Section - 4

General Management of Indian Railways

Lesson-1
History of Railways, Organizational Features and Corporate Plan of Indian Railways

1.0 History of Railways

The history of Railways is very old and is closely linked with the growth of civilization. As the necessity arose, man developed various methods of transporting goods from one place to another. In the primitive days the goods were carried by head loads. As the civilization grew, the goods were transported by carts drawn by man or animal. In 15th century stone slabs or wooden baulks were laid flush with the road surface for carriage of heavy goods loaded on carts and drawn by animals. These were called 'Tram ways'. These Tram ways were extensively used in 16thcentury in mines in central Europe for carriage of coal and other minerals.

The timber baulks were replaced by iron plates to reduce wear and these were called 'Plate ways'. These iron plates were also substituted in course of time by angle irons to give lateral support for better safety. As a further improvement, William Jesssop of U.K. in 1789 replaced iron plates with cast iron beams heaving stone supports at ends for better working. The present railway track is a gradual evolution from these plate ways.

Efforts were simultaneously made to replace animal power also by mechanical power. In 1769, a Frenchman called Nicholes Cugnot carried out for the first time some pioneering work for development of steam energy. Further work was done by a Scotsman William Murdoch, but he also met with only limited success. It was in the year 1804, that Richard Trevithick designed and constructed a steam locomotive. This locomotive, however, could be used for traction on roads only. The credit of perfecting the design finally goes to George Stephenson, who in 1814 produced the first steam locomotive used for traction in railways.

The first public railway in the world was opened to traffic on 27th September, 1825, when the first train made its maiden journey between Stockton and Darlington in U.K. Simultaneously other countries in Europe also developed such railways systems and most of the European countries introduced trains for carriage of passenger traffic at that time. The first railways in Germany were opened from Nurenberg to Furth in the year 1835. In U.S.A., the first railway was operated in 1833 between Mohawk and Hudson. This was followed by a spate of development all over the world.

1.1 Indian Scene

The Indian scene also could not remain unaffected by what was happening in other countries around. India was under the British Rule at that time when the railways were being introduced in various other countries. British had special political and economic interest in the country. Their main aim was to have a transport system which could facilitate them in the administration of the country and also provide an efficient system to take away raw materials from India to the mills in England and bring in the finished goods into the country. The entire import and export

was through the sea route. It was, therefore, the first priority of the British to connect the hinterland with the port cities such as Bombay, Calcutta and Madras. The East Indian Railway Company was formed in 1844 for looking after the construction activities in the country and a trial survey was completed for a railway line from Calcutta to Delhi in 1845-46 Construction of railway line was sanctioned from Howrah (Calcutta) to Raniganj, but the work progressed slowly. In the mean time, construction work started on Bombay – Thane route by another company called 'Great Indian Peninsular (G.I.P)' Railway in 1850 and the first railway in India was opened in 1853.

The maiden trip on Indian Soil of the first train consisting of one steam engine and four coaches was made on 16th April 1853, when it traversed a 21 mile stretch between Bombay and Thane in about 1 hour and 15 minutes. Starting from this humble beginning, the Indian Railways system has grown up today into a giant net work consisting of more than 66,687 route kms criss-crossing this great country from the Himalayan foot hills in the north to Kanya Kumari in the south.

The Indian Railways run about 18518 trains every day and carry about 8107 million passengers and about 1108 million tonnes of goods traffic in a year (15-16). For moving this traffic, the Indian Railways maintains about 11122 locomotives, 63,342 passenger coaches and 251256, goods wagons. The Indian Railways system today is the largest state owned railway system in the world under a single management.

The Railways in India are not only a mere transport agency, but have a deep social obligation to meet efficiently and fully the increasing transportation needs of the country and to provide necessary infrastructure for the healthy economic development and rapid industrialization of the country As far as transport needs are concerned, the railways endeavour to move as efficiently as possible the traffic for which they are best suited without entering into un-healthy competition with other modes of transport.

1.2 Development of Indian Railways

Important developments about Indian Railways have been chronologically listed in Table 1.1

Table 1.1 Important developments of Indian Railways

Year	Important events of Railways
1831-33	The first idea of Indian Railway conceived from Madras to Bangalore to improve the transport system of Southern India.
1844	Mr. R.M. Stephenson formed East Indian Railway Company for construction of railway lines
1850	Construction of railway line from Bombay to Thana started by Great Indian Peninsula Railways Company
1853	First railway line from Bombay to Thane was opened for passenger traffic for a distance of 21 miles.
1854	Railway line between Howrah and Hoogly (24 miles) opened for passenger traffic.

1856 Railway line between Veyasarpady and Waljah Road (63 miles) opened for traffic under the banner of Madras Railway Company. In fact this was the first proposal initiated in 1831 but could be completed only in 1854.

1850-68 First Stage of development of Indian Railways classified as 'Early guarantee System'. The Government guaranteed a minimum percentage of return to the share holders in order to attract the private enterprise to construct Railways, but retained the right to purchase these Railways at the end of 25 years or 50 years.

A number of Railway companies were formed for construction of railway viz. East India Railway (E.I.R.), Great Indian Peninsula Railway (G.I.P.), Bombay-Baroda & Central India Railway (B.B & C.I.R.) and Madras State Railway (M.S.R), etc.

1869-81 In 1869, it was decided by British govt. that future Railway projects should be either under new guarantee system or the state owned railways. A few princely states started construction of railway lines separately. The Govt., however, exercised considerable measure of control to optimize and coordinate the different lines. At this time, there were company managed railways under the new guarantee system as well as state-managed railways. After 1870 the development of railway was very fast.

1905 Railway Board was established with three members consisting of one president and two members.

1922 Railway Board was reconstituted and given wide powers.

1924 Railway finances were separated from general finances.

1925 First railway line was electrified consisting of harbour branch line of G.I.P.

1928 B.B & C.I. Railway electrified its Bombay Suburban section.

1931 Madras suburban section was electrified.

1937 Burma was separated from India and about 3200 kms. Of railway lines were taken out from Indian Railways.

1939-42 During 2nd world war, Indian Railways were called upon to release track materials, locomotives and wagons for construction of lines in middle east. This resulted into closing of 26 branch lines. Railway Workshops were used for manufacture of defence materials. At the end of war, there were heavy arrears of renewals and replacement of various assets.

1942 War Transport Board was formed.

1947 Due to partition of the country, division of railway lines and assets took place between India and Pakistan.

1947-51 After independence, there were 42 railway systems consisting of 13 class I railways, 10 class II Railways and 19 class III Railways. These included 32 lines owned by ex-Indian states. Government of India decided to rationalize these railways and put

them in workable groups, which can be viable and work efficiently.

Re-grouping of railways was completed and 6 zones were formed namely Central Railway. Eastern Railway, Northern Railway, North Eastern Railway, Southern Railway and Western Railway.

The main objective of planning of Indian Railways in post independence era has been to develop rail transport to provide appropriate support for the planned growth of national income as a whole. While doing so, the emphasis has been suitably re-adjusted during each 5 year period to take note of certain special features.

1951-56 During 1st Five Year Plan, there was special emphasis on rehabilitation and replacement of the assets overstrained and totally neglected during the World War II. A sum of Rs. 257crores (11.3%) was allotted to the Indian Railways out of total plan expenditure of Rs. 2378 crores.

1956-61 During 2nd Five Year Plan, the accent was on development of rail transport capacity to meet the requirement of movement of raw materials and goods. A sum of Rs. 896 crores (18.7%) was allotted to Indian Railway out of total plan expenditure of Rs. 4800 crores.

