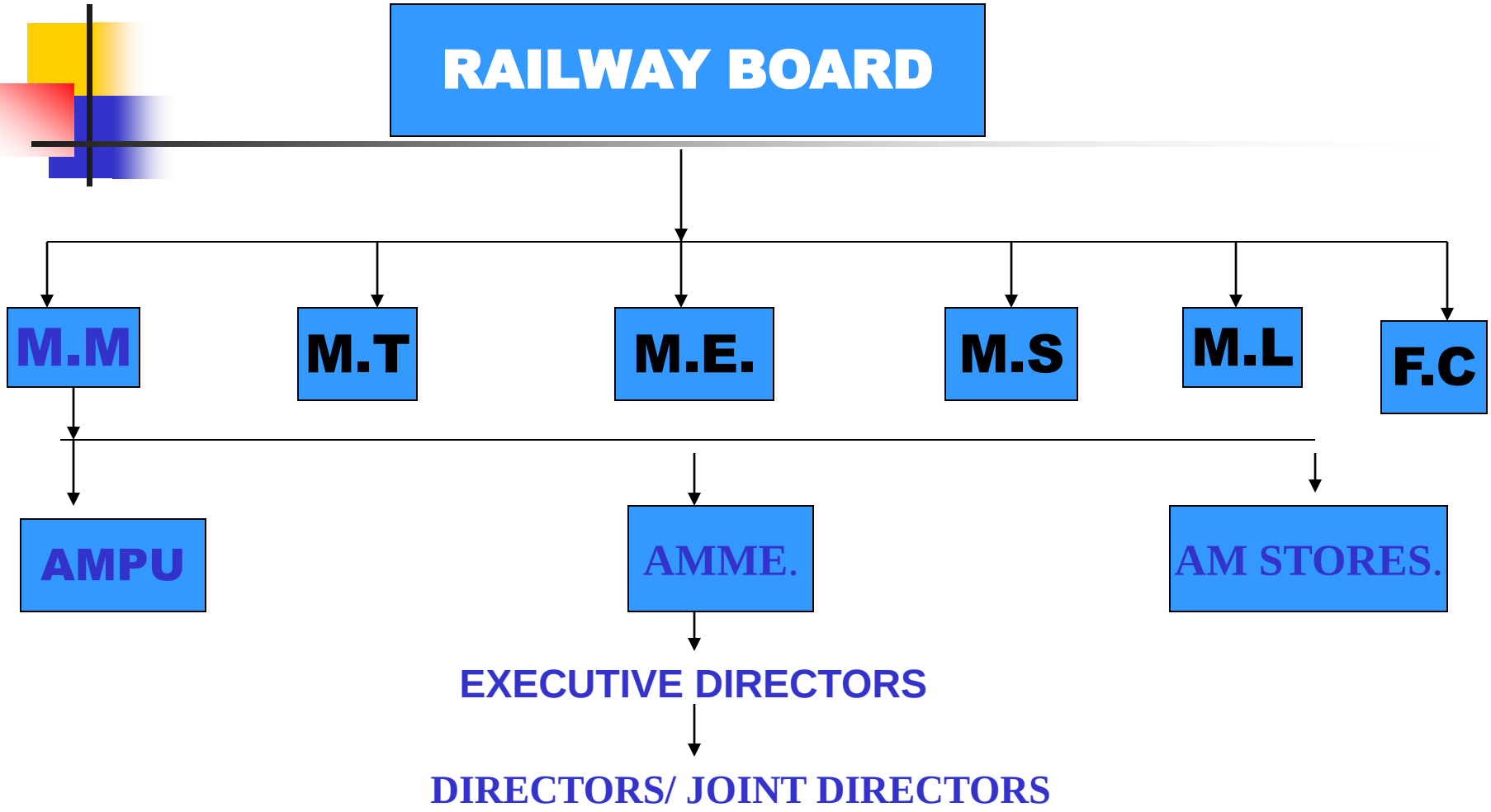
TYPES OF PASSENGER COACHES FOR DIFFERENT SERVICES

