ii) Platform occupation should be planned in such a manner as to leave adequate time lor the maintenance of tracks on platform lines.

(iii) The subject of dropping wastes from passenger carrying trams should be given serious thought, unproved arrangements need to be devised so that platform lines do not give the impression of open-air toilets.

(Para 258)

Level Crossings

111.

(i) Manning of accident-prone unmanned level crossings, on the basis of stipulated norms, must be left to the Railways themselves who should complete this work within the shortest possible time.

(ii) Once the need for manning an unmanned level crossing/upgrading a manned level crossing is established, the work should be processed and completed expeditiously by the Railways; adjustment of cost etc. could be settled with the State Government (s) later. (Para 260)

112. Census at level crossings should be conducted regularly and expeditious follow-up action taken on the results thereof. (Para 261)

113. At level crossings where opening of the gates becomes necessary at night also, two gatemen must be provided on 12-hour shift duty. Alternatively, level crossings with light road traffic at night should be considered for being kept closed during that period. (Para 262)

114.

(i) State Governments should be encouraged to utilise the Railway Safety Works Fund to the extent of actual requirements, adjustments vis-a-vis actual share of each State, on the basis of extant rules of apportionment could be done on a long-term basis.

(ii) The Railways must be free to use accumulations under the Railway Safety Works Fund for manning of unmanned level crossing/upgrading of manned level crossings and for provision of road over/ under bridges

Arrangements outlined above may have political implications, however, in view of the large number of accidents endangering public, which continue to take place at level crossings, these should be worked out at the highest level.

(Para 263)

115. The rate of accidents at manned level crossings provided with telephones was much less than those without telephones. We strongly reiterate what we had recommended in Part I of our Report (paras 322- 328) that telephone communication must be provided at all mid-section manned level crossings within the shortest possible time. (Para 264)

116. Speed breakers/bumps or rumble strips should, be provided on approaches to all level crossings used by road vehicles. The drivers of approaching road vehicles should be pre-warned adequately or the existence of these.

(Para 205)

117. All Special, A and B class manned level crossings in mid-section should be protected by gate signals. All such level crossings in Centralised Traffic Control and Automatic Signalling territories should be given priority. (Para 266)

118.

(i) Devices in the nature of loud warning bells/hooters which are actuated by approaching trams should be provided at all manned level crossings in the mid-section. Priority should be given to level crossings in sections where the incidence of accidents has been high. Such devices should also be provided at unmanned level crossings

frequented by road vehicles.

(ii) The RDSO should develop a warning device for level crossings, which will function satisfactorily in the conditions obtaining on the Railways. (Paras 267-269)

119. The involvement of tractors in accidents at level crossings has greatly increased in the States of Punjab, Haryana, and Uttar Pradesh. The Railways serving these States must take up with the State Governments the question of tractor drivers being made to observe safety rules at level crossings. (Para 270)

120. In certain areas there is high involvement of bullock carts in accidents at level crossings. The Railways should, in consultation with the State Governments, undertake a continuous programme, of educating the public in rural areas, through mass media of the hazards at level crossings and their responsibilities in this regard. (Para 271)

121.

(i) The Railways, in consultation with the State Governments, should examine the possibility of closing down some of the level crossings which are located in close proximity.

(ii) New unmanned level crossings should normally not be permitted and if they have to be provided, the decision should be taken only at a high level. (Para 273)

122. Speed Literate gatemen only, should be posted at manned level crossings having telephone communications. (Para 274)

123. More extensive trials with automatic half; barriers should be conducted on non-suburban sections, away from metropolitan cities. (Para 276)

124. The Railways must ensure that working instructions are available at every level crossing and an assurance is taken from each gateman about his having understood these. (Para 275)

Signalling and Interlocking

125. For ensuring minimum basic safety of train operation as well as to guard against derailments at a station, rudimentary interlocking must, at least, be provided at all stations on the narrow gauge. (Para 279)

126. Guidelines should be laid down for upgrading the standards of interlocking at stations on the basis oi density and speed of traffic. (Para 280)

127. Maintenance work at signalling installations should be analysed and split into its various component units, separating items of routine maintenance from items of adjustments of signal and points fittings etc. requiring

disconnection. (Para 281)

128. Only electrical signal maintainers in Grade I should be permitted to sign the Reconnection Notice in Form S&T/DN prescribed in Signal Engineering Manual. The disconnection notice may be signed by an electrical signal maintainer in a lower grade. (Para 282)

129.

(i) All problems connected with maintenance of signalling equipment should be thoroughly examined and a practicable and realistic solution found so as to ensure the availability of adequate time for maintenance.

(ii) Necessary time blocks should be provided in the timetable lor the maintenance of signalling and interlocking equipment, especially on busy time blocks can also be used maintenance programmes of track equipment. (Para 283)

130. Some minimum recovery time must be provided in the timetables which will cover detentions io trains on account of signal failures at least on the busy sections where important trains run. (Para 284)

131.

(i) At present the emphasis is only on periodical testing of locking and overhauling of lever- frames, and the electrical signalling portion including the circuitry does not receive such attention. AH electrical signalling equipment and circuitry must be inspected and tested according to stipulated schedules.

(ii) Adequate time must also be provided on the sections to enable the signalling staff to effectively cany out inspection and testing of electrical signalling equipment.

(Para 285)

132.

(i) Only inspectors and maintainers who have undergone special training in sophisticated signalling equipment in the Indian Railways Institute of Signal Engineering and Telecommunication, Secunderabad, should be entrusted with the maintenance of such equipment.

(ii) A system of issuing competency certificates to staff, who successfully complete training in the specialised field of signalling, should be introduced. While posting staff in the field, especially on modern signalling installations, this should be taken into account.

(Paras 286 & 287)

133. The progress and the follow-up action in the matter of providing electric lighting of distant signals has been extremely tardy. The Railway Board, having taken a decision, should have pursued it effectively. We stress that this work should now be completed without further delay. (Para 288)

134.

(i) Effective steps should be taken by all the concerned departments through more frequent inspections at different levels to improve the visibility of signals at night.

(ii) The work of electric lighting of semaphore signals should be progressed at a faster pace. (Para 289)

135. The For improving the visibility of colour light signals:

(i) Automatic voltage stabilisers be provided at different locations of signals.

(ii) Higher wattage bulbs, i.e. 33 watts instead of 25 watts should be used.

(iii) Improved design of double lenses should be used; and

(iv) Power supply should be drawn from OHE instead of local supply. (Para 290)

136. Joint inspection of signals by signal, loco and traffic inspectors, as per schedule, should be made more effective and intensive in order to ensure proper visibility of signals by day and by night. (Para 291)

137. All semaphore distant signals should be provided with electric signal motors, and these should be made to assume automatically the signal aspects, corresponding to the position of the home signals. (Para 292)

138. Colour fight signalling should be provided on a few remaining single line sections with A.C. traction. In doing so, advantage should be taken of the OHE power supply. (Para 293)

139. The conversion of semaphore signals into colour light signals at stations where signals of both types are there should be taken up on a programmed basis. (Para 294)

140. Route relay interlocking, which turns at centralising the control, must be provided at the more important junction stations.

(Para 295)

141. Norms for failures of signalling and interlocking equipment should be laid down for judging the efficiency of the system.

(Para 296)

142. Signal failures must be reviewed with the intention to learn more about the inadequacies of the system for taking corrective measures. The practice followed-on some divisions of the Western Railway important signalling and interlocking failures are analysed and discussed in detail along with remedial measures and are circulated to staff in the field for guidance, should be followed on all the railways.

(Para 297)

143. Signal defects or failures reported by drivers should receive prompt attention of the signal maintenance staff and remedial action taken without delay. (Para 298)

144. The station master on duty should report in writing or by telegram all cases of signal failures irrespective of whether a signal maintainer is available round the clock or not. (Para 299)

145. Signal failures which actually occur should be faithfully' recorded and reported and. there must be cross-checks on the. reported figures to ensure their veracity.

(Para 300)

146.

(i) Shortcut methods are adopted oy signalling staff in their maintenance, work, particularly while rectifying signal failures. The 'looping' or bridging of relays, under conditions of failure of a signal, points, or track circuit, by signal staff, either individually or jointly, with traffic staff, should be prohibited under rules.

(ii) Where any sectional release is required in the interests of train operation, authorised technical solutions like calling-on signals and emergency cancellation switches should be employed with built-in safeguards for safe movement of trains.

(Para 301)

147. Double locking of all relay rooms by the traffic and signalling staff as a safeguard against tampering with vital equipment in relay rooms and also to guard against the adoption of shortcut methods should be followed.

(Para 302)

148.

(i) Much higher allocation-of funds will be necessary to complete track circuiting works within a reasonable span of time.

(ii) The installation of an adequate number of axle counters, whether by import or by indigenous production, is not likely to materialise

within a reasonable period of time and, therefore, the original proposal to extend, track circuiting using wooden/concrete sleepers for the remaining stations should be proceeded with and completed without delay.

(Paras 303 to 305)

149. The portion between fouling mark and advance starter, at stations on trunk routes and main lines must be provided with track circuiting using wooden sleepers or axle counters, on high priority. Constraints of funds and materials must not be allowed. to stand in the way. **(Para 306)**

150. Track circuiting must be provided at block huts also on main trunk routes where the run-through mam line at stations has been track-circuited. (Para 307)

151. On CTC sections where loads remain stabled for long periods the Railways should take steps to ensure that the conductivity of rails in such cases is maintained at satisfactory levels. (Para 308)

152.

(i) The Railway Board should give sufficient thought to the design now being adopted for manufacture of axle counters in regard to its reliability in service. They should not hesitate to adopt imported designs of axle counters if reliability of indigenous design is in question.

(ii) Axle counters should be imported in part to cover the interim period of indigenous development.

(iii) The availability of axle counters, from sources within and outside the country, must be stepped up so that works of track circuiting are carried out on a time-bound programme.

(Paras 309 & 310)

153. While extending the Automatic Warning and Stop (AWS) system on all trunk routes with speed of 100 kmph. and above, covering all passenger and goods trains, recommended in Part I of our Report, the last stop signal, which is the authority to enter the block section, should also be provided with AWS equipment, in addition to the first stop signal.

(Para 311)

154. AWS equipment provided on the suburban sections of the Western Railway has the necessary infrastructure to facilitate introduction of a simplified system of cab signalling, which should be provided on such busy suburban, sections. (Para 313)

155.

(i) An effective monitoring system should be set up at different levels of maintenance and user departments for protection of AWS equipment from theft and outside interference.

(ii) Pilfer-proof housings should be provided for 11 field equipment of AWS system and the circuitry should incorporate earlier warning to the driver if the rack equipment is stolen. (Para 314)

156.

(i) In view of the serious nature and consequences of collisions on suburban sections, AWS system should be commissioned, on priority, on suburban sections of Bombay, Calcutta, Madras on a speedy time-bound programme.

(ii) Advance planning for provision of AWS system on suburban sections of the Southern Railway and Sealdah division of the Eastern Railway should be initiated straightaway. (Para 316)

157. The AWS system should incorporate a 20 kilometres per hour speed check so that trains, after stopping at an Automatic Signal at 'ON', cannot pick up speed in excess thereof till a signal displaying the OFF' aspect is reached.

(Para 317)

158. AWS equipment (of the type indicated in Para 317) should be provided not only on all Electric Multiple Unit trains but also on all main line passenger and goods trains running on the section. (Para 318)

159. As an interim measure till AWS system is introduced, an auxiliary warning switch to operate a red light in the motorman's compartment, should be provided as on the South-Eastern Railway. This should be operated by the motorman when he stops at an Automatic Signal at 'ON'. (Para 319)

160.

(i) A speed limit of 20 kilometres per hour should be specified for normal conditions of visibility under "Stop and Proceed" rule in automatic signalling and CTC territories.

(ii) The guard should be enjoined upon, under General Rules 278 and 437, to apply the brake with a view to bring the train to a stop when he observes the driver exceeding the speed restrictions laid down.

(Paras 320 & 321)

161. Motormen and drivers of trains in automatic signalling and CTC territories should be given a special course of training in signal training schools covering all aspects of the permissive working, as applicable to Automatic Block and Absolute Permissive Block Systems.
Further they should undergo refresher courses at least once every year. (Para 322)

162. Flashing lights in the rear of EMU trains, similar to those provided by the Western Railway, should be provided as a more prominent indication to attract the attention of the driver of a following train. (Para 323)

163.
(i) Technical measures suggested by a Committee of Directors of the Railway Board and the RDSO to overcome the problems of flickering/bobbing of signals and also display of more than one aspect by signals at the same time, should be implemented without delay.
(ii) General Rules 277 and 436 should be amended to include flickering/bobbing and display of more than one aspect by signals at the same time as defective signals on the lines of General Rules 78 and 79.

(Para 324)

164.
(i) The 'cascading' principle should be uniformly adopted on all Automatic Signalling and CTC territories so that when the green aspect bulb fuses, yellow aspect is displayed and so on and, under no circumstances, the driver comes across a signal without any light due to the fusing of signal bulb.
(ii) It must also be ensured that not more than one aspect of the signal appears at any one time, by using an improved design of lamp-proving relay. (Para 525)

165.
(i) Railways should take steps including Use of pilfer-proof fittings to ensure that all telephones at signals on CTC sections are kept in good working condition.
(ii) Telephone facility on signals should be provided in non-suburban Automatic Signalling sections like Rajkharswan-Sini-Chandil-Kandra on the South-Eastern Railway and Sitarampur-Pradhankanta on the Eastern Rahway. (Para 326)

166. (i) Maintenance gangs including assistant station masters required for

non-interlocked working in the affected yards must be set up on the basis of arrears and normal workload of overhauling of lever frames and similar equipment and coordinated programmes of traffic-blocks should be drawn up for every division. (Para 327)

167. Yardsticks should be evolved, without further delay, for sectional signal inspectors and signal maintainers based on the workload in equated signal units with due allowance for local conditions. (Para 328)

168. The cadre of signal and telecommunication engineers and signal inspectors must be strengthened to the levels envisaged in the study of the Efficiency Bureau on the workload of these categories. (Para 329)

169. Adjustment of jurisdictions of signal maintainers, provision of adequate rest givers and rostering of signal maintainers on the basis of proper job analysis of their work should be done. The time spent by maintainers in travelling should be properly renumerated. Signal staff for night maintenance on all trunk routes and busy yards should also be provided. (Para 330)

170. Testing instruments and equipment required by signal maintainers and signal inspectors for the performance of their duties must be supplied to them and maintained in good order. (Para 331)

171. Railways should ensure that dual-trained signal inspectors are posted on all sections. (Para 332)

172. Tokenless block instruments should be provided on trunk routes in replacement of the outmoded token or tablet instruments. (Para 333)

173. Instructions of the Railway Board for providing bracketed home signals or alternatively track circuiting of main and loop lines with electrical detectors for facing points on sections of multiple aspect upper quadrant signalling with single arm home signals should be complied with by the Southern and Northeast Frontier Railways at the earliest. (Para 334)

174. Having commenced the running of superfast Vaigai Express between Madras-Madurai on the metre gauge system of the Southern Railway the basic requirements of signalling to permit safe operation of trains at that speed must be provided without any further delay. (Para 334)

175. A satisfactory and reliable communication should be developed between trains in motion and ground station and also between functionaries on the train itself. (Para 335)

176. Walkie-talkie wireless pack-sets should be provided extensively in all busy yards for use by traffic and loco staff dealing with movements in the yard. (Para 336)

177. Handbooks on installation and maintenance of different types of signalling equipment should be prepared and supplied to signal inspectors and signal maintainers for their guidance. (Para 337)

178.

(i) Revision of the Signal Engineering Manual should be taken in hand without further delay.

(ii) Copies of the Signal Engineering Manual should be supplied to all inspectors.

(iii) Relevant sections of the Signal Engineering Manual should be translated into regional languages and supplied to artisans and maintainers for their better understanding.

(Para 337)

179. The arrangement whereby reception and departure signals taken 'OFF for a train should be restored to their normal position of 'ON' automatically by the passage of a train, incorporating 'one train- one slot' principle, should be adopted on both single- and double-line sections on trunk routes and main lines.

(Para 338)

180.

(i) The Railway Board should pursue with urgency development of a suitable indigenous design of last vehicle check device.

(ii) Pending development of a last vehicle check device, limited import may be resorted to.

(Para 339)

181. RDSO should investigate the use of solar energy for lighting of semaphore signals and even approach lighting of colour light signals. (Para 340)

182. The Railways should design all their future signalling systems on the basis of service braking distances. Existing signals on routes, where high speed trains run, should be relocated on this basis. (Paras 341 to 343)

183. A system of modular additions, like the superimposition of another distant signal over the existing signalling system for a block increase of one kilometre or below in braking distance, should be adopted for all high-speed routes, as has been done for the route between Howrah and New Delhi. (Para 344)

184. Any proposal of increase of speed on a route for one train or a class of trains should bp treated as a composite project involving the motive power, carriage and wagon, permanent way and signalling disciplines, and braking distance and inter-signal studies should be conducted jointly by all the concerned disciplines. (Para 345)

185. Appropriate steps should be taken to coordinate the activities in different signalling workshops with a view to utilising their full production capacity. (Para 346)

186. With a view to inject a sense of urgency and appreciation of the impact of signalling on safety and efficiency of train operation and evolve measures for speedy implementation of such projects on a planned basis the decision-making body in the Railway Board needs to be strengthened at the appropriate technical level.

(Paras 347 to 349)

Motive Power

187. Steam locomotives are going to be with the Railways for a long time to come, therefore, the Organization for their maintenance must not be weakened. Nothing should be done to reduce the effectiveness of this Organization by redeployment of well-qualified/ personnel to the diesel/electric side. (Para 351)

188. Head lights in steam locomotives must be maintained in fully operative condition. (Para 352)

189. Sanding equipment should be provided and maintained in proper working order on steam locomotives. This equipment should be specially certified at the time locomotive leaves the shed. (Para 353)

190.

(i) Installation of the vigilance control device in diesel and electric locomotives, need not be pursued under conditions of train operation now obtaining on the Indian Railways, namely, two employees manning every diesel and electric locomotive.

(ii) The vigilance control device may find application if and when the Indian Railways adopt a system of single manner crews on diesel and electric locomotives. Research and developmental efforts for evolving a suitable design, which will function satisfactorily without the present disabilities, may be continued. (Paras 354 to 357)

191. VDO speedometer in use at present on the Railways, which was designed for motor vehicles, is not suitable for locomotives. Import of Hasler speed recorders must be pursued with a sense of urgency. (Paras 358 to 359)

192. Considering that the speedometer problem has been with the Railways for nearly two decades, we feel that there has been a lack of determined effort to develop a suitable speedometer/speed recorder indigenously. (Para 360)

193. The new procedure for changing charts of speed recorders on locomotives, in force since January1980, according to which the driver has full access to the speed recorder charts, is apt to defeat the very purpose for which speed recording is found to be necessary. (Para 361)

194. Equipment of the type on trial on the Kottavalasa—Kirandul section of the South-Eastern Railway, which gives a clear indication to the driver in case of train parting, would be useful and its trials should be expedited. (Para 362)

195.

(i) Working of diesel locomotives with long hood leading has greater accident-proneness and also presents more difficulties in visibility of track and signals. In the overall interest of safety, trains should not be worked by diesel locomotives with long hood leading.

(ii) As a beginning, this restriction may be imposed on all passenger-carrying trains with maximum permissible speed of 100 kmph and over on the broad gauge and 75 kmph and over on the metre gauge.

(iii) This safety measure should also be extended to all trains hauled by diesel locomotives which run over difficult sections where the visibility of signals is restricted due to sharp cuttings, curves, etc.

(iv) As a long-term solution, provision of a second driving cab on diesel locomotives should be given serious consideration. (Paras 363 to 367)

196. Water level gauge in WDM2 diesel locomotives should be modified so as to serve the purpose for which at is intended. (Para 368)

197. Cowcatchers and headlights should be provided in the rear of WDMI locomotives. (Para 369)

198. Adequate maintenance facilities should be provided in workshops and sheds for electric locomotives. These should keep pace with additions to the electric locomotive fleet. (Para 370)

199. AH diesel and electric locomotives and electrical multiple units manufactured in the country should be provided with the basic fittings so that mounting of AWS equipment on. the driving unit could be done without much difficulty at a later stage.

(Para 371)

200. It must be ensured that the bell communication between motormen and guards on EMU trains is maintained satisfactorily. (Para 372)

201. A reliable locking arrangement 'should be devised for the unoccupied motorman's/guard's compartments in EMU trains. (Para 373)

Coaching and Goods Rolling Stock

202. The Railway Board should set up a committee consisting of officers of the mechanical and operating departments who will go into the pattern of goods train examination and rationalise it on an all-India basis, stipulating the places where examination should be carried out together with the type of examination to be done, and the time, facilities, equipment and manpower required for this purpose. The work of this Committee should be completed as quickly as possible. (Para 376 to 378)

203. Skipping of examination of goods trains should, ordinarily, not be permitted, but in case it becomes unavoidable, arrangements must be made to get the load examined within the shortest possible distance thereafter. (Para 379)

204. The practice of examining goods loads on sorting lines in marshalling yards should be stopped wherever it exists. (Para 382)

205. The practice followed on the South-Eastern Railway of deputing a mobile gang to examine a stabled load and give a fresh vacuum certificate, before it is allowed to move, should be adopted on other Railways. (Para 383)

206. Adequate brake power and proper maintenance of brake rigging must be ensured. (Para 386)

207. Railways should take steps to see that the vacuum gauges are. invariably provided in guards' brake vans of all passenger carrying trains. (Para 387)

208. It-must be ensured that guards have a vacuum gauge fitted in the brake vans of goods trains. There is need for providing a satisfactory fixing arrangement for vacuum gauges. (Para 388)

209. The Railways should undertake trials to determine the extent of the loss of brake power in different trains, under' actual field conditions and take remedial measures accordingly. (Para 389)

210. Recommendations made by the RDSO regarding introduction of air

brakes should be examined by the Railway Board and an early decision taken thereon. (Para 390)

211. With a view to ensuring satisfactory exam a nation -and maintenance of coaching stock: —

(i) timely placement/withdrawal of fakes on/from pit lines must be ensured.

(ii) adequate stabling capacity must be created to stable examined loads and release the pit lines for placement of other rakes.

(iii) Railways must immediately undertake a review of the pit line facilities and equipment required and make up the deficiencies on a time-bound programme.

(iv) all pit lines should be long enough to accommodate the longest passenger-carrying train in service and that contemplated in the near future.

(v) adequate lighting of pit lines should be ensured.

(vi) drainage in pit lines should be improved. Perhaps a change in the basic design of the pit is called for.

(vii) all slip coaches should be examined on pitlines. (Paras 392 to 394)

212.

(i) The Railways should be extremely cautious in the matter of introducing new train services and extending the run of the existing one. They must ensure that adequate maintenance facilities for carriages are created before new services are introduced.

(ii) In the face of popular demand for more and faster trains there are obvious limits to the resistance which the Railway Board and zonal railways can put up. The. political authority in the country should also not stretch the railway system too far.

(Paras 395 & 396)

213. Modernisation of sicklines and depots covering the provision of facilities like sheds, flooring, pathways for workers, plant, and machinery, equipment for handling materials, requirements of electric power, requirements of staff and their training should be taken up as a project. A task force, not bothered by the day-to-day stresses of railway working, must be set up to carry out this work within a period of five years. Necessary resources will have to be provided.

(Paras 397 & 398)

214.

(i) POH of coaching stock should be planned on the basis of kilometres earned so that more intensively worked rakes are given POH at shorter intervals than at present.

(ii) Arrangements to take up the increased workload of POH should precede the stipulation of revised intervals between two POHs.

(iii) The requirement of spare coaches should also be reviewed having regard to the fact that the coaches will have to be sent to the workshops more often.

(Paras 399 & 400)

215. EMU services should be so planned as to provide for the required time in shed. The Eastern Railway Administration should expand the existing facilities for POH/AOH to meet the maintenance requirements in full.

(Para 402)

216.

(i) The standard of maintenance of roller bearings in workshops should be improved so that attention to those on line does not become necessary at all during the intervals between two POHs.

(ii) If, however, the Railway Board and the Railway Administrations feel that inspection of roller bearings between two POHs is absolutely necessary, then conditions similar to those obtaining in workshops should be created in nominated sickness and maintenance depots.

(Paras 403 to 407)

217. The Railway Administrations should take urgent steps to provide adequate facilities for inspection and maintenance of roller bearings in workshops. (Para 408)

218. The recommendations made by the One-man Committee on roller bearings should be implemented expeditiously.

(Para 409)

219. The RDSO should develop some device to monitor the condition of roller bearings fitted on stock without the need to open them. (Para 410)

220. An urgent dialogue should be opened with the manufacturers of roller bearings, who should be apprised of the failures in service, for effecting improvement in the product. (Para 411)

221. The workshops and depots on zonal railways should follow a uniform system of giving identification numbers on roller bearings and maintaining record of the axle number on which it is mounted. (Para

412)

222. In order to check the overloading of box wagons:

(i) weigh-bridges capable of weighing wagons on the move be provided at coal and mineral loading points.

(ii) arrangements be made for the proper upkeep and maintenance of weighbridges.

(iii) deterrent penalties like confiscation of materials in overloaded wagons be considered. (Paras 413 to 416)

223.

(i) Expeditious steps should be taken by the Railway Administrations to improve the quality of laminated springs manufactured in railway workshops.

(ii) Statistically optimum sample size should be ascertained, and that percentage of springs should be subjected to-load deflection test in workshops.

(Paras 417 to 419)

224. The practice of moving box wagons over long distances with clamped broken bearing springs is unsafe and should be curbed effectively. (Para 420)

225. The practice of turning out wagons from sick lines and depots with broken helical springs should be stopped fort with.

(Para 421)

226. In view of the large-scale failures of axles on carriages and wagons on the metre gauge, the RDSO must investigate the practice of using old broad-gauge axles for metre gauge rolling stock. The desirability of pressing out old wheel discs from usable axles must also be gone into. (Para 422)

227. Adequate equipment for ultrasonic testing of all axles should be made available in workshops and maintenance depots.

(Para 423)

228.

(i) Provision of modified draw bar on metre gauge goods stock should be completed within the shortest possible time.

(ii) Quality control and testing of material for draw bars and process control during their manufacture should be tightened.

(Paras 424 & 425)

229.

(i) The Neutral Control Organization should be brought under the charge of Director Mechanical Engineering in the Railway Board.

(ii) Neutral control examination should be extended to all workshops and major carriage and wagon maintenance depots.

(iii) At the remaining depots and sidelines, neutral control staff can be deputed on a selective basis depending upon the importance of the unit.

(iv) Neutral control examination should be extended to selected major yards depending upon the pattern of goods train examination, which will be adopted on the suggestions of the Committee, the setting up of which has been suggested by us in para 378.

(Paras 426 & 427)

230. Railway Board should finalise expeditiously the list of defects in coaching and goods stock which have a direct bearing on safety or 'S' marked items in the Conference Rules. (Para 428)

231. Handbooks for the guidance of carriage and wagon maintenance staff should be brought out in local languages for the benefit of staff not knowing English.

(Para 429)

232.

(i) While ordering safety modifications, the Railway Board should lay down a period within which these should be completed. The zonal Railway Administrations should have the authority to sanction additional manpower required for this purpose.

(ii) A special drive should be launched to complete all pending safety modifications on coaching and goods stock speedily.

(iii) Neutral train examiners posted in workshops, should make a special check on the execution of safety modifications on all coaches/wagons turned out of workshops.

(Paras 431 to 433)

233. Replacement of old and obsolete machines in workshops should be done at a faster pace. (Para 434)

234. The hand brake in EMUs should be provided in the motorman's cab.

(Para 435)

235. There is need for further research into the problem of corrosion in steel-bodied coaches. This should be undertaken in collaboration with other research institutes.

(Para 436)

236. Problems arising out of the greater height of coupling in CRT wagons than in other types should be examined and remedial action taken. (Para 437)

237. Railway Board should plan production of adequate number of anti-telescopic/steel bodied SLRs and coaches for broad and metre gauges to ensure strict compliance of marshalling instructions.

(Paras 438 & 439)

238. In the light of experience on the British Railways, the advantages of using centre buffer couplers on coaching stock in reducing casualties during accidents should be examined with a view to determining whether it would be desirable to adopt this on the Indian Railways. (Para 441)

Safety Organization

239. The Safety Organization should primarily be a service Organization and not an executive department. The responsibility of ensuring safety on the Railways is squarely that of the different departments and their accountability in this respect must not be diluted.

(Para 452)

240. The Safety Organization should be manned by officers from any of the 5 major departments, namely. Operating, Civil Engineering, Mechanical Engineering, Signal & Telecommunication Engineering and Electric Traction, who are mainly concerned with safety in train operations. (Paras 447 & 452)

241. At the divisional level, the Divisional Safety Officer should put up periodic reports to the Divisional Railway Manager/Divisional Superintendent on deficiencies and problems so that the latter can get the executive officers to take action. At the headquarters level, the Chief Safety Superintendent should report directly to the General Manager. (Paras 453 & 454)

242. Men of ability and dynamism should be posted to the Safety Organization to dispel the impression that it is a refuge for unwanted people. (Para's 443 4 455)

243. Persons posted to the Safety Organization should have a minimum tenure of 2 years. (Paras 444 & 455)

244. The Divisional Safety Officer should be relieved of his miscellaneous function and left free to concentrate on his main responsibility of promoting safety on the division. (Paras 445 & 455)

245. The status of the Divisional Safety Officers should be brought on par with divisional officers of other executive departments. (Paras 446 & 455)
246. Each division should have safety counsellors from the four main disciplines, namely, Operating, Civil Engineering, Mechanical Engineering and Signal and Telecommunication Engineering. There should be provision to add to these counsellors from specialised disciplines like Electric Traction, wherever necessary. (Paras 448 & 455)
247. Safety counsellors should be appointed after a careful selection so as to ensure that they have, in addition to some technical background, a proper understanding of human nature and a flair for counselling work. (Paras 448 & 455)
248. The persons selected as safety counsellors should be given appropriate training in counselling techniques. (Para 455)
249. An effective system of monitoring the follow-up action on recommendations made by committees of inquiry into railway accidents should bd followed at the divisional and headquarters levels of zonal railways. (Paras 450 & 455)
250. Regular statistical studies must be done at the divisional and headquarters levels of zonal railways to analyse the short and long-term trends of various types of accidents and take remedial measures. (Paras 451 & 455)
251. Safety should be the only charge of Director, Safety in the Railway Board. He should also coordinate the efforts of zonal railways in the field of safety. (Para 457)

Accidents Statistics

252. The term "accident" should be applied to only the consequential accidents (Group I) and certain categories of miscellaneous accidents under Group III. Train partings should continue to be reckoned as indicative accidents. (Paras 458 to 462)
253. Every case of rail fracture should be reported and included in the statistics of permanent way failures. (Para 463)
254. A methodology should be evolved by which failures of tyres, wheels, axles, etc., are reported in totality to the Railway Administrations irrespective of the damage and other consequences. (Para

464)

255. The criterion of detention to traffic for classifying failures of signalling apparatus as failures of railway equipment should apply not only in the case of failures of route relay interlocking and CTO installations but also in the case of failures of other signalling and interlocking gears. (Para 465)

256. Accidents like derailments of light engines, trolleys, vehicles and wagons, etc. which occur in yards and at stations must be all reported irrespective of the cost of damage involved. Statistics thereof should be compiled and analysed for taking remedial measures.

(Para 467)

257. Truthful reporting and compiling of all accidents must be ensured so that accident records reflect the true picture of performance in the field of safety in operations.

(Para 468)

258. Maintenance of accident records, both at the divisional and headquarters level, must be placed on a satisfactory footing.

(Para 468)

Commission of Railway Safety

259. The Commission of Railway Safety should be placed under the Ministry of Railways, but independent of the Railway Board. The Chief Commissioner of Railway Safety should have direct access to the Minister of Railways. He should also be given a suitable status. (Para 481)

260. The officers of the Commission of Railway Safety should be empowered to summon witnessed from the public as in the case of Commissions of Inquiry. (Para 486)

261. The officers of the Commission of Railway Safety should be permitted to issue a brief press note giving the factual position and findings in non-technical language after the inquiry has been completed. (Para 487)

262. A few accredited representatives of recognised railway passenger associations and the press should be permitted to be present at the inquiries conducted by officers of the Commission of Railway Safety, except where the inquiring officer feels the need to take evidence in camera. (Para 488)

263. No railway officer should be allowed to sit with the inquiring officers of the Commission of Railway Safety during the course of the inquiries. (Paras 489 & 490)

264. The practice of sending the draft report of inquiry to the Railway Administration and the Railway Board should be given up. (Para 491)

265. All derailments and collisions involving superfast trains, irrespective of the casualties, should be inquired into by officers of the Commission of Railway Safety.

(Para 492)

266.

(i) The system of independent annual inspections by Commissioners of Railway Safety should be revived.

(ii) Maintenance certificates submitted by the various heads of departments of the zonal railways, which are appended to the annual reports of the General Managers, should be countersigned by the Commissioners of Railway Safety, as was the practice in the past. (Paras 493 to 495)

267. The Commission of Railway Safety should be expanded so that each circle covers one zonal railway only.

(Paras 496 & 497)

268. The Deputy Commissioner (General) at the headquarters of the Commission of Railway Safety should be in the rank of a commissioner. He should normally be drawn from a discipline different to the one to which the Chief Commissioner belongs. (Para 498)

269. The Government must take special steps to see that vacancies of Commissioners of Railway Safety and other officers of the Commission of Railway Safety are not allowed to lie unfilled for long. (Para 499)

270. All reports of inquiries into accidents made by officers of the Commission of Railway Safety should, be published promptly without exception. (Para 500)

271. Delays in the publication of annual reports of the Commission of Railway Safety should be avoided. (Para 501)

272. The setting up of a National Transportation Safety Board on the same lines as in the U.S.A, must be considered by the Government. (Para 502)

Research, Designs and Standards Organization

273.

(i) There is the need for a more enlightened policy in respect of recruitment and promotion of personnel in the RDSO with a view to attracting and retaining really top-class talent.

(ii) Officers in RDSO should be retained for a minimum tenure period of 5-6 years.

(iii) Officers engaged on specific projects in RDSO should not be transferred till after the completion of the project. The service and promotional prospects of such officers should be fully safe-guarded.

(iv) The permanent cadre in RDSO should consist of persons with higher basic qualifications and to make this possible the pay scales should be more attractive.

(Para's 508 to 510)

274. The RDSO should be relieved of routine inspections of all items except those pertaining to the development of new projects, equipment and materials. (Para 511)

275. The RDSO should have complete powers to procure all stores required for research and development in respect of projects approved by the Railway Board.

(Para 512)

276. For effective monitoring of projects/rolling stock initiated by the RDSO in the field, zonal railways should nominate one senior officer of the concerned department to liaise with the RDSO. (Para 513)

277. The Railway Board should give priority to the setting up of a test track in the RDSO at the earliest. (Para 514)

278. The RDSO must be given powers, in line with, other premier research institutes in the country, to enable them to depute their officers and staff to participate in appropriate seminars and conferences abroad.

(Para 516)

279. The RDSO should be free to create, and fill-up posts required in connection with consultancy work and debit the expenditure against the fees recovered.

(Para 517)

280. Research and Development cells must be setup in production units and major workshops to review the processes, methods and materials for improving performance. The activities of these cells should be coordinated by the RDSO. (Para 518)

281. There should be greater integration and close cooperation between the RDSO and. the institutes of advanced training on the Railways, through exchange of visits, involvement of teaching faculty in research projects initiated by the RDSO. (Para 519)

Law and Order—Theft and Vandalism

282. The whole responsibility, jurisdiction and mutual relationship of the

security agencies, namely, Railway Protection Force, Government Railway Police and State Police, which are involved is safeguarding of railway property be examined with a view to ensuring optimum cooperation among them for preventing thefts and other forms of lawlessness.

(Paras 528, 532 & 533)

283. Conditions must be created in which, staff, even at junior levels will be encouraged to report the theft, without fear.

(Paras 526 & 533)

284. Joint control centres be set up in cooperation with State Police, State Electricity Boards, Posts and Telegraph Department for speedy action in the case of theft OHE equipment and telephone wires, etc.

(Paras 532 & 533)

285. Measures should be taken by the Railway Administrations, in consultation with the RDSO, to evolve equipment which will be difficult to steal. (Para 533)

286. Efforts need to be made to educate the public about the nature and consequences of miscreant activity through mass media. Appropriate institutional and procedural arrangements should bet evolved. (Para 533)

Rules, Operation and Post Accident Relief Measures

287. The Railway Board should take effective action to overcome hurdles, if any, in bringing into force speedily the revised set of General Rules. (Paras 534 & 535)

288.

(i) Important rule books should be reprinted periodically, say once in 5 years, or when the number of correction slips exceeds 25.

(ii) Issue of rule book in a loose-leaf form should also be considered. (Para 536)

289. Rules must be drafted in simple language easily understood by staff. These should also be in the regional language, where necessary. (Para 537)

290.

(i) A uniform procedure applicable to all the zonal railways should be devised by which the station working rules are reviewed and reissued at regular intervals of 3 to 5 years.

(ii) Station working rules should be made into separate parts for the use

of different categories: of station staff. (Paras 538 & 539)

291.

(i) Greater care should be exercised in the correct preparation of working timetables.

(ii) Working timetables should show inter-sectional running time of trains in integers correct to a minute and not a fraction thereof. (Para 541)

292. Field telephone should be provided to the guard of each goods train so that he can contact, the station master on either side of the occupied section. (Para 544)

293. The display of the normal and reverse positions of the facing points on indicators in the station master's office should be arranged. (Para 545)

294. A study should be made to determine the workload in hump yards beyond which the use of skids would become impractical and mechanisation becomes necessary. In non-mechanised hump yards, skid porters should be provided in every sorting line. (Para 546)

295. The working timetables should show the time taken between successive signals, by trains running at the restricted speed of 20 kmph after stopping at an automatic signal in 'ON' position. (Para 547)

296. The introduction of battery power operated tail lamps and hand signal lamps in lieu of oil lamps should be considered by the Railways. (Para 548)

297. The running of trains and pilots without brakevans should be curbed effectively by mitigating the chronic shortage of brakevans. (Para 550)

298. Working conditions and facilities in cabins should be improved. (Para 551)

299. In the case of staff connected with train passing duties, job analysis and work measurement according to modem industrial techniques must be undertaken to determine if any relief by way of additional strength or reduction in duty hours is warranted. (Para 552)

300. The Railway Administrations should take effective remedial action to restore the faith of staff in the sanctity of rules and check the drift towards the adoption of shortcut methods and violation of rules. (Para 554)

301. Hydraulic buffers should be provided at dead ends on platform lines at terminal stations. A suitable design of a hydraulic buffer should be evolved speedily. (Para 555)

302. Railway doctors should be given powers to hire road transport vehicles so that they may proceed to the site of the accident by the quickest; means. (Para 557)

303.

(i) For dealing with accidents involving gas cylinders, gas masks should be provided as a part of the equipment of the accident relief train.

(ii) With the introduction of electric traction, it would be necessary to have more and more of hydraulic jacks or MFD equipment for re-railing operations.

(iii) With the introduction of heavier locomotives, and wagons it is necessary to have more powerful cranes than at present.

Stores

304.

(i) For improving the availability of stores, the stores Organization should be divisional based.

(ii) Divisional Stores Officers should be brought under the direct control of the Divisional Railway Manager/Divisional Superintendent.

(iii) The set up at the divisional level should be assigned the purchase functions in respect of such items for which supplies could be obtainable from local sources, after it has been suitably strengthened.

(iv) For undertaking the purchase function effectively adequate powers should be delegated to the Divisional Stores Officer and Divisional Railway Manager.

(v) In the case of stores depots which serve specified workshops, the Stores Officer should be placed under the control of the head of the workshop. (Paras 565 & 566)

305. In matters pertaining to escalation as well as splitting up of the tendered quantity amongst more than one tenderer, the General Manager should have full powers. (Para 567)

306. The procedure of risk purchase is not conducive to making quick alternate purchases. In the case of small value purchases, a penalty for default or forfeiture of the security deposit of the order and/ or removal from the list of approved suppliers would be more appropriate than resorting to risk purchases. (Para 568)

307. A comprehensive list of safety items of stores pertaining to different departments should be drawn up and procurement of these items should be through limited tenders, only from established and proven manufacturers of such stores. (Para 569)

308. The performance of the stores department in the matter of inventory control should not be judged only on the value of the inventory at the end

of the financial year but on the basis of the average value of inventory over the entire 12-month period. (Para 570)

309. Railway materials should be given highest priority for movement and should be exempted from all booking restrictions. (Para 571)

310. Modem materials management systems should be adopted on the Railways. (Para 572)

THE RAILWAY SAFETY REVIEW COMMITTEE, 1998 PART I & II (SHRI H. R. KHANNA COMMITTEE 1998)

32

32.1 Constitution of Committee

In view of the concern voiced by various sections of Indian society regarding train accidents and the safety performance of Indian Railways, Ministry of Railways (Railway Board) have decided to set up a High-Power Railway Safety Review Committee to go into all aspects connected with the safe running of train services in the country. The constitution of the Committee will be as follows:

Chairman

1. Shri Justice H. R. Khanna,
   Retired Judge of the Supreme Court

Members

2. Shri V. Dhananjaya Kumar, Member of Parliament (Lok Sabha)
3. Shri Ananta Sethi, Member of Parliament (Rajya Sabha
4. Shri CL Kaw, Retd. Chairman, Railway Board
5. Shri LK. Sinha, Retd. Member Mechanical, Railway Board
6. Shri S.M. Vaish, Retd. General Manager, Northern Railway
7. Shri V. S. Dutta, Commissioner of Railway Safety, Northern Circle
8. Shri Dr. Vinod Chandra, Professor, Deptt. of Elec. Engg, IIT, Delhi

One Senior Administrative Grade Officer will be appointed as Secretary of the Committee

32.2 Terms of Reference

The terms of reference of the Committee will be as under.

(a) To review the position of accidents on the Indian Railways since the appointment of the Railway Accidents Inquiry Committee, 1968 and to review the implementation of the recommendations of all previous Accident Inquiry Committees.

(b) To examine the adequacy of the existing organization, equipments and practices for ensuring safe running of trains on Indian Railways and to suggest measures for prevention of accidents,

(c) Implications of financial investment planning of Railway projects on safety; and

(d) To examine safety measures/equipments/technology as adopted by Railways of some of the advanced countries which would have relevance for Indian Railways and could also be adopted for use on Indian Railways.

The Committee will be required to submit the report within six months of the date of its constitution.

Issued And Signed By D.P Tripathi, Secretary, Railway Board and Ex-Officio, Additional Secretary to The Government of India

32.3 Summary of Recommendations

The Committees earlier appointed to enquire into the Safety situation on IR were required to report on the implementation of recommendations of the previous Committee. This they did.

In the case of our Committee, the Government made a departure & asked for "review of the implementation of all previous Accident Inquiry Committees". This stems from concern regarding the safety situation on IR. Perhaps it was felt that implementation was deficient.

(Para No. 5.1.2 of RSRC, 1998 (Khanna Committee))

Our study of this most important element of the improvement process confirms the view that **much more needs to be done regarding the recommendations of all Safety Committees than has been achieved**

so far. This is not to take away from the fact that quite a lot has been done. (Para No. 5.1.3 of RSRC, 1998 of (Khanna Committee)

It is really the plethora of other activities, the tight financial situation, politically motivated decisions, the deteriorating law & order situation, the general lax environment in the country and scores of well-known factors which make all Government (of which IR is a department) activity somewhat slow. Subterfuge then becomes practice. (Para No. 5.1.4 of RSRC, 1998 (Khanna Committee))

It is in the light of these facts that our committee has placed 'IMPLEMENTATION' as the first and most important recommendation (see Chapter-II). Some details have been spelt out so that the process gets institutionalized at several levels and accountability becomes clear from the suggested records. **It is felt that periodic verification of implementation on the ground is the only path to real improvement.**

(Para No. 5.1.5 of RSRC, 1998 (Khanna Committee))

In its pursuit of showing improvement in the implementation process, the Ministry of Railways found many methods of showing progress in Implementation, which are enumerated below; -

(i) Recommendations were treated as implemented purely on the grounds that necessary instructions had been issued by the Railway Ministry to the Zonal Railways. For instance, the Sikri Committee (Recommendation 65 in Part I) had enjoined upon the Railways the need to improve the overall conditions in the running rooms. This recommendation was treated as implemented as "necessary instructions had been issued to Zonal Railways." Similarly, issue of instructions was given as evidence of implementation of recommendations such as: the need to ensure against shortages of staff in safety categories (Recommendation No.66 of Sikri Part I); provision of proper equipment and training to gateman (Recommendation No.80 of Sikri Part I); the importance of ensuring that wagons with "rejectable" defects are not turned out of shops (Recommendation No.164 of Sikri Part I); curb on the practice of examining goods loads on the sorting lines (Recommendation No.204 of Sikri Part II); Divisional Safety Officers to be relieved of miscellaneous functions (Recommendation No.249 of Sikri Part II); safety counsellors to be

given appropriate training in counselling techniques (Recommendation No.248 of Sikri Part II).

(ii) Recommendations have been treated as implemented with the commissioning of trials, even when it was apparent that actual implementation was still many years down the road. An example of this type is the Railway's response to the Sikri Committee recommendation (no. 127 of Part I) urging the Railways to ensure that no locomotive which is to work a train leaves the shed or yard without speedometer/speed recorder in working order. This recommendation, which even today remains only partially implemented, was treated as implemented "in view of the policy decision of the Board to fit all new main line locos with Hasler speed recorders. In similar vein, the Sikri Committee recommendation (no 81 of Part II) that development and manufacture of thick-web turn outs should be undertaken on priority, was treated as implemented on the basis of trials being conducted in 1986. The Sikri Committee recommendations regarding electric lighting of semaphore signals (No. 134 of Part II), communication between driver, guard and SM (No.175 of Part II) were also disposed off in similar manner.

(iii) Some recommendations were treated as implemented even when there was no implementation. Among the recommendations that fall in this category is the Sikri Committee recommendation (No. 95 of Part II) that Railways should make use of AWS on track for protection of speed restrictions on sections where the AWS system is operative. This recommendation was shown as "implemented being long term process", although even today this provision is not available on the AWS system of the Bombay suburban network. On a similar note, the Sikri Committee recommendation (No. 141 of Part I) that BOX wagons should not be loaded beyond their carrying capacity has been treated as implemented, although there are instructions to the effect that BOX wagons can be loaded up to 2 tonnes above their carrying capacity.

(Para No. 5.1.6 of RSRC, 1998 (Khanna Committee))

From the stockpile of recommendations made by the Kunzru, Wanchoo and Sikri Committees, we have identified the issues that are of deep significance to safety on the Railways today. Considering that the Kunzru Committee submitted its report almost four decades ago and even the last, i.e. the Sikri Committee Report is twenty years old, many safety issues that were relevant to those Committees have become dated due to attrition and technological obsolescence. For instance, steam locomotives, which were a major concern of the earlier Committees, are now a relic of the past. Whereas there are numerous shortcomings in implementation due to a variety of reasons, we cannot fail to mention the considerable work done by the Railways on many recommendations such as setting up of training institutions for certain safety categories of staff, welding of rails into longer lengths, handbooks for staff of essential safety categories.

(Para No. 5.1.7 of RSRC, 1998 (Khanna Committee))

Keeping all these points in view, what we have done is to study the trajectory of the implementation of the earlier Committees important recommendations that are of relevance today. Instead of assessing the recommendations of each Committee in isolation, we have looked at all significant issues of safety raised by the three Committees in their entirety through a historical survey of the views of each Committee on every relevant subject and the Railways' response thereon. Such an approach of sequential narration ensures that we cover each subject fully.

(Para No. 5.1.8 of RSRC, 1998 (Khanna Committee))

Track Circuiting

Reference: Kunzru (Recommendation No.84 of Part II); Wanchoo (Recommendation No.169 of Part 1, Recommendation Nos. 116 & 144 of Part II); Sikri (Recommendation 116 of Part 1, Recommendation No. 149 of Part II)

Successive Committees of Enquiry, the Railway Reforms Committee, the Commissioners of Railway Safety, the Standing Committee of Parliament on Railways of Eleventh Lok Sabha, had all emphasized the importance of extending track circuiting at all stations as a basic safety requirement. The Railway management, in turn, wholeheartedly accepted track-circuiting as an essential safety aid. But the erratic progress of track circuiting through the decades provides a striking example of the

Railways' inadequate response to the recommendations of earlier Committees.

(Para No. 5.2.1 of RSRC, 1998 (Khanna Committee))

The Kunzru Committee had recommended that track circuiting should be extensively provided at stations as this device would almost completely eliminate collisions due to a second train being received on an occupied line. This Committee also urged the Railways to research and overcome the difficulties caused due to the paucity of wooden or concrete sleepers. It was also recommended that at large stations and yards, "the provision of route relay interlocking should be considered as an essential measure". At that time, the Railway administration responded with a general statement of intent that track circuiting would be provided "to the maximum extent possible", and that Zonal Railways would be asked to keep the Kunzru Committee's recommendation regarding route relay interlocking in view while making proposals for signalling works."

(Para No. 5.2.2 of RSRC, 1998 (Khanna Committee))

The Wanchoo Committee noted that the progress in track circuiting had been unsatisfactory: "we cannot help expressing our doubts whether Railways are addressing themselves to the task of providing track-circuiting with the necessary sense of urgency. The Railway Board had indicated that a target of track circuiting 200 stations every year had been fixed, but the actual execution was far short of this target. (Para No. 5.2.3 of RSRC, 1998 (Khanna Committee))

An important issue raised by the Wanchoo Committee was that track circuiting should cover the station area between the block clearance points instead of track circuiting only between fouling marks. (Para No. 5.2.4 of RSRC, 1998 (Khanna Committee))

The Sikri Committee also raised the issue of track circuiting between block clearance points and urged that "the portion between fouling marks and advanced starter at stations on trunk routes and main lines must be provided with track circuiting on high priority. Constraint of funds and materials must not be allowed to stand in the way." The Railway Reforms Committee and the Parliament's

Standing Committee on Railways (1995-96) also strongly emphasized the need for track circuiting between block section limits on all trunk routes and main lines. It is true that the execution of track circuiting work was slow. After the Ferozabad accident in August 1995 there has been good progress.

(Para No. 5.2.5 of RSRC, 1998 (Khanna Committee))

In Chapter II, Committee has indicated what we consider should be the route-wise priorities and target year of completion for track circuiting of stations.

(Para No. 5.2.6 of RSRC, 1998 (Khanna Committee))

Auxiliary Warning System/Automatic Train Control/Cab Signalling (Para no. 5.3)

Reference: Kunzru (Recommendation No.85 of Part I); Wanchoo (Recommendation No. 170 of Part 1, Recommendation Nos. 148, 149 & 150 of Part II); Sikri (Recommendation No. 117 of Part I and 156 of Part II)

The Railways can feel justifiably aggrieved that Committees of Inquiry have at times recommended the latest state-of-the-art devices for induction on IR without taking into account the financial implications, or the system's capability of absorbing the new technology. To make matters worse, the Railways has readily accepted such recommendations without fully analyzing the feasibility of implementation, as a consequence of which the Railways finds itself unable to show significant compliance. The slow progress of AWS/ATC reflects this dilemma of IR.

(Para No. 5.3.1 of RSRC, 1998 (Khanna Committee))

The Kunzru Committee had first suggested that automatic train control should be introduced on some suburban sections and specially selected trunk routes. The Committee also urged the Railways to undertake research for adapting the ATC in use in advanced Railway systems to Indian conditions and also suggested introduction of cab-signalling as an experimental measure.

(Para No. 5.3.2 of RSRC, 1998 (Khanna Committee))

The Wanchoo Committee felt that Indian Railways had not reacted positively to the adoption of ATC. The Committee opined that "if the trial and Installation of ATC been initiated earlier, certain signalling firms in India would have become interested in this field of manufacture already. The Wanchoo Committee made a specific recommendation that on sections with speeds of 100 kmph or over, ATC should be provided. According to the Committee, "as a means to prevent accidents, ATC is only second, if even second, in importance to track circuiting."

(Para No. 5.3.3 of RSRC, 1998 (Khanna Committee))

The Railways' response to the recommendations of the Wanchoo Committee was quite impressive. It was stated that "besides Howrah- 534 The Railways' response to the recommendations of the Wanchoo Burdwan and Mughalsarai-Gaya sections of Eastern Railways, provision of AWS has been sanctioned for suburban sections of Central and Western Railways also." It was further stated that for providing AWS equipment, priority would be given to suburban sections and trunk routes on which trains run at speeds of 120 kmph and more, with AWS being provided on locomotives of Mail/Express trains and EMUs, although the Wanchoo Committee had recommended that even goods trains be covered. Nevertheless, the Railways' plan outlined above for inducting AWS could not be faulted. (Para No. 5.3.4 of RSRC, 1998 (Khanna Committee))

The Sikri Committee criticized the poor progress in installation of AWS, which it attributed to "reluctance to import the equipment and to excessive time taken for its indigenous development and manufacture". It called upon the Railway Board to "take steps to fulfill at least their diluted commitment of providing AWS on trunk routes and suburban sections at the earliest." Although the Committee was aware of the tardy progress of AWS, it recommended a considerable enhancement in the spread of AWS: "a programme should be drawn up for extending AWS on all trunk routes with speeds of 100 kmph and above, covering all passenger and goods trains." The Railways accepted this recommendation without any reservations, and on the basis of work in progress on Howrah-Burdwan section of Eastern Railway and Church gate-Virar section of Western Railway, the recommendation was treated as implemented. (Para No. 5.3.5 of RSRC, 1998 (Khanna Committee))

The Railways are already committed to providing AWS on all suburban sections and trunk routes with speeds of 100 kmph and above which should cover all passenger and goods trains. But almost four decades after this issue was first raised by the Kunzru Committee, AWS has been installed only on the suburban systems of Central and Western Railways. Here too, the AWS system only covers the EMU services but not the other services, not even Mail/Express trains. Perhaps the problem of pilferage of the track magnet of AWS which was encountered in the eastern part of the country was responsible for the delay. The view of our Committee is that despite the importance attached to AWS by previous Committees, the Railways have made very slow progress in extending the use of this vital safety device. Our specific recommendations on the issue are indicated in Chapter II where the issue of pilferage has been taken into account. (Para No. 5.3.1 of RSRC, 1998 (Khanna Committee))

Train Actuated Warning Device/Automatic Lifting Barriers

Reference: Kunzru (Recommendation No.7 of Part II); Wanchoo (Recommendation Nos. 162 & 163 of Part I, Recommendations Nos. 122, 123 & 124 of Part II); Sikri (Recommendation Nos. 103 & 104 of Part I, Recommendation Nos. 118 & 123of Part II)

(Para No. 5.4 of RSRC, 1998 (Khanna Committee))

The Kunzru Committee, adverting to methods of level crossing gate protection in use in Europe and America, recommended that Indian Railways should make determined efforts to install fail-safe automatic barriers to suit Indian conditions, which would be automatically closed when a train is at a pre-determined distance from the LC gate. The Committee also suggested that the provision of bells and flasher signals at LC gates should be investigated by RDSO.

(Para No. 5.4.1 of RSRC, 1998 (Khanna Committee))

Despite the stand taken by the Railway Board that automatic half barriers were not suitable for Indian conditions, the Wanchoo Committee recommended that the Railways should continue experimenting with automatic half-barriers as a substitute for manned level crossings. However, with regard to the train actuated audio-visual warning device at unmanned level crossings, the Committee, in sharp contrast to the stand taken by the Kunzru Committee, expressed the view that such audio-

visual warning was not of practical value in Indian conditions, and that the onus for safe passage across unmanned LCS should rest squarely with the road users. (Para No. 5.4.2 of RSRC, 1998 (Khanna Committee))

The Sikri Committee recommended adoption of both automatic half-barters and the train actuated warning device (TAWD). The Committee felt that as the one trial Installation of automatic barriers on Northern Railway was sections away from metropolitan cities. The provision of TAWD was recommended in the first stage at all manned LCs in mid-section. Neither of these two recommendations was accepted by the Ministry of Railways on the grounds that these devices were unworkable in Indian conditions. (Para No. 5.4.3 of RSRC, 1998 (Khanna Committee))

There has since then been a change in the Railways' thinking on the TAWD, quite obviously because of the increase in number of level crossing accidents, particularly at unmanned gates. It is understood that the TAWD with audio-visual indication has been sanctioned at 10 level crossing gates each on Eastern and Western Railways.
(Para No. 5.4.4 of RSRC, 1998 (Khanna Committee))

On the issue of TAWD, we have given our recommendations in Chapter III. (Para No. 5.4.5 of RSRC, 1998 (Khanna Committee))

Overaged Signalling Gear

Reference: Kunzru (Recommendation No.86 of Part II); Wanchoo (Recommendation Nos 1) 173 & 174 of Part 1); Sikri (Recommendation No.124 of Part 1 (Para No. 5.5 of RSRC, 1998 (Khanna Committee))

The Kunzru Committee had observed that unless overhaul and replacement of lever frames and worn-out signalling gear are done according to the prescribed schedules, "signalling failures would continue to increase thereby reducing the factor of safety in rail operation."
(Para No. 5.5.1 of RSRC, 1998 (Khanna Committee))

The Wanchoo Committee had also stressed the importance of clearing the shortfall in replacement programmes for lever frames and block instruments. In July 1969, the Railway Board advised the Zonal Railways that whenever signalling equipment needed replacement on age-cum-

condition basis, replacement should be carried out early so that safety was not compromised. (Para No. 5.5.2 of RSRC, 1998 (Khanna Committee))

However, notwithstanding the guidelines issued by the Railway Board, there was further increase in the arrears of signalling gear due replacement, which prompted the Sikri Committee to state that the Wanchoo Committee's recommendations on the subject "not only remain unimplemented but there has been a distinct deterioration in the situation..... On the basis of instructions issued on the subject by the Railway Board to the Zonal Railways and considering the fact that "implementation was also of continuous nature", this recommendation was treated as implemented.

(Para No. 5.5.3 of RSRC, 1998 (Khanna Committee))

Our Committee has, in Chapter II, underlined the importance of replacing overaged signalling gear within a fixed timeframe. According to information furnished by the Ministry of Railways, there are at present 1560 stations where signalling gear are overdue replacement. When one considers that the Sikri Committee was sharply critical of the Railways for not ensuring timely replacement of signalling gear on account of which the Railways had accumulated arrears of 101 lever frames overdue replacement, the present status of signalling gear overdue replacement becomes a matter of grave concern. Our Committee once again reiterates the urgent need to pull up the arrears in replacement of signalling gear overdue replacement. (Para No. 5.5.4 of RSRC, 1998 (Khanna Committee))

Separation of Warner from Outer Signal/Provision of Multiple Aspect Signalling

Reference: Wanchoo (Recommendation Nos. 133 & 134 of Part II); Sikri (Recommendation Nos. 108 & 109 of Part 1)

The Wanchoo Committee, while stressing the need to provide multiple aspect signalling at all stations on trunk routes and main lines, had recommended that as an interim measure, the warner should be separated from the outer signal and placed at a distance of 1.5 kms outside the outer signal so that the drivers of trains get a pre-warning before the first stop signal. (Para No. 5.6.1 of RSRC, 1998 (Khanna Committee))

The Sikri Committee found that despite having accepted the recommendation of the Wanchoo Committee, there had been no significant progress in separation of warners from outer signals. The Committee also felt that the Railway Board needed to take up provision of multiple aspect signalling at the remaining stations on trunk routes and main lines as early as possible.

(Para No. 5.6.2 of RSRC, 1998 (Khanna Committee))

The Railway Ministry's written response to the Sikri Committee recommendation on the warner signal was not satisfactory. The Ministry stated that "Zonal Railways had not come up with a proposal of separation of warmer signal which indicated that they do not consider it necessary", implying thereby that even a recommendation that had been accepted could be implemented only if endorsed by the Zonal Railways. In reply to our questionnaire, the Zonal Railways (excluding South-Eastern and Western Railways) have indicated that there are still as many as 960 stations where the warner is placed below the outer signal. From these figures it is apparent that the Railways have not seriously addressed the issue of separating warners from the outer signals.

(Para No. 5.6.3 of RSRC, 1998 (Khanna Committee))

Our Committee has been advised that the entire 'A' route of Indian Railways has been provided with multiple aspect signalling. We would urge the Railways to provide multiple aspect signalling on the 'B' route within the next five years. This issue would be discussed in detail in our final report. (Para No. 5.6.4 of RSRC, 1998 (Khanna Committee))

Track Renewals

Reference: Kunzru (Recommendation Nos. 16, 96, 97, 98 of Part II); Wanchoo (Recommendation No.141 of Part 1); Sikri (Recommendation Nos. 84 & 85 of Part 1, Recommendation No.71 of Part II)

In order to underline the importance of timely track renewals, the Kunzru Committee reproduced the following observation made by the Estimates Committee in their Twenty first Report, 1955-56: “the Committee are definitely of the opinion that topmost priority should be given to wipe out areas of track renewals. Endorsing this view, the Kunzru Committee felt that non- fulfillment of the track renewal programme on certain Railways was responsible for a large number of derailments due to track

defects. Apart from the implications on safety, track renewals would also reduce the length of track under speed restriction on the Railways.
(Para No. 5.7.1 of RSRC, 1998 (Khanna Committee))

The Railways responded positively to this recommendation by pulling up the arrears in track renewals, a fact noted with appreciation by the Wanchoo Committee which commended the progress made on track renewals. The Committee expressed the hope that the pace of renewals would be maintained. (Para No. 5.7.2 of RSRC, 1998 (Khanna Committee))

According to the Sikri Committee, not only were the hopes of the Wanchoo Committee belied, "but the position has deteriorated considerably and its ill-effects are becoming apparent from the rising incidence of rail breakages and imposition of speed restrictions on increasing length of track." The Committee was concerned that the actual allocation of funds for track renewals was much less than the requirement, and emphasized the need to provide the full requirement so that the arrears are wiped out early. On account of the inadequate outlays, the backlog of primary renewals which was about 2400 Kms in 1974, had increased to about 6000 Kms in 1978. The Committee stressed that "requirement of funds for track renewals should be viewed by Government as an essential input for safety and should get commensurate priority." The Ministry of Railways treated this recommendation as implemented in 1986 with the following remarks: "Every effort was being made to allot maximum possible funds for track renewals, hence treated as implemented." (Para No. 5.7.3 of RSRC, 1998 (Khanna Committee))

The fears expressed by the Sikri Committee that unless larger financial allocations for track renewals are made, the backlog will get totally out of hand, has now become a grim reality. We have already referred to the huge arrears in track renewal of more than 12,000 Kms, which excludes loop lines and yard lines. It is clear that Railways is not in any position to bridge the gap from its own financial resources. As suggested by the Committee in Chapter II, the Central Government will need to lend a helping hand. (Para No. 5.7.4 of RSRC, 1998 (Khanna Committee))

Ballasting

Reference: Kunzru (Recommendation No. 101 of Part II); Wanchoo (Recommendation No. 145 of Part I); Sikri (Recommendation No. 86 of Part II)

The Kunzru Committee attached high priority to the adequacy and quality of ballast as a means for ensuring safe and satisfactory behaviour of track. Even at that time the Committee recognized that with introduction of concrete sleepers and mechanical tamping, there was vital need for the right type and quantity of ballast. The Committee, however, observed that the recoupment of ballast on IR was extremely unsatisfactory and demanded vigorous action for ensuring a ballast cushion of 10" on important routes. For this purpose, it urged the Railways to ensure adequate supply of hoppers for training out ballast, motor trucks for collection of ballast on the cess, and installation of mechanical crushers at suitable locations. (Para No. 5.8.1 of RSRC, 1998 (Khanna Committee))

The Wanchoo Committee noted that while the Railways had improved the training out capacity by increasing the fleet of hopper wagons, there was still a problem of shortage of ballast as also deficiency of clean ballast in many sections. The Committee felt that the Railways should increase the annual procurement of clean ballast to make good the shortfall. The Ministry of Railways treated this recommendation as implemented by stating that adequate availability of ballast was being ensured to meet the annual requirements for normal recoupment, track renewals, and for ensuring ballast cushion.

(Para No. 5.8.2 of RSRC, 1998 (Khanna Committee))

According to the assessment made by the Sikri Committee, the total quantity of ballast procured on all Railways from 1973-74 to 1977-78 averaged 2.68 million cubic meters per annum, which indicated that the procurement was not adequate even for recoupment. The Committee urged the Railways to ensure recoupment of ballast according to the accepted norms as also to streamline the working of ballast trains. The Ministry of Railways' response was that this recommendation had been already implemented in spirit."

(Para No. 5.8.3 of RSRC, 1998 (Khanna Committee))

Our committee is aware that there are large stretches of track on Indian Railways having scanty ballast, with Zonal Railways reporting shortages varying from 15 to 35 percent. There is also a large percentage of "caked" ballast on track. Ballasting is a major problem and our recommendations on the subject are given in Chapter II.

(Para No. 5.8.4 of RSRC, 1998 (Khanna Committee))

Ultrasonic Testing

Reference: Wanchoo (Recommendation No.105 of Part II); Sikri (Recommendation Nos. 98, 99 & 103 of Part II)

Recognizing the limitation of visual examination of rails which cannot detect many defects, the Wanchoo Committee felt that ultrasonic rail flaw detectors were essential for checking of rails. The Committee recommended that the Railways should procure an adequate number of these devices. The periodicity of ultrasonic examination visualized by the Committee was annual testing, "though more frequent testing could be carried out where track conditions so warrant."

(Para No. 5.9.1 of RSRC, 1998 (Khanna Committee))

The Sikri Committee, citing increase in derailments due to rail fractures on IR during the period 1973-74 to 1977-78, urged the Railways to intensify ultrasonic testing of rails. This Committee made a number of invaluable suggestions to improve the system of rail flaw detection which included the following measures:

(i) every new rail should be ultrasonically tested before being put on track;

(ii) schedules should be prescribed for testing of different types of track with ultrasonic rail flaw detectors;

(iii) provision of adequate number of rail flaw detectors on each division;

(iv) development of facilities for repair, maintenance and periodic calibration of the machines; (v) detectors to be provided with an arrangement for recording the flaws. It is significant that the Sikri Committee had highlighted all the most pertinent issues relating to ultrasonic testing. But it is unfortunate that the Railways are only now showing the necessary sense of

urgency to streamline this critical activity. The recent catastrophe involving Golden Temple Mail and Sealdah Express near Khanna on Northern Railway in November 1998 and the accident of Godavari Express near Kazipet on South Central Railway in June 1999 have exposed the infirmities in the existing system of ultrasonic testing. Our recommendations on the subject are given in Chapter II.

(Para No. 5.9.2 of RSRC, 1998 (Khanna Committee))

Speed Recorders/Speedometers

Reference: Kunzru (Recommendation No.53 of Part I); Wanchoo (Recommendation No. 178 of Part 1 and Recommendation No. 183 of Part II); Sikri (Recommendation No. 192 of Part II)

The Kunzru Committee emphasized the importance of providing speed recorders along with speedometer as a means to deter drivers from over-speeding for fear of detection. The Committee recommended that speed-recorders be provided on Mail/Express trains and speedometers on remaining passenger trains "within a period of 2 years from now. It was suggested that engines of fast goods trains be also provided with speedometers. (Para No. 5.10.1 of RSRC, 1998 (Khanna Committee))

The Wanchoo Committee was critical of the progress made on this front and urged the Railways to make determined efforts to indigenously manufacture more suitable and reliable type of speedometers-cum speed recorders. (Para No. 5.10.2 of RSRC, 1998 (Khanna Committee))

The Sikri Committee noted with concern that "considering that the speedometer problem has been with the Railways for nearly 2 decades, we feel that there has been a lack of determined effort to develop a suitable speedometer/speed recorder indigenously." This recommendation was treated as Implemented in 1989, on the grounds that "supplies (of speedometers-cum-speed recorders) against the development order placed on M/s. Autometers had started."

(Para No. 5.10.3 of RSRC, 1998 (Khanna Committee))

Almost four decades after the provision of speed recorders was insisted upon by the Kunzru Committee, there are still huge gaps in the Railways'

compliance on this issue in spite of the fact that there are now two Indigenous sources. To give but one example, our Committee learnt that out of the 74 locos homed in Siliguri (MG) Diesel Shed, of which 53 are nominated for passenger services, only 3 locos have been provided with speed recorders.

In Lumding (MG) Diesel Shed, not a single loco in a holding of 55 locos has this provision. It is apparent that the Railways are still to provide this basic device on a large number of locomotives. Our Committee feels that the Railway administration should provide this facility on all locomotives without further delay. (Para No. 5.10.4 of RSRC, 1998 (Khanna Committee))

Coaching Maintenance Facilities

Reference: Wanchoo (Recommendation No. 204 of Part II); Sikri (Recommendation No. 138 of Part 1, Recommendation No. 211 of Part II)

The Wanchoo Committee had underlined the importance of ensuring the provision of adequate number of washing lines and pit lines with the necessary facilities so that rakes are properly examined before their run. The Committee observed in the course of their inspections that the facilities for primary and secondary maintenance of rakes were not adequate. Some problems highlighted were shortage of pit lines, deficient drainage and poor illumination in the examination pits.

(Para No. 5.11.1 of RSRC, 1998 (Khanna Committee))

There was no substantive improvement in the position even 10 years later when the Sikri Committee reassessed the situation. The Sikri Committee made a pointed observation that the gap between the requirement and availability of maintenance facilities was widening. The Committee found that at a large number of stations the coaching rakes were not placed on the pit lines due to shortage of examination pits. Then there were problems of pits of Inadequate length, unsatisfactory lighting and poor drainage. (Para No. 5.11.2 of RSRC, 1998 (Khanna Committee))

Even 20 years later, these basic facilities for ensuring proper attention to coaching trains are far from satisfactory. We have indicated our views on the subject in Chapter II and at this point would only reiterate that

coaching maintenance facilities be provided in accordance with the prescribed norms on an emergent basis.

(Para No. 5.11.3 of RSRC, 1998 (Khanna Committee))

Neutral Control Organization

Reference: Kunzru (Recommendation Nos. 143, 144, 145 of Part II), Wanchoo (Recommendation Nos. 233 & 234 of Part 11); Sikri (Recommendation No. 137 of Part-1)

The Kunzru Committee lauded the positive role played by the Neutral Control Organization in ensuring the quality of work done in the workshops and sick lines. The Committee commented adversely on the high percentage of rolling stock that were rejected by the NCO which was "an ominous pointer to the unsatisfactory work done in the workshops." The Committee also recommended that the system of neutral control examination, which was effective in exercising a check on maintenance of rolling stock be extended to cover a greater number of workshops and sick lines. (Para No. 5.12.1 of RSRC, 1998 (Khanna Committee))

The Wanchoo Committee was emphatic that the neutral control organization served the very useful purpose of keeping rolling stock in good fettle and stressed the need to ensure that "nothing is done to weaken it in view of its independent character."

(Para No. 5.12.2 of RSRC, 1998 (Khanna Committee))

The Sikri Committee was sharply critical of Railways for turning out rolling stock without certification by neutral TXR at the nominated NTXR points. The Committee also underlined the importance of ensuring that rolling stock was turned out from workshops and sick lines after completion of al stipulated repairs.

(Para No. 5.12.3 of RSRC, 1998 (Khanna Committee))

To test the degree of compliance of the earlier Committees recommendations on the subject, we made a detailed study of the IRCA Report for the quarter ending June 1998. The report has many examples of rolling stock being turned out with rejectable defects. A simple statistic brings out the state of affairs. In the quarter April-June 1998 reviewed, out of 5747 coaches turned out by the nominated workshop subjected to

NTXR check, as many as 2158 coaches with rejectable "defects having safety implications" were "ca passed by the workshop authorities overruling the objections of the NTXR. The recommendations of the earlier Committees regarding attention to deficiencies pointed out by NCO remain substantially unimplemented. Our committee has given detailed comments on this subject in Chapter III.

(Para No. 5.12.4 of RSRC, 1998 (Khanna Committee))

Delay in Recruitment through Railway Recruitment Boards

Reference: Kunzru (Recommendations 48 & 49 of Part II), Wanchoo (Recommendation 120 of Part I), Sikri (Recommendation 21 of Part II)

The Kunzru Committee had referred to persistent shortages in several categories of staff due to the delays inherent in the procedure of recruitment through the Railway Service Commissions (RSCs) now called Railway Recruitment Boards. In this connection the Committee made certain suggestions for streamlining the working of RSCS. In response, the Railway Ministry prescribed a time schedule from the date of receipt of an indent by an RSC until finalization, which was 5 months in the case of technical categories, 7 months for non-technical categories and 75 days in the case of probationary ASMS.

(Para No. 5.13.1 of RSRC, 1998 (Khanna Committee))

The Wanchoo Committee observed that the time limits prescribed by the Railway Board for finalization of selections by the RSCS, had often been exceeded. (Para No. 5.13.2 of RSRC, 1998 (Khanna Committee))

The Sikri Committee was also critical of the inordinate delays in finalizing selections through the RSCs and recommended streamlining the recruitment procedure "so as to make available candidates as soon as vacancies arise. This recommendation was treated as implemented on the basis of the following general statement furnished by the Railway administration: "The time lag between arising of a vacancy and actual recruitment against the vacancy was being reduced at that time."

(Para No. 5.13.3 of RSRC, 1998 (Khanna Committee))

Our analysis shows that hardly any dent has been made in reducing the delays in finalizing selections through the RRBs (earlier RSCs) as evident

from the information furnished by some RRBs which is reproduced below:

RRB'S Name	Category/ Post	Year of Indent	Date of Indent	Date of sub-mission of Panel
Mumbai	Prob. ASM	1994	30.6.94	23.1.96
			07.4.94	23.1.96
	App Asst Driver (DSL/ Elec.)	1994	11.7.94	22.5.96
			15.6.94	22.5.96
			09.3.95	06.2.96
	Prob. ASM	1995	28.11.95	10.7.97
			02.8.95	10.7.97
Bangalore	ASM		16.10.95	05.12.96
	DSL Asstt.		10.4.96	24.6.97
	ASM		16.8.96	20.8.97
Guwahati	Appr JE(Sig) Gr II	1996	18.1.96	3.3.98
	Appr SI/Gr. II	1996	18.1.96	26.3.98
	Appr. CTXR	1996	18.1.96	26.3.98
	Appr. TXR	1996	18.1.96	26.3.98
	ASM	1996	05.9.96	09.1.98
Chandigarh	ASM	1996-97	25.7.95	25.9.96
	Asst. Driver (DSL/Elec)	1997-98	01.6.93	08.8.97
Ahmedabad	App. Asstt. Driver (DSL/Elec)	1994-95	22.3.94	2/3.8.95
	Prob. ASM	1995-96	07.9.95	08.3.97
Patna	Tr. Asst. Driver Elec.	1995-96	13.11.95	26.12.97
	Asstt. Driver DSL	1996-97	22.8.96	11.7.97
	Tr. ASM	1996-97	04.11.96	11.7.97
	Asst. Driver	1996-97	04.11.96	11.7.97
	Tr. ASM	1996-97	02.1.97	22.9.97
Malda	Tr Asst. Driver (Elec.)	1996-97	13.11.95	05.2.98
	Tr. Asst. Driver	1997-98	22.08.96	Written Test held on 22.3.98. Result

				suspended

(Para No. 5.13.4 of RSRC, 1998 (Khanna Committee))

Psycho-Technical Cell and Psycho-technical Research

Reference: Kunzru (Recommendation 36 of Part I); Wanchoo (Recommendations 129, 130 of Part 1, Recommendation 44 of Part II); Sikri (Recommendations 46 47 Part 1, Recommendation 20 of Part II)

The Kunzru Committee had first mooted the idea of applying psychotechnical tests to a limited number of drivers, cabinmen and levermen before selection to these posts. In pursuance of this recommendation, the Railways set up a psycho-technical cell which conducted job analysis with a view to standardizing tests for a few select categories of staff. (Para No. 5.14.1 of RSRC, 1998 (Khanna Committee))

The Wanchoo Committee, while endorsing the value of psycho-testing as a means to promote safety in train operation, felt that the application of tests in selection of personnel should be expedited by the Railways. The Committee also recommended that the scope of the cell be enlarged "to encompass the broader problems of socio-psychological make-up of the railway worker and of human engineering." By 1972 the test batteries had been developed and applied to some key categories of staff both at the stage of initial recruitment and also in service".

(Para No. 5.14.2 of RSRC, 1998 (Khanna Committee))

The Sikri Committee was of the view that not much progress had been made in enlarging the scope of activities of the psycho-technical cell in the area of labour-science research. The Committee stressed the importance of bringing within the purview of the psycho-technical testing those Class IV staff who, by promotion, would occupy jobs that have a vital bearing on safety. The Committee further urged the Railway administration to strengthen the Psycho-Technical Cell by improving the promotional prospects of the officials manning the Cell.

(Para No. 5.14.3 of RSRC, 1998 (Khanna Committee))

Although psycho-technology has made rapid advances and is today recognized as a key ingredient of human engineering in the work place, and an invaluable diagnostic aid for identifying aberrations in psychological make-up and behaviour, the overall progress made in

psycho-technology on IR has not been encouraging. The psycho-technical cell has conducted a few studies on problems of front-line staff, particularly drivers. The impact of psycho- technology has so far been only marginal. In Chapter-II we have indicated some of the shortcomings in the existing set-up. Our committee is of the view that the top management of the Railways will need to devote much greater attention than hitherto, to make the psycho-technical cell a truly professional outfit that is capable of finding solutions to the psychological and human behaviour problems on IR.

(Para No. 5.14.4 of RSRC, 1998 (Khanna Committee))

Running Rooms

Reference: Kunzru (Recommendation No.81 of Part II), Wanchoo (Recommendation No. 78 of Part II), Sikri (Recommendation No. 58 of Part II)

Recognizing the critical role of the driver in ensuring safety, the Kunzru Committee had stressed the importance of setting up suitable running rooms and "early completion of standard facilities in all of them." This recommendation was treated as implemented on the grounds that "the Railways have generally provided essential facilities." The Railway administration avoided commenting upon provision of "standard" facilities in the running rooms.

(Para No. 5.15.1 of RSRC, 1998 (Khanna Committee))

The Wanchoo Committee was also of the view that much needed to be done to make the running rooms adequately comfortable. The Committee felt that the prescribed yardsticks for provision of amenities in running rooms-

> *"Should be rigidly applied in order to ensure that adequate facilities are available for the comfort of the running staff."*

(Para No. 5.15.2 of RSRC, 1998 (Khanna Committee))

The need to provide the right kind of environment for the running staff to take rest at outstations also engaged the attention of the Sikri Committee, which was very specific about the facilities to be provided in the running rooms. Apart from recommending individual cubicles, the Committee called upon the Railway administration to provide basic necessities ties

like clean linen, mosquito nets, adequate water supply, improved sanitary conditions This recommendation was treated as implemented on the basis of various instructions issued by the Railway Board on the subject.

(Para No. 5.15.3 of RSRC, 1998 (Khanna Committee))

We have already referred to the state of the running rooms in Chapter 11. We would urge the Railway administration to make the improvement of running rooms a corporate mission.

(Para No. 5.15.4 of RSRC, 1998 (Khanna Committee))

Duty Hours of Crew

Reference: Kunzru (Recommendation No.42 of Part I); Wanchoo (Recommendation No. 119 of Part I); Sikri (Recommendation No.64 of Part I)

A constant and persistent source of friction between Railway management and labour has been disagreement on duty hours for the running staff. While most categories of Railway staff were covered by the Hours of Employment Regulations, 1931, running staff were initially kept out of its purview apparently due to operational considerations and the open-ended nature of their duties. It was only in 1951 that running staff were brought under the HOER as a result of the recommendation made in the Adjudication Award given by Justice Rajadhyaksha, who placed a limit on the "running duty" but excluded the pre-departure and post-arrival detentions. Thereafter, the Railway management has been progressively reducing the rostered duty hours of running staff.

(Para No. 5.16.1 of RSRC, 1998 (Khanna Committee))

The Kunzru Committee expressed concern that in many cases the actual duty hours of goods train drivers exceeded the rostered hours and desired that the Railways take steps to improve the situation. The Wanchoo Committee was also critical of the Railways' failure to make sufficient headway in keeping the duty hours of running staff within the prescribed limit. Although this recommendation on duty hours of running staff was treated as implemented, the actual situation on the ground provoked the Sikri Committee to state that the recommendation still remained to be implemented. The Sikri Committee further stated that it was "unfortunate that in a matter that has a direct bearing on safety the action taken so far has been tardy. (Para No. 5.16.2 of RSRC, 1998 (Khanna Committee))

According to the extant instructions, the overall duty at a stretch of running staff from "signing on" should not ordinarily exceed 12 hours. Indicating the present status of implementation of the recommendation on duty hours of running staff, the Railway Board has stated that in the period January to June 1998, "the overall duty is being completed within 12 hours from "signing on" on all the Railways except Southern and South Eastern Railways who have been advised to improve the position" However, the position furnished by the Zonal Railways to the Committee is as under:

Incidence of longer hours on duty of Drivers 'C' for the year 1997-98 railway-wise

Railway	Total No. of Trips by Drivers 'C'	No. of trips between 10-12 hrs overall duty	No. of trips between 12-14 hrs overall duty	No. of trips between 14-16 hrs overall duty	No. of trips over 16 hrs overall duty
CR	118288	15125	6483	2271	0
ER	160345	149952	6837	3556	0
NR	281139	261029	11000	4720	4390
NE	22637	2478	2289	1145	381
NF	46104	10382	3037	1742	0
SR	108001	16376	6970	17521	0
SC	216585	26409	11652	26002	0
SE	353703	58644	26391	47345	23673
WR	168929	23919	16493	9745	302
TOTAL	**1475731**	**564314**	**91152**	**114047**	**28746**
Percentage	**100.0**	**38.2**	**6.18**	**7.73**	**1.95**

(Para No. 5.16.3 of RSRC, 1998 (Khanna Committee))

Our committee is of the view that the Railways should make greater efforts to reduce the incidence of longer hours on duty of running staff. This subject will be taken up in detail in the Final Report. (Para No. 5.16.4 of RSRC, 1998 (Khanna Committee))

Status of Divisional Safety Officer and Tenure in Safety Organization

Reference: Wanchoo (Recommendation No 331 of Part II); Sikri (Recommendation Nos 243 & 245 of Part II)

The Wanchoo Committee had expressed itself strongly in favour of having the post of DSO in the same grade as other divisional officers so that the DSO was able, by virtue of his status, to "carry weight with his counterparts in the other departments This recommendation was reiterated by the Sikri Committee which felt that the relatively junior status of the DSO compared to his colleagues in the other disciplines was a major handicap as he was not able to impose any kind of discipline on the other departments even on issues directly linked to safety. The Sikri Committee was also in favour of a minimum of 2 years' tenure for persons posted to the Safety organization.

(Para No. 5.17.1 of RSRC, 1998 (Khanna Committee))

Our committee finds that these two recommendations remain substantially unimplemented by the Railways. There are as many as 39 divisions on the Indian Railways where the DSO is in Senior Scale whereas the other branch officers are in the Junior Administrative grade. And judging by the actual position on the ground, it would appear that the Railways have altogether forgotten about ensuring a minimum tenure of 2 years for persons posted to the safety organization. To cite a few examples, the post of Chief Safety Officer of South-Central Railway has had 20 incumbents in the period 1988-89 to 1997-98, on the Northern Railway 17 incumbents and an equal number on the North-Eastern Railway during the same 10-year period.

(Para No. 5.17.2 of RSRC, 1998 (Khanna Committee))

We have indicated our recommendations on the subject in Chapter III. (Para No. 5.17.3 of RSRC, 1998 (Khanna Committee))

Delay in Finalization of Accident Enquiries & Disciplinary Action

Reference: Kunzru (Recommendation No. 49 of Part 1, Recommendation No. 65 of Part II); Wanchoo (Recommendation No. 133 of Part 1); Sikri (Recommendation No.40 of Part I)

The Kunzru Committee had expressed itself strongly in favour of prompt punishment of railway staff who were guilty of lapses leading to accidents. The Committee felt that punishment must inevitably be meted out for an unsafe act or breach of rule, but the Committee warned that if punishments were delayed, the deterrent effect was lost. The Committee urged the Railways to conform to the targets laid down for finalizing accident cases and disciplinary action thereon.

(Para No. 5.18.1 of RSRC, 1998 (Khanna Committee))

The Wanchoo Committee found that the time taken for finalization of accident cases was far beyond the target prescribed. Ten years later, the Sikri Committee passed the verdict that this recommendation remained substantially 124 unimplemented as time taken by the Railways for finalization of accident cases exceeded in all cases the target laid down by the Railway Board. (Para No. 5.18.2 of RSRC, 1998 (Khanna Committee))

Though there has been a substantial improvement in the position since then, as seen in the figures given below, there is still considerable scope to effect improvement.

Year	No. of accidents	No. of cases in which inquiry has been completed including award of punishment within D+90 days	No. of staff held responsible	No. of staff finally awarded punishments	No. of enquiries pending finalization beyond D + 120 days
1993-94	674	344	912	879	49
1994-95	604	233	787	734	70
1995-96	440	210	537	508	64
1996-97	426	205	540	483	52
1997-98	420	198	582	467	66

(Para No. 5.18.3 of RSRC, 1998 (Khanna Committee))

Conclusion

In retrospect, we have traced the trajectory of the important topical recommendations made by the three earlier Committees and examined the nature of the Railways commitment to implement the accepted recommendations. The conclusion we draw is that there is scope for better implementation of the accepted recommendations of the various Committees. While it is acknowledged that constraint of funds has been

a hindrance, our committee has identified a number of frailties in the Railway management's response to the earlier Reports, not with the purpose of fault finding but to help reorient the entire corporate approach so that more productive results are achieved in the future.

(Para No. 5.19.1 of RSRC, 1998 (Khanna Committee))

Our committee is convinced that an essential prerequisite for ensuring that key safety issues remain an integral, critical part of the corporate vision is to set up a proper monitoring mechanism to oversee the compliance of the recommendations made by various Committees on rail safety and the very first recommendation has been given in Chapter II to that effect. (Para No. 5.19.2 of RSRC, 1998 (Khanna Committee))

The complete recommendations of the Sikri Committee juxtaposed with remarks furnished by the Ministry of Railways regarding implementation are given in Appendix A.

(Para No. 5.19.3 of RSRC, 1998 (Khanna Committee))

CORPORATE
SAFETY PLAN (2003 - 2013)

33

Collisions constitute 7% of total accidents but account for 38% of total fatalities. Collisions will be totally eliminated by extensive use of the Anti-Collision Device (ACD).

Derailments constitute 75% of total accidents but account for only 14% of total fatalities. Derailments will be reduced by 60% by following measures:

1. Replacement of overaged tracks, bridges, S&T gears and rolling stock under SRSF and current arisings under DRF.
2. Elimination of four-wheeler tank wagons, which are accident-prone.
3. Reduction of thermit welded joints which are weak areas.
4. Improved training facilities enhancement of human skills.
5. Rail/Weld failures cannot be totally eliminated due to inherent weak nature of thermit weld and inherent infirmities in rail, although measures like "Continuous Track Circuiting" and the use of 'State-of-the-art SPURT Cars' for rail flaw detection are going to be adopted.

Fire accidents constitute 2% of total accidents and account for 2% of total fatalities. Fire accidents and consequent fatalities will be reduced by 80% by adoption of fireproof coaches and fire-retardant material in the

existing coaches. Fire accidents cannot be totally eliminated as some of them occur because of unidentified elements on which Railways have little control.

Level Crossing Accidents constitute 16% of total accidents but account for 46% of total fatalities. These fatalities comprise of road users on which Railways have little control. There has been a rising trend in level crossing accidents in the last decade (+23%), which will, at least, be arrested by following measures.

1. Social awareness programmes
2. Construction of ROBs/RUBs at level crossings with TVUs > 1 lakh.
3. Manning of unmanned level crossings
4. Provision of phones & interlocking of level crossing gates
5. Use of Train Actuated Warning Device (TAWD) and Anti-Collision Device (ACD)

Bridges

Following measures being adopted:

1. Under Water Inspection
2. Integrity testing of foundations
3. Non-destructive testing techniques
4. Bridge Management System
5. Fatigue life and residual life assessment techniques
6. Replacement/rehabilitation of identified overaged and distressed bridges.

Overall consequential train accidents per million train kilometers will be reduced from 0.44 in 2002-03 to 0.17 in 2012-13. Fatalities in case of serious accidents will be appreciably reduced by use of Crash worthy Coaches and tight lock couplers with anti-climbing features.

Filling up of all Safety Category posts on urgency basis. Safety Related Retirement Scheme (SRRS) for gangmen and drivers in age group of 50 to 57 years.

Disaster Management measures for ensuring quick relief and rescue operation.

Funds requirement for safety enhancement works, including SRSF, outlined in the Corporate Safety Plan: Rs. 31,835 crores.

33.1 Corporate Safety Objectives

The core values of the Indian Railways (IR), which are uniquely inappropriable and sustainable, include safety apart from security, punctuality, and reliability. The constant endeavour of the Indian Railways is to become the leader in the nation's transportation sector by providing modern, reliable, safe, customer-led, and customer-focused services to the nation.

The demand for introduction of additional passenger services and other facilities on regional considerations is becoming stronger day-by-day.

The demand for new lines in underdeveloped and economically backward areas, though financially not viable, would continue to be made. The main area of concern is safety. With the rising awakening of rights, demand for higher safety in travel is bound to increase in the near future. Increased rail-road interface at the level crossings, both manned and unmanned, makes them potential accident spots. The continuous increase in the growth of rail traffic on saturated high-density corridors would require lesser dependence on human beings and greater technological support for the train operating staff for ensuring public safety.

The Indian Railways have one of the largest skilled, dedicated and qualified pool of professionals in the country. The rail sector is superior to other modes in terms of safety, environmental and noise pollution, energy consumption and land requirement. Public expects very high standards of safety from the Railways.

The Indian Railways, at their own initiative, have been periodically getting the system reviewed and scrutinized for safety performance. During the last four decades, four Safety Review Committees have investigated the deficiencies and suggested reforms for improving safety of the system. Railway Safety Review Committee (RSRC 1998), headed by Justice H.R. Khanna, retired Judge of the Supreme Court, was the last one in the series.

Railway Safety Review Committee (1998), in Part-I of its report recommended, inter-alia, that Railways should formulate a Safety Plan. It says:

"Railways should immediately make out a Comprehensive Corporate Safety Plan which will clearly state:

1. Safety policy/objectives & strategies for achieving them.
2. Unambiguously enunciate basic tenets & requirements of safety
3. Prioritize safety-related works and indicate timeframe, investments proposed, and set benchmarks for safety achievements" (Para 2.26.4)

On Safety Projects, RSRC recommended inter- alia: "Decisions on safety projects should cover the items completely in all aspects like funding, time-schedules, actions, accountability etc. over several years" (Para 2.3.1)

Major issues

The Corporate Safety Plan, as recommended by the Khanna Committee, is proposed to cover:

1. Items to be implemented in order of priority.
2. Laying down the timeframe for achieving them
3. Defining different managerial responsibilities
4. Investments required to complete the safety-related works.

Expectations on the safety front are becoming more demanding and stringent. Risk levels of earlier times are no longer acceptable to the people. Therefore, safety environment on the Indian Railways cannot be viewed in isolation. It must be seen as part of not only the IR system, but an interwoven segment of social ethos. Good management, improved work culture, meticulous planning and prudent financial management are necessary to enhance the safety standards of the system.

The goals to be achieved to enhance safety on Indian Railways are:

1. To make railways more reliable and a safer mode for transportation of men and material
2. To stimulate the implementation of modern, proactive, and systematic safety measures
3. To bring about both qualitative and quantitative improvements in safety performance
4. To encourage safety research and development
5. To reduce consequential train accidents

Need for Safety Culture

Safety is an ethos that should pervade all activities of railway operations and maintenance. This ethos must be instilled and nurtured. It is not an attribute that is likely to be evident merely because rules are reiterated, or

instructions issued. The concern for safety must be all pervasive in the functioning of the Indian Railways.

Responsibility for ensuring safety is entirely with different departments and their accountability in this regard cannot be diluted. The safety organization has essentially to be a coordinating service department helping the concerned departments to discharge their safety functions effectively.

Changes in policies pertaining to recruitment, training and redeployment taking into account modern developments and ensuring a code of conduct for safety staff will be the thrust areas in the Corporate Plan period. The safety organization will also be involved in investment planning for safety-related works. A safety action plan based on defined and acceptable levels will be prepared and its implementation will be the joint responsibility of the executive departments concerned and the safety wing.

Although statistically, the Indian Railways performance has been steadily improving and it has remained one of the safest modes of transport; yet a few serious accidents resulting in loss of life have affected the public perception about railway safety. The Khanna Committee made a number of recommendations relating to technological upgradation, institutional changes and investment planning which need to be acted upon.

The Corporate aim of the Indian Railways is to commit itself to ensuring that all its activities are managed to the highest level of safety which is pragmatic and reasonably practicable to achieve. Though the Railway Board retains the ultimate responsibility for ensuring safety, it must be discharged through zonal railways and divisions. To see that adequate safety management systems are in place, the Railway Board will have to continue to measure how effectively individual zonal railways are managing the affairs as far as safety of travelling public and infrastructure is concerned.

Areas to be covered

Following areas have been identified, being of particular importance, for which targets are to be laid down: -

1. Passenger safety
2. Road users' safety
3. Quantitative reduction in accidents

4. Improving asset reliability
5. Prompt rescue and relief operations.

Each Zone and Division is required to identify safety risks, particular to its business, and will have to prepare a detailed action programme to ensure that the standards of safety are improved. They will have to dovetail their programmes with the Indian Railways safety objectives. Though the Corporate Safety Plan is made for the next 10 years, most of its achievable targets are divided into two phases. Phase-I will cover the period between 2003-2008 and Phase II will span its safety activities up to the year 2012-2013. This has been, basically, done to have a mid-term assessment with changed circumstances, advancement of technology and assimilation of devices.

The Plan, inter alia, involves administrative decisions, policy directives, induction of safety equipment and acquisition of safety materials. It also aims at reduction of passenger casualties, road users' casualties, enhancement of human resource development, revision and modification of rules and efforts to curtail and contain asset failures etc.

Implementation

The timeframe of many activities cannot be legislated absolutely as it would depend on the quantum of work involved for implementing it over the entire Indian Railways and availability of funds. The project-wise requirement of funds may undergo changes on periodic reviews. Actual fund allocation for each safety project would also depend on the inter-se priority of the project and the total fund availability in a particular year.

The actual implementation of all safety projects would generally be done route-wise with 'A' and 'B' routes to be taken up first and 'E' and 'E. Spl.' routes lastly; except in case of level crossings, where the works would be taken up on basis of volumes of traffic on the rail-road intersections.

The investment priorities will have to be decided on the following considerations: -

1. Rehabilitation, renewal, and replacement of assets
2. Safety works and their prioritization
3. Modernization and technological upgradation
4. Capacity generation

Most of the arrears of renewals are proposed to be liquidated in a phased manner over a period of 5 years through the Special Railway Safety Fund. All fresh arisings of renewals are proposed to be liquidated through the Depreciation Reserve Fund by making adequate provisions. The decision on any safety project will cover the items completely in all respect, like funding, time schedules, and accountability, etc. over the entire duration of the project.

The main principles for operational safety will revolve round efforts to identify and develop appropriate methods and implement the same for reducing the risks associated with human interface in operations. Similarly, the IR would strive to reduce the risks associated with rail-wheel interaction.

Concerns

Finally, absolute rail safety is a concept that cannot be traded off with any consideration. Risk is an element of everyday life of every transportation mode. To eliminate accidents altogether would mean enormous investments and possibly unacceptable countermeasures. However, the primary aim of achieving higher standards of safety is to achieve zero-tolerance to all risks. Although the collated safety data indicate the improving safety standards on Indian railways, continuous efforts are to be made to improve it further with optimum utilization of technology, funds, and allied resources. The Corporate Safety Plan (2003-2013) is prepared with this broad objective.

The Safety Plan, as the long-term safety blueprint, prepared on the 10-year strategy, is generally based on the Railway Safety Review Committee's recommendations and the major items brought out in the White Paper on Railway safety. The plan envisages key areas like reduction of collisions, derailments, level crossing mishaps, fire in trains, signal passing at danger, trespass, and vandalism etc. with the objective of achieving reasonably higher standards of safety on Indian railways.

Safety: Plan Objectives

The Safety Plan will have the following broad objectives:

- To achieve reduction in rate of accidents per million train kilometers from the present level of 0.44 to 0.17 by the year 2013.
- Implement measures to reduce chances of passenger fatality substantially in consequential train accidents by 2013.

- Focus on development of manpower through major improvements in working environment and training to reduce the accidents attributable to human failure by 40% by 2013.
- Achieve safety culture on all fronts including maintenance depots, worksites, stations, controls etc.
- Progressively achieve an environment of "Fail-proof" from the present "Fail-safe" system of asset failures by upgrading the systems by 2013.
- Prioritization of safety related projects.
- Implementation of accepted recommendations of RSRC at an accelerated pace.