1961-66 The strategy adopted in 3rd Five Year Plan was to build up adequate rail transport capacity to meet the traffic demands. This was proposed to be done principally through modernisation of traction i.e. by switching from steam traction to diesel or electric traction in a progressive manner. Track technology and signalling was also improved to match the new traction system. During 3rd Five Year Plan, a sum of Rs 890 crores (11.9) was allotted to Indian Railways out of total of Rs.7500 crores.

1966-69 There was a gap of 3 years between the 3rd Five Year Plan and 4th Five Year Plan as the Government wanted to review the results of the preceding development plans and adjust the strategy. A sum of Rs. 592 crores was allotted to the Indian Railways for increase of transport capacity.

1969-74 The 4th Five Year Plan was drawn with a renewed emphasis on the twin objectives of modernisation of railways and improving the operational efficiency of the system by more intensive utilization of existing assets of railways. As sum of Rs. 1050 crores (6.6%) was allotted for development of railways out of total of Rs. 15900 crores.

1974-78 The main emphasis on the 5th Five Year Plan was for development of rapid transport system in metropolitan cities, improvement in financial viability through cost reduction techniques, resource mobilization and optimum utilization of assets and achievement of national self sufficiency in railway equipments.

A sum of Rs. 2200, crores (5.6%) was allotted to the railways out of total of Rs. 39300 crores.

1978-80 There was a rolling plan introduced for 2 years. Railway continued to follow the policy of 5th Plan period. A sum of Rs. 185 crores was allotted during this plan.

1980-85 The 6th five year plan was drawn up keeping in view the anticipated resource constraints and heavy backlog of arrears of renewal of assets like wagon and track. The main emphasis was that limited resources of railways should be used for rehabilitation of assets. The stress is to use the existing resources in the best possible manner for getting high operating efficiency. A sum of Rs.5100 crores was allotted to the railways out of total of Rs. 97500 crores for all the public sector undertaking for the full plan period.

1985-90 The Seventh Five Year plan provides for an outlay of Rs. 12,334 crores.

Augmentation of capacity for manufacture of passenger coaches, electric multiple units and electric locomotives, electrification of important routes, Track renewal works, upgradation of communication net work, introduction of computer based Freight Operation Information system and computerization of passenger reservation in certain metropolitan cities are the highlights of the Plan.

1992-97 The 8th plan provides an outlay of Rs 27202 crores (6.3%) for Indian Railways out of total outlay of Rs. 434,100 crores for the full plan.

Some of the main objectives in the Eighth Five Year Plan are General adequate transport capacity Complete the process of rehabilitation of over aged assets. Modernise the system to reduce cost and improve reliability, complete unigauge of 6,000 km. of M.G & N.G. to B.G., Phase out steam locomotives, Electrify 2,700 route kms, Expand and upgrade inter modal operation and Improve manpower productivity.

1997-2002 The Ninth plan Provides an outlay of Rs. 45413 crores (14.1%) for Indian Railways out of total outlay of Rs. 859200 crores for the full plan. Some of the main objectives in the Ninth Five Year Plan were generation of adequate rail transport capacity for handing additional freight and passenger traffic. Modernisation and upgradation of rail transportation system, continuation of the policy of unigauge.

2001-2007 The 10th plan envisages an outlay of Rs. 60600 crore which is 6.78% of total outlay of 893183 crores for the full plan. The main objectives of the 10th Plan are given in Para 2.1 of lesson 2.

2007-2012 The 11th plan envisaged an originating freight for the terminal year at 1100 million tonnes and originating passenger traffic at 8400 million passengers.

2012-2017 The 11th plan envisaged an originating freight for the terminal year at 1405 million tonnes and originating passenger traffic at 11700 million passengers.

2016 High Speed Rail Corporation Of India formed to take up work on High Speed Rail from Mumbai to Ahmedabad with Japanese assistance and loan.

1.3 Different modes of transport

There are basically 4 modes of transport for carriage of passengers and good viz. rail transport, road transport, air transport and water transport. Each transport, depending upon its various

characteristics, has intrinsic strength and weakness and can be best used for particular type of traffic as given below :

(i) ***Rail transport:*** Because of heavy expenditure on basic infrastructure and also being energy efficient, this mode of transport is best suited for carriage of bulk commodities and large number of passenger traffic for long distances.

(ii) ***Road transport:*** Because of flexibility of operation and being able to provide door to door service, this mode of transport is ideally suited for carriage of light commodities and small number of passengers for short distance.

(iii) ***Air transport:*** Because of heavy expenditure on sophisticated equipments and fuel costs to get higher speeds, this mode of transport is better suited in situation where passengers or goods have to reach to other destinations in a very short period of time.

(iv) ***Water transport:*** Because of low costs on infra-structure and relatively slow speeds, this mode of transport is best suited for carriage of heavy and bulky goods for long distances without consideration of time factor provided specific locations having water ways are available.

1.3.1. Railway as a mode of land transport

There are basically two modes of land transport viz. railways and roads and each has its relative advantages and disadvantages. These have been summarized in Table 1.2

Table 1.2. Rail transport versus Road transport

	Item	Rail Transport	Road Transport
1.	Tractive resistance	Movement of steel wheel on steel rail has basic advantage of low rolling resistance. This reduces haulage costs because of lesser tractive resistance.	Tractive resistance of pneumatic tyre on metalled roads is almost five times compared to that of the railways.
2.	Right of way is within protected limits.	Railway track is defined on two rails and Trains work as per the schedule prescribed & no other vehicle has right of way except at specified level crossings.	Roads, though having well defined limits, can be used by any vehicular traffic or even by pedestrians. It is open for all.
3.	Cost analysis	Because of heavy infrastructure the initial cost as well as maintenance cost of railway lines is high.	Cost of construction and maintenance of of roads is comparatively cheaper.
4.	Gradients and curves	Because of heavy loads, the gradients are flatter (normally not more than 1 in 100) and curves are limited up to only 100 on Broad Gauge.	Road are constructed normally with steeper gradients upto 1 in 30 & relatively much sharper curves
5.	Flexibility of movement	Because of defined routes & facilities requiredfor reception & dispatch of trains, railways can be used only between fixed points.	Roads transport have much more flexibility in movement & can give door-to-door service.

6.	Energy efficiency	Railways are 6 times more energy efficient than road for carrying the same volume of traffic.	
7.	Environment pollution	Railway have minimum adverse effect on environment	Road transport creates much more pollution on the environment.
8.	land economy		Railways require 25% of the land than required by a road for carrying same volume of traffic.
9.	Suitability of type of traffic	Railways are best suited to carry heavy goods traffic & large volume of passengers traffic for long distances.	Road transport is suited for carriage of lighter goods & less Passengers for shorter distances.

1.4 Organisation of Indian Railways

The Indian Railways are at present the biggest public undertaking of the Government of India having capital-at charge of about Rs. 2,75,135 crores. The enactment regulating the construction and operation of railways in India are the Indian tramway act of 1816 and the Indian Railway act of 1890 as amended from time to time. The executive authority in connection with the administration of the railways vests with the Central Government and the same has been delegated to the Railway Board as per the Indian Railway Act referred to above.

1.4.1 Railway Board

The responsibility for the administration and management of the Indian Railway rests with the Railway Board under the overall control of the Minister for Railways. The Railways Board exercises all the powers of the Central Government in respect of regulation, construction, maintenance and operation of the Railways. The Railway Board consists of the Chairman, Financial Commissioner for Railways and five other functional Members. The Chairman is ex-officio Principal Secretary to the Government of India in the Ministry of Railways. He is responsible to the Minister for Railways for arriving at decisions on technical and administrative matters and advising the Government of India on matters of Railway policy. All policy and other important matters are put up to the Minister through Chairman or other Board members.

