TYPES OF PASSENGER COACHES FOR DIFFERENT SERVICES

V.K. SAXENA
Sr. Prof. Mech. Engineer
COACH
Based on the basic structure Indian Railways has following types of coaches.

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

SHELL

Bogie
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
HEIGHT FROM RAIL LEVEL

OVER BODY

OVER BUFFERS

OVERALL WIDTH

COACH SHELL

COACH SHELL
ICF SHELL

SHIELD FOR ICF COACHES (CROSS SECTIONAL VIEW)
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 2\textsuperscript{nd} 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

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

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

POPULATION ON INDIAN RAILWAYS

<table>
<thead>
<tr>
<th>Type</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMU/DHMU</td>
<td>578</td>
</tr>
<tr>
<td>EMU</td>
<td>5316</td>
</tr>
<tr>
<td>Coaches</td>
<td>38,196 (seating capacity 2.75 million)</td>
</tr>
<tr>
<td>Other Coaching</td>
<td>5990</td>
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</tbody>
</table>
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 1\textsuperscript{st} Class and AC 2- Tier Sleeper has 10 berths for AC 1\textsuperscript{st} 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 1\textsuperscript{st} class (6 berths) rest 59 are 2\textsuperscript{nd} 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

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Type</th>
<th>LHB</th>
<th>ICF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AC-First Class</td>
<td>24</td>
<td>18</td>
</tr>
<tr>
<td>2.</td>
<td>AC-2 Tier</td>
<td>54</td>
<td>46</td>
</tr>
<tr>
<td>3.</td>
<td>AC-3 Tier</td>
<td>72</td>
<td>64</td>
</tr>
<tr>
<td>4.</td>
<td>Second Class 3-Tier</td>
<td>78</td>
<td>72</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Type of Coach</th>
<th>C-Driving Trailing Coach</th>
<th>B-Motor Coach</th>
<th>A- 1\textsuperscript{st} and 2\textsuperscript{nd} class coach</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seating Capacity</td>
<td>86</td>
<td>86</td>
<td>112</td>
<td>284</td>
</tr>
<tr>
<td>Standing capacity in ease</td>
<td>90</td>
<td>86</td>
<td>116</td>
<td>292</td>
</tr>
<tr>
<td>Crush load</td>
<td>176</td>
<td>172</td>
<td>228</td>
<td>576</td>
</tr>
</tbody>
</table>

**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 consists of 1DPC+3TC
- Train consists of 3 to 4 units
  - A new aerodynamically shaped DEMU brought into service
- DPC accommodate 56 passengers (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

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>LUGGAGE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>BREAKVAN</td>
<td>G</td>
<td>SELF GENERATING</td>
</tr>
<tr>
<td>P</td>
<td>POSTAL VAN</td>
<td>CD</td>
<td>DINNING CAR</td>
</tr>
<tr>
<td>Y</td>
<td>LADIES COMPT.</td>
<td>CW</td>
<td>2 TIER</td>
</tr>
<tr>
<td>W</td>
<td>VESTIBULED</td>
<td>CN</td>
<td>3 TIER</td>
</tr>
<tr>
<td>C</td>
<td>WITH COUPE</td>
<td>CG</td>
<td>3 TIER+SITTING</td>
</tr>
<tr>
<td>AC</td>
<td>A C COACH</td>
<td>CF</td>
<td>2TIER+SITTING</td>
</tr>
<tr>
<td>F</td>
<td>FIRST CLASS</td>
<td>CZ</td>
<td>CHAIR CAR</td>
</tr>
<tr>
<td>S</td>
<td>SECOND CLASS</td>
<td>CT</td>
<td>TOURIST CAR</td>
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## EXAMPLES

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>CTS</td>
<td>TOURIST CAR FOR SECOND CLASS</td>
</tr>
<tr>
<td>ART</td>
<td>ACCIDENT AND TOOL VAN</td>
</tr>
<tr>
<td>FSCN</td>
<td>FIRST CLASS+3 TIER SLEEPER</td>
</tr>
<tr>
<td>GS</td>
<td>SECOND CLASS-SELF GENERATING</td>
</tr>
<tr>
<td>LR</td>
<td>LUGGAGE+BRAKE VAN</td>
</tr>
<tr>
<td>SLR</td>
<td>SECOND CLASS+LUGG.+BRAKEVAN</td>
</tr>
<tr>
<td>WGACCN</td>
<td>VESTBULE+SELF GENER.+A C+3 TIER</td>
</tr>
<tr>
<td>WGACCW</td>
<td>VESTBULE+SELF GENER.+A C+2 TIER</td>
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<td>WGFACCW</td>
<td>VESTB.+S-G.+A C+FIRST CUM 2 TIER</td>
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<td>WGFAC</td>
<td>VESTBULE+SELF GENER.+A C+FIRST</td>
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<tr>
<td>WACCWEN</td>
<td>VESTBULE+END GENER.+A C+2 TIER</td>
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THANKS