The following requirements would need to be met to achieve these objectives:

- Safety should take **priority over other considerations**
- Responsibilities should be clearly assigned.
- Every railway zone should introduce **a clear safety management plan**.
- Qualitative changes should be brought about in the human resource development.

33.2 Safety Policy Issues

There are many areas requiring administrative decisions and directives for long-term policies. They primarily relate to accountability, supervision, maintenance of assets, quality of material related to safety components, train operations and industrial relations etc. Some of them are enumerated below:

Managerial Accountability and Human Resource Development

1. Responsibility at higher supervisory and managerial level for repeated failures or unsafe working
2. Accountability for prolonged abnormal working
3. Service review of critical categories at the age of 55 years or on completion of 30 years of service whichever is earlier, by a positive act of approval
4. Objective assessment of driving crews and performance-based categorization
5. Fighting alcoholism in certain categories at workplaces
6. Equipping safety organization with a pride of place in the hierarchy

Management of Assets

Track

1. Adoption of `zero missing fittings' concept applicable to all track gangs

2. Introduction of concept of zero avoidable track defects
3. Safety tolerances for track
4. Formulation of comprehensive policy for mechanized maintenance of track
5. Policy of lubrication on curves, points and crossings, weak track, work sites and at poor formations
6. Adoption of long-term policy for rail grindings
7. Procurement of longer rails (more than 13 meters) from steel plants
8. Planning of portable flash butt welding plant/machinery
9. Anti-sabotage measures for protection of track

Rolling Stock

1. Zero defects and `zero missing safety fittings at the time of turning out locos from base sheds and sample check and certification by officers
2. Adherence to `zero missing safety fittings at the time of turning out of coaches and wagons from workshops and sick lines
3. 100% brake power on air brake trains at originating points and 90% at any intermediate points for close circuit rakes
4. Review of pattern of examination
5. Extending the concept of close circuit rakes to more and more wagon fleet
6. Increased stress on quality of out- turn from workshops
7. Phasing out of four-wheeler tank wagons

Signalling & Telecommunications

1. Laying down maintenance schedules and their adherence for all types of signalling gears and equipments
2. Timely overhaul of all signalling installations
3. Safety tolerance of all Signal and Telecom gears and equipments for Mean Time Between Failures (MTBF) and Mean Time to Repair (MTTR)
4. Long-term policy on provision of Train Protection & Warning System and Anti-Collision Device
5. Comprehensive maintenance policy for signal and telecom equipments to achieve zero failure of track circuit and axle counter equipment
6. Policy of continuous track circuiting on identified routes
7. Mobile train radio communication
8. Solid State interlocking
9. Train actuated warning device (TAWD)

Level Crossings

Re-classification of all existing level crossings, both manned and unmanned, based on density of trains & road vehicles for the purpose of their manning, upgradation, and review of sanctioned works.

Material Procurement

Identification of safety components related to: -

1. Rail wheel interface
2. Locomotives, coaches, wagons etc.
3. Improvement of speed of trains or visibility of signals i.e. loco headlights, loco flashers, wipers, speed recorders, data recorders, vacuum and
4. air pressure equipment, Alarm Chain Pulling (ACP) equipment in coaches, etc.
5. Fire prevention/protection items in locos, coaches, and petroleum (POL) rakes
6. Signal equipment related to train operations viz. tail lamps, hand signal lamps, flashers, safety board indicators and signal indicators etc
7. Policy of procurement of safety related stores items
8. Adoption of life cycle costing principles
9. Review of specifications and inspection of material

General

1. Fixation of codal life of new assets, with the upgradation of infrastructure and induction of new technology
2. Review of codal life with rehabilitation of assets
3. Revision of maintenance schedules of new assets with improved technology
4. Premature condemnation/ replacement of assets
5. Issues related to inter-departmental co-ordination
6. Post-project techno-economic audit of safety-related projects

Train Operations

1. Assessment of line capacity, its constraints vis-à-vis new services
2. Review of maintenance infrastructure for safe and efficient operations
3. Guidelines on locomotives, coaches, wagons, overdue for maintenance schedules
4. Phasing out of 4-wheeler tank wagons or limiting their operation
5. Formulation and issuance of comprehensive policy for dealing with fire incidents in loaded POL rakes
6. Maintenance and operating disciplines for close circuit rakes<

7. Issues related to loading beyond the identified carrying capacity
8. Assessing physical and mental stress on driving crews and train passing staff.

33.3 The Role of Technology

The goals of new technologies are to improve safety through reduced human dependence, intervention and improved asset reliability and at the same time reduce costs as the costliest technology may not be necessarily the safest. In this direction, rail-wheel interaction must be the thrust area with a view to reduce wears and tear of both rail and rolling stock. Greater association of industries, technologies, R&D institutions, and Department of Science & Technology (Ministry of HRD) will have to be ensured in the development of new technology. The increased periodicity or reduced frequency of maintenance will be another priority area. Appropriate technologies will be adopted in phases during the Plan period.

Track & Bridges

1. Rail flaw detection
2. Rail grinding
3. Track management system.
4. Optimisation of schedule of dimensions
5. Improved thermit welding
6. Formation/Rehabilitation
7. Improved fastening
8. Improved high-speed turnouts.
9. Bridge management system
10. Under-water inspections of bridges
11. Mapping of unknown foundations and integrity testing of foundations
12. Non-destructive testing techniques like Ultra Sonics, Acoustic Emission, Strain Gauging and Radar etc.
13. ki Fatigue life and residual life assessment techniques

Rolling Stock

1. Achievement of zero defect in between two scheduled maintenances of rolling stock
2. Disc brakes with microprocessor-controlled wheel slide/slip prevention mechanism.
3. Aerodynamic designs
4. Radial and self-steering bogies

5. Wheels and axles of improved metallurgy
6. On-board diagnostics
7. Intelligent brake system in locomotives and other rolling stock
8. Censors for detecting dragging equipment, Hot-boxes, Hot wheels.
9. Crash worthiness in coaches.
10. Tight lock CBC couplers with anti-climbing features
11. New environmentally friendly paint system
12. Bogie mounted brake system.
13. Rail-wheel interaction status, including development of track friendly bogies, Wheel flat detection system, on-line monitoring of rail and wheel profiles.
14. Derailment detection devices
15. Driver friendly cabs in locos
16. Guard friendly brake van.
17. Disaster Management
18. Fire-proof coaches.
19. Modification in toilet discharge system in coaches to prevent rail corrosion.
20. Computer controlled master-slave multiple loco operation for heavier/longer trains (locotrols)
21. Solid state interlocking
22. Last Vehicle Check and end of train telemetry devices
23. Train Protection and Warning System
24. Anti-Collision Device
25. Train Actuated Warning Device
26. Mobile Train Radio Communication System

General

1. Driver vigilance control device
2. Predictive maintenance techniques
3. Ergonomic and eco-friendly practices
4. Remote monitoring and data recording analysis for maintenance/replacement decisions

(The list is not exhaustive as new areas for improving productivity with further technological developments will become available in future.)

Information Technology (IT)

One of the goals would be to reduce drudgery and to utilise manpower for more innovative and productive purposes. The Indian Railways would like to have much more asset reliability and higher safety through

continuous monitoring of state of health of the assets and feedback. For all these, the IR will have to work on IT-based projects to solve problems and inculcate an IT culture.

Few applications of IT, related to safety, would be in following areas: -

1. Track and bridge management.
2. Emergency response including accident and disaster management.
3. Wireless connectivity
4. Train protection and Warning System
5. Mapping of rail network and tracking of trains using Global Positioning System (GPS
6. Computer aided remote controlled signalling and train describer system with display panels.

Research and Development (R&D)

The aim is to achieve a high-quality R&D staff in addition to absorption and assimilation of new technology. The functions of Research, Design and Standards Organisation (RDSO) may undergo a major shift. Railways expenditure on R&D, as a proportion to gross earnings, has been about 0.2% only, which may be suitably stepped up as recommended in many studies.

It is proposed to build a scientific cadre in RDSO to provide a continuity in R&D efforts and consequently achieve high quality of research and development.

At present, RDSO is seized of wheel impact load detector, crashworthy coach design, prevention of rock falls in cuttings, datalogger for Ultra Sonic Flaw Detection (USFD) machines, development of track side bogie monitoring system, development of test-track facility, development of measuring wheel technology etc. Technology mission on railway safety is being launched in association with IIT/Kanpur and Department of Science and Technology (Ministry of HRD) to tackle some burning issues like wheel flat detection, problem of visibility during foggy weather etc.

Following items will also be pursued during the Plan period:

1. Laying of long-welded rails over bridges
2. Vibration signature analysis and development of rail vehicle-based testing car
3. Continuous foundation scour monitoring using Time Domain Reflectometry

4. Wheel flat detection
5. Visibility problems during foggy weather

33.4 Strategies for Targets for Reduction in Accidents

Barring a few years, the Indian Railways (IR) have been making continuous improvement in safety performance as far as number of consequential train accidents is concerned. The frequency of accidents per million train kilometers, an index adopted by most of the railway systems, has been falling gradually. The year 2002-2003 has witnessed the lowest number of accidents per million train kilometers.

Ideally, the Indian Railways should provide accident-free and casualty-free service and achieve zero level of risk for its passengers. Though it may not be possible to achieve the aspired level of safety in the near future, the IR are fully committed to ensure that all its activities are managed to the highest level of safety which is reasonably possible to achieve.

The trend, composition and fatalities of different types of accidents during the 10-year period (1992-93 to 2001-02) are indicated below:

Type of consequential train accidents	**Average number of accidents per year**	**Percentage share (%) of type of accidents**	**Fatalities per year in each category of accidents**	**Percentage share (%) of deaths in each type of accidents**	**Percentage (%) increase/decrease in average number of accidents w.r.t. previous decade (82-83 to 91-92)**
(1)	(2)	(3)	(4)	(5)	(6)
Collisions	32	7	148	38	(-) 18
Derailments	333	75	52	14	(-) 38
L-xing accidents	72	16	176 (all road users)	46	(+) 23
Fire accidents	8	2	8	2	(-) 40
Misc.	1	-	-	-	
Total	446	100	384	100	
					(-) decrease, (+) increase

From the above it is apparent that 46% of total fatalities are of road users and the balance 54% are predominantly of passengers. Collisions contribute substantially to passenger fatalities. Derailments, though in much larger numbers, cause much less fatalities.

Collision-free System:

With the completion of track circuiting works, provision of block proving axle counters, data loggers and a comprehensive safety coverage proposed to be given by ACD over the next few years, it will become a

'mission area' for Indian Railways to eliminate collisions and consequent deaths. In this direction, all works related to prevention of collisions are proposed to be completed in the Plan period. This is likely to take the IR to realize the dream of a collision-free system.

Level Crossings: Efforts to contain accidents.

Despite gradual manning of level crossings, construction of Road overbridges / Road under bridges (ROBs/RUBs) and intensive public awareness campaigns, it has not been possible for the Indian Railways to tackle the problem of reduction of level crossing accidents. As they are predominantly due to lapses on the part of road users, and in view of stupendous increase in road traffic, there does not appear to be any let up in the mishaps. As the IR do not have much direct physical control or intervention, it will be the aim of the Indian Railways, at least, to contain and control the accidents at rail-road intersections at the existing level. A coordinated approach, involving State Governments, various influence groups and intensive social awareness programmes will be principal measures to attain the objective.

Fire Accidents

Though the average number of fire accidents as well as the annual average fatalities are 8 per year for both, a stray major fire in train accident may lead to disaster. In general, nearly 40 % of fire accidents are caused by unidentified elements, of which the Railways have little control. With the rising social awareness, stringent scrutiny on trains, induction of fire-proof coaches & more and more technological inputs, it is assessed that the fire accidents and consequent fatalities would be reduced by 80% as compared to their present level.

Derailments.

The derailments, being the largest component of total consequential train accidents, are required to be tackled with greater urgency. Around 75% of derailments occur due to `railway staff failure, and another 10 % of derailments are caused by `equipment failures.

Around 15% are caused by the failure of `other than railway staff', sabotage and incidental reasons.

With the focused attention on human resource, technological upgradation and modern maintenance practices, the present level of human failures

causing derailments is bound to improve substantially. With phasing out of derailment-prone and less reliable 4-wheeler tank wagons from the fleet, investments being made through SRSF/DRF into rehabilitation of track and rolling stock etc., and anticipated improvement in the skills and quality of manpower through enhancement of HRD, it is feasible to attain a substantial reduction in derailments.

However, it is noted that few derailments, which occur on account of rail/weld failure (average 25 derailments per year), may not reduce substantially due to inherent infirmities in the existing rails. Taking the non-controllable factors viz. outside interference and incidental factors like landslides etc., as constant, the overall reduction in derailments is assessed to be around 60% by 2013 as against 38% reduction achieved in the previous decade (1992-93 to 2001-02).

The IR has planned for crashworthy coaches (discussed later in this chapter) and tight-lock coupler with anti-climbing features, which will go a long way to contain the number of casualties in case of serious accidents.

Overall Consequential Train Accidents

Based on the above-mentioned facts, the present level of accidents is targeted to be reduced significantly by the end of the plan period (2012-13) as detailed below. For this purpose, the present level of accidents has been taken as an annual average for three years i.e. 2000-01, 2001-02, & 2002-03.

Type of consequential train accidents	**Present Level of accidents**(Yearly average)	**Estimated accidents in 2012-13**	**Remarks**
Collisions	22	Zero	
Derailments	282	113	60% reduction
L-xing accidents	90	90	No Change
Fire accidents	14	3	80% reduction
Misc	5	-	-
Total	413	206	-

The total million train kilometers are expected to touch a figure of 1192 in the year 2012-2013. It is, thus, estimated that index of accidents per million train kilometers would be reduced from 0.44 (in 2002-03) to 0.17 in 2012-13.

Zonal Railways and Divisions will set their targets in a similar manner

for consequential train accidents, `other train accidents', yard accidents, and indicative accidents.

Track Circuiting

A major thrust was given to track circuiting at stations in the mid-nineties, to serve as a technical aid to station staff to prevent collisions. It is proposed to cover all the main BG routes, having passenger traffic, in the next five years.

In the last five years, o-n an average of 900 to 1000 locations per year have been provided with track circuits. Track circuiting works on A, B, C, D, D.Spl, E & E.Spl routes are being done in a phased manner. It has been one of the most important safety aids provided at the stations, which has reduced collisions in station areas. Works of track circuiting have been sanctioned under SRSF. Whereas works on over 2250 Stations of A, B, C have already been sanctioned, projects o-n other routes, of BG and MG are proposed to be taken up.

Block Proving by Axle Counters

Block proof by axle counters is to be provided on 'A', 'B' and `C' routes. All new works of panels will be provided with this device, to prevent collisions in the block sections due to some `parted' load being left out.

Auxiliary Warning System (AWS)/Train Protection Warning System (TPWS)

To eliminate human error in passing signals at danger, this system may be tried on certain stretches. The Auxiliary Warning System (AWS) has been working satisfactorily over a decade in Mumbai suburban sections of Central and Western Railways.

Anti-Collision Device (ACD)

Anti-collision device is a recently developed device by Konkan Railway Corporation to prevent collision like situation e.g., head-on collision, side and rear-end collision. This device may also help in detecting train partings and provide audible and visual warnings at level crossing gates when trains approach them. At present provision of ACD is sanctioned on about 3500 route kilometers on Southern, South Central, South-Western, Northeast Frontier and Northern Railways. ACD survey for 10000 route kilometers is also sanctioned. ACD will be further extended on entire BG section during the plan period on priority.

Light Emitting Diode (LED) based Loco Flasher Lights are proposed to be provided in rear of Guards brake van (SLRs) on passenger carrying trains. They will be identical to loco flashers and will be in addition to the guard's tail lamp. They would be switched on during any out-of-course stoppage in the block section.

LED-based Flashing Tail Lamps are being provided to guards. Similarly, LED-based Hand Signal Lamps would be provided to all stationary staff connected with train operations.

Signal circuitry of four aspect Multiple Aspect Colour Light Signalling (MACLS) will be modified to provide for interlocking of starter and advanced starter. `Negative' slides with ASM will be dispensed with, wherever existing.

Continuous Track Circuiting

Continuous track circuiting not o-nly helps in improving the capacity with automatic block signalling where more than one train can be sent in a block section but also improves safety. First, all the level crossing gates o-n the section gets protected by signals. Secondly, if double rail track circuit (audio frequency track circuit) is adopted, it may also detect electrical discontinuity in rails due to rail/weld failures or acts of sabotage etc. Since the Golden Quadrilaterals along with its diagonals o-n the IR carry the maximum traffic, it is proposed to provide continuous track circuiting on priority on these sections. Works o-n about 2000 route kilometers have already been sanctioned at a cost of Rs.425 crores.

Mobile Train Radio Communication

Mobile Train Radio Communication (MTRC) system has an intrinsic potential in enhancing the safety and security in train operations, besides being a valuable aid in providing reliable and secure communication to all those engaged in different facets of railway operations and maintenance functions.

Five works covering nearly 2400 Route Kms. at a cost of Rs.185 crores are sanctioned o-n trial basis.

Track Renewals

While in service, track is subjected to fatigue and wear and tear. For continued ability of track to withstand the expected traffic, it is required to be renewed periodically, as, and when it becomes due for renewal.

However, in general, the funds provided for track renewals have been less than those required/projected. Thus, annual arisings of track renewal could not be taken care of as they arose. A large kilometerage of track therefore got accumulated as overdue for renewal. With the creation of non-lapsable Special Railway Safety Fund (SRSF) amounting to Rs. 17,000 crores, it is expected that the arrears of track renewal, which stood at 16,538 km as on 01.04.2001, will get cleared by 31.03.2007. Year-wise work done and planned is as follows:

Year	Physical work (track km)	Cost Rs. Cr. (Net)	Remarks
2001-02	2490	1119	Actual
2002-03	3343	1657	Actual
2003-04	2700	1407	Targeted
2004-05	2676	1400	-
2005-06	2676	1200	-
2006-07	2676	887	-

The annual arising of track renewal is of the order of approximately 2350 track kms for main lines. In addition, certain special works like replacement of bridge timber sleepers, renewal of turnouts, systematic renewal of fittings, welds and ballast are also required at certain time intervals. The yard lines also need input. This work will be taken care of with funding from the Depreciation Reserve Fund (DRF) or Revenue.

Rail/Weld fractures

Rail/Weld fractures due to internal defects or due to corrosion etc., have a direct impact on the safety. They are potential safety hazards and action must be continuously taken to control them by following means:

1. **Improvement of quality of rails**- The Hydrogen content in the rail steel plays a very detrimental role in generation of internal rail defects. The IR purchase rails from Steel Authority of India Ltd. (SAIL/Bhilai). With close interaction and constant persuasion with SAIL/Bhilai, maximum permissible Hydrogen content has now been reduced to 2 ppm which earlier used to be permitted up to 5.5 ppm. It is further proposed to be reduced to 1.5 ppm in the next two years i.e. by 2005.
    i. The IR along with SAIL, have taken a decision to produce 65 to 78 m long rails which will be welded in Bhilai Steel Plant to make a rail panel of length 240 to 260 m. These long rail panels will be directly transported to the site thereby reducing the number of welds. This would also reduce the multiple handling of rails thereby improving

the quality. The project is planned to be implemented during the Plan period.

ii. For transportation of these larger rails, ten mechanized rakes are being procured under Rolling Stock Programme and are likely to be commissioned by 2005-06.

2. **USFD Testing of rails -** Considering that a large number of rail/weld fractures result in derailments and some flaws go undetected in USFD testing, new equipments would be procured having a computerized recording device. This would enable exhaustive analysis of defects and to identify those which are growing in size.

   i. The Railways have recently introduced a need-based concept of USFD testing of rails, under which the rails already laid in track will be tested after the passage of 8 gross million tonne (GMT) of traffic. The annual requirement for ultrasonic testing comes to about 1,55,000 km. As the testing at present is being done manually, which is a slow, strenuous, and time-consuming process and largely depends upon human judgement, it is planned to get the testing done through SPURT cars, where identified locations can subsequently be confirmed by manual testing. The testing of these cars would be faster as well as more reliable as it would cover a larger cross-sectional area of rail. Two SPURT cars of the improved version are to be procured by 2004 and three more by 2008.

3. **Improved Thermit Welding -** Thermit welding, carried out in an open line, generally suffers from poor quality. Some countries have already obtained better welding technology for stronger tracks. It is proposed to procure the latest technology of thermit welding and the most modern equipment for testing each weld. Efforts are being made to acquire the latest technology of AT welding of rails, being followed o-n developed railway systems. A work costing Rs 30 crores from SRSF has already been sanctioned which is to be completed by 2005.

4. **Reduction in thermit welds by mobile flash butt welding-** Alumino-Thermit (AT) welds are the weak links in track, whose population is to be gradually reduced and replaced by Flash Butt (FB) welds executed with the help of mobile flash butt weld plants. As a first step mobile flash butt welding will be introduced in construction projects w.e.f. year 2004 and gradually extended to other areas in next five years.

Way-Side Detection of overloaded rolling stock by in-motion weigh bridges

Such systems are in use on advanced railway systems. They help identify the defective wagons causing over stressing of rail. The in-motion weighbridge will help detect overloading. This will help reduce fatigue of rail/welds and, therefore, reduce chances of fracture. A number of rail/weld failures are caused by overloaded wagons. It has been planned to install weigh bridges at various locations, and brake gear would be improved to prevent generation of wheel flats. The focus will be on installing in-motion weigh bridges selectively on identified routes and ensure the functioning of these weigh bridges. Procurement and installation of 39 pitless, electronic-in-motion weigh bridges of 120 tonnes capacity is underway. All new weigh bridges will be installed at originating points only.

Lubrication of Gauge Face and Friction Modifier on top of Rail

Lubrication assists in reduction of wear and prevents derailments. It has therefore been decided that Track Mounted Lubricators should be tried. A work costing Rs 1.55 crores has been sanctioned and after successful trial, it will be adopted as a regular measure. A trial for Rail Top Friction Modifiers shall also be conducted to assess their suitability.

In-situ Rail Stress Measurement

The safety of Long Welded Rails (LWR) track is vitally affected by locked up thermal stresses, which play an important role in the phenomenon of buckling or fractures and thus have important bearing on safety. At present, the IR does not have any equipment to objectively assess these stresses and therefore de-stressing operations are carried out based upon the observation of movements at Switch Expansion Joint (SEJ).

Some countries have developed devices to measure stress, in long-welded rails ‘in-situ’ which makes it possible to monitor and take timely action to avoid rail fractures. It has been decided to obtain expertise to measure rail stress `in-situ', in the interest of enhanced safety. This will help in introducing the concept of "Need Based Destressing" of Long Welded Rails (LWR).

Track Safety Tolerances

As recommended by the Khanna Committee, efforts will be made by Research Design & Standards Organization (RDSO) to draw out safety tolerances for different speeds and categories of track, on the basis of practices followed in various countries and after studying the whole gamut of rail-wheel interaction.

Trespass on Track and sabotage.

To contain outside interference with track fittings, it is proposed to continue with following preventive efforts:

1. Development of anti-theft PRC sleepers, fitting and fastening for Short Welded Rail (SWR) stretches in vulnerable areas. These, however, cannot be used in LWR stretches due to technical reasons.
2. Burring of two fish bolts o-n vulnerable locations
3. Elimination of fish-plated joints by welding of rails
4. Deputing watchmen o-n important bridges, deep cuttings, tunnels, and their approaches, in the sections identified as sabotage prone.
5. Undertaking surprise mobile patrolling in night, by joint team of Railway Protection Force (RPF) and Gangman, in such sections

However, State Governments shall have to ensure safety of track and bridges in accordance with the statutory provision of responsibility.

Modern Bridge Inspection and Management System

Modernization of inspection and assessment systems shall be undertaken. A modern Bridge Management System shall be implemented with following focused areas:

1. Underwater Inspections of bridges
2. Mapping of unknown foundations and integrity testing of foundations.
3. Non-destructive testing techniques like Ultra Sonics, Acoustic Emission, Strain Gauging and Radar, etc.
4. Fatigue life and residual life assessment techniques
5. Bridge Management system

Projects from (a) to (d) have been approved. After their completion, the technologies shall be adopted over the entire system in a period of 3 to 4 years thereafter.

Mobile Bridge Testing laboratories with some Non-Destructive Testing (NDT) equipments have been approved for 16 zonal railways. In the next five years, these laboratories shall be implemented on the zonal railways along with balance complement of essential NDT equipment like Impact Echo testers, etc. The total cost of this project shall be approx. Rs. 30

crores.

Mobile Bridge Inspection units shall be provided at least o-ne per zonal railway in next 5 years. Two such units have been sanctioned with bucket, platform, and pier inspection units. These will facilitate access to difficult locations like the top of trusses and underside of girders and make them easy for proper inspections.

After absorption of the technology of Modern Bridge Inspection and Management Systems and provision of the necessary training, equipment, and infrastructure over next five years over the entire system, Bridge rebuilding shall be taken up after testing and detailed evaluations of strength and residual life.

Bridge engineers and supervisors working on the bridges for inspection and repairs shall be provided with safety gear like jackets with retro reflective strips, helmets, safety harnesses as required and hard boots etc. in the next two years.

Provision of microprocessor-based speed recorders

The majority of the speed recorders in use on the locos on the Indian Railways are of electro-mechanical type resulting in reliability problems. It has been decided to switchover to microprocessor-based paperless speed recorders.

Flasher lights on locomotives

Automatic flasher units have been provided on all locomotives to enable automatic switching 'on' of the flasher lights in case of train parting/alarm chain pulling. This would give immediate indication to the driver of the train coming from the opposite direction in case of derailment etc.

High intensity Twin - beam Head light for locomotives

Twin beam headlights have the advantage of better illumination and superior reliability as compared to the conventional headlights. These are being provided on all new locomotives.

Provision of Air Dryers on locomotives

The provision of air dryers on locos serves to avoid malfunctioning of the sensitive air brake equipment on Rolling Stock such as distributor valves

by removing the moisture in the compressed air supplied by the locomotives. All new as well as rebuilt diesel locos are being provided with air dryers.

Microprocessor-based Electronic Brake System with resetting VCD, Event Recorder

4000 HP GM and three-phase electric locomotives have this feature to monitor the alertness of the driver through all his normal actions. If driver performs no action for 20 seconds at a stretch, he gets an audio-visual indication and if still he does not react, the brakes come on automatically within 10 seconds on all indigenous electric and conventional ALCO locomotives, it is planned to retrofit microprocessor control with VCD and Event Recorder.

Better and Safer Coaches

Design of lightweight, stainless steel passenger coaches has been procured through a Transfer of Technology (TOT) contract from M/s LHB of Germany. The coach provides better ride index at higher speeds. The design provides a higher safety level as a result of modern technology in use in the design of high-speed bogies. Rail Coach Factory (RCF) has already turned out the first rake.

Use of high-capacity buffer packs

All new coaches are being manufactured with 10 kj (kilo joules) capacity buffers packs in place of earlier design with 5 kj capacity to absorb more shocks. All new buffers are being procured to the enhanced design.

Bogie-Mounted Brake System in place of under-floor mounted

Bogie-mounted brake system has superior reliability with fewer brake rigging components. All new coaches are being fitted with this design of air brake system and about 1000 coaches are being retrofitted per annum during POH (Periodic Overhaul).

Use of disc brakes; 30% reduction in emergency braking distance

Disc brake system with microprocessor-controlled wheel slip control system provides faster braking and increases high-speed capability of the

coaches. All new coaches are being manufactured with this brake system. With sufficient experience, the work of retrofitment of coaches with disc brakes will be considered.

Use of Composition Brake Blocks

All broad-gauge coaches, except high-speed coaches, have been switched over to composition brake blocks. Suitable alternatives are also being developed to replace the Cast Iron brake blocks used on high-speed trains. The composite brake blocks have superior braking behaviour with a more uniform friction coefficient.

Improved crash worthiness of interior of coaches-

51 modifications to the coach interior have been adopted to minimize the chances of injury to passengers from sharp edges, corners, or protrusions within the coach. Most of these modifications have already been adopted for new coaches. Workshops will also adopt these modifications during the periodic overhaul of coaches.

Improving the external crash worthiness of coaches.

M/s RITES (Rail India Technical & Economic Services Ltd.) have been awarded a contract to carry out the study and develop crash worthy design for passenger coaches through an international expert of repute. RITES will also help in developing in-house expertise at RDSO (Research, Designs and Standards Organization) as a part of the project. Redesigned coaches will have bodies, which will absorb most of the impact in case of an accident in non-passenger carrying areas, thereby saving precious human life even in the worst disasters.

Introduction of tight lock couplers and anti-climbing features

Tight lock center buffer type couplers have been adopted for the new technology based on LHB (Linke Hofmann Busch) type of coaches. Development of center buffer coupler type design for the existing ICF (Integral Coach Factory) coaches has also been completed and testing of the shell of the prototype coach has already been completed. These couplers do not permit the coaches to separate in case of accidents and prevent o-ne coach from climbing o-n another by holding them firmly in vertical plane. This anti-climbing property of the couplers minimizes the chances of a pile up in case of accidents and enhances safety of

passengers.

The existing couplers permit disengagement of coupling and consequently climbing of o-ne coach over other, in case of an accident. The adoption of the Tight lock couplers has, therefore, assumed extreme urgency. In view of the safety of passengers ensured by these couplers vis-à-vis the present screw coupling, both the coach manufacturing units have been directed to develop designs of the coaches to allow fitment of the tight lock couplers. This will require major design changes and both ICF and RCF are gearing up to ensure fitment.

Phasing out of derailment prone and less reliable four-wheeler tank wagons would be done.

Hot box detectors o-n existing wagon fleet are proposed to be provided.

Arrears of overaged freight stock (as o-n 31.3.2003) is proposed to be liquidated by 2006. Renewal of fresh overage arisings will be planned o-n year-to-year basis during the 2003-2013 period.

Use of fire-retardant materials

The Indian Railways have adopted fire retardant interior furnishing including, wall paneling, flooring, roof paneling etc. to minimize the risk of fire accidents. Fire retardant curtains and upholstery have been adopted all over the system. The prototype of a 'nearly fireproof coach' is expected to be manufactured soon by RCF.

Provision of emergency exit

AC and non-AC coaches are being provided with emergency escape windows. Provision of emergency escape windows in all new coaches and all coaches coming out from POH will be ensured.

Rear-view mirror outside loco cab, multi-resetting vigilance control device, audio-visual alarm system in SLRs, will be tried out to contain fire accidents.

Action Plan for Road Users' Safety

1. To curb accidents at Manned Level Crossing gates, IR will adopt following multi-pronged strategy: -

   The existing Task Force of the Ministry of Railways and State Governments for construction of ROBs/RUBs would be made more effective.

Items to be resolved between the Ministry of Railways and Ministry of Road Transport and Highways:

1. Speed breakers at level crossings, their standards and maintenance.
2. Testing of driving license applicants with regard to thorough knowledge pertaining to level crossings
3. Widening of roads at selected high-density locations to ease movement.
4. Training and counselling of road users
5. Lifting barriers with retro-reflective marker in lieu of gate leaves shall be provided o-n double and multiple lines.
6. On manned level crossings, with more than 500 road vehicles per day and where possible, the road width shall be widened in Railway land.

Signalling systems like interlocking arrangements and provision of telephones at LC gates enhance safety considerably. Extended field trials of Train Actuated Warning Devices are under way. These are likely to enhance safety at manned and unmanned LC gates significantly. o-n its success, it is proposed to extend it further o-n other level crossings.

Of 16500 manned level crossings, 6600 are already interlocked and provided with signals. It is envisaged that another 2000 gates would get interlocked in the next 10 years.

Inclusion of do's and don’ts near level crossings in primary school curriculum.

Reclassification of level crossing gates into `Special Class', `A' class, `B' class and `C' class as per revised criteria based o-n TVU (Train Vehicle Units) and density of road vehicles.

Telephones to facilitate communication between gatemen and station staff and illumination at the level crossing gates.

Distance of lifting barriers may be increased to 5 meters from the center of track instead of 3 meters, wherever feasible.

2. To reduce accidents at unmanned level crossings, it is considered necessary to adopt following measures: -

All unmanned level crossings shall be provided with modified design of Stop Boards in retro-reflective sheets.

1. Basic infrastructure o-n all unmanned level crossings will be ensured and it includes provision of adequate width, normal

gradient, level surface for 5 m from center of the nearest track, Whistle Boards in retro-reflective sheets, specified Road Warning Boards, road surface in good condition and speed breakers/rumble strips etc.

2. All level crossings, as per revised criteria for manning, falling in the three specified categories, are proposed to be manned in the next 5 years.
3. Periodic census of level crossings will be carried out by multi-disciplinary teams.
4. Compulsory whistling by train drivers by linking loco whistle to the Vigilance Control Device (VCD).
5. On sections where there are a number of unmanned level crossings, at close proximity, RUBs may be constructed at a convenient location and the remaining level crossings closed.
6. Checking visibility levels at all unmanned level crossings and taking corrective action for their improvement.
7. Appropriate approach road gradients within railway boundary to be ensured.

Intensive social awareness campaigns to counter misadventure in front of approaching trains.

3. It has been decided to provide Road Over/Under Bridges in replacement of all level crossings o-n cost sharing basis where the TVUs (number of trains x number of road vehicles in 24 hours) exceed o-ne lakh. There are 417 level crossings where the TVUs are more than o-ne lakh and have already been sanctioned as o-n 1.4.2003, for replacement with ROBs/RUBs. There are still 1252 level crossings with TVUs of more than o-ne lakh as o-n 1.4.2003 where the ROBs/RUBs are yet to be sanctioned. These will be sanctioned progressively depending upon the response of the State Governments for sharing of the cost and their sponsoring them for the same.

Employees' Operational Safety

Casualties among employees due to mishaps in the workplace are another area of concern. It is proposed to achieve a substantial reduction in such mishaps by adopting various safety measures. It is the responsibility of an employee not to willfully indulge in unsafe working. Staff must be

taught and constantly encouraged to work safely. It should be ensured that all protective systems are working and are in place before staff undertakes any work.

Necessary protective systems will be adopted to prevent recurrence. Training in personal safety will also be given to new entrants during their initial training course and refresher course. Special training on personal safety will be given to staff deployed to ARTs and operating other breakdown equipment.

Worksites would be supervised at pre-defined appropriate levels. Personal protective equipment would be provided in sufficient quantity, and they would include luminous jackets, protective gloves, crash helmets, safety belts, boots, safety jackets etc. depending upon the job requirement of the staff.

Accountability for System Failure

The direct responsibility of the persons responsible for an accident is determined by an accident inquiry committee, which also assesses failures at various levels of management. The pros and cons of pinpointing accountability have been deliberated by the Railway Safety Review Committee (RSRC) also. Accidents are the end-result of a series of failures. It recommends that the IR should introduce a system of accountability o-n critical issues relating to discipline, training, system failures, availability of critical safety related stores, etc.

In view of the above it has been decided that GMs/DRMs would be responsible for the continued neglect and grave/widespread failure of safety system and would endeavour to obviate the same by paying close attention to the following specific areas:

1. Periodical safety meetings to initiate action o-n emerging areas of concern.
2. Monitoring of vital safety inputs in areas like progress of critical safety works, availability of critical safety items, training, availability of infrastructure maintenance requirements, e.g., blocks, movement of material, etc.
3. Review of equipment failures and periodical analysis to improve reliability of assets.
4. Periodical inspections including surprise/night inspections and their monitoring to ensure that these are effective and meaningful, aimed at

removing inadequacy in workmanship and training etc.

5. Instill the importance of discipline at all levels and to take deterrent action against any act of indiscipline.

While assessing the accountability at managerial level, following aspects, would also be considered:

1. The officers have had sufficiently long and reasonable tenure to assess the prevailing situation and initiate the desired corrective action.
2. Wherever GMs/DRMs are held responsible, accountability must also traverse down the line in the concerned departments, unless it can be shown that sufficient and adequate action had been taken by such departmental officials.

General Managers in Zones are ultimately responsible and accountable for achieving safety objectives laid down in their respective zonal railways. They will discharge this responsibility through the management line and will ensure that their Railway has responded appropriately in this regard. They will be responsible and accountable for ensuring that all reportable accidents are promptly reported. Equipment failures are correctly accounted for. Implementation of Safety Plan as per laid down schedule, monitoring of zonal railways' safety performance, safety auditing, completion of all accident inquiries within the stipulated period, completion of all accident-related D&AR cases within fixed schedule, imposition of punishments in accident cases as per norms, monitoring of inspections of HODs, sorting out inter-departmental safety issues and conducting annual inspection will be other safety responsibilities of GMs. Railway Board Members will be individually and jointly responsible for laying down the safety norms, and also ultimately responsible for safe operation and maintenance of railways. The responsibility of the Board, as a collective body, will include determining safety goals and processing, approving and implementation of safety-related projects. It will also ensure that identified safety projects are neither starved of funds, nor will they have time and cost overrun.

HIGH LEVEL SAFETY REVIEW COMMITTEE, 2012
(KAKODKAR COMMITTEE REPORT, 2012)

34

34.1 Constitution of Committee

Ministry of Railways, Government of India set up a High-Level Safety Review Committee vide Notification No ERB-I/2011/23/37 dated 16.09.2011 reproduced below:

> Ministry of Railways (Railway Board) have decided to constitute a High-Level Safety Review Committee to go into all technical and technology related aspects in connection with safe running of train services in the country under the Chairmanship of **Dr. Anil Kakodkar**, former Chairman, Atomic Energy Commission and Secretary, Department of Atomic Energy. Shri E. Sreedharan, Managing Director, Delhi Metro Rail Corporation will be the Adviser to the Committee. The other Members of theCommittee will be as under: -
>
> i) Dr. N. Vedachalam, Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram
> ii) Prof. Sanjay Dhande, Director, IIT, Kanpur
> iii) Shri G.P. Srivastava, Director E & I Group, Bhabha Atomic Research Centre (BARC).
>
> (Shri Amitabh, SAG/IRSME, Chief Rolling Stock Engineer, Northern Railway will act as Secretary of

the Committee in addition to his own duties and will be assisted by a director level officer and 3 other staff.)

34.2 Term of reference

The Terms of reference of the Committee will be as under: -

Whereas Safety is an ongoing multi-disciplinary exercise well entrenched into Railway working that is subject to independent verification, the Committee shall suggest ways and means for reinforcing the mechanism for improvements that are timely, enduring, cost effective and aimed at further enhancement of safety margins, where warranted.

Based upon trends of accident and their consequences witnessed in the recent past theCommittee may lay down a roadmap for improving safety in respect of the following: -

a) Signalling Systems
b) Rolling Stock (of all types)
c) Fixed Structures (Tracks & Bridges and OHE)
d) Human resource development with emphasis on Training, Education, and research.
e) Need for a Third-Party Audit, organizational & structural changes in RDSO and in any other department, improvements in procedural system and improvement inprocedures and systems.
f) Any other item/modification which the Committee may desire.

The Committee will be required to submit its report within 3 months.

The headquarters of the Committee will be in New Delhi.

The terms and conditions regulating engagement of Chairman, Adviser and Members of the Committee will follow.

Letter issued and signed by **Shiv Dan Singh,** Joint Secretary (Gaz), Railway Board

Further, vide Ministry of Railways order of even no. dated 16.1.12, the term of the Committee was extended by two months up to 15.2.12 and further extended up to 02.3.12.

The Ministry of Railways have earlier constituted the Khanna Committee 1998, the Sikri Committee 1978, Wanchoo Commit1968,1968 and Kunzru Committee 1962. The present Committee, which is comprised

of scientists and technocrats, is more strongly mandated to go into all technical and technology-related aspects in connection with the safe running of train services in the country.

34.3 Approach and Methodology

The Committee is fully conscious of the fact that railway safety is deeply ingrained into the functioning of Indian Railways (IR in short) at all the levels. Different levels of management and staff directly or even indirectly associated with the railway functioning well understand that safety is one thing which is of paramount importance to the organization and cannot be compromised at all. The Committee is also aware of the sustained and continuous reduction in the number of consequential train accidents per year despite the phenomenal increase in volumes of traffic, both passenger and freight. As a prelude to the formation of the Committee, a detailed presentation was given to us by the Adviser (Safety), Railway Board in the presence of Hon'ble Minister of Railways and Railway Board Members. The presentation covered not only theever-improving safety performance of Indian Railways but also initiatives and steps being taken by different departments for improving safety.

Safety being a product of the functioning of railway management at different levels of hierarchy, our committee decided to interact with all the levels i.e. Divisional, Zonal and Railway Board. Considering that technical and technology related aspects on IR and functioning of Research Design and Standards Organization (RDSO) have been specifically mandated in our terms of reference, the Committee not only frequented RDSO but also invited RDSO officials in several interactions of technical nature. The Committee also visited some of the zonal railways to have firsthand experience of the field conditions. Representatives of recognized staff Federations were also invited by the Committee to seek their views. During the course of functioning, the Committee had 18 meetings/visits/interactions with various levels of functionaries. At this juncture, the Committee records its appreciation of the dedication, commitment, and deep passion of all those railway officials at various levels and the representatives of Federations with whom the Committee interacted. Free and frank suggestions were invited from Railway Officers working at different levels through letters and e-

mails. General public was also invited for their suggestion through IR official website <www.indianrailways.gov.in>. The Committee also interacted with Commissioners of Railway safety and some ofthe retired officials of IR for their valuable suggestions. A total of 53 suggestions were received from Railway personnel and general public which have been appropriately considered by the Committee.

The Committee noted that Indian Railways not only operate passenger trains but also freight trains on the same network. IR system is the transport backbone of the country for safe transport of suburban, medium to long distance passengers and freight. It is very affordable to the common man and is equally used by all sections of society. The Committee also noted that present financial condition of Indian Railways is not very encouraging. The size of Indian Railways also made us realize that any technological upgradation should be fully absorbed, and IR should be in full possession of technology to ensure its customization to suit Indian Railway operating environment which may not be similar to other countries.

However, in all our deliberations and conclusions the prime consideration of the Committee has been that safety on Railways is a non-negotiable subject and paucity of funds or shortage of manpower or for that matter the normal constraints faced by the Railways should not in any manner jeopardize safety.

34.4 Recommendations:

General Safety Matters

1. An IT system based on email / SMS should be introduced to report safety related matters by railway and non-railway persons. (Para 2.4.10)
2. Redundancies should be built in the system such as track circuiting by two diverse means at vulnerable locations so that normal operations are least hampered due to single point failure. (Para 2.5)
3. An IT-based system should be set up within 6 months to collect and collate all train accidents whether consequential or of little significance, near misses, safety related asset failures, etc. (Para 2.5)
4. Projects for augmentation of line capacity on busy routes and maintenance facilities for coaches and wagons in open line and

workshops should befunded and executed as top priority in mission mode. (Para 2.7)

5. No new trains should be introduced without adequate capacity for operation and maintenance. (Para 2.7)

Organizational Structure

1. The restructuring of IR should be examined and studied by a Separate Expert Group. (Para 2.8.2)
2. Earlier the system of only Operating and technical officers being considered for general posts of GMs and DRMs should be restored. Only capable officers should be selected as DRMs and posted in divisions with a minimum tenure of 3 years. (Para 2.8.3)

Empowerment at Working Level

1. Enhanced powers should be delegated to GMs and DRMs in regard to safety matters as under (Para 2.9.5):
    1. The powers of General Managers to be enhanced to 3 times for sanction of works under all Plan Heads except New Lines and M & P items. These should also be applicable on an out-of-turn basis, depending on the urgency. The powers of DRMs also to be accordingly enhanced to 3 times.
    2. General Managers are to be given full powers for re-appropriation of funds from one work to another under the same Plan Head and source of funds under all the Plan Heads, except New Lines.
    3. General Managers have full power to re-appropriate funds under Revenue under the same Demand from one PU to another within the overall budget allotment.
    4. DRMs to be fully empowered to decide the process/procedure such as Spot Purchase Committee, Single/Limited Tenders, etc.
    5. DRMs to have full powers:
        i) To accept tenders floated by the division.
        ii) To enter into repair or Annual Maintenance Contracts (AMC) through OEM or otherwise
        iii) To purchase stock items in case of shortages and non-stockitems up to Rs. 3 Lakhs per case but without any monthly ceiling

6. DRMs to be empowered to award works of essential nature related to operation and maintenance assets on quotation basis for 3 months as astop gap arrangement.
7. DRMs have full powers for hiring resources including utility vehicles.
8. DRMs have full powers to sanction construction of RUBs, limitedheight subways and ROB under Road Safety works.
9. Powers those vested with DRMs of the Division to be enjoyed by theChief Workshop Managers (CWM) in respect of their workshops.

2. Powers to sanction cash awards for good performance in safety related matters should be enhanced to three times. (Para 2.9.6)
3. Enhanced delegation of powers to the divisions should be directly mandated by the Railway Board as a onetime measure. (Para 2.9.7)

Safety Related Works and Issues

1. Core Safety Groups should be formed under the convenorship of the Additional General Manager/Safety (a new post carved into zonal headquarter as part of the new safety architecture) at headquarter level and Sr. Divisional Safety Officer at divisional level. Principal Heads of Departments at HQ level and branch officers at divisional level of Civil, Mechanical, Electrical, Signaling, Operating and Finance should be the members. (Para 2.10.1)
2. Group of Officers headed by AGMs and ADRMs at the Headquarter and divisional levels respectively should convene meetings once every week to clear all the pending Engineering and Signaling Plans. (Para 2.10.2)

Vacancies in Critical Safety Categories and Manpower Planning Issues

1. All the vacancies for supervisors and staff in the safety category should be filled up in a time-bound manner say within 6 months by leveraging IT based recruitment systems. Concerned officer in Railway Board should be given this responsibility along with commensurate empowerment.
2. Multi-disciplinary teams of 3 officers, one each from Personal,

finance and theconcerned department should identify surplus posts at the Divisional, Hd. Qrs. and production unit levels for surrendering to build up a surplus bank. These teams should identify the need for additional posts under safety categories. GMs should ensure that creation of additional posts is rightfully done in the deserving safety categories within 3 months. (Para 2.11.3)

3. GMs should be empowered to create additional posts with finance concurrence under Safety categories if no matching surrenders are available. (Para 2.11.3)
4. The existing staff yardstick to be looked afresh in a dispassionate fashion and the same should be issued to the zonal railways within 3 months. (Para2.11.4)
5. The Railway Board should issue an outsourcing policy to get expert service and save costs. (Para 2.11.5)

Shortage of Critical Safety Spares

1. Concerned directorates should issue a defined list of safety items to Zonal Railways for uniformity. (Para 2.13.1)
2. RDSO should take full responsibility for all those safety items for which drawing, specification, vendor approval, etc. are issued by RDSO. They should enter into long term rate contract with their approved vendors for 3 to 5 years after negotiating rates based on the value of the item which can be best assessed by RDSO. (Para 2.13.3)
3. A simple but effective vendor qualification and approval process should be followed for non-RDSO safety items at zonal railway level. (Para 2.13.7)
4. A thorough review of the quality system for material procurement processes by an external professional agency and revamping of the system should be done as necessary. (Para 2.13.8)
5. The conventional method of technical inspection should be replaced with a modern Quality Management System for which necessary check sheets should be developed by the respective departments directly associated with safety. These check sheets should be based on present rules, regulations, manuals, instructions, etc. and should form part of the safety manual of the Railway. (Para 2.14)

External Interference – Encroachment and Sabotage

1. Removal of all encroachments in the vicinity of railway track should

be addressed at the political level in the interest of safety. (Para 2.15.2)

2. PPEA (Public Premises Eviction Act) should be suitably amended so that eviction of encroachers is easily possible with the help of local police/Railway Protection Force. Suitable amendment to the Railway Act should also be made by which encroachers can be severely penalized. (Para 2.15.2)
3. Better coordination between Indian Railways and the policing authorities should be established to strengthen the intelligence network to pre-empt sabotage on the Railways. (Para 2.15.3)
4. The Railway Act should be suitably amended to impose stringent punishment on persons found guilty of sabotage. (Para 2.15.3)
5. Big railway stations should have 'Intelligent Security' largely based on CCTV cameras with proper monitoring in the control room. (Para 2.15.4)
6. The upper limit set for recruitment of Ex-Servicemen as per stipulated standards against vacant posts in RPF cadre should be removed to expedite filling up of vacancies. (Para 2.15.4)
7. Railways should also take up disruptions and vandalism to their assets to the courts for compensation and remedial measures. It should be examined whether suitable provisions can be incorporated in the Railway Act for this purpose. (Para 2.15.5)
8. A High-Level Task Force involving the State Government, ZRUCC and NGOs should be set up to recommend constructive measures which will alleviate or eliminate casualties due to railway infrastructure in the near future. (Para 2.16.2)

Signaling, Telecommunication and Train Protection

1. State of the art signaling and protection system – at least equivalent to the functionalities of ETCS L-2 should be deployed throughout IR, starting with thebusy routes (19000 Kms) immediately. A sub-group of the Committee shall examine some of the critical aspects during the visit to some of the European railway system and submit its report. (Para 3.5)
2. Diverse and redundant means of Satellite based train position sensing (as used in ACD) should be incorporated and merged into ATP functions. (Para 3.5)

3. A dedicated Special Purpose Vehicle (SPV) should be formed having full powers and the mandate to formulate and execute the sanctioned projects of ATP in a time bound manner (5 Years). (Para 3.6)
4. A high power standing technical review committee should be set up to guide the SPV on technical issues. This Committee should continue till the implementation of the project of ATP and should have experts from Railways as well as from outside. (Para 3.6)
5. Communication Based Train Control (CBTC) system should be used in Metros and dedicated corridor sections like Mumbai suburban, to meet the requirements of head way less than 1.5 minutes after study of design margins.(Para 3.6)
6. A "Task Force" should be set up to study the feasibility of communication backbone for IR, utilizing diverse and redundant technology to ensure the highest level of availability of the networks for safety and operational requirements. (Para 3.6)
7. RDSO signaling directorate should be augmented with comprehensive research framework in order to include work on forecasting /newer signaling and telecom technologies. (Para 3.6)

Rolling Stock

1. IR should switch over to the manufacture of LHB design coaches in all the coach manufacturing units and manufacture of ICF design coaches should be stopped immediately. (Para 4.2)
2. The problem of jerks on LHB design coach should be resolved by adopting a new design of draft gear subject to its satisfactory performance. The existing LHB coaches should also be retrofitted. (Para 4.2)
3. Other maintenance-related problems faced on LHB coaches such as consequential failure to roller bearings, wheel shelling, etc. should be addressed at the earliest. (Para 4.2)
4. Some adaptation should be designed and provided on all the existing ICF design coaches in a Mission mode for facilitating energy absorption and anti-climbing during crash or sudden deceleration. (Para 4.3)
5. IR must strategize to utilize only LHB coaches at 110 Kmph and abovespeeds with 18 and above coach formations on the trunk routes. ICF design coaches should be relegated to lesser speeds with shorter

compositions.(Para 4.2)

6. A simple low-cost device such as bimetallic sensor to open or close a circuit ataround 60 to 80 degrees Celsius on each axle with a display of red lights and alarm bell should be fitted in coaches that run on services having escorting technicians. (Para 4.3)
7. LHB coaches must be grounded at the Maintenance yards and sub-standard M8 Fasteners of speed sensor should be replaced with high tensile bolts ofthe specified quality of reputed make. (Para 4.3)
8. Toilets either with no discharge or with harmless discharge should be introduced in all the 43000 coaches within the next five years. (Para 4.5)
9. Flame detection system should be provided in coaches which should sound hooter at many places in the coach to warn the passengers. Its interface with ACP system should be considered based on field trials. (Para 4.6)
10. A simple ladder or equivalent feature with a permanent fitment or foldable and deployable provision should be available for assisting passengers to get downfrom coaches in the event of accident. (Para 4.6)
11. Existing instructions prohibiting cooking in Pantry Cars should be strictly enforced. The license of violating contractors should be cancelled and they should be severely penalized if found cooking. Necessary provisions in this regard should be made in the Railway Act. (Para 4.7)
12. Video Camera based data logging, storage, and display in monitoring room of Train Examiners Cabin should be introduced. (Para 4.8)
13. Hot box detectors, Wheel impact load detector (WILD) and Track side bogie monitoring system should be extensively deployed. (Para 4.4)
14. Radio tags on all types of rolling and a communication backbone should be provided along the railway network with last mile connectivity for transfer of condition data from track side to the control center as well as maintenance depots. (Para 4.4)
15. Every train should be checked for formation Leak rate during maintenance in addition to Brake Power Certification. (Para 4.9)
16. Weigh- bridges should be installed at all major loading depots and at

other places in a way that every loaded wagon is weighed within 50 to 100 kilometers. A uniform operating protocol to deal with overloaded wagons should be prescribed by the Railway Board. (Para 4.10.1)

17. Wagons with track friendly bogie should be deployed on Indian Railways on priority. (Para 4.10.2)
18. The concept of distributed power in freight operations to reduce coupler forces and rail wear should be developed. (4.10.3)

Track

1. A national level expert committee should be constituted to establish the root cause of rail failures and identify the metallurgical and chemical solutions including enhanced quality assurance and control protocols from steel melting to laying of rail on a war footing within the next three months. This expert team should also review Rail Welding technology. (Para 5.2)
2. A Senior Administrative Grade officer of high integrity and strong background in Material Science & Chemistry should be posted full time to monitor and control Rail production process at Bhilai Steel Plant. (Para 5.2)
3. Production of 52 kg rail should be stopped, and 52 kg PSC sleepers should no longer be produced. Only 60 kg/M head hardened rails should be used on curves sharper than 400-meter radius of curvature. (Para 5.2)
4. Modern technologically driven vehicle borne ultrasonic testing machine shouldbe introduced for faster and reliable detection of rail and weld flaws. (Para 5.2)
5. Rail grinding at required intervals should be mandatory to increase the life of rails and wheels of rolling stock. (Para 5.2)
6. A systematic AT welding improvement programme should be introduced conforming to European standards. Procurement of the latest and proven raw materials and quality welding procedures must be introduced to eliminate AT welding failure. (Para 5.3)
7. Directorate dealing with track formation in RDSO should be strengthened, stretches of weak formation identified and an action plan formulated to treat weak formations in a scientific manner with a view to eliminate such weak spots permanently including

improvement to drainage within the next 5 years. (Para 5.7)

Bridges

1. For recording and monitoring the condition of distressed bridges, photographs should be taken using modern handheld electronic cameras and should be posted on MIS/ sent through Internet to all concerned expert engineers havingvast experience. (Para 5.5)
2. Vulnerable bridges should be fitted with water level gauges and turbine flow meters to measure flow which should be interlocked in a way to warn thedriver of the approaching train. (Para 5.5)
3. Distressed and vulnerable bridges should be instrumented in terms of deflections/displacements, water level and flow velocity on a continuous basis and data should be communicated to the office of the concerned Chief Bridge Engineer for monitoring. Advanced scientific measurement and inspection for the condition assessment of the under-side of the bridges using mobile and articulating platform is essential. (Para 5.6)

Level Crossings

1. All Level Crossings whether manned (with or without signals) or unmanned should be eliminated in the next 5 years. This is gigantic task for which dedicated SPVs should be formed in each of the zonal railway fully empowered and mandated to complete the project in a time frame of 5 years. (Para 5.6)
2. Level Crossings having little road traffic should be closed. Merger of nearby LCs by constructing connecting roads at railway's cost even on non-railway land should be taken up. (Para 5.6)
3. Construction of limited height subways, Road under Bridge (RUB) and Road over Bridge (ROB) should be taken up in mission mode and traffic blocks should be generously granted. (Para 5.6)
4. No LC should be newly introduced under any circumstances on the existing system as well as during gauge conversion, doubling and construction of new railway lines. (Para 5.6)
5. No LC gate should henceforth be manned or interlocked. (Para 5.6)
6. The present policy of sharing the cost of RUB or ROB with the State Governments should be dispensed with and the full responsibility and entire cost of construction should be taken over by the Railways. For this purpose, the present Railway policy needs to be changed and

section 19 of the Railway Act needs to be amended. Further, to augment the Road Safety Fund a large share of diesel cess should come to the Railways for which Government of India should be approached. (Para 5.6)

7. To expedite the construction of limited height sub-ways, RUBs and ROBs the CRS's role should be taken away and relevant plans and documents should be approved and signed at the level of the concerned Principal Head of the Departments (PHODs) instead of sending them to the Commissioner of Railway Safety (CRS) for sanction unless there is some change in the track/yard layout. (Para 5.6)
8. Regular meetings and coordination between Railway and civil administration at the highest to the local levels should be held to expedite the execution.

Human Resource Development with Emphasis on Education and Training

1. A large number of projects of importance to Railways should be regularly awarded to some select engineering academic institutions in which students can participate. Courses, minor stream, and major specializations in the area of railway engineering should be introduced in the Indian engineering academic programs. (Para 6.1)
2. All officers should be periodically imparted training in safety engineering for building a safety culture. (Para 6.2)
3. One training institute at the divisional level should be nominated and upgraded for training to staff on safety environment in the Railways. This institute should have animation films; general equipment, tools and gadgets used on Indian Railways, etc. (Para 6.2)
4. Departmental staff should be encouraged and extended resources to upgrade their professional qualifications and skills to be fit for promotion to a higher level. (Para 6.3)
5. All the newly recruited Assistant Loco Pilots should be Diploma holders instead of present Matriculate/ ITI holders. All the Maintenance Technicians in all Technical Departments should at least be ITI holders and supervisors should be at least Diploma holders, preferably, Engineering Graduates. (Para 6.3)
6. The cadre of electric and diesel running staff should be separated in

the present operating environment having a large number of loco variants of both types. (Para 6.4)

7. Running staff who fail any of the mandatory refresher courses should begiven only one extra chance to repeat the course and the test should be taken at the concerned Branch Officer level. In case the running staff fails again, he should be debarred from running duty and posted on other non-safety related assignments or given voluntary retirement following the prescribed rules and process. (Para 6.5)
8. Some portable cheaper versions of loco simulators should be procured and located in drivers' running rooms where running staff can brush up theirdriving skills at their convenience. (Para 6.7)
9. Customized signaling Panels should be introduced at the earliest in Zonal Railway Training Institutes (ZRTIs) for the training of station operating staff. (Para 6.8)
10. Separate handbooks should be prepared for the operating staff, such as loco pilots, station masters, etc. which should contain all the necessary instructionsto be followed by them while performing their duty. (Para 6.9)
11. Each Division should have Grievance Redressal Machinery which should deal with staff grievances in a time-bound manner. (Para 6.10)
12. Special allowance equivalent to 25% of the salary and grade pay should be given to the staff who work as regular Gatemen as a special incentive during the intervening period till LC gates are closed. (Para 6.11)

Training Institutes on IR

1. All sanctioned capacity enhancement works of CTIs, ZRTIs and STSs should be fully funded and executed within the next two years. (Para 6.2)
2. Posting as a trainer in Centralized Training Institutions (CTIs) should be basedon the recommendation of a committee of which the Head of the institute concerned must be a member. Tenure of deserving officers may be extended on the recommendation of the Head of the CTI even if it involves transfer of elements of posts if such a trainer is due promotion so that he/ she can be promoted in the

training institute itself. (Para 6.2)

3. Heads of CTIs should be given full powers to invite academicians, industry leaders, technocrats, etc. as visiting faculty within the allocated budget grant. In case of Railway Staff College, where Management training is imparted to officers of all railway disciplines, arrangements should be made to have one or two professional academicians on loan from management institutes of repute for a few years fixed tenure. (Para 6.2)
4. Funds for CTIs, Zonal Railway Training Institutes (ZRTIs) and Supervisors Training Schools (STSs) should be allocated separately both under Works as well as Revenue. Incurrence of expenditure under these fund-allocations should be fully under the control of Heads of the institute. Considering the importance and size of CTIs, they should have their own maintenance infrastructure. (Para 6.2)
5. The terms of Principals of ZRTIs and STSs should be fixed for at least 3 years. (Para 6.2)
6. The teaching allowance of trainers of ZRTIs and STSs should be increased from 15% to 30% to bring it at par with trainers in CTIs. (Para 6.2)

Research Eco-System on Indian Railways

1. An apex body called Railway Research & Development Council (RRDC) should be established. It should be chaired by an eminent technologist / scientist of the country reporting to the railway minister. (Para 7.3.1)
2. Financial support up to 2 % of yearly revenue of Indian Railways should be available to support the entire research eco-system of railways in India. (Para 7.3)
3. The Advanced Railway Research Institute (ARRI) should be established which should be a high-end, research organization focusing on engineering challenges in railway specific areas. (Para 7.3)
4. A string of five or so Railway Research Centers should be established which should be co-located on the campuses of Indian technological academic institutions of national importance. Each center should specialize in specific areas like signaling, rolling stock, motive power, track and bridges, operations management, etc. (Para 7.3)

5. The present system of only having railway officers on deputation at senior positions in RDSO should be done away with and professionals and scientists from reputed technical institutions should also be inducted at higher levels on the permanent cadre. Their career progression should be on the similar lines as followed in other research institutions of Government of India. (Para 7.3.4)
6. Power of DG/RDSO should be enhanced as under:
    1. Full autonomy with financial powers to function within the sanctioned budget.
    2. To award consultancy contracts of enhanced value up to Rs. 1 Cr. In each case against the present delegation of Rs. 30 lakhs in each case. Powers for awarding MOU/Consultancy Contract should also be extended to benchmarked organizations in India and abroad like AAR, TTCI, UIC etc.
    3. Full powers to award Consultancy Contract once sanctioned by the Board for values more than Rs. 1 Cr. each and there should not be any further need to send the proposal to the Board. (Para 7.3.4)
    4. Full powers for placement of developmental order within lump sum Budget Grant of RDSO irrespective of cost. This will expedite prototype and field validation for which RDSO is presently dependingon PUs and Railway Board.

Safety Architecture on IR

1. A Railway Safety Authority (RSA) should be set up as a statutory body independent of Indian Railway Board under the Government. The Authority shall have a separate budget fully funded by the Ministry of Railways and shall be backed by a full-fledged Secretariat. (Para 8.5).
2. A new post of Member (Safety and Research) in the Railway Board should be created who will be the link between Railway Board, Railway Safety Authority (RSA) and Railway Research and Development Council (RRDC) at the apex level. (Para 8.5).
3. The existing posts of Chief Safety Officers on zonal railways should

be upgraded to Additional General Manager (Safety) as part of the new Safety Architecture.(Para 8.5)

4. The Institution of Commissioner of Railway Safety should be merged with Railway Safety Authority and should be strengthened and empowered. There should be CRS for each zonal railway and each CRS should have a Regulatory Inspection Team consisting of HODs of the concerned technical departments. (Para 8.5.3)
5. The role of Commissioner of Railway safety should be withdrawn from the routine clearance of proposals from the railways such as changes in Plans, Working Rules, etc. which consume lots of his time. These should be dealt and finalized by the concerned Principal Head of the department who should full responsibility of the changes. (Para 8.5.3)

Implementation of Recommendations

1. A non-fungible non-lapsable safety fund generated through safety cess on passengers of different classes in a graded manner should be created to raise funds to the tune of Rs. 5,000 Crores per annum. (Para 9.5)
2. Payment of dividend to the tune of Rs. 5,000 Crore per annum should be deferred in view of the social service obligation being borne by Railways which is assessed as Rs. 15,000 Crores every year. (Para 9.5)
3. An empowered group of officers (including an officer from finance) in Railway Board should pilot the implementation of safety enhancement recommendations and projects as accepted by the Ministry of Railways in a time bound manner with full funding. Other projects should be appropriately pended or slowed down for the time being to accommodate funding of these key projects. (Para 9.8.2).
4. Newly constituted Railway Safety Authority under the Govt. of India should also review the implementation of accepted Recommendations at a prescribed periodicity, say, once every 3 months for the next 2 to 3 years (Para 9.8.3).

RECOMMENDATIONS OF TASK FORCE ON SAFETY, 2017

35

35.1 Maintenance of Coaches in the field (Para no. 02 of report)

1. All pits to be provided with steel grates on the floor so that the artisan does not walk on muck and faeces. Designs exist for the same. Side walls of the pitlines should be lined with stain resistant tiles. [CAMTECH to design: two months, Zonal Railways to implement: one year] (Para no. 2.3.1 of report)
2. All pits to be provided with low voltage, energy efficient, bright LED lights. Lights should be directed upwards so that the undergear is illuminated. Low voltage is necessary to prevent electrocution. [Zonal Railways: six months] (Para no. 2.3.2 of report)
3. All pit lines to be provided with self-starting diesel-powered pumps in case of water accumulation. Diesel pumps are necessary to prevent electrocution. [Zonal Railways: six months] (Para no. 2.3.3 of report)
4. All new pitlines and those to be repaired should be done like the pitless design of Hubli/Siliguri Diesel sheds. These are built to best international practices and provide easy visibility for safety check as well as for movement of men and material.

[CAMTECH to design: three months, Mechanical Coaching Directorate: Policy in six months, Zonal Railways to implement: five years] (Para no. 2.3.4 of report)

5. All future pitlines and those being renovated/ expanded should be built for all-weather use, i.e. with a cover shed and adequate provisions for lighting, drainage etc. [CAMTECH to design: three months, Mechanical Coaching Directorate: Policy in six months, Zonal Railways to implement: five years] (Para no. 2.3.5 of report)

6. Catwalks in Coaching Depots are made of RCC. Due to constant flow of water and movement of material they begin to crumble in just a few years. All new catwalks and those to be repaired should be made of steel grating in single cantilever design. This will be easy and fast to construct, cheaper, more durable and user friendly. This design will not block light from the pits and undergear. It will also permit free and safe movement of men and material. Design can be adopted from the catwalk in Loco Frame Shop of DLW. [CAMTECH to design: two months, Mechanical Coaching Directorate: Policy in three months, Zonal Railways to implement: three years] (Para no. 2.3.6 of report)

7. LHB rakes require straight pitlines. This should be kept in mind for all new pitlines and those being converted for LHB. [Mechanical Coaching Directorate: Policy in three months, Zonal Railways to implement: three years] (Para no. 2.3.7 of report)

8. Tools and equipment for train examination should be standardised and issued to each staff member with personal lockers too allotted to each person for safekeeping. Standard list of common and personal tools needs to be made and tools procured for TXR and TL Staff. [CAMTECH: standardise in three months, Zonal Railways to implement in one year] (Para no. 2.3.8 of report)

9. These recommendations should also apply with appropriate modifications to Car Sheds and DEMUs Sheds. [CAMTECH to

design: two months, Concerned Board Directorates: Policy in three months, Zonal Railways to implement: three to five years] (Para no. 2.3.9 of report)

10. **Automatic Coach Washing Plants** must be installed in each Coaching Depot with holding of 300 or more coaches. This not only saves water but improves turnaround time and prevents flooding of train examination area, thus directly improving safety. [Mechanical Coaching Directorate: three years] (Para no. 2.3.10 of report)
11. Pit Examination should ordinarily not take more than four hours. Necessary tooling and outsourcing to achieve this should be done. [Mechanical Coaching Directorate to issue policy: three months, Zonal Railways to implement: one year] (Para no. 2.3.11 of report)
12. Capacity of Pit Lines to examine rakes should be possible over the entire 24-hour cycle. [Mechanical Coaching Directorate to issue policy: two months, Zonal Railways to implement: six months] (Para no. 2.3.12 of report)
13. **Dashpots in ICF Coaches** do not retain oil and fail to perform their basic function of damping. Friction snubber designs are under trials for over a decade. This should be finalized, and directives issued within three months to install them on all ICF coaches within three years. (Kh I 29.1) [RDSO to finalize: three months, Zonal Railways to implement: three years] (Para no. 2.3.13 of report)

35.1.1 Rolling-in Examination (Para no. 2.4 of report)

1. Proper Rolling-in Examination huts to be built to protect the TXR staff from weather. Salem Division's designs can be adopted. [CAMTECH to finalise Design: three months, Zonal Railways to implement: one year] (Para no. 2.4.3.1 of report)
2. Bright, lightweight and energy efficient LED lights to be introduced in place of the present design of clumsy, heavy lights. [CAMTECH to design and advise: one-month months, Zonal

Railways to implement: six months] (Para no. 2.4.3.2 of report)

3. A switch to Machine Vision Systems with Automatic High-Definition Camera and Artificial Intelligence based fault detection and recording system to be introduced. They should also keep a permanent record of what has been examined. (K 4.8) [Mechanical Development Directorate: Design and Policy: six months, Zonal Railways to implement: three years] (Para no. 2.4.3.3 of report)
4. Such Automatic Machine Vision Devices as above should also be introduced in pitlines to examine the undergear as trains are placed on them. [Mechanical Development Directorate: Design and Policy: six months, Zonal Railways to implement: three years] (Para no. 2.4.3.4 of report)

35.1.2 Empowerment of Sr. DMEs and CDOs (K 2.9) (Para no. 2.5 of report)

1. A new post of Sr. DME (Passenger Amenities) should be created in every Division, 68 in all, to exclusively handle Passenger Amenity and EnHM to ease the work of the main Sr. DME, who should devote his attention exclusively to Safety issues. [EnHM Directorate: six months] (Para no. 2.6.1 of report)
2. The Cash Imprest of each Sr. DME, in charge of train maintenance and passenger amenities (including EnHM) should be increased to Rs. 10 lakhs, and the Sr. CDO/CDO to Rs. 5 lakhs to be recouped every month. Recoupment should be automatic every month by recharging a prepaid card. Account of the previous month may be sent separately. [Finance Directorate: three months] (Para no. 2.6.2 of report)
3. A Sr. DME and Sr. CDO/CDO should be permitted to buy stock or non-stock items, without any restrictions, out of this Cash Imprest. [Finance Directorate: three months] (Para no. 2.6.3 of report)
4. These recommendations regarding Cash Imprest should also apply to Sr. DEEs in charge of Car Sheds and Loco Sheds and

Sr. DMEs in charge of DEMUs and Loco Sheds. [Finance Directorate: three months] (Para no. 2.6.4 of report)

5. Rule 145 of the GFR 2005 for purchase of up to Rs. 15,000 without calling for multiple quotations should be made immediately applicable in Railways. [Finance Directorate: three months] (Para no. 2.6.5 of report)

35.2 Coach Design and Deployment (Para no. 03 of report)

1. ICF should stop the manufacture of ICF Design coaches w.e.f. 01-04-2018 and RCF from 01-04-2019 and completely switch to LHB production for IR. MCF is already making LHB coaches to its entire capacity. (CSP 9.1) [Mechanical PU Directorate to issue policy: three months] (Para no. 3.5.1 of report)
2. Only Trains with LHB Coaches should run at speeds higher than 100kmph and in compositions of over 18 coaches. (K 9.5) (Para no. 3.5.2 of report)
3. The crashworthy design of LHB needs to be [Mechanical Coaching Directorate to issue policy: three months] revived and studied for adoption in new manufacture by 01-04-2021. [RDSO to finalize: six months] (Para no. 3.5.3 of report)
4. All ICF coaches should be equipped with CBC. Though not a substitute of an LHB design, CBCs on ICF are an established safer design. Energy absorption elements should necessarily be built into ICF coaches for this purpose. (K 4.2.5.3) [Mechanical Workshop Directorate to issue policy: three months] (Para no. 3.5.4 of report)
5. Non-CBC ICF coaches, in the interim, should be used only in branch lines with not more than 14-15 coaches and speeds not more than 90kmph. (K 9.5) [Mechanical Coaching Directorate to issue policy: three months] (Para no. 3.5.5 of report)
6. The Codal Life of ICF Coaches to be reduced to 20 years. MLR to be done after 9-10 years. [Mechanical Coaching Directorate: three months] (Para no. 3.5.6 of report)
7. All Corrosion Repair Shops should be audited by RDSO vis-à-

vis their shop practices, material procurement systems, welding, skills, and training needs. [Mechanical Workshop Directorate: three months] (Para no. 3.5.7 of report)

8. Corrosion Repair of Coaches should be done with flux cored MIG Welding wires only. Solid wires do not provide necessary flux for cleaning of dirty and corroded surface. This should be introduced within the next six months. [Mechanical Workshop Directorate to issue policy: one month's] (Para no. 3.5.8 of report)
9. The proposed MLR Workshops should be commissioned within the next one year. [Mechanical Workshop Directorate: one year] (Para no. 3.5.9 of report)
10. Mail Express Trains with ICF composition should not have any coach older than 8-9 years from the initial build, after which they should be relegated to branch lines and lower-speed, shorter-length operations till the MLR. Additionally, ICF coaches fresh out of MLR can be deployed in such trains for 5-7 years. [Mechanical Coaching Directorate to issue policy: three months, Zonal Railways to implement: one year] (Para no. 3.5.10 of report)
11. The possibility of providing an 8mm sole bar in passengers carrying ICF vehicles should be examined as is done in OCVs within three months. If its manufacturability and retrofit possibility is established, it should be done in all MLR coaches starting within six months. [Mechanical Workshop Directorate: six months] (Para no. 3.5.11 of report)
12. Trains with ICF coaches should not be longer than 18 coaches and speedier than 100kmph. They were never designed to absorb such high kinetic energies in cases of crash and that is the reason they completely disintegrate in accidents. (K 4.2.1 and 4.2.5.4) [Mechanical Coaching Directorate to issue policy: three months, Zonal Railways to implement: one year] (Para no. 3.5.12 of report)
13. All ICF coaches older than 7-8 years and 5 years after MLR

should work only in branch lines with not more than 14-15 coaches and speeds not more than 90kmph. These steps will mean some short-term loss of capacity, which should soon be overcome with faster induction of LHB coaches in large numbers ex-ICF, RCF and MCF. [Mechanical Coaching Directorate to issue policy: three months, Zonal Railways to implement: one year] (Para no. 3.5.13 of report)

14. There should be a complete ban on the introduction of new trains so that the entire production of LHB Coaches go into replacement of ICF coaches in long-formation and Mail Express Trains. [Traffic Coaching Directorate: immediate] (Para no. 3.5.14 of report)
15. The problem of jerks in the CBC of LHB remains unsolved. This needs to be done on top priority to make these coaches acceptable to travelling public. All new manufacture and retrofits should be with suitable draft gear. (K 4.2.5.2 and CSP 9.2) [Mechanical Coaching Directorate: six months] (Para no. 3.5.15 of report)
16. Airbag pneumatic suspension should be pursued with earnestness in LHB coaches so that GS-type coaches, which have widely varying loads, become suitable for deployment. [Mechanical Coaching Directorate: one year] (Para no. 3.5.16 of report)
17. A permanent solution to wheel shelling on LHB Coaches must be found within a year. [Mechanical Coaching Directorate: one year] (Para no. 3.5.17 of report)

35.3 A Completely ICF-Design-Free Regime (Para no. 04 of report)

1. All short distance trains, up to 500km, should switch to self-propelled stock. [Railway Board to issue policy: six months, Implementation: ten+ years] (Para no. 4.3.1 of report)
2. The existing capacity of ICF or RCF may not be able to provide enough self-propelled stock and certainly not of a contemporary design. Hence, it is necessary that a fresh look at the product mix of the proposed Kanchrapara Factory be given quickly. This may be

aimed at relieving ICF, RCF and MCF to manufacture only or largely LHB. KPA should be exclusively a high-speed/semi-high-speed self-propelled coach manufacturer. [Mechanical Coaching Directorate: three months] (Para no. 4.3.2 of report)

35.4 Fire in Passenger Trains (CSP 4.4) (Para no. 05 of report)

1. Aisle curtains in 2AC coaches should be removed as already done in 3AC. [Mechanical Coaching Directorate: three months] (Para no. 5.2.1 of report)
2. There should be at least four emergency exit windows in each coach marked by illuminate/fluorescent borders. The coach floor should have illuminated/phosphorescent guiding lights to help passengers exit in case of fire and accidents. [Mechanical Coaching Directorate: two years to implement in all coaches] (Para no. 5.2.2 of report)
3. Possibility of exit rope, ladders, or ramps at such windows to be explored in next three months. (K 4.6.5) [RDSO: six months to design] (Para no. 5.2.3 of report)
4. All mobile phone charging points should be USB sockets only, with 5 volts supply. This will prevent passengers from using the 110V sockets for heating water and milk for babies or making tea for themselves. Cases of fires due to such acts have been reported. [RDSO: three months to design, Zonal Railways and PUs: one year to implement] (Para no. 5.2.4 of report)
5. If we must provide sockets for charging of laptops, their numbers should be limited and protected by a 500mA fuse. [Zonal Railways: six months] (Para no. 5.2.5 of report)
6. Electric sockets in toilets for use of electric razors in LHB Coaches should be removed. With battery-powered shavers now available, such sockets have outlived their utility. [Zonal Railways: six months] (Para no. 5.2.6 of report)
7. Electric cables, fittings, fuses, circuit-breakers etc. for use in coach should be procured from a list of approved reputed vendors, not more than five in each case. [RDSO to issue revised list of approved vendors: three months] (Para no. 5.2.7 of report)
8. Each passenger bay in the coach should be provided with a suitable fire-extinguisher within easy reach of passengers. An alert

passenger may be able to use it and dowse an early fire. [Mechanical Coaching Directorate: six months] (Para no. 5.2.8 of report)

9. Modified Fuse Distribution Board should be universalised within the next one year. [Mechanical Coaching Directorate: six months] (Para no. 5.2.9 of report)

10. There should be no cooking permitted whatsoever in Pantry Cars. LPG Cylinders should be banned in Pantry Cars. Heating if any, of precooked food, should be done on induction ovens only. It will require an iron-fist to enforce it. (K 4.7.3) [Commercial Catering Directorate: three months] (Para no. 5.2.10 of report)

35.5 Freight Trains and Safety Issues (Para no. 06 of report)

1. The Coupler Specification WD-48 BD08 should become obsolete w.e.f. 01-01-2017. No coupler or its components should be procured to these specifications. [RDSO: immediate] (Para no. 6.5.1 of report)
2. All Wagon Couplers and Draft Gears should be procured to RDSO Specifications ED-70 and WD-71 respectively only w.e.f. 01-04-2017. [Mechanical Coaching Directorate: three months] (Para no. 6.5.2 of report)
3. RDSO should carry out a rate analysis for the new coupler and its components so that purchase decisions are facilitated in the field. [RDSO: three months] (Para no. 6.5.3 of report)
4. Low torque grease seals should be introduced for CTRBs of Wagons to control temperature rise in the bearings on the run. [Mechanical Freight Directorate: three years] (Para no. 6.5.4 of report)
5. Induction of zero-torque grease seals should be examined by RDSO and advised to Railway Board with cost-benefit analysis so that a decision can be taken on their eventual induction. [RDSO: one year] (Para no. 6.5.5 of report)
6. The population of CC Rakes should be increased to 70-75% of all freight rakes. This should be done in one year. (CSP 6.44) [Traffic Transportation Directorate and Mechanical Freight Directorate: one year] (Para no. 6.5.6 of report)
7. CAMTECH should be asked to audit a few CC Rake Depots and suggest steps to be taken to augment them for increased population and improvement of quality. [CAMTECH: three months] (Para no.

6.5.7 of report)

8. Infrastructure of CC Rake Maintenance Depots to be strengthened on the basis of CAMTECH audit. A onetime sanction of Rs. 500 Crores should be given for this purpose, to be spent over the next three years. [Mechanical Freight Directorate: three years] (Para no. 6.5.8 of report)
9. Twin-pipe operations should be universalized, and any deviation should require orders from Zonal Head Quarters for continued Operations. [Mechanical Freight Directorate: three months] (Para no. 6.5.9 of report)

35.6 Wagon Design (Para no. 07 of report)

1. All new wagon procurement should be procured with 25 Tonne axle load capacity. This may add to the cost of acquisition only marginally but make all these wagons compatible and interchangeable with DFCs. [Mechanical Freight Directorate: six months] (Para no. 7.1.1 of report)
2. The matter of smaller wheel diagram of 840mm necessary for 25T wagons and its implications should be entrusted to an IIT for resolution. This is a project, which needs to be pursued not only for safety, but also for the financial health of Railways. To be resolved in six months. [Mechanical Freight Directorate: six months] (Para no. 7.1.2 of report)
3. Track Friendly Bogies for Wagons is an old project, but still has to see the light of the day. A design should be finalized in next six months and induction planned w.e.f. 01-04-2019. (K 4.10.2 and CSP 6.40) [Mechanical Freight Directorate: six months] (Para no. 7.1.3 of report)
4. Goods Guard Vans must be made user-friendly with lights, fan, and comfortable furniture. A rechargeable battery of adequate capacity too should be provided to cover prolonged halts. This battery may also power the EOTT Device. This should be completed within one POH Cycle, i.e. four years. (CSP 7.22) [Mechanical Freight Directorate: four years] (Para no. 7.1.4 of report)

5. IR must eventually plan to do away with guards completely. [An action plan to be prepared by the Traffic Transportation Directorate: six months] (Para no. 7.1.5 of report)

35.7 Workshops (Para no. 08 of report)

1. All the powers of CWMs, for Sanction of Works, Sanction of Estimates, Tendering and Contracting, Re-appropriation etc. should be brought at par with the DRMs. These should be automatically linked to the DRMs' powers for future enhancements. Needless to say, such delegations will be done only in areas relevant to the functioning of CWMs. [Mechanical Workshop Directorate: three months] (Para no. 8.4.1 of report)
2. Mere empowerment is not enough though. Funds should be made available to the CWM to carry out these jobs. Since maintenance of Workshop assets as referred above is essential for proper maintenance of Rolling Stock, it would be appropriate that their upkeep too is charged to WMS, which will eventually reflect in the cost of repairs and POH. CWMs should be empowered to spend on activities as mentioned above out of the Workshop Manufacturing Suspense (WMS). [Mechanical Workshop Directorate: three months] (Para no. 8.4.2 of report)
3. CWMs must be empowered to spend up to 2% of their annual budget on meeting such needs for the Workshop. CWMs should be the final authority for all such expenditures out of WMS. [Mechanical Workshop Directorate: three months] (Para no. 8.4.3 of report)
4. Quality of Workshop's Output: Each Workshop will have as an associated Inspector a JAG/SG Officer of the Headquarters, who will carry out periodical or sample checks of the quality of output from each workshop. Such Inspectors should be nominated within the next three months for all Workshops of Mechanical, Electrical, S&T and Engineering Departments. [Mechanical Workshop Directorate: three months] (Para no. 8.4.4 of report)

35.8 Ancillarisation of Workshops (Para no. 09 of report)

1. Each Department (Directorate in The Railway Board) that controls Workshops (Mechanical, Electrical, S&T and Engineering) will identify non-core activities that should be outsourced on a long-term basis. (Kh I

2.17 and K 2.11.5) [Mechanical Workshop Directorate to coordinate: three months] (Para no. 9.6.1 of report)

2. A separate schedule of powers for outsourcing and terms and conditions for such long-term contracts will be prepared for uniformity. CWMs will be fully empowered to enter into such contracts. [Mechanical Workshop Directorate to coordinate: three months] (Para no. 9.6.2 of report)
3. Similar delegation of powers should also be done for Sr. DMEs and Sr. DEEs in-charge of Train Maintenance, Coaching Depots, Car Sheds, DEMU Sheds and Loco Sheds. [Concerned Board Directorates: three months] (Para no. 9.6.3 of report)

35.9 Locomotives (Para no. 10 of report)

1. Loco and Motor Cabs should be equipped with Audio-Visual Recorders like the cockpit. LPs and ALPs should be provided with noise-cancellation headphones for communicating with each other. [Electrical RS and Mechanical Traction Directorates: two years] (Para no. 10.3.1 of report)
2. If the VCD of a loco failure, the loco should be declared dead after clearing the block section. [Electrical RS and Mechanical Traction Directorates: one month] (Para no. 10.3.2 of report)
3. All loco cabs should be air-conditioned. New locos should be turned out with air-conditioning and old ones should be retrofitted within one POH Cycle. (Tripathi 9.75) [Electrical RS and Mechanical Traction Directorates: four years] (Para no. 10.3.3 of report)
4. An ergonomic design for the seats of Loco Crew and of Motormen should be developed with international standards and installed within next one year. [Electrical RS and Mechanical Traction Directorates: one year] (Para no. 10.3.4 of report)

35.10 Testing of Rail Vehicles (Para no. 11 of report)

1. The plan and specifications for a Dedicated Test Track should be finalised in consultation with the Pueblo Research Centre within next one year. Sanction for the same already exists. [Mechanical Traction Directorate: one year] (Para no. 11.4.1 of report)

2. The Dedicated Test Track, on the lines of one in Pueblo, USA should be built within the next five years. (Kh II 5.21.2) [Mechanical Traction Directorate: five years] (Para no. 11.4.2 of report)
3. IR should consult research agencies in Europe, Japan, and USA to develop specifications and layout of a crash test facility and protocols within the next one year. (Kh II 5.15.5) [Mechanical Coaching Directorate: one year] (Para no. 11.4.3 of report)
4. A crashworthiness testing lab/facility should be built within the test track within the next five years. [Mechanical Coaching Directorate: one year] (Para no. 11.4.4 of report)

35.11 Derailments (Para no. 12 of report)

1. Backlog of rail renewals, deep screening, de-stressing, renewals of Crossings, Welds, glued joints etc. must be taken up on topmost priority overcoming all constraints of budget. [Track Directorate: three years] (Para no. 12.6.1 of report)
2. Replacement of Defective (D-Marked and others) rails should be the topmost priority for IR and should rank higher than new lines, doubling, gauge conversion etc. [Track Directorate: five years] (Para no. 12.6.2 of report)
3. Mission Zero-Missing-Track-Fittings must be pursued in right earnest and fulfilled. [Track Directorate: six months] (Para no. 12.6.3 of report)
4. All future procurement of rails for all new line, doubling, gauge conversion and programmed rail renewal should be 20-rail panels using 65m or 130m rail, flash butt welded at rail manufacturers' factory. [Track Directorate: one year's] (Para no. 12.6.4 of report)
5. Rails should be galvanized or painted with anti-corrosion paint at the manufacturers' factory before dispatch. [Track Directorate: one year] (Para no. 12.6.5 of report)
6. In-situ Rail Stress Measurement Devices to be acquired for checking stress in LWRs and taking preventive action before rail fracture or rail buckling happens. A limited number, one for each Zonal Railway to be acquired in the next two years and then for each Division over next five years. (Kh II 5.20.3) [Zonal Railways: two years] (Para no. 12.6.6 of report)

7. Need for special wagons for such transportation of long rails and long panels must be ascertained in next three months and wagons acquired within next one year. [Mechanical Freight Directorate: one year] (Para no. 12.6.7 of report)
8. Scabbing of Rails must be avoided at all costs as scabbed rails are not immediately attended even though they are known to develop sub-surface cracks, ultimately leading to rail-fracture. For this purpose, the Load Tables for all sections must be re-examined by a committee of CFTM, CELE, CTE and CRSE in each Zonal Railway suitably powering of trains mentioned in the WTT. [Zonal Railways: three months] (Para no. 12.6.8 of report)
9. Rail Grinding must be put on a sound footing, if necessary, by acquiring additional machines on OPEX Model. (CSP 6.21) [Engineering Track Machines Directorate to issue policy: three months, Zonal Railways to acquire: two years] (Para no. 12.6.9 of report)
10. Track Recording Cars: All Track Recording Cars should be re-equipped with modern systems and laser-based sensors for effective measurements and recording of track parameters. This should be done within the next three years. (CSP 6.19) [Engineering Track Machines Directorate: three years] (Para no. 12.6.10 of report)
11. The lubrication of gauge face should be done frequently and without fail on curves, points and crossings, locations having exercise lateral wear, worksites and on bad formations to prevent climbing of wheel. A directive should be issued within a month. (Kh I 3.8.1 and CSP 5.21) [Zonal Railways: immediate] (Para no. 12.6.11 of report)

35.12 Rail Weld Technology (Para no. 13 of report)

1. A study should be commissioned to upgrade IR's AT Welding Techniques to the best in the world, viz. ENI 14730-1 or later standards. (K 5.3, Kh I 15.7 and CSP 5.19c) [Track Directorate: six months to begin study, one year to finalize] (Para no. 13.1.1 of report)
2. Consumables for AT Welding must come from proven sources. The manufacturers of such consumables should also be subject to process control and quality audits, which must be quickly laid down by RDSO with expert help. [RDSO: six months] (Para no. 13.1.1 of report)
3. Additional sources for AT Welding consumables must be proactively

developed to bring competition in the market. This will go a long way in ensuring quality, timely deliveries, and reasonable prices. [RDSO: six months] (Para no. 13.1.3 of report)

4. Flash Butt Welding is a reliable technique, not only for welding in the plants, but also in the field. Each Division must be equipped with a mobile Flash Butt Welding Machine within the next three years. (K 5.3 and CSP 5.19d) [Track Machine Directorate: three years] (Para no. 13.1.4 of report)
5. Training of Officers and Supervisors: Engineering Officers and P. Way Supervisors must be given specialized training in Rail Welding Technology with lab-work in appropriate Training Institute within Railways or Outside. If necessary, specialized training centers must be set-up for this purpose within next three years. [All Departmental CTIs: one year] (Para no. 13.1.5 of report)
6. Training of Welders: Formal training programmes along with lab work should be designed for Welders in the field. Annual refresher course and annual certification for such Welders should be made mandatory. [IRICEN to coordinate and plan: three months] (Para no. 13.1.6 of report)
7. Traffic Block for Welding of Rails should be of minimum 70 minutes so that Welding is properly cured. This must be ensured even at the cost of punctuality and throughput. A corridor block of 75 minutes should be built for each section in the WTT for this purpose. [Zonal Railways: immediate] (Para no. 13.1.7 of report)

35.13 Ultrasonic Flaw Detection (Para no. 14 of report)

1. The existing Trolley Mounted USFD Machines are too dependent on human interpretation of defects. New machines need to be procured, which detect a flaw and record the location of the flaw along the track. [Track Machine Directorates to issue technical specifications: three months, Zonal Railways to acquire: one year] (Para no. 10.1.1 of report)
2. Vehicle Borne USFD testing for rail and weld inspection, to be inducted, one for each Zonal Railway within next two years. (K 5.2.5.5 and Kh I 2.20.6 iv). OPEX model of acquisition of such devices should be adopted. [Track Machine Directorate to issue policy in three months] (Para no. 10.1.2 of report)

3. General Managers should be authorized to acquire one such system each so that large-scale trials can be quickly conducted and concluded. [Zonal Railways: two years] (Para no. 10.1.3 of report)
4. The number of Vehicle Borne inspection devices to be increased to one in each Division within the next five years. [Track Machine Directorate to issue policy: three months, Zonal Railways to acquire: five years] (Para no. 10.1.4 of report)

35.14 Bridges (Para no. 16 of report)

1. A full-fledged Bridge Management System, standalone of as a part of the TMS should be created within the next one year. [Track Management Directorate: one year] (Para no. 16.2.1 of report)
2. Rehabilitation and strengthening of bridges for 25 tonne axle loads to be completed on priority. [Bridge and Structures Directorate: five years] (Para no. 16.2.2 of report)
3. Replacement of corroded steel and concrete girders with anti-corrosive measures in corrosion-prone area. [Bridge and Structures Directorate: five years] (Para no. 16.2.3 of report)
4. The project of instrumentation of major bridges for online monitoring has been abandoned. This should be revived immediately and installed on 200 major bridges as planned earlier. [Bridge and Structures Directorate: three years] (Para no. 16.2.4 of report)
5. A scientific and proven system of inspection of underwater portions of bridges should be developed, with expert help, within next one year. IIT-Madras has done work in this area. They should be consulted. [Engineering Bridge and Structures Directorate: one year] (Para no. 16.2.5 of report)
6. Mobile Bridge Testing Labs, on the lines of Emission Test Car of RDSO should be developed. At least five of these should be inducted within next three years. [Bridge and Structures Directorate: three years] (Para no. 16.2.6 of report)
7. Mobile Bridge Inspection Units should be inducted with modern techniques. One for each Zonal Railway within next five years. [Bridge and Structures Directorate: five years] (Para no. 16.2.7 of report)
8. Drones with Ultra High-Definition Machine Vision should be designed within next one year on commercially available drone platforms within

next one year. A drone for each Division should be acquired within next three years. These should work in synergy with the Mobile Bridge Inspection Units. [Bridge and Structures Directorate: one year] (Para no. 16.2.8 of report)

9. Tractive Effort limiting devices should be a standard feature in all locomotives. [Electrical RS and Mechanical Traction Directorates: two years] (Para no. 16.2.9 of report)

35.15 Maintenance of Engineering Assets (Para no. 17 of report)

1. Dedicated Maintenance Block on all routes for at up to three hours should be given by the DRM, without referring the matter to Headquarters. If necessary, trains to be cancelled, rerouted, or regulated. The ETA will accordingly be revised for each section. All maintenance backlog for tracks should be wiped out in one year. (CSP 6.24 and 6.25) [Zonal Railways: one year] (Para no. 17.2.1 of report)
2. Blocks will be in the nature of integrated corridor blocks to be utilized for Engineering and TRD assets. As far as possible, S&T Maintenance should also be combined within these blocks. [Zonal Railways: one year] (Para no. 17.2.2 of report)
3. The authority seeking block will clearly specify, in advance, the quantum of work that will be carried out during the block period. This should be a verifiable volume of work. [Zonal Railways: one year] (Para no. 17.2.3 of report)
4. DRM's performance will be evaluated on the hours of block granted and output delivered as per standardized norms. [Zonal Railways: one year] (Para no. 17.2.4 of report)
5. Before a traffic block is granted, the Sectional Sr. DEN/DEN will certify that all material, equipment and manpower for the work to be done during the block has been arranged. [Zonal Railways: one year] (Para no. 17.2.5 of report)
6. A Special allowance of 30% should be given to Keymen and Gatekeepers, currently unpopular categories, so that we get willing and sincere staff for manning these important posts. [Track Directorate: three months] (Para no. 17.2.6 of report)

7. Vacancies of Trackmen should be filed on top priority in a time bound manner. (Para no. 17.2.7 of report)
8. There is an urgent need to take a new look at the tools and equipment of the Keyman to make his job easier, more hands-free and less tiring. [Track Directorate: three months] (Para no. 17.2.8 of report)

35.15.1 Empowerment of Sr. DENs/DENs (K 2.9) (Para no. 17.3 of report)

1. Sectional Sr. DENs and DENs should be given a Cash Imprest of Rs. 10 lakhs, to be recouped every month. Recoupment should be automatic every month by recharging a prepaid card. Account of the previous month may be sent separately. [Finance Directorate: three months] (Para no. 17.4.1 of report)
2. A Sr. DENs or DENs should be permitted to buy stock or non-stock items, without any restrictions, out of this Cash Imprest. [Finance Directorate: three months] (Para no. 17.4.2 of report)
3. Rule 145 of the GFR 2005 for purchase of up to Rs. 15,000 without calling for multiple quotations should be made immediately applicable in Railways. [Finance Directorate: three months] (Para no. 17.4.3 of report)
4. Divisions should also be empowered to procure tack fittings like ERCs, Liners, GRSPs and Fittings for Points and Crossings through the Divisional Stores Officer. [Finance Directorate: three months] (Para no. 17.4.4 of report)
5. Essential Track Fittings like ERCs, Liners, GRSPs, Fish Plates, Joggle Fish Plates, SEJs etc. should be made Stock Items and regular procurement made to an established EAR/AAC. [Track and Stores Directorates: three months] (Para no. 17.4.5 of report)
6. PWIs should have a Cash Imprest of Rs. One lakh for prior cleaning of tracks before maintenance work in undertaken. [Finance Directorate: three months] (Para no. 17.4.6 of report)

35.16 Encroachments (Para no. 18 of report)

1. New track works like new lines, doubling and gauge conversion should include fencing in all estimates. [Works Directorate to issue policy: three months] (Para no. 18.2.1 of report)

35.17 Protection of Road Users (Para no. 19 of report)

1. The mission of elimination of LC Gates should be pursued in right earnest. (Para no. 19.2.1 of report)
2. A system needs to be devised to periodically open the LC Gates, which are Closed to Road Traffic, so that the accumulated road traffic gets cleared. [Safety Directorate: three months] (Para no. 19.2.2 of report)

35.18 Signalling (Para no. 20 of report)

1. All Lever- Frames and Semaphore Signalling should be replaced in the next three years. [Signal Directorate: three years] (Para no. 20.5.1 of report)
2. All Relay Rooms of interlocked stations having more than 100 routes should be Air-conditioned, Dust-proofed and fitted with Fire Detection and Dowsing System. [Signal Directorate: three years] (Para no. 20.5.2 of report)
3. Signal and Telecom Assets are nerve centers of Train Operations. A study should be conducted to evaluate threats of sabotage, terrorist attacks etc. to them and to provide necessary protection. This should be done within next six months in consultation with the RPF to define the security protocol for implementation. [Signal Directorate: six months] (Para no. 20.5.3 of report)
4. Redundancy must be built/provided for items like BPAC so that in case of failure the backup system takes over in case of failure of one. [Signal Directorate: three years] (Para no. 20.5.4 of report)
5. Raise standard of interlocking to provide isolation for safe operation and to improve speeds. [Signal Directorate: five years] (Para no. 20.5.5 of report)
6. All starters at stations should be made free starters so that the need for physically ensuring correct setting of points protected by the signal is not required during failures like block failures. If due to the complexity of the signalling system, a free starter is not possible, a calling-on signal should be provided below the starter so that correct setting and locking of points can be ensured with the clearing of the calling-on signal. [Signal Directorate: five years] (Para no. 20.5.6 of report)
7. **Dual Detection:** Redundancy in design is an established Engineering Practice to improve the System Availability for Operational Use at the

same time maintaining the required Level of Safety in Train Operations. This has been extensively used in all critical applications, which includes apart from Satellite Systems, Nuclear Power Stations, Aeronautic Engineering Equipment, the Railway Train Control System. This comment has also been recommended by the Kakodkar Committee vide Para 2.5.3 (Recommendation No.1-2). The system has been deployed on Indian Railways for Fail Safe Train Detection, which forms the base for the Integrity of the Signalling & Interlocking Systems. The System does not claim to detect Rail Fractures at all, especially those which are on the Rail Head or are of Hairline nature and are on the Negative/Traction Current carrying Rail. In addition, Rail Head Cracks and Hairline Fractures even on the Positive Rail also will not get detected. (Para no. 20.5.7 of report)