The Financial Commissioner for Railways is ex-officio Secretary to the Government of India in the Ministry of Railways looking after all financial matters including budget and expenditure.

The Members of the Railways Board are separately in charge of matters relating to Staff, Civil Engineering, Traffic, Traction and Rolling Stock. They function as ex-officio Secretaries to the Government of India in their respective spheres. To enable the Railway Board to effectively tackle the additional duties and responsibilities arising from the increased tempo of work, the Railway Board is assisted by about 15Additional members,19Advisors and 70Executive Directors, in-charge of different Directorates such as Civil engineering, Mechanical, Electrical, Stores, Traffic and Transportation, Commercial, Planning etc., who are responsible for monitoring and control of their functions except major policy decisions, which are taken by the Board Members/Ministers.

The organizational structure of Railway Board is shown in Fig. 1.1

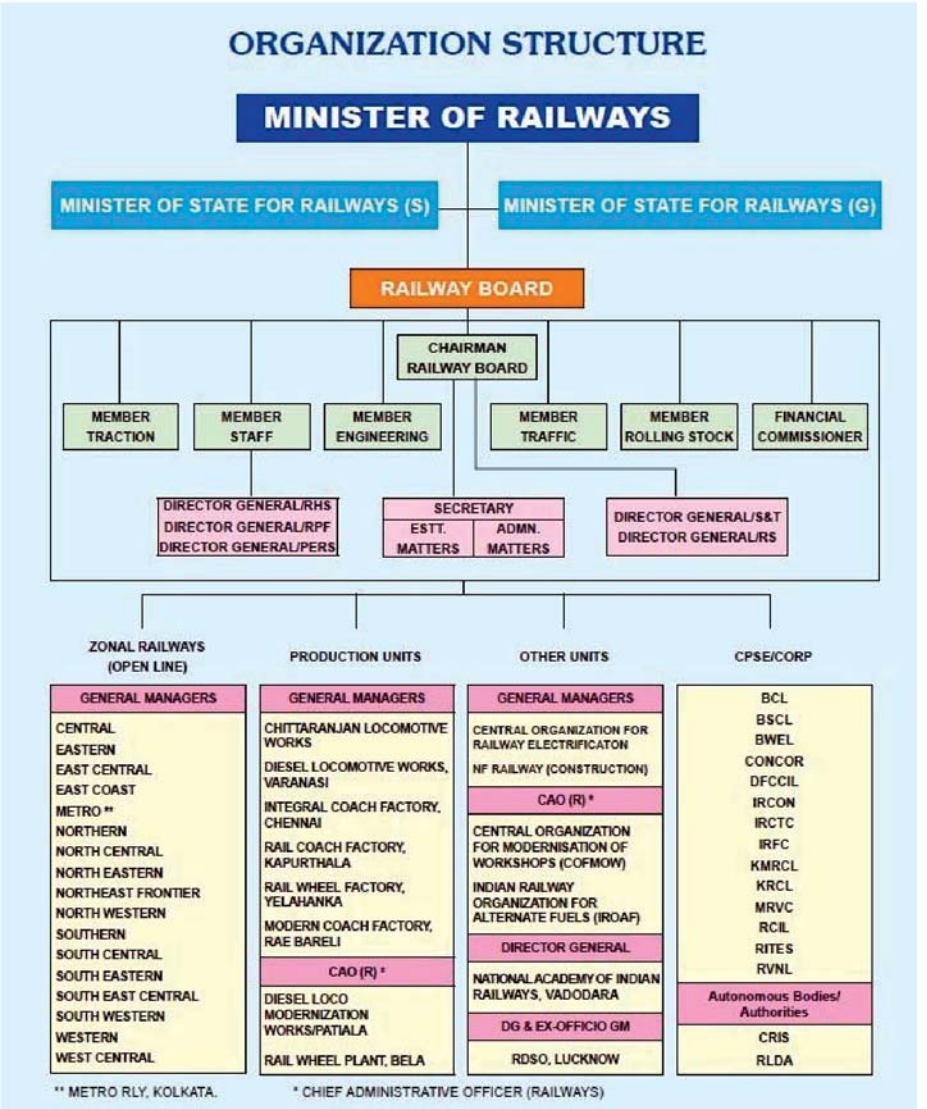

Fig. 1 : ORGANISATION STRUCTURE OF RAILWAY BOARD

1.4.2. Research Design & Standards Organisation (RDSO)

The Research, Designs and Standards Organisation is located at Lucknow. RDSO is headed by a Director General with a team of specialists from different field of railway working. RDSO functions as the technical wing of the Railway Board and provides consultancy, standard designs and research results to the Zonal Railways, Production Units and also to public and private sector undertakings.

1.4.3. Indian Railways Net work

The Indian Railways net work consists of Broad Gauge, Metre gauge and Narrow gauge having total route kms of 66,687 as per details given below (as on 31st march, 2016):

Gauge	Route Kms.	Running Track Kms.	Total Track Kms.
Broad Gauge (1676 mm)	60,510	85,614	1,12,388
Metre Gauge (1000 mm)	3,880	4,170	4,747
Narrow Gauge (762 mm nd 610 mm)	2,297	2,297	2,495

Note :* Route Km indicates the length of route from one point to another point.

** Running track kms. Indicate the length of running track on that route; on a double line section running track km is twice the route km.

*** Total track kms. Indicate total length of track including sidings & yards etc.

1.4.4. Zonal Railways

The entire Indian Railway system has been divided into sixteen zonal railways having different territorial jurisdictions which vary roughly between 2500 to 7000 route kms. The route kilometers of various zonal railways is given in the tabular from in table 1.3.

Table 1.3 Details of Various Zonal Railways (as on 31st March, 2016)

Zone/Headquarters	Route Kms	Running Track Kms	Total Track Kms
Central, Mumbai	4,063	6,237	8,491
Eastern Kolkata	2,712	4,790	7,461
East Central, Hajipur	3,925	5,637	8,199
East Coast, Bhubaneshwar	2,723	4,026	5,440
Northern, New Delhi	7,301	9,560	12,966
North Central, Allahabad	3,364	4,968	6,101
North Eastern, Gorakhpur	3,869	4,579	5,321
Northeast Frontier, Maligaon, Guwahati	4,072	4,470	6,025
North Western, Jaipur	5,550	7,015	7,430
Southern, Chennai	5,074	7,003	8,647
South Central, Secunderabad	6,027	8,216	10,107
South Eastern, Kolkata	2,715	5,062	6,834
South East Central, Bilaspur	2,506	3,659	5,048
South Western, Hubli	3,321	3,941	4,931

Western, Mumbai	6,440	8,022	10,239
West Central, Jabalpur	2,997	4,841	6,295
Metro Railway, Kolkata	27	55	95

These zonal railway take care of railways' business in their respective areas and are responsible for all management and planning of works. Each zonal railway is administered by a General Manager assisted by an Additional General Manager and heads of departments of different disciplines, viz. Civil Engineering, Mechanical, Operating, Commercial, Account, Security, signal and Telecommunications, Electrical, Personnel and Medical etc.