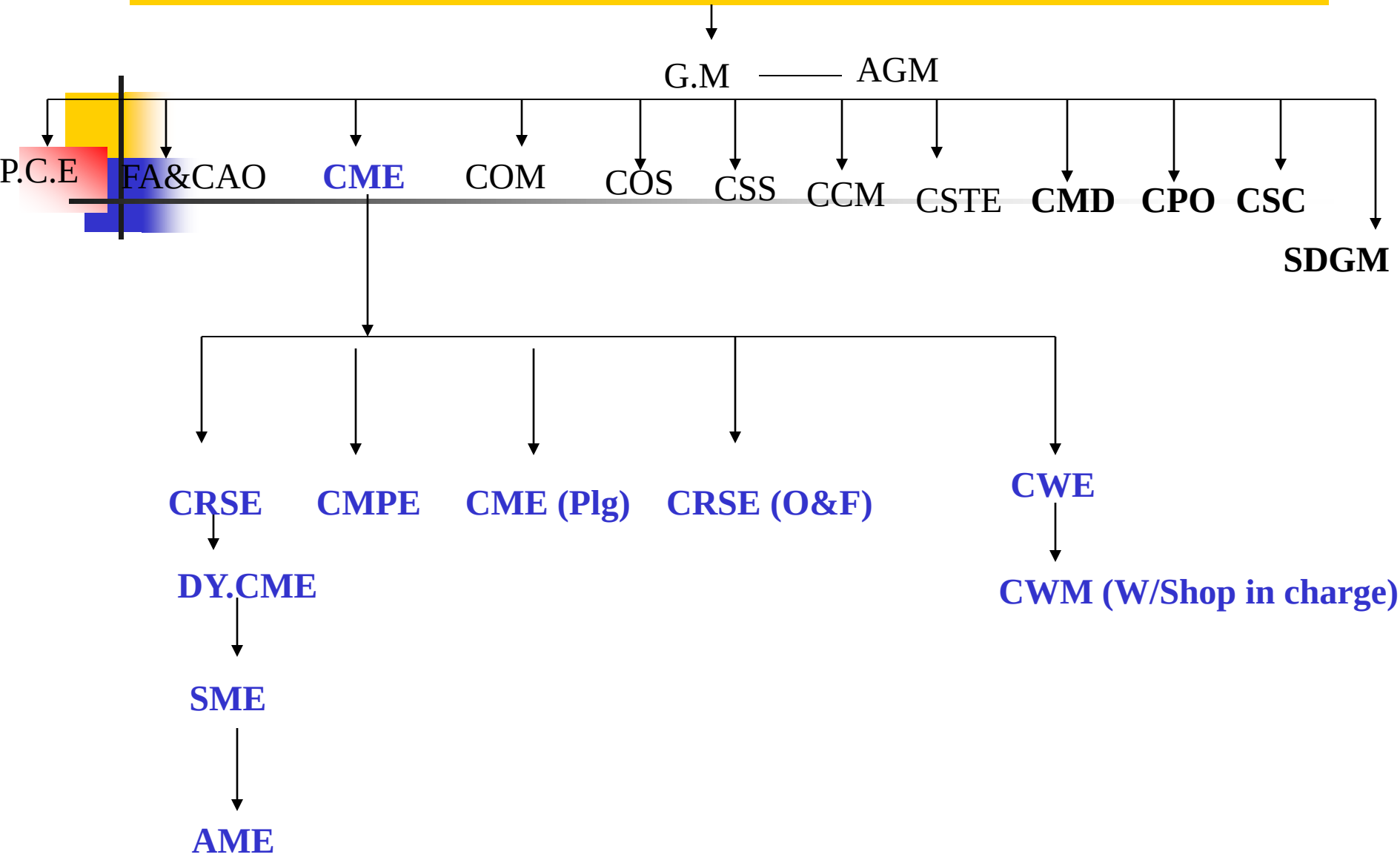
V.K.SAXENA

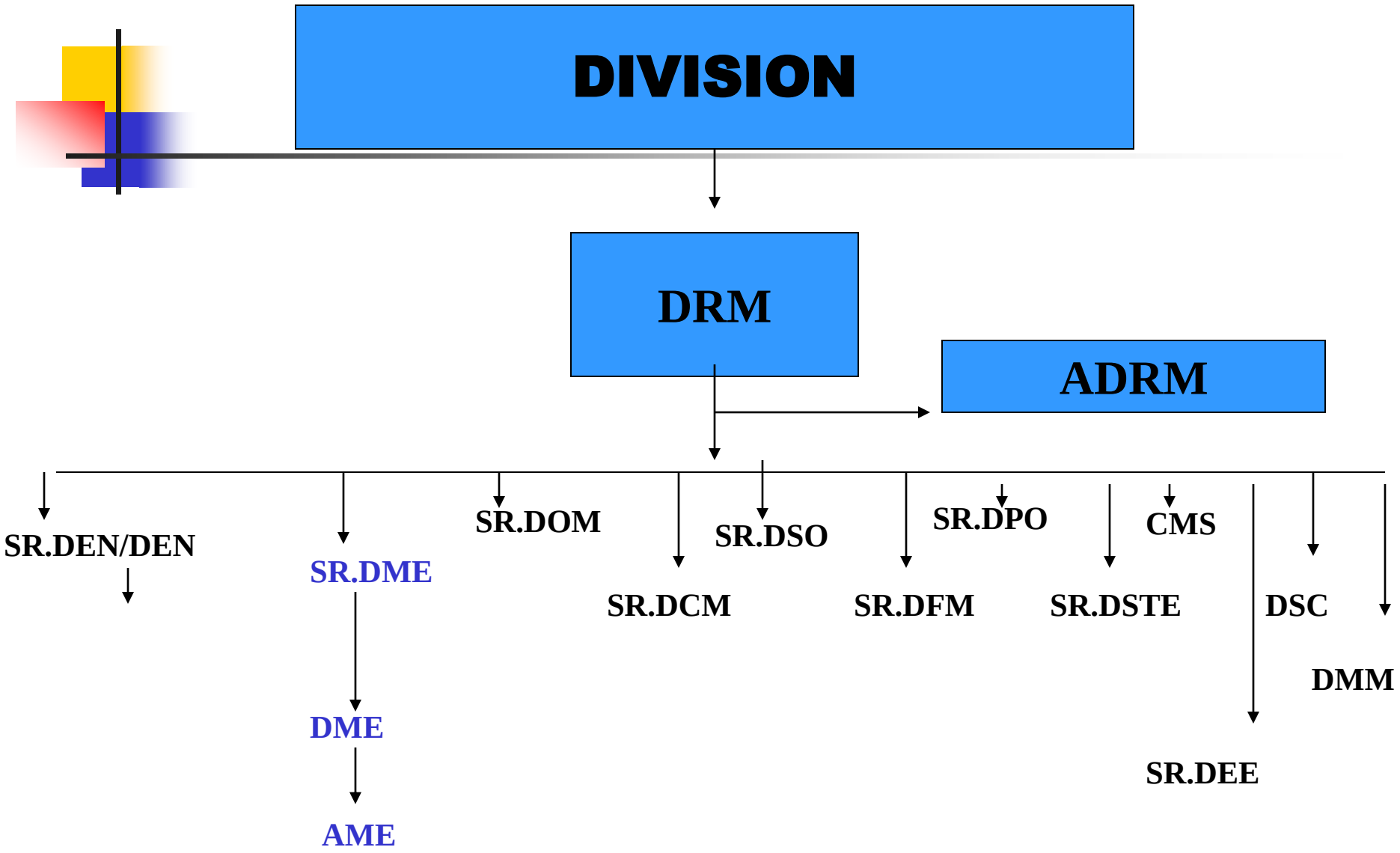
Sr. Prof.Mech.Engineer

Organisation of Mechanical Department

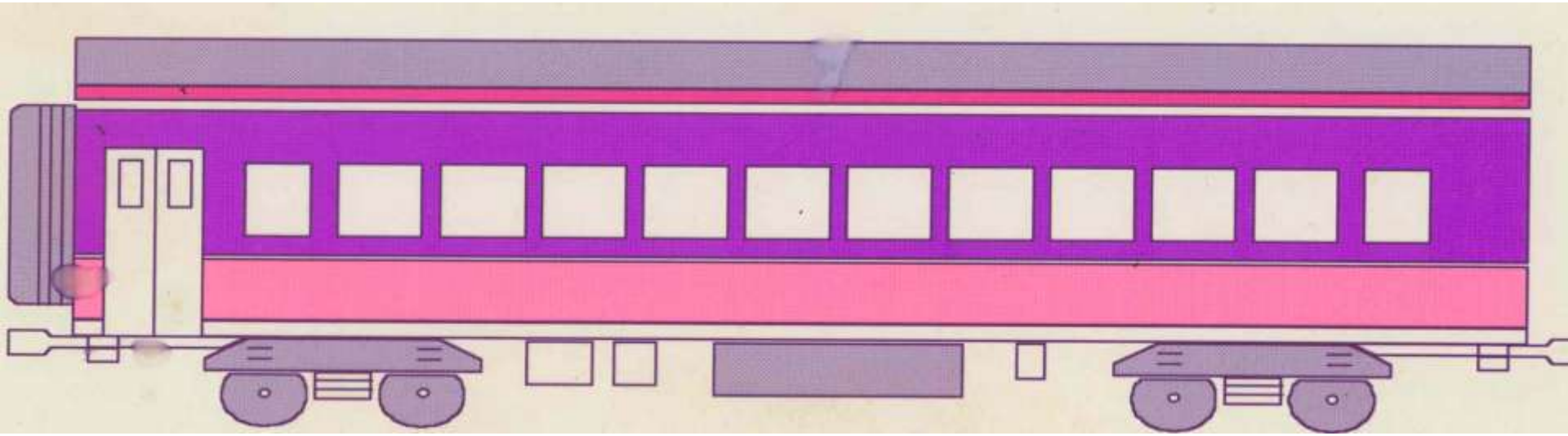

RAILWAY BOARD
M.M
M.T
M.E.
M.S
M.L
F.C
AMPU
AMME.
AM STORES.
EXECUTIVE DIRECTORS
DIRECTORS/ JOINT DIRECTORS

ZONAL RAILWAYS




DIVISION
DRM
ADRM
SR.DEN/DEN
SR.DME
DME
AME
SR.DOM
SR.DCM
SR.DSO
SR.DFM
SR.DPO
SR.DSTE
CMS
SR.DEE
DSC
DMM

COACH



Basic Structure

Based on the basic structure Indian Railways has following types of coaches.

- IRS Coach
- ICF Coach
- BEML Coach
- LHB Coach

Basic Structure- Continued

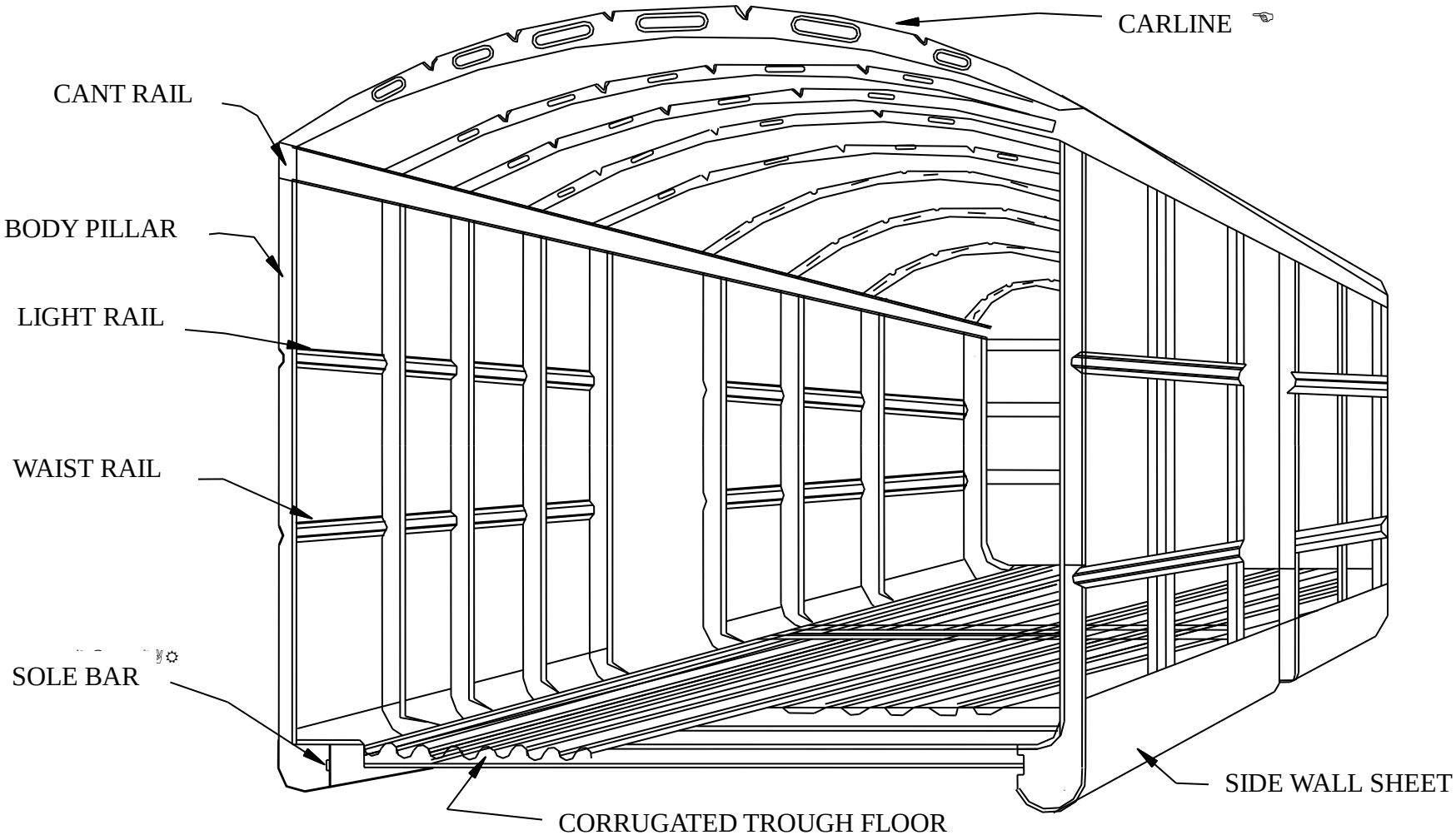
- IRS COACHES
  - Steel Under Frame,
  - Wooden Body,
  - Laminated Springs in primary suspension and coil springs in secondary suspension,
  - Tyred Wheels
- ICF COACHES (Started from 1955)
  - Integral All Metal Design
  - Design from Schelieren,Switzerland(1954).Original Design