35.19 Maintenance of Signalling Assets (Para no. 21 of report)

1. An IT based Asset Management System for online recording of signal defects, keeping records of assets, their age and maintenance history and management level monitoring, on the lines of CMM, FMM or TMS should be created within next one year. [Signal Directorate: one year] (Para no. 21.3.1 of report)
2. The Cash Imprest of each Sr. DSTE should be increased to Rs. 10 lakhs to be recouped every month. Recoupment should be automatic by recharging a prepaid card. Accounts of the previous month may be sent separately. [Finance directorate: three months] (Para no. 21.3.2 of report)
3. A Sr. DSTE should be permitted to buy stock or non-stock items, without any restrictions, out of this Cash Imprest. [Finance directorate: three months] (Para no. 21.3.3 of report)
4. Rule 145 of the GFR 2005 for purchase of up to Rs. 15,000 without calling for multiple quotations should be made immediately applicable in Railways. [Finance directorate: three months] (Para no. 21.3.4 of report)
5. A Sr. DSTE should be empowered to hire road transport for movement of men and material to attend to failures and exigencies without Finance concurrence. [Finance directorate: three months] (Para no. 21.3.5 of report)

35.20 Automatic Train Protection (CSP 4.6) (Para no. 22 of report)

1. IR should now lay down a roadmap for the introduction of ATP on its network. This should be done within the next six months. [Signal Directorate: six months] (Para no. 22.4.3 of report)
2. An India specific ATP system, matching at least ETCS L-1 standards should be developed. The endeavour should be to ensure significant indigenization of the hardware and software and full indigenous support. This should be finalised within a year. [Signal Directorate: one year] (Para no. 22.4.2 of report)
3. TCAS should be developed as a sub-set of the ATP. Necessary upgrades and changes in the TCAS system should be done to ensure this simultaneously. [Signal Directorate: one year] (Para no. 22.4.3 of report)
4. Assured Funding should be provided for the ATP System so that ATP on all A&B Routes can be provided by March 2022. [Finance Directorate: four years] (Para no. 22.4.4 of report)

35.21 Communication Backbone (K 4.4.4 and CSP 5.17) (Para no. 23 of report)

1. A clear roadmap for Communication Backbone including Mobile Train Radio Communication should be drawn within next six months. (K 8.6) [Telecom directorate: six months] (Para no. 23.3.1 of report)
2. Mobile Train Radio Communication should be installed on Routes A and C within the next three years. B and D Routes should be covered in another three years thereafter. (Kh I 2.11.1 and Kh II 3.2.2) [Telecom directorate: three and six years] (Para no. 23.3.2 of report)
3. A detailed plan for Communication Based Train Control (CBTC) in Suburban sections should be created within next one year and implemented in five years. (K 8.5) [Telecom Directorate: one year] (Para no. 23.3.3 of report)
4. A pan-India license for radio frequency (spectrum) should be taken centrally by the Railway Ministry to enable communication between wireless devices. This should be done within the next six months. [Telecom Directorate: six months] (Para no. 23.3.4 of report)

35.22 Signal Passing at Danger (SPAD) (Para no. 24 of report)

1. SPAD should be classified accordingly to the distance of overshooting. Cases of SPAD should be dealt differently upon whether the LP, after committing SPAD, has stopped within the signal overlap or crossed the overlap. This should also decide the penalty imposed on the erring crew. In ATP/AWS Territory this differentiation will not, however, apply. (Kh II 5.5.4) [Safety Directorate: three months] (Para no. 24.6.1 of report)
2. All new Loco Crew should be recruited with the minimum qualification of a Diploma. Even departmental candidates should fulfil this criterion. (K 6.3) (Para no. 24.6.2 of report)
3. All Running Rooms should be air-conditioned and made noise-proof regardless of their geographical location. (Para no. 24.6.3 of report)
4. There should be a separate Plan Head for Running Rooms, Lobbies and Crew Rest Rooms. (Tripathi 7.5.3) (Para no. 24.6.4 of report)
5. Loco Pilots coming to duty after availing a periodic rest or after a leave should be made to take a mandatory rest of 6 hours in the running room before being booked for a train. (Para no. 24.6.5 of report)
6. Loco Crew should be called to duty not before 08:00 hrs. after availing leave till the previous day. (K 6.6) (Para no. 24.6.6 of report)
7. Breathalyzers and Bio-Metric Identification should be integrated into the CMS across all Lobbies within six months. (Para no. 24.6.7 of report)
8. Loco Inspectors and Officers on footplate should be provided with portable breathalyzers to test the crew on the run. (Kh II 3.10.3) (Para no. 24.6.8 of report)
9. Loco crew should be mandatorily provided with accommodation in their headquarters and required to stay in them. (Para no. 24.6.9 of report)
10. A study should be commissioned with expert outside help within next three months on Alertness Management and Fatigue Mitigation. IIT-Kharagpur has done work on fatigue in Airlines Pilots. They must be consulted. (Kh II 5.4) [Mechanical Traction Directorate: six months] (Para no. 24.6.10 of report)
11. There is a need to revise and update the Psychological Tests for running crew. Vienna Test System, an acclaimed testing methodology may be

consulted for this purpose. [RDSO: six months] (Para no. 24.6.11 of report)

12. There is a need to lay down that maximum speed for crossing a signal at caution should not be more than a maximum specified. Provision for speed control already exists in GR 3.07, but no limit has been set by any Railway. This is also in line with maximum speeds prescribed after passing a signal at caution in AWS territory. [Safety Directorate: Three months] (Para no. 24.6.12 of report)
13. Cell phone jammers should be installed in Loco Cabs to prevent use of Mobile Phones by Loco Crew, a known cause of SPAD and collisions. [Electrical and Mechanical Directorates dealing with Locos and Self-Propelled Stock: six months] (Para no. 24.6.13 of report)
14. LPs/ALPs found guilty of SPAD should never be put back on running duty, if taken back after removal. Establishment Rules need to be changed to enable their posting in other categories. [Establishment Directorate: three months] (Para no. 24.6.14 of report)
15. The ALP should be tested and certified for application of Assistant's Emergency Brake operation on the driving simulator by the trainer by simulating a condition where the LP doesn't react to an unsafe situation. [Zonal Railways: Immediate] (Para no. 24.6.15 of report)
16. There is not direct supervision of ALPs as available for LPs and LP Shuting. There needs to be an LI for every 50 ALPs for better monitoring and mentoring. [Establishment Directorate to issue yardstick: three months] (Para no. 24.6.16 of report)
17. During categorization of LPs as A, B or C, the present system of 1 or 0 mark for each of the hundred attributes results in most of the LPs getting categorized as A. This needs to be reviewed and better system designed. [Mechanical Traction Directorate: six months] (Para no. 24.6.17 of report)

35.23 Train Operations (Para no. 25 of report)

1. EOTT trails should be concluded, and policy issued to begin installing the EOTT device in Freight Trains. [Mechanical Development Directorate to

conclude trail: six months, Traffic Transportation Directorate to issue policy: one year] (Para no. 25.3.1 of report)

35.23.1 Distributed Power (DP) or Locotrol (Para no. 25.4 of report)

1. Distributed Power Systems should be installed on Locomotives, where the same has been adequately proven. [Electrical RS and Mechanical Traction Directorates to install first five hundred DPs each in electrical and Diesel Locos: two years] (Para no. 25.5.1 of report)
2. Interoperability between various makes of DP should be ensured by creating an IR Standard for the same. [RDSO: three months] (Para no. 25.5.2 of report)

35.24 Realtime Safety Monitoring of Rolling Stock (Para no. 26 of report)

1. A study to be commissioned to study provision of Trackside Safety Devices in Modern Railroad Systems. This should be done within the next three months. Specifications, distance between successive installations, communication protocols etc. must be determined. [Mechanical Development Directorate: three months] (Para no. 26.2.1 of report)
2. There should be an immediate introduction of such Trackside Detection and Monitoring Systems (Online Monitoring of Rolling Stock, OMRS) with composite features of hot-box, bearing noise, camera-based inspection system, flat wheels, hanging-parts detection etc. The hundred sites as already planned should be installed quickly. [Mechanical Development Directorate: two years for first fifty and another two years for the remaining fifty] (Para no. 26.2.2 of report)
3. On-board Condition Monitoring Systems (OBMS) that monitor bearings, vibrations, and other parameters of rolling stock and communicate to a central server for alerts and action has been under deliberations for many years. OBMS should be fitted in all locomotives, coaches, and wagons along with associated IT infrastructure and control room. [Mechanical Development Directorate: two years for the first 2000 locomotives, 20,000 coaches and one lakh wagons, five years for 100% coverage] (Para no. 26.2.3 of report)

4. Machine Vision Intelligent Devices for detection of rolling stock defects should also be installed at entry of major yards. They should also be equipped with automatic wheel profile detectors. The first twenty such machines must be installed within the next two years (K 4.8). [Mechanical Development Directorate: two years] (Para no. 26.2.4 of report)

35.24.1 Weigh Bridges (Para no. 26.3 of report)

1. A Uniform Operating Protocol for weighing, movement of un-weighed wagons, movement of overloaded wagons etc. should be issued on the lines of that in use on NCR. [Traffic Transportation Directorate: three months] (Para no. 26.4.1 of report)
2. Periodic Inspections of Weigh Bridges should be ensured and made a KPC for evaluation of ADRMs' performance. In due course, all Trackside Safety Devices should be included in the protocol. [Zonal Railways: Immediate] (Para no. 26.4.2 of report)

35.25 Material Procurement System (Para no. 27 of report)

1. Anticipated Annual Consumption (AAC), also known as the Estimated Annual Requirement (EAR), should be treated as a purely technical decision. It is based on Maintenance Manuals, RDSO recommendations or real-life ground level experience. There is no role for Finance or Stores in deciding or changing the AAC. Likewise past consumption due to bad decisions, or non-availability for whatever reason is not a ground for reduction in AAC. [Stores Directorate to issue policy: one month] (Para no. 27.7.1 of report)
2. AAC should be fixed by the Executive Department based on the factors referred to above. This should be enhanced or reduced depending upon the population of assets in the field. This AAC will remain sacrosanct. [All Technical Directorates to issue policy: one month] (Para no. 27.7.2 of report)
3. The Finance, Procurement Officer or the Tender Committee will not reduce or enhance the AAC at all on account of lack of funds or record of past consumption. If Stores or Finance feel at any given stage, such as the initiating the procurement process, vetting of tender proposal, Tender Committee proceedings, it must mention that "While the AAC is 100 (for example), a Purchase Order can be placed only for 60 due to shortage of

funds in budget or shortage of purchase grant". [Stores Directorate to issue policy: one month] (Para no. 27.7.3 of report)

4. When the stock level of an item falls to three months' consumption as per AAC, it should be treated as out of stock and emergency procurement process should automatically set in motion. [Stores directorate to issue policy: one month] (Para no. 27.7.4 of report)

35.26 Procurement of Safety, Vital and Must-Change Items (Para no. 28 of report)

1. In each tender case for Safety, Vital and Must-Change items, P.O. should be placed on two firms for half the required quantity each. It will work like a mini–Rate Contract. The end user, for example, a Sr. DSTE, a Sr. DME/C&W or a Sr. DEE/Car Shed will be empowered to directly requisition material from either of the suppliers based on his performance against yardsticks of timely supply and quality. This will revolutionize the availability of such items. (Kh II 2.16.6) [Stores Directorate to issue policy: one month] (Para no. 28.6.1 of report)
2. P.O. for Safety, Vital and Must-Change Items should be placed for long term for up to 3 years. [Stores Directorate to issue policy: one month] (Para no. 28.6.2 of report)
3. Each bidder in tenders for Safety, Vital and Must-Change item must give an undertaking that if any malpractice is found in its business with Railways he will be summarily removed from the Approved List. A clause to this effect should be drafted by RDSO and circulated within the next three months for inclusion in tender notices. [Stores Directorate to issue policy: one month] (Para no. 28.6.3 of report)
4. Tenders for Safety, Vital and Must Change items should necessarily have provision of Earnest Money and Security Deposit. [Stores Directorate to issue policy: one month] (Para no. 28.6.4 of report)
5. Each Department will prepare a list of up to fifty Safety Items, fifty Vital Items and a hundred Must-Change Items for each type of asset, such as the LHB Coach, ICF Coach, WAG9 Loco, EMUs, BOXN Wagons, BLC Wagons, Signals, Track Circuits, OHE, PSI, etc. Procurement of these items will be governed by the provisions given above. (K 2.13.1) The lists

will be issued by respective Directorates in the Railway Board as a purely technical decision unencumbered by the Finance or Stores Directorates. The list and the AAC for each of these items will be approved at the Zonal level by the PHOD of the Department independent of Stores and Finance departments since this is a purely technical exercise. [All Technical Directorates: three months] (Para no. 28.6.5 of report)

6. Availability of funds should not be a pre-requisite for initiating purchase of Safety Items. (Kh I 2.16.7) [Stores Directorate to issue policy: one month] (Para no. 28.6.6 of report)
7. If the full monthly quota of a Safety, Vital and Must-Change Item is not issued, it must be considered out-of-stock. [Stores Directorate to issue policy: one month] (Para no. 28.6.7 of report)
8. There should be no vetting of the P.O. for Safety, Vital and Must-Change Items. The Finance Officer in the TC should carry out the necessary checks. [Stores Directorate to issue policy: one month] (Para no. 28.6.8 of report)
9. Finance Concurrence for operating the 30% Option clause for Safety, Vital and Must-Change Items should be dispensed with. [Stores Directorate to issue policy: one month] (Para no. 28.6.9 of report)

35.27 Complex Products (Para no. 29 of report)

1. Each Directorate will identify such Complex Products used in assets/areas controlled by it. [All Technical Directorates: three months] (Para no. 29.8.1 of report)
2. A Policy Directive to be issued for technology management, including purchase, restriction on numbers of vendor-designs, AMC, and Proprietary Purchase etc. in such areas, keeping in mind the need to control diversity, skills of manpower and indigenous support systems. (K 2.13.5) [RDSO: three months] (Para no. 29.8.2 of report)
3. For each Complex System, the Purchase Order should include training in selecting Railway Supervisors and Artisans from each consignee in different aspects, such as design, maintenance, and troubleshooting. [All Technical Directorates: three months] (Para no. 29.8.3 of report)

35.28 Procurement of Hardware (Para no. 30 of report)

1. All Departments should be asked to study and identify mild steel fasteners which must be replaced with high tensile fasteners. If they choose not to do so, they should be asked to give a certificate that there would be no unsafe situation due to continuing with the old fasteners. [All Technical Directorates: three months] (Para no. 30.2.1 of report)
2. High Tensile Fasteners should only be procured from reputed manufacturers. There are enough players in the market to get competitive rates. RDSO will prepare a list of approved vendors for the same within the next three months. (K 2.13.5) [RDSO: six months] (Para no. 30.2.2 of report)

35.29 Delegation of Purchase Powers to Purchase Officers in the Field (Para no. 31 of report)

1. Purchase Officers in the field, viz. the Sr. DMM attached with DRMs and the Dy. CMMs attached with CWMs should be delegated the same levels of purchase powers in the SOP as their counterparts of same rank in the Headquarters, both for stock and non-stock items. This should be done within three months. [Stores directorate: three months] (Para no. 31.2.1 of report)
2. For tenders floated by Purchase Officers in the field, where acceptance must be at the level of SAG, the DRM or the CWM will exercise the power to accept tenders. [Stores directorate: three months] (Para no. 31.2.2 of report)

35.30 Vendor Approval (Para no. 32.3 of report)

1. In the case of Safety, Vital and Must-Change items there should not be more than five approved vendors. If a safety item is also a Complex Product, the number of vendors should be restricted to three. (K 2.13.5) [Stores Directorate: three months] (Para no. 32.3.1 of report)
2. In case a new vendor has to be inducted, the worst performing out of the existing five (three in case of Complex Products) must be ejected from the list. This prescription will keep the vendor approving

authority on his toes since due diligence would be required for replacing an existing vendor with a new one. It will also ensure that the existing vendors continue to meet quality and delivery schedules. This will eliminate a situation like 100+ approved vendors for ERCs. (K 2.13.6 and Kh I 2.16.3) [Stores Directorate: three months] (Para no. 32.3.2 of report)

35.31 Role of RDSO in Vendor Approval (Para no. 33 of report)

1. The role of RDSO should be expanded in the area of Vendor Development, Vendor Approval and Inspections since it has all necessary test labs and associated directorates under one roof. [Efficiency and Research Directorate: three months] (Para no. 33.6.1 of report)
2. The Board's letter no. 2001/RS(G)/779/7 dated: 07-12-2013 should be withdrawn immediately. This is in contravention of the Report of a Judicial Committee headed by Justice Khanna. (Kh I 2.16.5) [Stores Directorate: one month's] (Para no. 33.6.2 of report)
3. Approval of Vendors for Safety, Vital and Must-Change Items as identified by various Directorates of the Railway Board should be entrusted to RDSO within next three months. [Efficiency and Research Directorate: three months] (Para no. 33.6.3 of report)
4. Likewise, Inspection of these items should also be entrusted to RDSO. [Efficiency and Research Directorate: three months] (Para no. 33.6.4 of report)
5. Inspections should also look at process control of the vendor rather than just the final quality. This should be incorporated in the RDSOs QAPs within the next six months. [RDSO to revise QAPs: six months] (Para no. 33.6.5 of report)
6. The supervisory cadre of RDSO suffers from chronic shortage. These should be filled up within the next six months so that RDSO can take up this expanded task in right earnest. RDSO should be permitted to select technically competent and willing personnel for this purpose. [Efficiency and Research Directorate: three months] (Para no. 33.6.6 of report)

7. A Supervisor selected to work in RDSO should be given a special allowance of 30% to encourage and motivate the best brains. [Efficiency and Research Directorate: three months] (Para no. 33.6.7 of report)
8. The registration application fee prescribed for aspiring Vendors should be raised to Rs. 2 lakhs for small and medium companies and Rs 5 lakh for large companies. For foreign applicants the fee should be raised to US$ 10,000/- [RDSO; three months] (Para no. 33.6.8 of report)
9. Vendors failing in delivery schedule and quality need to be ruthlessly stamped out. RDSO should create an on-line portal for logging of vendor performance by users of safety, vital and must-change items. A robust, yet user-friendly reporting system is the sine qua non for Vendor Evaluation. (K 2.13.6 and Kh I 2.16.3) [RDSO; three months] (Para no. 33.6.9 of report)

35.32 Grading of Vendors (Para no. 34 of report)

1. Railway Board's Letter no. 99/RS(G)/709/1 dated: 18-11-2016 should be modified with clarification that the provisions therein will not apply to Safety, Vital and Must-Change Items. [Stores Directorate: one month] (Para no. 34.3.1 of report)
2. There should be no provision of a 20% (or up to 20%) Developmental/Educational order for Safety, Vital and Must-Change items. All vendors must be pre-approved by RDSO. (Kh I 2.16.3) [Efficiency and Research Directorate: three months] (Para no. 34.3.2 of report)
3. Even the provision of 5% order outside the tender quantity should not apply to Safety, Vital and Must-Change items. All vendors must be pre-approved by RDSO. (Kh I 2.16.3) [Efficiency and Research Directorate: three months] (Para no. 34.3.3 of report)

35.33 Manpower Planning and Training (Para no. 35 of report)

1. Technical Officers must be freely allowed, indeed actively deputed, for short-term training programmes in International Institutes teaching advanced railroad technologies. A two-week programme for

each officer early in JA Grade, early in Selection Grade and then early in SA Grade should be planned, at least two of which should be in Institutes abroad. [Training and MPP Directorate: three months] (Para no. 35.3.1 of report)

2. Select technical supervisors too should be nominated for such training courses in India and abroad. [Training and MPP Directorate: three months] (Para no. 35.3.2 of report)
3. Refresher courses for Supervisors and Artisans/Technicians involved in maintenance must undergo an annual refresher course of one week, instead of three weeks or longer every three years. [Training and MPP Directorate: three months] (Para no. 35.3.3 of report)
4. For high-skill trades like TXR Staff, Welders, ESMs, Loco Shed Staff etc. the annual refresher course should be of two-week duration, followed by a test and certification/re-certification. (CSP 7.7) [All Technical Directorates to issue policy: three months] (Para no. 35.3.4 of report)
5. Recruitment of Artisans: Recruitment of artisans and technicians in Group D or Group C needs to be done so that only those persons are recruited, who have hands-on training and certification in the related trades. With the government's emphasis on vocational training, it is now increasingly possible. It is therefore recommended that only Class 10/12 and ITI pass candidates should be selected for the Railways through RRBs and RRCs. This will ensure that they are ready for mechanization and automation as and when IR adopts more and more modern ways of working. (K 6.3) [Establishment Directorate to issue policy: three months] (Para no. 35.3.5 of report)
6. Additionally, Group D Staff being recruited as Trackmen should be subjected to rigorous physical test since their job in the initial years of service will involve heavy lifting and tiring work. Yardsticks for the same should be redrafted within next three months, especially for women candidates. [Establishment Directorate: six months] (Para no. 35.3.6 of report)

7. e-Learning for all artisan staff should be a mission item, where they are encouraged to attend at workplace or at home. e-Learning courses should be prepared through professional agencies in the field. (Kh II 5.2.7 and CSP 7.7) [Training and MPP Directorate to issue policy: three months] (Para no. 35.3.7 of report)
8. Similar e-Learning programmes should be created for Station Masters and Loco Crew. [Training and MPP Directorate to issue policy: three months] (Para no. 35.3.8 of report)

35.33.1 Training of Station Masters (Para no. 35.6 of report)

1. **Training Manager:** Every Zonal Railway and PU should nominate a Dy. CPO/SPO as Training Manager, whose exclusive charge should be training of Officers, Supervisors and Staff. (CSP 7.14) [Training and MPP Directorate to issue policy: three months] (Para no. 35.7.1 of report)

35.34 Protection of Worksites (Para no. 36 of report)

1. After every reconnection following work on signal gear, correspondence between site and panel should be ensured before permitting traffic. [Safety Directorate: one month] (Para no. 36.2.1 of report)
2. Before every crane works, the site should be inspected and certified by a senior supervisor and prepared for location, propping, movement, and physical clearances for crane operations. [Safety Directorate: one month] (Para no. 36.2.2 of report)
3. In case work is taken up by non-open line agencies, such as Construction, RVNL etc. the responsibility for protection and safety for up to 100m on either side shall rest with such agency. [Safety Directorate: one month] (Para no. 36.2.3 of report)

35.35 Protection of Workmen at Worksite (K 5.46) (Para no. 37 of report)

1. Worksites of major works, extending for more than a day, must be audited at the level of an officer before commencement of work to ensure that all safety measures for protection of workmen, Railway's or Contractor's have been put in place. [Track Directorate: one month] (Para no. 37.2.1 of report)

2. Periodical audit for ensuring Workmens' safety should be done every week if the work extends to longer than a week. [Track Directorate: one month] (Para no. 37.2.2 of report)
3. All Railway's and Contractor's employees should be mandatorily provided with necessary safety gear such as luminous jackets, crash helmets, industrial boots, safety belts, safety jackets etc. (K 5.46 ii) [Track Directorate: one month] (Para no. 37.2.3 of report)
4. Disaster Management Staff of ART, ARME and others should be provided with special training in personal safety. [Mechanical Traction Directorate to issue policy: one month] (Para no. 37.2.4 of report)

35.36 Organizational Reorientation

1. Supervisors should not be allowed to join Trade Unions. (Kh I 3.2.3). [Establishment IR Directorate: three months] (Para no. 38.7.1 of report)

2. They should be encouraged to form their own Association for collective bargaining and negotiation and should find a place in PNMs and PREM Group. Similar provision has already been done for the RPF Staff. (Kh I 3.2.4) [Establishment IR Directorate: three months] (Para no. 38.7.2 of report)

3. D&AR Powers of Senior Supervisors was completely withdrawn as a consequence of the 6th Pay Commission. This should be restored. [Establishment Directorate: three months] (Para no. 38.7.3 of report)

4. Likewise, D&AR Powers of Junior Scale Officers should also be restored. There is, in reality, a need to restore all D&AR Powers to pre 6th PC provisions. [Establishment Directorate: three months] (Para no. 38.7.4 of report)

5. Supervisors should be empowered to grant spot cash awards to their staff to the extent of Rs. 500 in each case subject to an annual limit of Rs. 10,000. (Kh I 3.4.2) [Finance Directorate: one month] (Para no. 38.7.5 of report)

35.36.1 Safety Organization (Para no. 38.8 of report)

1. The Safety Department in each Zonal Railway should have a clearly defined sanctioned strength as follows: [Safety Directorate: three months]
   - CSO – 1 Dy. CSOs – 4 Safety Counsellors – 5
   - Chief OS – 1 OS – 1 Sr. Clerk/ Clerk – 4 PS/Stenographers – 3
   - Office Peons – 4 Motor Drivers – 2

   (Para no. 38.10.1 of report)
2. A similar enabling set-up in divisions should also be created as follows: [Safety Directorate: three months]
   - Sr. DSO – 1 DSO/ADSO – 1 Safety Counsellors – 5
   - Chief OS – 1 OS – 1 Sr. Clerk/Clerk – 4 PS/Stenographers – 1
   - Office Peons – 2 Motor Driver – 1

   (Para no. 38.10.2 of report)
3. The CSO, Dy. CSOs, Sr. DSOs and Safety Counsellors should be entitled to a Safety Allowance @30% of their basic pay. [Establishment Directorate: three months] (Para no. 38.10.3 of report)
4. The CSO and each Dy. CSO and Sr. DSO should be provided with a motor vehicle – departmental or hired. [Establishment Directorate: three months] (Para no. 38.10.4 of report)
5. Every Safety Officer, upon posting to Safety organization, should be given a two-week cross functional training in NAIR, which brings out interplay of factors leading to unsafe situations and accidents. [NAIR: three months] (Para no. 38.10.5 of report)
6. Every Safety Officer should be given a one-week training in Accident Investigation in a specialized Institute in India or abroad. [NAIR: three months] (Para no. 38.10.6 of report)

35.36.2 Quality Systems in Procurement of Material and Services (Para no. 38.11 of report)

1. A thorough review of the quality system for material procurement processes should be commissioned from an external expert agency. User departments should play an active role in the process. This should be done within the next three months and a report obtained

and implemented within the next one year. (K 2.13.8) [RDSO: three months] (Para no. 38.12.1 of report)

2. A similar study should be commissioned for quality systems to evaluate deliveries through works contracts. This should be done within the next three months and a report obtained and implemented within the next one year. [Finance Directorate: three months] (Para no. 38.12.2 of report)

35.36.3 Relationship of Finance and Executive (Para no. 38.13 of report)

1. The Executive at each level will normally act on the advice of the associate Finance. But, if the Executive thinks that the observations of advice of Finance is not conducive to smooth functioning of the organization, obstructs speedy implementation of projects, or directly impacts safety or output, he/she should, record his/her opinion in writing and go ahead with the proposed action under advice to the next higher authority. [Finance Directorate to issue amendment to the provision in Accounts Code: three months] (Para no. 38.14.1 of report)

35.36.4 Innovative Financing (Para no. 38.15 of report)

1. A Comprehensive Policy on OPEX route of hiring/leasing expensive equipment should be issued within the next six months. [Efficiency and Research directorate: three months] (Para no. 38.16.1 of report)
2. PHODs/CWMs should be empowered to enter into OPEX contracts once such a policy is in place. [Finance Directorate: six months] (Para no. 38.16.2 of report)

35.36.5 Relocate Sectional Sr. DENs/DENs (Para no. 38.17 of report)

1. Sectional Sr. DENs/DENs should be relocated within their "Sections", if necessary, by creating office and residential infrastructure. They may retain an office chamber in the Divisional Office too. [Engineering Directorate: three months] (Para no. 38.18.1 of report)

35.37 State of Railway's Finances and Impact on Safety (Para no. 39 of report)

1. Allocation to Primary Units for purchase of stock and non-stock should see a multifold increase. This will require the issue of a policy directive to make stocking of items and their purchase easier, such as not comparing the new demands with past years' consumptions, stocking of items actively being encouraged and simplified. [Finance Directorate: one year] (Para no. 39.5.1 of report)
2. Technical Departments should go back to basics, consult maintenance manuals, best practices, RDSO's recommendations and technical orders to determine realistic demands for Safety, Vital and Must-Change Items. [All Technical Directorates: six months] (Para no. 39.5.2 of report)
3. Allocation to DRF should not only neutralize inflation, it should also consider the increasing asset base and increased traffic levels. [Finance Directorate: one year] (Para no. 39.5.3 of report)
4. The Purchase Grant given to the Stores Department should be split into two parts, one for Safety, vital and Must-Change Items and another for the rest. (Kh I 2.16.7) [Finance Directorate: three months] (Para no. 39.5.4 of report)
5. Railway Safety Fund, which is now well endowed (Rs. 10,780 Crores for the Year 2016-17 as per **Annexure – 9**, should cover track renewal, bridge safety works, Modernization of Signal & Telecom and Safety Retrofits on rolling Stock as well. [Finance Directorate: three months] (Para no. 39.5.5 of report)
6. Expenditure Control Circulars should not apply to Safety, Vital and Must-Change Items. [Finance Directorate: immediate] (Para no. 39.5.6 of report)

35.38 Application of IT for Asset Management (Para no. 40 of report)

1. Each and every Vehicle moving on rails, such as Coaches, Wagons, Locomotives, Self-propelled Stock, Motor/Moped & Push Trolleys, Utility Vehicles, ARTs/ARMEs, Cranes, Track Machines, Tower

Wagons, everything, must be radio tagged and provided with tamper-proof RFID tags. (K 4.4.4) [Mechanical Development Directorate: two years] (Para no. 40.2.1 of report)

2. There should be a reliable traceability of wheels built into the system. (CSP 6.36) [Mechanical Workshop Directorate: six months] (Para no. 40.2.2 of report)
3. Comprehensive database of Rolling Stock, every Coach, Wagon and Locomotive to be built with its maintenance history, which can deliver a reliable MIS for actionable points across the country. They should be IR-One ICT compliant. [Mechanical Workshop Directorate: six months] (Para no. 40.2.3 of report)
4. The IT system so created should also capture "transaction data history", i.e. the date of entering of data so that tampering of data or post-event entry is easily detected. [C&IS Directorate: six months] (Para no. 40.2.4 of report)
5. Disjointed and half-hearted efforts for Coach Maintenance, Wagon Maintenance and Loco Maintenance have been going on for last many years. CMM, FMM and SLAM need to be expedited, rolled out nationwide and officers and staff trained to make full use of it. [Mechanical Development Directorate: one year] (Para no. 40.2.5 of report)
6. It was learnt from AM/IT that funds have been in short supply for these projects. It is felt that investments in these applications have a direct impact on reliability and increased availability for rolling stock apart from safety. It is therefore felt that funding from EBR should be done for these applications provided a workable ROR is possible. [Finance Directorate: six months] (Para no. 40.2.6 of report)
7. Similar on-line data capture and MIS should be adopted for Signal & Telecom assets as well. [Signal Directorate: one year] (Para no. 40.2.7 of report)
8. The Safety Department should have unrestricted read-only access to such databases. [C&IS Directorate: immediate] (Para no. 40.2.8 of report)

9. REMMLOT should be installed in all new Electric Locomotives w.e.f. 01-04-2017. [Electrical RS Directorate: immediate] (Para no. 40.2.9 of report)
10. REMMLOT must be retrofitted in all existing Electric Locomotives within the next three years. [Electrical RS Directorate: immediate] (Para no. 40.2.10 of report)

35.38.1 Chief Information Officer (Para no. 40.3 of report)

1. Each Zonal Railway, Production Unit and CTI will nominate a full-time Chief Information Officer. This should be done within the next three months by redesignating an SG/SAG post from any department. The model of NCR, where a Chief Manager IT (CMIT) has been appointed, may be followed. [C&IS Directorate to issue policy: one month] (Para no. 40.4.1 of report)
2. The CIO will look after the IT facilities such as Networking, Servers, AMCs, Purchases, Database backups and liaise with outside agencies like CRIS, FOIS, RAILTEL etc. [C&IS Directorate to issue policy: one month] (Para no. 40.4.2 of report)
3. Applications will continue to be owned by the respective Departments. (Para no. 40.4.3 of report)

35.39 FOG Operations (Para no. 41 of report)

1. Modified Automatic Signalling, as already adopted, must continue. (Para no. 41.3.1 of report)
2. Fog pass has undergone several refinements. It must be made SIL 4 compliant, its locational accuracy enhanced and then inducted in adequate numbers to provide assistance to crew during fog. To be done within next one year. [Mechanical Traction Directorate: six months] (Para no. 41.3.2 of report)
3. Trials with Composite Camera based technologies, which use optical, radio and infrared wavelengths to create a workable image of the path ahead, should be started in right earnest. [Mechanical Traction Directorate: six months] (Para no. 41.3.3 of report)
4. If found successful, these Fog vision Cameras should be installed in locomotives and Motor Cabs in Fog Prone areas. [Electrical RS and

Mechanical Traction Directorate: six months] (Para no. 41.3.4 of report)

5. As an interim measure retro reflective Zigma Boards should be provided on all masts for five masts in rear of stop signals in electrified territory to indicate to the loco pilot about an approaching stop signal. Similar arrangements should be done for non-electrified territory. [Zonal Railways: six months] (Para no. 41.3.5 of report)

35.40 Accident Reporting and Enquiry (Para no. 42 of report)

1. An honest and transparent system of capture of accident and safety related data should be put in place with a so that no comparison with past statistics would be made as two sets would be incompatible. Reporting of unsafe acts and accidents, howsoever minor should be encouraged. (Kh I 2.15.8) [Safety directorate: immediate] (Para no. 42.5.1 of report)
2. Equipment failure, as reported first in the Control Office Application by the Controllers, should be taken as sacrosanct. Any subsequent intervention is likely to vitiate the truth. (Kh I 2.15) [Safety directorate to issue policy: one month] (Para no. 42.5.2 of report)
3. All train timings should be captured through data loggers into the Control Office Application. This may require integrating the Control Office Application with SIMS or any SIMS-like platform created for this purpose. [Signal and C&IS Directorates: six months] (Para no. 42.5.3 of report)
4. Loss of punctuality should cease to be a Key Performance Metric for the annual evaluation of a Branch Officer. The number of failures should, instead, be the Performance Metric. [Efficiency and Research directorate: three months] (Para no. 42.5.4 of report)
5. An IT based system to compile and analyze the equipment failures thus captured needs to be built to generate an MIS and action plans for corrective action. [Safety Directorate: six months] (Para no. 42.5.5 of report)
6. Standard proforma for measurements of track and rolling stock has been finalised by RDSO and is awaiting issue. This should be

included in the Accident Manual. [Safety Directorate: three months] (Para no. 42.5.6 of report)

7. Accident Enquiries should go beyond the immediate cause and establish whether there has been a systemic neglect of maintenance, lack of material inputs, poor quality material, lack of training, lapses in supervisory and officer-level monitoring etc. There needs to be created a standard Performa for accident enquiries to ensure this. [Safety directorate: three months] (Para no. 42.5.7 of report)
8. Emphasis in every enquiry should be on "what went wrong" rather than "who went wrong". A policy directive needs to be issued in this matter. [Safety directorate: three months] (Para no. 42.5.8 of report)
9. A system for "Error Counting" rather than counting of actual incidents or accidents should be established as per the Heinrich Ratio Principle. This is a scientific principle that can prevent actual accidents. [Safety directorate: three months] (Para no. 42.5.9 of report)

35.41 Disaster Management (Para no. 43 of report)

1. Telescopic Boom Cranes with Tunnel Rescue Arrangement have been sanctioned over a decade ago. It was learnt that a tender is under process for over four years. This should be concluded in the next three months. (Kh I 3.19.8) [Mechanical Traction Directorate: three months] (Para no. 43.2.1 of report)
2. Air-plasma cutting devices, as already sanctioned, need to be inducted immediately. To be done within six months. [Mechanical Traction Directorate: three months] (Para no. 43.2.2 of report)
3. Explore cold cutting devices for stainless steel within the next three months and induct within two years. [Mechanical Traction Directorate: three months] (Para no. 43.2.3 of report)

35.42 Safety Cadre Vacancies, Yardsticks and Staff Surrender (Para no. 44 of report)

1. In order to incentivize Staff, Surrender the Department or the Officer surrendering such staff should be given two years' saving on the surrendered staff's salaries and allowances to acquire labour saving devices, bring in automation, material handling implements,

inspection tools, IT equipment etc. to compensate for the loss of manpower. This money will, of course, not be spent in one year and will most likely be spread out over 2-4 years. (Para no. 44.5.1 of report)

2. RRBs must speed up their process if tightening of yardsticks is to be acceptable. Vacancies yardsticks need to be quickly filled up. The time cycle for recruitment through RRBs and RRCs should be cut down to six months, i.e. from the date the indent reaches an RRB the panel should be ready within six months. (K 2.11.4 and 5.1) (Para no. 44.5.2 of report)
3. RRBs should make a standby panel of 100% of indented numbers in each selection so that coverage for non-joining and attrition can be made without waiting for the next selection cycle. (Para no. 44.5.3 of report)
4. A comprehensive Outsourcing Policy for non-core activities needs to be issued so that surrender of staff does not result in degradation of performance in safety and non-safety areas. This should be done within the next six months. (K 2.11.5 and 5.5) (Para no. 44.5.4 of report)
5. The stipulation of matching surrender for new assets, new services and new facilities should be withdrawn. New assets, services and facilities require additional manpower. [Finance Directorate: three months] (Para no. 44.5.5 of report)

35.43 VACANCIES IN SAFETY CATEGORY

S.N.	Railway	As on 01/04/2016			
	CATEGORY	SS	OR	Vacancy	Vac.%
		1	2	3	4
1	ASMS/SMS/SSS	39671	34398	5273	13.29
2	Controllers	2814	2346	468	16.63
3	Guards	38704	28078	10626	27.45
4	Gateman (Traffic)	10061	9332	729	7.25
5	Switchmen	1405	983	422	30.04
6	Cabinmen	5140	4124	1016	19.77
7	Leverman	2264	1695	569	25.13
8	Pointsman	40577	37816	2761	6.8

9	JE/SE/SSE (P. Way)	10063	8042	2021	20.08
10	Supervisor (P. Way)	236	315	-79	-33.47
11	Gangmen/Gangmate	247758	206291	41467	16.74
12	Keymen	6083	3649	2434	40.01
13	Gateman (Engg.)	11110	10047	1063	9.57
14	JE/SE/SSE(Signal)	3973	3456	517	13.01
15	ESM/MSM	17158	14221	2937	17.12
16	Drivers	47212	35770	11442	24.24
17	Motormen	3926	3309	617	15.72
18	Shunters/ Engine Turners	8243	5529	2714	32.92
19	Dsl./Elec. Asstts.	45064	38490	6574	14.59
20	JE/SE/SSE(C&W)	9337	7402	1935	20.72
21	Counsellors of all Deptts.	936	740	196	20.94
22	All other safety categories	194941	167880	27061	13.88
	Total	**746676**	**623913**	**122763**	**16.44**

PART F:
ACCIDENT ENQUIRIES AND THEIR TYPES

THE PRINCIPALS OF ACCIDENT INVESTIGATION

36

Hundreds of accidents and unusual of different types occur throughout the Indian Railways every year and most of the accidents are of trivial nature and may not have big impact on the system. However, the failure of staff, equipment, supplies, or surroundings are the major cause for such accidents. It is important for any organization to go into detail of every accident to prevent recurrence of such accident in future. The investigations determine how and why these failures had occurred. By using the information gained through an investigation, a similar or perhaps more disastrous accident can be prevented. All accident investigations must be carried out keeping accident prevention in mind. The purpose of accident investigation is not to blame but improve the system.

An accident is an unplanned event that results in personal injury or in property damage. When the personal injury requires little or no treatment, it is minor. If it results in a fatality or in a permanent total, permanent partial, or temporary total (lost time) disability, it is serious. Similarly, property damage may be minor or serious.

Investigate all accidents regardless of the extent of injury or damage.

The accidents or unusual in railways are part of a broad group of events that adversely affect the normal functioning of the railway. These events are incidents.

36.1 Objective of Accident Investigation

The accident investigation is primarily an act of a methodological effort to collect and interpret the facts of accident. The sole purpose is to do inquiry to find out how and why the accident occurred in order to explore actions that should be taken to prevent or minimize recurrence of the accident. The principle of investigation is to outline as under:

1. The investigation of any accident event will never progress unless that event is first properly reported to the appropriate management within an organization.
2. A Formal Policy requiring the proper and consistent reporting of all accidents is one of the most important principles of any accident investigation program.

The purpose of Accident Investigation is to ensure following:

1. To establish all facts of accidents.
2. To draw conclusion about the accidents.
3. To pinpoint the reason actual cause of the accidents, person or process or equipment.
4. To make recommendations
5. To prevent recurrence

Most of the accidents are generally of complex nature and may have always more than one reason and it can have even had a dozen or more events those can be responsible for accident.

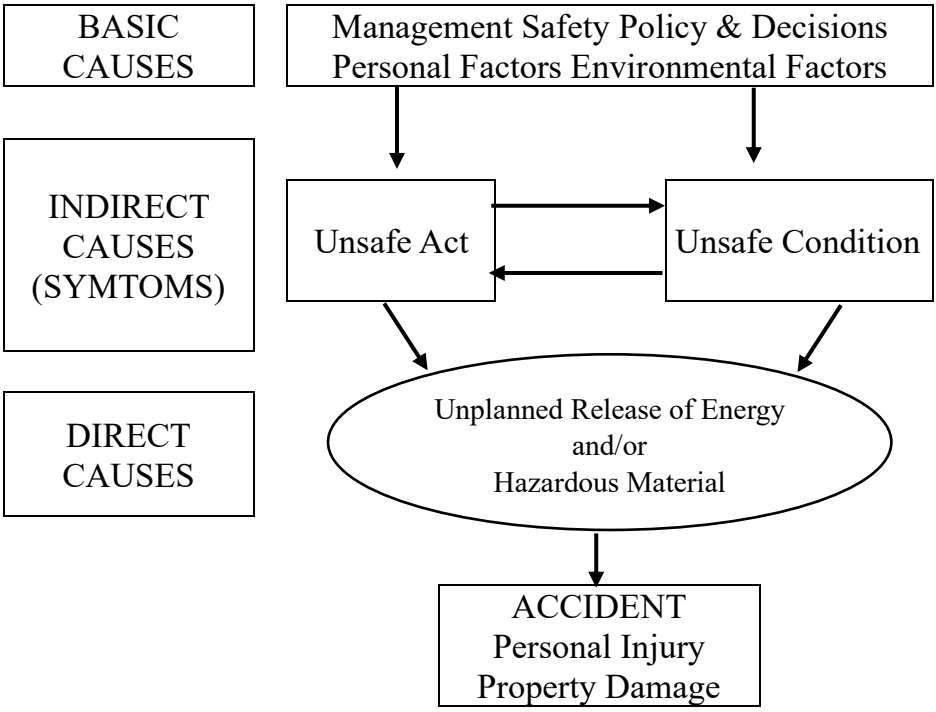
A detailed analysis of an accident will normally reveal three cause levels: 1. basic, 2. indirect, and 3. direct.

At the lowest level, an accident results only when a person or object cause an event which is unsafe and has adverse repercussion. This kind of act can be called as Basic Cause of the accident. The direct cause is usually the result of one or more unsafe acts or unsafe

conditions, or both.

Unsafe acts and conditions are the Indirect Causes or symptoms. In turn, indirect causes are usually traceable to poor management policies and decisions, or to personal or environmental factors.

Inspite of their complexity, most of the accidents are preventable by eliminating one or more causes.



Accident investigations determine not only what happened, but also how and why. The information gained from these investigations can prevent recurrence of similar or perhaps more disastrous accidents. Accident investigators are interested in each event as well as in the sequence of events that led to an accident. The accident type is also important to the investigator. The recurrence of accidents of a particular type or those with common causes shows areas needing special accident prevention emphasis.

A detailed analysis of an accident will normally reveal three cause levels: basic, indirect, and direct.

36.2 Investigative Procedures

The actual procedures used in a particular investigation depend on the nature and results of the accident. The agency having jurisdiction over the location determines the administrative procedures. In general, responsible officials will appoint an individual to be in charge of the investigation. The investigator or accident enquiry committee uses most of the following steps:

Step 1:

Define the scope of the investigation.

Step 2:

Assign specific tasks to each member of the committee (preferably in writing).

Step 3:

Present a preliminary briefing to the investigating team, including:

a. Description of the accident, with damage estimates.
b. Normal operating procedures.
c. Maps (local and general).
d. Location of the accident site.
e. List of witnesses.
f. Events that preceded the accident.

Step 4:

Visit the accident site to get updated information.

Step 5:

Inspect the accident site.

a. Secure the area. Do not disturb the scene unless a hazard exists.
b. Prepare the necessary sketches and photographs. Label each carefully and keep accurate records.

Step 6:

Interview each victim and witness. Also interview those who were present before the accident and those who arrived at the site shortly after the accident. Keep accurate records of each interview. Use a tape recorder if desired and if approved.

Step 7:

Determine or perceive as under:

a. What was not normal before the accident.
b. Where the abnormality occurred.
c. When it was first noted.
d. How it occurred.

Step 8:

Analyze the data obtained in step 7. Repeat any of the prior steps, if necessary.

Step 9:

Determine

a. Why the accident occurred.
b. A likely sequence of events and probable causes (direct, indirect, basic).
c. Alternative sequences.

Step 10:

Check each sequence against the data from step 7.

Step 11:

Determine the most likely sequence of events and the most probable causes.

Step 12:

Conduct a post-investigation briefing, Prepare a summary report, including the recommended actions to prevent a recurrence. Distribute the report according to applicable instructions.

An investigation is not complete until all data are analyzed, and a final report is completed. In practice, the investigative work, data analysis, and report preparation proceed simultaneously over much of the time spent on the investigation.

Collection of evidence

One of the primary duties of an accident investigator is to collect the physical evidence, information and witness account. It is essential that the investigator's behaviour and questions are neutral and do not allocate responsibility or blame. It is important to retain objectivity and accuracy without bias. The information can take the form of physical evidence, written evidence and personal testimony as under:

Physical evidence

Physical evidence can be obtained by observation and measurement. The level of detail and accuracy will depend on these circumstances and the nature of the serious harm. It may be necessary to get assistance with technical measurement. Observations and physical measurements must be recorded. Use of photographs and diagrams will assist.

Documentary evidence

Documentary evidence may vary in relevance, usefulness and reliability. Records are not always a reliable indication that events occurred as stated. Records may not give an indication of the standard to which the events or associated work were carried out.

Personal testimony

Personal testimony is essential in establishing the sequence of events. It needs to be recognised that different people will give different versions of the same events depending on their perspective. There is a need to distinguish fact, opinion and point of view. Attitude or circumstances may influence individual interpretation of events.

36.3 Collection of evidence from varying sources

1. An attempt should be made to place the events in a sequence and show the links between them and their relative importance.
2. It should be kept in mind that judging the reliability of sources, while recognising that the "truth" may not always be ascertainable.
3. Events usually have more than one cause and usually more than one

consequence.

4. If one can understand why people behaved as they did, then links between motive, cause and consequence may emerge.
5. In practise evidence is assembled and hypothesis tested as it is collected.

However, at the conclusion a coherent picture should emerge in the form of a written report of the events to clearly establish what happened and why. The investigator must test and assess the evidence in terms of its relevance, reliability, and relative importance.

Resolution of conflicting or incomplete evidence should be attempted but may be impossible.

Compare conditions with suitable standards and existing controls

The objective here is to decide whether suitable standards or controls have been established to control the factors influencing the event, and if these standards or controls exist, whether they are suitable and sufficient. If the standards and controls were suitable and sufficient, were they applied and implemented in practice?

36.4 Establish immediate and underlying causes

The collection of evidence will usually identify the immediate causes which led up to the event. The investigator should try to determine what led to the immediate causes by establishing underlying causes. Remedying underlying causes will result in more effective prevention of reoccurrence of the event.

Some questions which will assist in investigation follow:

1. Who was injured?
2. Who saws the accident?
3. Who was working with the person at the time?
4. Who else was involved?
5. Who was supervising?
6. What events and circumstances existed before the accident?
7. What is the damage or injury?

8. What is the description of the injury?
9. What were people doing at the time?
10. What equipment, tools, substances or plant were being used at the time?
11. What procedures were in place?
12. What similar accidents or near misses have occurred?
13. What did witnesses see?
14. What training had been given?
15. What were the causes of the accident?
16. What activities were occurring in a 24-hour period prior to the accident (both work and non-work)?
17. When did the accident occur?
18. When did the person start shift or work?
19. Why did the injury occur?
20. Why were procedures not in place?
21. Why was personal protective equipment not being used?
22. Why was the hazard not identified?
23. Where did the accident occur?
24. Where did the damage occur?
25. Where were the witnesses at the time?
26. How did the accident occur?
27. How could the accident be avoided?

36.5 Fact-Finding

Fact-Finding investigation is very important to ascertain the cause of accident. A scientific fact-finding enquiry must have followings:

1. Gather evidence from many sources during an investigation.
2. Get information from witnesses and reports as well as by observation.
3. Interview witnesses as soon as possible after an accident. Inspect the accident site before any changes occur.
4. Make photographs and sketches of the accident scene.
5. Record all pertinent data on maps.
6. Get copies of all reports.
7. Documents containing normal operating procedures, flow diagrams, maintenance charts, or reports of difficulties or abnormalities are particularly useful.

8. Keep complete and accurate notes in a bound notebook. Record pre-accident conditions, the accident sequence, and post-accident conditions.
9. In addition, document the location of victims, witnesses, the position of rolling stock, track, signal gears, etc. should also be collected.

36.6 Taking statement of the witnesses

In general, experienced personnel should conduct interviews. If possible, the team assigned to this task should include an individual with a legal background. In conducting interviews, the team should:

1. Appoint a person, who led the group of investigator or enquiry committee.
2. Get preliminary statements as soon as possible from all witnesses.
3. Locate the position of each witness on a master chart (including the direction of view).
4. Arrange for a convenient time and place to talk to each witness.
5. Explain the purpose of the investigation (accident prevention) and put each witness at ease.
6. Listen, let each witness speak freely, and be courteous and considerate.
7. Take notes without distracting the witness. Use a tape recorder only with consent of the witness.
8. Use sketches and diagrams to help the witness.
9. Emphasize areas of direct observation. Label hearsay accordingly.
10. Be sincere and do not argue with the witness.
11. Record the exact words used by the witness to describe each observation. Do not "put words into a witness' mouth."
12. Word each question carefully and be sure the witness understands.
13. Identify the qualifications of each witness (name, address, occupation, years of experience, etc.).
14. Supply each witness with a copy of his or her statements. Signed statements are desirable.

After interviewing all witnesses, the team should analyze each witness' statement. They may wish to re-interview one or more witnesses to confirm or clarify key points. While there may be inconsistencies in witnesses' statements, investigators should assemble the available testimony into a logical order. Analyze this information along with data from the accident site.

- Not all people react in the same manner to a particular stimulus. For example, a witness within close proximity to the accident may have an entirely different story from one who saw it at a distance.

- Some witnesses may also change their stories after they have discussed it with others. The reason for the change may be additional clues.
- A witness who has had a traumatic experience may not be able to recall the details of the accident.
- A witness who has a vested interest in the results of the investigation may offer biased testimony.
- Finally, eyesight, hearing, reaction time, and the general condition of each witness may affect his or her powers of observation.
- A witness may omit entire sequences because of a failure to observe them or because their importance was not realized.

36.7 Problem Solving Techniques

Accidents represent problems that must be solved through investigations. Several formal procedures solve problems of any degree of complexity. This section considers these problem-solving procedures.

36.7.1 The Scientific Method

The scientific method forms the basis of nearly all problem-solving techniques. It is used for conducting research. In its simplest form, it involves the following sequence: making observations, developing hypotheses, and testing the hypotheses.

Even a simple research project may involve many observations. A researcher records all observations immediately. A good investigator must do the same thing. Where possible, the observations should involve quantitative measurements. Quantitative data are often important in later development and testing of the hypotheses. Such measurements may require the use of many instruments in the field as well as in the laboratory.

When making observations, the investigator develops one or more hypotheses that explain the observations. The hypothesis may explain only a few of the observations or it may try to explain all of them. At this stage, the hypothesis is merely a preliminary idea. Even if rejected later, the investigator has a goal toward which to proceed.

Test the hypothesis against the original observations. A series of

controlled experiments is often useful in performing this evaluation. If the hypothesis explains all of the observations, testing may be a simple process. If not, either make additional observations, change the hypothesis, or develop additional hypotheses.

As with scientific research, the most difficult part of any investigation is the formulation of worthwhile hypotheses. Use the following three principles to simplify this step:

1. **The principle of agreement**
   An investigator uses this principle to find one factor that associates with each observation.
2. **The principle of differences**
   This principle is based on the idea that variations in observations are due only to differences in one or more factors.
3. **The principle of concomitant variation**
   This principle is the most important because it combines the ideas of both of the preceding principles. In using this principle, the investigator is interested in the factors that are common as well as those that are different in the observations.
   In using the scientific method, the investigator must be careful to eliminate personal bias. The investigator must be willing to consider a range of alternatives. Finally, he or she must recognize that accidents often result from the chance occurrence of factors that are too numerous to evaluate fully.

36.7.2 Change Analysis

As its name implies, this technique emphasizes change. To solve a problem, an investigator must look for deviations from the norm. As with the scientific method, change analysis also follows a logical sequence. It is based on the principle of differences described in the discussion of the scientific method. Consider all problems to result from some unanticipated change. Make an analysis of the change to determine its causes. Use the following steps in this method:

1. Define the problem (What happened?).
2. Establish the norm (What should have happened?).
3. Identify, locate, and describe the change (What, where, when, to what extent).
4. Specify what was and what was not affected.

5. Identify the distinctive features of the change.
6. List the possible causes.
7. Select the most likely causes.

36.7.3 Sequence Diagrams

Gantt charts are sequence diagrams. Use them for scheduling investigative procedures. They can also aid in the development of the most probable sequence of events that led to the accident. Such a chart is especially useful in depicting events that occurred simultaneously.

36.7.4 Failure Mode and Effect

Analysis Failure mode and effect analysis (FMEA) determines where failures occurred. Consider all items used in the task involved in the accident. These items include people, equipment, machine parts, materials, etc. In the usual procedure, FMEA lists each item on a chart. The chart lists the manner or mode in which each item can fail and determines the effects of each failure. Included in the analysis are the effects on other items and on overall task performance. In addition, make evaluations about the risks associated with each failure. That is, project the chance of each failure and the severity of its effects. Determine the most likely failures that led to the accident. This is done by comparing these projected effects and risks with actual accident results.

36.7.5 Fault Tree Analysis

Fault tree analysis (FTA) is a logic diagram. It shows all the potential causes of an accident or other undesired event. The undesired event is at the top of a "tree." Reasoning backward from this event, determine the circumstances that can lead to the problem. These circumstances are then broken down into the events that can lead to them, and so on. Continue the process until the identification of all events can produce the undesired event. Use a logic tree to describe each of these events and the manner in which they combine. This information determines the most probable sequence of events that led to the accident.

INTRODUCTION OF ACCIDENT ENQUIRY

37

The main purpose of an accident inquiry is to prevent future accidents. This can be achieved only if the real cause(s) of the accident and the underlying circumstances, which has caused the accident is/are established. While doing the enquiry, following points must be kept in mind:

1. The inquiry committee shall not be satisfied merely with the determination of the immediate cause or causes of the accident, but shall look for, elicit necessary evidence and ascertain the contributing factors, if any which have led the staff to commit the breach of rules and shall also go fully into the matter of the extenuating circumstances, if any.
2. To examine whether there has been any laxity/delay in rendering relief and restoring through communications.
3. To formulate proposals for preventing recurrence.

37.1 Classification of accident inquiries

Inquiries are classified as under:

1. Inquiry held by the Commissioner of Railway Safety.
2. Joint Inquiry ordered by the General Manager/Chief Safety Officer of which the Commissioner of Railway Safety, the Magistrate and

the Police are to be advised.

3. Inter-Departmental Inquiry of Officers ordered by the General Manager/Chief Safety Officer or Inter-Departmental Inquiry of Officers or Senior Subordinates ordered by the Divisional Railway Manager.
4. Where Joint Inquiry is not considered necessary, Departmental Inquiry by the departments concerned ordered by the Divisional Railway Manager.

   An Officer or senior subordinate conducting a Preliminary Inquiry is authorised to examine and take the deposition of employees of all departments. These depositions shall be produced at any subsequent inquiry and shall be included in the general evidence.

37.2 Accident Inquiry by the Railways

While ordering the enquiry following point must be kept in mind:

1. All serious accident shall be inquired into by the Commissioner of Railway Safety.
2. In case CRS or CCRS is not in a position to inquire into serious accident cases involving coaching train, notified to him under section 113 of Railway Act, the inquiry shall be carried out by a Committee of SA Grade Officers and CSO of the Railway shall be the Convener/Chairman of such Committee. The Accident Inquiry Report of the Committee shall be accepted by the General Manager of the Zonal Railway. (CM No.5 dated 16.01.2018) .
3. All cases of collisions falling under A-1 to A-4 categories shall be inquired into by a Committee of SAG Officers unless the same is being inquired by CRS with GM as the Accepting Authority.
4. In all SAG level accident inquires, PCSO/CSO should be made Convenor of the Inquiry Committee. (CM No.8 dated 04.01.2023)
5. All other consequential train accidents shall be inquired by Dy. CSOs from Safety Department to be nominated by GM with the GM as the accepting authority.
6. All other accidents shall be inquired into by a Committee of Senior Scale or Junior Scale Officers as decided by respective DRMs with DRM as the accepting authority.

7. All yard accidents shall be inquired into by a committee of Senior Supervisors with Sr. DSO/ DSO as accepting authority.
8. All cases of Indicative Accidents shall be inquired into by a committee of Senior or Junior Scale Officers with DRM as the accepting Authority except all cases of Signal Passing at Danger (SPAD) which shall be inquired into by a JA Grade Committee of officers at Divisional level with Sr. DSO/DSO as one of the members. (CM No.5 dated 16.01.2018)

   (a) In all JAG level inquiries, Dy CSO/Sr. DSO should be the convenor of the Inquiry Committee. (CM No.8 of accident manual, dated 04.01.2023)
9. General Manager or DRM can have the inquiry conducted by a Committee of higher levels of officers than the above-mentioned levels depending upon the seriousness of accident.
10. In accident cases wherein the inquiry Committee determines responsibility on the Staff of Foreign Railway, the inquiry Report should be put up to the Principal Head of the Department of concerned department of the Railway on which the accident took place through CSO after which such inquiry report shall be accepted by the AGM (instead of DRM). Finalization of Inter-Railway DAR cases arising out of such inquiry reports be followed up by the Principal Head of the Department of the concerned department of the Railway on which the accident took place. If suitable response is not received from the respondent Railway at General Manager' level, then the case should be referred to Railway Board. In case foreign Railway staff held "blameworthy" only, the accident inquiry case may be accepted by DRM. (CM No.5 dated 16.01.2018)
11. All cases of equipment failure shall be inquired into by Senior Supervisors/ Supervisors of respective departments.
12. All inquiries will be ordered by the concerned DRM except for inquiries falling under item (ii), (iii) and (iv) of the above wherein the General Manager will order the inquiries. (CM No. 04 dated

21.11.2017)

37.3 Acceptance of responsibility by departments concerned

Irrespective of whether or not a Joint or Interdepartmental Enquiry has been ordered by the Chief Safety Officer, the Divisional Safety Officer shall be advised, within two days immediately after the date of occurrence of an accident by the other Divisional Officers concerned whether or not their respective departments accept responsibility.

1. If no advice is received from a Divisional Officer concerned within this time limit, the Divisional Safety Officer shall assume that no department accepts responsibility.
2. When any department accepts responsibility, the Divisional Safety Officer shall immediately put up the case to the Divisional Railway Manager who may order a Departmental Enquiry.
3. If no department accepts responsibility, the Divisional Safety Officer shall at once put up the case to the Divisional Railway Manager who will decide and order an Interdepartmental Enquiry.
4. No advice regarding acceptance of responsibility need be sent in the case of accidents at level crossings, accidents resulting in injury to persons and accidents resulting in damage to public property.
5. No advice regarding acceptance of responsibility need be sent in cases where the railway is not responsible for the accident, e.g., accident due to heavy rain or wind or other 'Act of God', trespassers run over and killed or injured.

Note: Accidents connected with the fixed signal or the Trap (derail or derailing switch or trap points) or the junction points between the traffic yard and locomotive yard or between the traffic yard and an engineering siding shall be considered as having taken place in the traffic yard.

37.4 Special report

A Special Report on an accident is a brief narrative report and it shall be submitted in the cases indicated in Rule 10.28.

1. It shall contain only the facts of the case, relevant particulars from the statement of staff, the conclusions regarding the cause of the accident and the culpability of staff, together with the Rules

infringed.

2. When a Special Report contains any detail, which is in supersession of what has been furnished already in the accident message, this supersession shall be specifically indicated at the relevant place in the Special Report.
3. The 'matters brought to light' in the course of the investigation of the accident and suggestions, if any, regarding the steps to be taken to avoid a recurrence of the accident shall be incorporated in separate paragraphs.
4. Neither in the Special Report nor in the covering letter forwarding the report nor in the remarks on Special Report shall any reference be made to the disciplinary action to be taken against the staff held culpable. Only on receipt of the orders of the Chief Safety Officer regarding the finding in the Special Report, shall disciplinary action be taken by the appropriate authorities in accordance with the Discipline and Appeal Rules. The actual punishment imposed on the staff shall be communicated, in due course to the Chief Safety Officer.
5. The Divisional Officers concerned shall frame the Special Reports.
6. In the case of accidents where only the staff of the Railway Protection Force and the Fire Service are involved, the Chief Security Commissioner, Railway Protection Force shall submit a Special Report (in duplicate) to the Chief Safety Officer.
7. In the case of accidents where the Transportation (Traffic) Department accepts sole responsibility but the crew of the locomotive or electric unit are involved, the Divisional Safety Officer and the Divisional Mechanical Engineer or the Divisional Electrical Engineer(Traction) shall submit the Special Report jointly.
8. Where a Special Report is submitted jointly by more than one Divisional Officer a joint Special Report shall be framed and signed by all the Divisional Officers concerned.

In the case of Special Reports by departments other than the

Transportation (Traffic) Department where Transportation (Traffic) staff are involved, the Divisional Officer of the department concerned shall consult the Divisional Safety Officer to enable the responsibility on the Transportation (Traffic) staff involved to be adjudged properly.

37.5 Joint and inter - departmental inquiries

Joint inquiries will be ordered by the General Manager/Chief Safety Officer specifying the Officers who shall constitute the inquiry committee.

Inter - departmental inquiries will normally be ordered by the Divisional Railway Managers. In such cases, the inquiry Committee shall generally consist of Officers or Senior Subordinates of at least three departments including the departments prima facie and likely to be responsible for the accident. In specific cases, where considered necessary, Inter-departmental inquiries will be ordered by the Chief Safety Officer. In such cases, the Chief Safety Officer will specify the Officers or Senior Subordinates who shall constitute the inquiry Committee.

1. The Senior most officer in all cases shall preside. Seniority shall be decided by rank and Officers officiating or temporary in a rank shall be on par with Officers confirmed in that rank.
2. The relative seniority in any one rank shall be based on the date of increment on junior time scale.
3. In the event of the date for increment on junior time scale being the same in the case of two Officers of the same rank, the basic pay shall decide seniority; if the basic pay is also the same, the length of service in the rank shall decide seniority; if the length of service in that rank is also the same age shall decide seniority.
4. Group A Officers shall rank higher than Group B Officers.
5. When the inquiry Committee consists of Senior Supervisors only, the seniormost official, belonging to any department, shall preside.

37.6 Joint inquiry when dispensed with

Whenever a Reportable train accident, such as described in section 113 of the Act, has occurred in the course of working a Railway, the Head of Railway Administration concerned shall cause an inquiry to be promptly made by a committee of Railway Officers (to be called a 'Joint Inquiry') for the thorough investigation of the causes which led to the accident.

Provided that such an inquiry may be dispensed with-

(a) If any inquiry is to be held by the Commissioner of Railway Safety under Rule 2 of the Statutory Investigation into Railway Accidents Rule, 1998 or a Commission of Inquiry appointed under the Commissions of Inquiry Act, 1952 (60 of 1952) or any other authority appointed by the Central Government to which all or any of the provisions of the said Act have been made applicable under Rule 2 of the Statutory Investigation into Railway Accident Rules, 1998; or

(b) If there is no reasonable doubt as to the cause of the accident; or

(c) If any department of the Railway administration concerned intimates that it accepts all responsibility in the matter.

i) Where such inquiry is dispensed with under any of the clause (b) or (c) of the Provision to sub rule (i) it shall be the duty of the Head of the Department of the railway administration responsible for the accident to make such inquiry (to be called a 'Departmental Inquiry') as he may consider necessary and if his staff or the system of working is at fault, to adopt or suggest such measures as he may consider necessary for preventing a recurrence of similar accidents.

(A) Notice of joint inquiry

i) Whenever a joint inquiry is to be made, the Head of the Railway Administration concerned shall cause notice of the date and time at which the inquiry will commence to be given to the following Officer, namely:

(a) The District Magistrate of the district in which the accident occurred, or such other Officer as the State Government may appoint in this behalf, the Superintendent of the Railway Police and the District Superintendent of Police.
(b) The Commissioner of Railway Safety for the section of the railway on which the accident occurred; and
(c) The Head of the Railway Police having jurisdiction at the place where the accident occurred or if there are no Railway Police, the Officer in charge of the police station having jurisdiction at such place.

ii) The date and time at which the inquiry will commence shall be fixed so as to give the Officers mentioned in sub rule (i) sufficient time to reach the place where the inquiry is to be held.

iii) When a Joint Inquiry is held into an accident on receipt of information about the inability of the Commissioner of Railway Safety to hold an inquiry under sub rule (5) of rule (2) of the Statutory Investigation into Railway Accidents rules 1998, the Head of the Railway Administration concerned shall also issue a press note in this behalf inviting the public to tender evidence at the inquiry or send information relating to the accident to the Joint Inquiry Committee at an address specified in the press note.

(B) Arranging of joint and inter-departmental inquiries

i) When a Joint or Inter-departmental inquiry is ordered and the date of the enquiry is not fixed, the Divisional Railway Manager shall settle the date and place, in concert with and, as far as can be arranged, to suit the convenience of all departments; but, in all cases, the inquiry shall be held at the station nearest to the site of the accident and within three days after the accident.

ii) The date once fixed shall not be changed except in case of absolute necessity.

iii) The representative of each department shall be responsible for summoning and arranging for the attendance at the inquiry of the staff of his own department who may be able to give

evidence in the case.

iv) The Presiding Officer shall arrange for the attendance of any other witness whose presence he considers desirable or whom any other member of the committee wishes to have examined.

(C) Method of conducting joint and inter - departmental inquiries-

i) Before starting the inquiry, issues shall be framed, and the evidence confined to settling these issues as far as possible. Witnesses shall not be permitted to make long irrelevant statements, but from the outset shall be asked questions relevant to the point at issue, after which their evidence, as recorded shall be read over to them, and they shall be asked if they have anything to add. Witnesses shall be cross-examined and re-examined if necessary to elicit important details. Irrelevant matter shall be excluded as much as possible.

ii) If a witness has given a statement prior to the inquiry, that statement shall first be read over to him and recorded as his deposition. The witness shall also be specifically asked to state whether he has anything to depose in addition to, or in modification of, that statement and his reply recorded, and his signature obtained. Any further evidence on the part of the witness shall be the outcome of cross-examination and no fresh independent statements shall be recorded. The questions put to the witness in the cross-examinations and the answers shall be recorded then and there.

iii) If a witness in his statement gives evidence of facts which have occurred and which are contrary to the rules and regulations and which render him culpable of neglect of violation of the rules and regulations, it shall be elicited from the witness, during his examination, whether he is aware that the facts stated by him are contrary to the rules and regulations in force.

iv) The evidence of any Officer (including a member of the committee) who might have been present when the accident occurred shall be recorded.

v) The Inquiry Officer or Committee shall not be satisfied merely with the determination of the immediate cause or causes of the accident, but shall look for, elicit necessary evidence, and ascertain the contributory factors, if any, which have led the staff to commit the breach of rules and shall also go fully into the matter of the extenuating circumstances, if any, which have a bearing on the accident. Contributory factors are such factors as an irregular and unauthorized method of working followed at the station as a matter of custom, general laxity in the working having taken root at the station for want of proper supervision, etc., which have conducted to the breach of rules in the particular accident enquired into. Extenuating circumstances are such circumstances as inadequacy of signalling and interlocking equipment or other safety devices (such as interlocking key box, point indicator, etc.,), inadequacy or absence of communication equipment (such as telephones, key transmitters, etc.,) resulting in frequent trips on the part of the station staff over long distances, impossibility, especially at peak periods of carrying out all the operations and duties and operations laid down for the staff, absence of minimum staff required to perform all the duties and operations laid down, impracticability of complying with the Station Working Rules, staff working overtime owing to want of timely relief, etc. Considerable care shall be exercised in assessing the extenuating circumstances. The standards considered desirable shall be correlated to the workload at the station and shall be comparable to the standards obtaining at other similar stations.

vi) The Inquiring Officer or Committee shall also duly note matters brought to light in the course of the inquiry, which, though not having a direct bearing on the accident, are such as might lead to accidents of any other descriptions as it is essential that such potential dangers shall be taken note of and shall be eradicated without delay.

vii) In the case of Joint Inquiries, it is not necessary for the members of the Magistracy and Police to attend the deliberations in regard to the findings or to sign the Joint Inquiry Proceedings, but they may ask any questions while the examination of witnesses is going on and the answers given to such questions shall be recorded as part of the proceedings.

Note: Before commencement of inquiry, the witnesses while tendering evidence before the inquiry committee should be advised to speak only the truth and nothing but the truth. They should be warned that they will be taken up under DAR / Railway Service Conduct Rules if found lying.

(D) Proceedings of joint or interdepartmental inquiries

A report of the proceedings shall be written by the president or by someone deputed by him for this duty. The report may be typed, in Acc.18 (A) to 18(J) and any correction in it shall be initialed by the president. The signature of the witness shall be obtained then and there, all corrections being attested by the witness. It shall contain the following sequence: -

37.7 Departmental inquiry

A departmental inquiry will be ordered by the Divisional Railway Manager. The proceedings of the departmental inquiry shall be drawn up in the same forms as those prescribed for interdepartmental inquiries and the rules in regard to the conduct of interdepartmental inquiries shall apply to the conduct of departmental inquiries also.

37.7.1 Requirements in a departmental, interdepartmental and joint inquiry

i) The report should be prepared in the prescribed format and the summary should invariably be given as the top sheet in accordance with pro-forma in Acc.18(A) followed by other details subsequently.

ii) The sketch and all the details of the inquiry proceedings should be legible and in such a fashion so that some facts can be

comprehended from these details.

iii) It is the primary responsibility of the inquiry committee to work out the mechanics of the accident and not only mention certain defects and deficiencies in rolling stock or in the track or signalling or driving technique or operational deficiencies.

iv) A copy of a few photographs having bearing on inquiry findings or mentioned in the proceedings should be invariably annexed; and

v) In case of sabotage or accidents at level crossings not attributable to dereliction on the part of Railway or its employees, brief details of Police Report should be indicated with their current status.

37.8 Proforma of Accident Inquiry Report

1. **Form Acc. 18 (A) – Summary.**
2. **Form Acc.18 (B) –**
   List of members of the committed and other officials attending.
3. **Form Acc.18 (C) –**
   Descriptive account of the accident, which shall be brief record of the actual facts and shall inter alia, contain the information as given in Specimen Form Acc.18.C in Appendix F:-
   The descriptive account shall be confined to a brief but clear description of the accident and shall contain no reference to the evidence. The evidence shall be left to speak for itself.
   Note: Only such of the above items as are directly relevant to the accident under inquiry shall be included.
4. **Form Acc.18(D) –**
   List of witnesses examined with their names, designation and staff numbers.
   Each witness shall be assigned a number which, in addition to being entered after the name of the witness at the signature at the end, as 'Witness No ' and in the proceedings, wherever he is referred to.
   All particulars required by Form Acc.18(E) of the inquiry proceedings shall be given in the case of each witness. In the case of witnesses belonging to train or station staff, the hours of

duty and rest shall also be recorded.

5. **Form Acc.18(E) –** Deposition of witnesses.
6. **Form Acc.18(F) – Reasons for findings.**

The reasons for findings should, after arriving at the cause of the accident, also indicate the sequence of events and the dynamics of the accident. Only as a result of discussion of evidence whereby conflicting evidence is discussed and evaluated and valid evidence brought out can conclusions be reached. This shall embody the following three items in the three separate paragraphs: -

(a) Discussions of all conflicting evidence and the committee's deductions there from.
(b) The contributory factors, if any; and
(c) The extenuating circumstances, if any.

In the absence of either conflicting evidence, contributory factors or extenuating circumstances in a particular accident, this shall be specifically mentioned. vii) viii) ix)

7. **Form Acc.18(G) – Joint Finding.**

(a) The finding shall be concise and clear.
(b) It shall state the cause or causes of the accident, the staff responsible therefor (the staff primarily held responsible being separated from others) and the Rule or Rules or Instructions violated by each of the staff held responsible.
(c) When the committee is of the opinion that the evidence given by a witness is wilfully false, they shall record this under the heading 'matters brought to light'.

8. **Form Acc.18(H) – Matters brought to light during the inquiry.**
9. **Others matters brought to light**

Matters brought to light during the inquiry which, though not having a direct bearing on the accident, indicate irregularities in working which might lead to accidents of any other description, shall be mentioned. In the absence of any such matter, a 'Nil'

entry shall be made in Form Acc.18 (H) and submitted.

10. **Form Acc.18(I) – Suggestions.**
    Suggestions for the prevention of similar accidents, based not only on the cause or causes of the accident but also the contributory factors (if any) and the extenuating circumstances (if any), shall be made. If there are no suggestions to be made a 'Nil' entry shall be made in Form Acc.18 (J) and submitted.
11. **Form Acc.18(J) – Relief measures, etc.**
    An important aspect of all accidents is the relief arrangements made. It is, therefore, absolutely essential that the inquiry committee shall go into the adequacy and promptness of relief arrangements. A detailed note on this aspect along with failures should be highlighted in every accident inquiry, fixing staff responsibility wherever possible.
12. **Appendix for damage cause in accidents**
    An 'Appendix' stating the damage (if any) sustained by the permanent way and/or rolling stock and embodying a list of passengers and/or Railway employees injured or killed.
13. **Detailed dimension sketch**
    When necessary, a detailed dimensioned sketch illustrative of the accident, which must be jointly signed.
14. **The records must be accompanied with enquiry report.**
    The following basic records and documents must necessarily accompany the accident inquiry report-
    1. Combined Train Report of crew.
    2. Brake Power Certificate for train.
    3. Speedometer chart.
    4. Train Signal Register entries of adjacent stations.
    5. The Control Chart.
    6. The statement of senior supervisors and Officers at site.
    7. Doctor's report, in case staff have been examined by a doctor.
    8. Map showing jurisdiction of concerned inspectors

9. Track diagram showing GMT carried.
10. Joint observation of coaches/wagons involved.
11. PRO/POH details of coaches/wagons involved.
12. Copy of Rough Journal.
13. Keyman and Gangman diary.
14. Photos and video taken at the site.
15. Extract of coach repair register.
16. Extract of logbook of loco.
17. Details of Rail crack/weld crack in the section for the past six months.
18. GMT report if any.

37.9 Signing of joint or interdepartmental Inquiry proceedings.

The proceedings shall be drawn up and signed before the committee disperses. If the members of the committee are not unanimous regarding the 'finding' or 'reasons for the finding' or 'suggestion', the dissenting member shall record his opinion separately and sign there under.

The president of the committee shall arrange for typed copies of the proceedings when the Joint or Interdepartmental enquiry proceeding is completed. The copies after verification shall be signed by each member of the committee and the president shall send sufficient number of copies to the Divisional Railway Manager.

37.10 Sub: Definition and Re-classification of Accidents on Indian Railways.

Attention is invited to Item No. 9 – Level of Enquiry of Board's letter No. 2000/Safety(A&R)/19/20 dated 13.12.2000. Board has made some additions/modifications in Item No. 9. A copy of revised Item No. 9 is enclosed which may please be incorporated in the above letter and circulated to concerned officers of all your divisions for information and compliance. Please acknowledge receipt of this letter.

Reference: Letter No. 2005/Safety(A&R)/6/3, dated 03.01.2006 is signed and issued by Amitabh, Director/Safety-III, Railway Board and is given to The General Manager and All Indian Railways including Metro

Railway, Konkan Railway Corporation and Railway Electrification.

Revised Item No. 9 to replace the existing item 9 at pages 6-7 of letter No. 2000/Safety(A&R)/19/20 dated 13.12.2000 regarding levels of accident inquiries to be conducted in various accidents:

Accident Inquiry by the Railways:

(i) All serious accidents shall be inquired into by the Commissioner of Railway Safety.

(ii) In case Commissioner of Railway Safety or Chief Commissioner of Railway Safety is not in a position to inquire into serious accident cases the Inquiry shall be done by **JA Grade Inquiry Committee with DRM as the accepting authority subject to the review by CSO.**

(iii) **All cases of collisions falling under A1 to A4 categories shall be inquired into by a committee of SAG officers with General Manager as the accepting authority unless the same is being inquired into by CRS.**

(iv) All other consequential train accidents except Unmanned Level Crossing Accidents shall be inquired into by a committee of JA grade officers and in its absence by Branch Officers. **DRM shall be the accepting authority for these inquiries subject to the review by CSO.**

(v) Consequential Unmanned Level Crossing accidents and all other train accidents shall be inquired into by a committee of Senior Scale or Junior Scale Officers as decided by respective DRMs **with DRM as the accepting authority.**

(vi) All yard accidents shall be inquired into by a Committee of Senior Supervisors **with Senior DSO/ DSO as accepting authority.**

(vii) All cases of indicative Accidents shall be inquired into by a Committee of Senior or Junior Scale Officers **with DRM as the accepting authority.**

(viii) **General Manager or DRM can have the inquiry conducted by a committee of higher levels of officers than the above-mentioned levels depending upon the seriousness of accident.**

(ix) **In accident cases wherein the Inquiry Committee determines responsibility on the Staff of Foreign Railway, the Inquiry Report should be put up to the Principal Head of the Department of the concerned department of the Railway on which the accident took place through CSO after which such inquiry report shall be accepted by the AGM (instead of DRM). Finalization of Inter-railway DAR cases arising out of such inquiry reports be followed up by the Principal Head of the Department of the concerned department of the Railway on which the accident took place. If suitable response is not received from the respondent railway at General Managers' level, then the case should be referred to Railway Board.**

(x) All cases of equipment failure shall be inquired into by Senior Supervisors/Supervisors of respective departments.

(xi) **All inquiries will be ordered by the concerned DRM except for inquiries into collisions as per item (iii) as above wherein General Manager will order the inquiries.**

37.11 Sub: Definition and Re-classification of Accidents on Indian Railways.

Ref: CSO/S.E. Railway's letter No. 50/319/AM/Pt.3/2 dated 13.02.2006.

Vide above letter South-Eastern Railway has sought clarification on Item No. (vii) of revised item No. 9 circulated vide Board's letter of even number dated 03.01.2006 regarding accepting authority in all cases of indicative accidents. The matter has been examined in this office and it has been decided to modify Item No. (vii) as under:

"All cases of indicative Accidents shall be inquired into by a Committee of Senior or Junior Scale Officers with DRM as the accepting authority except all cases of signal passing at danger shall be enquired into by a JA grade Committee of officers at Divisional level with Sr. DSO/DSO as one of the members".

The above revised contents may be circulated to concerned officers of all your division for information and necessary action.

Reference: Letter No.2005/Safety(A&R)/6/3, dated ****** is signed and issued by Amitabh, Director/Safety-III, Railway Board and is given to General Manager and All Indian Railways (except South-Eastern Railway) including Metro Railway, Konkan Railway Corporation and Railway Electrification.

37.12 Sub: Procedure for completion of Departmental accident inquiries.

It is observed from the Accident Manuals of the Zonal Railways that there is no uniformity in time schedule of completion of Inquiry Report/D&AR at various levels. In order to ensure timely completion of accident inquiry report/DAR following model time schedule should be adopted.

Schedule of Procedure for Completion of Accident Enquiry at Zonal Railway Level

S.N.	Model Time	Remarks
1	D	Date of Accident
2	D + 1	DRM /GM* shall order the inquiry, if no particular department accepts the responsibility.
3	D + 3	Committee shall convene the inquiry into the accident.
4	D + 7	Committee shall submit the inquiry report to DRM/GM*.
5	D + 10	Acceptance of inquiry report by the DRM/GM*.
6	D + 15	Inquiry reports will be finalized by CSO/AGM.
7	D + 20	Submission of inquiry report to CRS for the section of the Railways on which the accident occurred with the remarks. A copy of findings of the Inquiry Report to be sent to Railway Board.
8	D + 90	DAR action against responsible officials to be completed.

* For SAG Level Inquiries.

(i) DRM/GM may decide to have the inquiry conducted even if a particular department accepts the responsibility for enabling through review of associated systems involved in the accident.

(ii) Time limits prescribed above are the maximum period of time. Railway should make efforts to finalize the Inquiry Report and D&AR action as early as possible but not beyond the prescribed time limits.

Reference: Letter No.2005/Safety(A&R)/6/4, dated 02.02.2006 is given to The General Manager and All Zonal Railways.

37.13 Sub: Procedure for completion of Departmental accident inquiries.

In continuation of Board's letter of even number dated 2.2.2006, the S.No.5 of the Model Time Schedule for completion of accident enquiry at Zonal Railway level has been slightly modified as under:

S.N.	Model Time	Remarks
5.	D+10	Acceptance of inquiry report by the GM*/DRM/Sr. DSO (only for yard accident).

* For SAG Level Inquiries

The above revised contents may be circulated to concerned officers of all your division for information and necessary action.

The board desires that the above schedule model for completion of accident inquiries / DAR may please be circulated to all concerned officers of all divisions of your Railway for strict compliance.

Reference: Letter No.2005/Safety(A&R)/6/4, dated 24.02.2006 is signed and issued by Amitabh, Director/Safety-III, Railway Board and is given to The General Manager and All Indian Railways including Metro Railway, Konkan Railway Corporation and Railway Electrification/Allahabad.

37.14 Sub: Definition and Re-classification of Accidents on Indian Railways.

In continuation of Board's letter of even number dated 3-1-2006, Sub item (ii) of item no.9 have been slightly amended as under:

"In case CRS or CCRS is not in a position to inquire into serious accident cases, the inquiry should be done at least by a committee of JA grade officer, formed in consultation with CRS/CCRS."

The above revised contents may be circulated to concerned officers of all your division for information and necessary action.

Reference: Letter No.2005/Safety(A&R)/6/3, dated 08.05.2006 is signed and issued by Amitabh, Director/Safety-III, Railway Board and is given to The General Manager and All Indian Railways including Metro Railway, Konkan Railway Corporation and Railway Electrification/Allahabad.

Copy to: The Commissioner of Railway Safety, Ashok Marg, Lucknow-226001 – in reference to their letter No.S.11011/1/95-RS Vol. III dated 13-4-2006 for information.

THE STATUTORY INVESTIGATION INTO RAILWAY ACCIDENTS BY COMMISSIONER OF RAILWAY SAFETY (CRS)

38

The Commissioners of Railway Safety (CRS) functions independent of the Ministry of Railways under the administrative control of the Ministry of Civil Aviation. For administrative control of CRS organization, there is one Chief Commissioners of Railway Safety (CCRS), which is headquartered at New Delhi. The CRSs are dealing with matters pertaining to Safety of rail travel and train operation. They are also given responsibility of certain inspectorial, investigative, and advisory functions as laid down in The Railways Act, 1989. There are 9 Commissioners of Railway Safety (CRS) and each one exercising jurisdiction over one or more than one Zonal Railways and the Metro Railway, Kolkata and Konkan Railway Corporation Limited.

38.1 The inquiries to be conducted by Commissioner of Railway Safety

The Commissioners of Railway Safety (CRS) investigate Serious Railway accidents. Other train accidents are investigated by the Committee of Railway Officers. Reports of these inquiries are sent by Railways for review by the concerned CRS. However, if the

Commissioner desires, he can ask the Zonal Railway to enhance the scale of inquiry and/or send it back to Railways for re-inquiry after review.

38.2 The Function of the Commission of Railway Safety

The principal functions of the Commission of Railway Safety are:

1. Inspection of new railway lines prior to authorization for passenger traffic,
2. Periodical inspection of open lines or of any rolling stock,
3. Approval of new works and renewals affecting passenger carrying trains,
4. Inquiry under the Railways Act, 1989 into the cause of any accident on a railway,
5. General advice on matters concerning safety in train operations.

Section 113 of Railways Act, 1989 requires intimation of serious accidents to be sent to the Commissioner of Railway Safety. Under the Statutory Investigation into Railway Accidents Rules, 1998 issued by the Ministry of Civil Aviation, a statutory inquiry by the Commissioner of Railway Safety is obligatory in every serious accident to a train carrying passengers which is attended with loss of human life, or with grievous hurt, as defined in the Indian Penal Code, to a passenger or passengers in the train or with serious damage to railway property of the value exceeding Rs.2 crores, which keeps changing over the time as decided by Government of India.

While holding statutory inquiry, the Commission not only examines affected passengers but also invites members of the public to give evidence in person during the inquiry or to write to the Commission. Some of the serious accidents at manned or unmanned level crossings attended with loss of life or with grievous injury to

persons travelling in road vehicles are also inquired into by the Commission of Railway Safety.

The Commission, in its discretion, may hold inquiry into any other accident.

The Commissioner of Railway Safety stops or discontinues his inquiry whenever a Commission of Inquiry under the Commission of Inquiries Act, 1952 is appointed.

38.3 Rules for Inquiries by Commissioners (CRS)

Rules for holding Inquiries into railway accidents are contained in 'Statutory Investigation into Railway Accidents Rules -1998' notified by the Ministry of Civil Aviation in the Gazette vide G.S.R. No. 257 dated 26.12.98 and G.S.R. No. 63, dated 06.03.99. Gist of some rules and procedures for statutory investigations by the CRS are given below: -

38.4 When should a Statutory Inquiry be held?

Inquiry by the CRS is obligatory in every accident to a passenger carrying train, which is attended with loss of human life, or with grievous hurt as defined in the Indian Penal Code, to a passenger or passengers travelling inside the train or with damage to railway property of a value exceeding Rs. 2 Crores. Workmen's trains and ballast trains carrying workmen are passenger trains for this purpose and in the event of a workman getting killed or grievously hurt as a result of an accident to such train, inquiry is obligatory.

38.5 The type of accidents excluded from CRS inquiry

Cases of trespassers run over and injured or killed through their own carelessness or of passengers injured or killed through their own carelessness, and; Cases involving persons being Railway employee or holding valid passes/tickets or otherwise who are killed or grievously injured while traveling outside the rolling stock of a passenger train such as on foot board or roof or buffer but excluding the inside of vestibules between coaches, or run over at a Level Crossing or elsewhere on the Railway track by a train, and Level crossing accident where no passenger or Railway employee

is killed or grievously hurt; **unless the Chief Commissioner of Railway Safety or Commissioner of Railway Safety is of the opinion that the accident requires the holding of an inquiry by the Commissioner of Railway Safety.**

As per this Para, any accident which is attended with loss of life is considered to be serious accident. There are provisions in this para which are qualified by certain conditions which may necessitate statutory inquiry by the Commissioner even if a simple reading of it implies otherwise for example, cases of **trespassers run over and injured or killed through their own carelessness** are not covered under the definition of Serious Accidents where statutory inquiry is obligatory. However, a simple interpretation of this Para is that not all cases of trespassers are exempted from being considered as serious accidents because if it is so, simply **"trespassers run over and injured or killed"** would have been written without qualifying **"through their own carelessness".**

A logical corollary to this interpretation would be that cases of trespassers run over, or injured, or killed because of carelessness of Railway employees are **not exempted** and very much covered within the classification of "serious accidents". However, this can only be ascertained after an inquiry whether people got killed or injured because of carelessness of Railway employees or not. Under this provision, even accidents involving death which prima facie appear to be excluded from the purview of CRS inquiry may qualify as one and therefore, many such accidents are inquired into by the Commissioners from time to time.

38.6 When shall the Commissioner stop or discontinue his inquiry?

Whenever the Central Government appoints a Commission of inquiry under the Commission of Inquiries Act, the CRS shall discontinue his inquiry.

38.7 Procedure when Commissioner is unable to hold an inquiry

When a CRS is unable to take up an inquiry, he is required to inform

CCRS of the reasons as to why the inquiry cannot be done by him. In such a case, CCRS can himself conduct the inquiry or direct another CRS to inquire into the accident or the inquiry can be entrusted to the Railway itself, which will then appoint a Committee of Railway Officers to inquire into the accident. The Committee's inquiry report is submitted to the CRS, who scrutinizes it and in case he agrees with findings, forwards it to the CCRS. In case CRS disagrees with the findings, he returns the enquiry report with his observations to Railways for review.

38.8 Procedure for conducting a Statutory Inquiry

On receipt of the intimation of occurrence of a serious accident from the concerned Railway, CRS notifies his intention to hold an inquiry and at the same time, fixes and communicates the schedule date, time and place of inquiry. A formal notice of inquiry is sent to the concerned Railway with copy to the CCRS, Railway Board and the Secretary, Civil Aviation. He also asks the concerned railway to make arrangement for his visit to the accident site at the earliest possible time. Notice of inquiry is also published in Newspapers to invite public to give evidence in the inquiry in person or through written communication to the CRS. Officers of the local Magistracy and police are also notified of the dates, time and place of the inquiry. Accordingly, the CRS inspects the accident site along with the Railway Officers and thereafter conducts the statutory inquiry.

38.9 The Scope of Commissioner of Railway Safety Inquiry

CRS holds inquiries into the accidents with a view to ascertain the causes of the accident. Investigations are also carried out into the question, whether prompt and adequate steps were taken by the railway administration for relief measures such as provision of first aid, medical treatment and refreshments to passengers, evacuation of injured passengers and other facilities like arrangements for trans-shipment of passengers for completion of their journey to destination by running of duplicate trains etc.

Based on his inquiry, the CRS makes recommendations:

1. To prevent the recurrence of such accidents,
2. To lay down new rules or modifying existing rules of working for safe working,
3. To improve standards of signaling for safe train operation,
4. To improve standards of maintenance of signaling, track, bridges, rolling stock etc.
5. For speedy restoration of traffic,
6. For prompt relief measures and other passenger amenities etc.

He also comments on matters, observed by him during the course of his inquiry, which may not have any direct bearing on the cause of the accident under investigation, but which may, in some cases, affect the safe working of the railway and lead to accidents.

38.10 Telephonic advice to the Commissioner of Railway Safety

The Commissioner of Railway Safety should be given telephonic advice in case of the following accidents.

1. Any accident to a train carrying passengers, workman special or material train resulting in
    i. loss of life and/or grievous injury (or defined in the Indian Penal Code) to anybody traveling in the train, and /or
    ii. damage to Railway property exceeding a value of Rs.2 crores, and/or
    iii. interruption to running on any important through line for at least 24 hours.
2. Accidents at manned level crossings involving collision between a train and a road vehicle in which there is loss of life or grievous injury to passengers in the road vehicles. Passengers in the road vehicles include both driver and other occupants of road vehicles.
3. Collisions and derailment of goods trains in which there is loss of life or grievous injury to any person.

The telephonic advice should be given by any of the Officers of the division in the order of priority given below:

(1) Sr. Divisional Safety Officer

(2) Sr. Divisional Operations Manager
(3) Assistant Operations Manager (G).
(4) Assistant Operations Manager (M)

While reporting the accident to Central Control, it should be confirmed by Dy. Chief Controller in Divisional control that the Commissioner of Railway Safety has been informed over the phone about the accident by the DRM of the division.

38.11 Accidents to be reported to the Commissioner of Railway Safety by Post:

The Divisional Railway Manager shall send, as soon as possible, a typed copy of the accident message by post, to the Commissioner of Railway Safety in case of the following accident classes: -

1. D 4.
2. F 1 to 4.
3. G 1 to 4.
4. H 1 and 2.
5. J 4 & 5 (When the parting occurs outside station limits.)
6 J 6 (Failure of rolling stock on running trains – axles.)
7. K 1,2 and 4 to 6

38.12 All concerned' telephonic message to the Commissioner of Railway Safety (CRS)

The Commissioner of Railway Safety shall be included in the ‗All Concerned' telephonic messages in case of the following accident classes: –

A1 to A4;	B1, B2 & B3;
C1, C2 & C4;	D1 to D3;
K3;	N1 & N2.

38.13 Non-reporting of accidents to the Commissioner of Railway Safety

Excepting the accidents mentioned in paragraph 37.11 or 37.12 above which are reportable to the Commissioner of Railway Safety

by telephone or by post, no other accidents shall be reported to the Commissioner of Railway Safety either by telephone or by post.

Statement of accidents to the Commissioner of Railway Safety

The Chief Safety Officer shall submit to the Commissioner of Railway Safety the following statements of accidents: -

a) Monthly–Accidents coming under accident classes M-1 to M–3 & N–1.

b) Quarterly – A statement showing summaries of accidents under section 113 of the Railways Act 1989.

Statutory investigation into Railway Accidents - under Section 122 of the Railways Act, 1989 (24 Of 1989):

Inquiry into a serious accident by the Commissioner of Railway Safety:

1. Where the Commissioner of Railway Safety receives notice under Section 113 of the Railways Act 1989 of the occurrence of an accident which he considers of a sufficiently serious nature to justify such a course, he shall as soon as possible notify the Chief Commissioner of Railway Safety, the Railway Board and the Head of the Railway Administration concerned of his intention to hold an inquiry and shall, at the same time, fix and communicate the date, time and place for the inquiry. He will also issue or cause to be issued a Press note in this behalf, inviting the public to tender evidence at the inquiry and to send information relating to the accident to his office address.

2. While notifying his intention to hold an inquiry as aforesaid, the Commissioner of Railway Safety shall also inform the District Magistrate, and the Superintendent of Police of the District concerned.

For the purpose of this rule, apart from the nature of accidents mentioned in para 37.10 above, any other accident which in the opinion of CCRS or CRS requires the holding of an enquiry shall be deemed to be an accident of serious nature as to requiring the holding of an inquiry.

When the Chief Commissioner of Railway Safety

considers the holding of an inquiry into an accident necessary, he may either hold the inquiry himself or direct theCommissioner of Railway Safety to do so.

Explanation

i) The inquiry under this rule shall be obligatory only in those cases where the passengers travelling in the train, killed or grievously hurt.

ii) If a person travelling on the footboard or roof of a passenger train is killed or grievously hurt or if a person is run over at a level crossing or elsewhere on the railway track, an inquiry under this rule shall not be obligatory.

iii) Similarly, if in a collision between a road vehicle and a train carrying passengers at a level crossing, no train passenger is killed or grievously hurt, it shall not be obligatory for CRS enquiry.

iv) For the purpose of this rule, workmen's trains or ballast trains carrying workmen shall also be treated as passenger carrying trains and in the event of a workman being killed or grievously hurt as a result of an accident to the train, an inquiry under this rule shall be obligatory.

3. When an accident requiring the holding of an inquiry occurs at a station where the jurisdiction of two or more Commissioners of Railway Safety meet, the duty of complying with this rule shall devolve on the Commissioner of Railway Safety within whose Jurisdiction the Railway working such a station lies.

4. **(i)** If, for any reason, the Commissioner of Railway Safety is unable to hold an inquiry at an early date after the occurrence of such an accident, he shall inform the Head of the Railway Administration concerned and the Railway Board accordingly and he shall also inform the Chief Commissioner of Railway Safety of the reasons why an inquiry has not been held by himself.