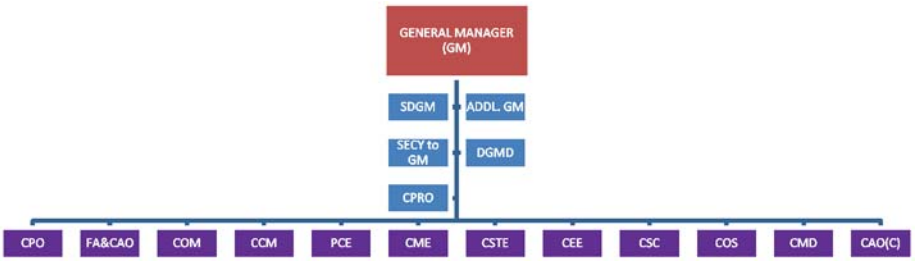

Fig. 1.2. TYPICAL ORGTANISATION CHART OF A ZONAL RAILWAY

A typical organization of a Zonal Railway is given in Fig.1.2. The duties of heads of departments are given in Table 1.4.

Table 1.4. Duties of Principal Heads of Department of Zonal Railway

S.No.	Designation	Abbreviation	Brief Duties
1	General Manager	GM	Overall in charge of a zonal Railway having about 2,000 to 7,000 route km
2	Additional General Manager	AGM	Number two position. In charge of general administration
3	Senior Deputy General Manager	SDGM	Chief Vigilance Officer
4	Chief Public Relation Officer	CPRO	Public Relation Work
5	Chief Personnel Officer	CPO	Establishment matter and labour relations
6	Financial Advisor & Chief Accounts Officer	FA&CAO	Accounting and all financial matters
7	Chief operations Manager	COM	Running of trains and transport of passenger & goods

8	Chief Commercial Manager	CCM	Sales and Marketing of passenger and goods services
9	Principal Chief Engineer	PCE	Maintenance and construction of track, bridges and Engineercivil engineering
10	Chief Mechanical Engineer	CME	Maintenance and repairs of rolling stock (coaches and wagons)
11	Chief Signal & Telecommunication Engineer	CSTE	Maintenance and construction of signaling and telecommunication facilities
12	Chief Electrical Engineer	CEE	Maintenance & Repairs of Locos, EMU stock and all electrical installation
13	Chief Security Commissioner	CSC	Security of Railway Installations
14	Controller Of Stores	COS	Procurement and Supply of stores
15	Chief Medical Director	CMD	Medical attention and healthcare of all Railway employees
16	Chief Administrative Officer (Construction)	CAO(C)	Construction of all major engineering projects

1.4.5 Production Units

Apart from Zonal railways there are eight production units as per details given in Table 1.5.

Table 1.5. Production Units or Manufacturing Units

S.No.	Manufacturing Units	Head Quarters at	Functions
1	Chittaranjan Locomotive Works (CLW)	Chittaranjan	Manufacture of Electric Locomotives
2	Diesel Locomotive Works (DLW)	Varanasi	Manufacture of Diesel Locomotives
3	Integral Coach Factory (ICF)	Chennai	Manufacture Of Coaches
4	Diesel Component Works (DCW)	Patiala	Manufacture of Diesel Loco Components
5	Rail Coach Factory	Kapurthala	Manufacture of coaches
6	Wheel & Axle Plant (W&AP)	Bangaluru	Manufacture of wheels and axles
7	Modern Coach Factory	Rae Bareli	Manufacture of coaches
8	Rail Wheel Plant	Bela	Manufacture of wheels and axles

1.4.6. Divisions

The zonal railways work on Divisional System. Each Zonal Railway is divided in 3 to 6 divisions; Each division having approx. 400 to 800 route kms in its territory. There are about 68 Division on

Indian Railways. Each Division works under the overall control of Divisional Railway Manager, who is assisted by one or two additional divisional Railway Managers. There are Divisional officers in charge of each discipline either in Junior Administrative grade or senior scale viz. Sr Divisional Engineer (co) or Sr DEN/DEN for Civil Engineering, Senior Divisional Mechanical Engineer or Divisional Mechanical Engineer for mechanical engineering, Senior Divisional Commercial Manager or Divisional Commercial Manager for Commercial department etc.

In case of Engineering Branch, Sr Divisional Engineer (Coordination) is normally the head of the branch in the division. In each division, there are 2 to 3 Senior Divisional Engineers (Sr. DEN) and/ or Divisional Engineers (DEN). Each Sr. DEN / DEN is in charge of approximately 1,100 integrated track kms and has 2 to 3 Assistant Engineers (AENs) to assist him in maintenance of track, bridges and works. The AEN has got approx.400-450 integrated track kms under his charge. The total number of DENs and AENs for maintenance work on Indian Railway is approximately 300 and 700 respectively. The AENs are assisted by Senior Section Engineers SSE/(P.way) in charges for maintenance of Permanent Way. Each SSE/P Way has jurisdiction of 50 to 70 route kms of track. The total number of SSE/P Way for normal maintenance works on Indian Railways is roughly about 2000. They are further assisted by SSE/JE (P Way) sectional and special.

1.5. Commission of Railway Safety

Brief history

To exercise effective control over the construction and operation of the first railways in India, which were entrusted to private companies, consulting Engineers were appointed under the Government of India. Later when the Government undertook the construction of railways, the consulting Engineers were designated as Government Inspectors. In 1883, their position was statutorily recognized. Later, the Railway Inspectorate was placed under the Railway Board which was established in 1905.

The Railways inspectorate was subsequently placed in the year 1940 under the ministry of Transport and Communication. In an attempt to give better status, Railway Inspectorate was named as 'Commission of Railway Safety' in the year 1961.

Commission of Railway Safety' is headed by a Chief Commissioner of Railway Safety and is headquartered at Lucknow and is now under the Ministry of Civil Aviation. The Commission of Railway Safety looks after the safety aspects and other statutory functions concerning various zonal Railways. Under the administrative control of Chief Commissioner of Railway Safety, there are nine Commissioners of Railway Safety who are at Lucknow, Mumbai, Delhi, Calcutta, Madras, Bangalore and Secunderabad etc.

The responsibility for safety in the working and operation of Railways rests solely with the Railway Board and the Zonal Railway administrations. The main task of the Commission of Railway Safety, however, is to direct, advise and caution the Railway executives with a view to ensure that all reasonable precautions are taken with regard to soundness of rail construction and safety of train operation.

Functions of Commission of Railway Safety

The principal functions of the Commission of Railway Safety are:

(i) Inspection of New Railway Lines prior to authorization for passenger traffic.

(ii) Periodical inspection of Open lines.

(iii) Approval of new works and renewals affecting passenger carrying lines;

(iv) Investigations into accidents, including inquiries into such accidents of passenger trains as are considered to be of a serious nature.

(v) General advice on matters concerning safety of train operation and

(vi) To inspect the railway systems, conduct Inquiries in the causes of accidents and sanction execution of works affecting the safety of running line in exercise of Statutory powers under section 4-5 and 6 of Indian Railway Act

1.6. Various Undertakings under Ministry of Railways

S.No.	Name	Year of Incorporation/ Inception	Core competence
1	RITES	1974	To design, establish, provide, operate, maintain and perform engineering, technical and consultancy services for development of projects/systems of all types and descriptions pertaining to Railways and Other Sectors/Industries in India and outside India.
2	IRCON	1976	To undertake construction activities in India and abroad on turnkey basis or otherwise in various fields of infrastructure like Railways, Bridges, Roads, Highways, Industrial and Residential Complexes, Airports, etc.
3	CRIS	1986	CRIS is the IT arm of Indian Railways. It designs, develops, implements and maintains centralized IT system for all departments of Indian Railways.
4	IRFC	1986	To raise funds from the market to part finance the Plan Outlay of IR.
5	CONCOR	1988	To develop multi-modal logistics support for India's international and domestic containerized cargo and trade.
6	KRCL	1990	To construct and operate railway lines, construct Road Over Bridges and rail line projects.
7	RCIL (RailTel)	2000	To utilize the surplus telecom capacity and right of way available with the IR to build nationwide optical fibre cable based broadband telecom and multimedia network.
8	IRCTC	2001	To undertake catering and tourism activities of the Railways. Also facilitates internet ticketing through its website.