ICF COACH

ICF COACH

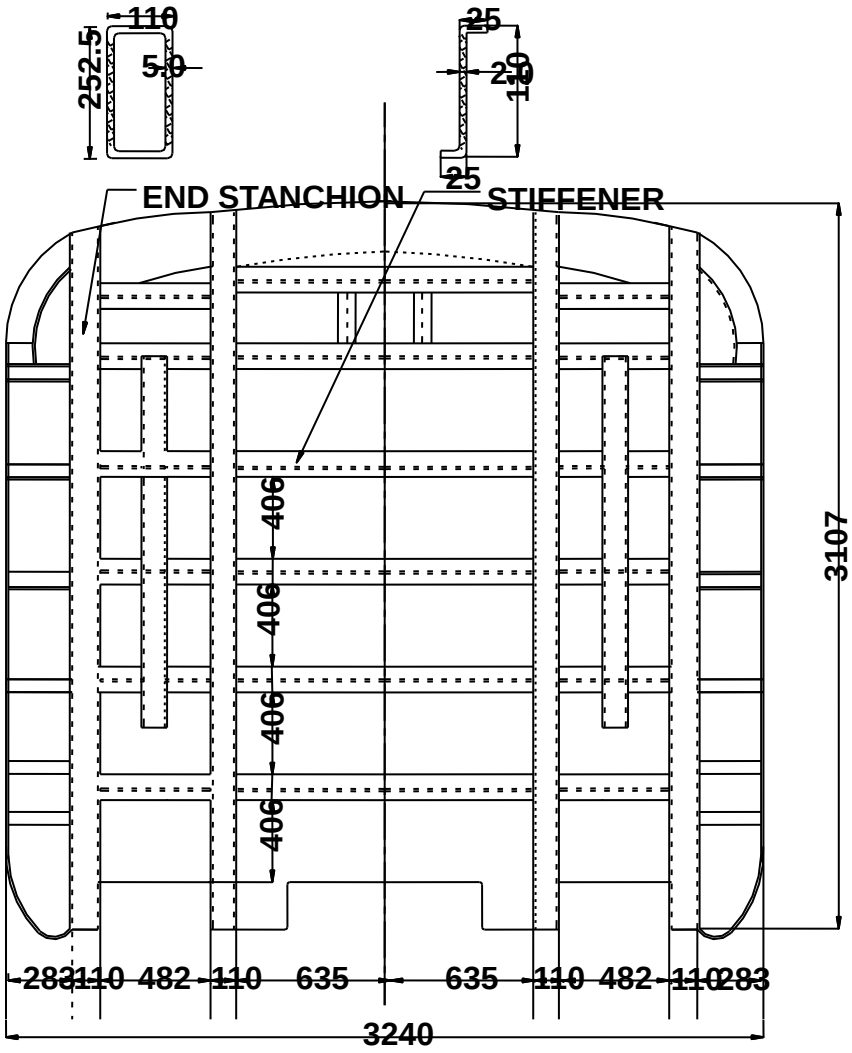
- Integral design
- Anti telescopic
- All coil springs
- Air brakes/Vacuum brake
- Self aligning spherical Roller bearings
- Stainless steel body for anti corrosion
- Better riding comforts

ICF SHELL



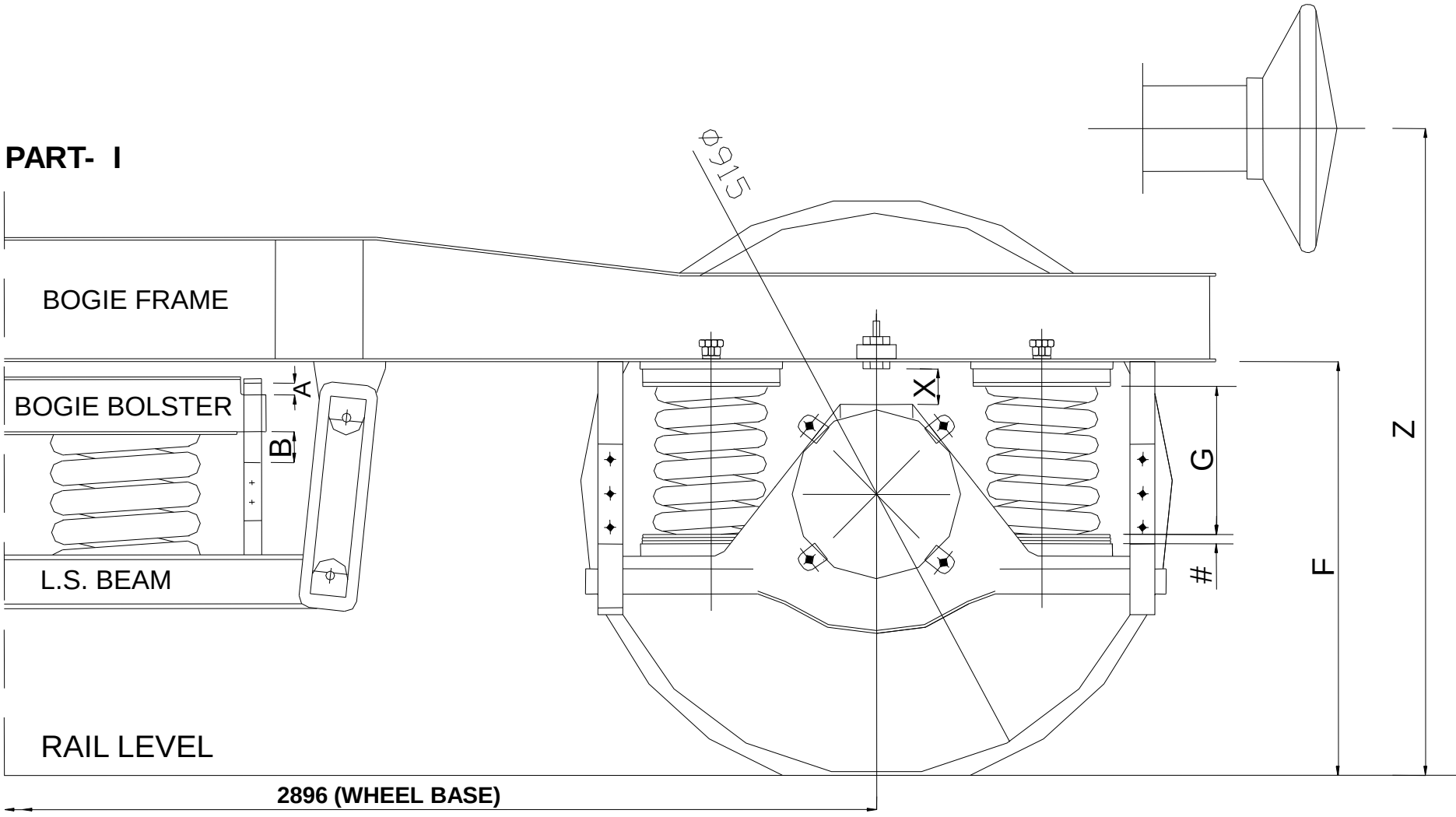
SHELL FOR ICF COACHES (CROSS SECTIONAL VIEW)