(ii) On receipt of the proceedings of the Joint Inquiry (inquiry made by a Committee of Railway Officers) from the Head of the Railway Administration in accordance with rule 214 of Railway (Notices of and

Inquiries into accidents) Rules, 1973, the Commissioner of Railway Safety shall scrutinize the same. In case he agrees with the findings of the Joint Inquiry, he shall forward a copy of the report to the Chief Commissioner of Railway Safety along with his views on the findings and recommendations made. If on the other hand the Commissioner of Railway Safety, after examination of the joint inquiry proceedings, considers that an Inquiry should be held by himself, he shall, as soon as possible, notify the Chief Commissioner of Railway Safety, the Railway Board and the Head of the Administration concerned, of his intention to hold an inquiry. He shall at the same time, fix and communicate the date, time and place for the inquiry.

5. **(i)** Where having regard to the nature of the accident, the Central Government has appointed a Commission of Inquiry to inquire into the accident under the Commissions of Inquiry Act 1952 (60 of 1952) or has appointed any other authority to inquire into it and for that purpose has made all or any of the provisions of the said Act applicable to that authority, the Commissioner of Railway Safety to whom notice of the accident has been given shall not hold his inquiry. Where he has already commenced his inquiry, he shall not proceed further with it and shall hand over the evidence, records or other documents, in his possession relating to the inquiry to such authority as may be specified by the Central Government in this behalf.

(ii) If, as a result of the police investigation, a regular case is lodged in criminal court by the police, the Commissioner of Railway Safety shall discontinue his inquiry.

38.14 Attendance of Railway employees to attend Inquiries

When an inquiry under rule 228 of the Statutory Investigation into Railway Accidents Rules, 1973, or a judicial inquiry is being held, the Head of the Railway Administration concerned shall arrange for the attendance, as long as may be necessary, at the place of inquiry,

of all railway employees whose evidence is likely to be required at such an inquiry. Further, if the inquiry is to be held by the Commissioner of Railway Safety under rule 228 of Statutory Investigation into Railway Accident Rules, 1973, the Head of the Railway Administration concerned shall issue notice of the date, hour and place at which the inquiry will begin to the officers concerned. He shall also arrange for the attendance of the Divisional Officers concerned at the inquiry.

38.15 Officers to assist Commissioner of Railway Safety

When an inquiry under rule 228 is held, the General Manager will nominate an Officer of Senior Administrative rank or above who shall attend the inquiry held by theCommissioner of Railway Safety along with other Officers of lower rank who are normally required to assist the Commissioner of Railway Safety. The Divisional Railway Manager should also attend the inquiry held by the Commissioner of Railway Safety into train accidents personally, unless it is beyond his control due to very compelling reasons. This is to facilitate the inquiry officer in obtaining the evidence, maintain liaison with local Magistracy and the Police for completing the inquiry expeditiously.

38.16 A brief Preliminary Narrative Report

Where the Commissioner of Railway Safety has held an inquiry in respect of any of the accidents described in sub-rule (2) of rule 228, he shall submit a brief preliminary narrative report to the Railway Administration concerned, the Chief Commissioner of Railway Safety and the Railway Board simultaneously. The report shall be factual and shall not contain any reference for the people involved.

38.17 Final Report

Whenever the Commissioner of Railway Safety has made an inquiry under rule 228, he shall submit a report in writing to the Chief Commissioner of Railway Safety and shall forward a copy of the report each to

1. The Railway Board.
2. The Railway Administration concerned.
3. In the case of a Railway under the control of a State Government or Local Administration to such Government or Administration also.
4. The Magistrate, making the inquiry if a magisterial inquiry is being made; and
5. The Director, Intelligence Bureau, Ministry of Home Affairs, Government of India, if the commissioner of Railway Safety finds that the accident was caused by sabotage or train wrecking.

38.18 Action on the report by Railway Administration

Whenever the Head of the Railway Administration concerned receives a copy of the report of the Commissioner of Railway Safety under rule 230 of the statutory investigation into Railway Accidents Rules, 1973, he shall at once acknowledge its receipt. If he differs from the views expressed in the report, he shall at the same time submit his remarks thereon, or, if he is not able to do so immediately, he shall, in his acknowledgement of the report, inform the Commissioner of Railway Safety, of his intention to submit his remarks later. If the Head of the Railway Administration concerned considers the prosecution of any person or persons desirable, he shall immediately forward a copy of the report together with a statement of such persons to the District Magistrate of the District in which the accident occurred, or to such other Officer as the State Government may appoint in this behalf and to the concerned Police authorities. On receipt of the findings of the Commissioner of Railway Safety, the Police Authorities shall, as soon as possible, inform the Head of the Railway Administration concerned about their decision regarding launching of any prosecution.

a) **Report to Commissioner of Railway Safety —**
Whenever the Chief Safety Officer is required to submit his report

to the Commissioner of Railway Safety in accordance with rule 1011, he shall submit it within a fortnight of the receipt of the draft report from the Commissioner of Railway Safety. Heads of Departments who are referred to herein shall submit their remarks within five days of receipt of the reference from the Chief Safety Officer.

b) Advice to the Chief Commissioner of Railway Safety and the Railway Board –

In every case in which in accordance with rule 1011, the Chief Safety Officer shall submit his remarks to the Commissioner of Railway Safety or advise him his intention to submit his remarks later, a copy of the remarks or of the advice of his intention to submit his remarks later, as the case may be, as also a copy of every communication issued by the Chief Safety Officer in regard to the reports of the Commissioner of Railway Safety, shall be sent by the Chief Safety Officer directly to the Chief Commissioner of Railway Safety with a copy to the Railway Board.

c) Commissioner of Railway Safety to be informed of Punishment Awarded —

In cases where departmental action is taken against railway servants held responsible for an accident as a result of an inquiry by the Commissioner of Railway Safety, he shall be informed of the punishment finally awarded to the railway employees concerned.

38.19 Railways Remarks on the Suggestions

Whenever the report of the Commissioner of Railway Safety points to the necessity for or suggests a change in any of the rules or in the system of working of the railway, the Head of the Railway Administration concerned shall, while acknowledging the report, intimate the action taken or proposed to be taken to prevent a recurrence of similar accidents or shall inform the Commissioner of Railway Safety of its intention to report further on the proposals contained in the report of the Commissioner of Railway Safety.

38.20 Publication of Reports

Recommendations with regard to the publication of reports shall be

made by the Chief Commissioner of Railway Safety to the Central Government.

38.21 District Magistrate to attend CRS inquiry

Where no Magisterial inquiry is being made under clause (a) or (b) of rule 216 of the Railway (Notices of and inquiries into Accidents) Rules, 1973, the District Magistrate shall, as far as possible, attend the inquiry conducted by the Commissioner of Railway Safety personally, or depute some other Officer to represent him at the inquiry.

38.22 District Superintendent of Police to attend CRS inquiry

The District Superintendent of Police shall, as far as possible, also attend the inquiry conducted by the Commissioner of Railway Safety personally or depute some other Officer to represent him at the inquiry.

38.23 Technical matters

The Commissioner of Railway Safety shall, as far as possible, assist any Magistrate making a Judicial inquiry or an inquiry under rule 216 of Railway (Notices of and Inquiries into Accidents) Rules, 1973, or a Commission of Inquiry appointed under the Commissions of Inquiry Act 1952 (60 of 1952) or any other Authority appointed by the Central Government to which all or any of the provisions of the said Act have been made applicable, or whenever he may be called upon to do so for the purpose of clarification of any technical matters.

38.24 Powers of the Commissioner of Railway Safety

Nothing in these rules shall, except to the extent provided in sub-rule (6) of rule 228, be deemed to limit or otherwise affect the exercise of any of the powers conferred on the Commissioner of Railway Safety by sections 7 & 8 of the Railway Act, 1989.

Target dates for submission of returns: Target dates for the submission of Accident Returns to Commissioner of Railway Safety.

S. N.	Particulars ofreturns	Date by which tobe submitted by the Divisions to GM (T)	Date by which to be submitted by GM (T) to CRS
i	Monthly statement of train accidents	Monthly	By the end of the month.
ii	Monthly summary of fatal and serious injury cases to passengers and railway servants	By the 15th of following month to which the statement relates.	By the 3rd week of the following month to which the statement relates.
iii	Summaries of Section 113 of Railways Act statements.	Quarterly- within two days after following quarter to which the statement relates	Quarterly – within one week of the following quarter to which the statement relates.
iv	Report on the working of the Commission of Railway Safety.	. . . . .	Annually-By 7th April for the year ending 31st March.

38.25 Target for completion of CRS Inquiries

The following guidelines are hereby issued to Zonal Railways and different Directorates in order to ensure finalization of CRS inquiry reports within six months.

S. No.	Target	Activity
i	D	Day of accident
ii	D+3	CRS will commence his inquiry
iii	D+10	CRS will forward a brief preliminary narrative report, provisional findings, and immediate recommendations to CCRS, GM of Railway concerned, Railway Board and Secretary, Ministry of Civil Aviation. On receipt of the Preliminary Report in Railway Board, same will be forwarded to Directorates concerned for suitable action on immediate recommendations.
iv	D+30	(a) The GM of Railway concerned will furnish his Railways remarks alongwith the action taken report to CRS and Railway Board. Action taken by Directorates in Railway Board will be communicated to the Safety Directorate.
v	D+60	CRS will submit its detailed report to CCRS and forward a copy of the report to each of Authorities mentioned in rule 4 of the Statutory Investigation into Railway Accident Rules, 1973. On receipt of the final report, it will be put up to the DRM and PHODs concerned. CSO shall consolidate all these

		remarks and along with his remarks submit to GM for his final remarks. All these remarks along with GM's remarks shall be sent to CCRS, CRS and Railway Board / Directorate concerned for action on the Inquiry Report. The Directorate concerned shall take suitable action on recommendations and will guide Zonal Railways on important policy matters.
vi	D+90	On receipt of the final inquiry report, GM of Railway concerned shall forward his comments on the final inquiry report to CRS with copy to CCRS and Railway Board On receipt of final inquiry report, Safety Directorate will forward views of Safety Directorate to CCRS.
vii	D+110	CCRS will submit his note on inquiry report to Secretary /Ministry of Civil Aviation forwarding simultaneously copies thereof to Railway Board. Comments of CCRS will be forwarded to different Directorates for suitable action.
viii	D+140	Directorates concerned will submit an action report on recommendations of CRS and comments of CCRS, after getting the same approved by the Executive Director concerned. (a) In case, recommendation has been accepted and an instruction has been issued, 30 copies of the same should be forwarded to Safety Directorate. (b) In case, any recommendation is not acceptable, approval of the Board (Member concerned) must be obtained and communicated to theSafety Directorate.
ix	D+180	The Railway Board will communicate their views on the report to CCRS endorsing a copy to Zonal Railway. Railway shall finalize D & AR Inquiry and send details of staff held responsible along with the details of punishment imposed in each individual case.

MAGISTERIAL AND JUDICIAL INQUIRY

39

39.1 Magisterial inquiry

Whenever an accident, such as is described in Section 113 of The Railway Act, has occurred in the course of working a railway, the District Magistrate or any other Magistrate who may be appointed in this behalf by the State Government, may either-

a) himself make an inquiry into the causes which led to the accident; or

b) depute a subordinate Magistrate, who, if possible, should be a Magistrate of the first class, to make such an inquiry; or

c) direct investigation into the causes which led to the accident, to be made by the police:

Provided that where, having regard to the nature of the accident, the Central Government has appointed a Commission of Inquiry to inquire into under the Commission of Inquiry Act, 1952(60 of 1952), or has appointed any other authority to inquire into it and for that purpose has made all or any of the provisions of the said Act applicable to that authority, a Magistrate or a police officer shall not make his inquiry or investigation under this rule and, where he has already commenced the inquiry or investigation, shall not proceed further with it; and such Magistrate or police officer shall hand over the evidence, records or other documents in his possession relating to the inquiry or investigation to

such authority as may be specified by the Central Government in this behalf.

39.2 Notice of Magisterial inquiry

Whenever it is decided to make an inquiry under clause(a) or clause(b) of Rule 17, the District Magistrate or other Magistrate appointed as aforesaid or the Magistrate deputed under clause(b) of Rule 17, as the case may be, shall at once inform the Head of the Railway Administration concerned and the Divisional Railway Manager by telegraph, of the date and hour at which the inquiry will commence so as to enable the Railway Administration to summon the requisite expert evidence, and thereafter, he shall proceed to the scene of the accident and conduct the inquiry.

39.3 Judicial Inquiry

A Magistrate, making an inquiry under Rule 17, may summon any railway servant, and any other person whose presence he may think necessary, and after taking the evidence and completing the inquiry shall, if he considers that there are sufficient grounds for holding a judicial inquiry, take the requisite steps for bringing to trial any person whom he may consider to be criminally liable for the accident.

39.4 The result of magisterial inquiry to be communicated to the Head of the Railway Administration

The result of every inquiry or investigation made under Rule 17 shall be communicated by the Magistrate who has held such inquiry or investigation, to the Head of the Railway Administration concerned and to the Commissioner of Railway Safety.

Procedure for summoning railway servants to assist the Magistrate holding judicial inquiry-

1. If in the course of any judicial inquiry into an accident occurring in the course of working a railway, the Magistrate holding such inquiry desires the assistance of the Commissioner of Railway Safety or Head of the Railway Administration concerned , he shall issue a requisition to the Chief Commissioner of Railway Safety or the Railway Board, for the presence of the Commissioner of Railway Safety or the Head of the Railway Administration, starting at the same time the nature of the assistance required, and if the assistance of any Railway Officer is required the Magistrate shall issue a

requisition to the Head of the Railway Administration for his attendance in the court.

2. The requisition referred to in sub-section (1) shall state the nature of the assistance required. In summoning railway officials, the Magistrate shall take care to not to summon on the same day so large a number of employees, especially of one class, as to cause inconvenience to the working of the railway. In the case of serious accidents, the Magistrate may obtain reports from the Commissioner of Railway Safety and the Head of the Railway Administration concerned in regard to the accident, before finally concluding the judicial inquiry.

39.5 Communication of the decision of judicial inquiry to the Railway Administration, Commissioner of Railway Safety, and the State Government

On the conclusion of the judicial inquiry the Magistrate shall send a copy of his decision to the Head of the Railway Administration concerned and to the Commissioner of Railway Safety, and shall, unless in any case he thinks it unnecessary to do so, report the result of the inquiry to the State Government.

Police investigation – when to be dispensed with- report on loss of life, grievous hurt, or damage to railway property-

1. The Railway Police may make an investigation into the causes which led to any accident occurring in the course of working a railway and shall do so whenever-

a) any such accident is attended with loss of human life or with grievous hurt, or with serious damage to railway property of the value exceeding Rupees Two crore or has prima facie been due to any criminal act or omission, or

b) the District Magistrate or the Magistrate appointed under Rule 17 has given a direction under clause(c) of that rule:

Provided that where, having regard to the nature of the accident, the Central Government has appointed a Commission of Inquiry to inquire into it under the Commissions of Inquiry Act, 1952 (60 of 1952), or has appointed any other authority to inquire into it and for that purpose has made has made all or any of the provisions of the said Act applicable to that authority, or where a magisterial inquiry

is being held under clause (a) or clause (b) of Rule 17, the Railway Police shall not make an investigation under this rule , and, where they have already commenced their investigation shall not proceed further with it; and shall hand over the records or other documents in their possession relating to the investigation to such authority as may be specified by the Central Government in this behalf.

2. The Railway Police shall report, with as little delay as possible to the nearest Station Master, or where there is no Station Master, to the railway servant in charge of the section of the railway, on which the accident has occurred, every accident which may come to their notice occurring in the course of working a railway attended with loss of human life, or with grievous hurt or with serious damage to railway property of the value exceeding Rupees Two crore or which has prima facie been due to any criminal act or omission.

Status of police officer investigating the accident-

1. whenever an investigation is to be made by the Railway Police-

a) In a case in which an accident is attended with loss of human life or with grievous hurt, or with serious damage to railway property of the value exceeding Rupees Two crore: or

b) In pursuance of a direction given under clause (c) of Rule17, the investigation shall be conducted by the Head of the Railway Police of the area in which the accident has occurred, or if that officer is unable to conduct the investigation himself, by an officer to be deputed by him.

2. The officer deputed under sub-rule (1) shall ordinarily be the senior officer available, and shall whenever possible be a Gazetted Officer, and shall in no case be of a rank lower than that of an Inspector:

Provided that the investigation may be carried out by an officer-in-charge of a police station: -

i. In a case such as is referred to in clause(a) of sub=rule(1), if no loss of life or grievous hurt has been caused to more persons than one or no damage to railway property of value exceeding Rupees Two crore has been caused or there is no reason to suspect that any servant of the railway has been guilty of neglect of any rule relating to the working of the railway;

ii. In the case referred to in clause(b) of sub-rule)1, if the District Magistrate so directs.

Notice of police investigation-

The officer who is to conduct an investigation in pursuance of Rule24 shall at once inform the Head of the Railway Administration concerned and the Divisional Railway Manager by telegraph of the date and hour at which the investigation will commence so that, if possible, the presence of a railway official may be arranged for to watch the proceedings and to aid the officer making the investigation , and thereafter, he shall proceed without delay to the scene of the accident and conduct the investigation there so, however, that the absence of a railway official shall not be allowed to delay the investigation which shall be conducted as soon as possible after the accident has taken place.

Assistance by the District Police-

1. In every case to which Rule 24 applies, immediate information shall be given by the Railway Police of the area to the District Police, who, if so, required, shall afford all necessary assistance and shall, if occasion arises, carry the investigation beyond the limits of the railway premises. But the Railway Police of the area shall primarily be responsible for carrying on the investigation within such limits.
2. Subject to the provisions of these rules, the further prosecution of the case, on the conclusion of the police investigation, shall rest with the Railway Police.

39.6 Communication of the result of police investigation

The result of every police investigation shall be reported at once to the District Magistrate or other officer appointed in this behalf by the State Government, to the Head of the Railway Administration concerned or other officer appointed by him, and to the Commissioner of Railway Safety.

39.7 District Police to discharge duties of Railway Police

Where there are no Railway Police in the area, the duties imposed by Rules23, 24 and 25, sub-rule (2) of Rule 26, and Rule 27 on the Railway Police of the area, or on the head of such Railway Police, shall be discharged by the District Police or by the District Superintendent of Police, as the case may be.

39.8 Repeal and saving

The Railway (Notices of and Inquiries into Accidents) Rules,1973, are hereby repealed. Notwithstanding such repeal, anything done, or any action taken under the rules hereby repealed shall be deemed to have been done or taken under the corresponding provisions of these rules.

PART G:
IMPORTANT LEGISLATIONS ABOUT ACCIDENT AND ENQUIRY

IMPORTANT SECTIONS
OF THE RAILWAYS ACT, 1989
REGARDING RAILWAY ACCIDENTS

40

40.1 Sections of the Railway Act 1989 relating to Commissioner of Railway Safety:

Section 5:

Appointment of Chief Commissioner of Railway Safety and Commissioners of Railway Safety –

The Central Government may appoint a person to be the Chief Commissioner of the Railway safety and such other persons as it may consider necessary to be the Commissioners of Railway Safety.

Section 6:

Duties of Commissioner: -

The Commissioner shall –

1. Inspect any railway with a view to determining whether it is fit to be opened for the public carriage of passengers and report thereon to the CentralGovernment as required by or under this Act.
2. Make such periodical or other inspections of any railway or of any rolling stock used thereon as the Central Government may direct.
3. Make an inquiry under this Act into the cause of any accident on a railway;and

4. Discharge such other duties as are conferred on him by or under this Act.

Section 7:

Powers of Commissioner —

Subject to the control of the Central Government, the Commissioner, whenever it is necessary so to do for any of the purposes of this Act, may: -

1. Enter upon and inspect any railway or any rolling stock used thereon.
2. By order in writing addressed to a railway administration, require the attendance before him of any railway servant and to require answers or return to such inquiries as he thinks fit to make from such railway servant or from the railway administration; and
3. Require the production of any book, document or material object belonging to or in the possession or control of any railway administration which appears to him to be necessary to inspect.

Section 8:

Commissioner to be Public Servant the Commissioner shall be deemed to be a public servant within the meaning of Section 21 of the Indian Penal Code (45 of 1860).

Section 9:

Facilities to be afforded to Commissioners A railway administration shall afford to the Commissioner all reasonable facilities for the discharge of the duties or for the exercise of the powers imposed or conferred on him by or under this Act.

Section 10:

Annual report of Commissioners The Chief Commissioner of Railway Safety shall prepare in each financial year an annual report giving a full account of the activities of the Commissioners during the financial year immediately preceding the financial year in which such report is prepared and forwarded before such date as may be specified by the Central Government, copies thereof to the Central government, and that Government shall cause that report to be laid, as soon as may be, after its receipt before each

House of Parliament.

40.2 Sections Relating to Construction and Maintenance of Works:

Section 14:

Temporary entry upon land to remove obstruction, to repair or to prevent accident. –

1) Where in the opinion of a Railway Administration
   - **a)** There is imminent danger that any tree, post or structure may fall on therailway so as to obstruct the movement of rolling stock; or
   - **b)** Any tree, post, structure or light obstructs the view of any signal provided formovement of rolling stock; or
   - **c)** Any tree, post or structure obstructs any telephone or telegraph line maintained by it, it may take such steps as may be necessary to avert such danger or remove such obstruction and submit a report thereof to the Central Government in such manner and within such time as may be prescribed.

2) Where in the opinion of a railway administration
   - **a)** A slip or accident has occurred; or
   - **b)** There is apprehension of any slip or accident to any cutting, embankment, or other work on a railway, it may enter upon any lands adjoining the railway and do all such works as may be necessary for the purpose of repairing or preventing such slip or accident and submit a report thereof to Central Government in such manner and within such time as may be prescribed.

3) The Central Government may, after considering the report under sub-section (1)or sub-section (2), in the interest of public safety, by order, direct the railway administration that further action under sub-section (1) or sub-section (2) shall be stopped or the same shall be subject to such conditions as may be specified in that order.

40.3 Sections Relating to Opening of Railways:

Section 24:

Temporary Suspension of Traffic

When an accident has occurred on a railway resulting in a temporary suspension of traffic, and either the original lines of rails and works have been restored to their original standard or a temporary diversion has been laid for the purpose of restoring communication, the original lines of rails and works so restored, or the temporary diversion, as the case may be, may, without prior inspection by the Commissioner, be opened for the public carriage of passengers, subject to the following conditions, namely:-

(a) The railway servant in charge of the works undertaken by reason of the accident has certified in writing that the opening of the restored lines of rails and works, or of the temporary diversion will not in his opinion be attended with danger to the public; and

(b) A notice of the opening of the lines of rails and works or the diversion shall be sent immediately to the Commissioner.

40.4 Sections Relating to Accidents:

Section 113:

Notice of Railway Accident –

1) Where, in the course of working a railway. –

(a) Any accident attended with loss of any human life, or with grievous hurt, as defined in the Indian Penal Code (45 of 1860), or with such serious injury to property as may be prescribed; or

(b) Any collision between trains of which one is a train carrying passengers; or

(c) The derailment of any train carrying passengers, or of any part of such train; or

(d) Any accident of a description usually attended with loss of human life or with such grievous hurt as aforesaid or with serious injury to property; or

(e) Any accident of any other description which the Central

Government may notify in this behalf in the Official Gazette, occurs, the Station Master of the station nearest to the place at which the accident occurs or where there is no Station Master, the railway servant in charge of the section of the railway on which the accident occurs, shall, without delay give notice of the accident to the District Magistrate and Superintendent of Police, within whose jurisdiction the accident occurs the, Officer-in-charge of the police station within the local limits of which the accident occurs and to such other Magistrate or Police Officer as may be appointed in this behalf by the Central Government.

2) The railway administration within whose jurisdiction the accident occurs, as also the railway administration to whom the train involved in the accident belongs, shall, without delay, give notice of the accident to the State Government and the Commissioner having jurisdiction over the place of the accident.

Section 114:

Inquiry by Commissioner. –

1) On the receipt of a notice under section 113 of the occurrence of an accident to a train carrying passengers resulting loss of human life or grievous hurt causing total or partial disablement of permanent nature to a passenger or serious damage to railway property, the Commissioner shall as soon as may be, notify the railway administration in whose jurisdiction the accident occurred of his intentionto hold an inquiry into the causes that led to the accident and shall at the same time fix and communicate the date, time and place of inquiry

Provided that it shall be open to the Commissioner to hold an inquiry into anyother accident which, in his opinion, requires the holding of such an inquiry.

2) If for any reason, the Commissioner is not able to hold an inquiry as soon as may be after the occurrence of the accident, he shall notify the railway administration accordingly.

Section 115:

Inquiry by Railway Administration –

Where no inquiry is held by the Commissioner under sub-section (1) of Section 114 orwhere the Commissioner has informed the railway administration under sub-section (2) of that section that he is not able to hold an inquiry, the railway administration within whose jurisdiction the accident occurs, shall cause an inquiry to be made in accordance with the prescribed procedure.

Section 116:

Powers of Commissioner in relation to Inquiries

For the purpose of conducting an inquiry under this Chapter into the causes of any accident on a railway, the Commissioner shall, in addition to the powers specified in Section 7, have the powers as are vested in a civil Court while trying a suit under the Code of Civil Procedure, 5 of 1900, in respect of the following matters, namely: -

- **a)** summoning and enforcing the attendance of persons and examining them on oath.
- **b)** requiring the discovery and production of documents.
- **c)** receiving evidence on affidavits.
- **d)** requisitioning any public record or copies thereof from any Court or office.
- **e)** any other matter which may be prescribed.

The Commissioner while conducting an enquiry under this Chapter shall be deemedto be a Civil Court for the purpose of section 195 and Chapter XXVI of the code of criminal procedure, 1973 (2 of 1974)

Section 117:

Statement made before Commissioner – No statement made by a person in the course of giving evidence in an inquiry before the Commissioner shall subject him to, or be used against him in, any civil or criminal proceeding, except a prosecution for giving false evidence by such statement:

Provided that the statement is –

- **a)** made in reply to a question which is required by the Commissioner to answer, or
- **b)** relevant to the subject – matter of the inquiry.

Section 118:

Procedure, etc. –

Any railway administration or the Commissionerconducting an inquiry

under this Chapter may send notice of the inquiry to such persons, follow such procedure, and prepare the report in such manner as may be prescribed.

Section 119:

No inquiry investigation etc. to be made if the Commission of Inquiry is appointed —

Notwithstanding anything contained in the foregoing provisions of this Chapter, where a Commission of Inquiry is appointed under the Commission of Inquiry Act, 1952 (3 of 1952) to inquire into an accident, any inquiry, investigation or other proceeding pending in relation to that accident shall not be proceeded with, and all records or other documents relating to such inquiry shall be forwarded to such authority as may be specified by the Central Government in this behalf.

Section 120:

Inquiry into Accident not covered by Section 113 —

Where any accident of the nature not specified in section 113 occurs in the course of working a railway, the railway administration within whose jurisdiction the accident occurs, may cause such inquiry to be made into the causes of the accident, as may be prescribed.

Section 121: Returns — Every railway administration shall send to the Central Government a return of accidents occurring on its railway, whether attended to with injury to any person or not, in such form and manner and at such intervals as may be prescribed.

Section 122:

Power to make rules in respect of matters in this chapter –

1. The Central Government may, by notification, make rules to carry out the purposes of this Chapter.
2. In particular, and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters, namely:
   - **a)** the injury to property which shall be considered serious under clause (a) of sub-section (1) of section 113.
   - **b)** the forms of notice of accidents to be given under Section 113 and the particulars of the accident such notices shall contain.
   - **c)** the manner of sending notices of accidents, including the class of accidents to be sent immediately after the accident.
   - **d)** the duties of the Commissioner, railway administration, railway servants, police officers and Magistrates on the

occurrence of an accident.

e) the persons to whom notices in respect of any inquiry under this Chapter are to send, be the procedure to be followed in such inquiry and the manner in which a report of such inquiry shall be prepared.

f) the nature of the inquiry to be made by the Railway Administration into the causes of an accident under Section 120.

g) the form and manner sending a return of accidents by a Railway Administration under Section 121.

40.5 Sections Relating to Liability of Railway Administration for Death and Injury ToPassengers Due To Accidents:

Section 123:

Definitions –

In this Chapter, unless the context otherwise requires –

1. accident means an accident of the nature described in Section 124.

2. Dependent, means any of the following relatives of a deceased passenger,namely:

i. the wife, husband, son, and daughter, and in case the deceased passenger isunmarried or is a minor, his parent.

ii. The parent, minor brother or unmarried sister, widowed sister, widowed daughter-in-law, and a minor child of a predeceased son, if dependent whollyor partly on the deceased passenger.

iii. a minor child of a pre-deceased daughter, if wholly dependent on the deceased passenger

iv. the paternal grandparent wholly dependent on the deceased passenger.

Section 124:

Extent of liability –

When in the course of working a railway, an accident occurs, being either a collision between trains of which one is a train carrying passengers or the derailment of or other accident to a train or any part of a train carrying passengers, then whether or not there has been any wrongful act, neglect or default on the part of the railway administration such as would entitle a passengerwho has been injured or has suffered a loss to maintain

an action and recover damages in respect thereof, the railway administration shall, notwithstanding anything contained in any other law, be liable to pay compensation to such extent as may be prescribed and to that extent only for loss occasioned by the death of a passenger dying as a result of such accident, and for personal injury and loss, destruction, damage or deterioration of goods owned by the passenger and accompanying him in his compartment or on the train, sustained as a result of such accident.

Explanation —

For the purpose of this section passenger includes a railway servant on duty.

Section 124A:-

When in the course of working of railway an untoward incident occurs, then whether or not there has been any wrongful act, neglect or default on the part of the railway administration such as would entitle a passenger who has been injured or the department of a passenger who has been killed to maintain an action and recover damages in respect thereof, the railway administration shall notwithstanding anything contained in any other law, be liable to pay compensation to such extent as may be prescribed and to that extent only of loss occasioned by the death of, or injury to, a passenger as a result of such untoward incident:

Provided that no compensation shall be payable under this section by the railway administration if the passenger dies or suffers injury due to-

- **a)** suicide or attempted suicide by him.
- **b)** Self-inflicted injury.
- **c)** his own criminal act.
- **d)** any act omitted by him in a state of intoxication or insanity.
- **e)** any natural cause or disease or medical or surgical treatment unless such treatment becomes necessary due to injury caused by the said untoward incident.

Explanation. -

For the purpose of this section, "passenger" includes-

- **i.** a railway servant on duty; and

ii. a person who has purchased a valid ticket for travelling, by a train carrying passengers, on any date or a valid platform ticket and becomes a victim of an untoward incident.]

Section 125:

Application for Compensation:

(1) An application for compensation under section 124 (or section 124-A) may be made to the Claims Tribunal–

(a) by the person who has sustained the injury or suffered any loss, or

(b) by any agent duly authorized by such person in this behalf, or

(c) where such person is a minor, by his guardian, or

(d) where death has resulted from the accident, (or the Untoward incident) by any dependent of the deceased or where such a dependent is a minor, by his guardian.

(2) Every application by a dependent for compensation under this section shall befor the benefit of every other dependent.

Section 126:

Interim relief by Railway Administration –

(1) Where a person who has made an application for compensation under section 125 desires to be paid interim relief, he may apply to the railway administration for payment of interim relief along with a copy of the application made under that section.

(2) Where, on the receipt of an application made under sub-section (1) and after making such inquiry as it may deem fit, the railway administration is satisfied that circumstances exist which require relief to be afforded to the applicant immediately, it may, pending determination by the Claims Tribunal of the actual amount of compensation payable under section 124 pay to any person who has sustained the injury or suffered any loss or where death has resulted from the accident, to any dependent of the deceased, such sum as it considers reasonable for affording such relief, so however, that the sum paid shall not exceed the amount of compensation payable at such rates as may be prescribed.

(3) The railway administration shall, as soon as may be, after making an order regarding payment of interim relief under sub-section (2) send a copy thereof to the Claims Tribunal.

(4) Any sum paid by the railway administration under sub-section (2) shall be taken into account by the Claims Tribunal while

determining the amount of compensation payable.

Section 127:

Determination of compensation in respect of any Injury or Loss of Goods –

(1) Subject to such rules as may be made, the rates of compensation payable in respect of any injury shall be determined by the Claims Tribunal.

(2) The compensation payable in respect of any loss of goods shall be such as the Claims Tribunal may, having regard to the circumstances of the case, determine to be reasonable.

Section 128:

Saving as to certain rights –

(1) The right of any person to claim compensation under section 124 shall not affect the right of any such person to recover compensation payable under the Workmen's Compensation Act, 1923 (8 of 1923), or any other law for the time being in force; but no person shall be entitled to claim compensation more than once in respect of the same accident.

(2) Nothing in sub-section (1) shall affect the right of any person to claim compensation payable under any contract or scheme providing for payment of compensation for death or personal injury or for damage to property or any sum payable under any policy of insurance.

Section 129:

Power to make rules in respect of matters in this chapter –

(1) The Central Government may, by notification, make rules to carry out the purposes of this Chapter.

(2) In particular and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters namely –

(a) The compensation payable for death.

(b) The nature of the injuries for which compensation shall be paid and the amount of such compensation.

40.6 Sections Relating to Penalties and Offences:

Section 145:

Drunkenness or Nuisance.

If any person in any railway carriage or upon any part of a railway.

a) Is in a state of intoxication; or

b) Commits any nuisance or act of indecency or uses abusive or obscene language;or

c) Willfully or without excuse interfered with any amenity provided by the railway administration so as to affect the comfortable travel of any passenger, he may be removed from the railway by any railway servant and shall, in addition to the forfeiture of his pass or ticket, be punishable with imprisonment which may extend to six months and with fine which may extend to five hundred rupees:

Provided that in the absence of special and adequate reasons to the contrary tobe mentioned in the judgment of the Court, such punishment shall not be less than —

i) A fine of one hundred rupees in the case of conviction for the first offence; and

ii) Imprisonment of one month and a fine of two hundred and fifty rupees, in the case of conviction for a second or subsequent offence.

Section 146:

Obstructing Railway servant in his Duties –

If any person willfully obstructs or prevents any railway servant in the discharge of his duties, he shall be punishable with imprisonment for a term which may extend to six months, or with fine which may extend to one thousand rupees, or with both.

Section 150:

Maliciously wrecking or attempting to wreck a train.

(1) Subject to the provisions of sub-section (2), if any person unlawfully –

(a) Puts or throws upon or across any railway, any wood, stone or other matter or thing or

(b) Take up, removes, loosens or displaces any rail, sleeper or other matter orthings belonging to any railway; or

(c) Turns, moves, unlocks or diverts any points or other

machinery belonging to any railway; or

(d) Makes or shows, or hides or removes, any signal or light upon or near to any railway; or

(e) Does or causes to be done or attempts to do any other act or thing in relation to any railway, with intent or with knowledge that he is likely to endanger the safety of any person traveling on or being upon the railway, he shall be punishable with imprisonment for life, or with rigorous imprisonment for a term which may extend to ten years:

Provided that in the absence of special and adequate reasons to the contrary to be mentioned in the judgment of the Court, where a person is punishable with rigorous imprisonment, such imprisonment shall not be less than —

(i) Three years in the case of a conviction for the first Offence; and

(ii) Seven years, in the case of conviction for the second or subsequent offence.

(2) If any person unlawfully does any act or thing referred to in any of the clausesof sub-section (1)-

(a) With intent to cause the death of any person and the doing of such act or thing causes the death of any person; or

(b) With knowledge that such act or thing is so imminently dangerous that it must in all probability cause the death of any person or such bodily injury to any person as is likely to cause the death of such person, he shall be punishable with death or imprisonment for life.

Section 151:

Damage to or Destruction of certain Railway Properties –

1) If any person, with intent to cause, or knowing that he is likely to cause damage or destruction to any property of a railway referred to in sub-section (2) causes by fire, explosive substance or otherwise, damage to such property or destruction of such property, he shall be punishable with imprisonment for a term which may extend to five years, or with fine, or with both.

2) The properties of a railway referred to in sub-section (1) are railway track, bridges, station buildings and installation, carriages or wagons, locomotives, signalling, telecommunications, electric traction and block equipment and such other properties as the Central Government being of the opinion that damage thereto or

destruction thereof is likely to endanger the operation of a railway, may by notification, specify.

Section 152:

Maliciously hurting or attempting to hurt persons travailing by railway –

If any person unlawfully throws or caused to fall or strike at against, into or upon any rolling stock forming part of a train, any wood, stone or other matter or thing with intent, or with knowledge that he is likely to endanger the safety of any person being in or upon such rolling stock or in or upon any other rolling stock forming part of the same train, he shall be punishable with imprisonment for life or with imprisonment for a term which may extend to ten years.

Section 153:

Endangering safety of persons traveling by railway by wilful act or omission –

If any person by any unlawful act or by any wilful omission or neglect, endangers or causes to be endangered the safety of any person traveling on or being upon any railway, or obstructs or causes to be obstructed or attempts to obstruct any rolling stock upon any railway, he shall be punishable with imprisonment for a term which may extend to five years.

Section 154:

Endangering safety of persons traveling by railway by rash or negligent act or omission –

If any person in a rash and negligent manner does any act or omits to do what he is legally bound to do, and the act or omission is likely to endanger the safety of any person traveling or being upon any railway, he shall be punishable with imprisonment for a term which may extend to one year or with fine, or with both.

Section 156:

Travelling on Roof, Step or Engine of a Train –

If any passenger or any other person, after being warned by a railway servant to desists, persists in travelling on the roof, step or footboard of any carriage or on an engine, or in any other part of a train not intended for the use of passengers he shall be punishable with imprisonment for a term which may extend to three months, or with fine

which may extend to five hundred rupees, or with both any may be removed from the railways by any railway servant.

Section 160:

Opening or breaking a Level Crossing Gate –

1) If any person, other than a railway servant or a person authorized in this behalf, opens any gate or chain or barrier set up on either side of a level crossing whichis closed to road traffic, he shall be punishable with imprisonment for a term whichmay extend to three years.
2) If any person breaks any gate or chain or barrier set up on either side of a level crossing which is closed to road traffic, he shall be punishable with imprisonment for a term which may extend to five years.

Section 161:

Negligently crossing Unmanned Level Crossing –

If any person driving or leading a vehicle is negligent in crossing an unmanned level crossing, he shall be punishable with imprisonment for a term which may extend to one years.

Explanation:

For the purpose of this section, ―negligence in relation to any person driving or leading a vehicle in crossing an unmanned level crossing means the crossing by such person –

a) without stopping or caring to stop the vehicle near such railway crossing to observe whether any approaching rolling stock is in sight, or
b) even while an approaching rolling stock is in sight.

Section 172:

Penalty for Intoxication –

If any railway servant is in a state ofintoxication while on duty, he shall be punishable with fine which may extend to five hundred rupees and when the performance of any duty in such state is likely to endanger the safety of any person travelling on or being upon a railway, such railway servant shall be punishable with imprisonment for a term which may extend to one year or, with fine, or with both.

Section 174:

Obstructing Running of Train etc – If any railway servant (whether on duty or otherwise) or any other person obstructs or causes to be obstructed or attempts to obstruct any train or other rolling stock upon a railway –

- **a)** by squatting or picketing or during any rail roko agitation or bandh, or
- **b)** by keeping without authority any rolling stock on the railway; or
- **c)** by tampering with, disconnecting or interfering in any other manner with its hose pipe or tampering with signal gear or otherwise, he shall be punishable with imprisonment for a term which may extend to two years, or with fine which may extend to two thousand rupees, or with both.

Section 175:

Endangering the Safety of persons –

If any railway servant, when on duty, endangers the safety of any person —

- **a)** by disobeying any rule made under this Act, or
- **b)** by disobeying any instruction, direction or order under this Act or the rules made there under; or
- **c)** by any rash or negligent act or omission, he shall be punishable with imprisonment for a term which may extend to two years, or with fine which may extend to one thousand rupees, or with both.

Section 176:

Obstructing Level Crossing –

If any railway servant unnecessarily—

- **a)** allows any rolling stock to stand across a place where the railway crosses a public road on the level; or
- **b)** keeps a level crossing closed against the public, he shall be punishable with fine which may extend to one hundred rupees.

Section 181:

Magistrate having jurisdiction under the Act –

Notwithstanding anything contained in the Code of Criminal Procedure, 1973 (2 of 1974), no Court inferior to that of a Metropolitan Magistrate or a Judicial Magistrate of the first class shall try an offence under this Act.

THE STATUTORY INVESTIGATION INTO RAILWAY ACCIDENTS RULES, 1998 (CRS INQUIRY)

41

The statutory Investigation into Railway Accidents Rules, 1998

The statutory Investigation into Railway Accidents Rules, 1998

1. These rules may be called the Statutory Investigation into Railway Accidents Rules, 1998.

They shall come into force on the date of their publication in the Official Gazette.

2. (1) a) **Inquiry into a serious accident by the Commissioner of Railway Safety**

Where the Commissioner of Railway Safety receives notice under section 113 of the Railways Act, 1989 (24 of 1989) hereinafter referred to as the Act, of the occurrence of an accident which he considers of a sufficiently serious nature to justify such a course, he shall, as soon as may be, notify the Chief Commissioner of Railway Safety, the Railway Board and the Head of the Railway Administration concerned of his intention to hold an inquiry and shall, at the same time, fix and communicate the date, time and place for the inquiry. He shall also issue or cause to be issued a Press Note in this behalf inviting the public to tender evidence at the inquiry and send information relating to the accident to his office address.

3. While notifying his intention to hold an inquiry as aforesaid, the Commissioner of Railway Safety shall also inform or cause to inform the Chief Secretary of the State, the District Magistrate and the Superintendent of Police of the district concerned.

(2) For the purpose of this rule, every accident to a train carrying passengers which is attended with loss of life of a passenger or passengers in the train or with grievous hurt, as defined in the Indian Penal Code (hereinafter referred to as the grievously hurt) to a passenger or passengers in the train or with serious damage or railway property of a value exceeding twenty-five lakh rupees and any other accident which in the opinion of the Chief Commissioner of Railway Safety or the Commissioner of Railway Safety requires the holding of an inquiry shall be deemed to be an accident of such a serious nature as to require the holding of an inquiry. These accidents shall be termed as "Serious train accidents".

(3) However, for any accident the Chief Commissioner may either hold the inquiry himself or direct any Commissioner of Railway Safety to do so.

Explanation. —The inquiry under this rule shall be obligatory only in those cases where the passengers, killed or grievously hurt were travelling in the train carrying passengers. If an accident involving a train carrying passengers leads to loss of life or grievous injury to any Railway Servant(s) irrespective of whether he was travelling in that passenger train or not, inquiry under this rule shall be obligatory. However, if a person being a railway servant or holding valid pass or ticket or otherwise travelling outside the Rolling Stock of a Passenger train (such as on footboard or roof or buffers but excluding the inside of vestibules between coaches) is killed or grievously hurt or is run over at a level crossing or elsewhere on the railway track, an inquiry under this rule shall not be obligatory. Similarly, if in a collision between a road vehicle and a passenger train at a level crossing, no passenger in the train is killed or grievously hurt, it shall not be obligatory to hold an inquiry. For the purpose of this rule, workmen's trains or ballast trains or Material trains or Accident Relief Trains or Tower wagons or such other trains carrying workmen or cattle specials/Military specials carrying authorised escorts or similar such trains shall also be treated as

passenger trains and in the event of a workman or escort being killed or grievously hurt as a result of an accident to the train, an inquiry under this rule shall be obligatory.

(4) When an accident requiring the holding of an inquiry occurs at a station whether the jurisdiction of two or more Commissioners of Railway Safety meet, the duty of complying with this rule shall devolve on the Commissioner of Railway Safety within whose jurisdiction the railway working such station lies. At other such locations where the issue cannot be resolved then it shall be finalised by the Chief Commissioner of Railway Safety.

(5) (a) If, for any reason, the concerned Commissioner of Railway Safety is unable to hold an inquiry at an early date after the occurrence of such an accident, he shall intimate by the fastest means of communication without any delay to the Chief Commissioner of Railway Safety of the reasons why the inquiry cannot be held by him. The Chief Commissioner may choose to conduct the inquiry himself or direct any other Commissioner to take up the inquiry or decide to let the inquiry be conducted by the Railway Administration. The concerned Commissioner shall thereafter notify the Railway Administration and the Railway Board accordingly.

(b) On receipt of the proceedings of the joint inquiry (inquiry made by a Committee of Railway Officers) from the Head of the Railway Administration in accordance with Rule 15 of Railway (Notices of and Inquiries into Accidents) Rules, 1997, the Commissioner of Railway Safety shall scrutinise the same, and in case he agrees with the findings of the joint inquiry, shall forward a copy of the report to the Chief Commissioner of Railway Safety along with his views on the findings and recommendations made. In case the Commissioner feels, he may direct the Railway Administration either to conduct inquiry de novo or re-examine specific issues and submit revised findings. On the other hand the Commissioner of Railway Safety, after examination of the joint inquiry proceedings, considers that an inquiry should be held by himself, he shall, as soon as possible, notify the Chief Commissioner of Railway Safety, the Railway Board, and the

Head of the Railway Administration concerned, of his intention to hold as inquiry and he shall at the same time fix, and communicate the date, time and place for the inquiry.

(6) (a) Where having regard to the nature of the accident, the Central Government has appointed a Commission of Inquiry to inquire into the accident under the Commission of Inquiry Act, 1952 (60 of 1952), or has appointed any other authority to inquire into it and for that purpose has made all or any of the provisions of the said Act applicable to that authority, the Commissioner of Railway Safety to whom notice of the accident has been given shall not hold his inquiry and where he has already commenced his inquiry he shall not proceed further with it and shall hand over the evidence, records or other documents in his possession, relating to the inquiry, to such authority as may be specified by the Central Government in this behalf.

(b) If, as a result of the Police Investigation a regular case is lodged in a Criminal Court by the Police or arising out of the accident, a case is lodged in a Civil Court by interested person(s), the Commissioner shall finalise his report and circulate the same as per Rule 4, as a strictly confidential document.

3. Commissioner of Railway Safety to submit a brief preliminary narrative report

Where a Commissioner of Railway Safety has held an inquiry in respect of any of the accidents described in sub-rule (2) of Rule 2, he shall submit a brief preliminary narrative report to the Chief Commissioner of Railway Safety and the Railway Board simultaneously. In case Chief Commissioner of Railway Safety has held an inquiry in terms of Rule 2(3) and 2(5) he shall submit the brief preliminary narrative report to the Railway Board. The report shall be factual and shall not contain any reference to persons implicated.

4. Commissioner of Railway Safety to submit a report.

1. Whenever the Commissioner of Railway Safety has made an inquiry under Rule 2, he shall submit a confidential report in writing to the Chief Commissioner of Railway Safety and shall forward copies of the report to—

a) The Railway Board.
b) The Railway Administration of all the Zonal Railways.
c) In the case of a Railway under the control of a State Government or Local Administration to such Government or administration if the accident has occurred in that Railway.
d) Other Commissioner of Railway Safety.
e) The Director, Intelligence Bureau, Ministry of Home Affairs, Government of India, if the Commissioner of Railway find that the accident was caused by sabotage or train wrecking.

2. In case the inquiry has been held by the Chief Commissioner of Railway Safety he shall forward his report to the authorities mentioned in (i) to (vi) of sub-rule (1) of this Rule.

5. Publication of reports

Recommendations in regard to the publication of reports shall be made by the Chief Commissioner of Railway Safety and Railway Board (Ministry of Railways) informed accordingly. In case the Railway Board has reservations on the recommendations of the Chief Commissioner, the matter shall be finally decided by the Central Government (Ministry of Civil Aviation).

6. District Magistrate or his representative to attend the inquiry conducted by Commissioner of Railway Safety

Where no Magisterial inquiry is being made under clause (a) or (b) of Rule 17 of the Railway (Notices of and Inquiries into Accidents) Rules, 1997, the District Magistrate shall, as far as possible, attend the inquiry conducted by the Commissioner of Railway Safety personally or depute some other officer to represent him at the inquiry.

7. District Superintendent of Police or his representative

The District Superintendent of Police shall, as far as possible also attend the inquiry conducted by the Commissioner of Railway Safety personally or depute some other officer to represent him at the inquiry.

8. Commissioner of Railway Safety to assist the Magistrate of the Commission of Inquiry etc. in clarifying technical matters

The Commissioner of Railway Safety, as far as possible, assist any Magistrate making a judicial inquiry or an inquiry under Rule 17 of

Railway (Notices of and Inquiries into Accidents) Rules, 1997 or a Commission of Inquiry appointed under the Commission of Inquiry Act, 1952 (60 of 1952), or any other authority appointed by the Central Government to which all or any of the provisions of the said Act have been made applicable, whenever he may be called upon to do so for the purpose of clarification of any technical matters.

9. Powers of the Commissioner of Railway Safety. –

Nothing in these rules shall, except to the extent provided in sub-rule (6) of Rule 2, be deemed to limit or otherwise affect the exercise of any of the powers conferred on Commissioner of Railway Safety by sections 7 and 8 of the Act of 1989.

10. Repeal and Saving. -

(1) The 'Statutory Investigation into Railway Accident Rules, 1973', published with notification of Government of India in the Ministry of Tourism & Civil Aviation No. 22, dated 2-6-1973, Part II, Section 3 are hereby repealed.

(2) Notwithstanding such repeal, anything done, or any action taken under the rules hereby repealed shall be deemed to have been done or taken under the corresponding provisions of these rules.

Sd/-

(Prakash Chandra)

Under Secretary to Govt. of India

THE RAILWAY (NOTICES OF AND INQUIRIES INTO ACCIDENTS) RULES 1998

42

42.1 Section 113 of the Railways Act, 1989

Section 113 of the Railways Act, 1989 requires intimation of serious accidents to be sent to the Commissioner of Railway Safety. Under the 'Statutory Investigation into Railway Accidents Rules, 1998' issued by the Ministry of Civil Aviation and Tourism, a statutory enquiry by the Commissioner of Railway Safety is obligatory in every serious accident to a train carrying passengers which is attended with loss of human life, or with grievous hurt, as defined in the Indian Penal Code, to a passenger or passengers in the train or with serious damage to railway property of the value exceeding ₹2 crores.

While holding statutory enquiries, the Commission not only examines affected passengers but also invites members of the public to give evidence in person during the enquiry or to write to the Commission. Some of the serious accidents at manned or unmanned level crossings attended with loss of life or with grievous injury to persons travelling in road vehicles are also inquired into by the Commission of Railway Safety. The Commission, in its discretion,

may hold an enquiry into any other accident. The Commissioner of Railway Safety stops or discontinues his inquiry whenever a Commissions of Inquiry under the Commission of Inquiries Act, 1952 is appointed.

In exercise of the powers conferred by Section 122 of the Railways Act, 1989 the central government has made following rules, which is called The Railway (Notices of and Inquiries into Accidents) Rules, 1989. The details of the rules are as under:

42.2 The Railway (Notices of and Inquiries into Accidents) Rules, 1989

Short title and commencement

1. These rules may be called the Railway (Notices of and Inquiries into Accidents) Rules, 1989.
2. They shall come into force on the date of their publication in the Official Gazette.

Particulars to be given in the notices.

The notices mentioned in Section 113 of the Railways Act, 1989 (24 of 1989) (here in after referred to as the Act), shall contain the following particulars, namely: -

1. Kilometrage, or station, or both, at which the accident occurred.
2. Time and date of the accidents.
3. Number and description of the train, or trains.
4. Nature of the accident.
5. Number of people killed or injured, as far as is known.
6. Cause of the accident, as far as is known; and
7. Probable detention to traffic.

Responsibility for sending notices, to whom to be sent and made thereof.

Whenever any accident, as falls under Section 113 of the Act (here in after referred to as "Reportable train accident") occurs in the

course of working a railway, the Station Master nearest to the place at which the accident has occurred or, where there is no Station Master, the railway servant in charge of the section of the railway on which the accident has occurred or any other Station Master in charge of a section of a railway to whom the report of the accident is made, shall give notice of the accident by telegraph to the Commissioner of Railway Safety, the District Magistrate and the District Superintendent of police of the district in which the accident has occurred or such other Magistrate or police officer as may be appointed in this behalf by the State Government concerned any by telegraph, telephone or through special messenger or such other quick means as may be available, to the Superintendent of Railway Police and to the officer-in –charge of the police station within the local limits of which the accident has occurred.

Explanation-

For the purpose of this rule, "Reportable Train Accident" under Section 113 of the Act also includes those usually attended with loss of human life(such as accidents to passenger trains involving collisions, derailments, train-wrecking, or attempted train-wrecking, cases of running over obstructions placed on the line, of passengers falling out of trains or of fires in trains), or grievous hurt as defined in the Indian Penal Code (here in after referred to as the grievous hurt), or serious damage to railway property of the value exceeding Rupees Two crores which have not actually occurred but which by the nature of accident might reasonably have been expected to occur; and also cases of landslides or of breach by rain or flood which cause the interruption of any important through- line of communication for at least 24 hours.

42.3 Mode of sending notices to the State Government-

The notice of accidents, required under Section 113 of the Act, to be sent without delay by the Railway Administration, shall be sent to the State Government-

1. By telegram in the case of-

a) Accidents are deemed, under the Explanation to Rule 3, to be serious by reason of loss human life.

b) Accidents by reason of which the permanent way is likely to be blocked for more than twenty-four hours; and

c) Train-wrecking or attempted train-wrecking; and

2. By letter in all other case.

42.4 Railway servants to report accidents-

Every railway servant shall report, with as little delay as possible, every accident occurring in the course of working the railway which may come to his notice and such report shall be made to the nearest Station Master, or, where there is no Station Master, to the railway servant in charge of the section of the railway on which the accident has occurred.

42.5 Station Master or railway servant in charge of the section report accidents-

The Station Master or the railway servant in charge of the section, shall report all accidents in accordance with the rules laid down by the Railway Administration concerned for the reporting of accidents.

42.6 Railway Administration to report serious accidents-

1. Whenever a serious accident, as defined in sub rule (2) of Rule 2 of the Statutory Investigation into Railway Accidents Rules,1998, occurs, the railway administration concerned shall, as soon after the accident as possible, by telegraph, supply to the press such particulars as are mentioned in Rule to and as are till then available, and by supplementary telegrams if necessary, immediately after further information is available. A copy shall be sent simultaneously by express telegram to the Railway Board, the Commissioner of Railway Safety. In addition, the

Commissioner of Railway Safety shall be informed, telephonically, of any serious accident, by the control of the division in which the accident has occurred.

2. For the purpose of sub-rule (1), an accident shall be a serious railway accident where-

i. Accident to train carrying passengers which is attendant with loss of life or with grievous hurt to a passenger or passengers in the train, or with serious damage to railway property of the value exceeding Rupees Two crore and any other accident which in the opinion of the Chief Commissioner of Railway Safety or Commissioner of Railway Safety requires the holding of any inquiry by the Commissioner of Railway Safety, shall be deemed to be serious accident. A workmen's train or a ballast train or a material or a relief train or tower wagon or such other train carrying workmen or cattle special, military special carrying authorized escorts, or similar such train shall be treated as a 'serious railway accident'.

Provided that-

a) Cases of trespassers run over and injured or killed through their own carelessness or of passengers injured or killed through their own carelessness, and

b) Cases involving persons being railway servants or holding valid passes/tickets or otherwise who are killed or grievously injured while travelling outside the rolling- stock of a passenger train such as on footboard or roof a buffer but excluding the inside of vestibules between coaches, or run over at a level crossing or elsewhere on the Railway track by a passenger train, and

c) Collision, between a Road vehicle and a passenger train at a level Crossing where no passenger or Railway

Servant is killed or grievously hurt shall not be treated as a 'Serious Railway Accident' even if those travelling in the road vehicle are killed or grievously hurt shall not be treated as serious railway accident, unless the Chief Commissioner of Railway Safety declares that.

42.7 Facility for reaching the site of the accident-

Whenever any accident has occurred in the course of working a railway, the Railway Administration concerned shall give all reasonable aid to the District Magistrate or the Magistrate appointed or deputed under Rule 17 or to the Commission of inquiry appointed under the Commission of inquiry Act, 1952 (60 of 1952), or any other authority to whom all or any of the provision of the said Act have been made applicable and to the Commissioner of Railway Safety, medical officers, the police and others concerned to enable them to reach the scene of the accident promptly and shall also assist those authorities in making inquiries and in obtaining evidence as to the accident.

42.8 Medical aid to the persons grievously hurt in accidents-

Whenever an accident, occurring in the course of working a railway, has been attended with grievous hurt, it shall be the duty of the Head of the Railway Administration concerned to afford medical aid to the sufferers, and to see that are properly and carefully attended to till they are removed to their homes or handed over the care of their relatives or friends. In any such case, or in any case in which any loss of human life or grievous hurt has occurred, the nearest available local Medical Officer shall be sent for if such Medical Officer is nearer at hand than the Railway Medical Officer.

4[9-A (1) The reports containing the names and addresses of the injured victims or persons deceased shall be dispatched to the Principal Bench of the Railway Claims Tribunal. Whenever the names of next of kin of the deceased passengers are known, the said

information shall also be furnished to the Principal Bench of the Railway Claims Tribunal.

(2) Legal Aid to Claimants or victims of accident-
It shall be the duty of the Railway Administration to forwards the names of the injured victims or other persons who died in a railway accident to the Principal Bench of the Railway Claims Tribunal for rendering appropriate legal aid for obtaining compensation in the manner provided under the Railway Claims Tribunal Act and to that end, whenever information is available, the names of the next of kin shall also be furnished to the Principal Bench of the Railway Claims tribunal.

42.9 Arranging attendance of railway servants at the place of judicial inquiries or inquiries conducted by Commissioner of Railway Safety or a Magistrate-

When an inquiry under Rule 2 of the Statutory Investigation into Railway Accidents Rules, 1998, or under Rule17 of these rules, or a judicial inquiry is being made, the Head of the Railway Administration concerned shall arrange for the attendance as long as may be necessary, at the place of inquiry, of all railway servants whose evidence is likely to be required at such inquiry; and if the inquiry is to be held by the Commissioner of Railway Safety under Rule 2 of the Statutory Investigation into Railway Accidents Rules, 1998 the Head of the Railway Administration concerned shall,-

1. Cause notice of the date, hour and place at which the inquiry will begin to be given to the officers mentioned in clauses(a) and (c) of sub-rule (1) of Rule 14, and
2. Arrange for the attendance of the divisional officers, railway servants required as witness at the inquiry.

42.10 Action to be taken by Head of the Railway Administration on receipt of the report of commissioner of Railway Safety-

Whenever the Head of the Railway Administration concerned receives a copy of the report of the Commissioner of Railway Safety under Rule4 of the Statutory Investigation into Railway Accidents Rules, 1998, he shall at once acknowledge its receipt, and-

submit his remarks, on the views expressed in the report, to the Chief Commissioner of Railway Safety with copy to the Commissioner of Railway Safety immediately on receipt of the report by the Railway Administration and if he is not able to submit his remarks immediately, he shall in his acknowledgment of the report indicate his intention to submit his remarks later as early as possible.

if the Head of the Railway Administration concerned agrees with the views expressed in the report and considers the prosecution of any person or persons desirable, he shall immediately forward a statement of such persons to the District Magistrate of the district in which the accident occurred, or to such other officer as the State Government may appoint in this behalf and to the concerned police authorities.

in case the District Magistrate or Police Authorities require copies of the report, it may be sent to them, and the confidentiality of the report should be made clear to the District Magistrate and Police Authorities, and the Police Authorities shall, as soon as possible, intimate the Head of the Railway Administration concerned about their decision regarding launching any prosecution.

42.11 Head of the Railway Administration to offer remarks on the suggestions made in the report of Commissioner of Railway Safety. –

Whenever the report of the Commissioner of Railway Safety points to the necessity for or suggest a change in any of the rules or in the system of working of the railway, the Head of the Railway Administration concerned shall, intimate the action which has been

taken, or which it proposes to take, to prevent a recurrence of similar accidents, to the Chief Commissioner of Railway Safety with copy to the Commissioner of Railway Safety.

42.12 Joint inquiry when dispensed with-

Whenever a reportable train accident, such as is described in Section 113 of the Act has occurred in the course of working in a railway, the Head of the Railway Administration concerned shall cause an inquiry to be promptly made by a committee of railway officers (to be called a "joint inquiry") for a thorough investigation of the causes which led to the accident:

42.13 Provided that such an inquiry may be dispensed with-

If any inquiry is to be held by the Commissioner of Railway Safety under Rule 2 of the Statutory Investigation into Railway Accidents Rules, 1998, or a Commission appointed under the Commissions of inquiry Act, 1952 (60 of 1952) or any other authority appointed by the Central Government to which all or any of the provisions of the said Commissions of Inquiry Act have been made applicable under Rule 2 of the said Statutory Investigation into Railway Accidents Rules; or if there is no reasonable doubts as to the cause of the accident; or

if any department of the railway administration concerned intimates that it accepts all responsibility in the matter.

Where such inquiry is dispensed with under clause (b) or clause (c) of the proviso to sub-rule (1), it shall be the duty of the Head of the Department of the Railway Administration responsible for the accident to make such inquiry (to be called a "department inquiry") as he may consider necessary and, if his staff or the system or working is at fault, to adopt or suggest such measures as he may consider necessary for preventing a recurrence of similar accidents.

42.14 Note of joint inquiry-

Whenever a joint inquiry is to be made, the Head of the Railway Administration concerned shall cause notice of the date and hour at

which the inquiry will commence, to be given to the following officers, namely: -

The District Magistrate of the district in which the accident occurred, or such other officer as the State Government may appoint in this behalf, the Superintendent of the Railway Police and the District Superintendent of Police; the Commissioner of Railway Safety for the section of the railway on which the accident occurred; and the Head of the Railway Police having jurisdiction at the place where the accident occurred or if there are no Railway Police, the officer-in-charge of the police station having jurisdiction at such place.

The date and hour at which the inquiry will commence shall be fixed so as to give the officers mentioned in sub-rule (1) sufficient time to reach the place where the inquiry is to be held.

When a joint inquiry is held into an accident after receipt of information about the inability of the Commissioner of Railway Accidents Rules, 1998 the Head of the Railway Administration concerned shall issue a press Note in this behalf inviting the public to tender evidence at the inquiry or send information relating to the accident to the Joint Inquiry Committee at an address specified in the press Note.

42.15 Report of joint inquiry or department inquiry to be sent to the Head of the Railway Administration and the action to be taken thereon-

1. As soon as any joint inquiry or departmental inquiry has been completed, the President of the Committee of railway officers or the Head of the Department, as the case may be, shall send to the Head of the Railway Administration concerned a report containing inter alia-
    - **a)** Brief description of the accident.
    - **b)** Description of the locality of the accident.
    - **c)** Detailed statement of the evidence taken.

d) The conclusions arrived together with a note of dissent, if any.

e) Reasons for conclusions arrived at.

f) The nature and extent of the damage done.

g) When necessary, a sketch illustrative of the accident.

h) The number of railway servants killed or injured.

i) The number of passengers killed or injured.

j) An appendix containing extracts of the rules violated by the staff responsible for the accidents.

2. The Head of the Railway Administration concerned shall forward, with his remarks as to the action that is intendent to be taken in regard to the staff responsible for the accident or for the revision of the system of working, a copy of the report referred to in sub-rule (1)-

a) To the Commissioner of Railway Safety for the section of the railway on which the accident occurred.

b) If no inquiry or investigation has been made under Rule 17 or if a joint or departmental inquiry has been held, first, to the District Magistrate or the officer appointed under clause(a) of sub-rule (1) of Rule 14; and

c) If any judicial inquiry is being made, to the Magistrate making such inquiry.

3. The copy of the report aforesaid shall be accompanied-

a) In the case referred to in clause (b)of sub-rule (2), by a statement of the persons involved in the accident whose prosecution the Head of the Railway Administration concerned considers to be desirable.

b) In the case referred to in clause (c) of sub- rule (2), by a copy of the evidence taken at the inquiry.

42.16 Reports of inquiries into accidents not covered by Section 113 to be forwarded to Commissioner of Railway Safety-

1. Whenever any accident, not of the nature specified in Section 113 of the Act, such as averted collisions, breaches of block rules or other technical accidents, occurs in the course of working a railway, the Railway Administration concerned may cause an inquiry, either a joint inquiry or a departmental inquiry, to be held into the accident.
2. Where an inquiry is held as provided under sub-rule (1), the Head of the Railway Administration concerned shall forward a copy of the report of the inquiry to the Commissioner of Railway Safety for the section of the railway in which the accident occurred.

THE ENQUIRY CONDUCTED UNDER THE COMMISSION OF INQUIRY ACT, 1952

43

In a democratic setup like our country, it is essential that there must be an independent, impartial, and transparent inquiry commission to investigate in detail any serious incident which causes public outcry. In the past there had been several judicial commissions over certain railway accidents. Whenever the Central Government decides that any railway accident which requires to be investigated by a commission other than Commissioner of Railway Safety, the inquiry is set up under The Commission of Inquiry Act, 1952. It is important that each railway officer dealing with railway operation and maintenance should be aware of such legislation.

The basic aim or purpose of the act is enactment of such laws, law enforcement, adjudication of dispute, supervision, licensing, collecting information and also taking action against the accused person. The basic object is to discover and explore actual facts, the investigation with an impartial and satisfactory role of administrators. For example, under this Act, the following

inquiry commissions were constituted.

1. The Justice G.C. Garg Commission was set up on 08.03.1999 to enquire into the train accident that took place between 2903 UP, Golden Temple Mail and 3152 DN Sealdah Express on 26.11.1998 in Ambala-Ludhiana Section of Northern Railway. The Commission submitted its report on 19.07.2004. The same was examined in consultation with various directorates of Railway Boards. The report and the action taken thereon was laid before Parliament on 12-13.05.2005 through Gazette notifications.
2. Justice Sagir Ahmed Commission was set up on 13.02.2001 to enquire into the train accident between 3005 UP, Howrah-Amritsar Mail and derailed wagons of DN Ajitwal – New Bongaigaon goods train on 02.12.2000 in Ambala-Ludhiana Section of Northern Railway.

43.1 History and Background

Before the ratification of The Commission of Inquiry Act, 1952, the government used to order the public either by giving executive order or notice under the Public Servants Inquiries Act,1850 or by making ad hoc committees (committees made for a special purpose and after the purpose is fulfilled it gets dissolved). The Act is not specific to any kind of matter, in fact, it includes almost all kinds of matters.

43.2 Salient features of The Commission of Enquiry Act, 1952

This Act is made for the appointment of commissions to inquire into matters which are related or concerned or affects the public at large. Some of the salient features are as under:

1. This Act applies to the whole of India provided it shall also apply to the state of Jammu and Kashmir.
2. When the central government may, by notification in the official gazette, appoint a commission from that day only the act shall come into force.
3. Under **Section 2** of the commission of inquiry Act, it has

provided certain definitions for reference which are further used in this act like "appropriate Government" which means only Central and State governments has the right to appoint a commission to make an inquiry related to any of the entries which are mentioned in List I or List II or List III in the Seventh Schedule of the Constitution.

4. It has also explained the meaning of commission which means a commission of inquiry appointed under Section 3,
5. "Prescribed" means that rules which are made under this act should only be referred.

43.3 Main provisions of The Commission of Enquiry Act, 1952

There are 12 provisions which are defined under the Commission of Inquiry Act, 1952. Some of the divisions are mentioned as below:

Section 3

This Section deals with the appointment of commission and says that an appropriate government by giving notification in the official gazette can appoint a commission of inquiry to investigate the matters of public importance within a specified period as given in the notification. Also, no state government can appoint another commission to inquire into the same matter. The commission can have more than one member appointed by the appropriate government also when the commission has more than one or more member then one of them should be appointed as the Chairman of the commission. The commission also must submit the report of inquiry along with a memorandum of the action taken within a period of six months of the capitulation of the report.

Section 4

Under this Section, powers of the commission have been defined which says that the commission has the power of a civil court under the Code of Civil Procedure, 1908 with respect to the following matters:

1. Asking and prosecuting the attendance of any person from any part of the country and examining him on the day of the oath.
2. Matters which require any discovery or production of any document.
3. Matters which are receiving matters on affidavits.
4. Matters related to any requisitioning of public record or copy thereof from any court or office.
5. Issues related to the examination of witnesses and documents.
6. Or any other matter which may be prescribed.

Section 5

Additional powers of the commission have been described in this section which says:

1. The commission has the power to require any person or individual, or subject to dispense information on such matters which in the opinion of the commission might be useful or relevant to the subject matter of inquiry.
2. No officer below the rank of a Gazetted Officer is authorized to enter any building for inquiry. but those who are above in the hierarchy can on the behalf of the commission enter any building or place where they believe that any document or the book of accounts which are relevant to the subject matter of the inquiry and can also seize under Section 102 and Section 103 of the Code of Criminal Procedure, 1898.
3. Any offence under Section 175, Section 178, Section 179, Section 180, or Section 228 of the Indian Penal Code and after the recording of any facts or the statement of the accused was taken the case should be forwarded to the magistrate who has the jurisdiction to try the same.
4. Any proceedings shall be deemed to be a judicial proceeding under Section 193 and Section 228 of the Indian Penal Code.

Section 8

Section 8 deals with the procedure that needs to be followed by the commission. Though the commission has the power to regulate or make its own procedures but is still bound by certain provisions:

1. The inquiry should not get interrupted by the reason for any vacancy in the commission or any sort of changes that occur in the constitution of the commission.
2. At any stage of the inquiry, if the commission wants that it is necessary to inquire into the conduct of the person or the commission is of the opinion that the reputation of any person will get injured because of the injury, then the commission should give a reasonable amount of time to the person to produce evidence and also the person should get an opportunity of being heard. All this can be done only when it doesn't discredit the witness to the case.
3. The appropriate government, or any other person, with the acknowledgement of the commission, whose evidence is being recorded has the right.
   a) to cross-examine a witness other than a witness that has been produced by the commission before.
   b) Can address the commission, and
   c) Also, it should be represented by a legal practitioner.

43.4 Amendments

Due to the limitations in the original Act, there was a need to amend this act quite a few times and due to the flexibility in the constitution of our country, it was made possible. In the meantime, of 68 years, this Act has been amended over five times:

1. The Commissions of Inquiry (Amendment) Act, 1971 (79 of 1971)
2. The Delegated Legislation Provisions (Amendment) Act, 1985 (4 of 1986)
3. The Commission of Inquiry (Amendment) Act, 1986 (36 of 1986)
4. The Commissions of Inquiry (Amendment) Act, 1988 (63 of 1988)
5. The Commissions of Inquiry (Amendment) Act, 1990 (19 of 1990)

43.5 Status and relevance

A commission of inquiry is not a judicature. The commission has the power to investigate, make laws, can record the evidence, and can make recommendations but without having any superior authority who can properly enforce them. Even the reports or the inquiry cannot be looked at as a judicial or administrative inquiry, rather it is being exercised as a so-called administrative function. The members of the commission don't have immunities to claim for otherwise, immunities are available to an officer governing over a court of law. There was a famous case of Biju Patnaik (P. V. Jagannath Rao & Ors. vs State of Orissa & Ors.) which made this fact clear that **a court of inquiry can be set up even if certain matters were pending in the courts**. The commission of inquiry in the case had nothing to impede or interfere with the powers of the court by acting in good faith and ejecting statutory functions under the Commission of Inquiry Act. The commission of inquiry does not have powers to penalize anyone for the distaste of his proceedings or for infringing its orders. The commissions are for an interim time period and do not have any specific schedule for their sittings.

43.6 THE COMMISSION OF INQUIRY ACT, 1952 ACT NO.60 OF 1952

[14thAugust, 1952.]

An Act to provide for the appointment of Commissions of Inquiry and for vesting such Commissions with certain powers.

Be it enacted by Parliament as follows: —

1. Short title, extent, and commencement. —

(1) This Act may be called the Commissions of Inquiry Act, 1952.

(2) It extends to the whole of India:

(3) It shall come into force on such a date as the Central Government may, by notification in the Official Gazette, appoint.

2. Definitions. —In this Act, unless the context otherwise requires, —

(a) "Appropriate Government" means—

(i) the Central Government, in relation to a Commission appointed by it to make an inquiry into any matter relatable to any of the entries enumerated in List I or List II or List III in the Seventh Schedule to

the Constitution; and

(ii) the State Government, in relation to a Commission appointed by it to make an inquiry into any matter relatable to any of the entries enumerated in List II or List III in the Seventh Schedule to the Constitution:

(b) "Commission" means a Commission of Inquiry appointed under section 3;

(c) "prescribed" means prescribed by rules made under this Act.

2A. [Construction of references to laws not in force in the State of Jammu and Kashmir***.]—**omitted by the Jammu and Kashmir Reorganization (Adaptation of Central Laws) Order, 2020, vide notification No. S.O. 1123(E), dated (18-3-2020) and vide Union Territory of Ladakh Reorganization (Adaptation of Central Laws) Order, 2020, Notification No.S.O.3774 (E), dated (23-10-2020).]

3. Appointment of Commission

(1) The appropriate Government may, if it is of opinion that it is necessary so to do, and shall if are solution in this behalf is passed by [each House of Parliament or, as the case may be, the Legislature of the State], by notification in the Official Gazette, appoint a Commission of Inquiry for the purpose of making an inquiry into any definite matter of public importance and performing such functions and within such time as may be specified in the notification, and the Commission so appointed shall make the inquiry and perform the functions accordingly.

Provided that where any such Commission has been appointed to inquire into any matter—

(a) by the Central Government, no State Government shall, except with the approval of the Central Government, appoint another Commission to inquire into the same matter for so long as the Commission appointed by the Central Government is functioning.

(b) by a State Government, the Central Government shall not appoint another Commission to inquire into the same matter for so long as the Commission appointed by the State Government is functioning, unless the Central Government is of opinion that the scope of the inquiry should be extended to two or more States.

(2) The Commission may consist of one or more members appointed by the appropriate Government, and where the Commission consists of more than one member, one of them may be appointed as the Chairman thereof.

(3) The appropriate Government may, at any stage of an inquiry by the

Commission, fill any vacancy which may have arisen in the office of a member of the Commission (whether consisting of one or more than one member).

(4) The appropriate Government shall cause to be laid before [2][each House of Parliament or, as the case may be, the Legislature of the State], the report, if any, of the Commission on the inquiry made by the Commission under sub-section (1) together with a memorandum of the action taken thereon, within a period of six months of the submission of the report by the Commission to the appropriate Government.]

4. Powers of Commission. —The Commission shall have the powers of a civil court, while trying a suit under the Code of Civil Procedure, 1908 (5 of 1908), in respect of the following matters, namely: —

(a) [summoning and enforcing the attendance of any person from any part of India] and examining him on oath.

(b) Requiring the discovery and production of any document.

(c) Receiving evidence on affidavits.

(d) Requisitioning any public record or copy thereof from any court or office.

(e) Issuing commissions for the examination of witnesses or documents.

(f) Any other matter which may be prescribed.

1. **Additional powers of Commission.**

(1) Where the appropriate Government is of opinion that, having regard to the nature of the inquiry to be made and other circumstances of the case, all or any of the provisions of sub-section (2) or sub-section (3) or sub-section (4) or sub-section (5) should be made applicable to a Commission, the appropriate Government may, by notification in the Official Gazette, direct that all or such of the said provisions as may be specified in the notification shall apply to that Commission and on the issue of such a notification, the said provisions shall apply accordingly.

(2) The Commission shall have power to require any person, subject to any privilege which maybe claimed by that person under any law for the time being in force, to furnish information on such points or matters as, in the opinion of the Commission, may be useful for, or relevant to, the subject matter of the inquiry [and any person so required shall be deemed to be legally bound to furnish such information within the meaning of section 176 and section 177 of the Indian Penal Code (45 of 1860)].

(3) The Commission or any officer, not below the rank of a Gazetted

Officer, specially authorized in this behalf by the Commission may enter any building or place where the Commission has reason to believe that any books of account or other documents relating to the subject matter of the inquiry may be found, and may seize any books of account or documents or take extracts or copies there from, subject to the provisions of section 102 and section 103 of the Code of Criminal Procedure, 1898 (5 of 1898), in so far as they may be applicable.

(4) The Commission shall be deemed to be a civil court and when any offence as is described in section 175, section 178, section 179, section 180 or section 228 of the Indian Penal Code (45 of 1860) is committed in the view or presence of the Commission, the Commission may, after recording the facts constituting the offence and the statement of the accused as provided for in the Code of Criminal Procedure, 1898 (5 of 1898), forward the case to a magistrate having jurisdiction to try the same and the magistrate to whom any such case is forwarded shall proceed to hear the complaint against the accused as if the case had been forwarded to him under section 482 of the CodeofCriminalProcedure,1898.

(5) Any proceeding before the Commission shall be deemed to be a judicial proceeding within the meaning of sections 193and 228 of the Indian Penal Code (45 of 1860).

5A. Power of Commission to utilize the services of certain officers and investigation agencies for conducting investigation pertaining to inquiry.

(1) The Commission may, for the purpose of conducting any investigation pertaining to the inquiry, utilize the services, —

(a) in the case of a Commission appointed by the Central Government, of any officer or investigation agency of the Central Government or any State Government with the concurrence of the Central Government or the State Government, as the case maybe; or

(b) in the case of a Commission appointed by the State Government, of any officer or investigation agency of the State Government or Central Government with the concurrence of the State Government or the Central Government, as the case may be.

(2) For the purpose of investigating into any matter pertaining to the inquiry, any officer or agency whose services are utilized under sub-section (1) may, subject to the direction and control of the

Commission, —

(a) Summon and enforce the attendance of any person and examine him.

(b) Require the discovery and production of any document; and

(c) Requisition of any public record or copy thereof from any office.

(3) The provisions of section 6 shall apply in relation to any statement made by a person before any officer or agency whose services are utilized under sub section (1) as they apply in relation to any statement made by a person in the course of giving evidence before the Commission.

(4) The officer or agency, whose services are utilized under sub-section (1), shall investigate into any matter pertaining to the inquiry and submit a report thereon (hereafter in this section referred to as the investigation report) to the Commission within such period as may be specified by the Commission in this behalf.

(5) The Commission shall satisfy itself about the correctness of the facts stated and the conclusions, if any, arrived at in the investigation report submitted to it under sub-section (4), and for this purpose the Commission may make such inquiry (including the examination of the person or persons who conducted or assisted in the investigation) as it thinks fit.]

5B. Power of Commission to appoint assessors. —The Commission may, for the purpose of conducting any inquiry, appoint persons having special knowledge of any matter connected with the inquiry as assessors, to assist and advise the Commission in the inquiry and the assessors shall been titled to such travelling and other expenses as may be prescribed.]

6. Statements made by persons to the Commission.

No statement made by a person in the course of giving evidence before the Commission shall subject him to, or be used against him in, any civil or criminal proceeding except a prosecution for giving false evidence by such statement:

Provided that the statement—

(a) Is made in reply to a question which he is required by the Commission to answer, or

(b) Is relevant to the subject matter of the inquiry.

6A. Persons are not obliged to disclose secret process of manufacture of goods in certain cases. — Except in cases where a Commission is expressly required to inquire into the process of manufacture of any

goods, nothing in this Act shall be deemed to compel any person giving evidence before the Commission to disclose any secret process of manufacture thereof.]

7. Commission to cease to exist when so notified

1) The appropriate Government may, by notification in the Official Gazette, declare that —
   (a) a Commission (other than a Commission appointed in pursuance of a resolution passed by [each House of Parliament or, as the case may be, the Legislature of the State] shall cease to exist, if it is of opinion that the continued existence of the Commission is unnecessary.
   (b) a Commission appointed in pursuance of are solution passed by [each House of Parliament or, as the case may be, the Legislature of the State] shall cease to exist if a resolution for the discontinuance of the Commission is passed by [each House of Parliament or, as the case may be, the Legislature of the State].
2) Every notification issued under sub-section (1) shall specify the date from which the Commission shall cease to exist and on the issue of such notification, the Commission shall cease to exist with effect from the date specified therein.]

8. Procedure to be followed by the Commission. —

The Commission shall, subject to any rules that may be made in this behalf, have power to regulate its own procedure (including the fixing of places and times of its sittings and deciding whether to sit in public or in private).

8A. Inquiry not to be interrupted by reason of vacancy or change in the constitution of the Commission. —

(1) Where the Commission consists of two or more members, it may act notwithstanding the absence of the Chairman or any other member or any vacancy among its members.

(2) Where during the course of an inquiry before a Commission, a change has taken place in the constitution of the Commission by reason of any vacancy having been filled or by any other reason, it shall not be necessary for the Commission to commence the inquiry a fresh and the inquiry may be continued from the stage at which the change took place.

8B. Persons likely to be prejudicially affected to be heard- If, at any stage of the inquiry, the Commission, —

(a) Considers it necessary to inquire into the conduct of any person; or

(b) is of opinion that the reputation of any person is likely to be prejudicially affected by the inquiry,

the Commission shall give to that person a reasonable opportunity of being heard in the inquiry and to produce evidence in his defence:

Provided that nothing in this section shall apply where the credit of a witness is being impeached.

8C. Right of cross-examination and representation by legal practitioner. —The appropriate Government, every person referred to in section 8B and, with the permission of the Commission, any other person who see evidence is recorded by the Commission, —

(a) may cross-examine a witness other than a witness produced by it or him.

(b) may address the Commission; and

(c) may be represented before the Commission by a legal practitioner or, with the permission of the Commission, by any other person.

9. Protection of action taken in good faith

No suit or other legal proceeding shall lie against the appropriate Government, the Commission or any member thereof, or any person acting under the direction either of the appropriate Government or of the Commission in respect of anything which is in good faith done or intended to be done in pursuance of this Act or of any rules or orders made there under or in respect of the publication, by or under the authority of the appropriate Government or the Commission, of any report, paper or proceedings.

10. Members, etc., to be public servants.

Every member of the Commission and every officer appointed or authorised by the Commission in exercise of functions under this Act shall be deemed to be a public servant within the meaning of section21ofthe Indian Penal Code (45of1860).

10A. Penalty for acts calculated to bring the Commission or any member thereof into disrepute.

(1) If any person, by words either spoken or intended to be read, makes, or publishes any statement or does any other act, which is calculated to bring the Commission or any member thereof into disrepute, he shall be punishable with simple imprisonment for a term which may extend to six months, or with fine, or with both.

(2) Not with standing anything contained in the Code of Criminal Procedure, 1973 (2 of 1974), when an offence under sub-section (1) is alleged to have been committed, the High Court may take cognizance of such offence, without the case being committed to it, upon a complaint in writing, made by a member of a

Commission or an officer of the Commission authorized by it in this behalf.

(3) Every complaint referred to it in sub-section (2) shall set forth the facts which constitute the offence alleged, the nature of such offence and such other particulars as are reasonably sufficient to give notice to the accused of the offence alleged to have been committed by him.

(4) No High Court shall take cognizance of an offence under sub-section (1) unless the complaint is made within six months from the date on which the offence is alleged to have been committed.

(5) A High Court taking cognizance of an offence under sub-section (1) shall try the case in accordance with the procedure for the trial of warrant cases instituted otherwise than on a police report before a court of a Magistrate:

Provided that the personal attendance of a member of a Commission as a complainant or otherwise is not required in such a trial.

(6) Notwithstanding anything contained in the Code of Criminal Procedure, 1973 (2 of 1974) an appeal shall lie as a matter of right from any judgment of the High Court to the Supreme Court, both on facts and on law.

(7) Every appeal to the Supreme Court under sub-section (6) shall be preferred within a period of thirty days from the date of the judgment appealed from:

Provided that the Supreme Court may entertain an appeal after the expiry of the said period of thirty days if it is satisfied that the appellant had sufficient cause for not preferring the appeal within the period of thirty days.]

11. Act to apply to other inquiring authorities in certain cases.

Where any authority (by whatever name called), other than a Commission appointed under section 3, has been or is setup under any resolution or order of the appropriate Government for the purpose of making an inquiry into any definite matter of public importance and that Government is of opinion that all or any of the provisions of this Act should be made applicable to that authority, that Government may, subject to the prohibition contained in the proviso to sub section (1) of section 3, by notification in the Official Gazette, direct that the said provisions of this Act shall apply to that authority, and on the issue of such a notification, that authority shall be deemed to be a Commission appointed under

section 3 for the purposes of this Act.

12. Power to make rules.

(1) The appropriate Government may, by notification in the Official Gazette, make rules to carry out the purposes of this Act.

(2) In particular, and without prejudice to the generality of the foregoing power, such rules may provide for all or any of the following matters, namely: —

(a) The term of office and the conditions of service of the members of the Commission.

(b) The manner in which inquiries may be held under this Act and the procedure to be followed by the Commission in respect of the proceedings before it.

(c) The powers of civil court which may be vested in the Commission.

[(cc)the travelling and other expenses payable to assessors appointed under section 5B, and to persons summoned by the Commission to give evidence or to produce documents before it;]

(d) Any other matter which must be, or maybe, prescribed.

(3) Every rule made by the Central Government under this section shall be laid, as soon as maybe after it is made, before each House of Parliament while it is in session for a total period of thirty days which may be comprised in one session or [in two or more successive sessions, and if, before the expiry of the session immediately following the session or the successive sessions aforesaid], both Houses agree in making any modification in the rule or both Houses agree that the rule should not be made, the rule shall thereafter have effect only in such modified form or be of no effect, as the case may be; so, however, that any such modification or annulment shall be without prejudice to the validity of anything previously done under that rule.]

(4) Every rule made by the State Government under this section shall be laid, as soon as may be after it is made, before the State Legislature.

****

PART H:
MEASUREMENT, JOINT NOTE AND ACCIDENT SKETCH

PROFORMA FOR JOINT MEASUREMENT DURING ACCIDENT (2019)

44

The relevant paras in this proforma are required to be filled in by the inspectors/officers of the respective department before leaving the site of the accident and the complete proforma should be countersigned by the senior most officer present at the site of accident.

This proforma should form a part of the proceedings of the enquiry and should be sent along with the proceedings.

44.1 General Guidelines

1. Careful observation of clues and a comprehensive record thereof is vital for accident enquiry. In addition, a comprehensive record of track and rolling stock parameters and operating features is required for investigation of derailments.
2. There are two broad categories of derailment -

   Sudden derailment caused by wheel set jumping of the rails. Such a derailment indicates that the derailing forces were high enough to suddenly force the wheel off the rail. These are typically caused by failure of vehicle/ track components, obstruction on track, entanglement of hanging parts of rolling

stock etc. These derailments are characterized by a short mark on the rail table between Point of Mount and Point of Drop. In some cases, the Point of Mount may even be absent.

Derailment by flange climbing, caused by wheel mounting the rail in a relatively gradual manner. It indicates that the derailing forces were powerful enough to overcome the normal stabilizing forces, yet not sufficient to cause a sudden derailment. Such derailments are characterized by a longer mark on the rail table between Point of Mount and Point of Drop. Track and rolling sock parameters and operating features influence the rail-wheel interaction forces and, hence, their complete record and a comprehensive analysis is required to arrive at the mechanism of derailment. Cause and consequence of derailment are required to be differentiated through this comprehensive analysis.

3. Locating and examining the wheel mounting mark(s) at the initial point of derailment is very important for identifying the category of derailment. Precise measurements and critical and detailed examination of the wheel mounting marks should be made e.g. their length, strong or faint, broken or continuous, single, or multiple, etc. Photographs should be taken of such marks, not only on the rail, but also on the fastenings, sleepers, and ballast.
4. Derailment proneness increases with increased Lateral wheel force, reduced Vertical wheel load (Off-loading) and increased Positive Angularity of wheel. Derailment proneness becomes substantially higher in case of axle moving with a persistently positive angularity. Track and rolling stock parameters and operating features should be critically analyzed for their contribution towards these causes. In case of derailments in curve, proper functioning of Bogie rotation system to ensure

undue angularity needs close examination. Contribution of track twist and spring defects and twist in bogie frame/ vehicle under frame to derailments caused by wheel Off-loading needs to be analyzed. In case of derailments at high speed, parameters affecting vehicle oscillation and damping thereof need a close analysis.

5. While analyzing the mechanism of derailment, relative contribution of track and rolling stock parameters to the rail-wheel interaction forces needs a comprehensive analysis. Reference should be made to the safety limits/ Maintenance limits specified in IRPWM/ IRCA Rules/ Maintenance Manuals.
6. Proforma for measurement of locomotive, wagon, and carriage are attached as annexure-A, B and C respectively for recording the details. The joint measurement to be submitted by senior supervisors shall not be complete till all the measurement of rolling stock and track as per enclosed proforma have been recorded. Only completed joint measurement w.r.t. rolling stock and track shall become a document to be relied upon by the enquiry committee for drawing conclusion regarding cause of accident.
7. No enquiry shall be completed before the complete measurement of rolling stock and track is available and made part of the enquiry report. President of the Enquiry Committee may get additional measurements done as per requirement of the derailment case.
8. The photographs of the concerned sections of track and part of rolling stocks shall be taken and annexed in the enquiry report. ART personnel should be trained in identifying such relevant part of track and rolling stocks involve in the accident.
9. In case of derailment of passenger trains causing injury to

passengers, video recording of the concerned part of track and rolling stock shall be carried out by nominated ART personnel, trained for the purpose.

Photography & videography of accident site shall be with great care & precision, similar to a crime scene photography/videography. ART personnel nominated for this shall be suitably trained for the purpose. The photographs and videos should be self-explanatory such that relevant conclusion can be drawn.

10. Site sketch of the derailment/accident location shall be prepared giving due care that all the relevant items are included along with the dimensions. A sample sketch is attached for the guidance.

    Preservation of relevant clues, documents & photographs/videography of the accident scene shall be done under supervision of Sr. DSO of the Division. Measurement shall be taken at least for 100m in rear of the point of Mount/Drop.
11. M&C report from RDSO must also be part of accident enquiry report in case of a rail fracture.
12. In case of a suspected sabotage, Tell-tale sign must be preserved and recorded.
13. If rail/weld failure is suspected to be cause of derailment, assessment of impact loading to which the rail/weld was subjected to prior to its failure becomes important. In such cases, WILD data for few preceding trains shall be analyzed for critical alarms and any critical alarm shall be brought out and deliberated by enquiry committee.

GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS
(RAILWAYS BOARD)

No. 2018/Safety(A&R)/1/8 **New Delhi, dated 25.01.2019.**

General Managers,
All Indian Railways,
(Including Metro Railway, Kolkata)

Managing Director,
KRCL, Navi Mumbai.

Sub: Revision and Standardization of Observation/ Measurement Proforma for Accident Investigation/ Inquiry.

Ref: 1. RDSO letter No. CT/Safety dated 08.06.2018
2.CCRS's letter No. M.15013/1/2017-18 T.W. (Pt.II) dated 07.06.2018

A revised Observation/ Measurement Proforma for various parameters related to track and rolling stock for Accident Investigation / Inquiry has been prepared by RDSO in consultation with Commission of Railway Safety Board (CRB) has approved the proforma for uniform adoption over Indian Railway for CRS Inquiry as well as Joint/Departmental Inquiry of the accidents. The approved proforma (total 34 pages) is enclosed herewith.

This is for kind information and necessary action please.

(Pankaj Kumar)
Director (Safety)-IV
Railway Board
Ph. 030-43574, 011-23070944
Mob.: 9910487540

Copy to:
1. DG/RDSO, Lucknow and Commission of Railway Safety, Lucknow for kind information in connection with letter under reference.
2. Chief Safety Officers, All Zonal Railways.

General Guidelines

1. Careful observation of clues and a comprehensive record thereof is vital for accident enquiry. In addition, a comprehensive record of track and rolling stock parameters and operating features is required for investigation of derailments.
2. There are two broad categories of derailment.
   Sudden derailment caused by wheel set jumping of the rails. Such a derailment indicates that the derailing forces were high enough to suddenly force the wheel off the rail. These are typically caused by failure of vehicle/ track components, obstruction of track, entanglement of hanging parts of rolling stock etc. These derailments are characterized by a short mark on the rail table between Point of Mount and Point of Drop. In some cases, the Point of Mount may even be absent.
   Derailment by flange climbing, caused by wheel mounting the rail in a relatively gradual manner. It indicates that the derailment forces were powerful enough to overcome the normal stabilizing forces, yet not sufficient to cause a sudden derailment. Such derailments are characterized by a longer mark on the rail table between Point of Mount and Point of Drop. Track and rolling stock parameters and operating features influence the rail-wheel interaction forces and hence, their complete record and a comprehensive analysis is required to arrive at the mechanism of derailment. Cause and consequence of derailment are required to be differentiated through this comprehensive analysis.
3. Locating and examining the wheel mounting marks(s) at the initial point of derailment is very important for identifying the category of derailment. Precise measurements and critical and detailed examination of the wheel mounting marks should be made e.g. their length, strong or faint, broken or continuous, single, or multiple, etc. Photographs should be taken of such marks, not only on the rail, but also on the fastening, sleepers, and ballast.
4. Derailment proneness increases with increased lateral level force, reduced vertical wheel load (Off-loading) and increase positive angularity of wheel. Derailment proneness becomes substantial higher in case of axle moving without persistently positive angularity. Track and rolling stock parameters and operating features should be critical analysis for their contribution towards these causes. In case of derailments and curve, proper functioning of Bogie rotation system to ensure undue angularity needs close examination. Contribution of track twist and spring defects and twist in bogie frame/ vehicle under frame to derailments caused by wheel Off-loading needs to be analysed. In case of derailments at high speed, parameters affecting vehicle oscillation and damping thereof needs a close analysis.
5. While analysing the mechanism of derailment, relative contribution of track and rolling stock parameters to the rail-wheel interaction forces needs a comprehensive analysis. Reference should be made to the safety limits/Maintenance limits specified in IRPWM/ IRCA Rules, Maintenance Manuals.

6. Proforma for measurement of locomotive, wagon, and carriage are attached as annexure-A, B and C respectively for recording the details. The joint measurement of rolling stock and track as per enclosed proforma have been recorded. Only completed joint measurement w.r.t. rolling stock and track shall become a document to be relied upon by the enquiry committee for drawing conclusions regarding causes of accident.
7. No enquiry shall be completed before the complete measurement of rolling stock and track is available and made part of the enquiry report. Enquiry Committee may get additional measurements done as per requirements of the derailment case.
8. The photographs of the concerned sections of track and part of rolling stocks shall be taken and annexed in the enquiry report. ART personnel should be trained for identifying such relevant part of track and rolling stocks involve in the accident.
9. In case of derailment of passenger trains causing injury to passengers, videos recording of the concerned part of track and rolling stock shall be carried out by nominated ART personnel, trained for the purpose.
   Photography & videography of accident site shall be with great care & precision, similar to a crime scene photography/videography. ART personnel nominated for this shall be suitably trained for the purpose. The photographs, videos should be self-explanatory such that relevant conclusion can be drawn.
10. Site sketch of the derailment/ accident location shall be prepared giving due care sketch is attached for the guidance. Instructions for the preparation of sketch of the site of accident has given in "Accident Manual" shall be followed.
    Preservation of relevant clues, documents & photographs/videography of the accident scene shall be done under supervision of Safety Officials of the Division.
11. M&C report from RDSO must also be part of accident enquiry report in case accident is attributed to breakage of any component of track or rolling stock.
12. In case of a suspected sabotage, Tell-tale sign must be preserved and recorded.
13. If rail/weld failure is suspected to be cause of derailment, assessment of impact loading to which the rail/weld was subjected to prior to its failure becomes important. In such cases, WILD data for few preceding trains shall be analysed for critical alarms and any critical alarm shall be brought out and deliberated by enquiry committee.
14. Observations of SM's Panel need to be recorded in case accident takes place in station area.
15. Speed recorders and event recorders in the locomotives shall be freezed immediately post the accident. SM's control panel shall be freezed till the time position of the knobs, switches, points & crossings etc. are jointly recorded. It is the responsibility of the concerned controlling officer / safety officials to ensure freezing of the above. Safety official shall take into custody of all the relevant documents, broken parts etc.

Rail Fastening Observations (For column – H)

Sleeper No.	Left Hand Rail						
	ERC		LINER		INSERTS		RUBBER PAD
	Driven, Under Driven, Over Driven, Tight, Loose, Missing		Tight, Loose, Missing		Damaged or Intact		Available/Missing Firm or Displaced Torn or Perished
	Inner	Outer	Inner	Outer	Inner	Outer	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
UP to 75 sleepers							

Sleeper No.	Right Hand Rail						
	ERC		LINER		INSERTS		RUBBER PAD
	Driven, Under Driven, Over Driven, Tight, Loose, Missing		Tight, Loose, Missing		Damaged or Intact		Available/Missing Firm or Displaced Torn or Perished
	Inner	Outer	Inner	Outer	Inner	Outer	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
UP to 75 sleepers							

Annexure- 'A'

44.2 Proforma for Motive Power (Diesel & Electric Locomotives)

Locomotive (Diesel £ Electric): Proforma to be filled in case of accident /dci ailment when loco is involved in accident.