9	PRCL	2001	To execute the Surendranagar-Rajula-Pipavav Port gauge conversion and new line projects in Gujarat.
10	RVNL	2003	To create and augment the capacity of rail infrastructure. To mobilize resources mainly through multilateral/bilateral funding agencies and also through domestic market for successful implementation of projects.
11	RLDA	2005	To develop vacant railway land for commercial use for the purpose of generating revenue by non-tariff measures for IR.
12	DFCCIL	2006	To plan and construct Dedicated Rail Freight Corridors (DFCs) for movement of freight trains on the corridors.
13	MRVC	1999	To plan and implement rail projects in the Mumbai Metropolitan Region.
14	BWEL	1978 (In MOR from 2008)	To manufacture wagons and undertake structural fabrication jobs
15	BSCL	1976 (In MOR from 2010)	To manufacture Railway Rolling Stock.
16	BCL	1976 (In MOR from 2010)	To manufacture wagons, undertake structural fabrication jobs and manufacturing, retrofitting of EOT crane.

(i) Rail India Technical and Economic Services Ltd. (RITES)

RITES, which is a Government of India Undertaking, provides consultancy services on all aspects of railways from concept to completion. RITES is closely linked with Indian Railways and is in privileged position to draw freely upon the huge pool of experience, expertise and technical know-how acquired over a century of operations on Indian Railways. RITES can provide consultancy services with regard to new lines, track doubling and gauge conversions, bridges and rail-road structures, signaling and telecommunications, rolling stock and workshop technology, railway electrification, material handling systems, railway operation, management and training, transport economic studies, inspection and such other allied fields of railways working. RITES is already providing consultancy services to about 40 developing countries of Asia and Africa with regard to railway operation. During 2015-16, RITES, had A turnover of about Rs. 1294 crores, giving net profit of about Rs339 crores.

(ii) IRCON International Ltd. (IRCON)

IRCON International limited, which is a public sector undertaking under the Ministry of Railways, is a specialized agency to undertake major railways projects both in India and abroad. This organization has been set up with a view to channelize the export of construction services, technological know-how and special skills gained by the Indian Railway engineers. IRCON is in ideal position to undertake the entire spectrum of construction activities concerning various aspects of railway disciplines such as civil, mechanical, electrical, signalling and telecommunication etc. During 2014-15, IRCON had

turnover of the order of Rs. 3122 crores, giving a net profit after tax of Rs. 579 crores.

(iii) Indian Railway Finance Corporation (IRFC)

The Indian Railway Finance Corporation has paid Rs.1368 crores as dividend to the Government on the paid up capital of Rs.232 crores was incorporated on December 12, 1986 under The Indian Railways Company Act 1956. The purpose of the new Public Sector undertaking was to raise funds through issue of bonds and augment Railway plan finance. Till march 2016, Rolling stock assets – 8390 Locomotives, 45,545 passenger coaches and 2,04,456 freight cars valued at 1,37,038 crores have been added to the asset base of Indian Railways with funding assistance of IRFC. The net worth of IRFC as on 31-03-2016 stood at 9525.35 crores.

(iv) Container Corporation of India (CONCOR)

The container Corporation of India (CONCOR) was set up as a Public Sector Undertaking with an authorized capital Rs. 10 crores for developing multi-model transport infra-structure for India's International and domestic trade and industry. It has taken over on 1st November, 1989 the management of seven inland Container Depots (I.C.D.S.) at New Delhi, Ludhiana, Bangalore, Coimbatore, Guntur, Anaparti and Amingaon (Guwahati), which were till then managed by the Indian Railways.

CONCOR has plans to establish a network of ICDS and CFS (Container Freight Stations) at crucial locations from the point of view of business. It has already constructed a new ICD at Tuglakabad, which promotes and facilitate the international traffic from Northern region. CONCOR had a turnover of about Rs6087 crores during the year 2015-16 and earned net profit after tax of Rs. 786 crores.

(v) Konkan Railway Corporation Limited (KRC)

A new public Sector Undertaking called 'Konkan Railway Corporation Limited' was set up some time back for constructing a B.G. railway line from Roha to Mangalore (Distance 760 kms.) to provide a reliable and efficient transport infra-structure for that region. The project is being jointly financed by ministry of Railway and concerned State Governments. The project was commissioned in January 1998.

Konkan Railway has substantially reduced journey time between Mumbai–Mangalore, Mumbai-Cochin & Mumbai–Goa. The line is also likely to accelerate the Socio-economic development of the Konkan region. KRC has earned a revenue of Rs. 1500 crores during 2015-16 with a net profit of Rs 120 crore.

(vi) Centre for Railway Information System (CRIS)

CRIS, which is an autonomous body under the patronage of Ministry of Railways, has been established as a non-profit making organization and has been entrusted with the design, development and information of all major computer service on the railways. During the last few years CRIS has made substantial progress in Freight operations, Information System, Passenger reservation system, Micro-Processor based self printing Ticketing Machines &

Track management system. During year 2014-15 total income of CRIS stood at Rs 6878 crores with a profit of Rs 177 crores.

(vii) Indian Railway Welfare Organistion (IRWO)

An autonomous body under the patronage of Ministry of Railways called 'Indian Railways Welfare Organisation (IRWO) has been registered on 25.9.1998 under the 'Societies Registration Act' for meeting specific needs of housing for serving and retired railway employees with its head-quarters at New Delhi. IRWO has been constructing houses in different cities and towns all over the country on a self financing basis for serving and retired railway employees purely as a welfare activity on 'No profit no Loss basis'.

In last few years, IRWO has already acquired land at many places and has announced group housing schemes at Asansol, Lucknow .Noida, Vasundara(Ghaziabad), Gurgaon, Gorakhpur, Kolkata, Chennai, Indirapuram (Ghaziabad), Hyderabad, Chandigarh, Ajmer, Moradabad, Bangalore, Meerut, Kundali/Sonepat (Haryana) and a few other places. They had completed the housing projects at Noida, Gurgaon and Gorakhpur in a record time and handed over the flats to owners.

(viii) Rail Tel

A reliable telecom network is essential for efficient functioning of the Railways as it plays an important role in train control, operation, safety and during emergencies, IR started building up its dedicated telecom network since 1960s. To expedite the modernization of old and worn out telecom network, Ministry of Railways set up Rail Tel Corporation of Indian Limited in 2000-01. Rail Tel has evolved a nation wide broadband telecom network, along the railway track, connecting metropolitan cities and the rural, remote and backward areas enroute.

So far Rail Tel has focused on building up of OFC backbone connecting 4 metros-Delhi, Mumbai, Chennai and Kolkata and 4 major cities-Ahmedabad, Pune, Secunderabad and Bangalore. This has been provided at 3335 station. Providing OFC connectivity between the metro cities, will also ensure an efficient telecom for Railways train control, operation and safety in important trunk routes. Its operating income in 2014-15 was 554 crores resulting in net profit of Rs.256 crore.

(ix) Rail Vikas Nigam Ltd. (RVNL)

Rail Vikas Nigam Limited (RVNL) is a Special purpose Vehicle created to undertake project development, mobilization of financial resources and implement projects pertaining to strengthening of Golden Quadrilateral and Port Connectivity.