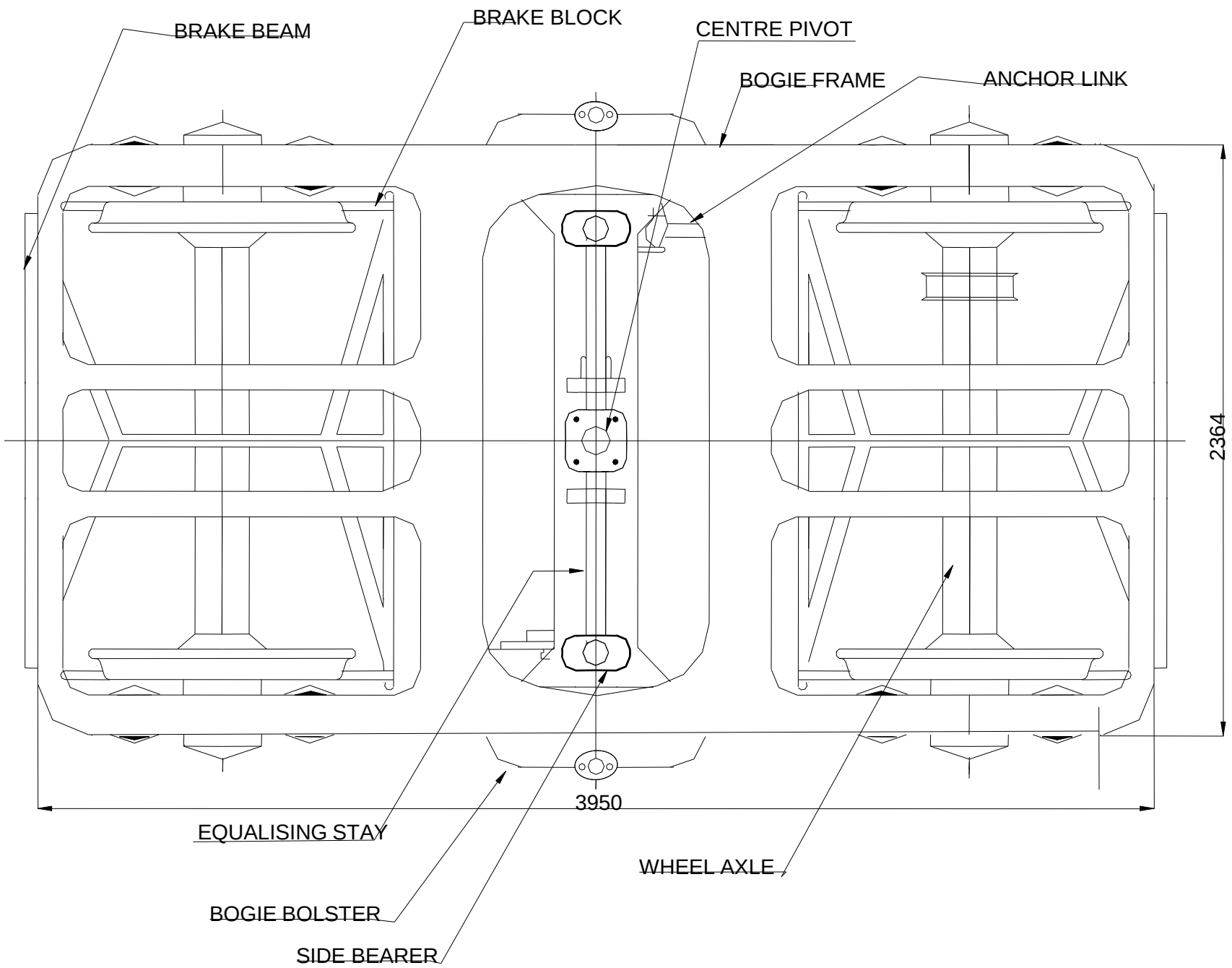
ICF SHELL-END CONSTRUCTION



END CONSTRUCTION

PART- I


ϕ915
BOGIE FRAME
BOGIE BOLSTER
A
B
L.S. BEAM
X
G
#
F
Z
RAIL LEVEL
2896 (WHEEL BASE)


BRAKE BEAM
BRAKE BLOCK
CENTRE PIVOT
BOGIE FRAME
ANCHOR LINK
2364
3950
EQUALISING STAY
WHEEL AXLE
BOGIE BOLSTER
SIDE BEARER

LC5 BOGIE

BEML COACH

- Just after independence, acute shortage of coaches
- Hindustan Aeronautics Ltd. (HAL) entered into a deal with M.A.N of Germany to produce all steel coaches
- Model 404 and 407 with centre lav , all third on IRS under frame
- First integral coach 41 series recognizable by small window on the toilet
- This business transferred to BEML in 1970
- Their floor level slightly higher than the ICF
- BEML coaches are mostly decommissioned.

LHB COACH

LHB /FIAT COACHES

Contract with M/s LHB in 1995 to supply

- 19 AC 2nd class chair car
- 2 AC Executive class chair car
- 3 Generator cum brake van

TOT available for

- AC first class sleeper
- AC second class sleeper
- AC pantry car

AC 3 tier developed by IR

LHB /FIAT COAHES FEATURES

- Shell manufactured by LHB and bogie by FIAT based on EUROFIMA concept
- Speed potential 160 kmph can be raised to 200 kmph
- AAR ‘H’ type tight lock coupler
- Window with double glazing with inert gas in between
- Noise and heat insulation
- Two microprocessor roof mounted air conditioned unit

LHB /FIAT COAHES FEATURES

• Axle mounted EP type disc brake with wheel slide protection

•Interlocking type of joint between vertical and longitudinal stiffener

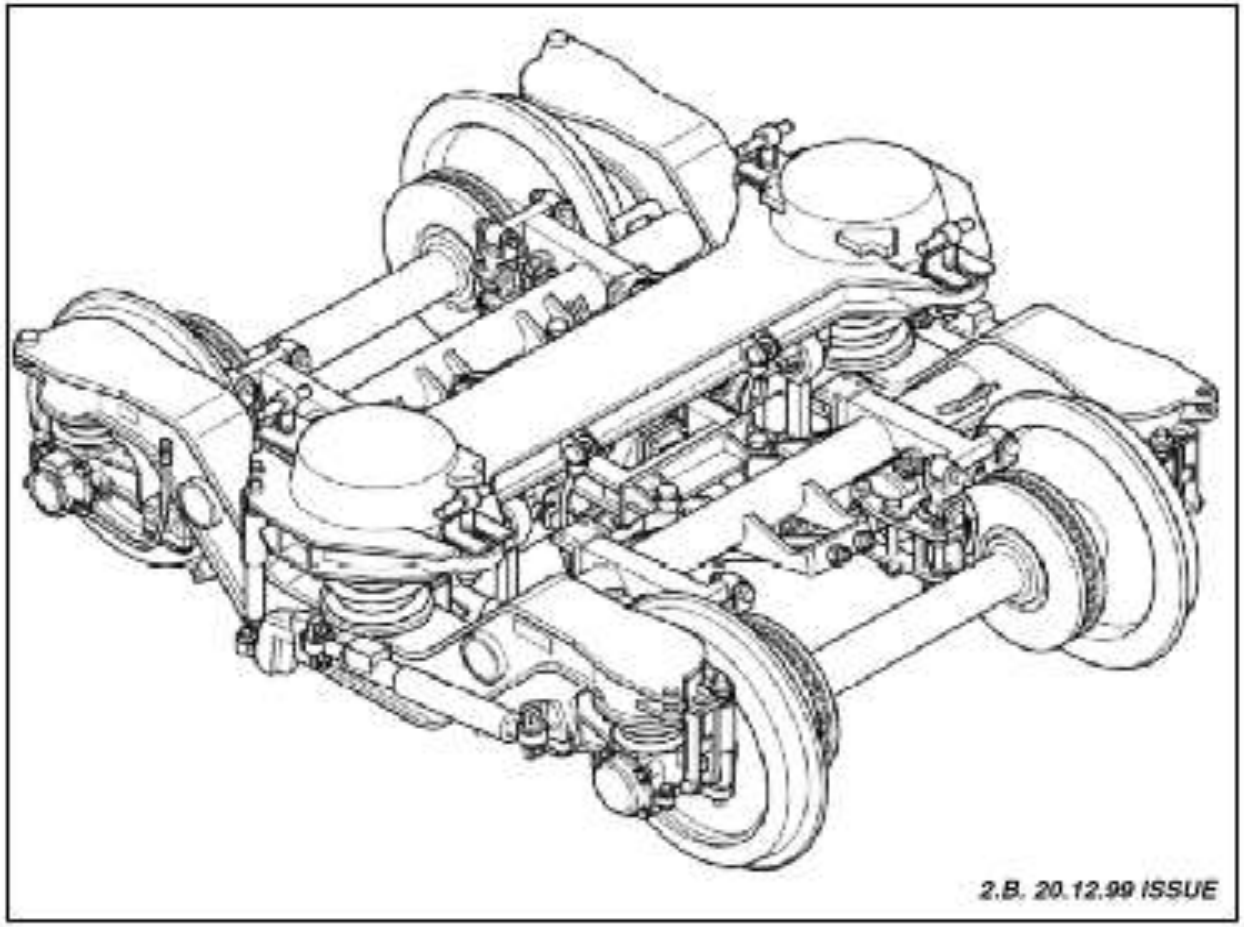
•Use of stainless steel to minimise corrosion

•Modular design interior

•Hygienic toilets with controlled discharge

•Spherical roller bearings

BOGIE GENERAL ARRANGEMENT



Comparison of LHB and ICF Coaches

S.No.	Item	LHB	ICF
1	Length of body (m)	23.54	21.337
2.	Width(m) External Internal	 3.24 3.07	 3.24 3.03
3.	Weight of coach (t)	40.2	47
4.	Bogie wheel base(m)	2.56	2.896
5.	Maintenance periodicity (in millon km)	1	0.3-0.4
6.	Riding index	2.75	3.5

