9. Coaching Stock - Design And Maintenance

The standard coach which was developed after first World War was a wooden coach on steel under frame (4-wheeled). Later bogie coaches with wooden body and steel under frame were developed (IRS coach). Further developments have since taken place to provide more built-in strength and to make the coach lighter. Now ICF anti-telescopic integral coach with all coil spring bogies have been made a standard design for Indian Railways which has a better riding quality compared to IRS design coach.

**ICF Coaches** - IRS coaches were heavy and used to suffer extensive damage in collision / accident resulting in heavy passenger casualties. Integral design was developed in late 30s in Switzerland by M/s Swiss Car and Elevator Mfg. Ltd. Schiliren. This could be visualized as a large hollow tube placed on wheels. Extensive use of advanced welding technology for sheet welding was made use of. Indian Railway obtained collaboration with this firm and set up the coach factory at Perambur, Madras in 1950s. The concept of separate coach body and under frame gave way to one piece single shell construction.

**ICF Shell** - The shell consists of pressed steel section welded together with sheet covering. The skeleton of the shell consists of a series of hoops each consisting of floor cross beam, body side pillars and roof carlines. The sole bar, waist rail, light rail, cant rail and roof purlines hold these hoops together. This is covered by roof sheet on top, side panels on sides and corrugated trough floor.
The trough floor offers considerable resistance to longitudinal crushing loads, but cannot take high vertical load. On each end, specially designed head stock with compression/destruction tubes are welded. These tubes when subjected to collision shock, get deformed absorbing most of energy hence reducing the adverse effect of impact. Body bolsters are welded on bottom side of trough floor.

The coach ends consist of 4 vertical stanchions box section, transversely connected by Z sections and are welded to the head stock. Collision impact is first received by end stanchions which absorb a large part of it. The residual shock is absorbed by deformation of compression/destruction tubes. These features make ICF coaches anti-telescopic. The windows are made separately and screwed on to the double chamber. The coaches can be provided with vestibules for passage from one coach to another in a running train.

**ICF Bogie** - The bogie frame is made from sections welded together. The axles are located on bogie by telescopic dash pots and axle guide assemblies. Helical springs are used in both primary and secondary suspensions. The axle guide provides damping across primary suspension and vertical shock absorber across secondary suspension. Rubber pad vibration isolation is also provided in primary suspension. Weight is transferred through side bearers. Coach/Bogie pivot only acts as centering device and transmits tractive/braking forces. Lateral shock absorbers are provided to dampen lateral vibrations.

![ICF BOGIE](image)

**Furnishing** - Following are important features of furnishing -

- Length of seat should not be less than 6' - 6".
- Width of seat should not be less than 21" for second class and 26" for first class.
- Hip width per passenger should not be less than 21".
- Height of seat should be 16" from floor.
- Knee space between opposite seats should not be less than 21".
Back rest should be slightly inclined.

**Coding of coaching Stock** - Coaches are coded as per end use and are same for all gauges. There are a large number of codes. Details are available at Appendix B of Conference Rules Part-IV. Important codes are:

<table>
<thead>
<tr>
<th>AC</th>
<th>AC Coach</th>
<th>P</th>
<th>Postal van</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>First Class</td>
<td>CD</td>
<td>Dining Car</td>
</tr>
<tr>
<td>S</td>
<td>Second Class</td>
<td>CW</td>
<td>2 Tier</td>
</tr>
<tr>
<td>C</td>
<td>With coupe</td>
<td>CN</td>
<td>3 Tier</td>
</tr>
<tr>
<td>G</td>
<td>Self Generating</td>
<td>CG</td>
<td>3 Tier + Sitting</td>
</tr>
<tr>
<td>L</td>
<td>Luggage</td>
<td>R</td>
<td>Guard</td>
</tr>
<tr>
<td>W</td>
<td>Vestibuled Coach</td>
<td>CB</td>
<td>Pantry Car</td>
</tr>
</tbody>
</table>

**Coaching Stock Maintenance** - Coaches are based at a primary maintenance depot which is responsible for maintenance of those coaches. A set of coaches which are combined to form a train is called a rake.

Rakes are given Primary maintenance by the owning railway / base depot and Secondary maintenance at the other terminus. No secondary maintenance is required if the round trip of the train is less than 3500 kms. Other depots en-route undertake safe-to-run examination of the train. While primary maintenance involves complete inspection and attention to the rake, secondary maintenance involves cleaning, washing and inspection of safety fittings.

The target availability for non-AC coaches is 90%, i.e. 10% ineffective is permitted- 6.5% on workshop account for POH and repairs, 1% for waiting in yards and 2.5% on open line repair account. For AC coaches 12% ineffective is permitted- 9% on workshop account and 3% on open line repair.