RVNL had an Authorized Capital or Rs. 500 crores and paid-up capital of Rs. 10 crore.

Cumulatively, up to 31.03.2016, RVNL has completed 6280.48 km of project length covering 213.82 km of New Lines, 1,997.59 km of Doubling, 1,590 km of Gauge Conversation and 2,479.07 km of Railway Electrification, 3 Railway Workshops and 1 Cable Stayed Bridge at Bardhhaman. 49 projects assigned to RVNL have been fully completed. During 2015-16, RVNL completed 697.66 km of project length including 352.59

km of Doubling, 17 km of New Line and 328.07 km of pure Railway

Electrification works and an additional 230.14 km of electrification as part of doubling and other projects. For the past five years, RVNL has been contributing more than 1/3rd of total project length completed on Indian Railways under Doubling & Railway Electrification Plan Heads.

(x) Indian Railway Catering and Tourising Corporation Ltd. (IRCTC)

IRCTC was set up with the basic purpose of hiving of entire catering and tourism activity of the Railways. The main object is to upgrade the catering services on IR, development of Food Plazas at railway stations, promotion of domestic and international tourism and development of rail based tourism infrastructure, strengthening railways' linkage with travel intermediaries, facilitating rail travel through internet based ticketing and electronic travel distribution system, provision of pure and safe packaged drinking water to the rail users and establishment of value budget hotels at important railway stations.

IRCTC has been fully operational from August 2001. It has taken up the following activities.

(i) On-board catering contracts for static units for sale of food, beverages and ice cream have been awarded.

(ii) In order to promote rail based tourism. Special Trains Charters, Special AC3 tier Coach Charters, assured reservation of berths on trains and value added tour packages with leading tour operators and Travel Agents Association of India have been asked to give wide publicity among their members for developing more such package.

(iii) Software has been developed to provide internet based reservation. It has been implemented and has found favour with the public and other persons who are able to make / cancel reservation any time on the internet.

(iv) IRCTC has also taken up manufacture of packaged drinking water to be sold in the Railways premises and two plants for manufacture of packaged drinking water have been set up at Nangloi and Danapur. Two more plants are being set up at Palur and Ambernath.

In 2015-16 the turnover of IRCTC stood at Rs 1506 crores with profit at Rs 189 crores.

(ix) Dedicated Freight CorridorCorporation of India.

Under this project it has been planned to construct new railway lines exclusively for the movement of Goods trains at high speed (100 kmph). These will be goods train which will be very long and will have very high axle loads. Initially there will be two corridors-one from West to North (1490 route km)and other from East to North (1800 route). There will be only limited number of stations on these routes.

1.7 Corporate Mission: Ist corporate plan was made in 1985 which has following objectives.

1.7.1 Corporate Objectives

(i) Capacity :Build-up capacity of the Railway system to carry the anticipated traffic.

(ii) Cost : Achieve 15% reduction in cost of transport in real terms.

(iii) Return on Capital: Generate additional capacity and minimize capital investment after making adequate provision for depreciation, maintain a reasonable surplus to cover the dividend liability and developmental expenditure.

(iv) Quality of Service: Improve quality and reliability of both passenger and freight services to comparable international standards.

(v) Safety : Reduce incidence of train accidents to the extent possible.

1.7.2 Strength of Indian Railways

(i) For our vast country with long distance and large population, Railways have an inherent advantage over other modes of transport in their suitability for movement of large volumes of passenger and goods traffic over long distances.

(ii) Movement of steel wheel on steel rail on the Railway system has the basic advantage of low rolling resistance which reduces energy requirements and haulage costs.

(iii) Railways are more efficient than roadways in land use.

(iv) Railways are an energy-efficient mode of transport particularly for freight traffic, and can use different forms of energy. Railways also cause relatively less environmental pollution than roadways.

(v) In our densely populated urban centres, a rapid transit rail-based system is the most appropriate mode of transport for suburban & intra-urban travel, as part of a city's integrated transport system.

(vi) Indian Railways are a well-established Organisation with a large pool of skilled and trained personnel.

(vii) Being part of the Central Government, Indian Railways have Government's financial backing. At the same time, they have considerable financial autonomy.

(viii) Indian Railways are a self-reliant system in respect of their major equipment needs.

1.7.3 Weaknesses of Indian Railways

(i) A large portion of the Railway's infra-structure is over aged, and is in urgent need of replacement/rehabilitation. This includes track, motive power and rolling stock, signalling, operational and maintenance facilities.

(ii) In certain parts of the infrastructure, technology is 15-20 years behind some of the developed railway systems. Correspondingly, productivity levels are comparatively low.

(iii) Indian Railways have a large force of un-skilled manpower. The training facilities need augmentation and modernisaton.

(iv) Persistent resource constraint in the past has adversely affected the Railways' development.

(v) The Railways carry a substantial 'social burden' in the form of continued operation of un-remunerative branch lines, subsidy on passenger and suburban travel, and even freight subsidy on certain commodities.

(vi) In certain areas, pilferage and vandalism seriously affect the operational efficiency.

(vii) Railways are not suited for carriage of small quantities of freight particularly over short leads.

(viii) Heavy investments are needed to build up railway transport capacity and gestation periods are long.

(ix) Transport capacity is volatile and cannot be recouped, if not utilized continuously.

1.7.4 Role of Indian Railways

Since their inception the Indian Railways have successfully played the role of prime mover to the economy and society of the Indian nation. As the principal constituent of the nation's transport infrastructure, the Railways have served to:

- Integrate fragmented markets and thereby stimulate the emergence of a modern market economy.
- Connect industrial production centres with markets and with sources of raw material and thereby facilitate industrial development.
- Link agricultural production centres with distant market and with sources of essential input thereby promoting rapid agricultural growth.
- Provide rapid, reliable and cost effective bulk transportation to the energy sector, to move coal from the coal field to power plants and petroleum products from refineries to consumption centres, and
- Most importantly, link places enabling large scale, rapid and low cost movement of people across the length and breath of the country.
- In the process, Indian Railway have become a symbol of national integration and strategic instrument for enhancing our Defence preparedness.

1.8. Various Gauges on World Railways

Gauge is normally defined as the minimum distance between running faces of the two rails. In some countries, gauges is measured between the running faces of the rails at a point 14 mm below the top of the rails. Various gauge have been adopted on the railways in the world due to historical and other considerations. In British Railways, a gauge of 5'0" was initially adopted but the wheel flanges were at that time on outside of rails. Subsequently in order to give better guidance to wheels, the flanges were made inside the rails. The gauge then became 4'8½" i.e. (5'0" – 2 x 1¾"), as the width of rail at top at that time was 1¾". Standard gauge (4'8½") thus became the gauge

of most of the European railways. The proportions of various gauges on the world Railways are as given in Table 1.3.