CLASSIFICATION OF COACHES

- Main Line Coaches
- Suburban Passenger Coaches
- Other Coaching Vehicles

- POPULATION ON INDIAN RAILWAYS

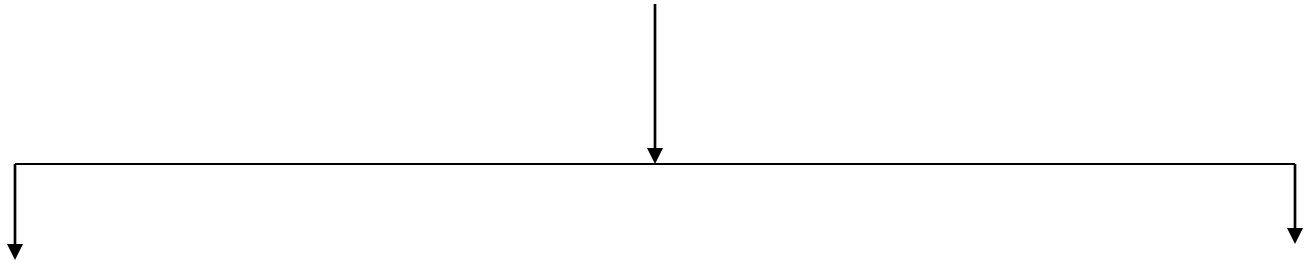
DMU/DHMU	578
EMU	5316
Coaches	38,196 (seating capacity 2.75 million)
Other Coaching	5990

Main Line Coaches

Requirements

- Journey is longer therefore better ride index 3.5
- More space per person
- Cushion seats or berths
- Toilet facilities
- Passenger Amenities
- Doors
- Vestibules

Types of Main Line Coaches- Based on Passenger Services



Non AC Services

General Class

Three Tier Sleeper

Chair Car

First Class

AC Services

AC Three Tier

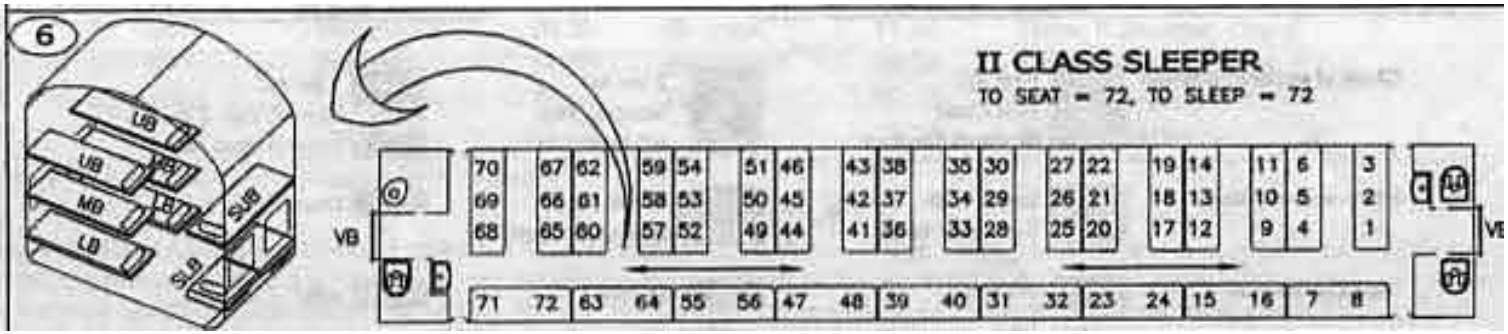
AC Two Tier

AC Chair Car

AC Executive Class

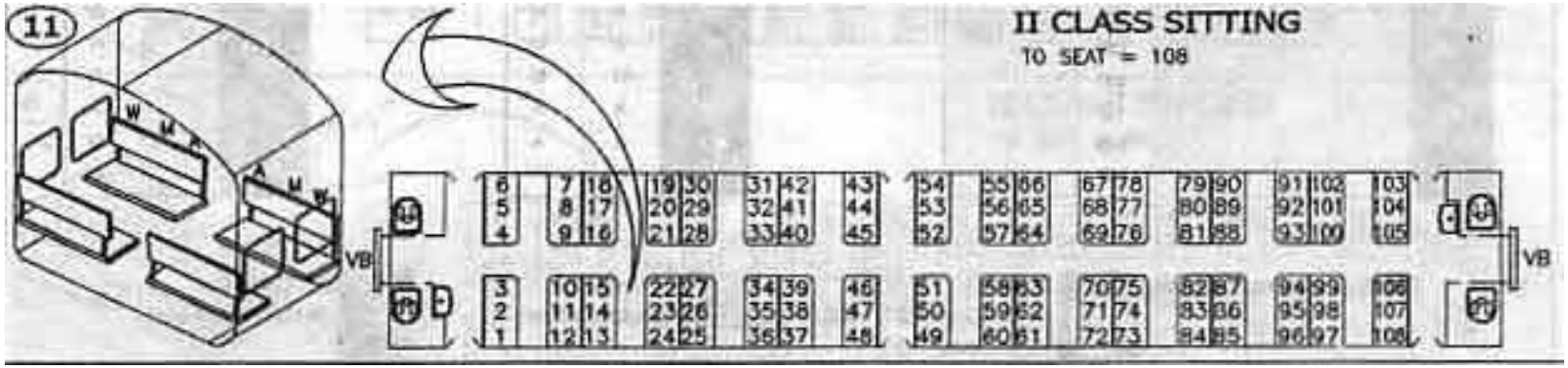
AC First Class

Three Tier Sleeper



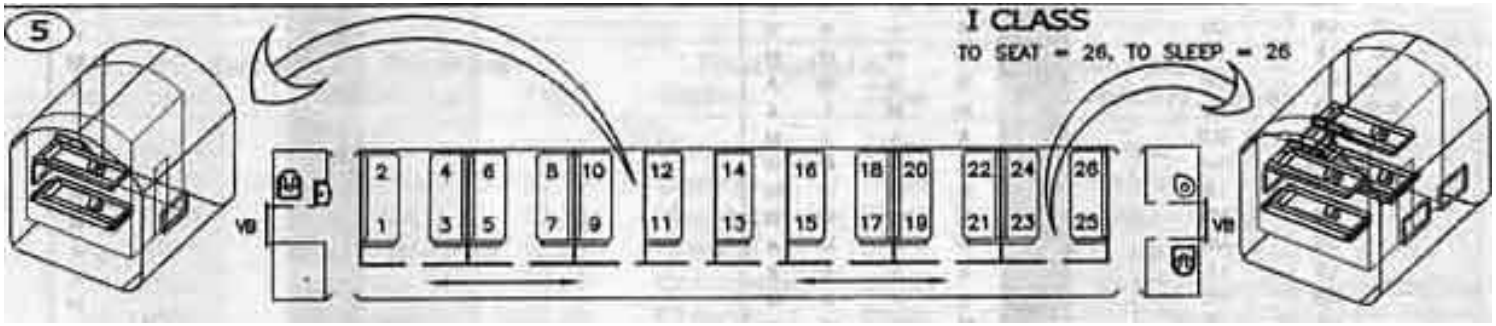
- Most Common Coach
- Used for general public going for long journey particularly involving night travel
- Accommodation for 72 persons
- Each compartment 6 berth, middle seat foldable, no doors for compartments
- Across the aisle two shorter berth along the length of Coach
- Toilets at the ends
- Some coaches with ladies compartment (6 Berth) with door

Second Class Chair Car



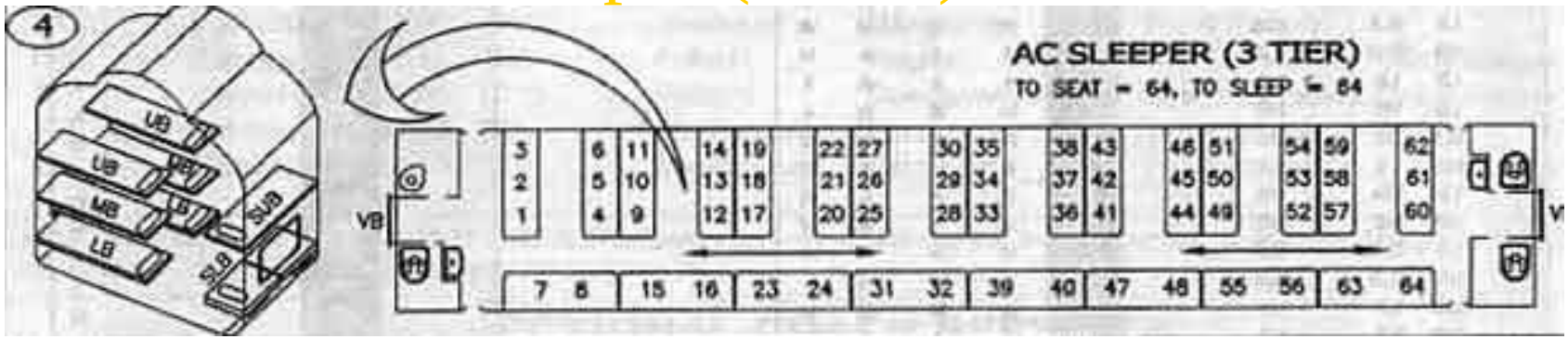
- Earlier Version have 72 seats(3 and 2 across the aisle)
- Since 1995 sitting accommodations for 108 persons (Seating 3 and 3 across)
- Toilets at the ends
- Used for intercity traveling spanning 5-6 hours