1. Basic information:

b. Date of Accident:
c. Train No.:
d. Loco Class:
e. Loco Number:
f. Loco manufacture year and place:
g. Base Shed of Loco:
h. Date & Place last POH:
i. Kilometers earned after last POH:
j. Date & place of last major inspection:
k. Date & place of last schedule inspection:
l. Whether any schedule id overdue? :

2. Give brief particulars to the safety items not provided or provided but missing/not working.

Whether Loco is provided with:

Safety fittings	Provided	Working
Headlight		
Speedometer		
Speed Recorder		
Flasher light'		
Horn		
Brake System		
VCD		

3. Check & record the observations as follows:

a. Position of control handles, cut-out cocks etc. after the accident.
b. Functioning of brake synchronizing valve-whether working or not.
c. Position of brake blocks after the accident- whether applied or not.

d. Condition of cattle guard.
e. Any sign of seizure of roller bearing in Axle box including condition of its components
f. Condition of Pivot and Side Bearer arrangement of bogie including obstruction to Bogie rotation.
g. Condition of Friction Damper components/ Hydraulic Dampers
h. Condition of Traction Rod/ Guide Rod including its connection.
i. Condition of Traction Link including its connection.
j. Condition of Lateral Stop components between Bogie and Loco body underframe.
k. Any other observation in respect to mechanical defect of the locomotive, which might have any bearing on safe running of loco.

Note: Defective or broken material should be sent to CMT for testing if necessary.

TO BE JOINTLY SIGNED BY		
SUPERVISOR (C&W)	**SUPERVISOR (TRAFFIC)**	**SUPERVISOR (P.WAY)**
SSE(Loco)	**CLI**	

4. Measurement for Wheels for All Classes of Locomotives with wheel gauge (04 locations applicable for Bo-Bo Locos)

S.No.	Description	Observed Value (in mm)			Remarks
1.	Particulars-of axle (ID No.)	1			
		2			
		3			
		4			
		5			
		6			
2.	Diameter of wheel at tread		LH	RH	
		1			
		2			

		3			
		4			
		5			
		6			
3.	Wheel Flange thickness		LH	RH	
		1			
		2			
		3			
		4			
		5			
		6			
4.	Wheel Root wear		LH	RH	
		1			
		2			
		3			
		4			
		5			
		6			
5.	Tread wear		LH	RH	Tread wear should be measured from trad at 63.5 mm from wheel gauge face (from the back face of flange) in BG and at 57 mm from wheel gauge face (from the back face of the flange) in MG.
		1			
		2			
		3			
		4			
		5			
		6			
6.	UST of axle: Give the date of last UST test done	**Axle**	**Observations**		Information is relevant in case of axle breakage.
		1			
		2			
		3			
		4			
		5			
		6			

Measurement for Wheels for All Classes of Locomotives with wheel gauge (04 locations applicable for Bo-Bo Locos) (Continued) -

TO BE JOINTLY SIGNED BY		
SUPERVISOR (C&W)	**SUPERVISOR (TRAFFIC)**	**SUPERVISOR (P.WAY)**
SSE (Loco)	**CLI**	

Notes:

1 Wheel number one is the outer end axle of truck under the short hood and wheel count increases towards the Long hood on diesel loco, whereas for Electric Loco, wheel number one is the outer end axle under Cab-1 (Cab- 1 is that side of the loco which has the compressors and Cab-2 is that side of the loco which has the ARNO convertor) and wheel count increases towards the Cab-2.

2 The measurements of wheels are to be done using ***wheel*** **gauges** to RDSO drawing No. SKDL-3592 for all BG locomotives except WAP5 locos. For WAP5 locos RDSO's drawing No. SKOL-4446 and SKDL-4447 may be followed.

3 All measurements are to be taken on a level, un-canted track at the nearest yard.

4 Service limits given in the Maintenance Manual are for good maintenance practice and these are not safety limits. However, the measured values shall be compared with the service limits and degradation in values shall be discussed while finalizing the findings.

S.No.	Description	Observed Value (in mm)		Remarks
7.	**Wheel gauge:** For checking wheel gauge, three measurements at equal spacing on the inner periphery of the two wheels on the same axle is to be recorded. Check for bent axle, if any.	1		All measurements shall be taken on a level tangent un-canted track. Information is relevant in the case of wheel disc shifting/bent axle only. For safety, similar limits as applicable for track gauge are relevant for wheel gauge also.
		2		
		3		
		4		
		5		
		6		

TO BE JOINTLY SIGNED BY		
SUPERVISOR (C&W)	**SUPERVISOR (TRAFFIC)**	**SUPERVISOR (P.WAY)**
SSE (Loco)	**CLI**	

Measurement of other relevant items:

S. No.	Description		Observed Value (in mm)	Remarks
1	Buiter /Coupler Height Measurement of parameters such as buffer length etc may also be done to check possibility of buffer entanglement.			All measurement shall be taken on a level tangent un-canted track. This measurement is required to be taken only in case of trailing stock is with buffers.
2	Lateral clearances	End Axles (1,3,4 &6)		

		Middle Axles (2 & 5)		
3	Lateral clearances	End Axles (1,2,3 &4)		Applicable for Bo-Bo locomotives only.
4	Longitudinal axle box & (for all axles	clearances, between bogies. Pedestal liner)		Except WDP3A, WDG4, WDP4, WDP4B, WAP5, WAP7, WAG9 locomotives.
5	Longitudinal clearances between axle box &bogie pedestal liner (for middle axles)			Applicable to WDP3A locomotive only.
6	Height of Rail Guard from rail level			
7	Condition of suspension Springs i.e. normal/ broken fresh and old fracture or deformities occurred after derailment due to sudden impact.			
8	Deflected height of coil spring after rerailing on level, uncanted track.			
9	Condition of Rubber/ Elastomeric Spring Assembly at the Secondary stage.			

Note: - Measurement of items (e) to (j) in Para 3& item 8 & 9in Para 5 will be done as per site condition.

TO BE JOINTLY SIGNED BY		
SUPERVISOR (LOCO)	**SUPERVISOR (TRAFFIC)**	**SUPERVISOR (P.WAY)**
SSE (Loco)	**CLI**	

****

Annexure- 'B'

44.3 Proforma for Wagon

Note: Details regarding all derailed vehicles should be given except.

1. **(i)** Where vehicles have derailed due to locomotive derailment
   (ii) When the obvious and indisputable cause is sabotage or an obstruction on track
2. Front and rear and left (L) and right (R) are with respect to direction of movement.
3. For an obvious cause of derailment such as a broken axle, spring dropping off the run, and/or some part of under gear hanging loose and causing obstruction only relevant particulars need.
4. Particulars for each derailing vehicle should be given in one sheet. Information against columns (5). (6), (8), (16), (17), (21), (22) should invariably be given for adjacent wagons on the same sheet.
5. Relevant details of adjacent vehicles should also be given if cause of derailment is not apparent.

		Details	
1.	**Serial Number**		
2.	**Date of incident**	2.	
3.	**Train no**	3.	
4.	**Details of BPC along with name of the station from where it is issued and Engineer (C&W) who issued**	4.	
D	**Wagon No.**	5.	
E	**Type**	6.	
F	**Mechanical Code**	7.	
G	**Tare in tones**	8.	
H	**Carrying capacity and Axle load**	9.	
I	**Built Date**	10.	
J	**Return Date**	11.	
K	**POH Particulars**	12.	Date:
		13.	Shop:

L	**ROH Particulars**	14.	Date:		
		15.	Depot:		
M	**Payload in Tones**	16.	From Lables		
		17.	From actual weighment		
N	**Commodity loaded and remarks regarding uneven loading (give sketch for details of uneven loading)**	18.			
O	**Stations**	19.	From		
		20.	To		
P	**Position from Engine**	21.			
2 2.	**Buffer/Coupler Height**	**1.** Measure Buffer/Coupler height after uncoupling & re-railing on un-canted level track. **2.** Record whether there is buffer entanglement (Yes/ No)			
R	**Wheel and Axle Face Particulars (in case of breakage of Wheel/Axle)**	23.	Axle Face Particulars	1L,1R,2L,2R,3L,3R, 4L,4R	
		24.	Ultrasonic Particulars on the Hub of the Disc	1L,1R,2L,2R,3L,3R, 4L,4R	
		25.	Stamping Particulars on wheel Disc regarding manufacturer/R A/RD	1L,1R,2L,2R,3L,3R, 4L,4R	
S	**Wheel diameter:** **a. Measurement** **b. Record whether below condemning size (Yes/No)**	26.		**Note:** Wheel diameter measurement is not mentioned in IRCA PART-III, Rule, not in rejectable defect, and also not mentioned in Accident Manual hence to be removed.	
T	**Wheel Gauge** in mm*	27.	1		

	(taken at three places) *The wheel gauge is to be measured at the horizontal plane passing through the centre of the axle.		2	
			3	
			4	This row to be removed due to wheel gauge in mm to be measured at three locations as per IRCA PART-III
U	**Wheel & Axle observations** after measuring the profile with tyre defect gauge (Good/Rejectable) ** ** ** The wheel profile to be checked with tyre defect gauge only (Ref: IRCA PART-III, Rule no. 3.2.2(d) and 4.18.1 Plate no. 57 to 66)	28.	**Defects**	1L,1R,2L,2R,3L,3R,4L,4R
			Thin Flange	
			Sharp Flange	
			Worn out Root	
			Deep Flange	
			Hollow Tyre	
			Flat Tyre	
V	**Roller Bearing:** (To be recorded in case of any abnormalities observed in Roller Bearing/ Axle Box)	29.	Condition of Face cover plate	
		30.	Condition of Locking plates & Studs	
		31.	Condition of **Roller Bearing and its components**	
W	**Axle Box (**for IRS Stock/UIC**)** **(**To be recorded only when failure of plain bearing is involved as a cause**)**	32.	Brass thickness mm	
		33.	Condition of box and brass	
		34.	Condition of sole plates	
		35.	Condition of journals	
		36.	Clearance between brass and collar of journal in (mm)	
	Axle Box (for IRS/UIC Stock**)**	37.	Lateral clearance between axle box and axle guard in (mm)	
		38.	Whether axle guard can work clear of axle box	
		39.	Are the axle guard bent or otherwise damaged to prevent free movement of	

			axle box	
		40.	Remark regarding bridle bar	
X	**Clearances for Casnub Bogie (**Corresponding measurements to be taken for IRS/UIC Bogie**)**	41.	Tyre of Bogie	
		42.	Lateral clearance between side frame & Bolster in mm	**Note:** Above measurement is not mentioned in IRCA PART-III, Rule, not in rejectable defect, and also not mentioned in Accident manual hence to be removed.
		43.	Lateral clearance between side frame & Axle Box Adaptor in mm	
		44.	Lateral clearance between side frame & Axle Box Adaptor in mm	
Y	**Spring and Spring Gear:** **Note: Col no. 50 to be eliminated as above measurement in not mentioned in IRCA PART-III, Rule, not in rejectable defect, and also not mentioned in Accident manual hence to be removed.**	45.	Any broken/ Cracked/ missing/ clearance of shackle & shackle pin and general condition (for UIC/IRS)	**UIC/IRS**
		46.	Thickness of packing plate under spring seat in mm	**UIC/IRS**
		47.	Remarks whether any spring eye touches sole bar (for laminated spring only)	**UIC/IRS**
		48.	Condition **of suspension springs; normal, broken/fresh, and old fracture or deformities after derailment due to sudden impact**	
		49.	Camber of Spring in mm after re-railing on a level un-canted track (for laminated spring only)	**UIC/IRS**
		50.	Deflected height of coil spring after re-railing on level un-canted track (For Casnub)	Not rejectable defect

		51.	Condition of Elastomeric Pad above adaptor (For Casnub)	
Z	**Bogie**	52.	Condition of **Centre Pivot including lubrication & wear (for Casnub)**	Lubrication & wear to be removed from this row due to this factor are not cause of the derailment because Lubricating in centre pivot has been provided to improve the serviceability of wagon stock as per Director General (Wagon) L. No. MW/PLNG/CSNB dt. 14/10/2016
		53.	Condition of **Side Bearer including vertical clearance at side bearers (for stock having clearance type side bearers only)**	For UIC bogie
		54.	Condition of **Friction Snubber Wedge assembly (For Casnub)**	To be checked for broken and missing in place of condition of friction snubber wedge assembly.
Z1	Whether a load is placed on more than one wagon	55.		
Z2	Any other defect in vehicle which may	56.	Col. No. 56 to eliminated as all measurement already given on this format,	

	have contributed to or caused the derailment		so there is no need to include this column.
Z3	Details of broken parts giving location w.r.t. point of mount and drop.	57.	
Z4	List of damages to the wagon due to accident	58.	
Z5	**Other Observations***	59.	Col. No. 56 to eliminated as all observations already given on this format, so there is no need to include this column.
Note: Measurement of Item 3,4 & 5 of opening note, item 42,43,44,46,47,49,50,56 & 59 will be done as per site condition.			

****

Annexure- 'C'

44.4 Proforma for Carriage
(LHB Coach Measurement)

Proforma to be filled in case of Derailment:

Note: Details regarding all derailed vehicles should be given except: -

1. **(i)** Where vehicles have derailed due to locomotive derailment.
   (ii) When the obvious or indisputable cause is sabotage or an obstruction on the track or broken axle or wheel.
2. Particulars for each derailed vehicle should be given in one sheet. Information against columns nos. (5), (6), (7), (14), (50) and (51) should invariably be given for adjacent coaches on the same sheet.
3. Front and Rear left (L) and Right (R) are with respect to direction of movement.
4. For an obvious case of derailment such as a broken axle, spring dropping off on run, and/or some pail of under gear hanging loose and causing obstruction, only relevant particulars need to be filled.
5. Relevant details of adjacent vehicles should also be given if the cause of derailment in not apparent.

S. N	Item	Details
2.	**Date of incident**	2.
3.	**Train No.**	3.
4.	**Details of BPC along with name of the station where issued and Engineer (C&W) who issued it.**	4.
5.	**Vehicle No.**	5.
6.	**Type**	6.
7.	**Tare in tones**	7.
8.	**Carrying capacity**	8.

	in tones	
9.	**Built Date**	9. **PU** [ ] **Date** [ ]
10.	**Return date**	10.
11.	**POH details**	11. W/Shop [ ] Date [ ]
12.	**Stations**	12. From [ ] 13. To [ ]
14.	**Position from engine**	14.
15.	**Wheel gauge** in mm (to be measured at three locations) measured in empty condition at the horizontal plane passing through the center of the axle	15.

	Reading 1	Reading 1	Reading 1
AXLE-1			
AXLE-2			
AXLE-3			
AXLE-4			

16.	**Wheel diameter:** **i)** Measurement **ii)** Record whether below c**ondemning size (Yes/No)**	16 (i)	1L	2L	3L	4L	1R	2R	3R	4R
			Note: Wheel diameter measurement is not mentioned in IRCA Part-IV, Rule, not in rejectable defect, and also not mentioned in Accident Manual hence to be removed.							
		16 (ii)								

17.	Any indication of **Bent axle** or wheel having shifted on axle.	17. **AXLE 1**	**AXLE 2**	**AXLE 3**	**AXLE 4**
		Note: to be deleted because wheel gauge measurement already mentioned in Cl. No 15.			

18.	Wheel and axle **face particulars** (in case of breakage of any wheel/ axle)	18. Axle Face particulars	1L	1R	2L	2R	3L	3R	4L	4R
		19. Ultrasonic particulars on the Hub of Disc	1L	1R	2L	2R	3L	3R	4L	4R

20.	**Stamping** particulars on wheel discs regarding manufacturer/RA/RD	20.	1L	1R	2L	2R	3L	3R	4L	4R

	(in case of breakage of any wheel/axle)	
21.	Observations after measuring the profile with wheel defect gauge **(Good/Rejectable)**	21. **Left** | **1** | **2** | **3** | **4** Remark 22. **Right** | **1** | **2** | **3** | **4** Remark
23.	**Roller Bearing:** (To be recorded in case of any abnormalities observed in Roller Bearing/ Axle Box)	23. Condition of Axle box, **rear, and front covers/End cap** (FIAT) — 1L 1R 2L 2R 3L 3R 4L 4R 24. Condition of face cover plate — 1L 1R 2L 2R 3L 3R 4L 4R 25. Condition of Bearing Seal & Studs/**Locking plate** and Bolts (For FIAT) — 1L 1R 2L 2R 3L 3R 4L 4R 26. Condition of **Roller Bearing** and its components — 1L 1R 2L 2R 3L 3R 4L 4R
27.	**Spring and Spring Gear:** Note: Col. No.30 to 33 **(for ICF)** to be eliminated as above measurement is not mentioned in IRCA PART-IV, Rule, not in rejectable defect, and also not mentioned in Accident manual hence to be removed.	27. Condition of **Coil suspension spring** i.e., Normal/Fractured (old/fresh) — Left / Right 28. Condition of **Rubber spring** i.e. Normal/Cracked including length of crack (for LHB only) 29. Condition of Air Spring including **leakage** in piping — Left / Right 30. Deflected height of coil spring after re-railing on a level un-canted track. 31. Crown Clearance 32. Bogie frame Bolster clearance 33. Body bogie frame clearance 34. Condition of Rubber Disc — Left

			and Bump Stop of Primary Suspension (for LHB)	Right			
		35.	Height of **Bogie Bolster base plate** from rail level (for LHB)	Left	1L	2L	
				Right	1R	2R	
36.	**Condition of Bogie Components:**	36.	Condition of Hanger (for ICF)				
		37.	Condition of Equalizing Stay (for ICF)				
		38.	Condition of Anchor Link (for ICF)				
		39.	Condition of **Control Arm, Rubber element** (for LHB)	1L	2L	3L	4L
				1R	2R	3R	4R
				Rubber element and bore (for LHB) to be deleted.			
		40.	Condition of Axle Guide Cum Dash Pot including Oil level (for ICF)				
41.	**Damping System:** **Note:** Col. No.40 measurement of Oil level (for ICF) as mentioned to be eliminated as above measurement in IRCA PART-IV, Rule, not in rejectable defect, and also not mentioned in Accident manual hence to be removed.	41.	Condition of **Hydraulic Dampers**	Left	Hydraulic Dampers are provided to improve the riding quality of coach. Hence to be deleted.		
				Right			
		42.	Condition of **Anti Roll Bar** (for LHB)	Front	The Anti roll bars are provided to curb the rolling motion of coach and there is no role in derailment. Hence to be deleted.		
				Rear			
43.	**System of Bogie Rotation and Clearance:**	43.	Condition of Center Pivot including vertically of Pivot Pin (for ICF)				
		44.	Condition of Side Bearer including Oil level and Wear (for ICF)				
		45.	Condition of Longitudinal/ Lateral flexibility of	**Note:** Col. No. 43 – 47 as mentioned to be eliminated as			

			Secondary Spring (for LHB)	above measurement is not mentioned in IRCA PART- IV, Rule, not in rejectable defect, and also not mentioned I Accident manual hence to be removed.
		46.	Clearance between Traction Center and Longitudinal/ Lateral Bump Stop (for LHB	
47.	Remarks regarding free movement of bolster and pivot and their condition.	47.		
48.	Condition of Grounding cables, Wheel Slip Protection (WSP), and Speed Sensor (for LHB)	48.	These items are provided for protecting the wheel from skidding and ground cables are provided to protect the component against electric current leakage and there is no role in derailment. Hence to be deleted.	
49.	Condition of Brake Gear Assembly			
50.	Buffer/**Coupler Height** (to be taken on a level un-canted track after uncoupling and rerailing) (in mm)	50	Front	
		51	Rear	
52.	Condition of Side Buffer Working, dead, drooping, entanglement			
53.	Details of broken parts giving location w.r.t. point of mount and derailment and whether breakage considered due to accident.	53		
54.	Any other defect in the vehicles which may have contributed to or caused the derailment such as condition of **coupler, draft gear pocket, shearing plates etc.**	54	There is no role of draft gear assembly in derailment as draft gear is provided to absorb the compressive and tensile force. Hence to be deleted.	
55.	List of Damages to the Coach due to accident	55	1	5
			2	6
			3	7
			4	8
56.	Other observations considered relevant to derailment	56		

Note: Measurement of Item 5 of opening note, item 24, item 28 to 49, item 54 & item 56 will be done as per site condition.

44.5 Proforma for Carriage

(LHB Coach Bogie Parameters)

(Applicable to EOG Coaches: Chair Car 2nd, Chair Car Exc., Hot buffet car, AC-21 & FAC)

S.N.	Description	Specified Values	Remarks
01	Wheel Gauge	1600 +/-1 mm	To be taken at three locations
02	Wheel Diameter	New- 915 +4/-0 Worn- 855 W/Shop- 862	**Not Required** Not mentioned in IRCA-IV, Not rejectable defect, not mentioned in Accident manual
03	Wheel Barrel No. & Axle face particulars.		
04	Stamping particulars on wheel discs in case of Axle breakage		
05	Wheel profile with wheel defect gauge		
06	Roller Bearing in case of abnormalities observed		
07	**Spring & Spring Gear** 1. Condition of Rubber Air Spring 2. Condition of Rubber Disc & Bump Stop		
08	Height of bogie bolster base plate (machined surface) from Rail level	930+6/-2 mm Less than or equal to 4 mm	
09	**Condition of Bogie** Condition of Control Arm,		Rubber element & bore to be deleted
10	**Damping System** Condition of Hydraulic Dampers		**Not required.** Provided to improve Riding quality. No contribution in derailment
11	Condition of Anti roll Bar		**Not required.** Provided to curb the rolling motion of coach, No role in derailment

12	**System of Bogie Rotation & Clearances** 1. Condition of Longitudinal/Lateral flexibility of Secondary spring		**Not required.** No role in derailment, Not rejectable defect. 80 Kmph speed allowed
	2. Clearance between Traction Centre &		**Not required.** No role in derailment.
13	Free Movement of Bolster		**Not required.** No role in derailment. Not rejectable defect.
14	Condition of Grounding cable, WSP & Speed Sensor		**Not required.** No role in derailment. Not rejectable defect.
15	Condition of Brake Gear/Brake caliper		
16	CBC Height/Buffer Height on level track	1090 to 1105 mm Under tare	
17	Details of Broken parts due to accident		
18	Condition of Draft gear pocket, CBC, Shearing plate		**Not required.** No role in derailment. Not rejectable defect. Provided to absorb compressive & Tensile forces
19	List of Damages to the coach due to accident	-	
20	Other observations considered relevant to derailment	-	
21	Clearance between Secondary vertical Bump stop gap	90 to 95 mm under tare test load	**Not required.** **Maintained during major schedules i.e. SS1 & POH, not in service. There is no role in derailment.**
22	Axle box to bogie frame (primary spring height)	260+0/-4 mm G. car 252+0/-4 mm G. car	**Not required** **These are not maintained during service.**
23	Clearance between safety pin & lug of control arm (Top/Bottom)	Top= 45 mm Bottom = 37.5 mm	**Not required** **These are not maintained during service.**

44.6 Proforma for Carriage

(ICF Design Coach Measurement)

Proforma to be filled in case of Derailment:

Note: Details regarding all derailed vehicles should be given except: -

6. **(i)** Where vehicles have derailed due to locomotive derailment.
(ii) When the obvious or indisputable cause is sabotage or an obstruction on the track or broken axle or wheel.

7. Particulars for each derailed vehicle should be given in one sheet. Information against columns nos. (5), (6), (7), (14), (50) and (51) should invariably be given for adjacent coaches on the same sheet.

8. Front and Rear left (L) and Right (R) are with respect to direction of movement.

9. For an obvious case of derailment such as a broken axle, spring dropping off on run, and/oi some part of under gear hanging loose and causing obstruction, only relevant particulars need to be filled.

10. Relevant details of adjacent vehicles should a 1 so be given if cause of derailment is not apparent.

S.N.	Items	Details				
A	**Date of incident**	2.				
B	**Train No.**	3.				
C	**Details of BPC along with name of the station where issued and Engineer (C&W) who issued it.**	4.				
D	**Coach No. & Owning Railway**	5.				
E	**Type**	6.				
F	**Tare in tones**	7.				
G	**Carrying capacity in tones**	8.				
H	**Built Date & PU**	9.	PU		Date	
I	**Return date**	10.				
J	**POH details**	11.	W/Shop		Date	

K	**Stations**	12.	From								
		13.	To								
L	Position from engine	14.									
M	**Wheel gauge** in mm (to be measured at three locations) measured in empty condition at the horizontal plane passing through the center of the axle	15.		Reading 1	Reading 1	Reading 1					
			AXLE-1								
			AXLE-2								
			AXLE-3								
			AXLE-4								
N	**Wheel diameter:** Measurement Record whether below **condemning size (Yes/No)**	16.	1L	2L	3L	4L	1R	2R	3R	4R	
			Note: Wheel diameter measurement is not mentioned in IRCA Part-IV, Rule, not in rejectable defect, and also not mentioned in Accident Manual hence to be removed.								
O	Any indication of **Bent axle** or wheel having shifted on axle.	17.	**AXLE 1**	**AXLE 2**	**AXLE 3**	**AXLE 4**					
			Note: to be deleted because wheel gauge measurement already mentioned in Cl. No 15.								
P	Wheel and axle **face particulars** (in case of breakage of any wheel/ axle)	18	Axle Face particulars	1L	2L	3L	4L	1R	2R	3R	4R
		19	Ultrasonic particulars on the Hub of Disc	1L	2L	3L	4L	1R	2R	3R	4R
Q	**Stamping** particulars on wheel discs regarding manufacturer/RA/RD (in case of breakage of any wheel/axle)	20.	1L	2L	3L	4L	1R	2R	3R	4R	
R	Observations after measuring the profile with wheel defect gauge **(Good/Rejectable)**	21.	**Left**	**1**	**2**	**3**	**4**				
			Remark								
		22.	**Right**	**1**	**2**	**3**	**4**				
			Remark								
S	**Roller Bearing:** (To be recorded in case of any abnormalities observed in Roller	23.	Condition of Axle box, **rear, and front covers/End**	1L	1R	2L	2R	3L	3R	4L	4R

	Bearing/ Axle Box)		**cap** (For FIAT)								
		24.	Condition of face cover plate	1L	1R	2L	2R	3L	3R	4L	4R
		25.	Condition of Bearing Seal & Studs/**Locking plate** and Bolts (For FIAT)	1L	1R	2L	2R	3L	3R	4L	4R
		26.	Condition of **Roller Bearing** and its components	1L	1R	2L	2R	3L	3R	4L	4R

T	**Spring and Spring Gear:** Note: Col. No.30 to 33 **(for ICF)** to be eliminated as above measurement is not mentioned in IRCA PART-IV, Rule, not in rejectable defect, and also not mentioned in Accident manual hence to be removed.	27.	Condition of Primary **Coil suspension spring** i.e., Normal/Fractured (old/fresh)	Left	
				Right	
		28.	Condition of **Rubber Air spring** i.e. Normal/Cracked including length of crack (for LHB only)		
		29.	Condition of Air Spring including **leakage** in piping	Left	
				Right	
		30.	Deflected height of coil spring after re-railing on a level un-canted track.		
		31.	Crown Clearance		
		32.	Bogie frame Bolster clearance		
		33.	Body bogie frame clearance		

U	Condition of Bogie Components:	36.	Condition of BSS **Hangers** (for ICF)	Left		
				Right		
		37.	Condition of **Equalizing Stay** (for ICF)	1L		2L
				1R		2R
		38.		1L		2L

				1R	2R
V	Damping System **Note:** Col no. 40 measurement of Oil level (for ICF) as mentioned to be eliminated as above measurement is not mentioned in IRCA PART-IV, Rule, not in rejectable defect, and also not mentioned in Accident manual hence to be removed.	40	Condition of Axle Guide Cum Dash Pot including Oil level (for ICF)	Axle guide will always be bent after an accident. No significance of measurement.	
W	**System of Bogie Rotation and Clearances:**	43	Condition of Centre Pivot including vertically of Pivot Pin (for ICF)	**Note:** Col no. 43 – 47 as mentioned to be eliminated as above measurement is not mentioned in IRCA PART-IV, Rule, not in rejectable defect, and also not mentioned in Accident manual hence to be removed.	
		44	Condition of Side Bearer including Oil level and Wear (for ICF)		
X	Remarks regarding free movement of bolster and pivot and their condition.	47			
Z	Condition of **Brake Gear Assembly (ICF)**	49			
Z1	Buffer/Coupler Height (to be taken on a level un-canted track after uncoupling and rerailing) (in mm)	50	Front		
		51	Rear		
Z2	Condition of **Side Buffers** Working, dead, drooping, entanglement (**ICF**)	52	1L	2L	1R	2R
Z3	Details of broken parts giving location w.r.t. point of mount and derailment and whether	53				

	breakage considered due to accident.	
Z4	Any other defect in the vehicles which may have contributed to or caused the derailment such as condition of **coupler, draft gear pocket, shearing plates etc.**	54 There is no role of draft gear assembly in derailment as draft gear is provided to absorb the compressive and tensile force. Hence to be deleted.
Z5	List of Damages to the Coach due to accident	55: 1 ; 2 ; 3 ; 4 ; 5 ; 6 ; 7 ; 8
Z6	Other observations considered relevant to derailment	56
Note: Measurement of Item 5 of opening note, item 24, item 28 to 49, item 54 & item 56 will be done as per site condition.		

*****

Annexure – 'D'

44.7 Proforma for Track Measurement (PART-A)

Proforma showing the detailed particulars to be collected in the case of Permanent Way during an Accident.

S.N.	Item	Details
2.	Soil Condition	2. Type i.e. Sandy, Loamy clay, Moorum, Black cotton etc. ; 3. Condition: Firm, Wet, Slushy etc.
4.	Type of Formation	4. Type of Formation
5.	Rain Fall	5. Rain Fall
6.	Ballast	6. Type/Stone, Moorum, Sand, Ash etc. ; 7. Depth below sleeper

			bottom in cms. Stating whether clean or caked		
		8.	Drainage		
9.	Width of Shoulder in **cm.** from **outside of sleeper.**	9.	Left		
		10.	Right		
		11.	Left		
		12.	Right		
13.	Sleepers	13.	**Type – PSC Sleeper, Wooden, CST-9, Steel trough** etc.		
		14.	Condition- New/Second hand, Serviceable, Damaged/ Unserviceable etc.		
		15.	Density		
		16.	Square or not	Measurement to be taken for checking the squareness.	
		17.	Packing loose or sound	i.e. Rubber pad, liner	
18.	Rail	18.	Weight- 52Kg., 90R/ 75R etc. (**Year of manufacturing**)		
		19.	Condition of wear i.e. Vertical wear Lateral wear Angular wear **(Attach Rail profile if wear is heavy)**		
		20.	GMT carried		

21.	Rail Fastenings	Dog/Screw spikes, Keys, Tie bars, Cotters, loose jaws etc.	21	Number per sleeper seat	
			22	Condition: Tight or Loose, Missing (in each sleeper)	
23.	Rail Joints	23		Condition: Hogged, Battered, Low etc.	
		24		Staggered or Square	
		25		Creep-Direction & extent of Creep, type of creep anchors used with numbers per rail in the affected section	
		26		General remarks about cracks or fracture of Fishplates, fish bolts and other components.	
		27		Description of Anti-sabotage measures like reverse jaws welded rails etc.	
28.	Location of points of Mount (POM)	28		Whether on Straight, Curve or Transition	
		29		Whether on a Falling grade, Level or Rising grade and or on Sag.	
30.	Location of Points of Derailment (POD)	30		Whether on Straight, Curve or Transition	
		31		Whether on a Falling grade, Level or Rising grade and or on Sag.	

NOTE:

(1) Left and Right are with respect to direction of Train movement.

(2) The data in Col. 2 to 26 need not be collected when the defect is obviously and indisputably on account of Sabotage and/or Obstruction on track.

(3) Only broken track material which is not indisputably to be broken after the accident should be included in Col. 25 and should be preserved.

(4) Col. 27 need to be filled in only when there is a suspicion about sabotage being the cause of derailment.

(5) Sag extends 90 meters on either side of theoretical junction of the grade lines Col. 29 and 31.

NOTE-2. Text green to be added.

44.8 Proforma for Track Measurement (PART-B)

Proforma showing the detailed particulars to be collected in the case of Permanent Way during an Accident.

<table>
<tr><th>S.N</th><th>Items</th><th>Details</th></tr>
<tr><td>1.</td><td>Station No.</td><td>1</td></tr>
<tr><td>2.</td><td>Distance apart (Meters)</td><td>2</td></tr>
<tr><td>3.</td><td>Gauge Slack or Tight from the Exact in loaded condition (mm)
Standard Gauge: 1676 mm (-6/06)
Curve up to 5 Degree: 1676 (-6/+15)
Curve more than 5 Degree: 1676 (-0/+20)</td><td>
<table>
<tr><th>Station No.</th><th>Gauge (Slack/Tight) In mm</th></tr>
<tr><td>0</td><td></td></tr>
<tr><td>1</td><td></td></tr>
<tr><td>2</td><td></td></tr>
<tr><td>3</td><td></td></tr>
<tr><td>4</td><td></td></tr>
<tr><td>5</td><td></td></tr>
<tr><td>6</td><td></td></tr>
<tr><td>7</td><td></td></tr>
<tr><td>8</td><td></td></tr>
<tr><td>9</td><td></td></tr>
<tr><td>10</td><td></td></tr>
<tr><td>11</td><td></td></tr>
<tr><td>12</td><td></td></tr>
<tr><td>13</td><td></td></tr>
<tr><td>14</td><td></td></tr>
<tr><td>15</td><td></td></tr>
</table>
</td></tr>
<tr><td>4.</td><td>Cross Level</td><td>4.Cross Level</td></tr>
</table>

	under **loaded** condition (mm)	Station No.	Sleeper No.	Sleeper Spacing (in cms)	Under **No-Load**	Under **Load**
		0				
		1				
		2				
		3				
		4				
		5				
		6				
		7				
		8				
		9				
		10				
		11				
		12				
		13				
		14				
		15				
5.	Marks on sleepers or rail top	**5.**				
6.	Grinding or Rubbing marks on Rail	**6.**				
7.	Examination of alignment perceptible kinds of track distortion in the vicinity of the point of the point of derailment	**7.**				
8.	Subsidence of Track	**8.**				
9.	Versine in mm **in loaded condition**	**9.** On 20M. or 10M. chord depending on practice prevalent on the Railway for flat curves more than 600 M. radius.				
		10. On 10 M. or such shorter chords as considered necessary for sharp curves (less than 600M. radius on				

		B.G. and M.G.)		
		11. Remarks regarding length of transition, degree of curve and specified superelevation general alignment etc.		
		12. Longitudinal level to be recorded in the case of M.G. and N.G. in case of sags and curves		

9.	Versine in mm (In Loaded condition) check degree of Curve Check rail in inner Rail Curve Post for details	**9 & 10: Versine**

Station No.	Short Curve/ 6meters chord (3 meters apart) for Sharp curves (Less than 600 M Radius)	Available at site	Long Curve/ 20 meters chord (10 meters apart) for Flat curves (more than 600 M Radius)	Available at site
0	For one degree value is 2.57 mm – variation permissible is 5 mm from station to station.		For one degree value is 28.57 mm – variation permissible is A Route – 10mm, B Route – 15mm and other - 40mm	
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

J	Remarks regarding length of Transition, Degree of Curve &	**11.**

<table>
<tr><td></td><td>specified Super-Elevation general alignment etc.</td><td></td></tr>
<tr><td>K</td><td>Longitudinal level to be recorded in the case of MG & NG in case of Sags and Curves.</td><td>12.</td></tr>
<tr><td>L</td><td>Super Elevation</td><td>13.
Super Elevation on curve
Super Elevation specified at the time of laying the track
Super Elevation available at the Accident site</td></tr>
<tr><td>M</td><td>If Derailment is at Point & Crossing</td><td>14.For Points:
<table>
<tr><th>SN</th><th>Items</th><th>Observation</th></tr>
<tr><td>1</td><td>Type of Turn out (Length of Tongue Rail)</td><td></td></tr>
<tr><td>2</td><td>Straight / Curved switch</td><td></td></tr>
<tr><td>3</td><td>Height of Switch from stock rail at tip</td><td></td></tr>
<tr><td>4</td><td>Gross length of breakage of Tongue (Switch) within one meter from trip</td><td></td></tr>
<tr><td>5</td><td>Condition of holding of Tongue rail (Uniform / not uniform)</td><td></td></tr>
<tr><td>6</td><td>Movement of Point while passing vehicles</td><td></td></tr>
<tr><td>7</td><td>Alignment of turn-out i.e. curve of Tongue rail by 6-meter Chord.</td><td></td></tr>
<tr><td>8</td><td>Profile of Tongue rail: Vertical wear, lateral wear etc</td><td></td></tr>
<tr><td></td><td>Packing under the sleepers & switch & CMS crossing</td><td></td></tr>
<tr><td>9</td><td>Gap between Stock rail & Tongue rail more than 5 mm or not</td><td></td></tr>
</table></td></tr>
</table>

			Measurement: 450 mm ahead, at ATS, 150mm behind, at heel, at 3m interval in lead portion, through of switch	
			Heal Divergence in mm	

14.For Crossings:

SN	Items	Observation
10	Condition of Nose vertical wear (not more than **10 mm**)	
11	Height of Nose from Stock rail in mm	
12	Main supporting sleeper cushioning condition / pumping	
13	Depth of ballast underneath of crossing	
14	Clearance of Wing rail	
15	Clearance of Check rail	
16	Clearance of Throat	
17	Type of crossing (Fabricated/Cast steel) (1:8.5/1:12)	
18	In case of Fabricated crossing, No. of bolt loose or missing.	
	Measurement: **Gauge & Cross level:** 1 meter ahead of ANC, 1 meter behind ANC, 150 mm behind ANC	

N In case of Creep

15.Creep

SN	Items	Observation
1	The creep to be measured, distance with respect to Left Rail Post. (+/-)/ SL	
2	The creep to be measured, distance with respect to	

			Right Rail Post. (+/-)/ SL	
		3	Gap of Switch Expansion Joint (SEJ)/ SL	
O	Buckling/Sunkinks if any	**SN**	**Items**	**Observation**
		1	Last De-stressing date	
		2	SEJ Gaps	
		3	Last Gang/TTM/BCM attention to track	

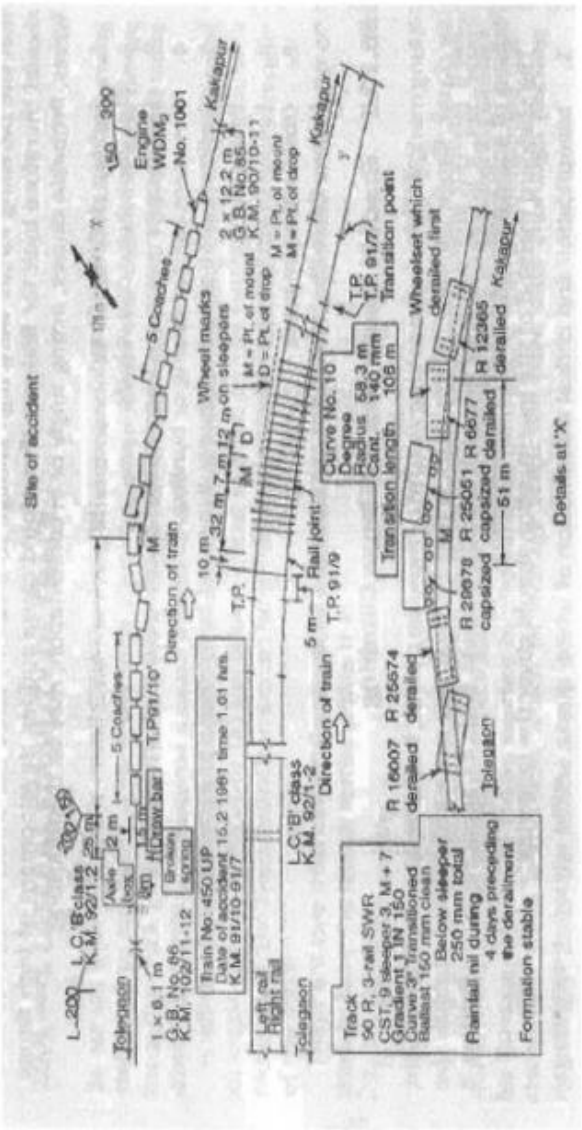
NOTE-1

Site sketch should indicate wheel position of derailed vehicle, POM. POD. Dragging distance track layout **45 mts** on either side of '0' station with broken parts location direction of traffic and track turn on left, right, or straight, all these are to be with respect of OHE Structure (KM).

NOTE-2:

i. The point of mount should ho marked station No. '0' and the stations numbered serially as (+) **for measurements Ahead** of site of derailment and (-) **for measurements in Rear.**
ii. The cross level will be measured on the **Left Rail only** as determined from the direction of movement.
iii. Normally measurement will be taken at station 3M. apart for a distance of 45 metres on either side of 0 station if the cause of derailment is indisputably known, otherwise there will be taken for a distance of 100 metres rear and 45 metres ahead of zero station.
iv. Where necessary, measurements for **Col. 3 & 4** may in addition **be** taken at **individual sleepers.**
v. This proforma need not be filled when the cause of derailment is obviously established as due to Sabotage, Obstruction on track, Broken Axle, and/or spring having fallen off prior to point of derailment.
vi. Longitudinal levels should be recorded for 300 meters on rear and 100 meters in front, in case of straights at the middle of each rail and at versine recording points on curves @ 20 M /10 M interval.

44.9 Accident Sketch



44.10 Important Information about filling the Joint Format

Permanent Way (Track)

Standard Dimensions of Permanent Way (To be reviewed as per IRPWM & its correction slips time to time)

Sr. No. Description	BG	MG
1. **Gauge**	1676	1000
2. Slopes of formation		
a. For embankment	2:1	2:1
b. For cutting	1:1	1;1
3. **Centre to center distance of track**		
1. minimum	4265	3660
2. Recommended	4725	3960
4. **Length of rail**	13000	12000
5. **Clearance of check rails at level crossing**		
1. minimum	51	51
2. maximum	57	57
6. **Clearance of Check Rail on the curves**	41	44
7. **Distance between the center of track and the face of platform**		
1. Max.	1680	1345
2. Min.	1670	1335
8. Height of passenger platform above rail level		
1. Max.	840	405
2. Min.	760	305
9. Standard length of tongue Rail		
1 in 8½ straight 1 in 12 1 in 12 Curve 1 in 16 curves	4725 6400 7730 9750	4116 5485 6700 7420
1. Check Rail clearance at turnout. 1. Min 2. Max	 44 48	 41
2. Throw off switch. 1. Max 2. Min	 115 95	 100
3. Min Thickness of Blunt nose	6	6
4. Size of ballast of track	50	50
5. Top width of Ballast	3353	2286

44.11 Calculation of Gauge slackness which may cause derailments.

Gauge= 1676 mm
Wheel Gauge=1600 mm
Difference=1676-1600= 76 mm
Thickness of flange =28.5 mm (as per wwp 29.4 mm)
Thickness of both flange =28.5 X 2 = 57 mm
Play between rail and flange= 76-57 = 19 mm
Condemning flange limit = 16 mm
Wear permissible for both flanges = (28.5-16) X 2 =25 mm
Slack permitted up to 4-degree curve = 13 mm
Total permissible play between flanges & running edges of rail.
= 19+25+13 =57 mm
Width of tyre = 127 mm
Slackness required to derail a stock = 127-57= 70 mm
The above calculations are normally advanced to prove that the slackness in gauge to the tune of 70 mm cannot be a cause of derailment. However, this logic applies only in case of wheel dropping purely on account of slack gauge. In actual practice, even lesser than 70 mm gauge slackness may cause increased lateral oscillations and build-up of excessive flange forces thereby resulting in derailment of stock.

****

PART I:
ACCIDENT INVESTIGATION

ACCIDENT SITE INVESTIGATION

45

It is the primary responsibility of any Railway employee or officer reaching at the site to ensure that clues, evidence, and other site condition must not be disturbed till initial inspection with a committee of inspectors or officers to comprehensive investigation in a logical sequence done and the site condition and initial measurements are recorded. It is seen that to restore the traffic, vital evidence which may ascertain the actual cause of accident are disturbed. Later, it may lead to either non-conclusion of actual cause of accidents or assigning the wrong cause to the accident. The safety in Railway cannot be improved unless we truthfully investigate the actual cause of the accident and taking remedial measures to prevent them in future.

The site investigation of any accident spot is most important as it help in identification of the evidence, related data, and breach of the rules before restoring the track and vehicles. The main purpose of the site investigation is to ensure as under:

1. Locate the principal cause of accident or in case of derailment, initial point of derailment.
2. To identify the first derailed vehicle and wheel

and condition of rail.

3. To obtain sufficient evidence to determine the course of events leading to accident or derailment in chronological order till affected train had come to a halt.
4. To explain the reason as why the vehicle had derailed initially at that point on the track.
5. To find out the Prima-facie cause of the accident or derailment.

The site investigation must be carried out in the following sequence:

1. Initial Observation
2. Visit of Panel SM room and Relay Room
3. Preparation of rough Site sketch
4. Finding Vital Clues
5. Probable Operational and Other Failures
6. Examination of Track Geometry, Site Survey, and track measurement
7. Rolling Stock (Carriage or Wagon) measurement
8. Examination of Locomotive
9. Taking statement of Railway staff
10. Collecting other information and statement of private witness if any

45.1 Initial Observation

The sequence of events to be recorded i.e., how derailment occurred prima facie, from the beginning to the time the train came to a halt. The position of vehicles after derailment must be recorded. The wheel marks at the initial point of derailment are to be examined to establish the category of derailment i.e., sudden, or gradual.

It is important for the investigators to make rapid observations and record the position of vehicles. It is also important that such a survey must be completed before the restoration work commences on the track especially in the rear of point of

derailment.

45.2 Visit of Panel SM room and Relay Room

Duties of Station Master

a) SM is responsible for the efficient discharge of duties by different members of staff at his Station. **(General Rules 5.01)**
b) Ensuring that the general working of the Station is being carried out in strict accordance with the current rules, procedures, and instructions.
c) Availability, helpfulness, and good conduct of station porters
d) He shall be responsible for keeping the safety and operating literature including circulars, pamphlets, gazette etc. up to date and these must be explained to the staff working under him and got noted by them.
e) He shall be responsible for maintaining Accident register and Accident charts and keeping these up to date.
f) He shall promptly attend all accidents, assume charge of the site to and assist in relief measures ensuring prompt evacuation of injured & stranded passengers. He shall take note of all the information available and protect the clues/evidence, which may be helpful in the enquiry. He shall intimate the control office at regular interval for current information and ask for the required assistance i.e., Relief Train, Medical van etc. He shall investigate yard accidents, obtain statements of the staff responsible and submit his report with conclusions and joint note to the Divisional office.
g) He shall ensure that firefighting equipments at the station such as fire extinguisher, fire buckets etc. are in fine fettle and ready for use.
h) The SM should regularly test and record in the charge book, the working of Points, Signals and Track Circuit to ensure that:
    1. The Signals are back to ON position when the relevant button is put back or intended train movement has been completed.
    2. It is not possible to take OFF conflicting signals at the same time.
    3. Signals are not taken OFF until all points are correctly set and

facing points locked.

4. Any other manner of testing prescribed by the Authorised Officer.
5. Panel testing: Normal/Abnormal by SM
6. At stations provided with continuous track circuits or at stations having solid state interlocking the method of testing shall be prescribed jointly by Signalling and Operating Branch which shall be described in the Station Working Rules to be followed by SM.

i) He shall see that Train Signal Register, Station Diary, Inspection Notebook, reference books and other station record is property maintained and preserved for a minimum period as prescribed later in this chapter.

j) He shall be responsible to ensure that all the operating staff working under him are relieved in time for their periodical NVT/Competency/Safety camp and special competency programmes. No one, overdue NVT/Competency shall be allowed to perform his normal duties.

Following details should be recorded and considered.

1. Actions taken by on duty SM after accident.
2. Entry in TSR (which is in custody of on duty SM)
3. Last date of medical examination of on duty SM and his staff
4. Panel competency certificate of on duty SM
5. Block competency certificate of on duty SM
6. Duty roster of station staff
7. Entries from crank handle register
8. Entries from ASM cancellation operation register
9. Entries from Emergency cancellation register.
10. Last date of resetting of Axle Counter section if any
11. Entries from S &T failure register
12. Any interference to S&T gears in station office.
13. On duty SM and his staff's behaviour with passengers after accident.

14. All safety equipment at station office
15. Last date and content of safety meeting with all departments from that station
16. Last date of renewing of first aid box

Following details should be recorded and considered – Accident involving S&T

1. If the station is interlocked, standard and system of interlocking and classification of station?
2. Are the signals concerned visible from the place of operation? If not, are repeaters provided both in cabin and in SMs office and what was the condition of repeaters at the time of accident?
3. Is the outer visible from the required distance? What is the approach like?
4. Is the Home Signal visible while approaching the outer? If so, at what distance before the outer?
5. Lighting of signal lamps or indicators and the condition of lamps.
6. Were the signals, points, repeaters, and slots tested by the committee concerned and what were their observations?
7. Recent History of signal concerned.
8. Are other points worked from a cabin or a ground frame? Whether rod operated or power operated?
9. Method of locking the points. Are points provided with point indicator or governed by starting signals whether FPL, Lock Bar or Track Circuit provided for route holding?
10. Method of controlling the reception and departure signal.
11. Were the rules and instructions complied with?
12. When did the maintenance staff last attended for the maintenance of the apparatus?
13. Were the points found correctly set and locked and what is the condition of the switches? Are they worn out or

chipped?

14. Was the Relay Room properly locked and Operating Key is in possession of SM/ ASM?
15. Were the Relays properly sealed?
16. When was the crank handle last used and for what purpose?
17. Was the Crank Handle sealed?
18. Was the Block Instrument properly sealed and locked?
19. Were Motor points in intact position and no tampering has been done?
20. Were Panel sealed and all the counters reading were properly recorded for last operation?
21. Whatever indications are shown on the panel (viz. Routes, Sub-routes, Signal aspects indications etc. should be recorded as shown on the panel).

Collision And Averted Collision

1. The position of the signal controls, point controls and block instruments should be immediately checked and recorded jointly with at least one dept.
2. The Train Register Books should be signed so as to indicate the last entry made and then seized.
3. If Line admission books are in force, these should be seized immediately record them, in whose possession they were last found.
4. If Line Badges are in force, the disposition of the Line Badges should be recorded.
5. The position of the two trains or train and obstruction should be marked on the sleepers. The distance between the two should be measured in meters in the case of averted collision.
6. A rough sketch should be drawn showing their position vis-a-vis signals, station platform, turnouts, and other fixed landmarks.

7. If the Loco Pilot complaints regarding vacuum trouble, arrangements must be made to take necessary tests by Inspectors/Loco Foreman at the nearest Loco changing or Carriage examining point.

45.3 Preparation of rough Site sketch

A sketch of the whole site showing the position of derailed vehicles relative to both rails as well as other evidence if any together with the track damages must be prepared. If this is not done, serious difficulties will be encountered later when this evidence is required for correlating the events relating to vehicle and track interaction.

Examination of site and preparation of sketches –

The first Engineering representative to arrive at site shall attend to the following**:**

a) He should examine the entire site inclusive of track over which the train has passed immediately before derailing, noting down any unusual features observed, especially any parts of vehicles or other material lying on or near the track.
b) A dimensioned sketch should be prepared covering the entire site of accident, showing all relevant features inclusive of track leading up to point of derailment, showing position of derailed vehicles, point of mount and drop and other relevant details.
c) He should record the particulars as detailed.
d) An examination of the derailed vehicle/vehicles for defects not caused by the derailment but which may have been the cause of the derailment should be made. He should make out notes for inclusion in the joint report.
e) He should examine the gang-charts/diary books to ascertain the date when track was last attended, details of engineering works in progress, if any, at the site of accident, caution orders in force and nature of protection should be noted.

45.4 Finding Vital Clues

The most important thing in investigating the derailments is to locate and examine the wheel mounting marks or the marks at the initial point of derailment to determine whether the derailment was sudden or gradual.

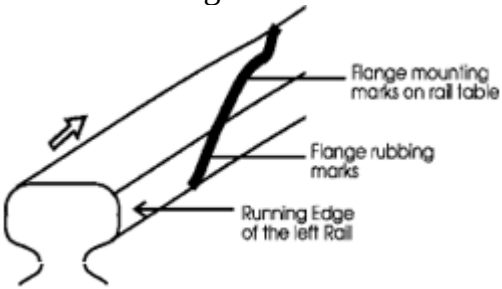


Fig. 2.1 Flange Mounting Marks

A careful analysis is required to be done on wheel mounting marks found on the rail table (Fig. 2.1). If it is difficult to ascertain the first vehicle which derailed, it is necessary to detail the damage sleeper by sleeper. The details of mounting marks must be recorded including the following details:

A. Length
B. Profile or path followed mounting.
C. Whether marks are strong or faint
D. Whether continuous or broken
E. Single/multiple marks

Preferably, photographs should be taken not only of mounting marks found on the rail but also those found on the sleeper fastenings and ballast. These marks must be carefully noted and measured.

Often many vehicles derail before the train comes to halt. This creates multiplicity of wheel mounting marks. Thus, it becomes necessary to identify the wheel set which derailed first. This can only be achieved by matching the length and nature of various trail marks left by wheels against the position and orientation of derailed vehicles, analysis of marks on the wheel tread and flanges, damage to vehicles and wheel sets etc.

45.5 Probable Operational and Other Failures

The following are the major operational features which are significant in a derailment:

1. Speed
2. Excess or Uneven Loading
3. Wrong Marshalling
4. Mis-manipulation of Point
5. Operating Staff Failure
6. Improper Train Operation by the Driver

1. **Speed**

   The speed of train plays a vital role in derailments. If speed is more than permissible speed, lateral forces on the flange increase and the formation may not be able to resist this increased force thereby resulting in either flange mounting or jumping off from the rail table.

   Under dynamic conditions, the speed of train plays a vital part in derailment of a vehicle. Higher the speed, smaller will be the range of permissible imperfections on the track and rolling stock. The rolling stock by virtue of its spring and suspension system responds to the disturbances and is free to perform inherent oscillations. As the rolling stock moves over the track, exciting oscillations are produced, and the exciting frequency directly depends upon the speed. Conditions of - resonance may occur if the exciting frequency approaches the natural frequency. The oscillations become more pronounced while the train is coasting i.e., when the drawbar pull is absent. The amplitude of these oscillations increases with increase in speed especially if the causative factors amplifying the oscillations are present.

   It will therefore be seen that the wheel load changes due to oscillations on run. The degree of track imperfections, state of maintenance on rolling stock, its suspension characteristics, disposition of load on wheels and speed are the main items of attention in the investigation of a derailment.

2. **Excess or Uneven Loading**

   Irregular or excess loading may lead to derailment of a vehicle as

the wheel may float due to off-loading.

3. **Wrong Marshalling**
   Empty stock marshalled in between two loaded wagons forces the empty stock, especially the four-wheeler units, to jump off under the impact of draw bar forces and derail.
4. **Mis-manipulation of Point**
   Due to mis-manipulation of a point under movement, derailment occurs. In such cases the leading wheel or trolley will travel on one side of the track and the trailing trolley will travel on the other track. This happens on points in facing direction only. In such cases, the important points to be checked are:
   A. Length of tongue rail
   B. Rigid wheelbase of the stock
   C. Gap between toe of switch and stock rail

   By examination of the above factors, one can ascertain whether the point was operated under movement. Another aspect which is not pertaining to operational failures but must be checked is whether the point was working freely and correctly.
5. **Operating Staff Failure**
   Following problems may also result in a derailment:
   1. Points not being properly set and locked during shunting operation at the station.
   2. Operation of point under wheel movement.
   3. Undetected obstruction between toe of switch and stock rail
   4. Loose couplings
6. **Improper Train Operation by the Driver**
   Sudden application of brakes causes bunching and offloading of light loaded wheels. This may also result in derailments.

45.6 Examination of Track Geometry, Site Survey, and track measurement

f) Track measurements should be taken, and a sketch should be prepared in accordance with instructions.
g) Measurements of rolling stock should be taken as per C & W Manual.
h) For Locomotive derailments, examination of locomotives should

be done.

i) The rail fittings and the point ridings including the locking arrangement should be examined. It should be seen whether there was any obstruction resulting in a gap in the points. Marks on the rails and sleepers should be observed and recorded.

j) In cases of derailments during shunting operations, it should be noted as to who was actually supervising the shunting. The position of the shunt signals, if any, point controls, point/track indicators concerned should be recorded.

Accident at Manned Level Crossing

1. Location and number of the gate
2. Whether engineering or traffic
3. Whether interlocked or non-interlocked
4. Gate working instructions validity.
5. Visibility of signals.
6. Visibility for road users.
7. Condition of the road surface and approaches of the Level Crossing.
8. Duty roster of the Gateman
9. Competency certificate of the Gateman
10. Last census date and TVU
11. Length of cleanliness of the check rails
12. Availability of the safety equipment.
13. Frequency of inspections and last inspections by officers/supervisors.
14. Availability of Whistle boards, Road signs, Speed breakers and Stop boards etc.

45.7 Rolling Stock (Carriage or Wagon) measurement

i) Examination of Removed of undamaged Rolling stock

Rolling stock which remains on track undamaged may be taken away after the written permission of the Senior Police Official at the site. These should be taken and stabled at the nearest convenient station where further examination of the fittings can be done under the supervision of the Sr. DME/ DME/ ADME.

Following details should be recorded and considered

a) A detailed examination of the engine and vehicles damaged due to accident must be made by the Sr. DME/DME (along with the Sr. Police Official in case of passenger Train accident involving casualty or sabotage).

b) All damages and deficiencies must be carefully noted down and particular comments made with regard to damages and deficiencies likely to cause accident and whether these appear to be old or fresh and the signature of the police official obtained on the note. These notes should be utilised for the purpose removal of making the final note in the joint examination. After this Break down operation only, remove these vehicles then it should be started.

ii) Wheel checks

1. Wheel gauge
2. Tyre boxes play parallel to the rail; play parallel to the sleepers, and play of journals in their brassies bent axles, restriction of free movement of axle on hot axles.
3. Axle Guard bent or broken. Horn check wedges adjusted or displaced.

iii)**Springs Condition**

1. Camber, conditions of individual plates, fit of the plate, gaping plates, loaded, and unloaded plates.
2. Fastenings, buckles, hangers, links, shackles, shoes breakages, cracks, or defective fittings.

iv)Buffers Condition

1. Variation in the height of buffers indicating twisted under frames.
2. Buffers interlocked and defective.
3. Examination of bogie control springs**:** Marking on the bogie frames of the control springs Buffers to indicate whether the springs have settled condition of bogie pivot.

v) Brakes Working

1. Vacuum brakes, examination of cylinders
2. Vacuum records on engine and brake van
3. Hand Brakes
4. Examination of records at last examination station.

vi) Vehicle Maintenance

1. Shopping schedule and POH records of examination.
2. Breakage or dropping out of any parts prior to derailment.
3. Position of derailed vehicle with respect to the train.

vii) The Load Sharing

1. Unequal, uneven loading
2. Light Loading
3. Over Loading
4. Shifting of Loads.

viii) Operational Mistakes

1. Sudden opening of the regulator
2. Sudden application of brakes
3. Costing
4. Evidence of train staff regarding lurches prior to derailment
5. Train out of control on Ghats Section.
6. Defective vision, intoxication or sleeping due to exhaustion of train Crew.
   Speed in excess of the authorised maximum.

45.8 Examination of Locomotive (Check list)

1. Weight distribution on the wheels of the engine and the tender.
2. Buffer heights and difference in level, if any, between the front and back of Locomotive and tender separately.
3. The clearance between the axle box and the horn stay.
4. Particulars of the last weighment of the engine and the tender and the weights.
5. Wheel gauge of the derailed axles, whether these axles were bent or straight (wheel to be gauged at the four quarters).
6. Thickness of type and gauge of all the wheels. In case where the tread or the flag is usually worn, the profile to be recorded.
7. Camber of bearing springs of engine or tender or both if both are derailed under load and free.

8. Conditions of the bearing spring, i.e., normal, plates broken old fracture, broken new fracture.
9. Any signs to indicate jamming of tender spring pillars.
10. Thickness of bearings.
11. Thickness of sole plates. The condition of the lips of the sole plates and the axle box grooves. Any indication of the sole plate having over – ridden
12. Side play of bearings
13. Side play of boxes in horns
14. Any signs of axle boxes coming in contact with the horn stay.
15. Condition of bogie slide and pivot, clearance between bogie pivot and bush, whether bogie slide stops show signs of repeated impacts.
16. Condition of control springs - Normal, broken old fractures, broken old fractures, broken new fractures, settled.
17. Inter draw bar - Normal, rigid, or slack.
18. The date when the Locomotive had been last scheduled for repairs and the class of the repairs done. Mileage done by the Locomotive since last POH.
19. Any previous bookings for repairs which have a bearing upon the case. It should particularly be recorded whether the engine had been booked as "Riding rough" prior to the accident.

Following details should be recorded and considered.

1. Buffer height and difference in level if any, between the front and back of the engine, and tender separately.
2. Clearance between axle boxed and horn - stays and also between the top of the axle boxes and the frame.
3. Particulars of the last weighment of the engine and tender.
4. If a weighing Bridge is available, the weight distribution on the wheels should be recorded.
5. Wheel Gauge of the derailed axle to check whether these axles are bent or straight (wheels should be gauged at four quarters)
6. Thickness and profile of the tyres. The profile of the tyres of every pair of derailed wheels must invariably be recorded.
7. Camber of bearing - springs, under load of the engine or tender or both, if both are derailed and condition of bearing springs, i.e.,

normal, broken plates of buckle, now breakages or old markings fracture.

8. Any signs of jammed spring pillars, hangers and compensating beams

9. Condition of bogie and pony control springs and dumbbell rods and also the measurement of the control springs both in the free and the compressed position.

10. Condition of bogie slide and pivot, clearance between bogie pivot and bush, whether bogie slide shown sign of jamming or bogie slide stops show signs of repeated impacts.

11. Thickness of tender and radial axle brass bearing. Any signs of seizure or bearings in case of engines fitted with roller bearings on carrying wheels.

12. Thickness of sole plates. The condition of the lips of sole plates and axle box grooves. Any indication of the sole plates having over-ridden.

13. Total side play on carrying and coupled wheels e.g. side play of boxes in horns and between the hub and collar liners.

14. Any sign of axle boxes coming in contact with the horn stays.

15. Any signs of wheels binding against the frame or horn rivets.

16. Condition of intermediate draw bar e.g., normal, rigid, or slack and condition of buffing gear.

17. Particulars of recent replacement of bearing, springs and wheels, etc.

18. Date of last POH of the Locomotive in shed and kilometres run by the Locomotive since last POH.

19. Any previous booked repair that may have a bearing upon the case. It should particularly be recorded whether the engine had been booked as 'riding rough' prior to the accident (say in the previous fortnight)

20. Any other mechanical defect on the Locomotive or tender which might have contributed to or caused the derailment.

21. In all cases, where a defect on the Locomotive is found, attempts should be made to explain when it developed and, if necessary, enquiries should be pursued further to determine the cause. Defective or broken material should be sent for testing, if

necessary. Tender details should be examined only if the tender is involved in derailment.

45.9 Taking statement of Railway staff

It is the responsibility of investigating officials to take the statement of railway staff, who were present on duty at first instance. It must be kept in mind that statement should not be influenced by any senior officials of that department to whom that railway staff is working. In case off duty staff is available and he or she is aware of the incident then statement from them also be taken.

45.10 Collecting other information and statement of private witness if any

In case some private person is willing to give the statement about the incident same may also be taken. During course of passenger carrying passenger train accident, the witness of private person become vital to ascertain cause of the accident.

SUPERVISOR'S JOINT NOTE
AND PREPARATION OF ACCIDENT SKETCH

46

46.1 Special Points for Examining the Site and for Preparation of Note and Drawings

1. Examining the site of suspected sabotage.
2. The exact position in which engines and vehicles came to rest and also where loose component parts were found.
3. The exact position in which rails and component parts, such as Sleepers, Fishplates, Bolts, Nuts, Dog spikes, etc. were found.
4. Wheel marks and other damage to Sleepers, Rails, and other fittings in the accident
5. The examination of rail ends at the displaced point or points for any dents or burrs and whether burrs are vertical or horizontal.
6. The position of wheels in relation to any displaced rail, its normal alignment, and the landing rail.
7. State of the track in rear for at least 800 m.
8. If the nature of the accident so requires, the position and condition of signals, point and signal levers and block instruments should be inspected.
9. Functioning of interlocking provided at the station should be tested.

10. Train passing records including Train Signal Register (TSR), private number sheets, line nomination book should be seized and carefully preserved.

11. Where line badges are in use, it should be recorded in whose possession each line badge was concerned. Statements of staff should be recorded.

46.2 Accident Sketch

The engineering representative should prepare dimensioned sketches adequate for the preparation of a scale plan covering the entire site of accident. In preparing the sketch, due regard should be paid to the following instructions:

1. The sketch giving train no., date, and kilometre of site of accident should be properly labelled.
2. The north point should be indicated.
3. It should indicate prominently the direction of the movement and the names of the stations in rear and advance of the accident site.
4. It should cover a length of about 300 meters behind the point of mount and almost an equal distance in front.
5. Each track of the Permanent Way must be denoted by a pair of lines.
6. The position of level crossing, Telegraph post, bridges, tunnels, Gradient posts with Gradient Symbols, curves, demarking the beginning and end giving details of degree of curvature prescribed, super elevation and length of transition should be indicated.
7. The accident sketch must also indicate following:
   a) The position of all derailed vehicles and the marks left by them either on sleepers, rails, or ballast.
   b) Point of Mounting with position of rail joints on either side.
   c) Point of Drop.
   d) The pair of wheels of the first derailing vehicle.
   e) The position in which every displaced rail/ wagon or part of rail/ wagon and detachable components were found.
   f) In all the cases dimensions from nearest kilometres post and centre line of track should be given.

8. In case of accident within station limits, sufficient details about the station layout should be showed to fully explain the movement of the effected train in relation to the topography.

9. The distance of site of accident from permanent structure to fix the site of accident precisely should be indicated.

10. The distance should be indicated to show the extent of the disturbance cause in P. Way or train composition on account of the accident.

11. Any marks of sleeper or other track fittings should be clearly indicated in their exact position in relation to the track or vehicles.

12. Broken parts of other extraneous material, if found on the site of accident, should be shown in the sketch, with details giving their precise position in relation to track.

13. If necessary, more than one sketch should be enclosed one clarifying the yard layout and the system of working it and the other giving details, such as, position of wheels marks etc. In the form, one line should be used to represent both rails of track and such portion of the station yard (in case of accidents within station limits) should be covered as may be necessary. All necessary details relevant to the issue must be embodied in the sketch. The terminal station on the downside should be mentioned on the right extremity of the sketch, the terminal station on the upside being mentioned on the left extremity. If the accident takes place within station limits the shorter sketch should be based on the station working diagram.

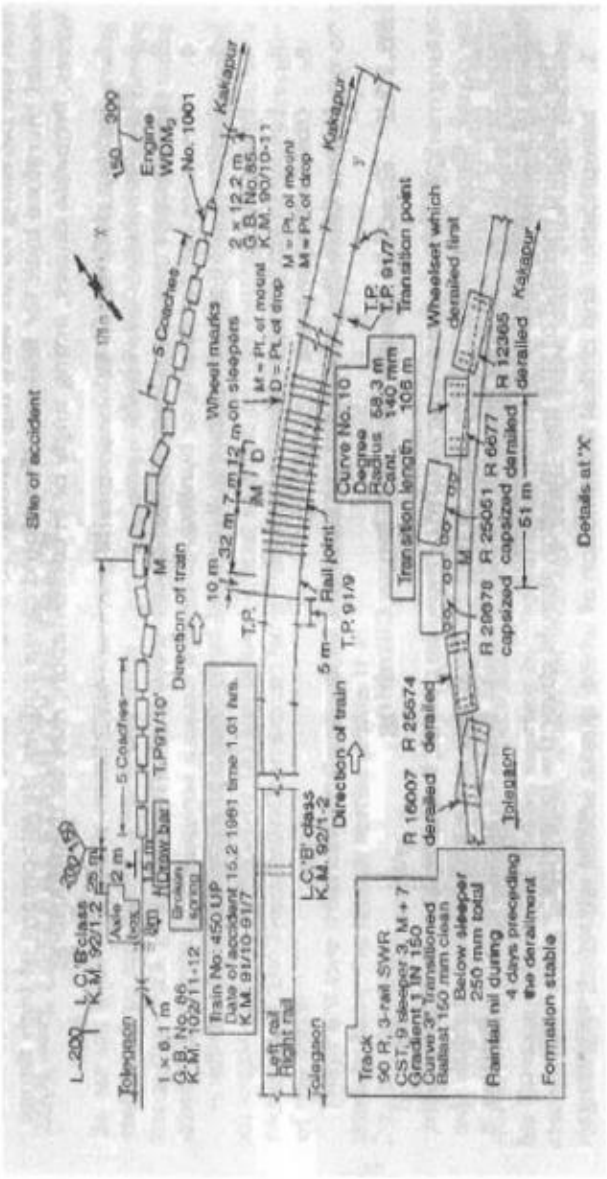
14. Details of track structure should be shown in the sketch.

15. Details of damage to bridges involved span wise should be shown.

16. In the case of accidents to and near level crossings, full details of the level crossings should be furnished.

17. Any other details as may be considered necessary to reconstruct the scene of the accident would also be shown.

46.3 Typical Sketch of Accident Site



ACCIDENT INVESTIGATION WITH DATA LOGGER

47

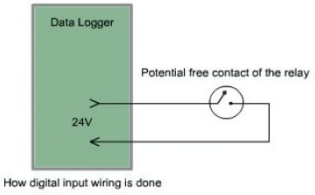
Datalogger is a Microprocessor based data recording system, which helps in analyzing the failures of relay based interlocking system / Electronic Interlocking system. The information / data can be transferred to the computer to analyze further "on-line" / "off-line" analysis of stored date. A printout also can be obtained through a printer by connecting directly to the datalogger unit. The data belonging to Relay contacts is considered as digital inputs and the data belonging to voltage levels / currents is considered as Analog inputs.

Dataloggers are mandatory for all new relay interlocking (PI/ RRI), EI installations and it is also recommended to provide in all existing PIs / RRIs. In mechanical and electromechanical interlocking yards, datalogger monitoring is not possible.

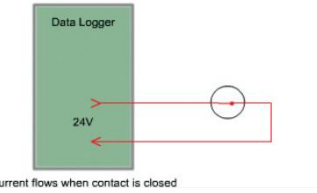
It is a vital tool for accident investigation. Datalogger is used at Stations / yards, whereas in case of Auto Section, IBH and interlocked LC gate locations, Mini dataloggers are used and called as Remote Terminal Unit (RTU).

47.1 Advantages of Dataloggers

1. Dataloggers help in monitoring the typical failures such as intermittent, auto right/Subsequently got right failures.
2. It helps in analyzing the cause of the accidents.
3. It helps in detecting the human failures / errors such as:
   a) Drivers passing signal at Danger (SPAD).
   b) Operational mistakes done by panel operators / ASM's of operating department (Wrong Operation)
   c) Signal and telecom engineering interferences in safety circuits.
   d) Engineering and electrical department interferences / failures.
   e) It helps as a "TOOL" in preventive maintenance of signaling gears.
4. Dataloggers can be connected in network. Networked dataloggers help to monitor the PI/RRI/EI remotely along with continuous data backup.
5. Failure reports can be generated remotely with the help of datalogger network.
6. Failure messages can be generated and may be conveyed to all concerned officials through SMS as soon as failure occurs in the section. (Additional Hardware to be installed for this purpose along with the datalogger)
7. On line and Off line track simulation is possible.
8. The speed of the train on point zones can be calculated.
9. Age of the equipment in terms of number of operations. etc. may be calculated.
10. Following data may also be fetched through datalogger:
    a) Train Detained – after signal.
    b) Train Speed
    c) Train speed in Loop line
    d) Train Stop
    e) Non-Signal Movement
    f) Driver Entering into Block Section without Line Clear
    g) Operation of More than one point at a time
    h) Point operated with repeated operations.
    i) Late Start of train
    j) Late Operation of signals
    k) Premature Operation of block instruments/Signals
    l) Route Cancellation
    m) Point Maintenance



How digital input wiring is done



Current flows when contact is closed

All the dataloggers require a potential free (spare) relay contact for monitoring digital inputs through Digital input cards & for monitoring Analog inputs such AC/DC bus bar voltage levels through Analog input cards.

Provision of Dataloggers is mandatory with RRI systems and is optional for PI systems as per amendment to the specification for Relay Interlocking systems (IRS/S-36). The data collected by the datalogger can be used for failure analysis, repetitive discrepancies, and for accident investigations.

47.2 Reports from Data logger for accident investigation

On Indian Railways, for the safe movement of trains, signals have been provided on all stations. The traffic department controls the operations of these signals. The failure in operating a signal is made available to traffic department. This information is then conveyed to the Signal Department mainly for signal failure. Following types of failures relating to various department can be learned from various reports of data logger. The summary of few failures is as under:

Failure relating to operation.

1. Wrong operation
2. Choosing wrong sequence of operations
3. Wrong reporting failure
4. Delay in operating the signal gears.

Failure relating to Engineering Department

1. Failure due to creeping
2. Failure due to distracted insulation of track circuit by rail fittings, Ballast resistance and water logging etc.
3. Failure due to stock /switch rail fittings, packing, out of square related failures.

Failure relating to Electrical Department

1. Low/ high voltage
2. Short circuit due to traction return current strip.
3. No electrical supply

Failure relating to Signalling Department

1. Blown off circuit fuse.
2. Fused signal bulb
3. Due to change in parameters of track circuit/ Axle counter.
4. Failure of power supply equipment due to which power is not available to the signal circuit.
5. Intermittent failure in relay contacts or high resistance.
6. Poor maintenance

Abnormal incidences

1. Bursting of point
2. Derailment of train
3. Train accident
4. Passing of signal in RED i.e. danger aspect

If failure gets automatically set right:

1. Measuring all parameters
2. Operating the gears
3. Observing the gears
4. Doing detail investigation

Research Design and Standard Organization (RDSO) has approved Fault logics relating to various railway working like unusual incidences and unusual sequences for assistance in the investigation of railway accidents. The reports required from data logger after any accident and unusual incident for investigation are given in following tables-

Table: Reports from station Data Logger

S.N.	**Reports from station**	**Details**
1	Analog status report	Different supplies status
2	Digital status report / Selected relays report	All Interlocking relays status/ Interlocking relays status of particular route
3	Fault summary report	With all intermittent failures
4	Modem link status report	Modem working condition
5	Offline track simulation report with text display	Signal clearance operation and actual train movement at given time.

With the help of the above reports the following lapses can be investigated.

1. Signal passed at Danger - TPR1 Down, RECR UP & TPR2 Down, TPR1 and TPR2 are in sequence.
2. Train detained - after signal.
3. Train Speed
4. Train speed in Loop line
5. Train Stop
6. Un-Signal Movement
7. Driver entering into block section without Line Clear
8. Operation of more than one point at a time
9. Point operated with repeated operations.
10. Late Start
11. Late Operation

12. Premature Operation
13. Route Cancellation
14. Point Maintenance
15. Time difference between Timer Relays in case of Route Cancellation - with the help of Log - Off Reports

From control room also generates the same reports and compare them with those of station data logger and compare both of them with train charting data to derive valuable insights into the case.

Table: Reports from control room data logger

S.N.	**Reports from control**	**Details**
1	Analog status report	Different supplies status
2	Digital status report / Selected relays report	All Interlocking relays status/ Interlocking relays status of particular route
3	Fault summary report	With all intermittent failures
4	Modem link status report	Modem working condition
5	Offline track simulation report with text display	Signal clearance operation and actual train movement at given time.
6	Punctuality report	Planning of controller and actual train movement
7	Trains List	Planning of controller and actual train movement
8	Caution order report	Caution orders actually issued to related trains
9	Blocks report	Block nature and timing
10	Prediction report	Preplanning of controller
11	Vector model graph	Distance vs Time

47.3 Instruction of Data loggers for signalling- Timely extraction of Reports

Instructions have been issued in the past vide above references in connection with provision, installation, configuration, maintenance, regular checking and extracting reports from Data Loggers. The performance, utilization and response from the system is still not very satisfactory. Recently, in few of unusual incidences/accidents, it has been observed that Officers and Supervisors have not been able to extract the required reports at all or in time for one reason or the other. Even for investigation of signal incidences, the system is not being used as regularly and effectively as is required. Use of Data Logger as a predictive maintenance tool is yet to be firmly ingrained in the maintenance organization.

2. Some of the major reasons for such a situation are incomplete or inadequate wiring/configuration of all relevant parameters, lack of involvement of S&T field staff, inadequate understanding of the procedures, improper upkeep of

Data Logger (DL) hardware & software, interfaces & accessories like Laptop PCs & Printers & related documents (User Manuals), absence of fortnightly checks & Annual Maintenance Contracts (AMCs) with OEMs, poor follow up in case of DL failure and insufficient monitoring by Sr. DSTES/Sr. DSOs & CSE/DRM/CSO/CSTE.

3. While reiterating the earlier instructions it is further directed that urgent action is required to be taken to ensure effective use of this extremely important sub-system monitoring signalling functions & train operations, for which following additional guidelines be followed:
   i) Correct configuration & design of Data Logger and wiring diagram to be approved by CSE. This will include specific approval of the functions or parameters to be logged. Verification & validation of the system at site by ASTE or DSTE
   ii) Training in the use of Data Logger be imparted to all Technicians Gr. I & MCM & JE/SE(Sig) of the section & be refreshed every time the system is changed or at the time of refresher course, whichever is earlier.
   iii) SE/SSE(Sig) & ASTEs of the section should also be trained to extract reports for a specific period. They should do this on each trip to the installation/station and enclose it along with their inspection report.
   iv) Regular drills should be conducted by Inspecting officials for extraction of reports at site and it should be ensured that the same is printed out within the shortest possible time after reaching the site.
   v) Provision of printers as stipulated by RDSO and/or OEM be ensured at each station to optimize on the time for taking a printout. One printer duly tested and in working order should also be kept either with the SSE in-charge of the section or in the ART for use on site.

Receipt of this letter may please be acknowledged with a compliance statement on the above items within ten days.

Reference: Letter no. 2010/Sig./SGF/12(Data Logger) dated 22nd July 2010 is issued and signed by Kapil Dev Sharma, Additional Member (Signal), Railway Board is given to General Managers and all Indian Railways, Metro Rail Kolkata, Managing Director MRVC, Director General RDSO, RSC, Director IRISET

ISHIKAWA WAY (FISHBONE) OF ACCIDENT INVESTIGATION

48

The purpose of accident investigation is to find out the cause of accident and take remedial measures to avoid recurrence of such kind of accident. To find the real cause of accident is a difficult task but it cannot be impossible. There is certain way of finding the real cause, but a Japanese technique called Ishikawa (Fishbone) diagram is quite effective. It is frequently being used in processes to identify the causes in several industrial sectors. It is based on cause-and-effect analysis.

The Railway Board has also laid great emphasis on using fishbone technique and issued a circular to adopt the Fishbone technique and other tools like the 5-why analysis, which would lead to better determination of the root-cause and, thereby, minimising the chances of recurrence. The technique is systematically looking at the effects and the causes and fins a solution to a problem. The Railway Board circular say as under:

> "The accident enquiry committees should, invariably, carry out Fishbone analysis in all cases of consequential accidents as a part of

> Accident Enquiry process for identification of the root-cause and recommend corrective measures based on the same.
>
> "Further, in case of SPADS (Signal Passing at Danger), 5-Whys (Why-Why) root-cause analysis may be carried out to improve the incisiveness of the accident investigation. The accident enquiry report approving authority may please be directed to ensure that root-cause analysis techniques as mentioned above are used in respective cases without fail,".

The Railway Board instructions also state that the introduction of these techniques may require training of officers and personnel involved which has to be organised by the railway zones at their end. Further, the short courses may also be organised by Director General of the National Academy of Indian Railways (NAIR) for officers.

48.1 Understanding Ishikawa Diagrams

Ishikawa diagram, also called the Fishbone diagram, is a tool used to identify problems in a system. It shows how causes and effects are linked and helps analyse what is going wrong with systems, processes, and products. The name comes from Japanese engineer Kaoru Ishikawa who developed the method in the 1960s.

Using the Ishikawa diagram, engineers may better understand manufacturing process defects. But today, many marketers use the Ishikawa diagram to analyze complex situations and find the most effective solution for their businesses.

48.2 When to Use

Ishikawa diagrams can be helpful in any situation where there is a need to analyze complex problems or identify the causes of issues in a system. Teams often use them in manufacturing, marketing, product development, and other fields that involve working with

people, processes, and procedures. Some common situations where Ishikawa diagrams may be helpful include:

1. When identifying the root causes of a problem
2. When brainstorming solutions to a problem
3. When developing or improving a process
4. When analyzing data from customer surveys
5. When evaluating the results of a marketing campaign
6. When troubleshooting an issue with a product or service
7. When planning future projects or initiatives

48.3 Advantages

There are several advantages of Ishikawa diagrams, such as:

1. They help identify the root causes of problems.
2. They help team members communicate and share ideas more effectively.
3. They enable teams to visually organize complex information.
4. They can be used to brainstorm solutions to problems.
5. They allow teams to track progress and plan future actions.

48.4 Disadvantages

There are a few disadvantages of Ishikawa diagrams to consider, such as:

1. They can be time-consuming to create.
2. They can be challenging to interpret if not well-designed.
3. They may be biased or incomplete if team members do not actively participate in the analysis process.
4. There can be a risk of focusing too heavily on individual factors instead of considering how they might interact with each other.
5. They can be challenging to apply in situations where multiple interrelated factors are involved.

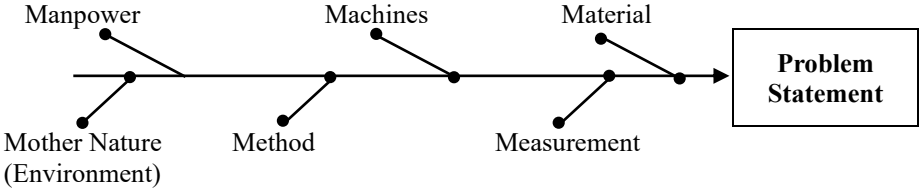
48.5 What are the 6Ms in the Ishikawa Diagram?

The 6Ms in the Ishikawa diagram are critical factors used to identify and analyze problems in a system. These factors include:

1. **Material**
   This refers to any physical or non-physical components of the system, including people, resources, and tools.

2. **Method/Process**
   This refers to the methods and procedures used to produce or deliver the product or service.
3. **Machine**
   This refers to the assets such as machines and equipment used to create or provide the product or service.
4. **Measurement**
   This refers to the tools and methods used to measure progress and performance.
5. **Manpower**
   This refers to the people involved in producing or delivering the product or service.
6. **Mother Nature (Environment)**
   This refers to the external factors that affect the system including weather, geography, and regulation.

Ishikawa Diagram: The 6Ms



48.6 The Process to Make an Ishikawa Diagram

When generating an Ishikawa diagram, there are a few steps to follow:

Step 1: Define the Problem

Start by clearly defining the problem you are trying to address using your fishbone diagram. It could be a quality issue, employee dissatisfaction, or any other issue that you want to understand and improve. You can use paper checklists or spreadsheets to define the problems or use specific tools such as Safety Culture (formerly iAuditor) to capture and organize your specified issues.

Problem Definition Tips:

1. Be as specific as possible when defining your problem. It will make it easier to identify root causes later on.

2. Make sure that everyone on your team understands the problem in the same way. Use a problem statement to ensure that everyone is on the same page.

Step 2: Decide on Key Categories of Causes

Sorting potential causes into different categories makes it easier to identify root causes later on. You can use the 6Ms as a starting point to help you decide on key types.

Step 3: Identify Possible Causes within Each Category

Once you have decided on your key categories, you can begin brainstorming possible causes for each one. Consider all of the factors that could affect your process or product and note them down as potential causes. Below is an example of possible causes in each category using the 6Ms (Material, Method, Machine, Measurement, Manpower, and Mother Nature).

Step 4: Sort and Prioritize Potential Causes

Once you have a list of possible causes, it is helpful to sort and prioritize them based on their likelihood of being root causes. It will help you focus your efforts on the most likely reasons. There are a few different quality management tools you can use to sort and prioritize potential causes; some of these include:

1. **The 5 Whys**
   This technique can be used to drill down to the root cause by asking "why" five times.
2. **Pareto Analysis**
   This technique can help you prioritize potential causes by identifying the most common ones.
3. **Failure Modes and Effects Analysis (FMEA)**
   This risk analysis tool can help you prioritize possible causes based on their potential impact.

Step 5: Test Potential Causes

After you have sorted and prioritized your potential causes, it is time to start testing them to see if they are root causes. Trying to find out what might be the possible causes can be done in several ways:

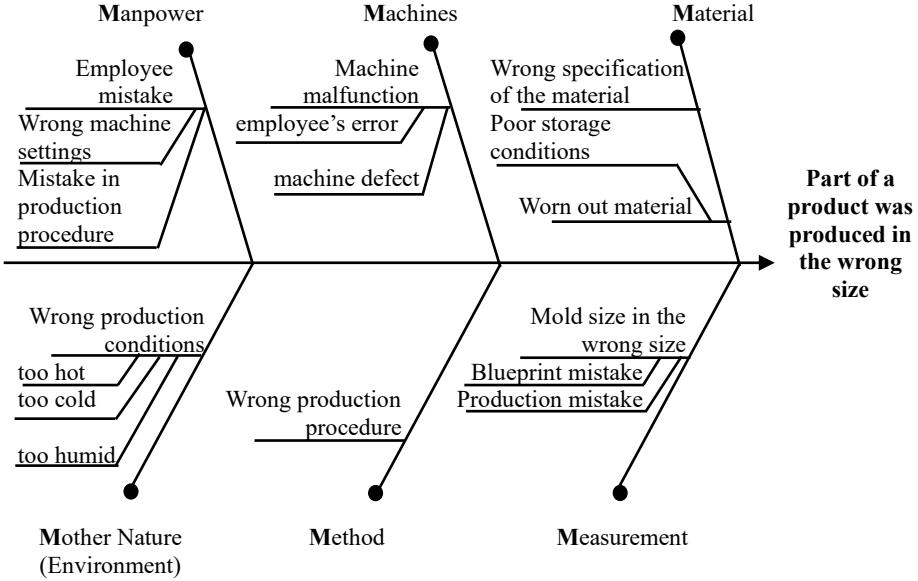
1. **Option A: Process Map**
   Branching out from the main problem, you can create a process map to test different potential causes. Using a process map, you can identify the gaps in your system that may lead to your problem's root cause.
2. **Option B: Brainstorming**
   You can also use brainstorming techniques to identify potential solutions that could address the root cause of your problem. It is an excellent way to get input from various team members and stakeholders.

Example of a Fishbone Diagram

Below is an example of a fishbone diagram for a manufacturing company. In this scenario, the company uses the 6Ms to better understand the causes of the problem, which is that a part of the product is in the wrong size.

The problem is stated on the right, with possible causes of the problem listed in the ribs under each 6Ms category.

Example Fishbone Diagram



SWISS CHEESE

48.7 Why-Why analysis?

"Why-Why analysis is an analytical method that is designed to help you identify all factors contributing to a problem one by one in an orderly fashion, rather than a hit-and-miss attempt to work out the factors and finally. we will have the root cause for the failure. Sakichi Toyoda developed this technique and firstly used it within the Toyota Motors.

It is a critical component of problem-solving training and also the same was delivered as part of the induction training into the Toyota Production System for the newly joined employees. This method is also used during the implementing of Kaizen, Lean Manufacturing, and Six Sigma projects.

90% of problems can be solved only by why-why analysis. The remaining 10% of problems need a high level and complex methodology for solving. The conclusion may lead to the root cause or will lead to the starting of the 5 Why method. This method is a very famous Root Cause Analysis Method.

48.8 Why is problem analysis required?

1. The problem analysis is required to prevent the recurrence of the failure.
2. To find out the root cause and we can easily take preventive action against that.
3. It is also very helpful for developing our problem-solving skills and mitigating future challenges.

48.9 What is the problem, cause, root cause, and countermeasure?

- The problem is what has happened, or it is an undesirable event.
- Observation is an understanding of what has

happened.

- The cause is the reason behind the failure.
- The root cause is exactly whom the cause has originated.
- Counter-measure: The action which you take against the root cause so the issue will not be repeated again.

48.10 Key Points of Why-why Analysis

1. It should be done in a team.
2. Verify facts from Genba the real place, and on Genbutsu- the real thing.
3. Connect the why-s in a chain of logic.
4. Should and up the investigation where the causes can be prevented.
5. Use the hence logic to check the chain of logic is continuous.
6. No assumptions, No guesses
7. Keep management in the loop during the five whys process in the company.
8. Use paper or whiteboard instead of computers because that in a more effective method.
9. Write down the issue and make sure that of people understand it.
10. Distinguish causes and symptoms. Don't mix up causes and symptoms.
11. Keep the focus on the logic of the cause-and-effect relationship.
12. Try to make your answers more precise.
13. Look for the cause step by step. Don't jump to conclusions.
14. Assess the process, not the people.
15. Never consider root cause as human error" or "worker's inattention.
16. Ask why till the root cause a determined.

48.11 How to perform a Why-why analysis?

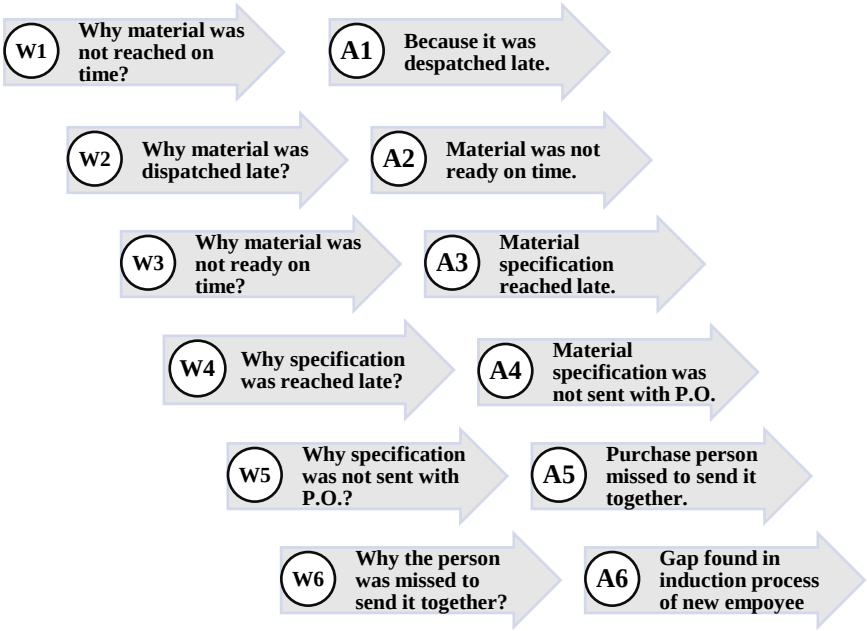
Repeat 'why' n-times (till root cause is found). Applicable for one single event. Stop the why chain when you reach the basic 5-causes. Can be done by Gemba people based on actual findings. It is not mandatory to stop after asking 5 why's sometimes we can reach at the root cause by less than 5 whys and sometimes it can go up to more than 5 whys.

Idea of countermeasure

1. Countermeasure is just opposite of the root cause identified.
2. Example:
   a) **Final Why -** No FG part checking standards are available in place.
   b) **Counter Measure -** Establish and display the FG part checking standard at the FG part checking area.

Example of 5 why analysis:

Problem: Material was not reached at the site on time.



Why-01: Why was material not reached on time?
Ans-01: Because it was dispatched late.
Why-02: Why was material dispatched late?
Ans-02: Material was not ready on time.
Why-03: Why material was not ready on time?
Ans-03: Material specification reached late.
Why-04: Why was specification reached late?
Ans-04: Material specification was not sent with P.O.
Why-05: Why was specification not sent with P.O.?
Ans-05: Purchase person missed to send it together.
Why-06: Why was the person missed to send it together?
Ans-06: The gap found in the induction process of a new employees.

Root Cause: The gap found in the induction process of new employees. [Process/System Failure]

Preventive Action: Introduce a training system for new joiners is updated.

Benefits of 5 Why Analysis:

1. Improves analytical thinking.
2. Develops an understanding of the relation of the failure with theories & fundamental principles.
3. Improves the knowledge of the function, structure, and mechanism of the equipment/process.
4. Develops the consciousness about the abnormalities causing troubles in the workplace.
5. Aims to level up the ability of the people.
6. Develops the way of prevention of recurrence.

COLLISION OF TRAINS:
CAUSES, INVESTIGATION AND PREVENTION

49

Collision of trains means one train colliding with another train or any other Rolling stock. Collisions are the most dreaded accidents causing maximum casualties. It is estimated that collisions constitute only 7% of total accidents but these are responsible for 38% of deaths that occurred in Railway accidents. The collisions can be divided into three major types as under:

(i) Head on Collisions:
When two trains collide with each other on the same track coming from opposite direction. Head on collisions are the most fatal of all accidents.

(ii) Rear End Collisions:
When a running train is ramming into another train from behind. It may be a stationary train, running train or stabled rake.

(iii) Side Collisions:
Side collision occurs when trains collide with

each other from one side or another side. Side collisions mostly occur in station areas when trains are converging or diverging or by fouling the adjacent track in multiple line territory.

Of the total consequential train accidents that occurred during the last decade, the percentage of collisions involving passenger carrying trains was 4% only, but they are highly volatile mishaps and call for necessary steps to prevent them at all costs.

49.1 The human failure as principal cause of collision

The human failure is one of the most important causes for collisions. The study conducted over a time has revealed that 64% collision occur due to failure of station staff, 18% due to failure on part of loco pilots, 04% on account of other technical staff and only 14% due to miscellaneous causes like failure of equipment, Track defects, Rolling stock in poor condition & defective signals.

The major causes of failure of station staffs are as under:

1. Reception of a train on blocked line or dispatching into a blocked section.
2. Wrong setting of points and reception of trains on a blocked line by Station Master/Switchman.
3. Reception on-line fouled by vehicles from adjacent line.
4. Derailed vehicles obstructing adjacent line in mid-section.
5. Wrong Shunting or Shunting without protection.
6. Non-Securing the stabled coaches or wagons in sidings or running lines.

49.2 Failure of station staff:

(a) Reception of a train on a Blocked Line due to: -

1. Line being occupied
2. Incorrect setting of points
3. Signals taken off for a previous train not put back to “on”
4. Fouling marks not being clear
5. Obstruction of line during shunting

6. Tampering with Block Instruments.

(b) When dispatching a train:

1. by sending it into an obstructed blocked section.
2. fouling mark not clear
3. obstruction during shunting
4. incorrect setting of points
5. tampering with Block Instruments

(c) Collisions in block sections due to vehicles escaping

49.3 Failure of Loco pilot:

1. Disregard of signals or overshooting
2. Failure to control trains on their journey
3. Failure to observe Rules in Automatic signalling territories
4. Moving against signal during shunting
5. Forcing Loco pilot to work on sections without learning the road or for long hours leading to fatigue

49.4 Failure of Equipments and Signal Staff

1. Weak brake power on trains:
2. Unsafe failure of signals
3. Dubious situations of signals
4. Non-protection or inadequate protection of lorries and trollies on line
5. Non-protection or inadequate protection of trains in block sections in the event of accidents, unusual occurrences
6. Maintenance of signal gear by signal staff without taking proper disconnection memo
7. Unauthorized interference by signal staff in field with relay cables

Several safety devices have been provided from time to time to eliminate/mitigate human factor as far as possible. Accordingly, the safety of railway operations is based on three simple cardinal principles, viz:

1. Interlocking of signals with points
2. Block working (Absolute or Automatic Block

working) which assures space interval between successive trains in Block sections

3. A type of brake that cannot only be applied by the loco pilot of a train, but which will apply itself automatically in the event of parting of a train, with a means of continuous communication bet- ween the Train manager, the passengers, and the loco pilot. (Effective twin pipe airbrake system, Train manager's brake and the alarm chain ensure this)

The above cardinal principles are also called, **"lock, block and brake**, for simplicity.

On busiest sections also, the very same principles are being adopted except that some degree of Automatic protection is intro- diced. For instance, a running train automatically protects itself in rear by placing the signal it passes to Danger. This signal can again be taken off for another train only when the previous train traverses a certain pre-determined safe distance and gets the protection of another signal in the Automatic Block working. Automatic train control is the next step towards greater safety. In this arrangement, the brakes of a train apply themselves automatically, if a loco pilot is not alert and disregards the aspect of a stop signal after getting warning at a distance not less than the Braking plus reaction distance from the stop signal.

49.5 Collisions in Absolute Block Working:

1. (a) Advanced starters are normally interlocked with Block instruments and cannot be taken off unless line clear is obtained Once taken off, they automatically go back to Danger when a train enters the Block section. But the starters are free and can be operated by traffic staff at will. They are deliberately made free with a view to facilitate shunting within station section limits.

   (b) There have been several cases in the past when the starters

were inadvertently taken off by switchmen when the Block section ahead was occupied and the Loco pilots of the trains stopping. or received at the stations, took it that the block section ahead was clear, passed the starter in the taken off position, somehow missed the aspect of the Advanced Starter (which was still in the 'ON'' position) and entered the occupied block section with the resultant rear-end collision with the preceding train.