Table 1.3 Various gauges on World Railways

S No	Type of Gauge mm	Gauge in mm	Gauge in feet	% of total	Name of countries
1	Standard Gauge	1435	4'-8½"	62	England U.S.A. Canada, Turkey, Persia & China
2	Broad gauge	1676	5'6"	6	India, Pakistan, Srilanka, Brazil, Argentine
3	Broad gauge	1524	5'-0"	9	Russia, Finland
4	Cape gauge	1067	3'-6"	8	Africa, Japan, Java, Australia & New Zealand
5	Metre gauge	1000	3' – 3"	9	India, France, Switzer land, Malaysia, Thailand & Argentine
6	23 various other gauges	Different gauges	Different gauges	6	Other countries

1.8.1 Different Gauge on Indian Railways

In India originally it was the intention of the East India Company to adopt the standard gauge 1435 mm i.e. 4'8½". This proposal was however, challenged by Mr. W, Simms, consulting Engineer to government of India, who recommended a 1676 mm (5'6") gauge. The court of Directors of East India Company decided to adopt Mr. Simm's recommendation and 5'-6" finally become the Indian Railways main gauge. In 1871, the Government of India wanted to construct cheaper railways for the development of the country and Metre Gauge i.e. 1 metre (3'3") gauge was accordingly introduced. In course of time two more gauges having width of 0.762 metre (2'-6") and 0.610 metre (2'-0") were also introduced for thinly populated areas, mountain railways and for such other miscellaneous purpose.

Indian Railways presently have 60,510 kms (90.73%) of B.G., 3,880 kms (5.81%) of M.G. and 2,297 kms (3.44%) of N.G.

1.8.2 Choice of gauge

The choice of gauge is very limited as each country has fixed its own gauge and all new lines are to be constructed with this gauge. The following factors, however, theoretically influence the choice of gauge.

1. Cost considerations:There is only a marginal increase in the cost of construction, if a wider gauge is adopted.
2. Traffic considerations:Volume of traffic depends upon size of wagons, speed and hauling capacity of trains.
3. Physical features: It is possible to adopt steeper gradient and sharper curves, if a narrower gauge is to be constructed.
4. Uniformity of gauge: the existence of uniform gauge in a country is a great asset for smooth operation of trains.

1.8.3 Problems of change of gauge

The need for uniformity of gauge has been recognized by all the advanced countries of the world. There are a number of problems that have cropped up on the Indian Railways because of three gauges. The evil effects due to the change of gauge (more popularly known as break of gauge) are numerous and some of these are enumerated below :

1. Inconvenience to passengers.
2. Difficulty in transhipment of goods.
3. Inefficient use of rolling stock.
4. Hinderance to fast movement of goods and passenger traffic.
5. Requirement of additional facilities at stations and yards.
6. Difficulties in balanced economic growth.
7. Management and operating problems due to different gauges and difficulties in decision making as to which gauge requires to be given how much priority.

1.8.4. Gauge-wise Traffic Analysis :

Broad gauge, though forming 90.74 of the route, generated 99.9% of the freight output (NTKms) and 98.77% of the passenger output (Pkms).

1.9. Uni-gauge policy of Indian Railways

The problems of multi gauges system has been agitating the minds of rail users, economists, technocrats, administrators, managers and public at large, for quite some time. This multi gauge system is not only costly and cumbersome, but also causes serious bottlenecks in efficient operation of Railways and hinderance in balanced development of the country. Indian Railways, therefore, took a bold decision in 1992 to take up large scale selected conversion of MG/NG lines and move toward unigauge.

1.9.1 Benefits of Uni-Gauge Policy of adopting B.G. (1676 mm)

Uni gauge system has the following potential benefits :

(i) Fewer transport bottlenecks:There will be fewer transport bottlenecks after a uniform gauge is adopted and this will result in improved operational efficiency resulting in fast movement of goods and passengers.

(ii) No transhipment hazards: There will be no hazards of transhipment and as such there will be no delays, no damage to goods, no inconvenience to passengers for transfer from one train to another train.

(iii) Provisions of alternate routes: By uni-gauge policy, alternate routes will be available for free movement of traffic and there will be less pressure on existing B.G. net work. This is expected to result in long haul road traffic reverting to Railways.

(iv) Better turn round: There will be better turn round of wagons and locomotives and their usage will improve the operating ration of the railway system as a whole and immense benefits will flow to the community at large.

(v) Improved utlisation of assets: There will be improved utlisation of assets and reduction in working expenses of the railway.

(vi) Balanced economic growth: The areas presently served by M.G. would receive an additional fillip and this will lead to removal of regional disparities and help in balanced economic growth.

(vii) No multiple tracking works:The uni gauge project will eliminate need for some of the traffic facilities and multiple tracking works, which will offset to certain extent the cost of gauge conversions.

(viii) Better transport infra-structure: Some of the areas served by M.G. have raw material and the potential for becoming highly industrialized and skilled man power is also available. The Uni gauge policy will help in providing these areas with a better transportation infrastructure.

(ix) Boosting Investor's confidence: With liberalization of economic policy, Uni gauge project of Indian Railways has played a significant role. It has helped in boosting investor's confidence that their goods will be distributed throughout the country in time and without any hindrance. This will also help in setting up of Industries in areas not yet exploited because of lack of infrastructure facilities.

1.10. Classification of Railway Lines

Indian Railways have three gauges viz Broad gauge (B.G.), Metre Gauge (M.G.) and Narrow Gauge (N.G.).

Indian Railways have classified all its routes based on Speed Criteria' for B.G. and M.G. separately. Speed criteria in a broad term means the maximum speed that the route can carry. Details of these classifications are given in subsequent paras.

1.10.1. Broad Gauge (B.G.) Routes :

On the basis of future maximum permissible speeds and traffic density BG lines have been classified into SIX groups as under:

S.N.	Classification	Criteria
1	Group 'A'	Future maximum permissible speeds up to 160 km/h
2	Group 'B'	Future maximum permissible speeds up to 130 km/h
3	Group 'C'	Suburban sections of Mumbai, Delhi, Chennai and Kolkata
4	Group 'D-Spl'	Speeds upto 110 km/h and annual traffic density is more than 20 Gross Million Tonne (GMT).
5	Group 'D'	Speeds upto 110 km/h and the annual traffic density is less than 20 Gross Million Tonne (GMT).
6	Group 'E'	All other Sections and branch lines with speed upto 100 km/h.

List of various Routes:

(a) BG Group 'A' Routes

1 New Delhi to Howrah – Rajdhani Route (via the Grand Chord and Howrah-Barddhaman Chord)

2 New Delhi to Mumbai Central (Frontier Mail Route)

3 New Delhi to Chennai Central (Grand Trunk Route)

4 Howrah - Nagpur - Mumbai CST

(b) BG Group 'B' Routes

1. Allahabad – Katni – Jabalpur – Itarsi - Bhusaval
2. Kalyan – Pune – Daund – Wadi – Secunderabad - Kazipet
3. Kharagpur – Waltair - Vijayawada
4. Wadi – Raichur – Arakkonam - Chennai Central
5. Howrah – Bandel - Barddhaman
6. Khanna – Barharwa - Farakka Bridge - Malda Town
7. Sitarampur – Madhupur – Kiul – Patna - Mughal Sarai
8. Kiul – Bhagalpur – Sahibganj - Barharwa
9. Delhi – Panipet - AmbalaCantt. - Kalka
10. AmbalaCantt. – Ludhiana – Jallandhar - Pathankot
11. AmbalaCantt. – Moradabad – Lucknow – Pratapgarh - Mughul Sarai
12. Arakkonam – Jolarpettai – Salem – Erode – Coimbatore - Ernakulam
13. Vadodara - Ahmedabad
14. Jolarpettai - Bangalore
15. Ahmedabad – Ajmer – Jaipur – Bandikui – Rewari - Delhi
16. Malda Town – Barsoi - New Jalpaiguri
17. Chennai Beach - Dindigul
18. Bangalore – Dharmavaram - Gooty
19. Ghaziabad - Saharanpur
20. Chennai Beach - Chennai Egmore 3rd line
21. Bandikui - Agra Fort
22. Sawaimadhopur - Jaipur