First Class



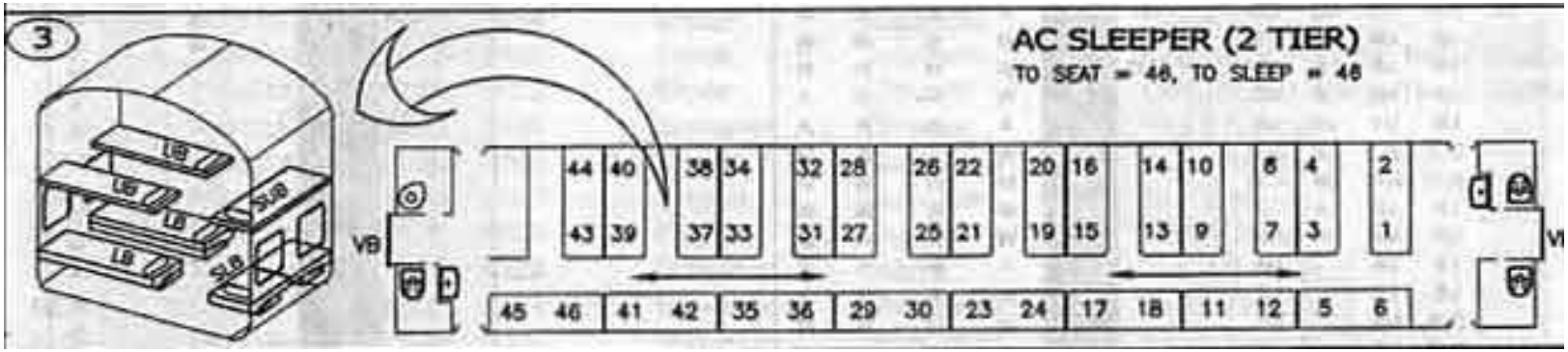
- Used for longer journey by affluent class
- Accommodation for 26 persons
- Provided with door
- 5 compartment with 4 berth each
- 3 Coupe with 2 berth each
- Toilets at the end
- These are being phased out

AC Sleeper (3 Tier)



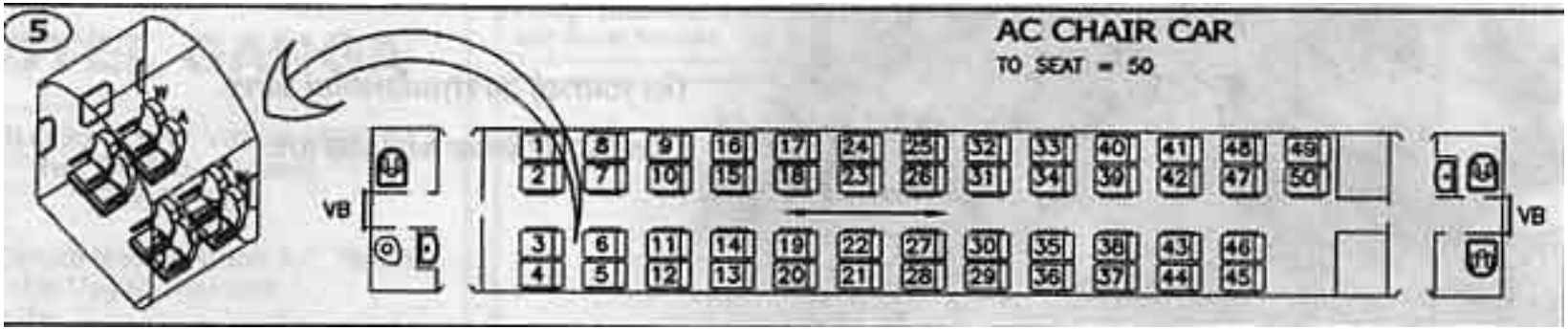
- Used for longer journey involving night
- It has 64 berths , LHB coach has 72 berths
- It has 3 oriental and one western style of toilets
- There are no doors
- 8 compartment (LHB-9) each with 6 berths.
- 2 shorter berths provided in front of each compartment along the length of the coach

AC Sleeper (2 Tier)



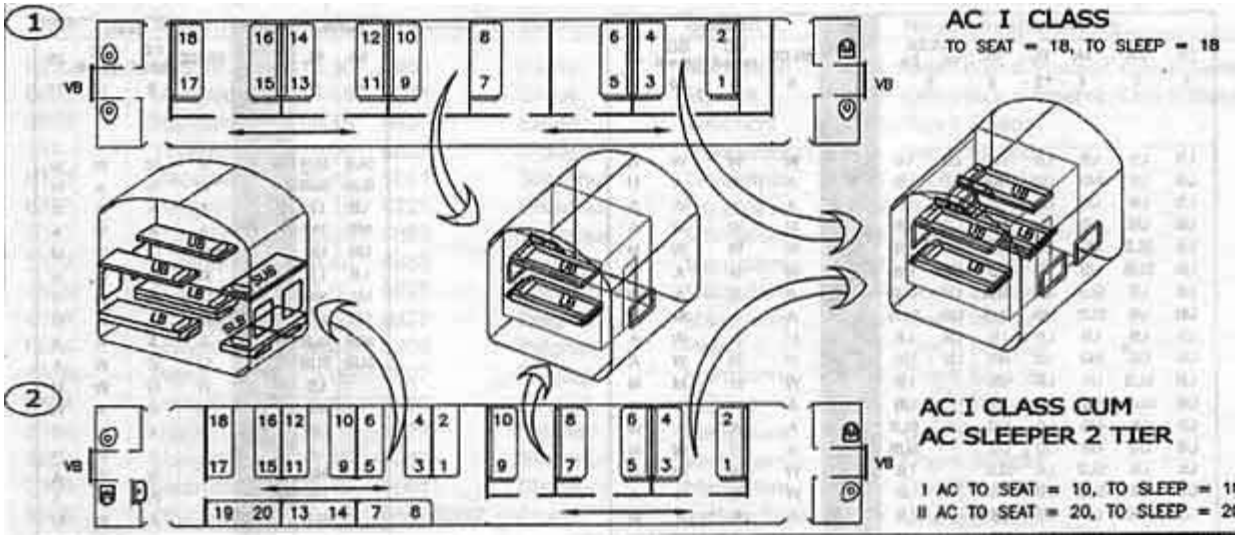
- Used for longer journey involving night by affluent class
- It has 46 berths , LHB coach has 54 berths
- It has 3 oriental and one western style of toilets
- There are no doors but curtains are provided
- 8 compartment (LHB-9) , 7 are with 4 berths, One with 2 berths.
- 2 shorter berths provided in front of each compartment along the length of the coach

AC Chair Car



- 50 seating capacity
- Used for short journey like intercity travel etc.

AC First Class & Composite AC First Class



- Super Luxurious Class with only 18 berths
- Each compartment has door for privacy
- 3 Compartment each with 4 berths and 3 coupe with 2 berths each
- Combination of AC 1st Class and AC 2- Tier Sleeper has 10 berths for AC 1st and 20 berths for AC 2-Tier sleeper

Garib Rath

- Seating capacity 102 against usual 73
- Speed potential-130 KMPH
- AC with 3 doors aside
- Each passenger with snacks table,magazine bag and bottle stand
- Each row with window
- Cell Phone charger
- Four emergency windows

Composite Classes

• AC first class coaches with one section having sleeping accommodation and rest being a chair car- Coal field Express

•Composite first and second class coach with two compartment being 1st class (6 berths) rest 59 are 2nd class berths. Only handful of this type.

•Earlier odd mixed accommodation which was like a 2 Tier sleeper coach but provided sleeping accommodation only for some passengers in the upper berths (24) and lower berths are for sitting only(48)

•Double decker coaches on WR- Flying Rani, They have a single level at either end with the double deck portion forming mostly of the middle of the coach. Underframe has a well. Used mainly for intercity traffic but not very popular.