(c) This danger is all the more in the following cases: -

1. Stations where Advanced Starters are located at excessive distances to berth full length goods train between the outer-most points and the Advanced Starters or to do shunting of full-length trains on main line by drawing them ahead up to Advanced starters without blocking forward. The distance between starters and advanced starters is about one kilometer in such cases.
2. In the case of MAUQ/MACL signalling. A Loco pilot gets only caution aspect on starter when the Advanced Starter is at danger and thus the chances of Loco pilots missing the danger aspects of Advanced starters are remote, since they observe caution after passing the starters. But in the LQ/MLQ signal- ling, the Loco pilot gets 'Off' or 'Green' aspect on starters and there is every likelihood of his not carefully looking for the aspect on Advanced starters. Most of such collisions, in fact, took place only in L.Q. signalling territories.
3. The Chances of missing the aspect of Advanced Starters are even more-
   (1) in winter months when the visibility is generally poor due to fog, etc.
   (2) in the case of steam engines where Loco pilots are obliged to give some attention or the other

immediately after starting from a station.

(3) when steam engines run tender foremost or diesel engines run long-hood leading.

(d) The Railway Board, therefore, issued instructions that the length between Starters and Advanced Starters should be track- circuited when the Advanced Starters are located far away. This costs Rs. 6 to 10 lakhs per station. Even then, there is no guarantee of avoiding such accidents. Once the previous train has cleared the Advanced starter but is still in the Block section, nothing prevents a Starter (which is free) being taken off. Collisions can still take place as explained in sub-para (b) above. The Commission of Railway Safety, therefore, suggested that Advanced Starters should be brought back to be within 120 to 180 meters from the outermost points and any shunting of full-length trains should be done by blocking forward except at a few stations where location of Advanced Starters at excessive distances become unavoidable due to peculiar location of goods sheds or other sidings, etc. In fact, this problem of Advanced Starters located at excessive distances is acute only on the ex-East Indian Railway portions of Eastern and Northern Railways.

2. A few examples of how accidents can occur due to failure. of staff are given below:

(a) A Switchman in a cabin, say at Station A, was absent from duty for some time for some personal reasons with the result that a Goods train which approached this station was detained at the outer signal in a Double Line section. Meanwhile, a following passenger train was received at the station, say B. in rear. The Switchman at Station A, on returning for duty, became funky and gave line clear to the waiting passenger train at 'B' by tampering with the Lock and Block instrument with the expectation that the Goods

train could be taken into the station and cleared from the block section by the time the passenger train arrived. Accordingly, he took off the signals for the goods train. But the Goods train could not move in time as expected due to some reasons like the delay in regrouping the crew, creating vacuum, etc. Meanwhile, the passenger train entered the block section on correct line clear and collided with the Goods train. This case reveals how a switchman can give line clear without the co-operation of others by tampering with the Block Instruments. Arising out of this accident, an earlier rule which stated that 'Block Instruments should be sealed or locked' was changed into. Block Instruments should be sealed and locked" with dual control of S&T and station staff on Block Instruments.

(b) There was a typical case of a collision at a B. G. station, when a Down Goods train was admitted on clear signals on a line (not track circuited) occupied by an Up Goods train. The accident was due to short-cut methods followed by the ASM, Leverman and Pointsman of East Cabin, Platform ASM and Points Jamadar. They failed to verify that the line was free before taking off signals, as per the station working rules. A number of people failed in this case.

(c) There was an irregular system of a shunting engine going from Station A to B and returning with the same token. One day, the shunter went even without this token and was returning, when Porter dispatched another train from Station A, of course, this time with the token. This resulted in a collision. The Station Master left the station without being properly relieved and the Porter was managing. Pouches were also not being used for handing over tokens.

49.6 Collisions in Automatic Block Signalling:

2. A loco pilot is authorized to pass an Automatic stop signal in 'ON' position, subject to General Rules 277, 278 and 279 which are reproduced below for ready reference: -

General Rule 277: loco pilots Duty When Automatic Signal Is 'On":

(1) When a Loco pilot finds an Automatic stop Signal with an 'A' marker at 'ON', he must bring his train to a stop in the rear of that signal. After bringing his train to a stop in the rear of the signal, the Loco pilot shall wait there for one minute by day and two minutes by night. If after waiting for this period the signal continues to remain at 'ON', he shall give one long whistle and exchange signals with the Train manager and then proceed ahead, as far as the line is clear, towards the next stop signal in advance, exercising great caution so as to stop short of any obstruction.

(2) Where owing to the curvature of the line, fog, dust storm, engine working the train pushing it, or other causes, the line ahead cannot be seen clearly, the Loco pilot shall proceed at a very slow speed, which shall under no circumstances exceed 8 kilometers per hour: The Loco pilot, if he considers necessary, may seek the assistance of the Train manager by giving a prescribed code of whistle:"

General Rule 278: Train manager's Duty When Automatic Stop Signal Is 'On':

When an Automatic Stop Signal is to be passed at 'ON' and a Loco pilot is not accompanied by a Fireman or an Assistant Loco pilot, and where the line ahead cannot be seen clearly for a sufficient distance, owing to a curvature of the line, fog, dust storm or any other cause, the Train manager, on being

sent for by the Loco pilot, shall accompany him on the engine cab, before he moves forward, to assist Loco pilot in keeping a sharp look out."

General rule 279: Precautions After Passing Automatic Stop Signal At 'On'

When an Automatic Stop Signal has been passed at 'ON' the Loco pilot shall proceed with great caution until the next stop signal is reached. Even if this signal displays "Caution' or "Attention" or 'Clear' aspect, the Loco pilot must continue to look out for any possible obstruction short of the same: He shall proceed cautiously up to that signal and shall act upon its indication only after he has reached it:"

3. Most of the collisions in Automatic Block Signalling territories are attributed to violation of General Rules 277 and 279 by Driving crew of the trains, who-
   (a) fail to stop at an Automatic Stop Signal with an 'A' marker at 'ON' and wait there for one minute by day and two minutes kay night:
   (b) fail to exercise great caution after passing an Automatic Stop Signal at 'ON', so as to stop short of any obstruction, until the next stop signal is reached:
   (c) fail to proceed at very slow speed, which under no circumstances exceed 8 km/h in conditions of poor visibility:
   (d) fail to look out for any possible obstruction short of the next stop signal, even if this signal displays 'Caution' or 'Attention' or 'Clear' aspect.
4. In view of the fact that there have been frequent accidents of this type in the past, some steps should be taken to prevent such accidents. Some of the suggestions made for the consideration of the Board from time to time are-
   (a) The rear-end warning system (taillight) on trains should be considerably improved. RDSO is presently in this job.
   (b) (i) The speed of trains should be invariably restricted to 15

kmph during night-time under G. R. 277 (1):

(ii) The speed should be restricted to 15 kmph during daytime also in sections where visibility is generally poor due to cuttings, curves, and or controlling becomes difficult due to steep and continuous down gradients or when steam engines run tender-foremost, or diesel engines run with long-hood leading. This is in addition to the restriction of 8 kmph under G. R. 277 (2)

(c) Even with all these restrictions, there is no guarantee that Loco pilots will observe restrictions on their own. They tend to overlook such restrictions under a mistaken impression that the line ahead is clear of any trains and/or that the concerned Automatic Stop Signal is showing red not because of any obstruction ahead but due to failure of the signal itself, which is a common occurrence Frequent ambush checks should be conducted to ensure that Loco pilots are meticulously observing the Rules while passing Automatic Signals at Danger. These checks should be intensified during winter months when the visibility conditions are poor due to fog, etc. The erring Loco pilots should be taken up severely.

(d) Spacing of Automatic Signals at abnormal distances throws strain on Loco pilots who will have to be extra cautious when they pass an Automatic Signal at Danger till, they reach the next Signal in clear aspect. Provision of 4-aspect Signals is a must in Automatic Block Working, with signals spaced at close intervals of about 1 km. to cater for the braking distances of Goods trains and fast Express/ Mail trains.

(e) The crashworthiness of E. M Us should be improved to reduce casualties.

(f) There should be a system of explaining to the Loco pilots and Train managers working in Automatic Block sections

the implications of General Rules 277, 278, 279 and 280 at frequent intervals. This education should be buttressed with some case studies of past accidents so that several implications may go home to the crew.

5. Again, **General Rule 280** is meant to avert accidents in the Automatic Signalling territories. This Rule is reproduced below:
   (a) "**General Rule 280:** Protection of A Train Stopped in **An Automatic Signalling Section:**
      (1) When a train is stopped in an Automatic Signalling Section, the Train manager shall immediately exhibit a 'Danger' hand signal towards the rear and check that the tail board or taillight is correctly exhibited.
      (2) If the stoppage is on account of accident, failure or obstruction and the train cannot proceed, the Loco pilot shall sound the prescribed code of whistle, and the train shall be protected immediately as per Rule 166 except that for the protection of the occupied line. one detonator shall be placed at 90 meters from the train on the way out and similarly two detonators, 10 meters apart, not less than 180 meters from the train or at such distance as has been fixed by the special instructions."
   (b) In the above Rule, rear protection is envisaged under special circumstances i.e., on account of accident, failure, or obstruction and when the train cannot proceed. This rule is all right so far as Automatic/Semi-Automatic signals are concerned since Loco pilots are authorized to pass such signals at danger and the question of indefinite stoppage at such signals does not arise. But the problem arises when a train stops at a Home Signal of a block station due to some difficulty in receiving the same into the station for want of vacant line or point failures, etc. General Rule 280

does not envisage protection in such cases. This has led to avoidable accidents and casualties in the past.

(c) **General Rule 280** which existed prior to issue of correction slip No. 172 dated 7-11-1977 envisaged compulsory rear protection irrespective of the cause for stoppage after a halt of 5 minutes. But this rule was amended deleting this protection in the above correction slip. It is considered necessary that G.R. 280 as originally Existed prior to the issue of the correction slip should be restored. Train services should not be affected on this account since such stoppages are only at Home Signals and very rare.

6. Some of the points which came to light during inquiries into collisions in Automatic Signalling territories are as follows: -

(a) In the case of halts, Automatic Stop Signals are at times provided at the entry end instead of at the exist end of the halt. The net result is that even when a Loco pilot of a passenger train scheduled to stop at the halt passes such signal at Danger, of course, after stopping for a minute or two, he must again stop at the halt for the convenience of the passengers. During such a stoppage, he is likely to forget that he has passed a previous signal at danger and may not exercise great caution as envisaged till he reaches the next signal. This may result in collisions. It is, therefore, necessary that Automatic signals should be invariably located at the exit end of halts and not at the entry end.

(b) If an Automatic Stop Signal is provided at the end of a Girder Bridge, etc., and when passenger train stops at such signal in the 'ON' position, there is the danger of passengers unwittingly getting down from the train and falling into the stream below. Normally Automatic Signals should be provided at the entry end of Girder Bridges. Further if there is not enough space between an Automatic Stop Signal and a Girder Bridge at the exit end to accommodate the longest passenger train, the 'A'

marker on the Automatic Stop Signal at the entry end should be removed.

(c) Automatic Signals should be so located that an engine or motor coach should not get stalled in neutral sections.

(d) Neutral sections should not be located in dips since Loco pilots cannot observe speed restrictions in such locations, for they need some momentum to negotiate the rising gradient ahead.

49.7 Remedial Measures

Following remedial measures can be taken to eradicate the collision:

1. As we know, the failure of the human element, which is attributed to error of judgement, forgetfulness, drowsiness, absent-mindedness, domestic worries, fatigue, overwork. intense activity.
2. Continuous night duty, nervous breakdown, or negligence be avoided at all costs.
3. Make all out efforts to recruit the right type of persons for the important jobs after screening with psychological test.
4. Better training of the staff in a good environment and boosts their morale.
5. Sort out staff grievances and other problems.

It has been argued that 'the best safety device known is a careful man'. While this is true to a limited extent, the high speeds and intensity of traffic on suburban sections and trunk routes call for some form of mechanical signalling, electrical or electronic aid to human memory and reactions, or audio-visual warning at the appropriate time. Some of the technological improvement like improved signalling techniques and innovative electronic systems, Automatic block signalling and continuous Track-circuiting, Automatic train protection and warning system. Block proving by axle-counters, Panel and solid-state interlocking, Anti-collision device. (A.C.D.)

These systems will ensure that even if there is human failure, they will give warning or apply brakes to prevent an accident.

49.8 Prevention of Collision

1. **Track Circuiting**

   A major thrust was given to track circuiting at stations in the mid-nineties, to serve as a technical aid to station staff to prevent collisions. It is proposed to cover all the main BG routes, having passenger traffic, in the next five years.

   In the last five years, on an average of 900 to 1000 locations per year have been provided with track circuits. Track circuiting works on A, B, C, D, D.Spl, E & E.Spl routes are being done in a phased manner. It has been one of the most important safety aids provided at the stations, which has reduced collisions in station areas. Works of track circuiting have been sanctioned under SRSF. Whereas works on over 2250 Stations of A, B, C have already been sanctioned, projects on other routes, of BG and MG are proposed to be taken up.

2. **Block Proving by Axle Counters**

   Block proof by axle counters is to be provided on ‘A’, ‘B’ and `C' routes. All new works of panels will be provided with this device, to prevent collisions in the block sections due to some `parted' load being left out.

3. **Auxiliary Warning System (AWS)/Train Protection Warning System (TPWS)**

   To eliminate human error in passing signals at danger, this system may be tried on certain stretches. The Auxiliary Warning System (AWS) has been working satisfactorily over a decade in Mumbai suburban sections of Central and Western Railways.

4. **Anti-Collision Device (ACD)**

   Anti-collision device is a recently developed device by Konkan Railway Corporation to prevent collision like situation e.g., head-on collision, side and rear-end collision. This device may also help in detecting train partings and provide audible and visual warnings at level crossing gates when trains approach them.

5. **Light Emitting Diode (LED) based Loco Flasher Lights**
   Light Emitting Diode (LED) based Loco Flasher Lights are proposed to be provided in rear of Guards brake van (SLRs) on passenger carrying trains. They will be identical to loco flashers and will be in addition to the guard's tail lamp. They would be switched on during any out-of-course stoppage in the block section.
6. **LED-based Flashing Tail Lamps**
   LED-based Flashing Tail Lamps are being provided to guards. Similarly, LED-based Hand Signal Lamps would be provided to all stationary staff connected with train operations.
7. **Improvement in Signal circuitry**
   Improvement in Signal circuitry of four _ aspect Multiple Aspect Colour Light Signalling (MACLS) will be modified to provide for interlocking of starter and advanced starter. `Negative' slides with ASM will be dispensed with, wherever existing.
8. **Continuous Track Circuiting**
   Continuous track circuiting not only helps in improving the capacity with automatic block signalling where more than one train can be sent in a block section but also improves safety.
   First, all the level crossing gates on the section gets protected by signals. Secondly, if double rail track circuit (audio frequency track circuit) is adopted, it may also detect electrical discontinuity in rails due to rail/weld failures or acts of sabotage etc. Since the Golden Quadrilaterals along with its diagonals on the IR carry the maximum traffic, it is proposed to provide continuous track circuiting o-n priority on these sections.
9. **Mobile Train Radio Communication**
   Mobile Train Radio Communication (MTRC) system has an intrinsic potential in enhancing the safety and security in train operations, besides being a valuable aid in providing reliable and secure communication to all those engaged in different facets of railway operations and maintenance functions.
10. **Flasher lights on locomotives**
    Automatic flasher units have been provided o-n all locomotives to enable automatic switching `on' of the flasher lights in case of train parting/alarm chain pulling. This would give immediate indication to

the driver of the train coming from the opposite direction in case of derailment etc.

11. High intensity Twin - beam Head light for locomotives

Twin beam headlights have the advantage of better illumination and superior reliability as compared to the conventional headlights. These are being provided on all new locomotives.

With the completion of track circuiting works, provision of block proving axle counters, data loggers and a comprehensive safety coverage proposed to be given by ACD over the next few years, it will become a `mission area' for Indian Railways to eliminate collisions and consequent deaths. In this direction, all works related to prevention of collisions are proposed to be completed in the Plan period. This is likely to take the IR to realize the dream of a collision-free system.

49.9 Investigation of Collision and Averted Collision

When collision or averted collision happened then it is ensured that all clues are preserved, and important register must be checked. Some of the action must be taken at first hand, such as:

1. The aspect of the signal and position of point levers/ knobs in the panel, and block instruments must be checked and noted down immediately.
2. The train signal register should be signed to indicate the last entry made and then seized.
3. Line Nomination Books if any are in force, they shall be seized from the concerned staff immediately.
4. The position of the two trains or train and obstruction shall be marked on the sleepers.
5. The distance between them shall be measured in meters in case of Averted Collision.
6. A rough sketch shall be drawn showing their position vis-à-vis signals, station platform, turnouts, and other fixed landmarks.
7. Arrangement for testing brake power of the train/trains shall be made by the Officers / Sr. Subordinates at the nearest C&W examination point.
8. Breathalyzer test on the Loco Pilot/ALP shall be done immediately and blood samples taken and then sent for further medical examination.
9. A Breathalyzer test & Medical examination shall be conducted for on duty station operating staff.

DERAILMENT ON INDIAN RAILWAYS AND HOW TO PREVENT THEM

50

The derailments, being the largest component of total consequential train accidents, are required to be tackled with greater urgency. Around 75% of derailments occur due to 'railway staff failure', and another 10 % of derailments are caused by 'equipment failures.'

Around 15% are caused by the failure of 'other than railway staff', 'sabotage' and 'incidental reasons.'

With the focused attention on human resource, technological upgradation and modern maintenance practices, the present level of human failures causing derailments is bound to improve substantially. With phasing out of derailment-prone and less reliable 4-wheeler tank wagons from the fleet, investments being made through SRSF/DRF into rehabilitation of track and rolling stock etc., and anticipated improvement in the skills and quality of manpower through enhancement of HRD, it is feasible to attain a substantial reduction in derailments.

However, it is noted that few derailments, which occur on account of rail/weld failure (average 25 derailments per year), may not reduce substantially due to inherent infirmities in the existing rails. Taking the non-controllable factors viz. outside interference and incidental factors like landslides etc., as constant, the overall reduction in derailments can be possible by less than around 60%.

IR has also planned for crashworthy coaches and tight-lock coupler with anti-climbing features, which will go a long way to contain the number of casualties in case of derailments and other serious accidents.

50.1Prevention of derailment

50.1.1 Track Renewals

While in service, track is subjected to fatigue and wear and tear. For continued ability of track to withstand the expected traffic, it is required to be renewed periodically, as and when it becomes due for renewal. However, in general, the funds provided for track renewals have been less than those required/projected. Thus, annual arisings of track renewal could not be taken care of as they arose. A large kilometrage of track therefore got accumulated as overdue for renewal.

It is estimated that the annual arising of track renewal is of the order of approximately 2500 track kms for main lines. In addition, certain special works like replacement of bridge timber sleepers, renewal of turnouts, systematic renewal of fittings, welds and ballast are also required at certain time intervals. The yard lines also need input.

50.1.2 Rail/Weld fractures

Rail/Weld fractures due to generation of internal defects or due to corrosion etc., have direct impact on the safety. They are potential safety hazards and action must be continuously taken to control them by following means:

a) **Improvement of quality of rails-** The Hydrogen content in the rail steel plays a very detrimental role in generation of internal rail defects. The IR purchase rails from Steel Authority of India Ltd. (SAIL/Bhilai). With close interaction and constant persuasion with SAIL/Bhilai, maximum permissible Hydrogen content has now been reduced to 2 ppm which earlier used to be permitted up to 5.5 ppm. It is further proposed to be reduced to 1.5 ppm in next two years i.e. by 2005.

The IR along with SAIL, have taken a decision to produce 65 to 78 m long rails which will be welded in Bhilai Steel Plant to make a rail panel of length 240 to 260 m. These long rail panels will be directly transported to the site thereby reducing the number of welds. This would also reduce the multiple handling of rails thereby improving the quality. The project is planned to be implemented during the Plan period.

For transportation of these larger rails, ten mechanized rakes are being procured under Rolling Stock Programme and are likely to be commissioned by 2005-06.

b) **USFD Testing of rails -** Considering that a large number of rail/weld fractures result in derailments and some flaws go undetected in USFD testing, new equipment's would be procured having a computerized recording device. This would enable exhaustive analysis of defects and to identify those which are growing in size.

The Railways have recently introduced a need-based concept of USFD testing of rails, under which the rails already laid in track will be tested after the passage of 8 gross million tonne (GMT) of traffic. The annual requirement for ultrasonic testing comes to about 1,55,000 km. As the testing at present is being done manually, which is a slow, strenuous, and time-consuming process and largely depends upon human judgement, it is planned to get the testing done through SPURT cars, where identified locations can subsequently be confirmed by manual testing. The testing of these cars would be faster as well as more reliable as it would cover a larger cross-sectional area of rail. Two SPURT cars of the improved version are to be procured by 2004 and three more by 2008.

c) **Improved Thermit Welding -** Thermit welding, carried out in an open line, generally suffers from poor quality. Some countries have already obtained better welding technology for stronger tracks. It is proposed to procure the latest technology of thermit welding and the most modern equipment for testing each weld. Efforts are being made to acquire the latest technology of AT welding of rails, being followed o-n developed railway systems. A work costing Rs 30 crores from SRSF has already been sanctioned which is to be completed by 2005.

d) **Reduction in thermit welds by mobile flash butt welding-** Alumino-Thermit (AT) welds are the weak links in track, whose population is to be gradually reduced and replaced by Flash Butt (FB) welds executed with the help of mobile flash butt weld plants. As a first step mobile flash butt welding will be introduced in construction projects w.e.f. year 2004 and gradually extended to other areas in next five years.

50.1.3 Way-Side Detection of overloaded rolling stock by in-motion weigh bridges

Such systems are in use on advanced railway systems. They help identify the defective wagons causing over stressing of rail. The in-motion weighbridge will help detect overloading. This will help reduce fatigue of rail/welds and, therefore, reduce chances of fracture.

Several rail/weld failures are caused by overloaded wagons. It has been planned to install weigh bridges at various locations, and brake gear would be improved to prevent generation of wheel flats. The focus will be on installing in-motion weigh bridges selectively on identified routes and ensure the functioning of these weigh bridges.

Procurement and installation of pitless, electronic-in-motion weigh bridges of 120 tonnes capacity is need of the time and must be installed at all freight loading or originating points.

50.1.4 Lubrication of Gauge Face and Friction Modifier on top of Rail

Lubrication assists in reduction of wear and prevents derailments. Therefore, Track Mounted Lubricators must be tried and be adopted as a regular measure. A trial for Rail Top Friction Modifiers has also to be tried to assess their suitability.

50.1.5 In-situ Rail Stress Measurement

The safety of Long Welded Rails (LWR) track is vitally affected by locked up thermal stresses, which play an important role in the phenomenon of buckling or fractures and thus have important bearing on safety. At present, the IR does not have any equipment to objectively assess these stresses and therefore de-stressing operations are carried out based upon the observation of movements at Switch Expansion Joint (SEJ).

Some countries have developed devices to measure stress, in long-welded rails `in-situ' which makes it possible to monitor and take timely action to avoid rail fractures. It has been decided to obtain expertise to measure rail stress `in-situ', in the interest of enhanced safety. This will help in introducing the concept of "Need Based Destressing" of Long Welded Rails (LWR).

50.1.6 Track Safety Tolerances

As recommended by the Khanna Committee, efforts will be made by Research Design & Standards Organization (RDSO) to draw out safety tolerances for different speeds and categories of track, o-n the basis of practices followed in various countries and after studying the whole gamut of rail-wheel interaction.

50.1.7 Trespass on Track and sabotage.

To contain outside interference with track fittings, it is proposed to continue with following preventive efforts:

- Development of anti-theft PRC sleepers, fitting and fastening for Short Welded Rail (SWR) stretches in vulnerable areas. These, however, cannot be used in LWR stretches due to technical reasons.
- Burring of two fish bolts o-n vulnerable locations

- Elimination of fish-plated joints by welding of rails
- Deputing watchmen o-n important bridges, deep cuttings, tunnels, and their approaches, in the sections identified as sabotage prone.
- Undertaking surprise mobile patrolling in night, by joint team of Railway Protection Force (RPF) and Gangman, in such sections

However, State Governments shall have to ensure safety of track and bridges in accordance with the statutory provision of responsibility.

50.1.8 Modern Bridge Inspection and Management System

Modernization of inspection and assessment systems shall be undertaken. A modern Bridge Management System shall be implemented with following focused areas:

- Underwater Inspections of bridges
- Mapping of unknown foundations and integrity testing of foundations.
- Non-destructive testing techniques like Ultra Sonics, Acoustic Emission, Strain Gauging and Radar, etc.
- Fatigue life and residual life assessment techniques
- Bridge Management system

Projects from (a) to (d) have been approved. After their completion, the technologies shall be adopted over the entire system in a period of 3 to 4 years thereafter.

Mobile Bridge Testing laboratories with some Non-Destructive Testing (NDT) equipment's have been approved for 16 zonal railways. In next five years, these laboratories shall be implemented on the zonal railways along with balance complement of essential NDT equipment like Impact Echo testers, etc. The total cost of this project shall be approx. Rs. 30 crores.

Mobile Bridge Inspection units shall be provided at least o-ne per zonal railway in next 5 years. Two such units have been sanctioned with bucket, platform, and pier inspection units. These will facilitate access to difficult locations like the top of trusses and underside of girders and make them easy for proper inspections.

After absorption of the technology of Modern Bridge Inspection and Management Systems and provision of the necessary training, equipment, and infrastructure over next five years over the entire system, Bridge rebuilding shall be taken up after testing and detailed evaluations of strength and residual life.

Bridge engineers and supervisors working on the bridges for inspection and repairs shall be provided with safety gears like jackets with retro reflective strips, helmets, safety harnesses as required and hard boots etc. in the next two years.

50.1.9 Provision of microprocessor-based speed recorders

The majority of the speed recorders in use on the locos on the Indian Railways are of electro-mechanical type resulting in reliability problems. It has been decided to switchover to microprocessor-based paperless speed recorders.

50.1.10 Flasher lights on locomotives

Automatic flasher units have been provided o-n all locomotives to enable automatic switching 'on' of the flasher lights in case of train parting/alarm chain pulling. This would give immediate indication to the driver of the train coming from the opposite direction in case of derailment etc.

50.1.11 High intensity Twin - beam Head light for locomotives

Twin beam headlights have the advantage of better illumination and superior reliability as compared to the conventional headlights. These are being provided on all new locomotives.

50.1.12 Provision of Air Dryers on locomotives

Provision of air dryers on locos serves to avoid malfunctioning of the sensitive air brake equipment on Rolling Stock such as distributor valves by removing the moisture in the compressed air supplied by the locomotives. All new as well as rebuilt diesel locos are being provided with air dryers.

50.1.13 Microprocessor-based Electronic Brake System with resetting VCD, Event Recorder

4000 HP GM and three-phase electric locomotives have this feature to monitor the alertness of the driver through all his normal actions. If driver performs no action for 20 seconds at a stretch, he gets an audio-visual indication and if still he does not react, the brakes come on automatically within 10 seconds. on all indigenous electric and conventional ALCO locomotives, it is planned to retrofit microprocessor control with VCD and Event Recorder.

50.1.14 Better and Safer Coaches

Design of lightweight, stainless steel passenger coaches has been procured through a Transfer of Technology (TOT) contract from M/s LHB of Germany. The coach provides better ride index at higher speeds. The design provides a higher safety level as a result of modern technology in use in the design of high-speed bogies. Rail Coach Factory (RCF) has already turned out the first rake.

50.1.15 Use of high-capacity buffer packs

All new coaches are being manufactured with 10 kj (kilo joules) capacity buffers packs in place of earlier design with 5 kj capacity to absorb more shocks. All new buffers are being procured to the enhanced design.

50.1.16 Bogie-Mounted Brake System in place of under-floor mounted

Bogie-mounted brake system has superior reliability with fewer brake rigging components. All new coaches are being fitted with this design of air brake system and about 1000 coaches are being retrofitted per annum during POH (Periodic Overhaul).

50.1.17 Use of disc brakes; 30% reduction in emergency braking distance

Disc brake system with microprocessor-controlled wheel slip control system provides faster braking and increases high-speed

capability of the coaches. All new coaches are being manufactured with this brake system. With sufficient experience, the work of retrofitment of coaches with disc brakes will be considered.

50.1.18 Use of Composition Brake Blocks

All broad-gauge coaches, except high-speed coaches, have been switched over to composition brake blocks. Suitable alternatives are also being developed to replace the
Cast Iron brake blocks used on high-speed trains. The composite brake blocks have superior braking behaviour with a more uniform friction coefficient.

50.1.19 Improved crash worthiness of interior of coaches

51 modifications to the coach interior have been adopted to minimize the chances of injury to passengers from sharp edges, corners, or protrusions within the coach. Most of these modifications have already been adopted for new coaches. Workshops will also adopt these modifications during the periodic overhaul of coaches.

50.1.20 Improving the external crash worthiness of coaches.

M/s RITES (Rail India Technical & Economic Services Ltd.) have been awarded a contract to carry out the study and develop crash worthy design for passenger coaches through an international expert of repute. RITES will also help in developing in-house expertise at RDSO (Research, Designs and Standards Organization) as a part of the project. Redesigned coaches will have bodies, which will absorb most of the impact in case of an accident in non-passenger carrying areas, thereby saving precious human life even in the worst disasters.

50.1.21 Introduction of tight lock couplers and anti-climbing features

Tight lock center buffer type couplers have been adopted for the new technology based on LHB (Linke Hofmann Busch) type of coaches. Development of center buffer coupler type design for the existing ICF (Integral Coach Factory) coaches has also been

completed and testing of the shell of the prototype coach has already been completed. These couplers do not permit the coaches to separate in case of accidents and prevent one coach from climbing o-n another by holding them firmly in vertical plane. This anti-climbing property of the couplers minimizes the chances of a pile up in case of accidents and enhances safety of passengers.

The existing couplers permit disengagement of coupling and consequently climbing of one coach over other, in case of an accident. The adoption of the Tight lock couplers has, therefore, assumed extreme urgency. In view of the safety of passengers ensured by these couplers vis-à-vis the present screw coupling, both the coach manufacturing units have been directed to develop designs of the coaches to allow fitment of the tight lock couplers. This will require major design changes and both ICF and RCF are gearing up to ensure fitment.

50.1.22 Hot box detectors on existing wagon fleet are proposed to be provided.

Derailments will be reduced by **60%** by following measures:

1. Replacement of overaged tracks, bridges, S&T gears and rolling stock under SRSF and current arisings under DRF
2. Elimination of four-wheeler tank wagons, which are accident-prone
3. Reduction of thermit welded joints which are weak areas
4. Improved training facilities enhancement of human skills
5. Rail/Weld failures cannot be totally eliminated due to inherent weak nature of thermit weld and inherent infirmities in rail, although measures like "Continuous Track Circuiting" and use of `State-of-the-art SPURT Cars' for rail flaw detection are going to be adopted.

DERAILMENT ON CURVE

51

A curve is provided to bypass obstacles, to have longer and easier gradients or to route the line through obligatory or desirable locations. The maximum degree of a curve depends on various factors such as gauge, wheelbase of the vehicle, maximum permissible superelevation, and such allied factors. The maximum degree of a curve permitted on Indian Railways in case of BG, MG and NG on plain track is 10°, 16º, and 40°, respectively, and maximum 8°, 15°, and 17° respectively on turnout.

Safe speed on curves for all practical purposes means a speed which is safe from the danger of overturning and derailment. The maximum value of superelevation has been laid down based on experiments carried out in Europe on standard gauge for overturning velocity and on considerations of track maintenance standards.

The maximum value of superelevation is approximately 1/10th to 1/12th of gauge. As curves are subjected to more stresses than straight tracks, they tend to go out of alignment and form elbows at joints on fish plated track. Curves out of alignment cause severe

lurching because of change in centrifugal forces and must be brought back to alignment. This is done by slewing manually or mechanically.

51.1 Derailment on Curves

The rolling stock has higher chances of derailing on a curved track since the flange is almost continuously pressing against the running edge of outer rail in addition to the normal tread contact with the rail. As per analysis made on mid-section derailments on Central Railway reveals that the number of derailments is much higher on curved alignments then compared to straight track. It is therefore essential to pay utmost attention to proper maintenance of curved tracks.

51.2 Adverse Factors on a Curve

The curved track has higher chances of developing following adverse conditions:

1. Excessive angular wear on the outer rail
2. Excessive flattening of head on the inner rail
3. Fracture and failure of rails.
4. Gauge widening.
5. Track distortion.

Vehicles entering a curve at speeds higher than maximum permissible speed may cause distortion of the track or lead to mounting of wheel over the outer rail. Wheel mounting on the inner rail is also possible in case of sudden braking causing bunching of vehicles.

The outer rails on curves also suffer higher angular wear which may present a convenient inclined plane for the wheel to slide up.

Similarly, a wagon stopping on a sharp curve with high superelevation causes the outer wheels to get offloaded. When the wagon starts moving even at crawling speed, the guiding force acting on the outer leading wheel is significantly more as higher force is needed to turn the vehicle and follow the curved path. The

Y/Q ratio for the outer leading wheel thus becomes higher and the wheel may mount the rail if it exceeds the critical limit.

51.3 Cant or Superelevation

When a vehicle moves on a circular curve, it is subjected to a constant radial acceleration which produces a centrifugal force acting away from the centre in a radial direction. The value of this centrifugal force is given by the formula:

$$F = WV^2/ GR$$

Where:

F - Centrifugal force in tons
W - Weight of the vehicle in tons.
V- Speed in feet/sec
G - Acceleration due to gravity in feet / sec2
R - Radius of the curve in feet

To counter this centrifugal force, outer rail on the curves is kept little higher than the inner rail. The inner rail is normally maintained at its original level and considered as a reference rail. Raising of outer rail on curve to a specified height in this fashion is known as Cantor Superelevation. The state of equilibrium reaches when both the wheels bear equally on the rails. In this state of equilibrium, the level difference between outer and inner rail on the curve is called equilibrium super elevation. The equilibrium super elevation is given by:

$$e = GV^2 / gR$$

In metric system: $e = GV^2 /127R$

where:

e- Equilibrium super elevation
G- Gauge + Width of rail head in mm
V- Velocity
R- Radius of the curve

Note: The cant for each curve is normally indicated on the web of inside face of inner rail to the nearest 5mm.

Reasons for providing Superelevation.

1. To have a better distribution of load on two rails.
2. To reduce wear and tear of rails and rolling stock.
3. To neutralise the effect of lateral forces.
4. To provide comfort to passengers.

Degree of Curve V/S Radius of Curve

The degree of a curve (D) is the angle subtended by the curve at its centre by a chord of 30.5 metres. The relationship between radius and degree of a curve is given by the equation:

$$D = 1750/R$$

Hence for :1 deg. curve, R = 1750 meters2 deg. curve, R = 875-meter 4 deg. curve, R = 438 meter and so on.

Effect of excessive or inadequate Cant

The maximum value of superelevation is approximately 1/10 to 1/12 of gauge. The values of maximum superelevation prescribed on Indian Railways are given below in Table 5.1. (Para. 406 of IRPWM)

Table 5.1

Gauge	Track Group	Max. cant in mm
B.G.	A, B, C ---	165
	D & E ---	140
M.G.	All Groups	90 (100 with special permission of C.E.)
N.G. (762mm)	All	65 (75 with special permission of C.E.)

It is very important to provide super elevation suiting the degree of curve. If super elevation is less, there is a possibility of:

1. Outer rail getting worn out as it will have to bear more strain due to tendency of wheels to move away from the centre of the curve under the influence of centrifugal forces.
2. The fast-moving trains will have more lateral oscillations causing discomfort to travelling public.

On the other hand, excessive super-elevation has these effects:

1. Inner rail will have to bear maximum strain and there is every possibility of this rail giving way due to excessive strain and cause gauge widening.
2. Due to excessive super elevation, there is every possibility of slow-moving goods trains getting derailed.

Thus, keeping in view, the maximum permissible speed of the section and the volume of goods traffic moving over the section, a compromise must be made which permits fast moving trains to traverse safely and without discomfort to passengers while permitting slow moving trains without risk of derailments. This is the purpose for which cant deficiency is provided.

51.4 Cant Deficiency

Cant deficiency is the difference between equilibrium cant necessary for maximum permissible speed on a curve and the actual cant provided. The cant deficiency is limited due to following two considerations:

1. Higher cant deficiency causes discomfort to passengers.
2. Higher cant deficiency leads to higher unbalanced centrifugal force which in turn requires stronger track and fastening to withstand higher lateral forces.

For Indian railway B.G., Maximum value of cant deficiency

(i)For nominated rolling stock = 100mm/150mm.

Note (1): For rolling stocks permitted with 150 mm cant deficiency, cant deficiency is to be limited to 115mm on track with turnout with crossing on outer rail and on track with expansion device.

Note (2): Nominated stock shall be permitted cant deficiency of 100 mm/115 mm /150 mm after found satisfactory during oscillation trial and specified as such in Speed Certificate issued by RDSO.

(b) For other rolling stocks not covered above - 75 mm.

(CS 10 to Para 404(2) of IRPWM-2020)

The equilibrium and proposed cants to be provided on curves for various maximum permissible speeds are given below in Table 5.2. as per IRPWM Para. 406 (3).

Table 5.2

Degree of curve	Radius in meters	Max permissible speed	Equilibrium cant in mm	Proposed cant
1	1746	160	200	100
1.25	1395	160	250	150
1.5	1164	155	285	185
2	873	135	285	185
3	585	100	285	185
4	436	95	285	185
5	389	85	285	185
6	291	80	185	185

Derailments have been noticed in which a vehicle just started moving after stopping on a sharp curve with high super elevation. The reason is that the outer wheels get off-loaded when a vehicle stands on high cant. Therefore, during maintenance of curves, following precautions should be taken:

1. Cross levels and gauge must be maintained within specified permissible limits.
2. The cant gradient on transition should be as flat as possible to get greater tolerance for irregularities in the twist parameter.
3. Lubricate the gauge face of rail to reduce wear.

51.5 Transition Curve

As soon as a vehicle enters a circular curve from straight alignment, it is subjected to centrifugal forces. This increases lateral flange force and affects the track alignment. In order to limit these and provide smooth entry to the curve, transition curves are provided on either side of a circular curve (see Fig 51.1). The change of degree is uniform throughout the length of transition curve. Thus, the curvature increases gradually from zero at the straight end and becomes equal to the curvature of circular portion at the other end. The superelevation increases at the same rate as curvature so that full cant is achieved simultaneously with the beginning of circular arc. This gives gradual and slow building of centrifugal force as

well as superelevation. The transitions are thus critical portions to be examined for the correctness during derailments on curves. The transition curves are usually laid in the shape of a cubic parabola.

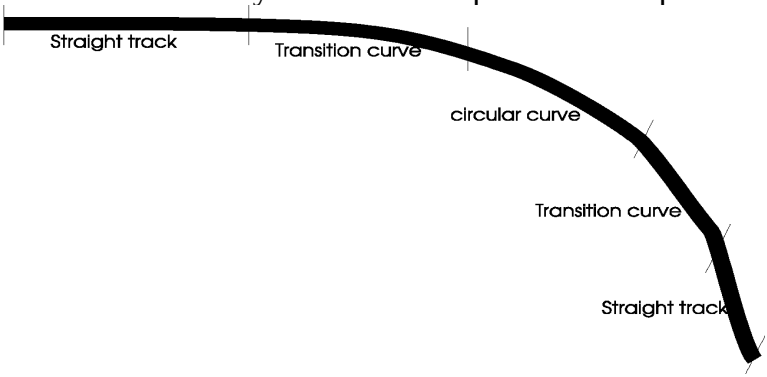


Fig. 51.1 Transition Curve

Length of Transition Curve

The length of transition portion depends upon the degree of curve, max. permissible speed, amount of superelevation and the rate at which the cant is run off. The desirable length of transition curve in meters is maximum of following three values.

(1) 0.0056 Ca*Vm
(2) 0.0056 Cd * Vm
(3) 0.72 Ca

Where C_a is actual cant provided in mm, Cd is cant deficiency in mm and V_m is maximum permissible speed in kmph. In exceptional cases where enough space is not available, length should be maximum of these values: 5/6 of (1) & (2) or 1/2 of (3) above. (CS No 10 dated 07.11.22 to para 405 of IRPWM 2020)

51.6 Versine

Versine is the perpendicular distance measured in mm from the centre of the chord line to the arc between two marked stations (Fig 51.2).

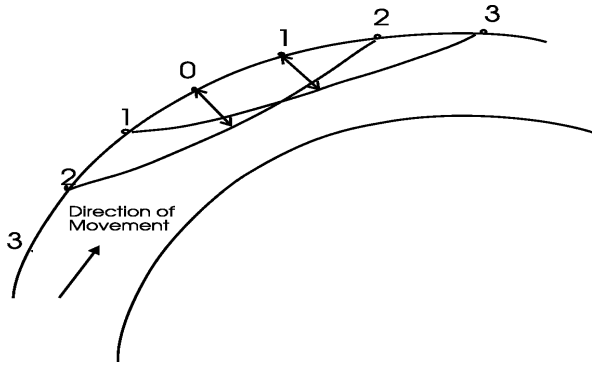


Fig. 51.2 Measurement of Versine

Objective of measuring versine

The main objective in measurement of versine is to check the degree and radius of curved track. The Track Recording cars are used for periodical measurements. On straight track, versine measurement is done on a 7.2 metre chord in order to check lateral alignments.

How to Measure Versine

The versines on curves are measured using 20 metres overlapping chords with stations at 10 metres intervals. For checking the radii of turnout and turn-in curves, versines to be measured every 3 metres with overlapping chord of 6 meters [IRPWM-2020 Para. 401(4)]. A fishing/nylon wire is stretched between two ends of the chord at the inner edge of the outer rail. Care should be taken while stretching the chord or wire to ensure that it is applied at the running side of the rail at gauge point. The perpendicular distance between the rail and the chord/wire at the middle point of the chord is measured in mm which gives the value of versine for the chord.

To determine the Degree of Curve with the help of Versine

On a curved track, the versine in c.m. on a chord of 11.8 meters directly gives the degree of curve. Thus, versine measured in c.m. on a 6-meter chord gives approx. 1/4 of the degree of curve and versine in cm. on a 3-meter chord gives approx. 1/16 of the degree of curve. Thus, these values should be multiplied by 4 and 16 respectively to arrive at the exact degree of curve.

DERAILMENT ON POINTS AND CROSSINGS

52

One of the most critical zones of failure in the railway track is points and crossings which form the weakest parts of the track. But these are to be provided on stretches of track to divert the trains in different directions. The failure to ensure proper upkeep of points and crossings may lead to accidents. The following precautions must be taken for proper maintenance of points and crossings:

1. Proper drainage should be ensured.
2. Spherical washers of specified size should be used on correct side.
3. Clearance at the toe, heel, check rails and wings must be within tolerance as prescribed in schedule of dimensions.
4. Loose or defective packing should not be permitted anywhere on the turnout
5. Chairs and fastenings should be properly secured.
6. Gauge should be as per Permanent Way Manual.
7. Creep posts are to be erected at all the interlocked facing points opposite the toe of the switch and the creep should not be allowed at this location.

8. Tongue rail classified as worn out or damaged is required to be replaced without delay if it is
   a) chipped or cracked over a length of 20 cm from its toe, badly twisted or bent and does not house properly against
   b) stock rail causing a gap of over 5 mm at the toe,
   c) knife edged, and wear on tongue rail exceeds vertical
   d) wear of 6 mm and lateral wear of 8 mm for 52 kg and 90R, and 5 mm for 75R and 60R rails measured at 13 mm to 15 mm below top of stock rail.
   e) Burred stock rail likely to obstruct the movement of lock- bar should be replaced.
9. Proper gauge and level should be ensured throughout the crossing assembly to avoid damage and wear to crossings and check rails. Gauge tie plates should be provided on wooden sleepers for maintaining gauge at the nose of the crossing and toe of the switch. The vertical wear on wings or nose of crossing should not exceed 10 mm.
10. Lead and turn-incurves should be properly maintained and stations at 1.5m intervals are to be marked, versine's checked and maintained to correct radius of curvatures. Inspection should be conducted as per schedule laid down and the defects rectified in time.

The defects detected during track testing by Track Recording Cars. Oscillograph Cars and at the time of footplate and other inspections should be attended to promptly.

At railway stations and yards, a number of tracks are provided for receipt and dispatch of trains. When trains are received or dispatched, they have to cross other tracks and come to the desired line. In this process, they pass over a number of points and crossings.

A set of points and crossing consists of the following main items:

1. Switch assembly.
2. Crossing assembly
3. Lead rail joining switch and crossing assembly.

1. Switch Assembly

A switch assembly consists of two tongue and two stock rails. The stock rail is actually part of main rail while the tongue rail has a tapered edge which sets against the stock rail so as to set the route for the reception and despatch of train in the desired direction. The inner or tapered edge of tongue rail is known as T**oe** while the thicker edge is known as H**eel** of the tongue rail. The toe of the tongue rail is tapered such that it doesn't cause any obstruction to the movement of wheels.

If length of tongue rail is less, the wheel weight on heel causes the toe to jump upwards. This jumping of the toe results in a gap between tongue and stock rail which may cause derailment. Therefore, to stop jumping or rising of toe of the tongue rail, a **Stretcher Bar** is provided. This stretcher bar presses the bottom of stock rail and arrests the jumping of tongue rail. At these points, it is essential to provide sufficient room for the passage of wheel flange. This passage is made available with the help of **Crossing assembly** which guides the movement of wheels.

2. Crossing Assembly

A crossing assembly is prepared by joining the following rails (see fig 6.1):

i. V Rail
ii. Two wing rails (left and right)
iii. Two check rails

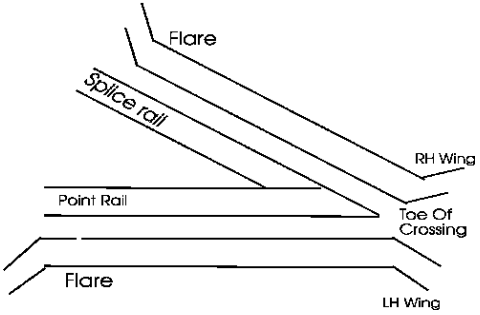


Fig. 6.1 Crossing Assembly

52.1 Important Aspects in Points And crossing Maintenance.

Some important provisions of IRPWM Para. 237 are:

1. There should be no junction fish plates at the stock rail joints (SRJ) or at the heel of crossing (HOC). At least one rail on either of the points and crossing should be of the same section as the Point and Crossing assembly rail section.
2. At all places in a point and crossing, the gauge shall be uniform except at point just ahead of the toe of the switch where it will be slightly slack. (enough to house the tip of the tongue rail)
3. Badly worn and damaged stock and tongue rails should be replaced by serviceable ones.

Tongue rail may be classified as worn/damaged when (Para 429(2)(c) IRPWM,2020).

(i) It is chipped/cracked over a length of 200 mm within 1000 mm from its toe chipped length will be the portion where tongue rail has worn out for a depth of more than 10 mm over a continuous length of 10 mm.

(ii) It is badly twisted or bent and does not house properly against the stock rail causing a gap of more than 5 mm at the toe (the limit prescribed in the I.R. Signal Engineering Manual.

(iii) wear on stock rail shall not exceed the limits laid down in IRPWM Para 702 (1)(b).

The tongue rail can however be reused after reconditioning of the broken tip, by welding and rectification of the bend/twist by Jim crowing. It is also a good practice to replace a tongue rail having a knife edge tip as it is liable to break at that location.

Slight wide gauge at the toe of switch may be adjusted by providing suitable steel packing between the web of the stock rail and the lug of the slide chair.

5. If wing rails or check rails are badly worn laterally, it could be due to wide gauge at the crossing. Gauge can be maintained properly by the provision of a gauge tie plate under the nose of the crossing, on lay out of wooden sleepers.
6. In obtuse crossings, the distance between the throat and the nose must be maintained correctly.
7. In a diamond crossing, obtuse crossing should be laid square to each other with respect to centre line of the acute crossing.
8. Maximum vertical wear on wing rail or nose of crossing shall be 10 mm.
9. The curve lead should be laid by offsets from the gauge face of the straight track. Stations at 1.5-meter intervals should be marked and the versine

checked and track attended as necessary.

10. The versine's of turn-in curves on loops should be recorded at stations at 1.5 m intervals during inspection of points and crossings to check the sharpness of the curve and rectified as necessary. The turn-in curve should be checked for the condition of sleepers and fastenings.
11. There should be no change of cant between points 20 meters on B.G. and 15 meters on M.G. outside the toe of switch and heel of crossing respectively, except in cases where points and crossings have to be taken off from the transition portion of a curve. In exceptional cases however specific relaxation may be given by the Chief - Engineer.

Any work involving the insertion or removal of points and crossings on a running line must be carried out only after obtaining the sanction of the - Commissioner of Railway Safety.

Senior Section Engineer (Permanent Way) is responsible for the correct gauging of the switches and SI will be responsible for the correct fixing of the interlocking apparatus.

52.2 Derailments on Points and Crossings

1. The derailments on points and crossings occur at switches (points) which either gape initially or open slightly under the passing wheels. Gaping points are caused by a bent tongue rail and by wrongly adjusted heel bolts. Any obstruction like a piece of stone will also result in the switches not setting home. Although, on carefully maintained interlocked points, an obstruction is detected and proper closing of points is ensured, loss of lever movement in the interlocking equipment will permit pulling of lever even in the presence of such obstruction. A frequent cause of defective points is their being forced open in the trailing direction during shunting operation. If the defect is not set right, the switches will not close effectively and there will be a danger to vehicles passing in the facing direction. A bent rear point rod is a usual indication of points trailed through when not set.

2. Very loose heel bolts and badly packed sleepers under the heel chairs will permit the toe of switches to lift under passing wheels. Where the cause for derailment is under dispute, demonstration with loaded wagon will expose this defect. (Fig. 6.2)

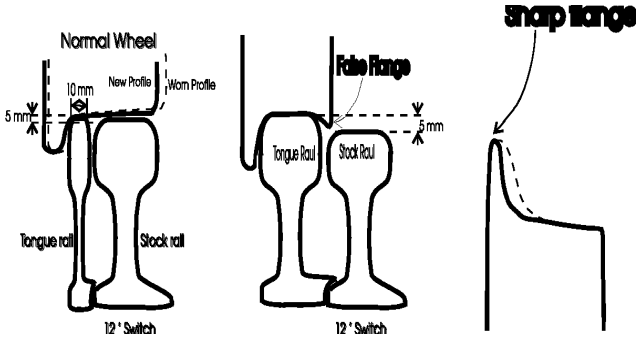


Fig. 6.2 Derailments on Switch Assembly

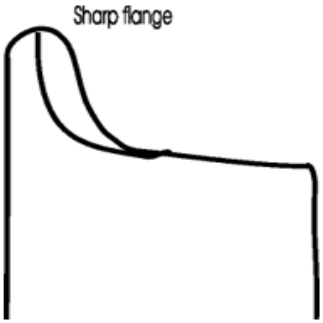


Fig. 6.3 Sharp Flange

3. Excessive wear in switches may sometimes induce derailment due to splitting of the switch longitudinally. When the stock is also worn, the tyres of vehicle will bear on the switch head earlier then intended by design and will cause a certain amount of crushing of the metal.

4. In the design of the 100 lbs 12 feet switch, the head of the switch is 5 mm lower than the stock rail at 450 mm from the toe. Its thickness at this section is 10 mm.

Therefore, if the stock rail is worn out by 5 mm and the side wear of the switch is permitted to proceed too far, the crushing of the switch head and resulting flow of metal will prevent the proper setting of the switch.

5. In many cases where derailment occurs at facing points, the flange profile of the wheel of the derailed vehicle should be examined for sharpness (Fig 6.3). Grease marks on the vertical side of the flange will usually locate the defective wheel. Figure shows when the flange should be considered sharp.

6. Unmanned and unlocked hand points are liable to open slightly due to the play in the pins connecting the pullover rod to the lever box. It is the

responsibility of the traffic department to see that all facing movements over hand points are manned by a pointsman who should ensure that the points are held down or locked.

7. Figure 6.4 shows the limiting position of a broad-gauge axle with new wheels at the nose of a crossing. It will be seen from the dimensions given that the wheel flange will hit the edge of the nose normally at the tip of the flange if the gauge is tight by 10 mm or the clearance of the check rail is 47+10 = 57mm. In this case, the wheel will certainly mount the nose.

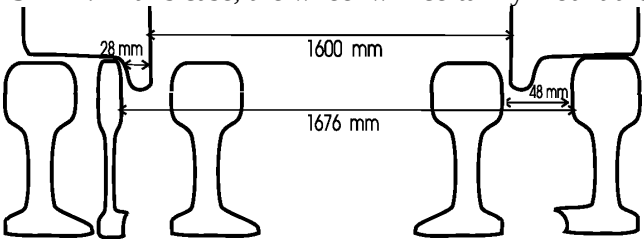


Fig. 6.4 Critical limits of Check Rail Clearance and Tight Gauge

Hence the maintenance of the correct check block clearance and gauge at the nose of crossing is of great importance to permit the maintenance of the correct check block clearance, check rail blocks for IRS crossings are provided with three mm packing pieces which may be moved when the check rail gets worn out.

8. It is sometimes not realized that a high wing rail of a crossing may cause a derailment in the trailing direction. In facilitating the passage of a wheel in the trailing direction, the function of the wing rail is to progressively relieve the load on the "Vee" of the crossing (Fig. 6.5)

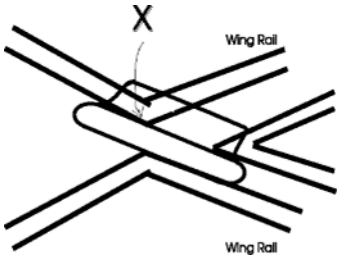


Fig. 6.5

52.3 High Wing Rail at the Crossing

This gradual transfer of the load starts at a point "X", provided the wing rail permits the wheel tread to bear on it. If the crossing is

worn and the wing rail is new, the tyre may get wedged between the two wing rails and force them apart as the axle moves forward. Careless renewals of wing rails without due consideration to the amount of wear on the crossings should therefore be avoided.

- Loose crossing bolts or incorrect assembly of crossings permitting relative vertical movement between the "VEE" and the wing rail may also increase proneness to derailment.

Revised Norms of Track Maintenance and Criteria of Turnout
(Railway Board's Letter No. 2021/CE-II/TSC/10th Extraordinary dated 16.07.2021)

Revised norms of para 405 maintenance and criteria of turnout duly approved by Board [Member Infrastructure (MI)] is given below -

Service life of **Turnout (Para 717(1)(b) of IRPWM-2020)**	**Switches:** 52 Kg. - 250 GMT or condition basis as decided by CTE. 60 Kg - 300 GMT or condition basis as decided by CTE. **CMS Crossing:** i. 52 Kg & 60 Kg. - 350 GMT with replacement of fittings on condition basis, in case of in-situ reconditioning using Robotic welding machine. ii. 52 Kg. & 60 Kg. — 300 GMT, in case of reconditioning using H3B/H3C IRS electrodes. **Thick web Switches:** 52 Kg & 60 Kg. - 800 GMT or on condition basis as decided by CTE.

52.4 Joint Inspection of Point and Crossing

1. Joint inspection by SSE / P. Way and SSE/Signal

- All interlocked points are to be inspected jointly once a quarter.
- Mainly switch portion is to be inspected.
- Results and compliance to be reviewed at Division level.

2. Maintenance requirements from signalling consideration

- Proper housing of tongue rail up to JOH.
- The switch should not be out of the square (not more than 15 mm.).
- Min. gap between stretcher bar and bottom of the rail to be ensured.

3. **Badly worn and damaged tongue rails should be replaced.**

Maintenance of Switches (Para No 237 of page No 39 of IRPWM of 1986)

The condition of Stock rail and Tongue rails should be carefully examined. Badly worn- out and damaged stock and Tongue rail should be replaced by serviceable ones. A Tongue rail may be classified as worn out/damaged when -

1. It is chipped/ cracked over a small length aggregating to 200 mm within the distance of 1000 mm from its toe.
2. Chipped length will be portioned when tongue rail has worn-out for a depth of more than 10 mm over a continuous length of 10 mm.
3. If it is badly twisted or bent and does not house properly against the stock rail causing a gap of 5 mm or more at the toe, the limit described in the IRPWM is to be checked. The Tongue rail can however be reused after reconditioning of the broken/worn/damaged tip by welding.
4. Tongue rail should be replaced/reconditioned when vertical/lateral wear exceeds the values laid down. The wear shall also be measured at a point with 13 mm head width and the point where Tongue & Stock rail are at the same level.

   a. **Tongue rails should be replaced /reconditioned when-**
      - **Vertical wear** > 8 mm. (for 60 KG.)
        > 5 mm. (for 52 KG. & 90R)
      - **Lateral wear** > 8 mm. (for 60 KG.)
        > 6 mm. (for 52 KG. & 90R)

   b. **Wear on stock rails should not exceed the following limits.**
      - **Vertical wear** > 13 mm. (for 60 KG.)
        > 8 mm. (for 52 KG.)
        > 5 mm. (for 90R)
      - **Lateral wear**
        For Straight
        > 6 mm. (for Group A & B Routes)
        > 8 mm. (for Group C & D Routes)
        For Curve
        > 8 mm. (for Group A & B Routes)
        > 10 mm. (for Group C & D Routes)

52.5 JOINT INSPECTION OF POINTS
Thick Web Switch (TWS) BY SSE/JE SIGNAL AND SSE/JE P-WAY

Station	—	**Angle of Crossing**	
Point No.		**1:12/1:16**	
Installation date of T/out		**Switch on curve/straight**	
Section of Rail (60KG/52KG/90R) Type of sleeper (PRC/Steel /Wooden)	—	**Roding /Motor operated**	—

S. N	Inspection Details	Observation Condition
A.	**P. Way items description**	
1	**Condition of Tongue/Switch rail LH/RH**	Good/Satisfactory/Poor
a	Whether Tongue rail resting on slide chairs, when set with stock rail.	Yes/No.
b	Housing of LH/RH Switch rail with Stock rail (Mini for 1:8.5=4 sleepers & 1:12 = 8 sleepers).	No. of sleepers.
c	Whether switch rails are in square.	Yes/No.
2	**Condition of Stock rail LH/RH.**	
a	Whether any bur on Stock /Tongue rail obstructing Jiousing/movement of switch	Yes/No.
b	Condition of LH/RH Stock rail (Lateral/Vertical wear).	Good/Satisfactory/Poor
3	**Rendition of packing of point layout**	Good/Satisfactory/Poor
4	**Opening of switches at toe (160+/-5 mm)**	Actual in mm
5	**Condition of fitting of switches.**	
a	Gauge tie plate.	OK/Worn out; Nut bolts
b	Slide chairs.	OK/Worn out; Screw spikes loose/missing.
c	Stretcher bars (if provided).	OK/Worn out; Nut bolts loose/missing/ WSB nut bolt
d	Nuts & bolts including plate screws on machine sleepers.	OK/Worn out; Nut bolts loose/missing/non-standard.
e	Stock/tongue rail Flange holes condition.	Tight/Fit/Loose
f	Condition of Liners.	No. Missing /No. broken
6	**Rendition of Cotter wedges of chair**	Tight/loose/missing
7	**Gauge and Cross level.**	Actual in mm
	Condition of sleepers.	

a	2 Machine sleepers.	Good/Satisfactory/Poor
b	2 SRJ sleepers.	Good/Satisfactory/Poor
	SSD sleeper.	Good/Satisfactory/Poor
	Signature of SSE/JE(Sig) with date	
	Signature of SSE/JE(P-Way) with date	
8	**Condition of Ballast & Drainage**	
a	Ballast clearance below bottom of rail (Minimum 50 mm).	Yes/No
b	Drainage condition in Switch portion.	Good/Satisfactory/Poor
9	**Lubrication of slide chairs (Lubrication to be done 4th sleeper onwards by Engg.)**	Yes/No
10	**Switch setting device (SSD)**	Actual in mm
a	Whether distance between gauge faces of stock rail at JOH is 1745 +/-2mm for 60Kg. and 1740+/-2mm for 52 Kg. switch?	
b	Whether open side clearance at JOH is 57mm or more?	Actual in mm
c	Whether greasing and lubrication of moving parts inside of cover of SSD is	Yes/No
d	Insulation condition	Good/Satisfactory/Poor
e	Spring Length in Normal /Reverse.	Actual in mm
f	Squareness of arms, condition of base plate. Gap between bolt & stopper of SSD.	Both arms shall be in straight alignment.
g	How Many times SSD adjusted in last quarter.	No. of times and date of replacement of SSD, if any
11	**Other Defects/Comments require**	
B-	**S&T items description.**	
1	**Condition of point machine and ground connection.**	Yes/No
a	Whether point machine free from any obstruction (dust/rust/ corrosion or any foreign material)	Yes/No.
b	Point machines all nut bolts are tight.	Yes/No.
c	Play in ground connection pins.	Yes/No.
d	Squareness of ground connections.	Yes/No.
e	**Rodding:** Driving rods having sufficient clearance from bottom of rail or not.	Yes/No.
f	Whether pin tight fit in F-bracket and ground connection without hammering.	Yes/No.

g	Condition of ground connection	Good/ replacement required.
h	Fitting of clamp assembly.	Nut bolts loose/missing.
12	**Operation of Point machine.**	
a	Whether any unusual noise observed while operating.	Yes/No.
b	Obstruction test by 5mm test piece	
i)	Without test piece	Point should set and lock
ii)	With test piece.	Point should not set and lock.
3	Lubrication of slide chairs (Lubrication to be done up to 3 sleepers by S&T)	Yes/No.
4	Other Defects/Comments require attention	
	Signature of SSE/JE (Sig) with date	
	Signature of SSE/JE (P. Way) with date	

52.6 TWS-Thick Web Switch

JOINT INSPECTION OF POINTS

(OTHER THAN Thick Web Switch (TWS))

BY SSE/JE SIGNALAND SSE/JE P-WAY

Station		Angle of Crossing	
Point No.		1:8:5/1:12/1:16	
Installation date of T/out		Switch On	
Section of Rail (60 KG/52 KG/ 90 R)		Roding /Motor	
Type of Sleeper (PRC/Steel/Wooden)			

S.N	Inspection Details	Observation Condition/ Parameters
A-	**P-Way items description**	
1.	**Condition of Tongue/Switch rail LH/RH**	Good/satisfactory/ Poor
a.	Whether chipped or cracked	Yes/No
b.	Knife edged	Yes/No
c.	Tongue rail floating (LH/RH)	Yes/No
d.	Housing of LH/RH Switch rail with stock rail (minimum for 1:8.5 = 3 sleepers and 1:12 = 5 sleepers)	No. of sleepers
e.	Whether any burr on Stock/Tongue rail obstructing housing/movement of switch (LH/RH)	Yes/No
2.	**Condition of Stock rail LH/RH**	
a	Whether any burr on stock /Tongue obstructing housing/movement of switch (LH/RH)	Yes/No

b	Condition of LH/RH Stock rail (Lateral/Vertical	Good/satisfactory/ Poor
3.	**Condition of packing of point layout**	Good/satisfactory/ Poor
4.	**Opening of switches at toe (95 mm to 115**	Actual in mm
5.	The clearance between leading stretcher bar & bottom of rail should be up to **3 mm** and not	Actual in mm
6.	**Condition of fittings of Switches**	
a	Gauge tie plate	OK/Worn out: Nut bolts loose/missing
b	Slide chairs	OK/Worn out; screw spike loose/missing/Slide chairs welding broken
c	Stretcher bars	OK/Worn out; Nut bolts loose/missing/WSB nut bolt touching sleeper
d	Nuts & bolts including plate screws on machine sleepers	OK/Worn out; Nut bolts loose/missing/Non-standard
e	Stud bolts	OK/Worn out: loose/missing
	Signature of SSE/JE(Sig) with date	
	Sign of SSE/JE(P-Way) with date	
7	**Gauge and Cross level**	Actual in mm
8	**Condition of sleepers**	
a	2 Machine sleepers	Good/satisfactory/ Poor
b	2 SRJ sleepers	Good/satisfactory/ Poor
9	**Condition of Ballast &Drainage**	
a	Ballast clearance below bottom of rail	Minimum 50 mm
b	Drainage condition in Switch portion	Good/satisfactory/ Poor
10	**Lubrication of slide chairs** (Lubrication to be done 4th sleeper onwards by Engg.)	Yes/No
11	**Other Defects/Comments require attention (if**	
B-	**S&T items description**	
1.	**Condition of Point Machine and Ground**	I
a	Whether point machine free from any obstruction (dust/rust/ corrosion or any foreign	Yes/No
	Point Machine's all nut bolts are tight	Yes/No
c	Play in ground connection pins	Yes/No
d	Squareness of ground connections	Yes/No
e	**Rodding**: Driving rods having sufficient	

2.	**Operation of Point Machine**	Yes/No
a	Whether any unusual noise observed while	
b	Obstruction test by 5mm test piece	1
i	Without test piece	Point should set and lock
ii	With test piece	Point should set and lock
3.	**Lubrication of slide chairs** (Lubrication to be done up to 3 sleepers by S&T)	Yes/No
4.	**Other Defects/Comments require attention if**	
	Signature of SSE/JE(Sig) with date	
	Signature of SSE/JE(P-Way) with date	

52.7 TWS: Thick Web Switch

JOINT INSPECTION OF POINT AND CROSSING

(By SSE/JE P-Way & SSE/JE Signal)

SN	**Crossing angle (1 in 8 1/2 , ' 1 in 12,1 in16)**	**Sleeper (steel/ wooden/PRC)**	**Straight/curve**			
			Limit	**Left**	**Right**	**Remark**
A-	**P-Way Items:**					
1	**Condition of Sleeper**					
	a. Two machine sleepers b. Two SRJ sleeper c. Two heal block sleeper		Good/Satisfactory/poor Good/Satisfactory/poor Good/Satisfactory/poor			
2	**Condition of Ballast**					
	a. Size b. Muck c. Clearance below rail		>50mm. W/O muck 50 mm.			
3	**Drainage**		Available or not			
4	**Switch Assembly**					
	a. condition of stock rail b. condition of tongue rail c. whether moment jerky d. Oblong hole for leading stretcher bar e. whether the creep anchor switch anchor and level		Good/Satisfactory/poor Good/Satisfactory/poor Yes /No Yes /No Available or not			
5	**Resting of tongue rail on**		All chair plates			

6	Do the Switch houses proper throughout? indicate no. of	Should be JOH but minimum 4 sleepers			
7	Clearance between open switch & stock rail Clearance between open switch & stock	(115 mm.) 160 mm			
8	**Condition of fitting switch**				
	a. Gauge tie plate b. Slide chairs c. Stretcher bar d. Heal block. e. Nut and bolts	Good/Satisfactory/poor Good/Satisfactory/poor Good/Satisfactory/poor Good/Satisfactory/poor Good/Satisfactory/poor			
9	- Gauge at the toe of switch in mm. and 450 mm. from toe towards SRJ - Cross level				
10	**Squareness at the toe of**	Less than 20 mm.			
11	**Packing under switch assembly**	There should not be vertical movement under the train			
12	**Switch setting device (SSD)** a. Pressure b. Lubrication c. Insulation	 Equal on both side Proper/Not Good/Poor			
13	Gap between stretcher-Bar and bottom flange	1.5 to 3 mm.			
B.	**S&T items**				
14.	Function of lock detection a.Without test piece b. With 5mm. test piece	Set and locked Cannot be locked			
15	Time taken in completing the operation in second. a. Without test piece b. With 5mm. test piece	Not more than 6 sec. 15 to 20 sec.			
16	Whether pin sung fit in D bracket and	Yes/No			
17	Squareness of lock with reference to split stretcher bar	Yes/No			

18	Operation of lock bar where provided. a. No. of clip available b. No. of stoppers available c. Below rail level in mm.	9 to 12 3 to 5 25 mm.			
19	Squareness of Ground connections	Yes/No			
20	Condition of lock and detection where provided	Good/satisfactory/Poor			
21	Condition of insulation where provided	Good/satisfactory/Poor			
22	Lubrication of point (chair plate, tongue rail stock rail)	Yes/No			
23	General defects if any				
	Sign. SSE/JE P. Way **Sign. SSE/JE Signal**				

DRAFT PROFORMA
JOINT INSPECTION OF TRACK CIRCUIT

S. N.	Description of items	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Remarks
1	Is Ballast touching the rail					
2	Is the track largely clear of all muck & fairly screened up to formation level to ensure drainage of the track					
3	Are the drains and cross drains clear of all obstruction with proper out fall to provide adequate draining arrangement in the yard					
4	Has any spike, bolt screw etc. in the rail sleeper fastening gone through the sleeper fully and touches formation or girders					
5	Is the insulation joint have proper gap and well packed					
7	Any other item relevant with the efficient functioning of track circuit					
	Signature of SSE/JE P. Way					
	Signature of SSE/JE Signal					

****

ACCIDENT ON LEVEL CROSSING

53

Level crossings are provided on the railway lines to pass the road traffic across the track. As the road traffic passes at the same level on that of the railway track, the crossing is termed as level crossing. Other type of crossings is Road Over Bridge (ROB) or Road Under Bridge (RUB), where the road traffic passes over or under the railway track

53.1 Classification of Level Crossings

1. The classification of level crossings should be settled in consultation with the Road authorities concerned keeping in view the class of the road, visibility conditions, the volume of the road traffic and the number of trains passing over the level crossing.
2. The classification of level crossings shall be as under-
   On the basis of class of road, visibility condition, volume of road traffic and number of trains (TVU Train Vehicle Unit=Number of Trains X Number of Road Vehicles crossing at the Level Crossing):

Special	For roads	TVUs > 50,000
'A' Class	For roads	TVUs > 30,000 but 50,000
'B' Class	For roads	TVUs > 20,000
'C' Class	For roads	All other L-xings for road not covered above.
'D' Class	For cattle crossings	

3. Level crossings over colliery, factory and other similar sidings where railway traffic is light may however be dealt with according to local conditions, subject to the approval of the Commissioner of Railway Safety concerned being obtained in each case to the measures adopted for the safe working of trains over the crossing.

Categories of roads:

Class I - National and State highways
Class II - Major and district roads.
Class III- Earth roads and cart tracks
Class IV- Cattle crossings.

53.2 Categories of Level Crossing Gates

Gates can be broadly divided into the following categories:

Non-Interlocked Gates, Interlocked Gates:

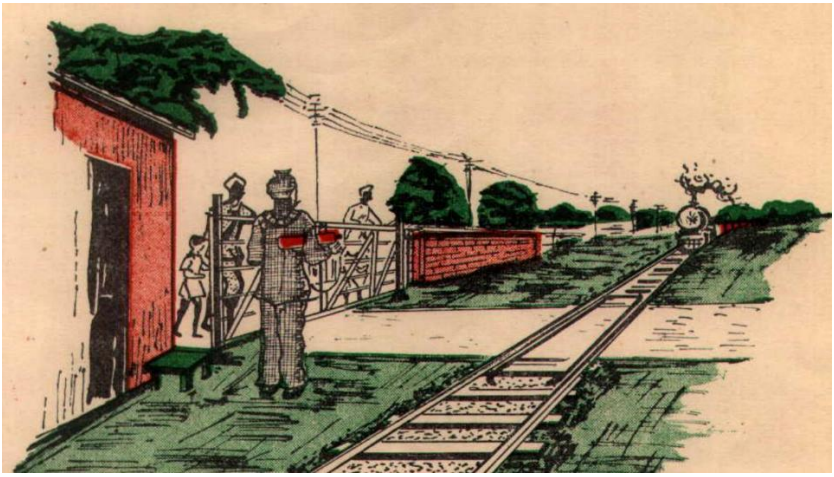
(i) Non-Interlocked Gates: These gates may be in the form of lifting barriers or swing/ movable gates of approved design. These gates are installed and maintained by the engineering department. Communication equipment of approved type is provided and maintained at such manned gates by S&T department.

(ii) Interlocked Gates: At interlocked gates, interlocking and communication equipment are provided and maintained by S&T department. These gates are interlocked and protected with signals.

53.3 Type of Gates

(i) **Engineering Gates**: Gates beyond the outermost stop signals are called Engineering gates and are manned and operated by Engineering staff. These gates may be non-interlocked or interlocked with signals.

(ii) **Traffic Gates**: Gates located between the outermost stop signals are called Traffic Gates and are manned and operated by Traffic staff. These gates shall be interlocked with station signals.



53.4 Normal Position of Gates

Normal position of Interlocked gates shall be as per para 904 and 907 of IRPWM.

Design at level crossings:

Width of level crossing gate is based on width of carriage way

Class I roads -9m or X + 2.5m, whichever is more
II - 7.5m or X + 2m, whichever is more
III - 5m or X + 1.25m, whichever is more
IV - not less than 2m.

1. In skew crossings, the width of the gate shall be correspondingly increased.
2. Metalling shall be provided for the same width as the gate and continued outside for a length of 7m, 5.5m, 3.78m and 2m in the case of class I, II, III and IV roads. The road surface which is to be maintained by the railway should be to the same standard as that outside the railway boundary. The width of formation between the gates and for a length of 30m outside the gates should be 5m more than the width of the gate in the case of class I and II roads, 2.5m more than the width of the gate in case of class III roads and not less than 3m in the case of class IV roads.
3. At the level crossing, leveling and gradient to be provided on the approach will be as under;
   - **a.** Level up to 15 m and 1:40 beyond, for class I roads.
   - **b.** Level up to 8 m and 1:30 beyond, for class II roads.
   - **c.** Level up to 8 m and 1:20 beyond, for class III roads
   - **d.** 1:15 for class IV roads

- **Lifting barriers** are provided. Gates close across the track in special crossings, but open outside in others. Minimum distance of gate post is 3m in BG and 2.5m in MG.
- **Warning bell** operated by approaching trains is provided where LC gate is outside station limits in Special class gates, and in A, B and C class gates in all suburban sections and non-suburban sections with automatic signaling.

53.5 Warning board



Warning for the Speed Breaker at Road is provided at the same distance at the requisite sight distance, which shall be for :

- **Roads in plain or rolling country**
  - 120 m for class I,
  - 60 m to 90m for class II and
  - 40 m for class III roads
- **Roads in hilly country**
  - 60m for class I,
  - 40 0r 50m for class II and
  - 30m for class III roads
- Provision of rumble strips on the approaches of level crossings as per standard design is the responsibility of road authorities. Till such time rumble strips are provided, speed breaker of the following design may be provided by the Railway, at a distance of 20m from gate post.

53.6 Guard Rails:

Guard rails are provided for both the rails and the space in between is filled in and surfaced to a condition similar to the roads. The width of these rails should be at least 2m more than the width of the gate.

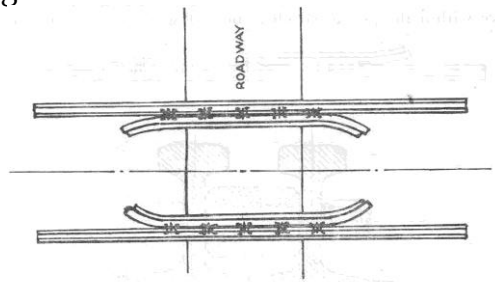


FIG. 94.1: Guard rails on level crossings

Lamps are provided at Special, A and B class gates and optionally at C class. These display red to road users when closed and white when gate or barrier is open. There is red indication to drivers of approaching trains only in special class gates. **Gate lodge** is provided at a minimum distance of 6m.

53.7 Telephone communication: If the gate is within station limits, telecommunication is provided with ASM's office in all except D class gates. If the gate is outside station limits, telecommunication is provided in all Special and A Class gates, and in B and C Class gates on the Rajdhani route, in suburban sections and on curves obstructing view.

53.8 Electrified Territory: Gateman has to follow and has the knowledge of Safety precautions to be followed by Staff and Level Crossing users in the electrified territory. Additionally, Jumpers and Gloves – 02 sets are to be provided for electrified territory.

53.9 Whistle Indicators: Marked W/L in bilingual shall be provided at 600m along the track from the level crossing to enjoin the drivers of approaching trains to give audible warning to road users, as under.

53.10 Working rules for gates: Instructions on whether gates are to be normally open to road or rail traffic shall be incorporated in working rules for gates. These instructions including the signal diagram shall be kept at the gate lodge and at the nearest station. These shall be in English and in the local language.

Gates and locking arrangements

1. **Gates:**
   The gates may be in the form of chains, lifting barriers or movable gates of approved design.
2. **Locking arrangements:**
   Lifting type barriers, swing gates or chains when closed against road traffic shall be securely locked. When the locking arrangement is of the hasp and staple type with padlocks, two spare chains with loops at both ends should be provided for locking the gates when the locking arrangement goes out of order. In the case of all manned level crossings, two long spare chains with loops at both the ends, should be kept as a reserve for use as an alternate to the barrier/gate, in case of damage to them. Two discs painted red with the words "stop" with arrangements for fixing them to the ground should also form part of the spare equipment. Separate rail posts should be erected near the gate, so that the chains can be fixed on them.
3. **Skew level crossings:**
   All roads should preferably cross the railway line at right angles. In special cases when modification is required to suit the road approaches the angle of crossing should not be less than 45 degree and at all level crossings, the gate posts shall be fixed square to the road.
4. **Gate Lamps and Blinders Fixture of gate lamps and indicators to road users. -**
   Gate lamp should be mounted preferably in rectangular sockets over gates so as to give correct indication to road users. The lamp should be lighted by the gateman at sunset and remain lighted till sunrise. All gate lamps should be provided blinders.
5. **Traffic and Engineering Gates Traffic Gates –**
   The manning and operation of the gates at level crossings located between the outermost stop signals shall be under the control of Operating Department. The level crossings and structures pertaining there to shall be maintained by the Engineering Department. When protected by signals the equipment shall be governed by the signals of the station/block hut and the

operation as per the station working rules. Engineering Gates - Level crossings beyond the outermost stop signals shall be under the control of the Permanent Way Inspectors (PWI) both as regards to their operation and maintenance.

6. Equipment at Level Crossings

The equipment for a manned level crossing shall be as follows; in addition to such others as may be prescribed by special instructions:

1. 2 hand signal lamps, tricolor provided with bright reflectors.
2. 1 hand signal flag, green.
3. 2 hand signal flags, red.
4. 1 staff suitable for exhibition of red lamp or red flag.
5. 2 long spare chains with "stop" marked disc attachment at the center to cover the full width of the gate, for use in case the gates/barriers are damaged.
6. 2 spare small chains and padlocks for locking gates, in case locking arrangements of gates become defective.
7. 12 detonators.
8. 1 tin case for flags.
9. 1 canister for muster sheet.
10. 1 tin case for detonators.
11. 1 can for oil.
12. 1 tommy bar.
13. 1 water pot or bucket.
14. 1 mortar pan.
15. 1 powrah.
16. 1 rammer.
17. 1 pickaxe.
18. 1 tool list (with columns drawn for checking of tools).
19. 1 book of safety rules in Hindi or regional language.
20. Duty roster.
21. Complaint book for road users.
22. Inspection register.
23. Level crossing working instructions (in local language) where applicable.
24. Two gate lamps.
25. Gatemen working on double line/multiple lines, ghats, suburban and automatic block territories shall be provided with three fusees. Gatemen working on single line sections shall be supplied with one fusee.
26. Diagram indicating the method of protection to be adopted, in case of obstruction in the level crossing.

27. Wall clocks in gate-lodges at all manned level crossings to enable the gateman to correctly record the time of exchange of private number, expected and actual time of passage of train, time for opening and closing of level crossing, etc., In addition to this sufficient stock of kerosene oil and match at the gate lodge. Quantity of detonator, signal flags/ lamps may increase suitably in the case of level crossings in multiple lines.

53.11 Maintenance and Inspection of Level Crossing

1. **Clearing of trees and bushes:**
   All trees, bushes or undergrowth that interfere or tend to interfere with the view from the Railway or roadway when approaching level crossings, should be cut down.
2. **Overhauling of level crossing:**
   The level crossings having sleeper other than concrete sleepers overhauled at least once a year or more frequently, as necessary. However, level crossings laid on concrete sleepers should be overhauled with each cycle of machine packing or more frequently as warranted by conditions and in no case, should be delayed by more than two years. During overhauling, the condition of sleepers and fastening, rails and fastening should be examined. The wooden sleepers be given a coat of coal tar.
3. **Maintenance of rail track:**
   In all cases, rail and fastening in contact with road shall be thoroughly cleaned with wire brush and a coat of coal tar applied. Flange way clearance, cross levels, gauge and alignment should be checked and correct as necessary, and the track packed thoroughly before reopening the level crossing for road traffic.
4. **Maintenance of check rails:**
   Check rails of level crossings are required to be removed for tamping, over hauling distressing, track renewal and should be re fixed as quickly as possible preferably before leaving site. In case check rails cannot be fixed a speed restriction of 30 kmph. will follow, a standing watch man shall be posted to ensure safety besides arrangement for diverting the passage of road traffic.
5. **Clearance of check rails at level crossings**

Item	BG	MG	NG
Minimum clearance of check rails at level crossing	51 mm	51 mm	51 mm
Maximum clearance of check rails at level crossing	57 mm	57 mm	57 mm
Minimum depth of space for wheel flange from	38 mm	35 mm	31 mm

the rail level			

6. Identification post for detonators:

Should be provided so as to indicate the location and number of detonators to be placed in case of obstruction to level crossings.

1. Indication post with one dot at 600 meters and another post with three dots at 1200 meters from rear of level crossings in the case of BG.
2. In case of MG and NG indication post will be at 400 and 800 meters.

7. Height gauges:

A height gauge should be erected suitably on either side of the level crossing so as to ensure that all vehicles can pass with adequate clearance. The height gauge shall be located at a minimum distance of 8 m from the gate post. The road surface up to height gauge is at same level as the road surface inside the gate post.

8. Duty huts:

Should be so located that a clear and unobstructed view is obtained of all approaching trains and road vehicles. The minimum distance of duty hut from the center line of nearest track edge of road metalling shall be 6 meters.

9. Checking of equipment and examination of gateman in rules:

The Assistant engineer should inspect every manned level crossing on the sub-division every six months and examine the gateman in rules during his inspection. Sectional PWI should inspect each level crossing once in a month. During their inspection, they shall:

a) Inspect the equipment with gateman.

b) Ensure that the gateman have a correct knowledge of rules. Besides this, they should endeavour to examine them periodically their trolley inspection particularly on appointment, promotion or transfer by conducting practical demonstration of protection of level crossings in case of emergency.

c) Ensure presence and alertness of gateman by carrying out surprise night inspection of level crossing once in a month.

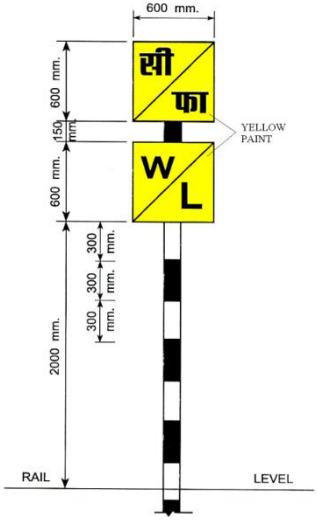
10. Visibility requirement for the unmanned level crossing

For new unmanned level crossings, the visibility requirements for road users along the track shall be 600M. with single- or double-line track. where this is not feasible, the distance may be reduced suitably with the approval of the Chief Engineer provided the maximum permissible speed is less than 100 kmph. and/or there is only a single track to be crossed on the level crossing. Visibility of trains for road users at unmanned level

crossing may be assessed, from a distance of 5 meters from the center of the track.

11. Census of Traffic at Level Crossings, Unmanned/Manned

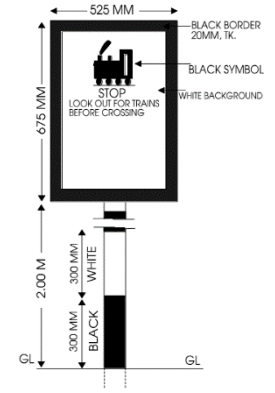
Periodical census of traffic at all level crossings, unmanned/manned should be taken at least once in five years to review the classification, in the case of manned level crossing and need for manning in the case of unmanned level crossing. However, for manned level crossings with traffic density 75000 TVUs or more but less than 1 lakh TVUs, the census should be taken up once in 2- 1/2 years to determine their eligibility and priority for replacement with ROBs/RUBs on cost sharing basis. The total train vehicle units/day (Train units ´ vehicle units) are worked out taking the census for a week. Train, motor vehicles, Bullock carts and Tonga's being considered as one unit. Cycle rickshaw/ Auto rickshaw being considered as half unit.



53.12 Level Crossing indicators

1. Whistle indicator –

a) At the approach to all unmanned 'C' class level crossings or manned level crossing where the view is not clear on either side for a distance of 600 meters and those which have normal position open to road traffic, without interlocking and protection by signals , under special conditions, bilingual whistle boards as per IRPWM annexure 9/5 should be erected at 600 meters along the track from the level crossing to enjoin the Drivers of the approaching trains to give audible warning of the approach of a train to the road users. The Drivers of the approaching train should whistle continuously from the time they pass whistle boards to the time they cross the level crossing.



b) The whistle indicator shall consist of two 600 mm. square boards painted yellow and bearing letter W/L in black. Its height shall be 2000 mm. from the rail level to the underside and the post on which it is fixed, painted with 300 mm. high bands in white and black. As far as

possible luminous paint or strip may be used.

Details of whistle board on the approach of a level crossing

2. 'Stop' Boards

a) On the road approaches to all the unmanned 'C' class level crossings 'Stop' Boards should be provided on the road at either sides of the level crossings at suitable points, within the railway boundary.

b) This shall consist of a board 675 mm X 525 mm on a suitable post bearing the indication of an engine and the legend "Stop, look out for trains before crossing" in English, Hindi and Regional language. The paint used shall preferably be of luminous variety. The distance of the "Stop" board from the track on the approaches of the unmanned level crossings shall be 5 meters from the center line of the nearest track, within the Railway boundary.

c) The vertical post shall be painted black and white, each strip to be 300 mm. in height starting with black paint at the bottom.

53.13 Speed breakers on the approaches of level crossing

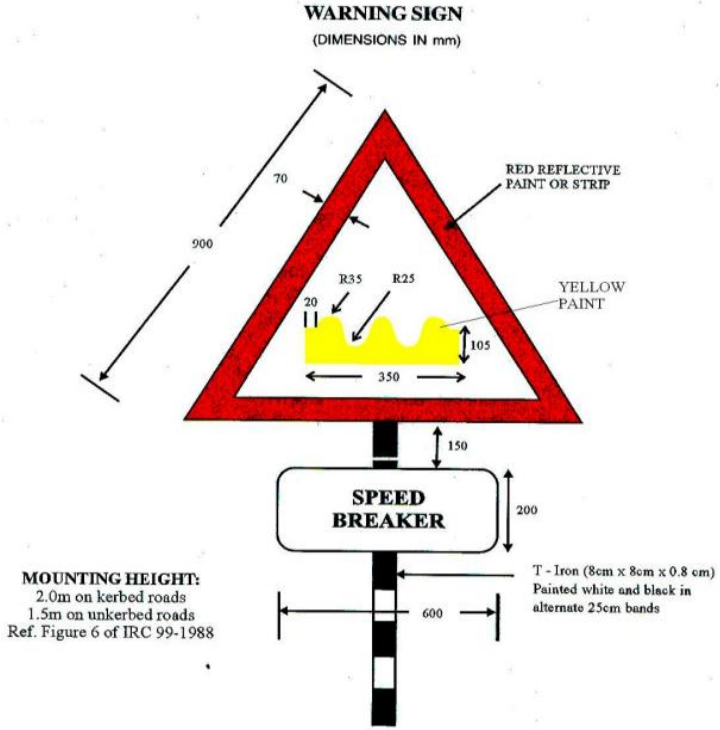
Provision of rumble strips on approaches of level crossings as per the standard design is the responsibility of Road authorities. Matter may be pursued with all State Governments/Road authorities to ensure that rumble Strips are provided on all level crossings as per standard design over the total width of the road i.e., edge of the berm to edge of berm with proper road warning signs as per the standard design. However, it is incumbent upon Railways to provide speed breakers as per the standard design on both manned as well as unmanned level crossing irrespective of whether the approach road is metalled are ummetalled, as a temporary safety measure, till such time these are replaced with rumble Strips of proper design by the Road authorities. While providing speed breakers, following guidelines may be observed.

a. One speed breaker should be provided on either approach of level crossings located within the Railway land boundary at a distance maximum feasible but not exceeding 20m covering full width of the road including berms. For safety reasons, the paint marking should be provided and their maintenance ensured.

b. Standard warning signs for speed breakers should be invariably provided at a prescribed distance as follows.

Class of Road	Plain Area	Hilly area
Class I	120 m	60 m
Class II	60 to 90 m	40 to 50 m
Class III	40 m	30

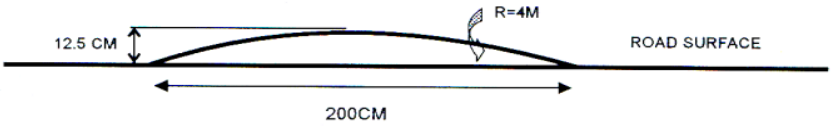
c. Speed breakers should be constructed with hot pre-mix bituminous material, well compacted after laying on well-prepared surface. Enough time is to be allowed for the bituminous material to harden before opening to the traffic.
On berms and un-metalled roads, the speed breakers should be supported on proper base of compacted road metal.



Location –To be so placed on road formation that no part of the sign comes of the vehicles

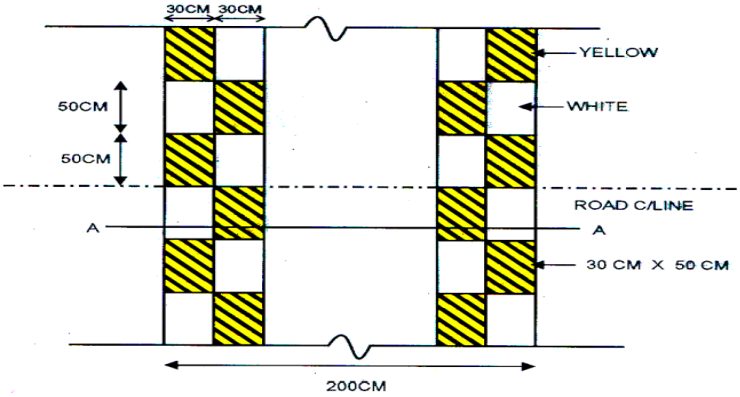
Fig: Speed Breaker

Speed Breaker Design



Note: The hump should extend to the full roadway width appropriate base course material should be extended over the shoulders for placing the humps over these

Speed breaker – Section – 'AA'



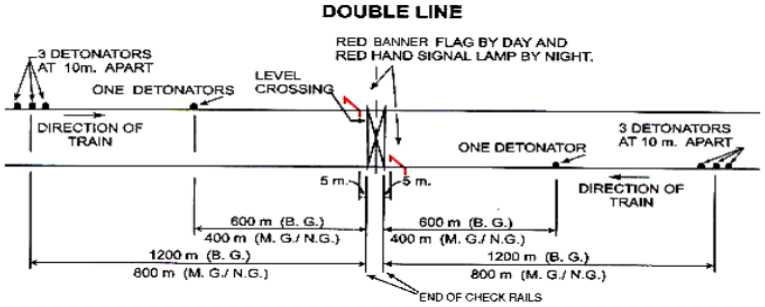
53.14 Protection of level crossings gate in an emergency

In the case of an obstruction at the level crossing, the gateman should maintain the gate signals if any in the "ON" position and if unable to remove it, protect the line as follows.

53.15 On Double Line

On Double Line, if both lines are obstructed,

1. Gateman shall plant a red flag by day and red by night on the line on which a train is expected to arrive first,
2. then attach another red flag red light to the staff and fix it on the other line at the site of obstruction.
3. He shall then pick-up the first danger signal and proceed on that line plainly showing his stop hand signal (red flag by day and red light by night) to a point 600 m for BG and 400 m for MG and NG from the level crossing and place one detonator on the line
4. After which proceed further to not less than 1200 m for BG and 800 m for MG and NG from the level crossing and place 3 detonators on the line about 10 m (10 yards) apart.
5. Having thus protected the line on which a train is expected to approach first,
6. He should return to the level crossing picking up the intermediate detonator on his way back and remove from the other line the staff with the red flag red light and plant it on the line towards the direction protected with detonators.
7. He shall then proceed on the other line showing the danger signal, place detonators similarly and return to the site of obstruction to warn the Driver of an approaching train.

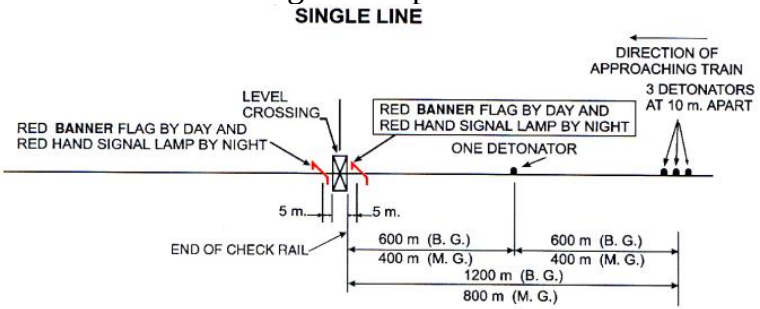


Note: In the case of Meter Gauge (MG) section where trains run at more than 75 kmph the detonators shall be placed at distances to be specified under special instructions by the administration.

On the Signal Line-

1. if the line obstructed during day, he shall plant a red flag towards the direction from which a train is expected to arrive first,
   Note: The hump should extend to the full roadway width appropriate base course material should be extended over the shoulders for placing the humps over these
2. then attach another red flag to the staff and fix it towards the opposite direction at the site of obstruction.
3. He shall then pick up the first danger signal and as in above protect the line in the direction from which a train is expected to approach first,
4. return to the site of obstruction, refix the staff to show the danger signal on the side the line is protected and proceed with all haste in the other direction to protect the line.
5. Having protected the line on both sides he should station himself at the place of obstruction to warn the Driver of an approaching train.

At night the gateman should light the two hand signal lamps and take action to exhibit red lights and protect the line as in above.



Note: Protection for the direction opposite to that of approaching train to be repeated on the other side also.

53.16 Important points must be kept in mind while investigating level crossings accidents

When road vehicles are run into, particulars regarding number, position and damage to vehicles.

1. Whether the level crossings are manned or not?
2. Whether the gates are single or double leaf or lifting barrier?
3. Whether the gates close across the rail and road or across the road only?
4. Whether the gates are protected by signals and if, so of what description?
5. If the gates are not protected with signals, what is the normal position of the gates, whether usually kept open for road traffic or otherwise?
6. Whether the gates are lit at night and if so, how?
7. Description of the scene of occurrence: -
   (a) Whether on straight or curve.
   (b) Length of clear view for the road user obtainable in both directions.
   (c) Whether the line is fenced or not.
8. Whether the engine was fitted with electric headlight?
9. Particulars of road vehicle involved, whether damaged or not. Position of vehicles, in comprised in a string passing over a level crossing.
10. The distance at which the gate is visible to the Loco Pilot of the approaching train.
11. Whether the level crossing is connected by bell or telephone with the adjacent block station?
12. Whether red discs are painted on the gates of the level crossings?
13. Whether the gates are opened and closed electrically or mechanically or by hand?

14. Are the gates situated at or between stations.
15. Whether the level crossing is situated on a level surface or on a gradient. If on a gradient, indicate the gradient with reference to the direction of movement of the train?
16. Whether the level crossing is provided with road signs on road approaches?
17. Whether the level crossing is on a curve, whether there is clear visibility for the road users at 5 meters from the center of the track on both up and down directions for the Loco Pilot of all trains?
18. Whether W/L boards are provided for train Loco Pilot?

SIGNAL
PASSING AT DANGER (SPAD)
BY LOCO PILOT

54

The safety in Train Operations largely depends upon the working of staff, who drives the loco, grant the line clear, lower the signal and maintain the assets like track, coaches, wagons loco motive, signal gear, etc. But out of all these staff loco pilots play an important role for maintaining the safety. During Railway Operation, one of the most freighting situations emerges when a loco pilot passes a signal at a dangerous position, which means that loco pilots supposed to obey the position of the signal and stop at a nominated place, but he fails to do so. This situation is a kind of averted accident or collision. In Railway terminology, it is called Signal Passing at Danger (SPAD). It can be defined as an event when a train passes a signal at danger (stop) without any authority. Although, Signal Passing at Danger (SPAD) is classified as an indicated accident, but it has the potential of a consequential

accident-like Head on collision, Rear End collision, Side collision and Derailment.

Every Railway system of the world is extremely concerned about this safety risk as it poses one of the severest kinds of Railway Accident i.e., collision. Signal Passing at Danger is also a kind of situation, when multiple collisions can happen at same spot, if density of traffic is high at that spot. Often, collision turn to a major disaster causing loss of several human lives, loss to the railway property and shack the confidence of common people travelling with railway.

There are constant efforts by railway organization to prevent Signal Passing at Danger (SPAD) with advancement of technology and minimizing human element but so far, no technology could succeed, however trails are on to install safe anti-collision device in locos.