**LHB Coaches**

![LHB Coach Image]
Contract was made with LHB in 1995 to supply the following:

1. 19 AC 2nd class chair car
2. 2 AC Executive class chair car
3. 3 Generator cum brake van

TOT is available for

1. AC first class sleeper
2. AC second class sleeper
3. AC pantry car
4. AC 3 tier developed by IR

**Double Decker AC Chair Car**

1. Designed by RDSO, Lucknow
2. Manufactured by RCF, Kapurthala
3. 128 seating capacity
4. Oscillation trails successfully conducted upto 180 kmph
5. Certified to run up to 160 kmph
6. Disc brake
7. FIAT bogie with air springs
8. LED destination board
Features of LHB/FIAT coaches are as under:

1. Shell manufactured by LHB and bogie by FIAT
2. Speed potential 160 kmph can be raised to 200 kmph
3. AAR ‘H’ Type tight lock coupler
4. Window with double glazing with inert gas in between
5. Noise and heat insulation
6. Two microprocessor roof mounted air conditioned unit
7. Axle mounted EP type disc brake with wheel slide protection
8. Interlocking type of joint between vertical and longitudinal stiffener
9. Use of stainless steel to minimise corrosion
10. Modular design interior
11. Hygienic toilets with controlled discharge
12. Catridge roller bearings

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>Sitting capacity II class</td>
<td>78</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>I Class</td>
<td>56</td>
<td>46</td>
</tr>
<tr>
<td>2</td>
<td>Length of body (m)</td>
<td>23.54</td>
<td>21.337</td>
</tr>
<tr>
<td>3</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>4</td>
<td>Weight of coach (t)</td>
<td>40.2</td>
<td>47</td>
</tr>
<tr>
<td>5</td>
<td>Bogie wheel base (m)</td>
<td>2.56</td>
<td>2.896</td>
</tr>
<tr>
<td>6</td>
<td>Maintenance periodicity (in lakh km)</td>
<td>10</td>
<td>3-4</td>
</tr>
<tr>
<td>7</td>
<td>Riding index</td>
<td>2.75</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Preventive maintenance schedules -- Preventive maintenance schedules followed for coaching stock in the form of examination and repair and POH are:

(a) Trip Schedule (Primary and Secondary maint. ) - Every trip.
(b) Schedule "A" by primary maintenance depot - (Monthly) +/- 3 days
(c) Schedule "B" - (do - Quarterly) +/- 7 days
(d) Schedule "C" - (do - Half-Yearly) replaced by IOH - 9 months +30/-0 days
POH by Coach Repair Workshop of Owning Rly.

POH Periodicity of Coaches:

**POH Schedule (New)**

<table>
<thead>
<tr>
<th>COACH CATEGORY</th>
<th>PERIODICITY IN MONTHS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IOH in Depot</td>
</tr>
<tr>
<td>New Coach turned out by PU or A coach turned out after MLR</td>
<td>12</td>
</tr>
<tr>
<td>Rajdhani / Shatabdi</td>
<td>--</td>
</tr>
<tr>
<td>Mail/Express, Garib Rath, Jan Shatabdi &amp; OCV forming part of standard rake composition of Mail/Express Trains</td>
<td>9</td>
</tr>
<tr>
<td>Passenger</td>
<td>9</td>
</tr>
<tr>
<td>Other OCV</td>
<td>12</td>
</tr>
</tbody>
</table>

Ref: Railway Board Letter No 2007/M(C)/141/1 dated 26.9.08

**Major items attended during trip Schedule - Time allowed in 6 hours (to be done at washing line)**

- Washing & Cleaning
- Oiling if required (oiling to be done every 15 days)
- Lubrication of all moving parts
- Wheel, suspension, draw & buffing gear examination.
- Change brake block, if needed, and adjust brake rigging slack.
- Alarm signal apparatus testing.
- Examine and provide passenger amenity fittings.
- Check for proper flow of water in all pipes.

"A" Schedule (to be done on washing line)

- All items of trip examination.
Flush water tanks.
Disinfection of coach.
Check train pipe & brake system for leakage.
Grease alarm chain apparatus.
Clean Direct Admission Valve.
Examine & replace brake gear pins.
Check & fill oil in ICF side bearers & dash pots.

"B" Schedule (at washing line)

All items of "A" schedule.
Overhaul alarm testing apparatus, release valve.
Touch up painting.
Check and fill oil in ICF side bearers.

"IOH' Schedule - The coach is to be marked sick and taken to sick line for this schedule.