DOUBLE DECKER COACHES

Comparison of Capacity of LHB and ICF Coaches

S.No.	Type	LHB	ICF
1	AC-First Class	24	22
2.	AC-2 Tier	54	48
3.	AC-3 Tier	72	72
4.	Second Class 3-Tier	78	81

Suburban Passenger Traffic Coaches

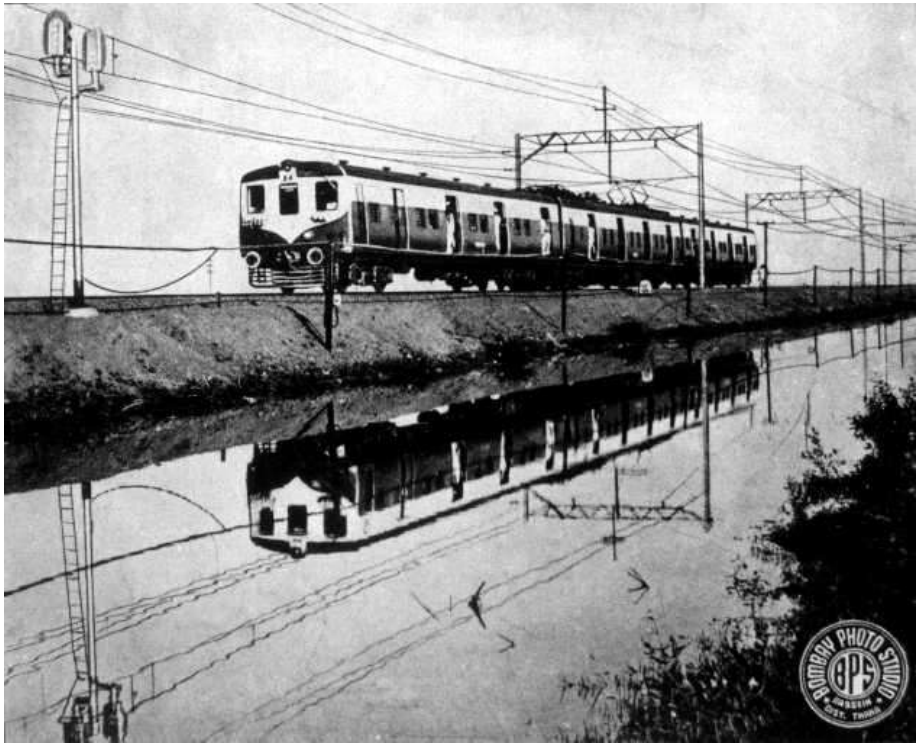
Requirements

- Journey is short mainly intercity or city transportation
- Berth are not provided.
- No facilities for toilets.
- Less passenger amenities.
- Wider doors.
- Floor at the platform level.
- More space for standing.
- Suspension system to suit variation in load.
- Ride Index = 4.0 for EMU/DMU
- High Acceleration/deceleration

Suburban Passenger Traffic Coaches-Types

- Electric Multiple Unit(EMU).
- Main Line Electric Multiple Unit (MEMU)
- Diesel Multiple Unit
- Rail Bus

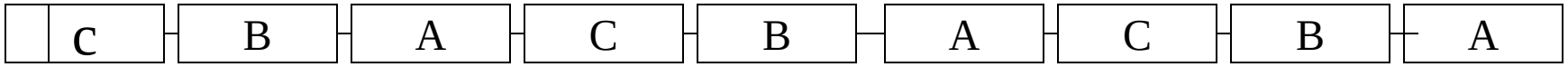
Electrical Multiple Unit



- Run in suburban section of Mumbai, Kolkatta, Chennai
- Fast acceleration and deceleration
- Basic unit is 3 coaches where one motor coach and 2 trailer coach
- Run in consist of three units
- First and Second Class accommodation is available
- Coach for ladies are also provided

Electrical Multiple Unit-Continued

Churchgate



Type of Coach	C-Driving Trailing Coach	B-Motor Coach	A- 1st and 2nd class coach	Total
Seating Capacity	86	86	112	284
Standing capacity in ease	90	86	116	292
Crush load	176	172	228	576

Train Normal load - 852 all seating

Crush load - 852 seating + 876 standing

Dense Crush Load - 852 seating + 1740 standing

Main Line Electrical Multiple Unit

•Run other then suburban area connecting two cites nearly covering about 150 to 200 kms.

•In general 8 coach trains runs where 2 units are provided having one motor coach and three trailer coaches in each unit.(1DMC+3TC)

•DMC- 64 , TC -80

Diesel Multiple Unit

- Powered by diesel engine
- Transmission- hydraulic/electric
- One unit consist of

-1DPC+3TC

- Train consist of 3 to 4 units

- A new aerodynamically shaped DEMU brought into service
- DPC accommodate 56 passenger(37 ladies +19 handicapped), TC accommodate 96 passengers and TC/vendor 97(2nd class 85 and vendors 12.

Rail Bus

- Used where traffic is less
- Substitute to road bus
- Powered by diesel engine
- Seating capacity of about 60 passengers
- Driving cab on both the sides

Other Coaching Vehicles

- Accident Relief Medical Van
- Accident Relief Train
- Parcel Van
- Inspection Carriage
- Pantry Car

Accident Relief Medical Van

•Diesel Powered -sometimes actually converted EMU units with diesel units
•Usually two such coaches coupled together, one supplying power and other converted to house an emergency medical treatment facility
•Usually beds for 12 patients are also provided

Accident Relief Tool Van

•Usually coupled in pairs, one as a hospital coach and other coach with rerailing and metal working equipments and tools.
•Coaches modified to keep equipments
•Staff coaches are also added in formation

SELF PROPELLED ACCIDENT RELIEF TRAIN

New Developments

ICF has come up with

- Special coaches for disabled
- Wider and longer side berths
- Improved exhaust arrangement in the toilets of air conditioned coaches.
- Emergency window
- A reclining mechanism in chair car
- Night light with berth number indication
- Improved reading lamps
- Wider window glasses etc.

CODES FOR COACHING STOCK-GUIDLINES

L	LUGGAGE		
R	BREAKVAN	**G**	SELF GENERATING
P	POSTAL VAN	CD	DINNING CAR
Y	LADIES COMPT.	**CW**	2 TIER
W	VESTIBULED	**CN**	3 TIER
C	WITH COUPE	**CG**	3 TIER+SITTING
AC	A C COACH	**CF**	2TIER+SITTING
F	FIRST CLASS	**CZ**	CHAIR CAR
S	SECOND CLASS	**CT**	TOURIST CAR

EXAMPLES

CTS	TOURIST CAR FOR SECOND CLASS
ART	ACCIDENT AND TOOL VAN
FSCN	FIRST CLASS+3 TIER SLEEPER
GS	SECOND CLASS-SELF GENERATING
LR	LUGGAGE+BRAKE VAN
SLR	SECOND CLASS+LUGG.+BRAKEVAN
WGACCN	VESTBULE+SELF GENER.+A C+3 TIER
WGACCW	VESTBULE+SELF GENER.+A C+2 TIER
WGFACCW	VESTB.+S-G.+A C+FIRST CUM 2 TIER
WGFAC	VESTBULE+SELF GENER.+A C+FIRST
WACCWEN	VESTBULE+END GENER.+A C+2 TIER

Glimpses of Railways Other Countries

Comparison of Traffic

Country	Traffic in millions			
	Passenger journeys	Passenger Km	Freight tonnes	Freight tonnes km
India (2007-08)	6688	768755	795.0	515670
Sri Lanka (2003)	113	2349	1.6	-
Thailand (2006)	48.9	8824	12.5	3508
Vietnam (2006)	12.7	4557	8.6	2927

SRI LANKA

Summary of Track and Stations

- Present operation track length = 1261 km
- Double track length = 137 km
- Track gauge = 1676mm (5’-6”)
- Maximum Total length of track = 1449 km
- axle load = 16.5 T
- Maximum permissible speed = 80kmph
- No. of main stations = 172
- No of sub stations = 161

Present Fleet of Coaching Stock

1.	Air Condition Coaches	AFC	12
2.	Reserved Saloon	RS	10
3.	Restaurant Car	RC	22
4.	Berth (First class)	NF	15
5.	Berth (Second class)	NS	12
6.	Second class	SC	150
7.	Third class	TC	373
8.	Second & Third composite	ST	02
9.	Brake second	CV	16
10.	Brake third	TV	251
11.	Third class buffet	TCBU	20
12.	Observation saloon	OFV	15

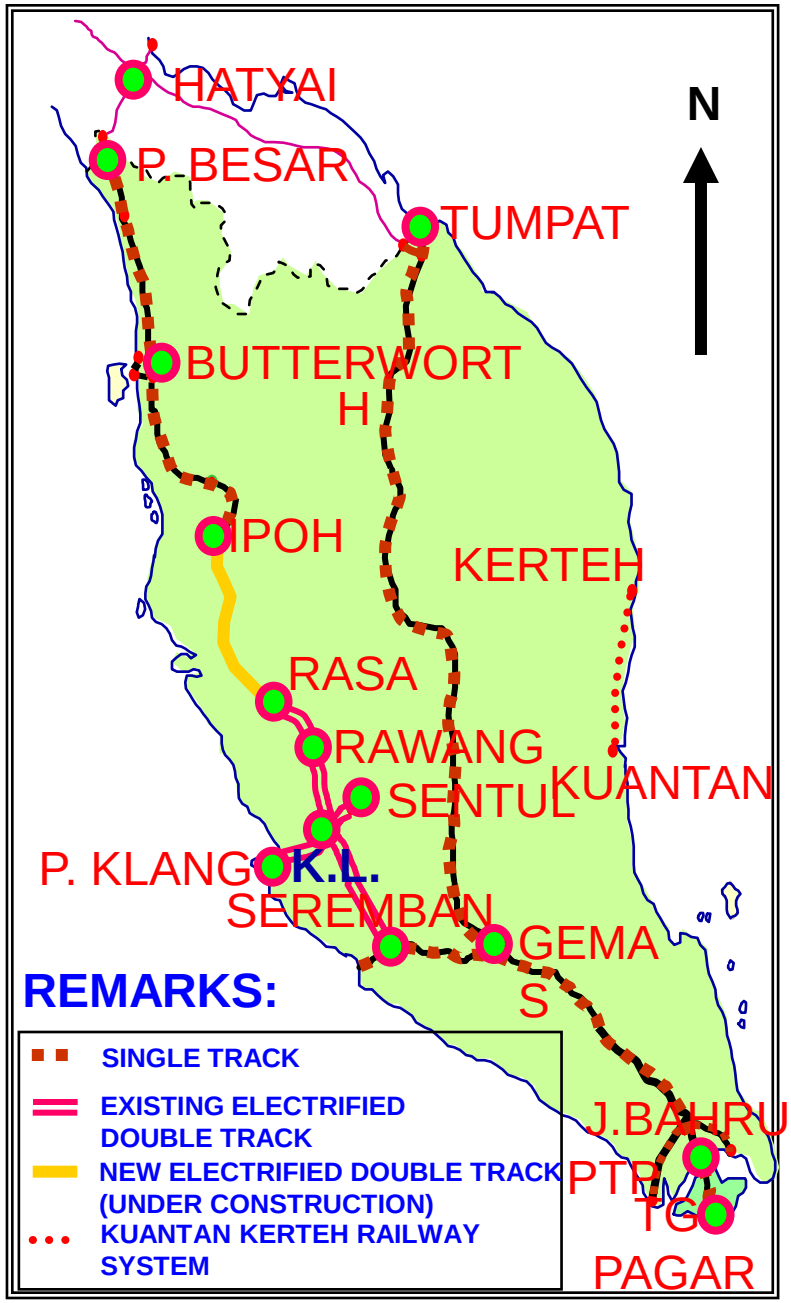
Present Fleet of Coaching Stock (contd)