54.1 Signal passing at Danger (SPAD)

1. To avoid any dispute later, the fact that a Loco Pilot has passed a signal at danger, should be formally brought to his notice through a written memo by the station master of the concerned station.
2. The SM / ASM / Points man must confront the Loco Pilot and Train Manager about the position of the signal and the position of the lever / knob concerned. The position of the signal and route should be recorded by the SM and signed by the SM, Loco Pilot, Guard, and other witnesses, if available.
3. The distance by which the train has passed the signal shall be recorded with respect to the length of engine + coach/wagons and / or telegraph/OHE posts, or by measuring the actual distance in meters.
4. In the nighttime, the brightness of the signals should be noted. The weather conditions such as foggy/tempestuous condition shall also be recorded.
5. If the Loco Pilot is required to use glasses, it should be checked whether he was in possession of them and using them.
6. Arrangement for testing brake power of the train shall be made by Officers /Sr. Subordinates at the nearest C&W examination point.
7. Breathalyzer test on the Loco Pilot/ALP should be done immediately and blood samples of LP/ALP shall be collected. The Loco Pilot /ALP shall be sent for further medical examination.

8. Data logger output in relation to this incident should be obtained from S&T officials.

54.2 Loco pilot passing signals at danger—Factors responsible

1. **Loco pilot expectation or hypothesis**
   When loco pilot finds most of the signals always in favour and occasionally one is against.
2. **Taking cognizance of wrong signal:**
   The driver might meet a display of several signals and respond to one, which did not apply to his train. Such an error might be due to fault in the display or to poor visibility or to inadequate knowledge on the part of driver or due to negligence.
3. **Glare due to sunshine**
   Glare due to sunshine resulting in blurred vision of the driver and thus possibly making a mistake of responding to wrong aspect of the signal.
4. **Signal showing wrong aspect (Phantom signals)**
   Signal showing wrong aspect (Phantom signals) has been noticed that sometimes signals give wrong indications to the driver on account of cracked red lens showing orange or sunlight reflection. There have been cases when lens gets covered with moisture or greeze & gives wrong indication. Such cases come under the category of Thantom Signals' & mislead the driver leading to unsafe conditions.
5. **Pre-occupation and distraction**
   Pre-occupation and distraction due to some serious domestic problems as a result of which he misses a signal.
6. **Momentary Mental Blankness**
   Momentary Mental Blankness due to some worries or other causes
7. **Wrong Practices:**
   Loco Pilot and Assistant Loco Pilot should repeat the aspects of signals to each other as per rules, but do not do so in practice. No checks are exercised by supervisory officials from time to time. Education and proper drill are very important in such cases.
8. **Lack of Vigilance:**
   The Driving crew may be careless including sleeping or being drunk on duty.
9. **Short cut methods:**
   With a notion to save time.
10. **Incompetency**
    Incompetency due to his lack of knowledge and adequate

qualifications.

54.3 Action plan for preventing Signal Passing at Danger (SPAD)

Signal Passing at Danger (SPAD) can be prevented with certain precautions, if taken by Loco Pilots (LP) and Assistant Loco Pilots (ALP). Frequent monitoring and counseling of Loco Pilots (LP) and Assistant Loco Pilots (ALP) is the key to prevention of Signal Passing at Danger (SPAD). Loco inspectors, who have been assigned the job to counsel LPs and ALPs must devote their time and energy in this aspect. Several studies have been done to explore the causes and reason for such causes, if following precautions are adopted then incidence of SPAD can be minimized.

1. Assistant Loco Pilot must call out the correct aspect of signals and display with his hand gesture. He must loudly speak about the name of the signal or number and Loco Pilot must acknowledge the same the way as Assistant Loco Pilot.
2. In case Loco Pilot is not vigilant or reacting to the Assistant Loco Pilot then Assistant Loco Pilot must apply emergency brakes by opening of DI piloU RS valve.
3. Loco Pilot must always keep his train under perfect braking control and maintain a sharp look out to the correct signals given for his train. The Loco Pilot drives and maintains the speed of the train in accordance with the aspect of signal and we can control the train if signal is restrictive.
4. Loco pilot must stop the train at nominated place before the foot of stop signal. If a place is not nominated then he should stop the train with adequate distance before foot of the signal and must have clear view of signal from cab, subject to clearance of fouling mark.
5. The Loco Pilot never uses walkie-talkie to get information about the signal aspect. He must also not follow the operational instructions on walkie-talkie from station staff.
6. The Loco Pilot and Assistant Loco Pilot must be vigilant and focus only on safe driving of his Locomotive and train.
7. Before the start of the train, Loco Pilot must be tested with breath analyzer to ensure that they are not intoxicated with liquor.
8. The Loco Pilot must ensure that before the start of their train, they must have a signal for them or in case of a signal is not available then

paper authority to proceed.

9. During run, Loco Pilots and Assistant Loco Pilot should not use their mobile phones. It is also be ensured that Foot plating Officials are also not using the same as it distracts the attention of Loco Pilot.
10. When Loco Pilot noticed that visibility is restricted due to fog or other conditions, he must run the train at a prescribed speed or if not prescribed then he should run at the speed, which he can control the train at sort of any obstruction.
11. The safety devices like Vigilance Control Device, Auxiliary Warning System etc. should not be isolated by Shed or Loco Crew. Loco Pilot should bring MP to 'o' (zero) notch before applying of A9 & SA9 in case of any unusual incidence like train parting etc.
12. The Loco Pilots should not be given the train till they complete stipulated Learning Period (LP), if still Loco Pilot are not confident then it is better to extend Learning Period (LP) until Loco Pilots (LPs) are well conversant with the sections and confident to work independently.
13. Chief Loco Inspectors (CLIs) must keep interacting with family members of Loco Pilots and Assistant Loco Pilots to aware them about need of quality rest of Loco Pilots and Assistant Loco Pilots at home. An awareness campaign for the family members is a must. Similarly, Loco Pilots and Assistant Loco Pilots are to be counseled about taking a rest at home and in running rooms.
14. Continuous night duty of Loco Pilot be avoided or if it is necessity same to be limited to two nights. Loco Pilot who reports after long leave/sickness/ absent/ training should be booked after 6AM in the morning next day.
15. If LP is absent or on leave for a longer time, then he should be counseled by Loco Inspector about the safety and other instruction during his absence. The Loco Pilot who had come from long leave, it is better to book him on duty for day hours.
16. Signal Passing at Danger (SPAD) cases must be discussed during counselling session of Loco Inspectors and at training centers. It is one of the important duties of Loco Inspector and training instructor to impart awareness about Signal Passing at Danger (SPAD) and be given adequate training to do so.
17. The Loco Pilot must exchange alright hand signal with station staff and other Loco Pilot and Train Manager of passing train on adjoining railway track. They should observe all permanent & temporary speed

restrictions rigidly.

18. The Loco Pilots and Assistant Loco Pilots must appear on duty at the right time in duty at lobby and must read all latest circulars, caution orders and notifications before signing ON.
19. Loco Pilot must not leave locomotive unmanned en-route after taking charge of the Locomotive.
20. To ensure that Signals are visible and without any obstruction, a signal sighting committee must be formed and be asked to do regular joint inspections in day and nighttime.
21. Loco pilot must conduct brake continuity, brake feel and brake power test of the train in first section after start or as prescribed.
22. The duty hours and periodical rest of Loco Pilots and Assistant Loco Pilots must be watched and ensured that no Loco Pilot is generally working beyond prescribed duty hours. It is also to be ensured that Loco Pilot before signing on duty must have availed full rest as prescribed at home station and out station.
23. There is tendency among running staff that they start packing the personal belongings before approaching the duty termination station, it sometime creates a kind of mental confusion and signal passed at danger; therefore, Loco Pilots need to be counseled that they should not be in unnecessary hurry and be vigilant till they arrived at destination.

Safety Directorate of Indian Railway had analysed Signal Passing at Danger (SPAD) cases happened in the period from 01.04.2013 to 31.03.2017 and the analysis of these indicates the following:

1. 60 % of SPAD cases occur in passenger trains.
2. Departmentally promoted crew is involved in SPAD cases is 2.4 times compared to crew recruited through RRB.
3. In 63 % of cases crew after headquarter rest are involved in SPAD.
4. 21.3% of SPAD cases occurred in the time period 0600 to 1000 hrs.
5. In 70 % of cases crew have completed less than 6 hours of duty.
6. Crews in the age group of 55-60 are involved in maximum cases.
7. In 74 % of cases lack alertness and negligence of crew is attributed to SPAD.
8. In 18% of cases delayed brake application is attributed to SPAD.

Analysis doesn't indicate any specific reason for lack of alertness of crew resulting into SPAD. Hence, it is imperative that overall working/living conditions need to be improved to minimize stress

on the running staff. In this role of Loco Inspectors and running supervisors becomes paramount and their performance needs to be monitored closely and effectively.

Annexure to Railway Board letter No.2015/Safety/DMYSPAD/1 dated 20.04.17.

1. All the cases of SPAD should be reported to the Board in SIMS.
2. Data logger reports must be analyzed to identify unreported SPAD cases and short cut methods being followed in shunting operations.
3. All the cases of SPAD must be thoroughly investigated to arrive at the root cause. During the Inquiry an effort should be made to bring out any extraneous reasons for the accident. All the relevant details should be filled in SIMS so that a meaningful analysis can be done at the Railway Board. Invariably all the Inquiry reports should be uploaded on SIMS.
4. Time schedule for conducting Accident inquiries and D&AR should be strictly followed.
5. Punishment should be imposed as per the Railway board norms in SPAD cases.
6. Instructions issued vide Board letter No.99/Safety(A&R)/6/1 pt. dated 05.08.2016 regarding assigning running duties to crew involved in SPAD cases should be strictly followed.
7. Zonal Railways should complete the annual cadre review if pending and fill the vacancies at the earliest.
8. Loco inspector posts should be created in the annual crew cadre review as per the norms prescribed.
9. Vacancies in loco inspector posts should be filled up as top priority. This should be reviewed at least once in six months at Divisional level and at CSOs level.
10. Categorization of Drivers should be carried out as per the instructions issued vide Railway Board letter No.97/Safety-1/23/15 dated 29.03.2007. Whenever Loco pilot is upgraded by LI it should be done only with the personal approval of power officers.
11. 'A' category Pilots should be monitored at least once in three months, 'B' category once in two months and 'C' category once in a month by the nominated Loco inspector.
12. Event recorder downloads of microprocessor-based Locomotives should be scrutinized by Loco inspector to check loco pilot a) has carried out continuity test, Brake feel test and brake power test, b)

Whistling habits, c) Over speeding tendency, d) braking and powering habits, e) Activation of VCD on run etc.

13. Officers should check the knowledge of the Inspectors & Trainers and their regular training must be ensured for being conversant with latest modifications, new technologies etc.,
14. The performance of the Loco Inspector should be reviewed by the controlling officer once a month.
15. Full cell-based Breath alcohol analyzer shall be purchased as per RDSO specification No. RDSO/2015/EL/SPEC/0119 dated 17.09.2015.
16. A foolproof system needs to be evolved for conducting breath analyzer test during signing ON and OFF. Ambush checks should be conducted to prevent and check drunkenness on duty. All the Loco inspectors should be issued with fuel cell-based breath analyzer as personal equipment.
17. JPO issued by Railway board vide letter no.2010/Tele/2(1)/1 dated 27.12.2012 regarding usage of CUG/Personal mobile telephones should be strictly implemented.
18. Instructions issued by Railway board vide letter No. E(NG)I/2002/PM1/31dated 22.08.2003, 29.03.2005 and 20.03.2007 regarding Aptitude test (Previously known as psychology test) should be strictly implemented.
19. Running staff should be counselled not to consume any sedative drugs during on duty and eight hours prior to reporting for duty.
20. The proper learning road of the crew must be ensured.
21. Crew overdue for refresher and PME should not be booked for service.
22. Crew should be booked 'As per rule' in Crew Management System.
23. Loco pilot should be counselled to conduct brake continuity test and brake feel test as per laid down procedure.
24. Crew should be counselled regarding clear and loud calling out of the aspects of the signals.
25. Guidelines issued by Railway Board vide letter No.2014/Safety (DM)/7/1 dated 25.08.2014 regarding functioning of VOD should be adhered to.
26. Crew should be counselled to avoid unwarranted pressing of VCD acknowledgement button.

27. ALP needs to be counselled not to hesitate to apply emergency brake in case he finds anything unusual, and he feels that Loco Pilot is not alert.
28. Close monitoring of duty hours and periodical rests must be ensured.
29. The 10-hour rule should be strictly adhered to. Identify the bad sections, these should be monitored closely and improved upon.
30. The work of all safety items in the locomotives should be ensured before dispatching from the shed.
31. All rolling stock should be maintained in good fettle and minimum brake power prescribed for the train should be ensured.
32. GDR check should be conducted religiously as per prescribed procedure.
33. Rakes with invalid BPO should be offered for examination in the first freight examination depot as per the rules.
34. Except in emergencies, trains should be run with the Train Manager and Brake van.
35. Guidelines issued by RDSO for movement of dead locomotives should be.
36. A proper feedback mechanism for acknowledgement of any unusual incidents reported by the running staff and action taken thereafter should be implemented.
37. Signal sighting committees should be activated, and a system should be developed to monitor the action taken to rectify the deficiencies noticed by them.
38. Increased interaction of inspectors with the crew and his/her family members for bringing about awareness on the need for proper rest at the home station.
39. The welfare inspectors nominated for each lobby should be closely monitored by DRM.
40. A team of concerned officers headed by DRM/ADRM should interact with the running staff in the crew lobbies/running rooms to understand their problems and their concerns should be addressed as top priority.
41. A visible and effective grievance redressal mechanism should be established at the divisional level.
42. The condition of crew booking lobbies and Running rooms should be monitored and improved as per the Railway Board instructions vide letter No. 2001/M(L)/467/2 dated 10.11.2003.

43. Standing committee under the chairmanship of ADRM should inspect running rooms as per the instructions issued vide Railway Board letter No.96/ML/467/Misc. dated 27010.2000 and 14.03.2007.
44. All running rooms should be provided with Air conditioning as per guidelines issued. vide Board letter No. 2016/M(L)/165/3 dated 22.09.2016.
45. Effective night inspections at every level should be ensured.
46. Ensure that the cases of SPAD/accidents on the Railways including cases of other Zonal Railways discussed in the training centers for mass awareness.

With Reference to Railway Boards Letter No. **No. 2015/Safety (DM)/SPAD/1**, **New Delhi, Dt. 20.04.2017** issued by Vinod Kumar (Adviser Safety) addressed to all General Managers**: Accidents due to Signal passing At Danger.**

54.4 Conclusions of the Analysis of SPAD Cases

1. 7.75% of the SPAD cases result into consequential accidents.
2. 1.76% of SPADs were caused by Track ma- chine/Tower wagon drivers. 40.14% and 58.10% are attributed to Diesel and Electric loco pilots respectively.
3. 36% cases are attributed to Goods trains. Rest are passenger trains including Suburban trains.
4. Out of 16 major Railways, six Railways namely, CR, SCR, WR, NCR, NR and SR have contributed to almost 63.5% of SPADs.
5. 61% of SPAD cases are happening after HQs rest.
6. A whopping 77.24% of SPAD cases occurred within six hours of duty time. In only 3.4 % of SPAD cases crew had worked beyond 10 hours.
7. Cases are spread over all hours round the clock. No specific pattern of occurrence of SPADs with respect to any particular time zone could be established.
8. In 57% cases, the train could be stopped within 100m of passing the signal at danger i.e. within the signal overlap. However, in 28% cases, the train travelled beyond 200m and in 7.6% of cases, the train travelled for more than a kilometre after SPAD. These 28% cases have a potential of getting converted into consequential accidents.
9. In 10.5% cases, the engine was in long hood position.
10. 63.6% of cases are attributed to loco pilots beyond the age of 45 yrs.
11. Although 66.5% SPADs have been caused by LPs recruited through RRB as compared to 33.5% departmental LPs, this data when normalized per thousand crew indicates that total SPADs per thousand crew is 8.74 for departmental LPs as against 6.69 for RRB recruited

LPs.

12. Maximum numbers of SPAD cases occurred in the month of May followed by November.
13. Starter/Home/Automatic signals constitute 88% of signals passed at danger.
14. Almost 75% of SPAD cases occurred due to lack of alertness/negligence of the crew.

It is clear from the above analysis that the major cause of SPADs is lack of alertness/negligence of the crew. Majority of SPADs are occurring within first six hours of duty and after HQ rest. Some of the reasons for this may be any or combination of the following:

1. Lack of proper rest before duty
2. Stress related to personal/family problems.
3. Physical/mental condition of LP
4. Stress due to long pre departure detentions
5. Age and experience of the Loco pilot
6. Training and competence
7. Organisational pressure
8. Physical characteristics of signal and their location
9. General expectations of the aspect of the signal based on prior experience etc.

54.5 Recommendations

1. All vacancies of ALPs be filled on priority which would enable the LPs to get leave when required to carry out their family responsibilities.
2. Regular interaction with the families of the LPs be done to explain to them the importance of their jobs with a view to provide a relaxed atmosphere at home.
3. Railway Board's instructions with respect to Aptitude test be followed strictly. Operators deputed for working tower cars and track machines should also be subjected to aptitude test.
4. Working of Vigilance control devices (VCD) provided in locos should be strictly adhered to for ensuring alertness of the crew on the run.
5. Signal sighting committees should be activated, and deficiencies noticed about visibility of signals be attended on priority.
6. Efforts should be made to reduce Pre departure detentions by better planning and arrangements be made to bring the LPs to the running

room/HQ at the earliest in cases of DCR to enable them to avail desired rest.

7. As the reflexes of LPs slow down with age, ALPs must be counselled to use emergency brakes when they face a situation of SPAD without waiting to be told by LP.
8. As per present system, aptitude test is done once at the time of induction as ALP and again as LP for high-speed trains like Rajdhani/Shatabdi. As most accidents have been done by LPs aged beyond 45yrs, there is a necessity to introduce psycho-intervention and training/ counselling for loco pilots at other stages of their career as well. The age at which this intervention is required needs to be studied separately.
9. Present medical examination does not cover psychological aspects and depends on voluntary disclosure of problems by the examinee. In many cases running staff does not disclose the ailments and tend to conceal in fear of de-categorisation. Moreover, it is a fact that running staff do consult private practitioners. So, the elements of Periodic medical examination should be reviewed duly in-corporating problems related to sleep deprivation, fatigue, stress, health profile and other related aspects.
10. Specific training needs of departmentally promoted candidates in the ALP cadre needs to be studied a fresh.
11. With execution of Automatic signalling/IBS works, the number of signals encountered by LPs on a trip have greatly increased. A trial may be done by providing fog safe devices during all seasons to alert the driver of an approaching signal. Feedback from drivers may be analysed for further decision in this regard.
12. A suitable automatic train protection system may be planned to be provided in mission mode on high density routes to mitigate SPADs resulting in consequential accidents.
13. Following remedial measures suggested by RDSO for increasing mental alertness of the crew may be implemented in the right earnest:
    1. Mental exercises on regular basis will enhance cognitive abilities and in turn increase level of alertness.
    2. Physical exercise keeps physiological activities activated thus helping in sound sleep and eliminates the risk of fatigue at work.
    3. Good food habits and balanced nutrition will help in mental

health which keeps the toxins away from body thus making a person more agile and active.

4. Proper rest and sound sleep will restore the body to work again with physical and mental vigour.
5. Yoga and pranayama increase alertness by mitigating the factors responsible for stress.

54.6 Braking Distance (as per IRISET S-1)

The distance travelled by a train after its brakes are applied is known as the braking distance, and this is an important concept in signalling for determining the signal sighting distance. There are two methods of application of brakes:

a) A normal or service application which involves only the shutting off the power (steam to the cylinders or electric power to the motors as the case may be) and the gradual application of brakes, and
b) An emergency application in which shutting off power and full application of brakes are done without any loss of time.

Braking distance is a function of speed and other factors, such as the brake power available, gradient, rollability of wheels, and the state of rails (wet or dry), curvature of track and velocity of wind, etc., which cannot be established very accurately.

As the only accurate method of ascertaining the Braking distance is to conduct trials at each location which is impracticable, all that can be done is to prepare curves from test data obtained from isolated test runs or devise a formula based on experience & in different situations and trains.

54.7 Service Braking Distance

Service Braking Distance is the distance required to stop the train running at the maximum permissible speed of the line, at such a rate of deceleration that the passengers do not suffer discomfort or alarm.

54.8 Emergency Braking Distance

Emergency Braking Distance is the distance travelled by train before coming to a stop by sudden application of brake at one stretch.

This braking distance depends on various factors such as speed, Type of Locomotive, Type of Rolling stock Type of Braking (Air

brake/ Vacuum brake, it's integrity), Load, Gradient, Adhesion on track, Wind speed etc. An example is given below for information. EBD for full load passenger trains on level gradient at 100 KMPH is typically about 1200m.

S.N.	Train configuration	Speed In Kmph	EBD in (m) at Different Down gradients			
			1 in 250	1 in 200	1 in 150	1 in 100
1	2WDG3A/WAG7/WAG5 + 58 loaded BOXN + 1 B/V (with 'L' type brake block)	65	709	742	777	867
		75	907	935	983	1105
		80	1016	1048	1104	1243
		95	1376	1045	1486	1666
2	1 WAG9 + 58 loaded BOXN + 1B/V (with 'L' type brake block)	65	588	597	634	680
		75	748	761	793	870
		80	829	845	881	967
		95	1109	1133	1182	1286
3	2 WAG7/WAG5 + 58 loaded BOXNHS + 1 B/V (with 'L' type brake block)	65	731	753	790	888
		75	935	952	1016	1134
		80	1034	1068	1127	1263
		95	1403	1438	1521	1715
4	2 WDG3A/ 1 WAG5 + 40 LOADED box + 1 B/V (with C.I brake block)	65	1005	1053	1155	1397
		75	1334	1405	1539	1882
		80	1513	1596	1743	2154
		95	2154	2260	2482	3094
5	1 WAM4 + 20 vaccum brake coaches (with C.I. brake block)	65	578	593	610	662
		75	764	782	816	875
		80	985	1001	1045	1139
		105	1227	1251	1308	1430
6	2 WDM2/1WAM4 + 22 air brake coaches (with C.I. brake block)	75	475	480	498	528
		85	634	658	674	719
		95	833	843	877	941
		105	1049	1067	1107	119
7	1 WAP4 + 24 air brake coaches (with C.I. brake block)	75	479	481	497	527
		85	642	656	672	729
		95	832	842	877	951
		105	1050	1074	1118	1199
	Ref: RDSO Letter No SD INV 5 dated 4.11.2004					

PUNISHMENT NORMS IN ACCIDENT CASES

55

(Ref. : Railway Board's letter no.99/safety (A&R)/6/1 dated 23.04.99)

NOTE:

(i) **'D' staff:** Staff directly held responsible for the accident.
'S' staff: Staff who are found to have secondary responsibility. In their case, the penalty imposed will depend on the degree of their contribution to the accident / engine failure and the Disciplinary Authority will use its discretion in the matter.
W I P – With holding of increment with cumulative effect.
W I T – With holding of increment without cumulative effect.

(ii) The Disciplinary authority must impose the minimum penalty if the responsibility of staff is clear. Factors, like the employee's past record of service may be taken into account by the Appellate Authority if and when an appeal is made to it. The Disciplinary Authority should deal with the case solely with regard to the facts and circumstances of the accident itself.

55.1 Collision involving a train

S.N.	Nature of Accident	Minimum penalty
	Collision involving a train-	
1.	**(a)** Resulting in loss of human life.	**(a)** 'D' staff – Dismissal **(b)** 'S' staff – Major penalties (v), (vi) or (vii)
	(b) Not resulting in loss of human life.	**(a)** 'D' staff – Removal from service. **(b)** 'S' staff – Major penalty(v) or (vi)
2	Averted collisions involving a train-	**(a)** 'D' staff – Removal from service. **(b)** 'S' staff – Major penalty (v) or (vi)
3	Train passing signal at danger	Removal or compulsory retirement where entirely due to neglect of Loco Pilot; reduction to a lower grade if there are contributory factors like loss of brake power on the run which he could not have detected when he took charge of the engine.

55.2 Over speeding by Loco Pilot

4	**Over speeding by Loco Pilot (in cases other than collisions, averted collisions and passing signal at danger for which penalties have been prescribed in items 1 to 3 above)**	
	(i) Resulting in derailment of passenger train involving loss of human life.	Dismissal - if there are no other contributory factors like track or rolling stock defects. Removal - if there are such contributory factors.
	(ii) Resulting in derailment of passenger trains not involving loss of human life.	Removal - if there are no other contributory factors like track or rolling stock defects.

		Reduction to 'C' grade for 3 years if working substantively in 'C' or 'B' grade and reduction to Shunter for 3 years if working substantively in 'C' grade with loss of seniority in both cases. If there are such contributory factors.
	(iii) Resulting in derailment of goods trains on the main line in mid-section or within station limits.	Reduction to grade of shunter for one to three years with loss of seniority.
	(iv) Resulting in derailment of goods train in station yard on other than main line.	Reduction to Shunter for one to three years, depending on the extent of damage, without loss of seniority on being restored to 'C' grade Loco Pilot.
5	Failure to detect hot axle or other defective wagon resulting in derailment for which Loco Pilot/ Guard can be held responsible if it is within range of visibility.	Reduction to next lower grade in the case of passenger train. WIP for 3 years with loss of seniority in the case of goods train.
6	Failure to detect hot axle or other defective wagon resulting in derailment for which station staff / cabin staff can be held responsible or failure to stop the train on information regarding hot axle being given by the previous station for control.	Removal in the case of passenger train reduction to the next lower grade in the case of goods train, if working in lowest grade, WIP for 3 years.

55.3 Station derailments while shunting

7	**Station derailments while shunting.**	
	i) Due to Loco Pilot's fault in not obeying signals including hand signals or starting the train without authority proceed.	WIT for 2 yrs.
	ii) Due to Loco Pilot's failure to control the train	WIT for 2 yrs.
8	Breach of Block Rules (which do not result in collision or averted collision) such as train entering the section without proper line clear, receiving trains on wrong line blocked for engineering work etc. Placing material trolly on line without block protection and so on.	Reduction to a lower stage in the time scale.
9	Accidents at Manned Level crossings	
	(i) Failure of Gateman to close the gate.	Dismissal if there is loss of human life, removal if there is no loss of human life.
	(ii) Failure of SM/ASM to ensure closure of level crossing gates before allowing any movement where rules provide.	Reduction to a lower grade or post with loss of seniority (WIP 3 yrs. In case in the lowest grade).
	(iii) Failure of Loco Pilot in observing rules before passing a gate signal in danger.	Reduction to a lower grade with loss of seniority.
	(iv) Where no breach of rules is proved but lack or vigilance on the part of Loco Pilot/ guard of other staff is proved.	WIT up-to 2 years 11 months.

55.4 Accident at unmanned level crossings

10	**Accident at unmanned level crossings due to lack of vigilance on the part of Loco Pilot or failure to whistle on approaching the whistle board.**	
	(i) Accident involving loss of human life.	Reduction to a lower grade.
	(ii) Where no loss of human life is involved.	WIT for 1 year.

55.5 Carriage & Wagon defects or improper securing

11	**Carriage & Wagon defects or improper securing of loads or failure to detect improper securing of loads by TXR.**	
	(i) Resulting in derailments on the main line, Mid – section or within station limits.	For the first offence WIT for 2 yrs. 11 months. For the second offence reduction to a lower grade for 3 years with loss of seniority (If any staff such as TXR are in the lowest grade, reduction by three stages in the scale of pay with loss of seniority; if the staff are in the lower stages of pay where reduction by three stages is not possible WIP for three years with loss of seniority).
	(ii) Resulting in derailments in a station yard other than main line.	Same as for item (i) above but without permanent effect and without loss of seniority.

55.6 Locomotive defects

12	**Locomotive defects**	
	(i) Negligence in repairs or maintenance in shops or shed resulting in accidents.	Reduction to a lower stage in the time scale with loss of seniority for the first offence, reduction to a lower grade with loss of seniority for the

		second offence and removal for the third offence.
	(ii) Negligence in repairs of maintenance in shops or sheds or bad engineman ship by Loco Pilot resulting in engine failure.	For the first offence stoppage of Passes and PTOs for 1 year; the second offence WIT 1 year and for the third offence reduction to a lower grade for years.

55.7 Traffic staff failure other than collisions

13	**Traffic staff failure, resulting in accidents other than collisions or averted collisions.**	
	(i) Wrong setting / manipulation of points.	Reduction to a lower grade with loss of seniority.
	(ii) Incorrect signalling.	WIP upto three years.
	(iii) Wrong marshalling.	Reduction to a lower stage in time scale of pay.
	(iv) Excessive / uneven loading or improper securing of loads.	WIT upto three years

55.8 Signal & interlocking failures

14	**Signal & interlocking failures, signal and interlocking defects for which maintenance staff are held responsible resulting: -**	
	(a) Accidents of passenger train involving loss of human life	**(i)** If due to causes where 'interlocking' has been shorted, circulated / made inoperative. **'D' staff –** Dismissal **'S' staff –** Major penalties under item (v), (vi) or (vii)(ii) If due to causes where 'interlocking' has deteriorated due to bad maintenance repairs.

		'D' staff – Removal **'S' staff –** Penalties under Item (v) or (vi)
	(b) Accidents of passenger or goods train not involving loss of human life.	**(i) 'D' staff -** Removal **'S' staff –** Penalties under Item (v) or (vi) **(ii) 'D' staff –** item (vi) **'S' staff –** item (v)
	c) Derailment of goods train on the main line in mid-section or within station limits.	**(i) 'D' staff –** item (vi) **'S' staff –** item (iv) or (v)
	d) Derailment of goods train within station yard other than main line.	**(i)'D' staff –** item (v) **'S' staff –** item (iv)

55.9 Civil Engineering Department

Ref.: Railway Board's letter no.99/safety (A&R)/6/1 dated 23.04.99)

NOTE:

(i) **'D' staff:** Staff directly held responsible for the accident.
'S' staff: Staff who are found to have secondary responsible including that of Supervisors, JE/SE/SSE (P. Way) and PWS etc., whose failure to do proper inspections and take timely remedial measures and slack supervision would have contributed to the accident. The penalty to be imposed in these cases will depend on the degree of the contribution of the accident. The disciplinary authority will use his discretion in this matter. While fixing responsibility for slack supervision and neglect of periodical inspections the period, the supervisors have been in charge of the section is also to be taken into account.
W I P – With holding of increment with cumulative effect.
W I T – With holding of increment without cumulative effect.

(a) The Disciplinary authority must impose the minimum penalty if the responsibility of the staff is clear. Factors, like the employee's past record of service may be taken into account by the Appellate Authority if and when an appeal is made to it. The Disciplinary Authority should deal with the case solely with regard to the facts and circumstances of the accident itself.

55.9.1 Major track defect such as buckling, worn out switches

S.N.	Nature of Accident	Minimum penalty
1	**Major track defect such as buckling, worn out switches & crossings and spread of gauge**	
	(i) Resulting in derailment of passenger trains	**(a) 'D' Staff –** (i) Dismissal, if there is loss of life. (ii) Removal from service if no loss life. **(b) 'S' Staff –** Reduction to a lower grade for a period of 3 years, with loss of seniority, if any staff such as JE / P. Way are in the lowest grade reduction by 3 stages in the scale of pay with loss of seniority. If the staff are in the lowest stage of pay where reduction by three stages is not possible, WIT for 3 years with loss seniority.
	(ii) Resulting in derailment of goods trains on the main line in mid-section or within station limit.	**(a) 'D' Staff -** Reduction to a lower grade for a period of 3 years, with loss of seniority, if any staff such as JE / P. Way are in the lowest grade reduction by 3 stages in the scale of pay with loss of seniority. If the staff are in the lowest stage of pay where reduction by three stages is not possible, WIT for 3 years with loss seniority. **(b) 'S' Staff –** Reduction to a lower stage in time scale of pay of 3 years with effect of postponing future increments on expiry of such period.
	(iii) Resulting in derailment of goods trains in station yards other than main line.	**(a) 'D' Staff –** Reduction to a lower stage in time scale of pay for a period of 2 years without the effect of postponing future

		increments. **(b) 'S' Staff –** WIT up-to 2 years 11 months or with holding of pass/ PTOs for 2 years where the staff has reached the maximum of the grade.

55.9.2 Other track defects like cross levels or low joints

2	**Other track defects like cross levels or low joints and defective alignment in curves etc.,**	
	(i) Resulting in derailment of passenger trains	**(a) 'D' Staff –** (i) Removal from service if no loss of human life. (ii) Reduction to a lower grade for a period of 3 years, with loss of seniority of no loss life. If any staff such as JE / P. Way are in the lowest grade, reduction by 3 stages in the scale of pay with loss of seniority. If the staff are in the lowest stage of pay where reduction by three stages is not possible, WIT for 3 years with loss seniority. **(b) 'S' Staff –** Reduction to a lower stage in time scale of pay for a period of 3 years with effect of postponing future increments on expiry of such period.
	(ii) Resulting in derailment of goods trains on the main line in mid-section or within station limit.	**(a) 'D' Staff –** Reduction to a lower grade for one to three years with loss of seniority. **(b) 'S' Staff –** Reduction to a lower grade in time scale of pay for a period of one to three years without postponing the increments.
	(iii) Resulting in derailment of goods train in station yard or other than main line	**(a) 'D' Staff -** Reduction to a lower stage in time scale of pay for a period of one to three years without the effect of postponing future

		increments. **(b) 'S' Staff –** WIT for one year or with holding of passes and PTOs for one year if at maximum of grade.
3	Miscellaneous cause like infringement of track by irregular unloading of ballast track materials etc., due to neglect of P. Way staff or failure to protect track in case of destruction, opening of track, breach etc.,	WIT up to 3 years or reduction to a lower grade or removal from service according to the gravity of accident and damages caused.
4	In respect of accidents during shunting operations in sidings and other non and running lines due to track defects.	WIT for one year or with holding of passes PTOs where the staff has reached the maximum should be imposed depending on the extent of neglect of maintenance and other circumstances.

55.10 For Staff of Electrical Department

(a)	Accidents to passenger train involving loss of human life.	Removal from service.
(b)	Accidents to passenger train not involving loss of human life	**(i)** Reduction to lower grade. **(ii)** If the staff is in the lowest grade reduction to a lower stage.
(c)	Fire accidents involving loss of human life	Removal from service
(d)	Fire accidents involving without loss of human life	**(i)** Reduction to lower grade. **(ii)** If the staff is in the lowest grade reduction to a lower stage.

PART J:
SCHEDULE OF DIMENSION IN CIVIL ENGINEERING

SCHEDULE OF DIMENSIONS IN CIVIL ENGINEERING

56

Indian Railway Schedule of Dimensions (BG) is the standard for construction and maintenance of railway track and other allied activities of the railway for ensuring safety in railway operation. The last schedule of dimensions (BG) has been revised in 2004 in two heads as one for existing works and other for new works. The schedule of dimension pertaining to civil engineering department of railways is as under:

56.1 General

The DIMENSIONS given in this Schedule-I have been classified under two heads namely for 'Existing works' and for 'New works.' Existing works means the works which were existing before issue of Indian Railway Schedule of Dimensions (BG), Revised-2004.

New works would include altogether new constructions, additions of new lines, new structures, gauge conversion and doubling. However, it does not include the works of alteration such as shifting of a Points and Crossings, extension of siding, extension of loop line, alteration in building etc.

The dimensions, except for existing works, are to be observed on all 1676 mm gauge on Indian Railways for execution of new works. Provided that infringement to any provision of IRSOD Chapter I, II, III, V, VA & VB of Schedule I can be condoned by the Commissioner, provided further that for infringement beyond the dimensions prescribed in Schedule II, if any, or wherever specific mentions appear in Schedule I, sanction for condonation shall be obtained from Railway Board through Commissioner/Chief Commissioner of Railway Safety.

[See Diagram Nos. 1A, 1A (Modified), 1B, 1C and 1D]

Note: -

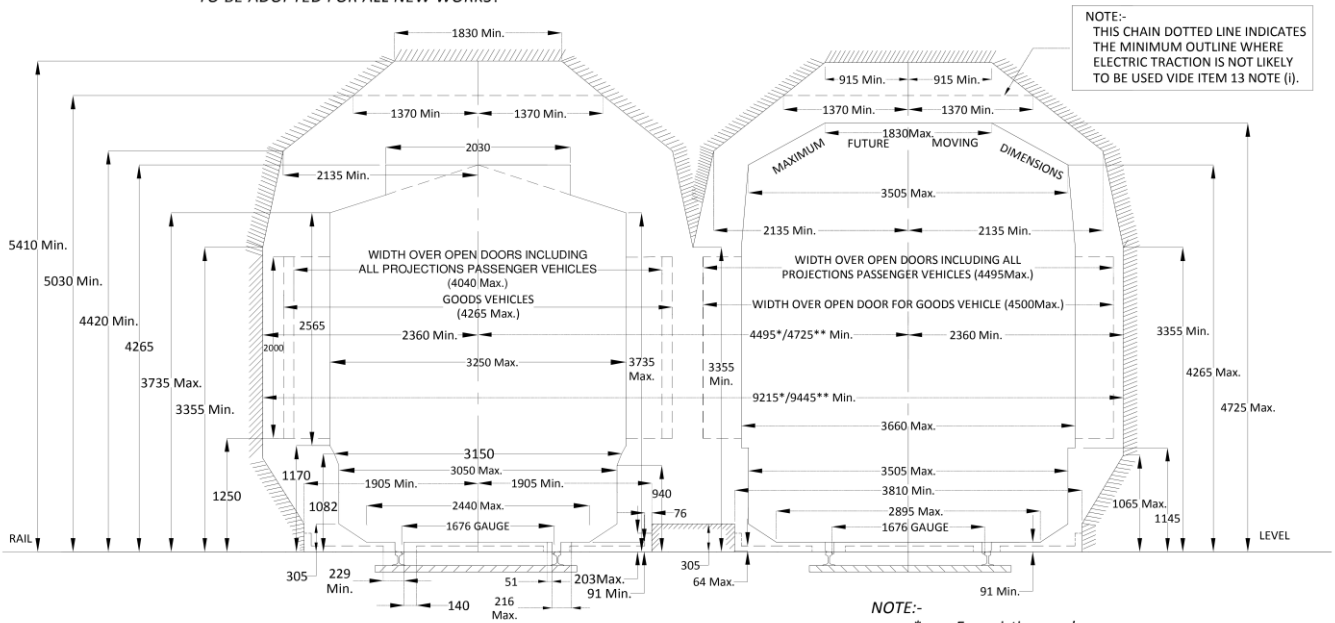
1. Items 8 and 10 are applicable only to structures outside station yards. All other items are of general applicability.
2. For running EMU and other 3660mm Stock on existing works, clearances prescribed in items 13(i) (a) and (ii) of Chapter I "Tunnels, Through and Semi Through, Girder Bridges" shall also be required for all structures governed by items 1(i), 7(i), 8(i) and 12 of this chapter and not only for tunnels, through and semi through girder bridges.

STANDARD DIMENSIONS FOR TUNNELS & THROUGH GIRDER BRIDGES
SCHEDULE I - CHAPTER I

DIAGRAM No. 1A
1676mm GAUGE

NOTE:- *1. WHERE THE LINE IS ON A CURVE ,THE HORIZONTAL DISTANCE OF ANY STRUCTURE FROM THE CENTRE OF ADJACENT TRACK AND THE DISTANCE BETWEEN CENTRES OF TRACKS ARE TO BE INCREASED ACCORDING TO THE APPENDIX.*

2. WHEN RE-SPACING EXISTING LINES,THE MINIMUM DISTANCE CENTRE TO CENTRE OF TRACKS MAY BE REDUCED FROM 4725 TO NOT LESS THAN 4495 FOR THE PURPOSE OF AVOIDING HEAVY ALTERATIONS TO TUNNELS OR THROUGH GIRDER BRIDGES. THE 4725 DIMENSION IS TO BE ADOPTED FOR ALL NEW WORKS.



NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

NOTE:-

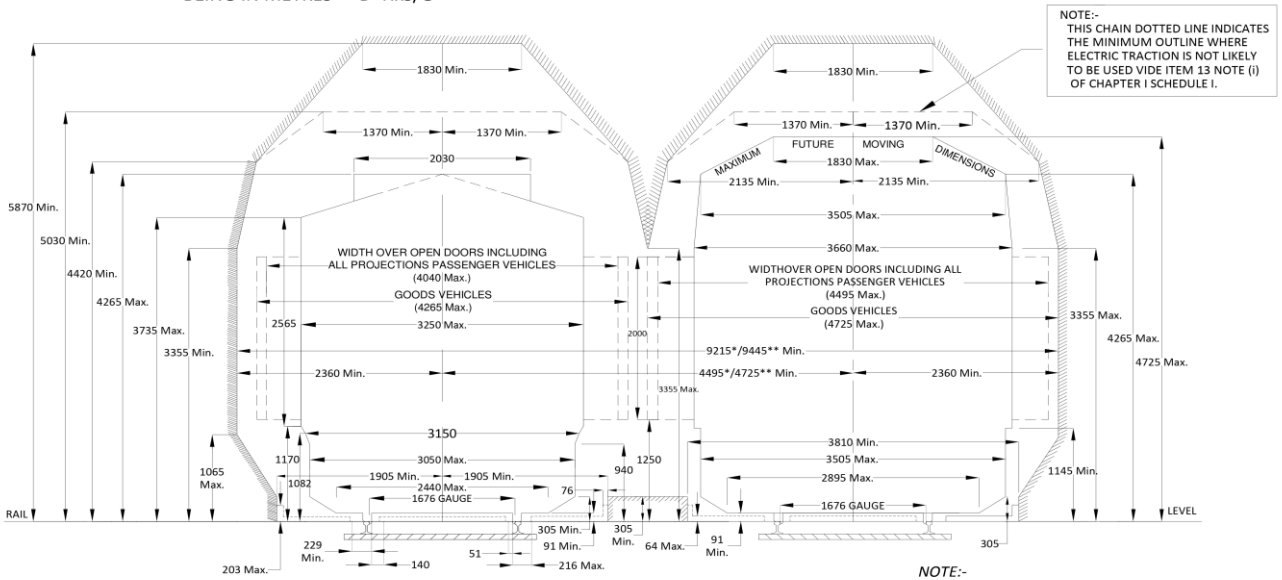
* - *For existing works*

** - *For new works or alteration to existing works*

DIAGRAM No. 1A (MODIFIED)
1676 mm GAUGE

STANDARD DIMENSIONS FOR TUNNELS & THROUGH GIRDER BRIDGES TO SUIT 25 k.V. A.C. TRACTION SCHEDULE I CHAPTER I

NOTE:- THE DISTANCES SPECIFIED APPLY ONLY IN CASE OF STRAIGHT TRACKS.ON CURVES, THE HORIZONTAL DISTANCE SHOULD BE INCREASED BY AN AMOUNT 'D' TO ALLOW FOR THE LEAN DUE TO SUPER-ELEVATION CALCULATED BY THE FOLLOWING FORMULA, WHERE 'H' IS THE HEIGHT OF THE CONTACT WIRE, 'S' THE SUPER- ELEVATION AND 'G' THE GAUGE OF THE TRACK, ALL DIMENSIONS BEING IN METRES D=HxS/G



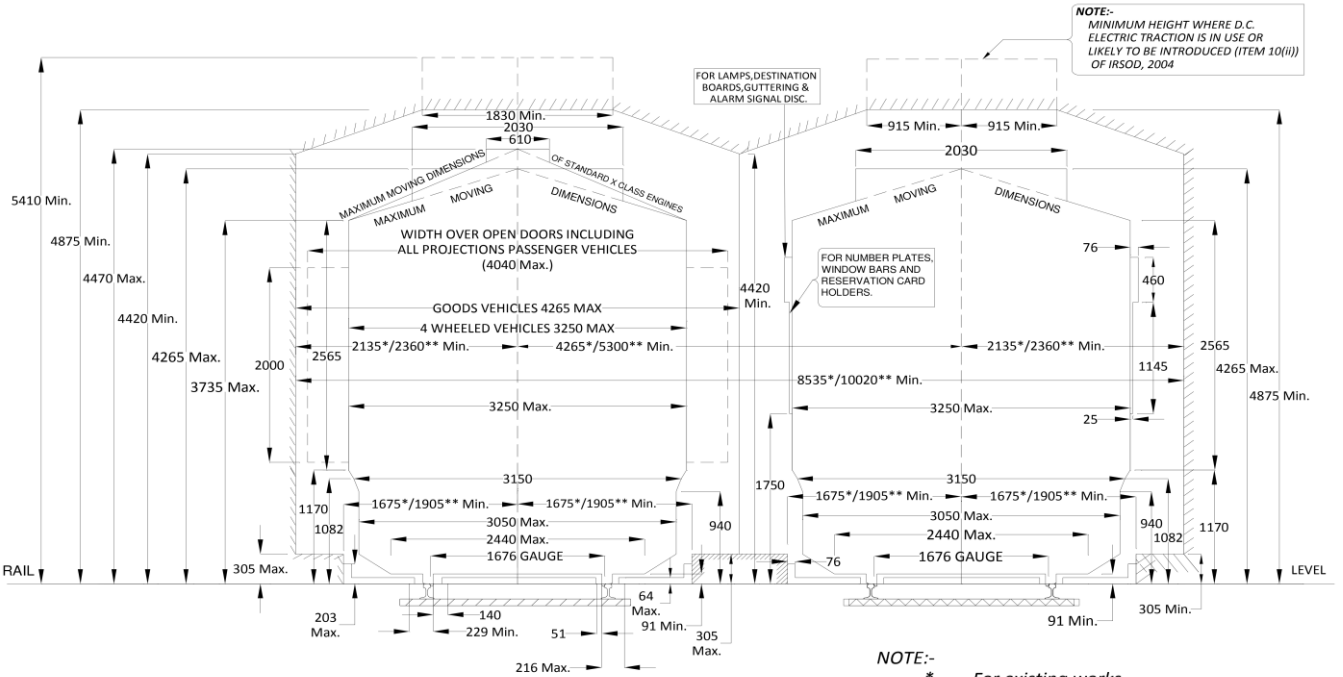
NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

NOTE:-
* - *For existing works*
** - *For new works or alteration to existing works*

STANDARD DIMENSIONS OUT OF STATIONS
SCHEDULE I - CHAPTER I

DIAGRAM No. 1B
1676 mm GAUGE

NOTE:- *WHERE THE LINE IS ON A CURVE, THE HORIZONTAL DISTANCE OF ANY STRUCTURE FROM THE CENTRE OF ADJACENT TRACK AND THE DISTANCE BETWEEN CENTRES OF TRACKS ARE TO BE INCREASED ACCORDING TO THE APPENDIX.*



NOTE:-
* - *For existing works*
** - *For new works or alteration to existing works*

NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

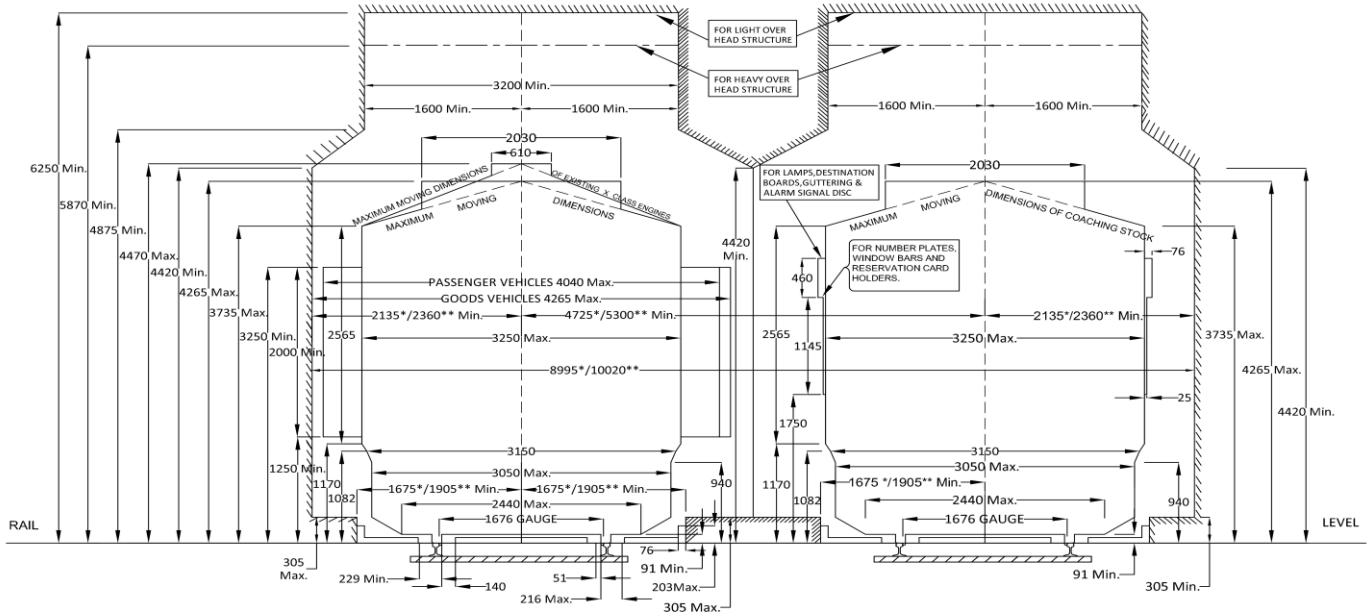
STANDARD DIMENSIONS OUT OF STATIONS

TO SUIT 25 kV. A.C. TRACTION

SCHEDULE I - CHAPTER I

DIAGRAM No. 1C
1676 mm GAUGE

NOTE:- *THE DISTANCES SPECIFIED, APPLY ONLY IN CASE OF STRAIGHT TRACK. ON CURVES,THE HORIZONTAL DISTANCE SHOULD BE INCREASED BY AN AMOUNT 'D' TO ALLOW FOR THE LEAN DUE TO SUPER-ELEVATION CALCULATED BY THE FOLLOWING FORMULA, WHERE 'H' IS THE HEIGHT OF THE CONTACT WIRE, 'S' THE SUPERELEVATION AND 'G' THE GAUGE OF THE TRACK, ALL DIMENSIONS BEING IN METRES* $D = \frac{H \times S}{G}$



NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

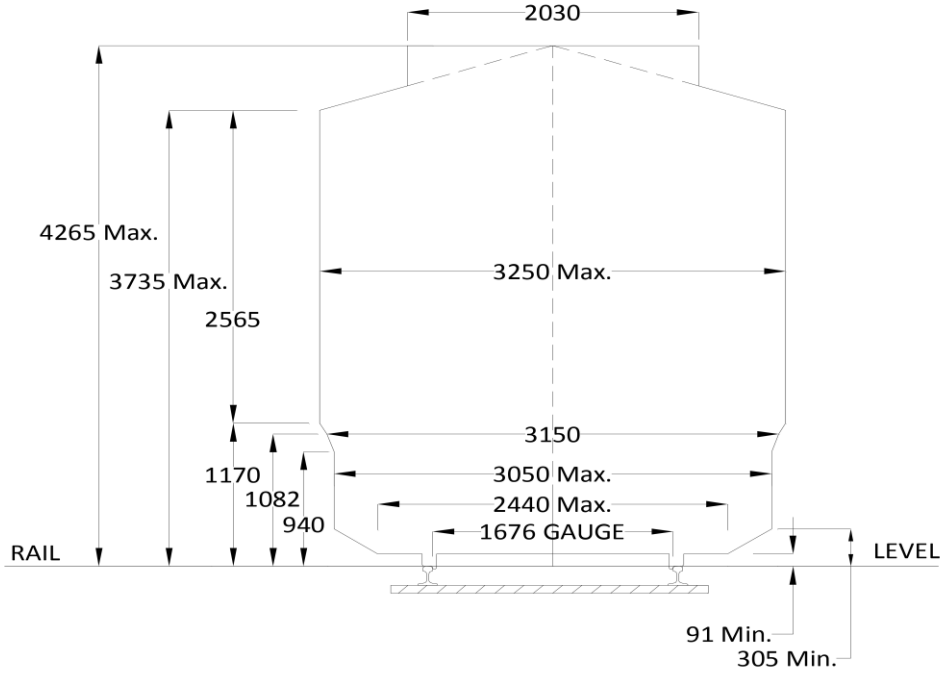
NOTE:-

* - *For existing works*

** - *For new works or alteration to existing works*

MAXIMUM MOVING DIMENSIONS

DIAGRAM No. 1D
(EDO/T-2202)
1676mm GAUGE



NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

56.2 Spacing of Tracks: -

1. **Minimum distance center to center of straight tracks**

(i)	**For existing works**	4265mm
(ii)	**For new works/addition to existing works**	5300mm

Note:

a) See Appendix for extra clearance required on curves.

b) For spacing of tracks in tunnels, Road Over Bridges/Flyovers, through and semi through girder bridges, see item 13.

c) New/Additional works cover laying of new line and new running loops. Extension of the existing line or replacement of points & crossings will not be treated as new work.

d) OHE mast and Signal post shall preferably not be provided in between tracks. However, under unavoidable circumstances, the clearances mentioned in para 1(ii) above shall be increased equal to the width of such provisions/structures/foundation, as the case may be.

e) In case of tunnels, ROBs, flyovers, through & semi-through girder bridges, where center to center distance lesser than 5300mm between tracks has been provided, lesser center to center distance between tracks can be provided on approaches also up to adequate distance to facilitate gradual increase in center-to-center distance up to minimum 5300mm.

f) Further, in case lesser than 5300mm center to center distance between tracks has been provided in the existing station yard, lesser center to center distance between tracks can be provided on approaches towards block section also, up to adequate distance to facilitate gradual increase in center-to-center distance up to minimum 5300mm.

56.3 Curves:

2.	**Minimum radius of curves**	175m (10 degrees)

56.4 Bridges:

3. Bridges must conform to the requirements of chapter IV of the Railways opening for the public carriage of Passengers, Rule 2000.

On existing bridges where there is nothing solid between sleepers to prevent a derailed wheel dropping, the clear distance between two consecutive sleepers shall not exceed 510mm. The clear distance between the joint sleepers shall not, however, exceed 200mm and that between the two consecutive sleepers 450mm in all new constructions and in existing bridges when regirdering or carrying out through

sleeper renewal.

Bridge sleepers resting directly on longitudinal girders should not be less than 150mm deep exclusive of any notching which may be required to allow for cover plates, camber, etc. and not less than 305mm greater in length than the distance outside to outside of girder flanges subject to a minimum of 2440mm. The minimum length of steel trough sleepers should be the distance outside to outside of girder flanges subject to a minimum of 2440mm

56.5 Rails:

4.	**Minimum clearance of check rails for a curve**	44mm

Note:

a) This clearance must be increased by not less than half the amount of any difference between 1676mm and the gauge to which the curve is actually laid.

b) Check rail to be provided in curves where the radius is 218 m or less i.e. curvature is 8^0 or more. It may be required in the case of flatter curves also, if high speed is contemplated.

5.	**(i) Minimum clearance of check rail at a level crossing**	51mm
	(ii) Maximum clearance of check rail at a level crossing	57mm

6.	**Minimum depth of space for wheel flange from rail level**	38mm

56.6 Buildings and structures: -

7.	**Minimum horizontal distance from center of track to any structure from rail level to 305mm above rail level**	
(i)	**For existing works**	1675mm
(ii)	**For new works or alterations to existing works**	1905mm

Note:

(a) Any material stacked by the side of line is to be considered a structure in the sense in which the word is used here. These items also apply to projections of rock etc., from the side of cutting.

(b) See appendix for extra clearance required on curves.

8.	**Minimum horizontal distance from center of track to any**

	structure except a platform	
(i)	**For existing works**	1675mm
(ii)	**From 305mm above rail level to 4420mm above rail level**	2135 mm
	(a) From 305mm above rail level to 1065mm	1905mm increasing to 2360mm
	(b) From 1065mm above rail level to 3355mm	2360mm
	(c) From 3355mm above rail level to 4420mm	2360mm decreasing to 2135mm
	(d) From 4420mm above rail level to 5870mm	2135mmdecreasing to 915mm

Note:

(a) Any material stacked by the side of line is to be considered a structure in the sense in which the word is used here. These items also apply to projections of rock etc., from the side of cutting.

(b) See appendix for extra clearance required on curves.

Light structures such as ladders, thin posts etc. erected alongside the track at a distance of less than 2360mm from the center of the adjacent track should be blanked off to a height of 300mm between 2060mm and 2360mm above rail level.

(iii)	**(a) Below the rail level up to the formation level of the track on straight and curves up to radius of 875m**	2575mm
	(b) Below the rail level up to the formation level of the track on curves with radius less than 875m	2725mm

Note:

(a) The required clearances mentioned under item 8 (iii) (a) and (b) above will be applicable in case of new lines/doubling/electrification.

(b) The various fixtures which are attached to the track like traction bonds etc. and are required to be fitted with the rail can be provided and the clearance as mentioned in item 8 (iii) (a) & (b) above will not be applicable to these fixtures.

The clearances as mentioned in item no. 8 (iii) (a) and (b) above will not be applicable in the case of bridges, tunnels & ballast less track (including washable apron).

9. Minimum horizontal distance of any telegraph post measured from the center of and at right angles to the nearest track.

(i) For existing works	The height of the post plus 2135mm
(ii) For new works or alterations to existing works	The height of the post plus 2360mm

Note: When the line is in cutting a telegraph post erected outside the cutting, must be at a distance from the edge of the cutting not less than the total height of the post.

10. **Height of Road Over Bridges & Foot Over Bridges:**

a) Minimum height above rail level for a distance of 915mm on either side of the center of track for overhead structures	4875mm
b) Where D.C. electric traction is in use or is likely to be used, this dimension shall be	5410mm
c) Where 25 KV A.C. traction is likely to be used, the minimum height above rail level for a distance of 1600mm on either side of the center of track shall be as under: (i) Light Overhead structure, such as Foot Over Bridges (ii) Heavy Overhead Structure, such as Road Over Bridges and 5870mm Flyovers	6250mm 5870mm

Note:

(a) See appendix for 'extra clearance required on curves.'

(b) In case of restricted height of existing structures, a special study shall be made, as indicated in Appendix-A to Chapter V-A before 25

kV A.C. traction is introduced. Accordingly, only in such cases, the minimum height above rail level shall not be lower than 5070mm in case of Heavy Overhead Structure (such as Road Over & Flyover) and 5270mm in case of Light Overhead Structures (such as Foot Over Bridge) for a minimum contact wire height of 4800mm from above rail level. OHE arrangements shall be as per RDSO Drawings.

(c) In areas where 25 kV A.C. traction is used or likely to be used, if any turnout or crossover is located under a heavy overhead structure or within 40m from its nearest face, irrespective of the position of level crossing gate, the minimum height of such overhead structure shall be 6250mm*. In case the turnout is beyond 40m; but the level crossing gate is within 520m from the nearest face of the bridge, the height of such overhead structure shall be 6250mm*.

(d) The height mentioned against items 10(a), 10(b) & 10(c) above shall be measured from the higher or super elevated rail.

(e) On lines, existing or proposed to be electrified on 25kV A.C. system, necessary provision shall be made in overhead structure and overhead equipment, if necessary, by using longer traction overhead equipment masts to permit an extra allowance of 275mm for raising of track in future to cater for modern track structure in the form of increased ballast cushion, larger sleeper thickness and deeper rail sections.

* In case of restricted height of existing heavy overhead structure, minimum height above rail level shall not be lower than 5270mm, adhering to the provisions of note (b) above.

(f) For Mumbai Suburban, the height of Foot Over Bridges mentioned under para 10(c)(i) above may be reduced to 5750mm subject to following conditions:

i) The minimum height of the contact wire shall be 4800 mm.
ii) A special study shall be conducted as indicated in appendix A of chapter V-A to ascertain the feasibility of the contact wire height as 4800mm.
iii) There shall be no crossover below FOB or within 40 m from the face of FOB.
iv) There shall be no level crossing within 520 m from the face of FOB.
v) The maximum height of rolling stock shall be restricted to 4420 mm.
vi) The height shall be measured from the higher or super-elevated

rail.

11. **Clearance for Power line crossings including Telephone line crossings of Railway Tracks –**

(i) Clearances for Power line crossings in Non-Electrified & Electrified Territory:

SL	Overhead crossing voltage	Minimum clearances from Rail Level		Minimum clearance between highest Traction Conductor and lowest Transmission line crossing conductor
		Existing power line crossing for Non-Electrified Territory	New power line crossing or crossing planned for alteration	
(1)	(2)	(3)	(4)	(5)
1	Up-to and including 11kV	Normally by underground cable		
2	Above 11kV & up-to 33kV	10860 mm	14660 mm	2440 mm
3	Above 33kV & up-to 66kV	10860 mm	14960 mm	2440 mm
4	Above 66kV & up-to 132kV	11760 mm	15560 mm	2440 mm
5	Above 132kV & up-to 220kV	12660 mm	16460 mm	4580 mm
6	Above 220kV & up-to 400kV	14460 mm	16460 mm	5490 mm
7	Above 400kV & up-to 500kV	15360 mm	16460 mm	7940 mm
8	Above 500kV & up-to 800kV	18060 mm	16460 mm	7940 mm

Note:

(i) All height/clearances are in mm and under maximum sag conditions.

(ii) If the crossing is provided with a guarding, a minimum clearance of 2000mm shall be maintained between bottom of guard wire and highest traction conductor.

(iii) Power line crossings in yards and stations areas shall be avoided.

(iv) For electrification works of existing track or construction of new track/gauge conversion with electrification, existing power line crossings can continue, if dimensions are as per column (5) above, even if dimensions of column (3) are not satisfied i.e., for electrification works column (3) is not applicable.

(ii) Minimum clearance between any conductor not adequately insulated and any railway structure under most adverse conditions.

SL	Voltage	Minimum Clearance
(1)	(2)	(3)
(a)	Up-to and including 650 volts	2500mm
(b)	Above 650 volts and up-to & including 33 kV	3700mm
(c)	Above 33 kV and up-to & including 66 kV	4000mm
(d)	Above 66 kV and up-to & including 132 kV	4600mm
(e)	Above 132 kV and up-to & including 165 kV	4900mm
(f)	Above 165 kV and up-to & including 220 kV	5500mm
(g)	Above 220 kV and up-to & including 400 kV	7300mm
(h)	Above 400 kV and up-to & including 500 kV	8200mm
(i)	Above 500 kV and up-to & including 800 kV	10900mm

(iii) Minimum height above rail level for telegraph, telephone 6100mm and other such low-tension wires crossing a railway

(iv) **Minimum Horizontal Distance of Structures:**

The minimum horizontal distance measured at right- angle to, and from the center of nearest track to any part of the structure above ground level, carrying electrical conductor crossing a railway line shall be:

(i)	**For new structure**	(H+6) m
(ii)	**For existing rigid well founded post/structures**	3m, or 1.5m away from the toe of embankment/top of cutting, whichever is more
Where, 'H' is the height of post/structure from nearest ground level		

Note:

1. Rigid well founded post/structure: Any post/structure which is so constructed or guyed as to remain in a vertical position, or failing this to

continue to provide the minimum horizontal clearances of 2.135m from the center of nearest track, with one or all of the conductors broken or with its conductors attached, when subjected to maximum wind pressure, shall be considered to be a "rigid well founded post/structure".

The existing rigid well founded post/structures, presently at a distance equal to or more than (ii) as given above, but less than (H+2.135) m, shall be inspected by railway's nominated electrical official once in a year jointly with the owner of the post/structure and certify the safety of the structure, keeping appropriate records of inspections.

2. If the existing post/structure carrying electrical conductors crossing a railway line, is not rigid and well-founded then the minimum horizontal distance, measured at right angles from the center of nearest track, shall be equal to height of post/structure above ground level plus 2.135m.

56.7 Interlocking and signal gear: -

12	Maximum height above rail level of any part of interlocking or signal gear for a width of 1600mm or 1830mm in the case of tunnels, through and semi- through girder bridges on either side of center of track subject to the restriction embodied in the note (a) below.	64mm

Note: -

a) For a distance of 229 mm outside and 140mm inside the gauge faces of the rail, no gear or track fittings must project above rail level except such parts as are required to be actuated by the wheels or wing rails and point rails of special crossings leading to snag dead ends or elevated check rails of crossing or check rails/check flats of diamond crossings.

b) Signal wires or supports for signal wires may be allowed at not less than 1600 mm or 1830mm in the case of tunnels or through or semi-through girder bridges [see note at item 32 of chapter IV(A)] on either side of the center of track provided that they are not more than 203mm above rail level.

c) Metal covers with ramps on both sides must be provided over all interlocking gear projecting above rail level between the rails of a track to prevent hanging couplings from damaging the gear.

56.8 Tunnels, Through Girder Bridges and Semi-Through Girder Bridges:

[(See diagram No.1A; 1-A (Modified)]

13	(i) Minimum distance at center to center of track		
		a) For existing lines	4495mm
		b) For new works and alterations to existing works	4725mm
	(ii) Minimum horizontal distance from center of track to any structure shall be as follows:		

Height above rail level	**Horizontal distance from center of track**
a) From 0.0mm to 305mm	1905mm
b) From 305mm to 1065mm	1905mm increasing to 2360mm
c) From 1065mm to 3355mm	2360mm
d) From 3355mm to 4420mm	2360mm decreasing to 2135mm
e) From 4420mm to 5870mm	2135mm decreasing to 915mm

Note:

(i) Where electric traction is not likely to be used, over-head bracing of bridges may be 5030mm above rail level for a distance of 1370mm on either side of the center of track.

(ii) In the case of existing structures, a special clearance study shall be made which will be accepted by Electrical Inspector of the Railways, as indicated in Appendix-A to chapter V-A before electric traction is introduced.

(iii) See Appendix for extra clearances required on curves.

(iv) Where D.C. traction is in use, Para 13(ii) (e) above shall be as under:
From 4420mm to 5410mm : 2135mm decreasing to 915mm

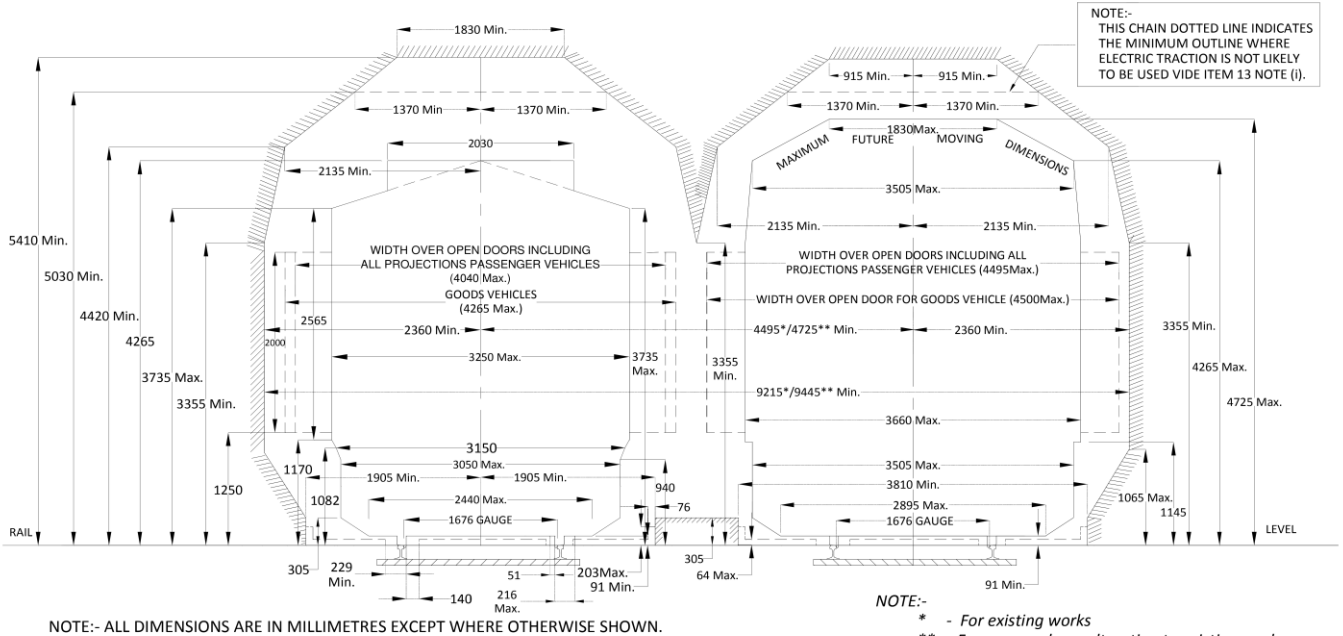
(v) Tunnels, through girder and semi through girder bridges outside station yards should be treated as heavy overhead structures such as ROB for electrification works and the same dimensions as mentioned in note (c) at para 10 above shall be applicable and OHE arrangement shall be as per RDSO Drawings.

DIAGRAM No. 1A
1676mm GAUGE

STANDARD DIMENSIONS FOR TUNNELS & THROUGH GIRDER BRIDGES
SCHEDULE I - CHAPTER I

NOTE:- *1. WHERE THE LINE IS ON A CURVE ,THE HORIZONTAL DISTANCE OF ANY STRUCTURE FROM THE CENTRE OF ADJACENT TRACK AND THE DISTANCE BETWEEN CENTRES OF TRACKS ARE TO BE INCREASED ACCORDING TO THE APPENDIX.*

2. WHEN RE-SPACING EXISTING LINES,THE MINIMUM DISTANCE CENTRE TO CENTRE OF TRACKS MAY BE REDUCED FROM 4725 TO NOT LESS THAN 4495 FOR THE PURPOSE OF AVOIDING HEAVY ALTERATIONS TO TUNNELS OR THROUGH GIRDER BRIDGES. THE 4725 DIMENSION IS TO BE ADOPTED FOR ALL NEW WORKS.



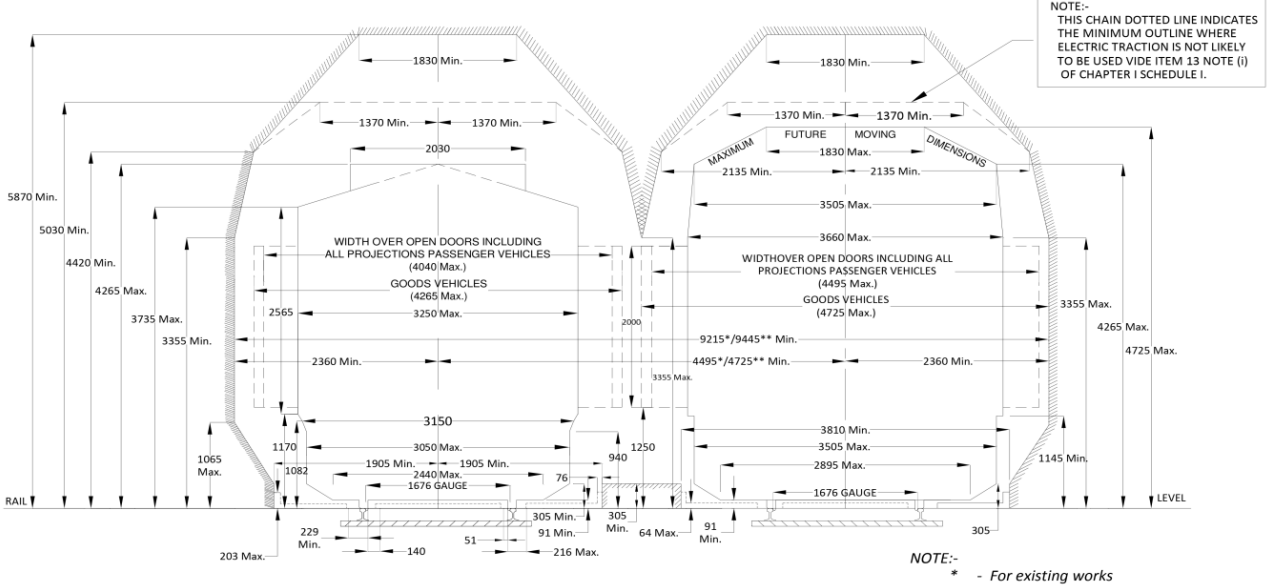
NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

NOTE:-
** - For existing works*
*** - For new works or alteration to existing works*

DIAGRAM No. 1A (MODIFIED)
1676 mm GAUGE

STANDARD DIMENSIONS FOR TUNNELS & THROUGH GIRDER BRIDGES TO SUIT 25 k.V. A.C. TRACTION SCHEDULE I CHAPTER I

NOTE:- THE DISTANCES SPECIFIED APPLY ONLY IN CASE OF STRAIGHT TRACKS.ON CURVES, THE HORIZONTAL DISTANCE SHOULD BE INCREASED BY AN AMOUNT 'D' TO ALLOW FOR THE LEAN DUE TO SUPER-ELEVATION CALCULATED BY THE FOLLOWING FORMULA, WHERE 'H' IS THE HEIGHT OF THE CONTACT WIRE, 'S' THE SUPER- ELEVATION AND 'G' THE GAUGE OF THE TRACK, ALL DIMENSIONS BEING IN METRES D=HxS/G



NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

NOTE:-
* - *For existing works*
** - *For new works or alteration to existing works*

56.9 Safety Refuges:		
14	Maximum distance apart of refuges in tunnels	100m
15	Maximum distance apart of trolley refuges:	
	(i) On bridges with main spans of less than 100m	100m
	(ii) On bridges with main spans of 100m or more	A refuge over each pier
56.10 Formation width:		
16	Formation width for single line straight track	
	(i) For existing works a) Minimum width in embankment b) Minimum width in cutting (excluding side drains)	 6850mm 6250mm
	(ii) For new works/alteration to existing works a) Minimum width in embankment b) Minimum width in cutting (excluding side drains)	 7850mm 7850mm
17	**Formation width for double line straight track**	
	(i) For existing works	
	a) Minimum width in embankment	12150mm
	b) Minimum width in cutting (excluding side drains)	11550mm
	(ii) For new works/alteration to existing works	
	a) Minimum width in embankment	13160mm
	b) Minimum width in cutting (excluding side drains)	13160mm

Note:

(a) The minimum formation width is based on:
- (i) Ballast section having 1.5:1 side slope.
- (ii) Cross slope on top of formation of 1 in 30
- (iii) Track center in case of double line section is 5300 mm

18. Formation width on curves:

a) Increase due to extra ballast on outside of curves:

On curves, the actual width to be provided should take into account 150mm extra widening of ballast shoulder (500mm in place of 350mm) required on the outer side of curves. Thus, additions in the width on this account will be 150mm for single line and 300mm for double line.

b) Increase on double line due to effect of super-elevation:

Due to requirement of extra clearances on double line on curves, increase in track center with corresponding increase in formation width would be necessary to take into account the effect of super- elevation.

Increase in formation width on curves will be decided after taking into account the increase mentioned in (a) & (b) above.

56.11 Gauge on straight and curves

19. **Gauge on straight and curves:** The gauge shall be as follows:

(i) Straight including curves of 350m radius or more	-5mm to +3mm i.e. 1671mm to 1679mm
(ii) For curves of radius less than 350m	up to +10mm i.e.1686mm

SCHEDULE - II

56.12 Existing infringements of schedule I which may be permitted to continue on existing 1676 mm gauge Railways.

The following infringements of the dimensions prescribed in schedule I may, subject to such restrictions of speed as are considered necessary, be permitted on existing railways (see diagram No. 3) it being understood that when structures are altered, they will be rebuilt to comply with schedule I, except in case of structures falling under item 7.

Dimensions marked (a) refer to the requirements for 3250 mm wide stock [chapter IV(A) of schedule I], and those marked (b) refer to the requirements for 3660 mm wide and 4725 mm high

stock (chapter IV(B) of Schedule I)

1	**(a) Minimum distance center to center of tracks**	3660mm
	(b) Minimum distance center to center of tracks	4040mm
2	**(a) Minimum clear horizontal distance from center of track to any fixed structure from rail level to 1065mm above rail level**	1675mm
	(b) Minimum clear horizontal distance from center of track to any fixed structure from rail level to 1065mm above rail level	1905mm
3	**(a) Minimum clear horizontal distance from center of track to any fixed structure from 1065mm above rail level to 3505mm above rail level**	1980mm
	(b) Minimum clear horizontal distance from center of track to any fixed structure from 1065mm above rail level to 3355mm above rail level	2135mm
4	**(a) Minimum clear horizontal distance from center of track at 4265mm above rail level**	2055mm
5	**(a) Minimum clear height above rail level for a distance of 305mm on either side of center of track.**	4420mm
	(b) Minimum clear height above rail level for a distance of 915mm on either side of center of track.	5030mm

Note:

i) Items 2(a), 3(a), 3(b) and 4(a) refer to structures outside station yards only.

ii) Where speed is restricted to 16 km/h, the minimum clear horizontal distance under 4(a) may be reduced to 1980 mm.

iii) Where, as on girder bridges, ashpits, etc., the structure is not likely to be out of plumb and the super- elevation (or level of rails) does not vary and where the speed is restricted to 16 km/h, the above dimensions may be reduced to:
3580 mm for 1(a),
3960 mm for 1(b),
1905 mm for 3(a),
2055 mm for 3(b),
1980 mm for 4(a),
4265mm for 5(a),
4875 mm for 5(b)

iv) To the horizontal distance given in 1 to 5 must be added the extra allowance for curves (See Appendix). Where existing structures do not permit these allowances being given, they may be reduced by limiting the superelevation to be allowed for outer over inner rail. When this is done a noticeboard should be erected against the structure, stating the maximum permissible superelevation.

56.13 The minimum permissible clearances in existing tunnels and girder

6.	**The minimum permissible clearances in existing tunnels and girder bridges shall be:**		
i)	**Under any circumstances and subject to any restriction of speed which it may be considered necessary to impose:**		
		In tunnels (See Diagram No.3)	**On girder bridges**
At	'A'	229mm	229mm at top of sides of vehicles
	'B'	305mm	229mm at side of vehicles
	'C'	380mm	305mm between moving trains
	'D'	229mm	152mm above vehicles
ii)	**For unrestricted speeds:**		
		In tunnels	**On Girder Bridges**
At	'A'	380mm	229mm at top of sides of vehicles
	'B'	535mm	455mm at sides of vehicles
	'C'	610mm	535mm between moving trains
	'D'	305mm	229mm above vehicles.

Where doors opening inwards or of the recessed or sliding type are provided the minimum clearances in tunnels and bridges may be reduced to 380 mm, at `B' and 455 mm at `C' for unrestricted speed. To the above must be added the extra allowance for curves (See Appendix).

7. Structures which have already been built in accordance with items 10 and 13 of chapter I, items 9,10 and 11 of chapter II and items 5 and 6 of chapter III of Schedule I as contained in the 1958 reprint, reproduced in note below, may infringe the dimensions now shown against these items. Such infringements may continue and alterations for the removal of such infringements need be taken up only when 25 K.V. A.C. Electric Traction is undertaken when a study shall be made of each structure to limit the extent of alterations as indicated in Appendix A to chapter V-A.

Note: The above items as reproduced below are not minimum dimensions of Schedule -II. The minimum dimensions of Schedule-II are as mentioned in items 1 to 6, 8 and 9 of Schedule –II.

56.14 Minimum height above rail level for overhead structure

Item 10 chapter I, Schedule I

Minimum height above rail level for a distance of 915 mm on either side of the center of track	4875mm

Note: See Appendix for 'extra clearance required on curves'

Item 13, Chapter I Schedule I

56.15 Minimum distance center to center of tracks

(i)	**Minimum distance center to center of tracks**	4725mm

Note: When respacing existing lines, the minimum distance center to center of tracks may be reduced from 4725 mm to not less than 4495 mm for the purpose of avoiding heavy alterations to tunnels or through or semi through girder bridges. The 4725 mm dimension is to be adopted for all new works.

56.16 Minimum horizontal distance from center of track

(ii)	**Minimum horizontal distance from center of track to any structure shall be as follows:**	
	Height above rail level	**Horizontal distance from center of track**
a)	**From 0 to 305 mm**	1905 mm
b)	**From 305mm to 1065mm**	1905 mm increasing to 2360mm
c)	**From 1065mm to 3355mm**	2360 mm
d)	**From 3355mm to 4420mm**	2360 mm decreasing to 2135mm
e)	**From 4420mm to 5410mm**	2135 mm decreasing to 915mm

Note:

a) Where electric traction is not likely to be used overhead bracing of bridges may be 5030 mm above rail level for a distance of 1370mm on either side of center of track.

b) See Appendix for extra clearance required on curves.

Item 9, chapter II, schedule I

56.17 Minimum height above rail level in a passenger station

Minimum height above rail level for a width of 1370mm on either side of the center of track, of tie rods or any continuous covering in a passenger station.	6100mm

Note: Item 9 does not apply to overhead piping parallel to the track.

Item 10, Chapter II, Schedule I

Minimum height above rail level for a width of 1370mm on either side of the center of track of a signal gantry or a foot over bridge in passenger station	4875mm

Note:

(a) This also applies to overhead piping arrangements parallel to track wherever provided which shall necessarily be changed over to the ground hydrants when the section is electrified.

Item 11, chapter II, Schedule I

56.18 Minimum horizontal distance from center of track to any structure

(i)	**From rail level to 305mm above rail level**	1675mm
(ii)	**From 305mm above rail level to 3355mm above rail level**	2135mm
(iii)	**From 3355mm above rail level to 4115mm above rail level**	2135mm decreasing to 1980mm
(iv)	**From 4115mm above rail level to 6100mm above rail level**	1370mm
Note:	See Appendix for clearance required on curves.	

Item 5, Chapter III, Schedule I

56.19 Minimum height above rail level to overhead tie bars, girders etc. in workshops and running sheds

(i)	**Where electric traction is not likely to be used**	5030mm
(ii)	**Where electric traction is likely to be used**	6176mm

Item 6, Chapter III, Schedule I

56.20 Minimum height above rail level of doorways for a width of 1370mm on either side of center of track, in both workshops and running sheds

(i)	**Where electric traction is not likely to be used**	4875mm
(ii)	**Where electric traction is likely to be used**	6176mm

56.21 A.C Traction 25 K.V. 50 cycles

8.	**General: For tunnels & through girder bridges.**	
	Minimum horizontal distance from center of track to any structure from 4420mm to 5410 mm above rail level	2135mm decreasing to 915mm

Note: See Appendix for extra clearance required on curves.

9.	**Minimum horizontal distance from center of track to any structure from 4115 mm to 6100 mm above rail level**	1370mm

Note: See Appendix for extra clearance required on curves.

APPENDIX

Note:

a) Column 5 applies to goods platforms 1065 mm above rail level which are not on a running line. For such platforms on running lines 25mm should be added to the figures given in column 5.

b) Where electric traction is likely to be used, add 1mm for every 12mm of height above 5410 to the figures given in column 7 up-to the height at which the conductor wires are likely to be fixed.

c) Where there is a structure between tracks, the extra clearance to be provided must be according to columns 5, 6, 7 and 8 instead of column 9.

d) Appendix showing extra clearance on curves has been revised. In the revised table, the maximum permissible speed and corresponding superelevation are indicated, and the required clearances based on these superelevation's have been given.

Note on Extra Clearance on Curves

1. It has been contended that the extra clearance prescribed for curves both in the 1913 and in the 1922 Schedule of Dimensions was too liberal in the case of platforms and caused a gap between the platform and foot board at certain parts of a bogie carriage, which was dangerous to passengers. In the 1922 schedule, the allowance for lurching and sway of the carriage was treated as entirely additional to that already provided for such motion in the clearance given for straight platforms whereas only additional sway due to the curved track in excess of the maximum occurring on straight track need be provided for. The amount of superelevation allowed for was also excessive on the sharper curves.

2. The clearance provided between a vehicle (i.e. the foot boards) and the platform coping on the straight is 152mm. It is considered that to reduce the average distance between a curved platform and the foot boards the minimum clearance between a platform on the outside of a curve and the ends of a vehicle may safely be reduced to 127mm. The maximum movement due to lurching at the center of a vehicle cannot be greater than seven tenths of that at the ends, so that the minimum clearance between the center of a vehicle and a platform on the inside of a curve may be safely reduced to 102mm. Therefore, in calculating the extra allowance to be provided on curves as explained in paragraph 5, 6, 7 and 8, a reduction of these extra allowance has been made of 51mm on the inside and 25mm on the outside of curve as shown in paragraph 7.
3. **Allowance to be made: -** The additional clearance to be given on the inside of a curve must include the effect of curvature, the lean due to superelevation, and an allowance for any additional sway of the vehicles over that already provided for in the clearance on straight tracks. The additional clearance to be given on the outside of a curve must allow for the effect of curvature. Additional sway or lurch due to curve can be considered as fully counteracted by the inward lean of the vehicle due to superelevation.
4. **Allowance for curvature:** The allowance for curvature for a vehicle 21340mm long, 14785mm between bogie center shall be calculated as under: -

   At the center of vehicle

   $$V = \frac{14.785\ x\ 14.785\ x\ 1000}{8R} = \frac{27330}{R}\ \text{mm}$$

   At the end of vehicle

   $$Vo = \frac{21.340\ \text{x}\ 21.340\ \text{x}\ 1000}{8R} - \frac{27330}{R} = \frac{29600}{R}\ \text{mm}$$

   Where R is the radius of the curve in meters.

5. **Allowance for superelevation:** The lean due to superelevation at any point at height `h' above rail level is given by:

   $L = \frac{h}{g} \times S$ where S is the superelevation, g is the gauge of the track.

6. Allowance for additional sway on curves: The provision for additional lurch and sway on the inside of a curve as given in the 1913 and 1922 schedules has been adopted, namely one-fourth of the lean due to superelevation. No provision has been made for additional sway due to a curve in the outward direction for reasons already given in paragraph 3 above.

7. **Platforms: -** For platforms the total additional clearance to be provided is:

   On the inside of a curve

   (i) $V + \frac{5}{4} L - 51$ mm

   Where L is the lean in millimeters.

   On the outside of a curve--

   (ii) Vo – 25 mm

   (see paragraph 2 above)

   Column 5 of the Appendix has been calculated for a high passenger platform 840mm according to formula (i).

8. **Clearance from adjacent structure on the inside of a curve:** For obtaining the figures given in columns 6 & 7, formula (i) of paragraph 7 above has been used.

9. **Clearance from adjacent structures on the outside of a curve:** For column 8, formula (ii) of paragraph 7 above has been used.

10. **Extra clearance between adjacent tracks:** The worst case will be when the end of a bogie carriage on the inner track is opposite the center of a similar carriage on the outer track. Nothing is allowed for superelevation; it being assumed that both tracks will be inclined the same amount. Though there

are cases where a different superelevation is provided on each track, the distance allowed between centers of tracks gives a sufficient margin of safety to permit of this being omitted from consideration. The formula used for column 9 is

$$V + Vo + \frac{2L}{4}$$

and as the height adopted for the value of h in calculating L, is 3355mm, the above therefore reduces to

$$V + Vo + S$$

11. While locating any permanent structures by the side of the track in the case of trunk routes and main lines which have the potential for the increase of speed in future, the need for additional clearances for realignment of curves for higher speed operation should be kept in view. A table showing extra clearances necessary on curves between structures and the adjacent track, and between tracks when there are no structures is given in Annexure -1 for speed of 160 kmph.
12. The clearances worked out (Annexure I) are for a vehicle 21340 mm long with bogie centers 14785 mm apart. For vehicles having different dimensions, the clearances can be worked out in a similar manner.

ANNEXURE-I
ADDITIONAL APPENDIX EXTRA CLEARANCES
EXTRA CLEARANCES ON CURVES FOR HIGH-SPEED ROUTES (160 KMPH)

Degree of curvature	Radius of curve	Maximum permissible speed	Super-elevation	Extra Clearance between structure and adjacent track				Extra clearance between adjacent track when there is no structure between track
				Inside of curve			Outside of curve any height	
				Upto 840 mm above rail level	At 4420 mm above rail level	At 5410 mm above rail level		
1	2	3	4	5	6	7	8	9
degree	m	kmph	mm	mm	mm	mm	mm	mm
1	1750	158	95	25	280	350	-	130
1.5	1167	145	142	60	440	545	-	190
2	875	130	164	85	520	640	10	230
3	583	106	165	100	540	665	25	265
4	438	92	165	115	555	680	45	295
5	350	83	165	130	570	695	60	300
6	292	75	165	145	590	710	75	360
7	250	70	165	165	605	725	95	395
8	219	65	165	180	620	740	110	425
9	194	62	165	195	635	755	130	460
10	175	58	165	210	650	770	145	490

Note:

i) For any other heights extra clearance shall be worked out as per the Appendix of this Schedule of Dimension.

ii) In case of new line/ Gauge conversion/ Doubling (except in platform area)-

(a)	Below the rail level up to the formation level of the track on straight and curves up to radius of 875m	2575mm
(b)	Below the rail level up to the formation level of the track on curves with radius less than 875m	2725mm

iii) Maximum permissible speed has been worked out for can't deficiency value of 100mm and can't of 165mm. However, maximum cant of 185mm may be assumed for the purpose of locating all permanent structure by the side of the curves on new construction and doubling on Group A routes having potential of increasing the speed in future.

APPENDIX A TO CHAPTER V-A
Clearances required for 25 K.V., single phase, A.C. Electric Traction

1. It is desirable to provide the maximum possible clearances in the case of lines equipped for 25kV AC 50 Cycle single phase electric traction.

   Minimum Clearances between live bare conductors/ pantographs and Structure –

(a)	**Short term clearances -** Vertical and lateral distance between live Conductors and earth (normally existing only for a brief period)	200 mm
(b)	**Long term clearance -** Vertical and lateral distance between live Conductors and earth (which may remain for a considerable period)	250 mm

2. In order to ascertain whether the requisite clearance would be available under an existing structure, the permissible height of the contact wire shall be determined. For this purpose, the following particulars should be known: -
   (a) Particulars of the structure including profile
   (b) Allowance for slewing of tracks
   (c) Allowance for low joints in tracks.
   (d) Radius of curvature of track under the structure
   (e) Super-elevation of track under the structure
   (f) Maximum permissible speed under the structure
   (g) Maximum dimensions of over-dimensional consignments which are permissible and safety measures which would be taken for movement of over-dimensional consignments.
   (h) Location of the structure in relation to level crossings, water columns and turnouts in the vicinity.
   (i) Type of overhead equipment.
3. After determining permissible height of the contact wire based on above particulars, the clearance required between the lowest portion of the bridge or structure and the topmost

position of the overhead wire shall be determined in each case after study of the following:

a) System of tensioning of the overhead equipment
b) Atmospheric conditions.
c) Maximum permissible number of electric locomotives per train (double or triple headed)
d) Location of the structure in relation to points and crossings, overlap, spans, etc.
e) Length of structure along tracks.
f) Type of structure, girder, masonry etc.
g) The span of overhead equipment under the bridge
h) Presence of traction feeder
i) Likelihood of diesel locomotives halting under the structure.

4. (a) The minimum height of contact wire for a stock height of 4.42m to be able to run on all sections electrified with 25 kV A.C. traction system with live traction overhead equipment:

(i)	Height of the locomotive	4.42m
(ii)	Minimum clearances to contact wire	0.25m
(iii)	Allowance for track maintenance	0.02m
(iv)	Minimum height of contact wire (Total)	4.69m

Note: For OHE span length of 49.5m or below, the oscillations of contact wire get reduced to 0.05m and the minimum height of contact wire in para 4(a)(iv) can be reduced to 4.69m.

(b) After determining the minimum height of contact wire on the assumption that it would permit passage of standard locomotives and stock, the maximum height of over Dimensional Consignments (ODC) with the live overhead equipment at speed over 15km/h (when vertical oscillation of overhead equipment is pronounced) is derived as under:

Minimum height of Contact Wire: 4.69m

Less-

(i)	Minimum electrical clearance	0.20m
(ii)	Track allowance	0.02m
(iii)	Allowance for vertical oscillation of contact wire under influence of moving pantographs	0.05m
	Total	0.27m
Permissible maximum height of Over Dimensional Consignment		**4.42m**

(c) If an Over Dimensional Consignment is moved at slow speed not exceeding 15 kmph, there will be no downward displacement (due to oscillation) of contact wire. However, to cater for the likelihood of an Over Dimensional Consignment halting under a structure, a clearance of 0.25 m under rest condition is to be provided, vide item 1 of Chapter V - A. In this case the derived height of contact wire may be reduced by 50 mm.

5. In the case of light structures such as foot-over bridges, it would be desirable to keep a standard height of contact wire of 5.50m. In case of heavy structures, such as flyover bridges or road over bridges, it is desirable to keep the height of contact wire as low as possible, consistent with the requirements of movement of Standard Class `C' Over-Dimensional Consignments of height 4.80m.