All items of "B" Schedule.
Lift coach, Run out bogies, Overhaul bogies./ Use workshop overhauling bogie
Painting if, needed.
Overhaul Vacuum cylinder.
Check slack adjuster, shock absorbers etc.
Check & repair vestibules.
Corrosion repair.
Brake system
Draw/ Buffing gear

Cost of new coaches

Cost of AC Coaches – Rs. 60 to 80 lakhs (depending upon type of coach AC2T, AC3T, End on generator or Self generating car etc.)
Cost of non-AC coaches – Rs. 25 to 40 lakhs.

Codal Life of Coaches

Steel-bodied coaches ( ICF type )-- 25 Years
Wooden- bodied coaches ( IRS type )– 30 Years
Lightly utilized coaches – 40 years
10. Linen Management

Linen management has become one of the important and sensitive activities in Passenger services. The linen management involves the procurement of linens, blankets, pillow covers, pillows, and face towels, washing and packing, and distribution to the station and in turn to passengers in the coach.

The linen management had been carried out, traditionally by the commercial department from the introduction of linen supply in AC coaches. The linen management is now being carried out by different departments in various Railways based on the Zonal Railway guidelines. To standardize the Linen Management on Indian Railway, Board has taken a decision to entrust the Comprehensive Linen Management to Mechanical department (C&W) in the year 2009. By this order, Mechanical department has to undertake the comprehensive linen management i.e., Purchasing, washing, storage, supply & distribution of the linen kit to the passengers in AC coaches.

<table>
<thead>
<tr>
<th>Different methods</th>
<th>ACTIVITY</th>
<th>DONE BY</th>
<th>DONE BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1</td>
<td>PROCUREMENT</td>
<td>MECHANICAL</td>
<td>DEPARTMENTAL</td>
</tr>
<tr>
<td></td>
<td>WASHING</td>
<td>MECHANICAL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISTRIBUTION</td>
<td>ELECTRICAL</td>
<td></td>
</tr>
<tr>
<td>Type 2</td>
<td>PROCUREMENT</td>
<td>MECHANICAL</td>
<td>DEPARTMENTAL</td>
</tr>
<tr>
<td></td>
<td>WASHING</td>
<td>CONTRACT</td>
<td>OUTSOURCING</td>
</tr>
<tr>
<td></td>
<td>DISTRIBUTION</td>
<td>CONTRACT</td>
<td></td>
</tr>
<tr>
<td>Type 3</td>
<td>PROCUREMENT</td>
<td>CONTRACT</td>
<td>OUTSOURCING</td>
</tr>
<tr>
<td></td>
<td>WASHING</td>
<td>CONTRACT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DISTRIBUTION</td>
<td>CONTRACT</td>
<td></td>
</tr>
<tr>
<td>Type 4</td>
<td>PROCUREMENT</td>
<td>MECHANICAL</td>
<td>DEPARTMENT</td>
</tr>
<tr>
<td></td>
<td>WASHING</td>
<td>CONTRACT</td>
<td>BOOT MODEL</td>
</tr>
<tr>
<td></td>
<td>DISTRIBUTION</td>
<td>CONTRACT</td>
<td></td>
</tr>
</tbody>
</table>

Flow Process Chart of linen Washing
11. BIO TOILETS

- An environment Friendly Toilet System
- Green toilet aims at – Zero – defecation on the ground

Problem with present system- Discharge on track creates environmental problems as well as problem in working to work man.

Bio Toilet - Bio-digester is provided, effluent is discharged on track after bio de-gradation

Action Taken

A multi-directional strategy has been implemented for adoption in IR-Passenger Coaches.

MOU has been signed with DRDO for joint technology development

The first rake with bio-toilets developed with DRDO is running in Bundelkhand Express since 18th January -2011.

05 more rakes fitted with DRDO technology toilets have been allotted to NR, NCR, NER, NFR, CR, WR, WCR and SECR.

2500 more coaches will be fitted with DRDO toilets during 2013-2014.

Advantages

1. No bed smell in toilets from the tanks
2. No infestation of Cockroaches & flies
3. Fecal matter in the tank not visible
4. No clogging of digester
5. Effluent is free from off odour and solid waste
6. No maintenance required
7. Reduction in organic matter by 90%
8. No requirement of adding bacteria/ enzyme
9. No need of removal of solid waste

**Working of Anaerobic System**

- **Human Waste**
  - Anaerobic Bacteria (Liquid bacteria)
    - Liquid waste
  - Chlorination
    - Disinfected Liquid discharge to Track
  - $\text{CO}_2 + \text{Methane gases released to atmosphere}$
  - System does not require Oxygen and also does not require regular cleaning
BIO TOILET