13.	Suburban trailing coach	SBC	156
14.	Suburban driving coach	SBD	60
15.	Second class sleeprette	SCS	17
16.	Air Conditioned reserved saloon	ARS	01
17.	Generator van	GV	02
18.	Parcel brake van	PBV	31
19.	Post office van	POV	12

Type of coaches	Imported from	Year	Present Nos.	Length in feet
I	China	1960	44	55
II	Romania	1976	13	55
III	Romania	79-80	188	55 & 45
IV	India	1980	34	45-50
V	Romania	1981	90	55
VI	Romania	1989	130	55 & 45
VII	Romania	1990s	312	55-45
VIII	China	2007-08	100	65
IX	Locally built	Before 55 years	1989	45

Type 8

Malaysia



- Route length : 1,658 km
- *Meter Gauge*: 1,000 mm
- Electrified Double Track (175 km)
  - Rawang – Seremban: 105 km
  - Sentul – P. Klang: 45 km
  - Rasa – Rawang: 25 km

  (newly opened on 21 May 2007)
- Electrified Double Tracking Project
  Rawang – Ipoh 180 km
- Staff Strength : 5,057

Rolling Stock:

Electric Multiple Units	58
Locomotive	109
Coaches	256
Wagons	3,862
Power Generating Cars	24

PASSENGER COACHES

AFC - Aircond First Class
ASC - Aircond Second Class
AEC(S) - Aircond Economy Class/ with Surau / Ekonomi Plus
ABC - Aircond Buffet Coach
ADNF - Aircond Day Night First (B&D)
ADNS - Aircond Day Night Second
SK - Selun Khas (Reserved Saloon)
TC - Third Class
BC - Buffet Coach
SK - Selun Khas (Reserve Saloon)
PV - Parcel Van
PGC - Power Generation Car

ASC - Aircond Second

AEC - Aircond Economy Class (E-Plus)

ADNFD - Aircond Day Night First Deluxe

AFC - Aircond First Class

State Railway of Thailand

Important features

Gauge	1000 mm, 1435 mm
Route length	4042km ; 28.8 km (under construction)
Electrification	28.8 kms of 1435 mm at 25 kv.(under construction)

Traffic	2006 -in million
Passenger journeys	48.9
Passenger kms	8824
Freight Tonnes	12.5
Freight tonne km	3508

Rolling Stock

In May 2007 SRT was operating

Steam locomotive	5
Diesel Electric locomotive	232
Diesel Hydraulic	34
Diesel rail car	230
Passenger car	1256(including 275 sleeping, 69 restaurants and 84 baggage cars)
Freight wagons	5843

Diesel Railcars or Multiple-Units

BPD: Bogie power car for diesel railcar with driving cab
BTD: Bogie trailer for diesel railcar with driving cab
ASR: Air conditioned Sprinter Railcar
APD: Air conditioned power diesel railcar with driving cab
APN: Air conditioned power diesel railcar non driving cab
As at June 2007

Class	Cars per unit	Motor cars per unit	Motores axles/car	Power/ motor kW	Speed km/h	No in service (cars)[2]	First built
BPD/ BTD	2	1	2	175x2	85	7+7	1967
BPD/ BTD	2	1	2	175x2	90	23+26	1971
BPD/ BTD	3	2	1	164	70	8 +4	1971

Diesel railcars or multiple-units--contd

Class	Cars per unit	Motor cars per unit	Motores axles/car	Power/ motor kW	Speed km/h	No in service (cars)[2]	First built
BPD	2	2	1	175	100	40	1983
APD	2	2	1	212	120	9	1991
APN	Intermediate motor car		1	212	120	8	1991
BPD	2	2	1	175	100	62	1985
APN	Intermediate Motor car		1	175	100	11	1985
APD	2	2	1	261	120	12	1995
APN	Intermediate motor car		1	261	120	8	1995
APD	2	2	1	261	120	19	1986

Electric Multiple Units

Class	Cars per unit	Motor cars per unit	Motored axles/ car	Output /motor kW	Speed km/h	Units in service	First built
Express	4	2	2	250	160	4	2007
City Line	3	2	2	250	160	5	2007

Vietnam

VIETNAM RAILWAY MAP

Constructed in 1881

Track Gauge 1000mm and 1435 mm

- 2770 Kms of 1000 mm-gauge
- 150 Kms of 1435 mm- gauge
- 223 Kms of mixed gauge

Rolling Stock

Locomotive 336 (20#1435mm & 316 #1000mm)

Passenger coaches 1098

(1090 # 1000 mm and 8 # 1435mm)

Freight coaches 5123

(4769 # 1000 mm and 354# 1435 mm)

Double desk car

Chair coach

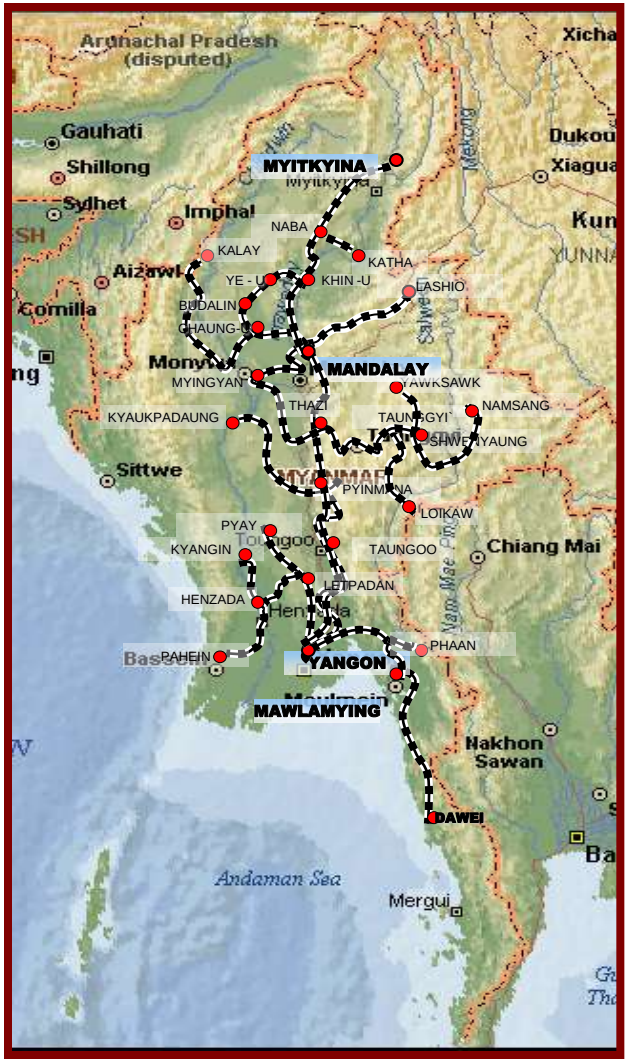
Berth coach

Myanmar

Myanmar

Track Gauge 1000mm

Route length 3955



Passenger Coaches

SN	Heading		Total
1	Upper class	Bogie	312
2	Ordinary class	Bogie	697
3	Mail Vans	Bogie	16
4	Restaurant	Bogie	17
5	Brake vans	Bogie	105
6	Departmental	Bogie	67
7	Departmental	Bogie	34
8	Others	Bogie	32
9	Others	4 wheelers	
	Total	Bogie	1246
	Total	4 wheelers	34
	Grand Total		1280
	Total Nos of Unit		2526

Interior of New Constructed Upper Class Coach

Newly Constructed Rail Bus Rake

THANKS