ANNEXURE-II

Statement showing the correction slips issued to Indian Railway Schedule of Dimensions (BG), Revised-2004

Correction Slip No.	File No.	Date of issue	Page Nos. of IRSOD-2004
1. 97/CEDO/SR/14		March, 2006	10
2. 97/CEDO/SR/14		March, 2006	10
3. CT/SD/REV/BG/MG		Sept, 20	3,5,8,9,12,13, 14,15,16,19, 21,22,25,31 & 34
4.	Not Issued		
5. CT/SD/REV/BG/MG		Feb, 2009	11
6. CT/SD/REV/BG/MG		Oct, 2009	22
7. 2011/CEDO/SD/IRSOD/Elect. /02		March,2012	6,7,8,27,28,37 ,38,39
8. 2008/CEDO/SD/09		Nov, 2012	16
9. 2012/CEDO/SD/IRSOD/O		Oct, 2012	4,8 and10
10. 2011/CEDO/SD/IRSOD/Elect. /02		Nov, 2012	6,7,8,14,27,2 8, 32 and 38
11. 2012/CEDO/SD/IRSOD/O/01		Dec, 2012	12
12. 2013/CEDO/SD/IRSOD/O/01		May, 2013	10
13. 2011/CEDO/SD/IRSOD/Elect. /02		Oct, 2013	6,7,8,14 and 32
14. 2012/CEDO/SD/IRSOD/O/03		Nov, 2013	19,20,21,23,2 5
15. 2011/CEDO/SD/IRSOD/Elect. /02		June,2014	14
16. 2015/CEDO/SD/IRSOD/O/01		May.,2015	10 and 14
17. 2015/CEDO/SD/IRSOD/O/01		Aug, 2015	10
18. 2012/CEDO/SD/IRSOD/O		Nov, 2016	4
19. 2012/CEDO/SD/IRSOD/O(Pt.)		Nov.,2016	10
20. 2011/CEDO/SD/IRSOD/Elect. /02(Pt. II)		July, 2017	7 and 8
21. 2012/CEDO/SD/IRSOD/O/ACS-21		Sept, 2017	28
22. 2011/CEDO/SD/IRSOD/O/1		Dec, 2017	6, 7, 14, 12
23. 2011/CEDO/SD/IRSOD/O/2		Dec, 2017	12
24. 2017/CEDO/SD/IRSOD/O/2		Aug, 2018	12
25. 2018/CEDO/SD/IRSOD/ACS		Nov, 2018	04
26. 2017/CEDO/SD/IRSOD/O/ACS-83rd TSC		Jan, 2019	4,6,9,10, 14,20,22,25

27. 2019/CEDO/SD/IRSOD/O/ACS-27	July, 2019	4, 10, 12,21,25,28
28. 2019/CEDO/SD/IRSOD/ O/ACS-27	July, 2019	10
29. 2019/CEDO/SD/IRSOD/ O/ACS-27	May, 2020	10
30. 2020/CEDO/SD/IRSOD/ O/ACS-30	Feb, 2021	4, 6, 10,14
31. 2021/CEDO/SD/IRSOD/ O/ACS-a	Oct, 2021	30, 31, 32
32. 2021/CEDO/SD/IRSOD/ O/ACS-b	Oct, 2021	10

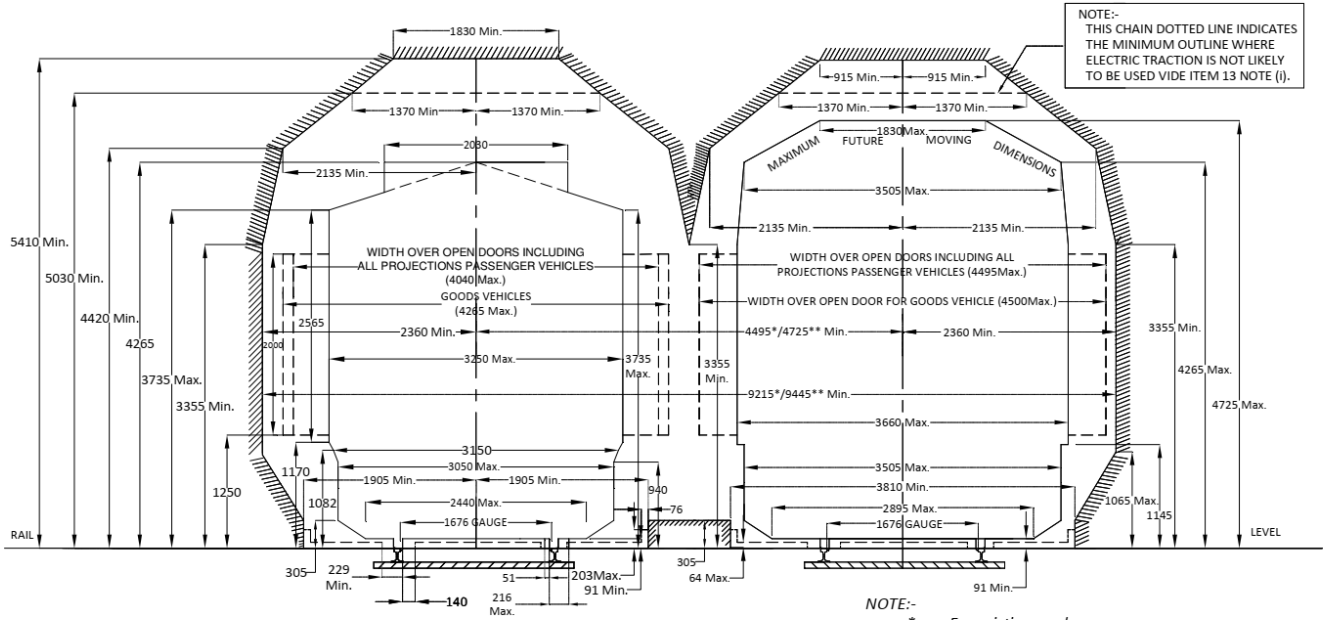
DIAGRAM No. 1A
1676mm GAUGE

STANDARD DIMENSIONS FOR TUNNELS & THROUGH GIRDER BRIDGES
SCHEDULE I - CHAPTER I

NOTE:-

1. *WHERE THE LINE IS ON A CURVE ,THE HORIZONTAL DISTANCE OF ANY STRUCTURE FROM THE CENTRE OF ADJACENT TRACK AND THE DISTANCE BETWEEN CENTRES OF TRACKS ARE TO BE INCREASED ACCORDING TO THE APPENDIX.*

2. *WHEN RE-SPACING EXISTING LINES,THE MINIMUM DISTANCE CENTRE TO CENTRE OF TRACKS MAY BE REDUCED FROM 4725 TO NOT LESS THAN 4495 FOR THE PURPOSE OF AVOIDING HEAVY ALTERATIONS TO TUNNELS OR THROUGH GIRDER BRIDGES. THE 4725 DIMENSION IS TO BE ADOPTED FOR ALL NEW WORKS.*



NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

NOTE:-

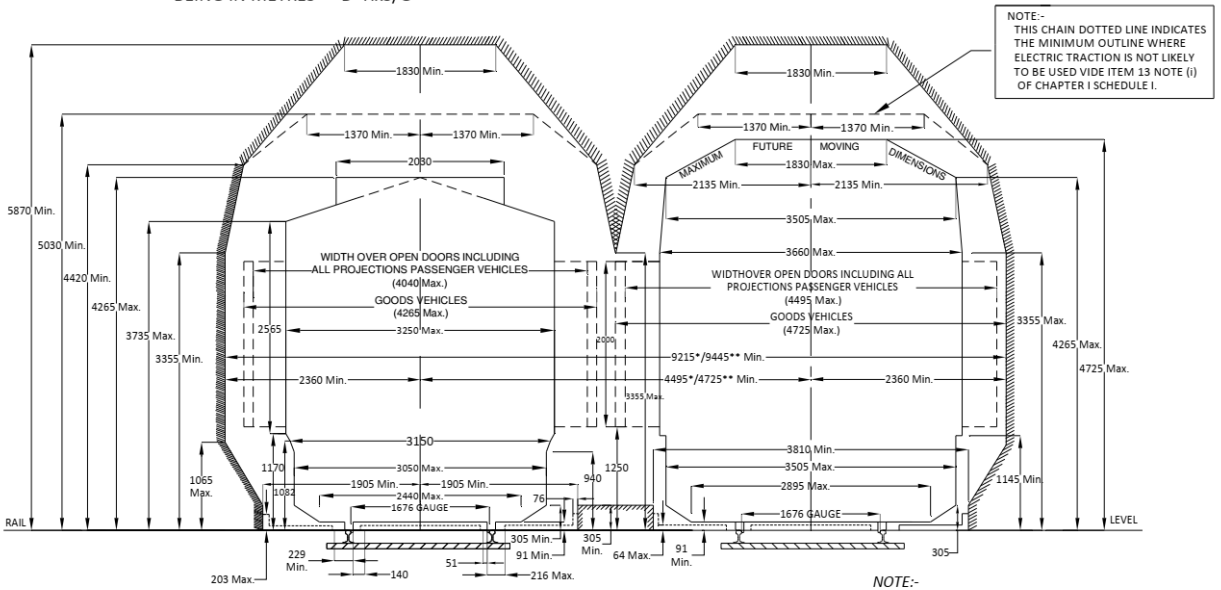
* - *For existing works*

** - *For new works or alteration to existing works*

DIAGRAM No. 1A (MODIFIED)
1676 mm GAUGE

STANDARD DIMENSIONS FOR TUNNELS & THROUGH GIRDER BRIDGES TO SUIT 25 k.V. A.C. TRACTION SCHEDULE I CHAPTER I

NOTE:- THE DISTANCES SPECIFIED APPLY ONLY IN CASE OF STRAIGHT TRACKS.ON CURVES, THE HORIZONTAL DISTANCE SHOULD BE INCREASED BY AN AMOUNT 'D' TO ALLOW FOR THE LEAN DUE TO SUPER-ELEVATION CALCULATED BY THE FOLLOWING FORMULA, WHERE 'H' IS THE HEIGHT OF THE CONTACT WIRE, 'S' THE SUPER- ELEVATION AND 'G' THE GAUGE OF THE TRACK, ALL DIMENSIONS BEING IN METRES D=HxS/G



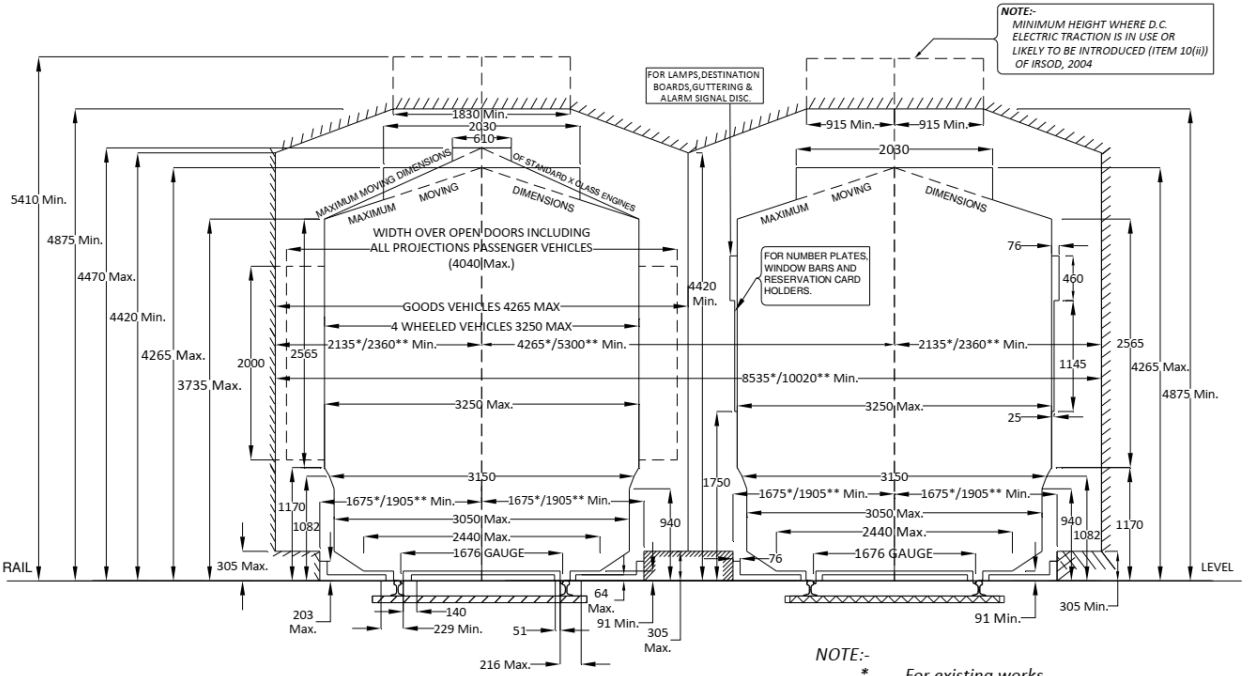
NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

NOTE:-
** - For existing works*
*** - For new works or alteration to existing works*

STANDARD DIMENSIONS OUT OF STATIONS
SCHEDULE I - CHAPTER I

DIAGRAM No. 1B
1676 mm GAUGE

NOTE:- *WHERE THE LINE IS ON A CURVE, THE HORIZONTAL DISTANCE OF ANY STRUCTURE FROM THE CENTRE OF ADJACENT TRACK AND THE DISTANCE BETWEEN CENTRES OF TRACKS ARE TO BE INCREASED ACCORDING TO THE APPENDIX.*



NOTE:-
* - *For existing works*
** - *For new works or alteration to existing works*

NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

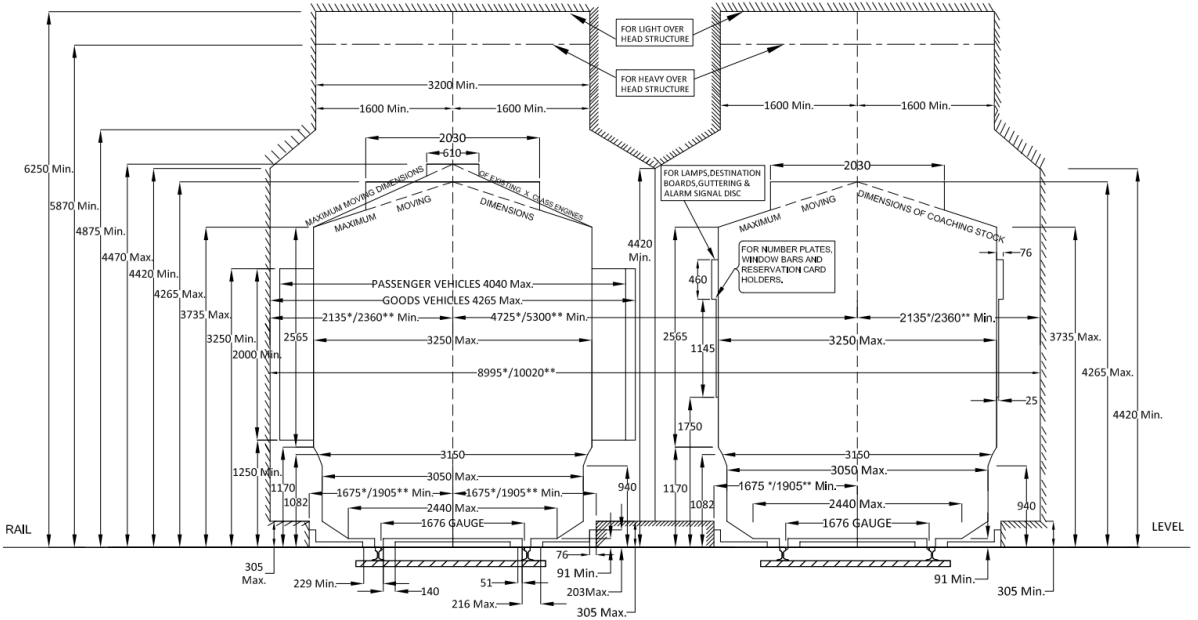
STANDARD DIMENSIONS OUT OF STATIONS

TO SUIT 25 kV. A.C. TRACTION

SCHEDULE I - CHAPTER I

DIAGRAM No. 1C
1676 mm GAUGE

NOTE:- *THE DISTANCES SPECIFIED, APPLY ONLY IN CASE OF STRAIGHT TRACK. ON CURVES,THE HORIZONTAL DISTANCE SHOULD BE INCREASED BY AN AMOUNT 'D' TO ALLOW FOR THE LEAN DUE TO SUPER-ELEVATION CALCULATED BY THE FOLLOWING FORMULA, WHERE 'H' IS THE HEIGHT OF THE CONTACT WIRE, 'S' THE SUPERELEVATION AND 'G' THE GAUGE OF THE TRACK, ALL DIMENSIONS BEING IN METRES* $D = \frac{H \times S}{G}$



NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

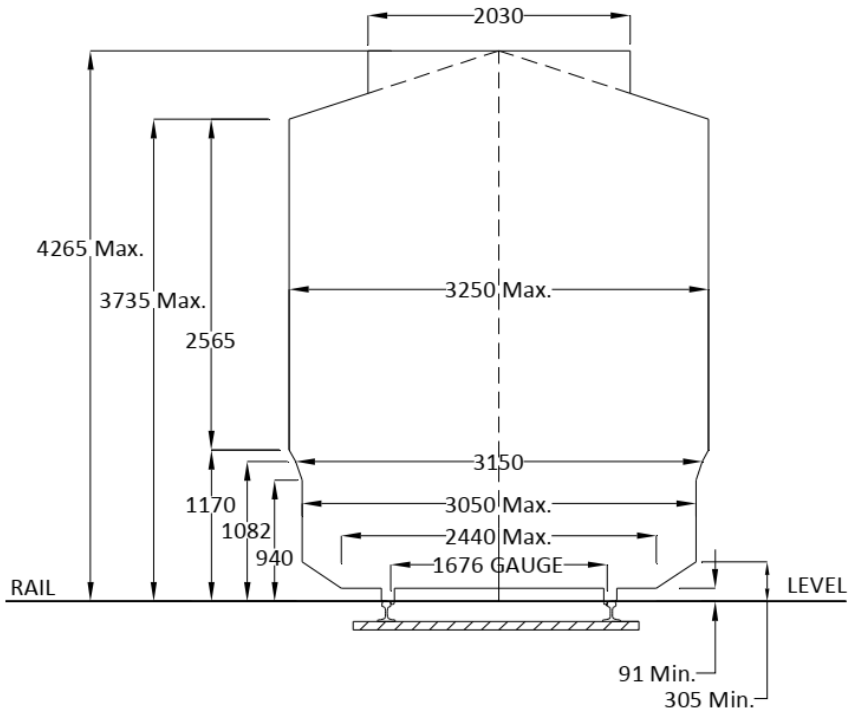
NOTE:-

* - *For existing works*

** - *For new works or alteration to existing works*

MAXIMUM MOVING DIMENSIONS

DIAGRAM No. 1D
(EDO/T-2202)
1676mm GAUGE

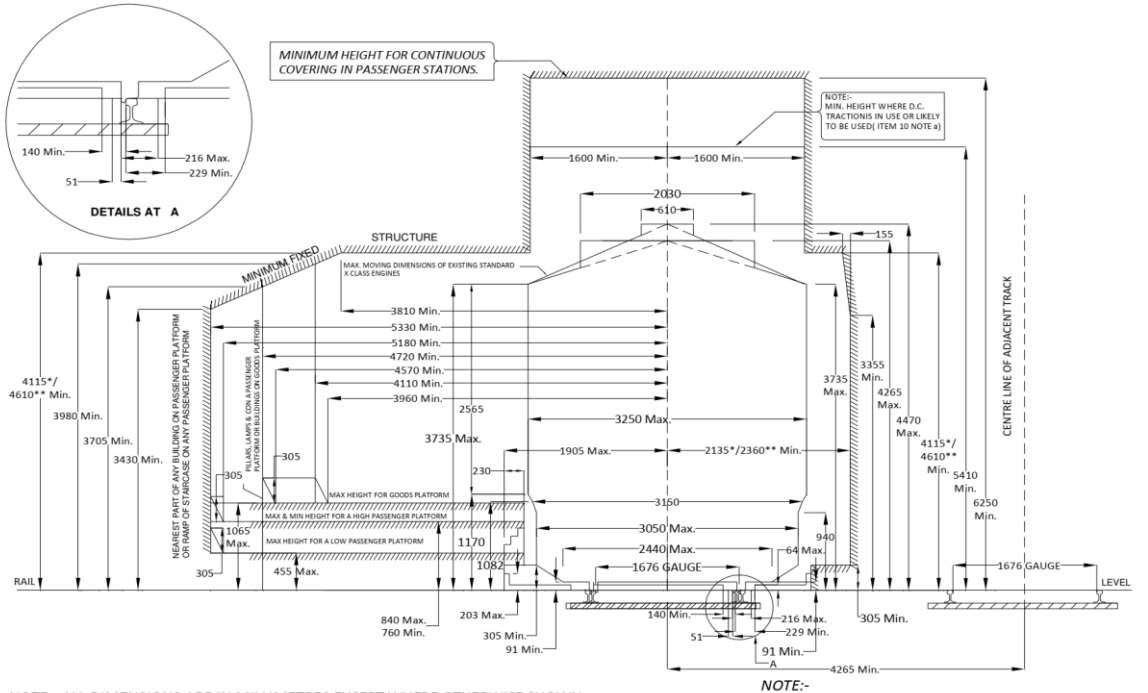


NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

DIAGRAM NO. 2
1676 mm GAUGE

STANDARD DIMENSIONS IN STATIONS
TO SUIT 25 kV.A.C. TRACTION SCHEDULE I-CHAPTER II

NOTE:- THE DISTANCES SPECIFIED, APPLY ONLY IN CASE OF STRAIGHT TRACK. ON CURVES, THE HORIZONTAL DISTANCE SHOULD BE INCREASED BY AN AMOUNT 'D' TO ALLOW FOR THE LEAN DUE TO SUPER-ELEVATION CALCULATED BY THE FOLLOWING FORMULA, WHERE 'H' IS THE HEIGHT OF THE CONTACT WIRE, 'S' THE SUPERELEVATION AND 'G' THE GAUG OF THE TRACK, ALL DIMENSIONS BEING IN METRES $D = \frac{H \times S}{G}$



NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

NOTE:-
* - *For existing works*
** - *For new works or alteration to existing works*

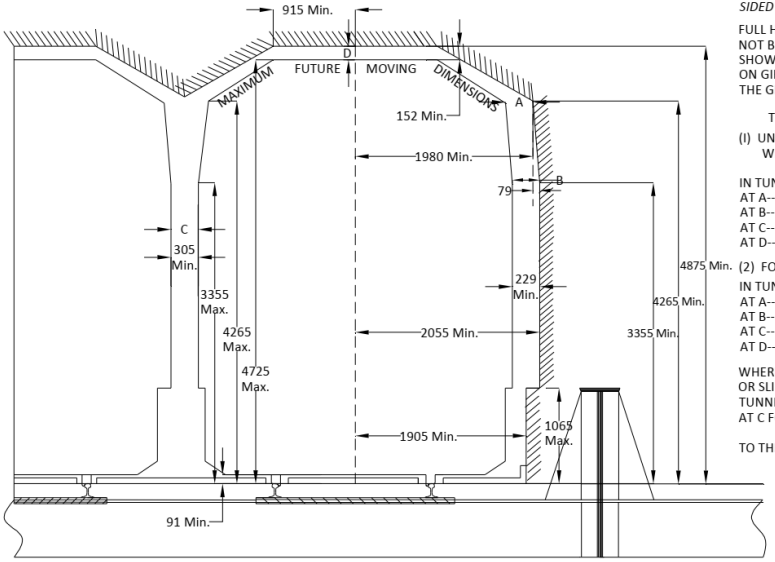
DIGRAM NO. 3 (FIG I)
1676mm GAUGE

INFRINGEMENTS OF SCHEDULE - I

FOR 3660 mm GOODS STOCK & NEW STANDARAD LOCOMOTIVES IN EXISTING BRIDGES ONLY

PIERMTTED UNDER SCHEDULE-II

MINIMUM CLEARANCES ON EXISTING GIRDER BRIDGES



NOTES:-

FULL LINES SHOW MAXIMUM MOVING DIMENSIONS OF FUTURE 3660 WIDE STOCK & OF EXISTING 3200/3250 WIDE STOCK & OUTLINE OF EXISTING 3660 WIDE ELECTRIFIED STOCK DOTTED LINES SHOW OUTLINE OF NEW STANDARD X.E. & W.H. ENGINES & OF PROPOSED 3660 WIDE HIGH SIDED OPEN TRUCK.

FULL HATCHED LINES SHOW DIMENSIONS WHICH SHOULD NOT BE INFRINGED IN TUNNELS, DOTTED HATCHED LINES SHOW DIMENSIONS WHICH SHOULD NOT BE INFRINGED ON GIRDER BRIDGES WHERE THE TRACK IS FIXED TO THE GIRDERS.

THE MINIMUM PERMISSIBLE CLEARANCES WILL BE.

(I) UNDER ANY CIRCUMSTANCES & SUBJECT TO ANY RESTRICTION OF SPEED WHICH IT MAY BE CONSIDERED NECESSARY TO IMPOSE.

IN TUNNELS	ON GIRDER BRIDGES
AT A---------229mm	AT A----229mm (AT TOP OF SIDES OF VEHICLES)
AT B---------305mm	AT B----229mm (AT SIDES OF VEHICLES)
AT C---------380mm	AT C----305mm (BETWEEN MOVING TRAINS)
AT D---------229mm	AT D----152mm (ABOVE VEHICLES)

(2) FOR UNRESTRICTED SPEED:

IN TUNNELS	ON GIRDER BRIDGES
AT A---------380mm	AT A----229mm (AT TOP OF SIDES OF VEHICLES)
AT B---------535mm	AT B----455mm (AT SIDES OF VEHICLES)
AT C---------610mm	AT C----535mm (BETWEEN MOVING TRAINS)
AT D---------305mm	AT D----229mm (ABOVE VEHICLES)

WHERE DOORS OPENNING INWARDS OR OF THE RECESSED OR SLIDING TYPE ARE PROVIDED, THE MINIMUM CLEARANCE IN TUNNELS & BRIDGES MAY BE REDUCED TO 380 AT B & 455 AT C FOR UNRESTRICTED SPEED.

TO THE ABOVE MUST BE ADDED THE EXTRA ALLOWANCES FOR CURVES (SEE APPENDIX.)

NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

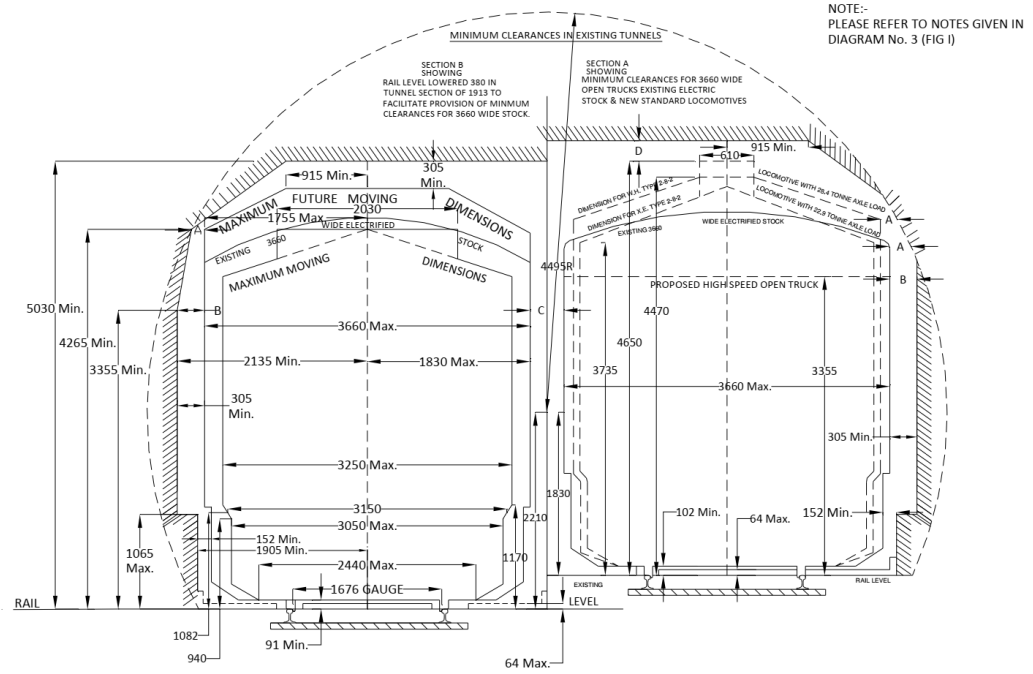
DIGRAM NO. 3 (FIG II)
1676mm GAUGE

INFRINGEMENTS OF SCHEDULE - I

FOR 3660 mm GOODS STOCK & NEW STANDARAD LOCOMOTIVES IN EXISTING TUNNELS ONLY

PERMTTED UNDER SCHEDULE-II

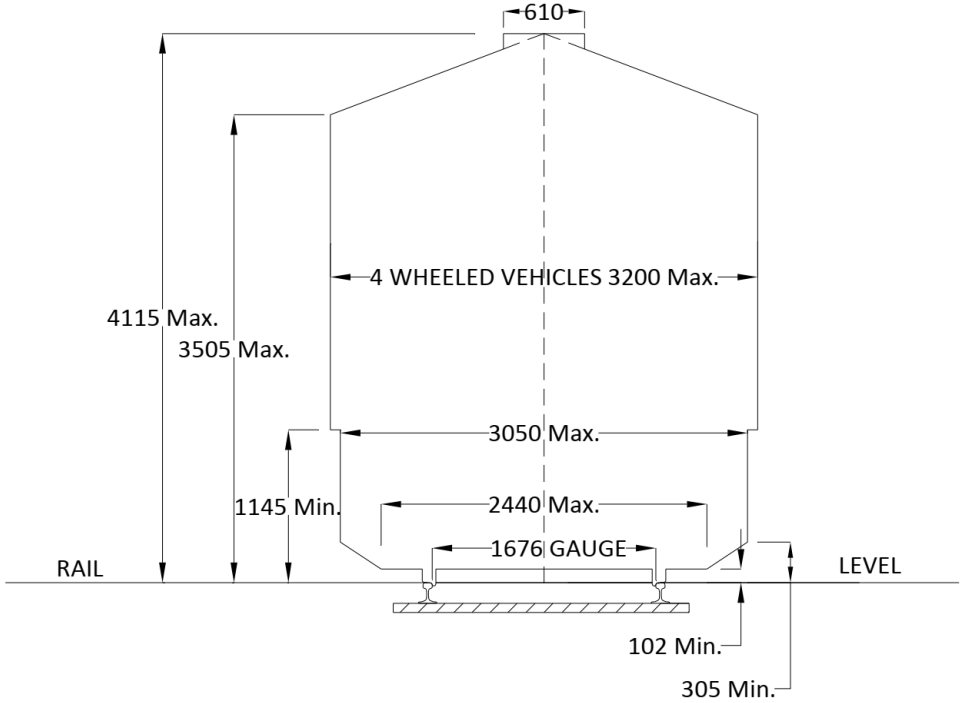
TUNNEL SECTION OF 1913



NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

DIAGRAM NO. 4
1676mm GAUGE

MAXIMUM MOVING DIMENSIONS OF 1929 PROFILE



NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

Sr. No.	Description	BG mm	MG mm
General		**(ft. inch)**	**(ft. inch)**
1	Minimum distance center to center of track	4265	3660
	a. Recommended distance center to center of track	4725	3960
2	Minimum radius of curves	175m	109m
3	Minimum clearance of check rails for a curve	44	41
4	Minimum clearance of check rails at level crossing	51	51
5	Maximum clearance of check rail at level crossing	57	57
6	Minimum depth of space of wheel flange from RL	38	35
7	Minimum horizontal distance from center of track to any structure from R1 to 305mm (1') above RL	1675	1370
Station Yards			
8	Minimum distance c/c of track	4265	4265
9	Recommended distance c/c of track	4725	4420
10	Maximum gradient in station yards	1 in 400	1 in 400
11	Recommended –do-	1 in 1200	1 in 1200
Platforms			
12	Height above RL for high pass plat.	Max. 840	405
		Min. 760	305
13	Max. height above RL for low pass. Platforms for BG	455	
Points & Crossings			
14	Clearance of check rail opposite nose of crossing or of wing rail at nose of Xing	Max. 48	44
15		Min. 44	41
16	Clearance between toe of open switch and stock rail	Min. 95	89
17		Max. 115	100

SCHEDULE OF DIMENSIONS IN STATION YARDS

57

57.1 Station Yards

Note:

1) The expression "in station" as mentioned in Diagram No. 2 is to be interpreted in accordance with the definition of "station limits" given in chapter I, part I, of the General Rules for open lines, viz "station limits" means the portion of a railway which is under the control of a station master and is situated between the outermost signals of the station. **(See Diagram No. 2)**
2) For running EMU and other 3660 mm stock, clearances prescribed in item 13(i)(a) and (ii) of chapter I "Tunnel, through and semi-through girder bridges" shall also be required for all structures governed by items 1(i) and 11(A) of this chapter and not only for tunnels and through and semi through girder bridges. However, a platform shelter may infringe item 13(ii) (e) of chapter I and edge of the platform shelter may be kept at a minimum horizontal distance of 1600 mm from center line of track and at a minimum height of 4610mm above rail level.

57.2 Spacing of tracks: -

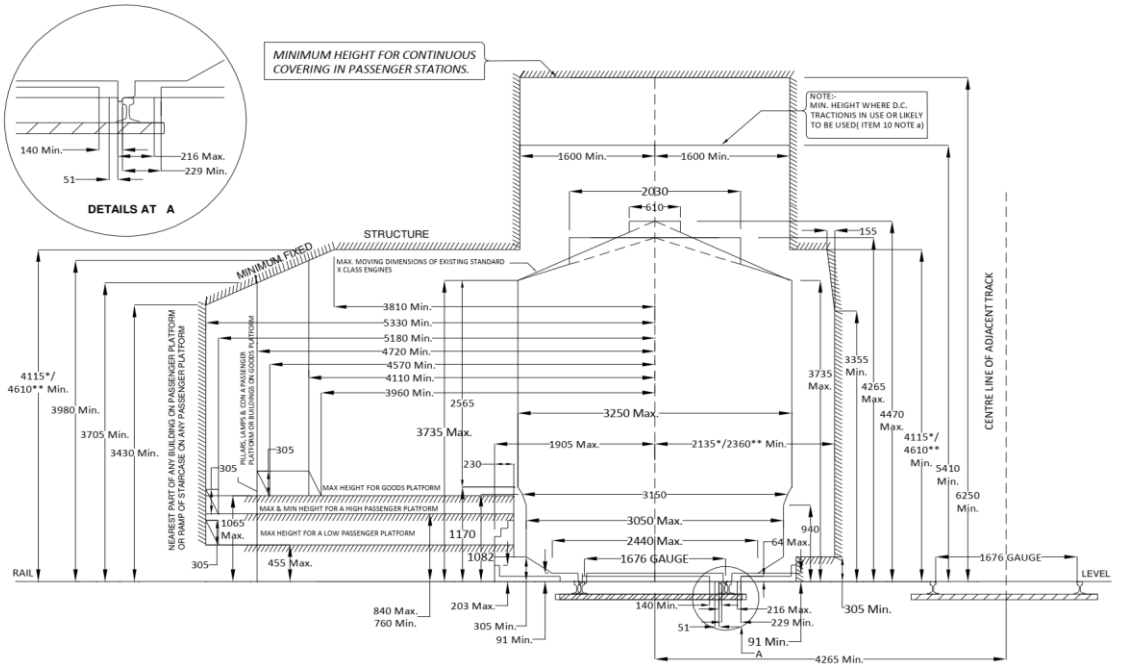
1 Minimum distance center to center on straight tracks

(i)	**For existing works**	4265mm
(ii)	**For new works/ addition to existing works**	5300mm

DIAGRAM NO. 2
1676 mm GAUGE

STANDARD DIMENSIONS IN STATIONS
TO SUIT 25 kV.A.C. TRACTION SCHEDULE I-CHAPTER II

NOTE:- THE DISTANCES SPECIFIED, APPLY ONLY IN CASE OF STRAIGHT TRACK. ON CURVES, THE HORIZONTAL DISTANCE SHOULD BE INCREASED BY AN AMOUNT 'D' TO ALLOW FOR THE LEAN DUE TO SUPER-ELEVATION CALCULATED BY THE FOLLOWING FORMULA, WHERE 'H' IS THE HEIGHT OF THE CONTACT WIRE, 'S' THE SUPERELEVATION AND 'G' THE GAUG OF THE TRACK, ALL DIMENSIONS BEING IN METRES $D = \frac{H \times S}{G}$



NOTE:- ALL DIMENSIONS ARE IN MILLIMETRES EXCEPT WHERE OTHERWISE SHOWN.

NOTE:-
* - *For existing works*
** - *For new works or alteration to existing works*

Note:

a) See Appendix for 'extra clearance required on curves.'

b) In case new OHE masts/Signal posts are required to be provided in between tracks under unavoidable circumstances, the clearance maintained in 1(ii) above shall be increased by equal to the width of such provisions/structures/foundations, as the case may be.

c) For "New Works/additions to existing works such as conversion of existing loop lines into main line, laying of new loop lines and/or shifting of existing lines etc." in the existing yard, if the stipulation mentioned in 1(ii) and Note (b) above are not likely to be achieved due to existing field constraints, then minimum horizontal distance from center of track to any structure, as mentioned in Note (c) of para 11(B) of Chapter-II, IRSOD-2022 shall be ensured.

d) In a completely new yard or portion of existing yard, where "New Work" is being done independent of the existing yard, stipulation under 1(ii) above shall be ensured.

e) In case of tunnels, ROBs, flyovers, through & semi-through girder bridges, where center to center distance lesser than 5300mm has been provided, lesser center to center distance can be provided on approaches also up to adequate distance to facilitate gradual increase in center-to-center distance up to 5300mm.

2 Maximum (Steepest) gradient in station yards –

Maximum (Steepest) gradient in station yards, unless special safety devices are adopted and/or special rules enforced to prevent accidents in accordance with approved special instructions.

(i) For New Works & Alteration to Existing Works-

(a) Recommended : 1 in 1200 (0.083%)

(b) Maximum (Steepest): 1 in 400 (0.25%)

(ii) For Existing works : 1 in 400 (0.25%)

Note:

a) Recommended dimension is generally the good practice, the adoption of which will lead to desirable uniformity on Indian Railways; but it is not to be treated as standards, a departure from which requires sanction.

b) In case, it is not possible to provide recommended gradient of 1 in 1200 (0.083%) in yard even after making efforts to provide grades as flat as possible, reasons for deviation from recommended gradient and up-to the specified maximum (steepest) gradient of 1 in 400 (0.25%) shall be recorded on the ESP. However, for new yards in new line projects

adoption of yard gradient steeper than 1:1200 will require approval of General Manager before finalization of ESP.

c) No station yard shall be constructed, nor shall any siding join a passenger line on a grade steeper than 1 in 100 (1.0%), except where it is unavoidable and then also only with the previous sanction of Railway board, obtained through the Commissioner of Railway Safety, when adequate arrangements are made to prevent accident.

d) The powers of condonation for gradient steeper than the specified standard maximum gradient of 1 in 400 (0.25%) shall be as under:

(i)	Existing Yard: Steeper than 1 in 400(0.25%) and up-to 1 in 100 (1.0%) Steeper than 1 in 100 (1.0%)	Commissioner of Railway Safety Railway Board through Chief Commissioner of Railway Safety
(ii)	For New Yard in New Line Projects: Steeper than 1 in 400 (0.25%) and up-to 1 in 260 (0.38%) Steeper than 1 in 260 (0.38%)	Commissioner of Railway Safety Railway Board through Chief Commissioner of Railway Safety

e) For above purpose, "Station yard" means:

i) On single line to a distance of 50 m beyond Stock Rail joint of outermost points at either end of the station.

ii) On double line where 2 Aspect Signaling is provided: For each line, from home signal to a distance of 50m beyond Stock Rail joint of outermost facing point or Fouling Mark of outermost trailing point or up to Last Stop Signal where there is no point.

iii) On double or multiple lines where Multiple Aspect Signaling is provided, for each line: At either end, to a distance of 50 m beyond Stock Rail Joint of outermost facing point or to a distance of 50m beyond Fouling Mark of outermost trailing point, as the case may be; or where there are no points on that line, from Block Section Limit Board to Last Stop Signal.

f) There must be no change of grades within 30m of any points or crossings.

g) In case of "New Lines" projects, the above provisions shall also apply to Flag station, Halt station, or class 'C' station (where there is no station section as defined in IR General Rules, 1976). This is to keep provision for conversion of Flag, Halt, or class 'C' station into class 'A' or 'B' station in future.

h) For other than 'New Lines' projects, the above provisions shall not be

applicable for Flag station, Halt station, or class 'C' station.

57.3 Platforms:

3 (i) Horizontal distance from center of track to face of passenger platform coping -

Maximum	-	1680mm
Minimum	-	1670mm

Note:

(i) The coping of passenger platform must be so constructed that, when necessary, to allow for introduction of wider stock, it can be easily and expeditiously set back to 1905 mm. from center of track (see diagram no. 2)

(ii) Horizontal distance from center of track to face of goods platform coping

Maximum	-	1680mm
Minimum	-	1670mm

(iii) Horizontal distance from center of track to face of any platform wall.

Maximum	-	1905 mm
Minimum	-	1675 mm

Note:

(a) New platform walls should be built to maximum dimensions and the coping corbelled out to 1675mm unless provision is made to allow for the introduction of wider rolling stock either by slewing the platform track out by 230 mm or by moving the platform wall 230 mm farther from the track.

(b) See Appendix for extra clearance required on curves.

4	**Height above rail level for high passenger platforms**	840mm maximum 760mm minimum
5	**Maximum Height above rail level for medium level passenger platform**	455mm
6	**Maximum height above rail level for goods platforms (except horse and end loading platforms)**	1065mm

Note: For items 4, 5 and 6

(a) Platforms may be flush with rail level.

(b) The ends of all platforms (except end loading platforms) must be ramped to a slope of 1 in 6 for a width of not less than 1 m from the face of the platform wall, the rest can either be ramped to the same slope or fenced.

(c) The height of platforms serving canted track should be measured vertically from the face to a plane passing through the top of both the rails.

(d) End loading platforms and platforms on sidings used exclusively for horse loading may be raised to a height of 1295mm above rail level.

(e) Signal wires or supports for signal wires may be allowed underneath the platform coping.

(f) The length of a passenger platform should be not less than the length of

the longest passenger train excluding the engine, booked to stop at the platform.

(g) No passenger platform in case of new line, would be constructed on a curve having radius less than 875m.

(h) In case of construction of a new platform on the existing line addition/alteration to existing platforms or in gauge conversion/doubling works, where either the new platform(s) are to be constructed or the old being dismantled and reconstructed, efforts should be made to ease out the existing curves having radii less than 875 m. However, for these works, having platform located/to be located on curves with radii less than 875 m, no condonation of CRS/Board would be necessary.

(i) For Item 4: the height for Mumbai suburban passenger platform and Pune suburban passenger platform may be in range of 840mm-900mm for reducing gap between bottom of sole bar of EMU coach & platform floor and shall be applicable for operation of EMU stocks having height of bottom of sole bar above rail level not less than 1039mm above rail level in fully loaded condition. The height of platform more than 840mm shall be permitted by General Manager, after ensuring maintenance condition of track and maintenance condition of rolling stock as under:

a. Improvement in maintenance practices and monitoring condition of spring during trip inspection of EMU rakes.
b. Improvement in track maintenance on platform lines to the standards specified in Para 522 of IRPWM - 2020.
c. Improved monitoring and corrective action to control sinkage of vertical level of track.
d. In case a new design EMU stock, different from the existing stock is to be introduced on suburban section, running trial over increased height suburban platforms shall be required before clearing the stock for passenger operation.

57.4 Buildings and structures:

7 (a) Minimum horizontal distance of any building/structure on a passenger platform from center line of track:

(i)	From platform level to 305mm above platform level	5180mm increasing uniformly to 5330mm
(ii)	From 305mm above platform level to 3430mm above rail level	5330mm
(iii)	From 3430mm above rail level to a) 4115mm above rail level in case of existing works	5330mm decreasing uniformly to 3810mm

	b) 4610mm above rail level in case of new works or alterations to existing works	5330mm decreasing uniformly to 3810mm

Note:

1) For the return end of platform fencing these dimensions may be reduced to 2740mm.
2) Isolated structures are covered in Item 8 below.
3) In Mumbai suburban area, when it is not possible to provide platform width to meet provisions at 7(a) (i), 7(a) (ii) and 7(a) (iii) above, the dimensions at 7(a) (i), 7(a) (ii) and 7(a) (iii) can be reduced by Commissioner of Railway Safety for construction of new foot over bridge on the platform, on case to case basis subject to stipulations (a), (b), (c) & (d) below, as under:

i) From platform level to 3430mm above rail level	4115 mm
ii) From 3430mm above rail level to 4610mm above rail level	4115 mm decreasing uniformly to 3810mm

(a) The supporting column of FOB deck and landing on platform shall be designed in such a way that there is no lateral bracing between two columns up to a height of 2400 mm from platform level to allow free movement of passengers.

(b) The FOB structure as well as platform surface in the 'entire zone covering the members of FOB having horizontal clearance less than 5330 mm from centerline of track from PF level to 2400 mm above PF level' shall be painted with yellow and red retro reflective paint strips to alert the alighting passengers. No temporary or permanent structure, no stabling of hand trolley shall be permitted in this zone. This area shall be well illuminated during nighttime.

(c) No Slewing of track towards adjoining platform shall be permitted in the FOB zone.

(d) In any case, FOB landing width should not be more than 50% of Platform width.

7 (b) Minimum horizontal distance of any building or longitudinal boundary fence from the center line of track of passenger platform which is not an island platform (for new works or alterations to existing works):

(i) **Minimum**	6830mm
(ii) **Recommended**	12130mm

Note:

(a) Item 7(b) (ii) allows for setting back the platform to make room for an

additional track in future, without infringing item 7(b) (i).

(b) Item 7(b) should also apply to buildings and isolated structures not readily removable, erected on ground over which it is anticipated that a platform may be extended in future.

(c) Item 7(b) (i) may be reduced to 5330mm in case of foot over bridge at any station and/or provision of longitudinal boundary fence at 'D', 'E' and 'F' category stations; subject to stipulation that if any other pucca construction of building/structure is done in future, provisions of Item 7(a) & 7(b) shall be followed.

(d) In Mumbai suburban section, for construction of new foot over bridge on the platform, provision of item 7(a) shall be applicable.

8 Minimum horizontal distance from center line of track to a pillar, column, lamp or similar isolated structure on a passenger platform or any building on a goods platform.

(i)	**From platform level to 305mm above platform level**	4570mm increasing uniformly to 4720mm
(ii)	**From 305mm above platform level to 3705mm above rail level**	4720mm
(iii)	**From 3705mm above rail level to**	
	a) 4115mm above rail level in case of existing works	4720mm decreasing uniformly to 3810mm
	b) 4610mm above rail level in case of new works or alterations to existing works	4720mm decreasing uniformly to 3810mm

8A. Minimum horizontal distance from center line of track to a pillar, column, lamp or similar isolated structure on goods platforms:

(i)	**From platform level to 305mm above platform level**	3960mm increasing uniformly to 4110mm
(ii)	**From 305mm above platform level to**	
	a) 3980mm above rail level in case of existing works	4110mm
	b) 4310mm above rail level in case of new works or alterations to existing works	4110mm
(iii)	a) From 3980mm above rail level to 4115mm above rail level in case of existing works	4110mm decreasing uniformly to 3810mm
	b) From 4310mm above rail level to 4610mm	4110mm decreasing

	above rail from 4310mm above rail level to 4610mm above rail	uniformly to 3810mm

Note:

A pillar or column (vide items 8 & 8A) which covers more than 3716 sq.cm in plan, must be classed as "building" and not as " isolated structure".

9 Minimum height above rail level for a width of 1600mm on either side of the 6250mm center of track, of tie rods or any continuous covering in a passenger station

Note:

(1) On lines other than main lines where 25 kV A.C. electric traction is not likely to be used, the dimensions given above may be modified as under:
For a width of 1370mm on either side of center of track: 6100mm

(2) On existing primary lines, not likely to be electrified, dimension as in Note (1) may be allowed to Continue

(3) Item 9 does not apply to overhead piping parallel to the track.

(4) A low roof that infringes item 9 is permissible in the case of goods or transshipment shed on a siding, provided it does not infringe the outline of the figures for the minimum fixed structure out of stations (see diagram 1B).

(5) Extra vertical clearance of 275mm under overhead structures and overhead equipment in electrified section be provided to allow for any raising of track to permit modern track structure to be introduced.

Note:

On lines proposed to be electrified on 25 kV A.C system, necessary provision should be made in overline structures and overhead equipment, if necessary, by using longer traction overhead equipment masts to permit possible raising of the track by 275mm in future to cater for increased ballast cushion, larger sleeper thickness and deeper rail sections.

10 Height of Over Head Structures –

Minimum height above rail level for a width of 1600mm on either side of 6250mm center of track, of a foot over bridge or a signal gantry in a passenger station

Note:

(a) Where D.C. traction is in use or likely to be used, this minimum height shall be 5410mm.

(b) On secondary lines, where electric traction is not likely to be introduced, this minimum height shall be 4875mm. This also applies to overhead piping arrangements parallel to track wherever provided, which shall necessarily be changed over to the ground hydrants, when the section is electrified.

(c) However, for existing overhead structure, dimensions given in note (c) of para 10 of Chapter-I, Schedule -1: General shall be applicable.

(d) Tunnel, through girder bridge and semi-through girder bridge in station yards shall be treated as heavy overhead structures, such as ROB for electrification works and the same dimensions as mentioned in note (c) of para 10 of schedule 1, chapter -1: General shall be applicable.

(e) For Mumbai Suburban, the height of Foot Over Bridges mentioned above may be reduced to 5750mm subject to following conditions:
  (i) The minimum height of the contact wire shall be 4800 mm.
  (ii) A special study shall be conducted as indicated in appendix A of chapter V-A to ascertain the feasibility of the contact wire height as 4800mm.
  (iii) There shall be no crossover below FOB or within 40 m from the face of FOB.
  (iv) There shall be no level crossing within 520 m from the face of FOB.
  (v) The maximum height of rolling stock shall be restricted to 4420 mm.
  (vi) The height shall be measured from the higher or super-elevated rail.

11 Minimum Horizontal Distance from center of track to any structure:

(A) For existing works:

1	**From rail level to 305mm above rail level**	1675mm
2	**From 305mm to 3355mm above rail level**	2135mm
3	**From 3355mm to 4115mm above rail level**	2135mm decreasing to 1980mm
4	**From 4115mm to 6250mm above rail level**	1600mm
5	**Below the rail level and up to formation level of the track on straight and curves up to radius of 875m**	2575mm
6	**Below the rail level and up-to the formation level of the track on curves with radius less than 875m**	2725mm

Note:

a) See appendix for 'extra clearances required on curves.'

b) On lines other than main lines or existing main lines, where electric traction is not likely to be introduced, the horizontal distance of 1370mm for height from 4115mm to 6100mm above rail level may be allowed to continue.

c) The various fixtures, which are attached to the track like lock bar, point machine, traction bonds, point and signal rodding etc. and are required to be fitted with the rail, can be provided and the clearance, as mentioned in item (v) and (vi) above will not be applicable to these items.

d) In case of electrification works in existing yards, no foundation/mast/signal

post/any other structure shall be provided between two tracks. In case it is inescapable, the minimum distance of edge of foundation/mast/signal post/any other structure at and above formation level up-to rail level from center of track, shall be 2360mm on straight track & on curve having radius 875m & more and 2510mm in case of curve having radius less than 875m.

e) Items (v) and (vi) above shall not be applicable in the case of bridges, tunnels and ballast less track (including washable apron).

(B) For New Works or Alteration to Existing works:

From rail level to 305mm above rail level	1905mm
From 305mm to 1065mm above rail level	1905mm increasing to 2360mm
From 1065mm to 3735mm above rail level	2360mm
From 3735mm to 4420mm above rail level	2360mm decreasing to 2135mm
From 4420mm to 4610mm above rail level	2135mm decreasing to 1980mm
From 4610mm to 6250mm above rail level	1600mm
Below the rail level and up-to formation level of the track on straight and curves up-to radius of 875m	2575mm
Below the rail level and up-to the formation level of the track on curves with radius less than 875m.	2725mm

Note:

(a) See Appendix for 'extra clearances required on curves.'

(b) Items (vii) & (viii) above shall not be applicable in the case of bridges, tunnels, ballast less track (including washable apron).

(c) For addition/alteration to works in existing yard the minimum horizontal distance shall be maintained as 2360mm on straight track and on curve having radius 875m & more, and 2510mm in case of curve having radius less than 875m, if it is difficult to provide prescribed clearances as mentioned in items and (viii) above due to existing field constraints.

(d) The various fixtures which are attached to the track like traction bonds etc. and are required to be fitted with the rail can be provided and the clearance as mentioned in item (vii) and (viii) above will not be applicable to these fixtures.

57.5 Points and crossings:

12.	**Maximum clearance of check rail opposite nose of crossing**	48mm

Note: In case of turnouts laid with 1673mm gauge, the clearance shall be 45mm instead of 48mm.

13.	**Minimum clearance of check rail opposite nose of crossing**	44mm

Note: In case of turnouts laid with 1673mm gauge, the clearance shall be 41mm instead of 44mm

14.	**Maximum clearance of wing rail at nose of crossing**	48mm

Note: In case of turnouts laid with 1673mm gauge, the clearance shall be 45mm instead of 48mm

15.	**Minimum clearance of wing rail at nose of crossing**	44mm

Note: In case of turnouts laid with 1673mm gauge, the clearance shall be 41mm instead of 44mm.

16. Minimum clearance between toe of open switch and stock rail

(i) For existing works - 95mm

(ii) For new works or alterations to existing works - 115mm

Note: The clearance can be increased up-to 160mm in curved switches in order to obtain adequate clearance between gauge face of stock rail and back face of tongue rail.

17.	**Minimum radius of curvature for slip points, turnouts or crossover roads**	218 m (8 degree)

Note: In special cases mentioned below this may be reduced to not less than the minimum of

i) 213m radius in case of 1 in 8.5 BG turnouts with 6.4m overriding switch, and

ii) 175m radius in case of 1 in 8.5 scissors crossing to allow for sufficient straight over the diamond crossing between crossovers.

18.	**Minimum angle of crossing (ordinary)**	1 in 16

Note: Crossings as flat as 1 in 20 will usually be sanctioned if recommended by the Commissioner of Railway Safety.

19. Diamond crossings not to be flatter than 1 in 8.5

Note: Diamond crossings as flat as 1 in 10 will usually be sanctioned if recommended by the Commissioner of Railway Safety.

20. Minimum length of tongue rail 3660mm

21. Minimum length of train protection, point locking or fouling treadle bar	12800mm

Note: There must be no change of super elevation (of outer over inner rail) between points 18m outside toe of switch rail and nose of crossing respectively, except in the case of special crossings leading to snag dead-ends or under circumstances as

provided for in item– 22.

22. Superelevation and speed in stations on curves with turnouts of contrary and similar flexure:

Main line: Subject to the permissible run through speed, based on the standard of interlocking, the equilibrium superelevation, calculated for the speed of the fastest train, may be reduced by a maximum amount of 75mm without reducing the speed on the mainline.

57.6 Turnouts:

i) Curves of contrary flexure: -

The equilibrium superelevation in millimeters should be calculated by the formula

$C = GV^2 / 127R$

Where,

G = Gauge of track + width of rail head in mm

V = Speed in kmph

R = Radius in m

C = Superelevation in mm

The permissible negative superelevation on the turnout (which is also the actual superelevation of the main line) may then be made as (75-C) mm.

ii) Curves of similar flexure: -

The question of reduction or otherwise of super-elevation on the mainline must necessarily be determined by the administration concerned. In the case of a reverse curve close behind the crossing of the turnouts, the superelevation may be run out at the maximum of 1mm in 360m

23. Minimum clear available length of one siding at any station where it is intended to cross trains: -

i) Shall be length of longest train permitted in the section plus 35m

ii) Although it may not be necessary till traffic develops

to provide sidings for the largest possible train loads, land should be acquired for them and no building, level crossings or other obstructions should be permitted that will interfere with the crossing siding being lengthened to the following dimensions: -

On sections of the railways where the Ruling gradient is	Minimum clear available length of one siding for new work or alterations to existing works
1 in 100 or flatter	750 m
Steeper than 1 in 100	Length of the longest train permitted in the section plus 35 m

Note: Clear Available length denotes:

(i) Distance between foot of the signal to Fouling Mark in the rear on the same line in case of Main line and Directional Loop at station yard.

(ii) In the case of Common Loop at the stations, Clear Available Length/Clear Standing Length shall be the distance between two starter signals of opposite direction on the same line.

SCHEDULE OF DIMENSIONS IN WORKSHOPS AND STATION MECHINERY

58

Workshops and Station Machinery

58.1 Water tanks and water cranes:

1	**a) Minimum height above rail level for discharge orifice of water crane**	3660mm
	b) Distance from center of track to face of tank house less than 60 meters beyond the end of a passenger platform.	
	i) Minimum	7165mm
	ii) Recommended	11890mm

Note: -

(a) Item 1(b) need not be observed in the case of small subsidiary or relay tanks which can easily be removed back to provide room for an extension of the yard.

(b) Item 1(b)(i) allows for the extension of the platform and item 1(b) (ii) allows for the laying of an additional track and extending of the platform in future.

(c) Minimum height for bottom of tank above rail level at water column:
   (i) For watering engines - 7620mm
   (ii) For washing engines - 12190mm

(d) Minimum total tank capacity at any station 56.5 cum or 56825 liters

(e) Minimum internal diameter for piping from tank to water crane 203mm

58.2 Workshops and running sheds:

2 Minimum distance from center-to-center of tracks:

(i)	**For existing works**	4570mm
(ii)	**For new works or alterations to existing works**	
	(a) In workshops	4570mm
	(b) In running sheds	5260mm

Note: Where there is a structure between tracks, the distance of center-to-center of tracks is to be increased by the amount of the width of the structure like O.H.E. post etc.

3 Minimum clear distance from center of track to any isolated structure such as a pillar in:

(i)	**Workshops**	
	(a) For existing works	2285mm
	(b) For new works or alterations to existing works	2360mm
(ii)	**Running sheds**	2515mm

4 Minimum clear distance, for a height of 1830 mm above rail level, from center of track to any continuous structure in

(i) Workshops - 2745mm

(ii) Running sheds - 3275mm

Note: For standard 'C' Railways, minimum horizontal distance for a height of 1830mm above rail level on either side of center of track to any continuous structure in running sheds shall be 2745mm.

5 Minimum height above rail level to overhead tie bars, girders etc. in workshops and running sheds:

(i)	**Where electric traction is not likely to be used**	5030mm
(ii)	**Where electric traction is likely to be used**	6250mm

6 Minimum height above rail level of doorways for a width of 1370mm on either side of center of track in both workshops and running sheds

(i)	**Where electric traction is not likely to be used**	4875mm
(ii)	**Where electric traction is likely to be used**	6250mm

58.3 Ashpits etc.:

7 Average depth for ashpits in station yards, pits in running sheds and carriage examination pits. - 760mm

Note: Siting of Ashpits on run through lines, should, if possible, be avoided.

SCHEDULE OF DIMENSIONS IN ROLLING STOCK (CARRIAGE & WAGON)

59

Rolling Stock (Carriage & Wagon)

59.1 Wheels & Axles

1	**Wheel gauge, or distance apart, for all wheel flanges**	Maximum 1602mm Minimum 1599mm
2	**i) Maximum diameter on the tread of new carriage or wagon wheel, measured at 63.5 mm from wheel gauge face**	1092mm
	ii) Minimum diameter on the tread of new carriage or wagon wheel, measured at 63.5mm from wheel gauge face	914mm

Note: Minimum diameter on tread of new wagon wheel, measured at 63.5mm from wheel gauge face can be reduced to 840mm, subject to following conditions.

(a) For operation of loaded wagons on curves sharper than 875m radius.
   (i) On Grade 880 rail (as per IRS-T-12-2009 specification), speed restriction of 65kmph at axle load of more than 22t & up to 23t and of 45kmph at axle load more than 23t & up to 25t
   (ii) On grade 1175HT rails, no speed restriction.

(b) No speed restriction on curves flatter than 875m radius.

(c) Limit of wheel flat 50mm for operation of loaded wagons at axle load more than 22t & up to 25t.

Note: For other rail grades and wheel diameters, separate study will be required.

3	**Minimum projection for flange of new tyre, measured from tread at 63.5mm from wheel gauge face**	28.5mm
4	**Maximum projection for flange of worn tyre, measured from tread at 63.5mm from wheel gauge face**	35.0mm
5	**Maximum thickness of flange of tyre, measured from wheel gauge face at 13mm from outer edge of flange**	29.4mm
6	**Minimum thickness of flange of tyre, measured from wheel gauge face at 13mm. from outer edge of flange**	16mm
7	**Minimum width of tyre**	127mm
8	**Incline of tread**	1 in 20

59.2 Height of Floors

9	**Maximum height above rail level for floor of any unloaded vehicle including goods vehicle having side doors for platform loading/ unloading**	1345mm

Note: Not applicable for goods vehicles not having side doors

10	**Minimum height above rail level for floor of any fully loaded vehicle other than goods vehicle -**	1200mm

11	**Minimum height above rail level for floor of any fully loaded goods vehicle which has side doors for platform loading/ unloading**	1145mm

Note: Not applicable for goods vehicles not having side doors

Note: Maximum/Minimum floor height of such goods vehicle which does not have side doors for platform loading/ unloading, should be determined keeping in view the profile of the maximum moving dimension to diagram no. 1D particularly with respect to width of wagon at various heights.

59.3 Buffers & Couplings

12	**Distance apart for centers of buffers**	1956mm
13	**Maximum height above rail level for center of buffers & CBC couplers for unloaded vehicle**	1105mm
14	**Minimum height above rail level for center of buffers & CBC couplers for fully loaded vehicle**	1030mm

Note: In case of wagons operated in unitization concept having different coupler heights, the maximum height of coupling line at the outer ends of the Unit shall be as per clause 13 & minimum height of coupling line at the outer ends of the Unit shall be as per clause 14. The minimum height of coupling line at other than outer ends shall not be less than 770mm in fully loaded condition and 845mm in unloaded condition.

59.4 Wheelbase & Length of Vehicles

15	**Maximum rigid wheelbase for four wheeled vehicles**	6100mm
16	**Minimum distance apart of bogie centers for bogie vehicles**	5400mm
17	**Maximum distance apart of bogie centers for bogie vehicles**	14900mm
18	**(i) Minimum rigid wheelbase for bogie truck of any vehicle** **(ii) Minimum rigid wheelbase for bogie truck of passenger vehicle**	1830mm 2440mm
19	**Maximum length of body or roof for:** **a. 4- wheeled vehicle** **b. Bogie vehicles**	 8540mm 21340mm

Note:

(i) Maximum length of body or roof of bogie vehicles can be upto 23540 mm, subject to tapering of the ends in a manner that the end throw, when calculated as per Appendix, is same as that for ICF coach of 21340 mm length and within this Schedule of Dimensions.

(ii) A cornice may project beyond the maximum permissible length of the roof up to 51mm in the case of(a) above, beyond each end of the vehicle.

(iii) Fittings on the end of a vehicle, such as step iron, vacuum brake piping, electrical connections, vestibule etc., need not be kept within the prescribed maximum permissible lengths for bodies of vehicles, but may project beyond the end of the body to a reasonable extent.

20	**Maximum length over center buffer couplers or side buffers:** **a. 4 – wheeled vehicle** **b. Bogie vehicles**	 9810mm 22300mm

Note: Maximum length over the center buffer couplers or side buffers can be increased up to 24000mm for Bogie Vehicles, in accordance with maximum length of body or roof. However, the maximum length over the center buffer couplers or side buffers for longer coaches shall be so arranged that difference between length over side buffers and length of body or roof is not less than 460mm.

21	**Maximum distance apart between any two adjacent axles**	12345mm

59.5 Maximum Moving Dimensions (See diagram 1D)

22	**Maximum width over all projections at 102mm above rail level, when fully loaded**	2440mm
23	**Maximum width over all projections, at 305mm above rail level, when fully loaded**	3050mm

24	**Maximum width over all projections from 305mm above rail level, to 940mm above rail level, when fully loaded**	3050mm
25	**Maximum width over all projection from 940mm above rail level to 1082mm above rail level, when fully loaded**	3050mm increasing gradually to 3150mm
26	**Maximum width over all projection from 1082mm above rail level, to 1170mm above rail level, when fully loaded**	3150mm increasing gradually to3250mm

Note: For freight bogie vehicles with maximum length of body or roof up-to 14500mm and bogie center distance up-to 10000mm, maximum width overall projections from 305mm above rail level to 1060mm above rail level, when fully loaded, can be relaxed to 3135mm instead of 3050mm.

27	**Maximum width over all projections from 1170mm above rail level, when fully loaded to a height of 3735mm when empty** (i) Guttering, side lamps and destination boards may project 76 mm on each side beyond the dimensions given above from a height of 2895 mm to 3355 mm above rail level, up-to a maximum over all width of 3402 mm. (ii) Coach number plates may project 25mm on each side beyond the dimension given above from a height of 2590 mm to 2895mm above rail level, up-to a maximum over all width of 3300mm. (iii) Reservation card holders may project 25mm on each side beyond the dimensions given above from a height of 1750 mm to 1980 mm above rail level up-to a maximum over all width of 3300 mm. (iv) The doors are to be either sliding or opening inwards. Hand bolts, door locks, handles and window bars shall not, however, project beyond the dimensions given against item above.	3250mm
28	**Maximum width over open doors, including all projections for passenger vehicles**	4040mm
29	**Maximum width over open doors, including all projections for goods vehicles**	4265mm

Note: Doors of horse boxes, brake vans, luggage vans and rising and falling flap doors of goods wagons are exempted from this rule.

30	**Maximum height above rail level for a width of 1015mm on either side of the center of unloaded vehicles**	4265mm
31	**Maximum height above rail level at sides of unloaded vehicles**	3735mm

Note:

i) Destination boards for passenger vehicles may project 76 mm above the dimensions up-to a maximum height above rail level at sides of vehicles when empty.

ii) (Applicable for clause 27, 28 & 31)

In case of stocks exceeding the 1929 profile and within the maximum moving dimensions shown in diagram 1D, clearance of the following railway is required to be obtained for the following locations before permitting the stock for the general adoption:

S. No.	Railway	Section	Location
1	**2**	**3**	**4**
1.	E. Railway	Andal-Sainthia Chord	Br.No.66
2.	N. F. Railway	Old Malda -Singhabad	Tangon Br.
3.	S. E. Railway	Tata-Rourkela	Up Saranda Tunnel
4.	S. E. C. Railway	Bilaspur-Katni	Dn Bhortonk Tunnel

32	**Minimum height above rail level when fully loaded for a width of 1220mm on either side of center of track with the exception of wheels and attachments thereto (vide note below)**	91mm

Note: A tyre or an attachment of a wheel may project below the minimum height of 91 mm from a distance of 51 mm inside to 216 mm outside of the gauge face of the wheel.

33	**Minimum height above rail level, when fully loaded at 1525 mm from center of track**	305mm

Loading Gauge for Goods

34	**Maximum width**	3250mm
35	**Maximum height above rail level at center**	4265mm
36	**Maximum height above rail level at sides**	3735mm

Note: The loading gauge is for testing loaded and empty vehicles; the maximum moving dimensions are given in items 27, 28, 30 and 31 above.

CHAPTER IV (B)

59.6 Rolling stock, 3660 mm wide stock

Note:

These dimensions shall not be adopted in designs for rolling stock without the special sanction of the Railway Board in each case.

59.7 Maximum future moving dimensions:

(See diagram No. 1-A)

1	**Maximum width over all projections:**	
	(i) **At 102mm above rail level, when fully loaded**	2895mm
	(ii) **At 305mm above rail level, when fully loaded**	3505mm
	(iii) **From 305mm above rail level to 1145mm above rail level when fully loaded -**	3505mm
	(iv) **From 1145mm above rail level, when fully loaded to a height of 3355mm when empty**	3660mm
	(v) **At 4265mm above rail level, when empty**	3505mm
2	**Maximum width over open doors, including all projections, for passenger vehicles**	4495mm
3	**Maximum width over open doors, including all projections, for goods vehicles**	4500mm

Note: Doors of horse boxes, brake vans, luggage vans and rising and falling flap doors of goods wagons are exempted from this rule.

4	**Maximum height above rail level for a width of 915mm on either side of the center of unloaded vehicles**	4725mm
5	**Maximum height above rail level at sides of unloaded vehicles**	4265mm
6	**Minimum height above rail level, when fully loaded for a width of 1450mm on either side of center of track, with the exception of wheels and attachments thereto (vide note below)**	102mm

Note: A tyre or an attachment to a wheel may project below the minimum height of 102mm from a distance of 51mm inside to 216mm outside of the gauge face of the wheel.

7	**Minimum height above rail level, when fully loaded at 1755mm from center of track**	305mm

59.8 Loading gauge for goods:

8	**(i) Maximum width at a height of 3380mm above rail level**	3710mm
	(ii) Maximum width at a height of 4295mm above rail level	3555mm
9	**Maximum height above rail level for a width of 915mm**	4750mm

	on either side of the center of track	
10	**Maximum height above rail level at sides**	4295mm

Note: The loading gauge is for testing loaded and empty vehicles, the maximum moving dimensions are given in items 1(iv), 4 and 5 above.

Chapter IV (C)
59.9 Rolling Stock (Locomotive)

59.10 Wheel and axles:

1	**Wheel gauge or distance apart for wheel flanges:**		
(a)	**Wheels with thick flanges/wear adopted wheel profile**	1596mm	
(b)	**Wheels with standard flanges**	1600mm	
(c)	**Wheels with thin flanges**	1600mm	
(d)	**Wheels without flanges**	1600mm	
(See item 5 for identification of thick/wear adopted, standard & thin flanges)			
2	**(i) Maximum diameter on the tread of new locomotive carrying wheels measured at 63.5mm from wheel gauge face**	1250mm	
	(ii) Minimum diameter on the tread of new locomotive carrying wheels measured at 63.5mm from wheel gauge face	914mm	
3	**Minimum projection for flange of new tyre measured from tread at 63.5mm from wheel gauge face**	28.5mm	
4	**Maximum projection for flange of worn tyre measured from tread at 63.5mm from wheel gauge face**	35mm	
5	**Maximum and minimum thicknesses of tyre flanges measured at 13mm from outer edge of flange:**	Max.	Min.
a)	**Thick flanges/wear adopted wheel profile**	32mm	-
b)	**Standard flanges**	28mm	-
c)	**Thin flanges**	18mm	-

Note:

(i) The above values of flange thicknesses are measured from the back face of the tyre.

(ii) The minimum size of flange of locomotive tyres shall be determined by condemning profile gauge which specifies the minimum thickness and the limits of angularity of the flange on the gauge face.

6	**Minimum width of tyres:**	
(a)	**Locomotive coupled wheels**	133mm
(b)	**Locomotive wheels other than coupled**	127mm
7	**Incline of tread**	1 in 20 for all profiles except wear adopted profile for which the tread inclination of 1 in 20 will merge with radii of the wear adopted profile.

59.11 Buffers & Couplings:

8	**Distance apart for centers of buffers**	1956mm
9	**Maximum height above rail level for centers of buffers & CBC for empty locomotive**	1105mm
10	**Minimum height above rail level for centers of buffers & CBC when fully loaded**	1030mm

59.12 Maximum Moving Dimensions:

(see New Diagrams 1D)

11	**Maximum length of body or roof**	21340mm

Note: Maximum length of body or roof can be up-to 23540mm, subject to tapering of the ends in a manner that the end-throw, when calculated as per Appendix, is same as that for ICF coach of 21340mm length and within this Schedule of Dimensions.

12.	**Maximum length over center buffer couplers or side buffers**	22300mm

Note: Maximum length over the center buffer couplers or side buffers can be increased up-to 24000mm for Bogie Vehicles, in accordance with maximum length of body or roof. However, length over the center buffer couplers or side buffers is so arranged that difference between length over side buffers and length of body or roof is not less than 460mm.

13.	**Maximum width over all projections:**	
(i)	**At 91mm above rail level, when fully loaded**	2440mm
(ii)	**At 91mm to 305mm above rail level, when fully loaded**	2440mm increasing gradually to 3050mm
(iii)	**From 305mm above rail level, to 940mm above rail level, when fully loaded**	3050mm
(iv)	**From 940mm above rail level, to 1082mm above rail level, when fully loaded**	3050mm increasing gradually to 3150mm
(v)	**From 1082mm above rail level, to 1170mm above rail level, when fully loaded**	3150mm increasing Gradually to 3250mm
(vi)	**From 1170mm above rail level, when fully loaded**	3250mm

	to a height of 3735mm above rail level, when empty	

Note: (i) Maximum width over all projections from 925mm (minimum in all conditions) above rail level to 1082mm above rail level, when fully loaded can be 3075mm (in the bogie portion only).

(ii) Maximum distance apart of bogie centers (i.e. pivot centers) for locomotives shall be 15810mm, subject to the condition that width of locomotive at the center is such that mid-throw, when calculated as per Appendix, is same as that for ICF coach of 21340mm length and within this Schedule of Dimensions.

14	**Maximum height above rail level for a width of 1015mm on either side of the center of unloaded vehicle**	4265mm
15	**Maximum height above rail level at sides of empty locomotives**	3735mm

59.13 Maximum Moving Dimensions for X-Class locomotives

16	**Maximum width overall projections**	
(i)	**At 102mm above rail level, when fully loaded**	2440mm
(ii)	**From 305 mm above rail level to 1110 mm above rail level, when fully loaded**	3135mm
(iii)	**From 1110mm above rail level to a height of 1145mm above rail level, when fully loaded**	3135mm increasing gradually to 3200mm
(iv)	**From 1145 mm above rail level when fully loaded to a height of 3735 mm above rail level, when empty**	3200mm
17	**Maximum height above rail level for width of 305 mm on either side of center of empty locomotives**	4470mm

Note: The dimensions given in item no. 17 shall not be adopted without obtaining prior approval of the Railway Board.

18	**Maximum height above rail level at sides of empty locomotives**	3735mm
19	**Minimum height above rail level when fully loaded for a width of 1220 mm on either side of center of track with the exception of wheels and attachments thereto (vide note below)**	91mm

Note: A tyre or an attachment to a wheel or sand pipes in line with the wheel may project below the minimum height of 91mm from a distance of 51mm inside to 216 mm outside of the gauge face of the wheel.

20	**Minimum height above rail level when fully loaded at 1525 mm from center of track**	305mm

Chapter IV (D)

59.14 Rolling Stock (Track Machines)

Note: Any Rail bound vehicle used for track laying and track maintenance will be treated as Track Machines. The provisions under this chapter shall be applicable for Track machines.

59.15 Wheels & Axles

1	**Wheel gauge, or distance apart, for all wheel flanges**	Maximum 1602mm Minimum 1599mm
2	**(i)Maximum diameter on the tread of new carriage or wagon wheel, measured at 63.5 mm from wheel gauge face**	1092mm
	(ii)Minimum diameter on the tread of new carriage or wagon wheel, measured at 63.5mm from wheel gauge face	730mm
3	**Minimum projection for flange of new tyre, measured from tread at 63.5mm from wheel gauge face**	27.5mm
4	**Maximum projection for flange of worn tyre, measured from tread at 63.5mm from wheel gauge face**	35.0mm
5	**Maximum thickness of flange of tyre, measured from wheel gauge face at 13mm from outer edge of flange**	32mm
6	**Minimum thickness of flange of tyre, measured from wheel gauge face at 13mm. from outer edge of flange**	16mm
7	**Minimum width of tyre**	127mm
8	**Incline of tread**	1 in 20

59.16 Height of Floors

9	**Maximum height above rail level for floor of unloaded vehicle**	2100mm
10	**Minimum height above rail level for floor of any fully loaded vehicle**	1145mm

59.17 Buffers & Couplings

11	**Distance apart for centers of buffers**	1956mm
12	**Maximum height above rail level for centers of**	1105mm

	buffers & CBC couplers for unloaded vehicle	
13	**Minimum height above rail level for centers of buffers & CBC couplers when fully loaded**	1030mm

59.18 Wheelbase & Length of Vehicles

14	**Maximum rigid wheelbase for four wheeled vehicles**	6100mm

Note: Maximum rigid wheelbase can be up-to 8000mm subject to maximum speed in train formation shall be 60kmph. Speed restriction on other aspects has not been considered.

15	**Minimum distance apart of bogie centers for bogie vehicles**	5400mm
16	**Maximum distance apart of bogie centers for bogie vehicles**	16000mm

Note: Maximum distance apart of bogie centers for bogie vehicle more than 14900 mm shall be permitted, subject to the condition that mid-throw, when calculated as per Appendix, shall be same or less as that for ICF coach of 21340mm length and within this Schedule of Dimensions.

17	**Minimum rigid wheelbase for bogie truck of any vehicle**	1800mm
18	**Maximum length of body or roof for:** **a) 4- wheeled vehicle**	8540mm

Note: Maximum length of body or roof can be up-to 13590mm, subject to maximum speed in train formation shall be 60kmph. Speed restriction on other aspects has not been considered.

	b) Bogie vehicles	21340mm

Note: (i) In case of single unit, maximum length of body or roof can be up-to 23540mm, subject to tapering of the ends in a manner that the end-throw, when calculated as per Appendix, is same as that for ICF coach of 21340mm length and within this Schedule of Dimensions.

(ii) In case of two unit of Track Machines coupled together and working as one-unit, maximum length of body or roof can be up-to 38200mm, subject to in a manner that the end throw, when calculated as per Appendix, is same as that for ICF coach of 21340mm length and within this Schedule of Dimensions.

19	**Maximum length over center buffer couplers or side buffers:**	
	a) 4 – wheeled vehicle	9810mm

Note: Maximum length over centre buffer couplers or side buffers can be up-to 14780mm, subject to maximum speed in train formation shall be 60kmph. Speed restriction on other aspects has not been considered.

	b) Bogie vehicles	22300mm

Note: (i) In case of single unit, maximum length over the center buffer couplers or side buffers can be increased upto24000mm for Bogie Vehicles, in accordance with maximum length of body or roof. However, length over the center buffer couplers or side buffers is so arranged that difference between length over side buffers and length of body or roof is not less than 460mm.

(ii) In case of two unit of Track Machines coupled together and working as one-unit, maximum length over the center buffer couplers or side buffers can be increased up to 39440mm, subject to in a manner that the end throw for each unit, when calculated as per Appendix, is same as that for ICF coach of 21340 mm length and within this Schedule of Dimensions.

20	**Maximum distance apart between any two adjacent axles**	14170mm

Note: Maximum distance apart of any two adjacent axles more than 12345 mm shall be permitted, subject to the condition that mid-throw, when calculated as per Appendix, is same or less as that for ICF coach of 21340mm length and within this Schedule of Dimensions.

59.19 Maximum Moving Dimensions (See diagram 1D)

21	**Maximum width over all projections at 91mm above rail level, when fully loaded**	2440mm
22	**Maximum width over all projections, at 305mm above rail level, when fully loaded**	3050mm
23	**Maximum width over all projections from 305mm above rail level, to 940mm above rail level, when fully loaded**	3050mm
24	**Maximum width over all projection from 940mm above rail level to 1082mm above rail level, when fully loaded**	3050mm increasing gradually to 3150mm
25	**Maximum width over all projection from 1082mm above rail level, to 1170mm above rail level, when fully loaded**	3150mm increasing gradually to 3250mm
26	**Maximum width over all projections from 1170mm above rail level, when fully loaded to a height of 3735mm when empty**	3250mm
(i)	Guttering and side lamps may project 76 mm on each side beyond the dimensions given above from a height of 2895 mm to 3355 mm above rail level, up-to a maximum over all width of 3402 mm.	
(ii)	The doors are to be either sliding or opening inwards. Hand bolts, door locks, handles and window bars shall not, however, project beyond the dimensions given against item above.	

27	**Maximum width over open doors, including all projections for vehicles**	4265mm
28	**Maximum height above rail level for a width of 1015mm on either side of the center of unloaded vehicles**	4265mm
29	**Maximum height above rail level at sides of unloaded vehicles**	3735mm

Note: In case of stocks exceeding the 1929 profile and within the maximum moving dimensions shown in diagram 1D, clearance of the following railway is required to be obtained for the following locations before permitting the stock for the general adoption:

S. No.	Railway	Section	Location
1	**2**	**3**	**4**
1	E. Railway	Andal-Sainthia Chord	Br.No.66
2	N.F. Railway	Old Malda -Singhabad	Tangon Br.
3	S.E. Railway	Tata-Rourkela	Up Saranda Tunnel
4	S.E.C. Railway	Bilaspur-Katni	Dn Bhortonk Tunnel

30	**Minimum height above rail level when fully loaded for a width of 1220mm on either side of centre of track with the exception of wheels and attachments thereto (vide note below)**	91mm

Note: A tyre or an attachment of a wheel may project below the minimum height of 91 mm from a distance of 51 mm inside to 216 mm outside of the gauge face of the wheel.

31	**Minimum height above rail level, when fully loaded at 1525 mm from center of track**	305mm

SCHEDULE OF DIMENSIONS IN ELECTRIC TRACTION

60

60.1 Electric Traction (Direct Current)

Note: Wherever electric traction, employing overhead conductor wires, is in use strict orders must be issued prohibiting any one from getting on the roofs of vehicles until the current in the overhead conductors has been switched off and the conductors themselves have been earthed.

1	**Minimum height from rail level to the underside of live conductor wire: -**	
(i)	**Under bridges and tunnels**	5030mm
(ii)	**In the open**	5335mm
(iii)	**In running and carriage sheds**	5790mm
(iv)	**At level crossing**	5485mm

Note: The height prescribed in item 1(iv) applies also to tramway trolley wires crossing the railway.

2	**Maximum height from rail level to the underside of live contact wire except in running and carriage sheds**	5790mm

Note: In the case of running and carriage sheds, the maximum height of the contact wire will be determined in each case based on the operating range of the pantograph and the permissible electrical clearances required inside the sheds.

3	**Maximum variation of live conductor wire on either side of the central line of track**	
(i)	**On straight track**	230mm
(ii)	**On curves (on the inside of the curve)**	380mm
4	**Minimum distance between live conductor wire and any structure**	130mm
5	**Maximum width of pantograph collector**	2030mm

CHAPTER V (A)

60.2 Electric Traction 25 kV A.C. 50 Cycles

Note: Wherever electric traction is in use, special precautions shall be taken in accordance with provisions made in chapter XVII of 'General Rules' for all Open lines of Railways.

60.3 Electrical clearances:

1. Vertical and lateral distance between 25 kV live parts and earthed parts of fixed structures or moving loads/rolling stocks shall be as large as possible. The minimum vertical and lateral electrical clearances to be maintained under worst condition of temperature, wind etc. between any live part of the overhead equipment or pantograph and parts of any fixed structures (earthed or otherwise) or moving loads/rolling stocks shall be as under:

(i)	**Long duration**	250mm
(ii)	**Short duration**	200mm

Note:

(a) Long Duration means when the conductor is at rest and short duration means when the conductor is not at rest.

(b) A minimum vertical distance of 270 mm shall normally be provided between rolling stock and contact wire to allow for a 20 mm temporary raising of the track during maintenance. Wherever the allowance required for track maintenance exceeds 20 mm, the vertical distance between rolling stock and contact wire shall correspondingly be increased.

(c) Where adoption of the above clearances is either not feasible or involves abnormally high cost, Permanent Benchmark shall be

provided to indicate the level of track to be maintained.

2	**Minimum height from rail level to the underside of contact wire:**	
(i)	**Under Bridges and in Tunnels**	4.80 meter
(ii)	**In the open**	5.50 meter
(iii)	**At level crossings**	5.50 meter
(iv)	**In Running and Carriage Sheds**	5.80 meter

Note:

(a) In cases where it is proposed to allow Locomotives or Rolling stocks not higher than 4.42 m, the minimum height of Contact Wire, specified under item 2(i) above may be reduced to 4.69 meters.

(b) In cases where it is proposed to allow only Locomotive or Rolling Stocks not higher than 4.27m, the minimum height of contact wire, specified under Item 2(i) above may be reduced to 4.54m. A board showing this restriction and specifying "locomotives or Stocks not permitted to ply on such section" shall be exhibited at the entrance to the same.

(c) For movement of Over Dimensional consignments, the height specified under Item 2(i) above shall be increased by the difference between the height of the consignment contemplated and 4.42m. In case, such an over dimensional consignment is moved at speed not exceeding 15Km/h and is also specially escorted by authorized Railway Staff, the derived height of Contact Wire may be reduced by 50 mm.

(d) On curves, all vertical distances specified in Item (2) above, shall be measured above the level of the inner rail, increased by half the super-elevation.

(e) Suitable prescribed gradient on the height of contact wire shall be provided for connecting these wires installed at different heights.

3	**Maximum variation in alignment of the live Conductor Wire on either side of the center line of track under static condition:**	
(i)	**On straight track**	200 mm
(ii)	**On curves**	300 mm

Note: These limits would not apply to special locations e.g. Insulated Overlaps and Out of Run Wires.

4	**(i) Maximum width of pantograph collector**	2030mm
	(ii) When DC traction is converted to 25 kV AC traction, width of Pantograph collector {subject to it	2030mm

	being within the approved MMD}	

Note: A tolerance of plus 10 mm on maximum width specified is permissible to accommodate variation in manufacture and mounting with respect to the center line of vehicle.

5. In the case of light structures such as foot-over bridges, it would be desirable to keep a standard height of contact wire of 5.50m. In case of heavy structures, such as flyover bridges or Road over bridges, it is desirable to keep the height of contact wire as low as possible, consistent with the requirements of movement of Standard Class 'C' Over-Dimensional Consignments of height 4.80m.

CHAPTER V (B)

60.4- 25 kV A.C. Electric Traction with High Rise OHE

Note: Provisions under this chapter are applicable only for electrification of routes where double stack container having maximum height of 6809 mm is plying.

1.	**Minimum Height from rail level to the underside of contact wire in open**	7520mm

Note: On curves, the height shall be measured from the higher or super elevated rail.

2.	**Minimum Height of Overhead structure above rail level for a distance of 1600 mm on either side of the center of track shall be as under:**	
(A)	**Light Overhead Structures, such as Foot Over Bridges**	8430mm
(B)	**Heavy Overhead Structures, such as Road Over Bridges and Flyovers**	8050mm
(C)	**Heavy Overhead Structures, such as Road Over Bridges and Flyovers, if any turnout or crossover is located under that heavy overhead structure or within 40 meters from its nearest face**	8430mm

Note:

(i) Necessary provision shall be made in overhead structure and overhead equipment to permit an extra allowance for raising of track in future to cater for modern track structure in the form of increased ballast cushion of 350 mm, larger sleeper depth of 230 mm and heavier rail sections of 200 mm including 10 mm thick rubber pad by using longer traction overhead equipment masts, if necessary.

(ii) In case of restricted height of existing overhead structures, minimum height of overhead structure for a distance of 1600mm on either side of the center of track for provision of high-rise OHE as per note (iii) below, to permit operation of double stack container having maximum height as 6809 mm shall be as under:

a)	**Light Overhead Structures, such as Foot Over Bridges**	7568mm
b)	**Heavy Overhead Structures, such as Road Over Bridges and Flyovers**	7468mm
c)	**Heavy Overhead Structures, such as Road Over Bridges and Flyovers, if any turnout or crossover is located under that heavy overhead structure or within 40 m from its nearest face**	7568mm

For these minimum restricted heights, catenary wire shall be terminated outside overhead structure (Road Over Bridges & Flyovers / Foot Over Bridges).

(iii) In case of restricted height of existing overhead structures, bridges and tunnels as mentioned in (ii) above, the minimum height of underside of the contact wire from rail level can be reduced to 7166 mm. In such cases, a special study shall be made, before 25 kV AC traction is introduced as explained below:

(a)	**Height of the rolling stock**	6809mm
(b)	**Short duration electrical clearance**	200mm
(c)	**Additional electrical clearance for oscillation of the contact wire (For OHE span length of 49.5m or below)**	50mm
(d)	**Allowance for track upgradation/maintenance**	50mm
(e)	**Rise in rolling stock height under dynamic conditions**	57mm
(f)	**Minimum height of contact wire**	7166mm

(iv) **Extra vertical clearance shall be provided on curves as under:**

Extra vertical clearance (mm) = $\frac{Width\ of\ MMD\ (mm)\ x\ Super\ elevation\ (mm)}{Dynamic\ guage\ (mm)}$

This extra vertical clearance on curve would be with respect to inner rail of curve.

2. Clearance for Power Line Crossings Including Telephone Line Crossings of Railway Tracks:

SL	Over Head Crossing Voltage	Minimum Clearances from Rail Level		Minimum Clearance Between Highest Traction Conductor and Lowest Transmission Line Crossing Conductor
		Existing Power Line Crossing for Non-Electrified Territory	New Power Line Crossing or Crossing Planned for Alteration	
(1)	(2)	(3)	(4)	(5)
(a)	Upto and including 11kV	Normally By Underground Cable		
(b)	Above 11kV & upto 33kV	10860mm	16660mm	2440mm

(c)	Above 33kV & upto 66kV	11160mm	16960mm	2440mm
(d)	Above 66kV & upto 132kV	11760mm	17560mm	3050mm
(e)	Above 132kV & upto 220kV	12660mm	18460mm	4580mm
(f)	Above 220kV & upto 400kV	14460mm	20260mm	5490mm
(g)	Above 400kV & upto 500kV	15360mm	21160mm	7940mm
(h)	Above 500kV & upto 800kV	18060mm	23860mm	7940mm

Note:

(i) All height/clearances are in mm and under maximum sag conditions.

(ii) If the crossing is provided with a guarding, a minimum clearance of 2000mm shall be maintained between bottom of the guard wire and highest traction conductor.

(iii) Power line crossings in yards & stations area shall be avoided.

(iv) For electrification works of existing track or construction of new track/ gauge conversion with electrification, existing power line crossings can continue, if dimensions are as per Column (5) above, even if dimensions of Col (3) are not satisfied i.e. for electrification works Col (3) is not applicable.

4.	**Maximum width of Pantograph Collector**	2030 mm

Note: A tolerance of plus 10mm on maximum width specified is permissible to accommodate variation in manufacture and mounting with respect to center line of vehicle.

ABOUT THE AUTHOR

61

Shri Hari Shankar Verma, author of this book, is an officer of the 1987 examination batch of Indian Railway Traffic Service. He joined IRITM as Director General on 22.05.2023. Shri Verma was born in Village Akori, Bairagarh, District Jalaun, Headquarter Orai. He completed school education at the village and a nearby village Ait, Post-office Ait and later moved to District Headquarter Orai for Graduation. Later he moved to Banaras Hindu University (BHU) for higher education. He did M.Sc. in Agriculture with a specialization in Mycology and Plant Pathology. He secured distinction in the final examination and set a record.

Shri Verma has supported his family from the young age of nine. He succeeded in the family business and became quite prominent as young businessman. Later, with a change of mind, he moved to Banaras for higher study. During student days, he was actively engaged in student politics and won several College and University elections.

He has cleared the Civil Service Examination, 1987, in first attempt and joined the Indian Railway Traffic Service on 25.08.1988 at Lal

Bahadar Shastri National Academy of Administration (LBSNAA), Mussoorie and later Railway Staff College [RSC, now National Academy of Indian Railway (NAIR)], Vadodara. He was initially allotted the Southern Railway as lien Railway and later the Railway lien changed to Western Railway.

He has been trained on Southern Railway, Western Railway and Central Railway. He had been given an initial posting at Jaipur, Western Railway (now North-Western Railway) as Assistant Commercial Superintendent, which later changed to Assistant Commercial Manager.

He had been posted on Central Railway as Divisional Operating Manager (DOM), Divisional Safety Officer (DSO), Jhansi Central Railway (now North Central Railway). On promotion to Junior Administrative Grade, he was posted as Principal Zonal Training Center (ZTC now ZRTI), Bhusawal, Central Railway. He has been Senior Divisional Operations Manager (Sr. DOM), Bhopal, Central Railway and later West Central Railway. He has also worked as Senior Divisional Safety Officer (Sr. DSO), Central Railway, Mumbai. On promotion to Senior Administrative Grade, he was posted as Chief Claim Officer (CCO), Chief Commercial Manager/ Freight Marketing (CCM/FM), Chief Passenger Traffic Manager (CPTM), Central Railway, Mumbai.

He has also worked as Additional Divisional Railway Manager (ADRM), Mumbai, Central Railway, Divisional Railway Manager/Salem/Southern Railway and Principal Chief Operations Manager (PCOM), South-Western Railway/ Hubballi. During his career spanning more than 35 years in the Railways, he has been decorated with several awards like Railway Minister award, General Manager award, Railway Minister's Silver Medal, and Certificate for promotion of Rajbhasha and a number of other awards and appreciation from seniors.



He is a pioneer in standardization and ISO certification in Operating Department. His efforts culminated in the ISO certification of ZTC, Bhusawal, which was the first ever for any training center in the country. Further, he also got ISO certification for the Divisional Control Office, Bhopal, Habib-Ganj railway station (now Rani Kamlapati Railway Station) and Habib-Ganj-Nizamuddin daily Express during his 5 years stint as Sr. DOM, Bhopal. Shri Verma excelled in each of his postings and achieved the highest targets of his time. As ADRM, Mumbai and later CPTM, he is credited with running of additional 278 daily suburban services in CR. He also started the first 15-car-rake on CR. It is noteworthy that all his achievements were marked by the maintenance of complete industrial peace.

As DRM, Salem he had been instrumental in easing traffic bottlenecks by way of yard remodelling, completion of long pending traffic facility works, restoration of Nilgiri Mountain Railway track, bridges and stations and infrastructural development of Salem Division Headquarter (as it was a newly created division).

During his tenure, Salem Division had received several Shields from the Zonal Headquarter.

As PCOM South-Western Railway, he had completed all long pending traffic facility works and facilitated doubling and construction of new lines. He achieved record performance in all operating parameters including highest ever loading, which was appreciated by MO&BD through a letter and a shield. He had been instrumental in making SWR the top performer amongst all Zonal Railways in Key Performance Indices (KPIs).

Over the last 13 months as DG IRITM, he has been instrumental in achieving quality in training and the standardization of the training process. **IRITM has been rated as 'Ati Utkrisht' (4 Stars)** as per the **National Standards for Civil Services Training Institutions** (NSCSTI) under the aegis of Capacity Building Commission of India (CBC). Chairman and CEO, Railway Board has personally appreciated his effort in this regard. Further, IRITM has also been awarded **ISO 21001, which is the latest Standard for Training Institute and named as Educational Organizations – Management System (EOMS)**.

He has written, designed and edited the reading material for first batch of Indian Railway Management Service (IRMS) probationary officers. Under his leadership, IRITM has been credited with conduction of training of first batch of as Indian Railway Management Service (IRMS) after Civil Service Examination, 2022. Following books has been authored or edited by him:

1. IRITM Handbook
2. Journal & Art of Journaling for IRMS
3. Handbook of Foundation Course
4. Reading material for IRMS Foundation Course Vol-I (**General Administration, History, Railway Account and Finance, Medical & Rajbhasha**)
   ISBN No.: 978-81-966251-8-4

5. Reading material for IRMS Foundation Course Vol-II (**Civil Engineering, Railway Bridges, Railway Land, Schedule of Dimension, Project Management, Signals Engineering and Telecommunication Engineering**)
   ISBN No.: 978-81-966251-9-1
6. Reading material for IRMS Foundation Course Vol-III (**Mechanical Engineering, Electrical Engineering and Material Management**)
   ISBN No.: 978-81-966251-7-7
7. Reading material for IRMS Foundation Course Vol-IV (**Operating, Traffic Planning, Safety, Commercial Management & Business Development**)
   ISBN No.: 978-81-966251-3-9
8. A Railway Executive's Guide to Soft Skills, Communication, and Personality Development, ISBN No.: 978-81-971687-9-6
9. The Railway Executive's Guide to the General Law, Railway Act 1989 and Other Related Acts and Rules, Volume I.
   ISBN No.: 978-81-971687-7-2
10. Railway Executives Guide to the Law, Labour Law, Contract Law, Anti-Corruption Law, Service Rules, Conduct Rules, Disciplinary Rules, etc., Volume II
    ISBN No.: 978-81-973413-2-8
11. An Elementary Textbook of Railway Operation, Safety and Management (Reading Material for **TSTS, TCTC** and other **promotional** and **Group B integrated** course) ISBN No.: 978-81-971687-1-0
12. A Guide to Supervision, Counselling and On Job Training **(TSTS, TCTC, CABD, SFMC and other Supervisory and Group 'B' training)** ISBN No.: 978-81-971687-3-4
13. An Elementary Textbook of Railway Commercial and Business Development, **(CABD)** (Reading Material for Commercial and Business Development Course (CABD) for Supervisors, Promotional and Induction course for Group B Officers)
    ISBN No.: 978-81-971687-2-7

14. A Guide on Ethics and Vigilance Management for Railway Officers, Volume I and II.
ISBN No.: 978-81-973123-8-0

15. The Science and Art of Indian Railway Safety Management (Volume I- **Accident Prevention**)
ISBN No.: 978-81-973123-7-3

16. The Science and Art of Indian Railway Safety Management (Volume II- **Accident Investigation**)
ISBN No.: 978-81-973123-0-4

17. The Science and Art of Indian Railway Safety Management (Volume III- **Accident Management**)
ISBN No.: 978-81-973123-1-1

Safety Review Committees (Compiled and Edited)

18. Readings on Report of **Shahnawaz Committee** Report 1954,
ISBN No.: 978-81-966251-1-5 (Safety Series I)

19. Readings on Report of The Railway Accidents Committee 1962
(Kunzru committee) Part I and II (Safety Series II)
ISBN No.: 978-81-973123-9-7

20. Readings on Report of The Railway Accidents Inquiry Committee 1968 (**Wanchoo Committee 1968)** Part I,
ISBN No.: 978-81-966251-2-2 (Safety Series III)

21. Readings on Report of The Railway Accidents Inquiry Committee 1968 (**Wanchoo Committee 1968)** Part II,
ISBN No.: 978-81-966251-6-0 (Safety Series IV)

22. Readings on Report of The Railway Accident Enquiry Committee 1978 (**Sikri Committee 1978)** Part I
ISBN No.: 978-81-971687-5-8 (Safety Series V)

23. Readings on Report of The Railway Accident Enquiry Committee 1978 (**Sikri Committee 1978)** Part II
ISBN No.: 978-81-971687-4-1 (Safety Series VI)

24. Readings on Report of The Railway Safety Review Committee1998 **(Khanna Committee)** Part I,
ISBN No.: 978-81-966251-5-3 (Safety Series VII)

25. Readings on Report of The Railway Safety Review Committee1998 **(Khanna Committee)** Part II
ISBN No.: 978-81-971687-6-5 (Safety Series VIII)

26. Readings on Report of High-Level Safety Review Committee 2012 **(Kakodkar Committee)**
ISBN No.: 978-81-966251-4-6 (Safety Series IX)

27. Readings on Report of Corporate Safety Plan, High-Level Committee's report on disaster management over Indian Railway, Report of Task Force on Safety, 2017 and White Paper on Indian Railway Safety (Safety Series X) ISBN No.: 978-81-973123-4-2

Railway Committees Reports (Compiled and Edited)

28. Readings on Report of Report of the Committee appointed by the Secretary of State for India to enquire into the administration and working of Indian Railways (East India Railway Committee 1920-21) **Acworth committee 1924** Volume I Report

29. Readings on Report of Report of the Committee appointed by the Secretary of State for India to enquire into the administration and working of Indian Railways (East India Railway Committee 1920-21) **Acworth committee 1924** Volume II, Evidence Taken in London

30. Readings on Report of Report of the Committee appointed by the Secretary of State for India to enquire into the administration and working of Indian Railways (East India Railway Committee 1920-21) **Acworth committee 1924** Volume III, Evidence Taken in India

31. Readings on Report of Report of the Committee appointed by the Secretary of State for India to enquire into the administration and working of Indian Railways (East India Railway Committee 1920-21) **Acworth committee 1924** Volume IV, Written Statements by witnesses and others.

32. Readings on Report of The Indian Railway Enquiry Committee 1937 along with action taken. **(Wedgwood Report)**
ISBN No.: 978-81-973123-3-5

33. Readings on Report of The Indian Railway Enquiry Committee 1947
ISBN No.: 978-81-966251-0-8

Corruption Enquiries Reports (Compiled and Edited)

34. Readings on Report of The Railway Corruption Enquiry Committee (1953-55) **Kripalani Report**
ISBN No.: 978-81-971687-0-3

35. Readings on Report of The Committee on Prevention of Corruption, 1964 **(Santhanam Committee Report 1964)**
ISBN No.: 978-81-971687-8-9

36. Readings on Report of Ethics in Governance 2007, Second Administrative Reforms Commission.
ISBN No.: 978-81-973123-2-8





वयं राष्ट्रे जागृयाम

भारतीय रेल परिवहन प्रबंधन संस्थान
रेल मंत्रालय, भारत सरकार
INDIAN RAILWAYS INSTITUTE OF TRANSPORT MANAGEMENT
(Hardoi By-Pass Road, PO Manak Nagar, Lucknow-226011, Uttar Pradesh)

ISBN : 978-81-973123-0-4