23. Bellary - Guntkal
24. Gudur - Renigunta
25. Pagadipalli – Nadikudi – Guntur - Tenali
26. Vijaywada – Guduwada – Bhimavaram - Nidadavolu
27. Guntkal - Guntur & Guntur - Krishna canal
28. Manmad – Mudkhed - Secundrabad
29. Secundrabad - Dhone
30. Renigunta – Tirupati – Pakala – katpadi

(c) BG Group 'C' Routes

1 CSTM – Ravli - Kurla – Panvel
2 Ravali – Mahim - Andheri
3 Churchgate – Mumbai Central – Borivali - Virar
4 Chennai Central – Basin Bridge – Veysarpadi– Arakonam
5 Chennai Central – Basin Bridge - Washermanpet – Chennai Breach – Tambaram
6 Chennai – Central – Basin Bridge – Korukkupet – Tondiarpet – Tiruvottiyar – Gummidipundi
7 Chennai Beach – Thirumayilai – Tiruvanmiyur – Velachery
8 Sealdah – Dumdum – Naihati – Kalyani – Ranaghat – Krishnanagar
9 Sealdah – Sonarpur – Baruipur – Lakshmikantapur - Namkhana
10 Ballygunj – Budge Budge
11 Seoraphuli – Tarakeshwar
12 Dum Dum Jn – BarasatJn-BangaonJn
13 Howrah – Panskura – Kharagpur
14 Ranaghat - Bangaon
15 Kalyani - KalyaniSimanta
16 Ranaghat - Gede
17 Kankurgachi - Ballygunge
18 Kalinarayanpur - Shantipur
19 Barasat - Hasnabad
20 Sonarpur - Canning
21 Baruipur – Diamond - Harbour

22 Dum Dum Jn - PrincepGhat - Majerhat

23 Dum Dum - Dankuni

24 Dum Dum Jn - Chitpur

25 Bandel - Naihati

26 Bandel - Katwa

27 Liluah - Belur Math

28 Palval – Okhla - Tilak Bridge

29 Okhla – Lajpatnagar - Dayabasti,

30 Delhi - Delhi Kishanganj – Dayabasti - NayaAzadpur

31 Sahibabad – Shahdara - Delhi

(d) BG Group 'D Spl' and 'D' Routes

1 Bina – Katni – Anuppur - Bilaspur

2 Bhopal – Ujjain - Nagda

3 Udhna - Jalgoan

4 Ahemdabad - Viramgoan

5 Bellary - Hospet

6 Champa - Gevra Road

7 Anara - Sini

8 Kharagpur - Adra

9 Jharsuguda – Titlagarh - Vijaynagaram

10 Titlagarh - Raipur

11 Barabanki - Gorakhpur Cantt - ChapraKacheri

12 Burhwal - Sitapur

13 Delhi – Ghaziabad – Hapur - Moradabad

14 Kanpur - Lucknow

15 Varanasi – Zafarabad – Sultanpur – Utartia – Lucknow

16 Hajipur – Chapra

17 Hajipur – Mujjafarpur – Samastipur – Barauni

18 Hajipur – Bachawara

19 Barauni – Katihar

20 Gomoh – Chandrapura
21 Barakakhana – Gevraroad – Sonenagar
22 Gevraroad – Chopan
23 Kota – Chittorgarh – Neemuch – Ratlam
24 Kota – Ruthiyai – Bina
25 Bayan – Agra – Tundla
26 Ujjain – Indore
27 Viramgoan – Okha
28 Kanalus – Porbandar
29 Surendranagar – Dhola – Dhasa
30 Dhola – Pipavav
31 Rajkot – Junagarh
32 Dhola – Bhavnagar
33 Palanpur – Samakhali – Gandhidham
34 Ghandhidham – Kalol
35 Banglore – Ariskere – Hubli
36 Banglore – Maysore – Hasan – Ariskere
37 Hasan – Manglore
38 Hospet – Hubli – Londa – Miraj – Pune
39 Baiyappanahalli – Omlur
40 Vikarabad – Parlivaijnath – Parbani
41 Nadikuide – Macherla
42 Samalkot - Kakinada Port
43 Gooty – Pendekallu
44 Karur – Dindigal – Madurai – Vanchchimaniyachchi
45 Ernakulam – Thiruvananthapuram
46 Ernakulam – Alappuzha – Kayanlwlam
47 Thoke – Manglore – Shoranur
48 Mayipaduturai – Kumbakonam – Thanjavur – Trichchirapalli
49 Jodhpur – Marwar

50 Udaipur – Chittorgarh – Ajmer
51 New Jalpaiguri – Lumbding – Tinsukia
52 New Jalpaiguri – Alipurdwar - Samukhala Road
53 Kumedpur – Katihar
54 Bhatni – Varanasi – Allahabad
55 Manakpur – Ayodhya
56 Aunrihat – Chapra
57 Laskar – Haridwar
58 Lucknow – Faizabad – Zafarabad
59 Janghad – Phaphamav – Allahabad
60 Phaghamau – Unchahar
61 Daund – Manmad
62 Pen – Roha
63 Diva - Vasai Road
64 Gorakhpur – Vaknujubagar
65 Thave – Siwan
66 Mau – Sahganj
67 Indore – Peptina
68 Salempur - Barjtaj Bazar
69 Jhansi – Kanpur
70 Jhansi – Manikpur
71 Bhimsen – Kharirar
72 Delhi – Bhatinda - FirojpurCantt
73 Jalandhar – Amritsar
74 Baraiti – Chandausi
75 Nerunti – Talchar
76 Cuttack – Paradeep
77 Barey – Rajatgarh
78 Kapilash Road – Salegoin
79 Kirandul – Kottavalsa

80 Nergundi – Talchar

81 Koraput - Singapur Road

82 Sambalpur – Angul

83 Manuguru – Dornakul

84 Karepalli – Singareni

85 Bypass Sanatnagar - Moula Ali

86 Bondamunda – Barsuan

87 Barajamda – Gua

88 Barajamda – Bolanikhadan

89 Bhojudhi - Mohuda

90 Molunda-Gomoh

91 Muri-Barkakana

92 Muri-Rajabera

93 Padapahar-Banspani

94 Panskura-Haldia

95 Rajkharsawan - Badajamda

96 Talgoria-Bokaro

97 Annuim-Bidhranpur

98 Boridand- Chirmiri

99 Durg – Marauda - Dallirajahara

100 Urkura- Sarona

101 Londa-Vasco-Da-Gama

102 Katihar – Mukuria

(e) BG Group 'E' Routes

All lines not classified as Group 'A', 'B', 'C', 'D-spl' and 'D' Routes

1.10.2. Metre Gauge (M.G.) Routes

On the basis of speed potential and traffic density in the section the MG lines have been classified into three categories as under:

S.N.	Classification	Criteria
1	'Q' Routes	Routes where the maximum permissible speed will be more than 75 km/h. The traffic density is generally more than 2.5 GMT.
2	'R' Routes	Routes where the speed potential will be 75 km/h and the traffic density is more than 1.5 GMT. Depending on volume of traffic these routes are further classified into three categories.
	'R-1' Routes	When the traffic density is more than 5 GMT.
	'R-2' Routes	When traffic density is between 2.5 to 5 GMT.
	'R-3' Routes	when traffic density is between 1.5 to 2.5 GMT.
3	'S' Routes	Routes where the speed potential is less than 75 km/h and the traffic density is less than 1.5 GMT.

1.10.3 N.G. routes : There is no special classification for Narrow gauge routes having gauge width of 762 mm (2'6") or 610 mm (2'0"). All the N.G. lines are considered identical.

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