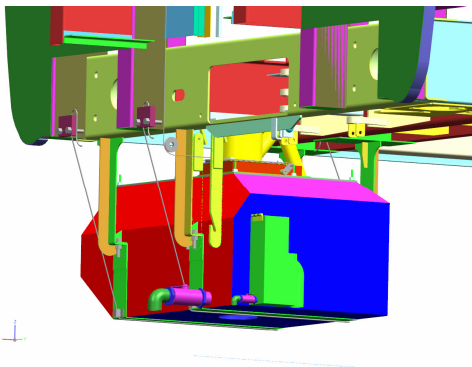


New Design and
Developments
at
RCF, Kapurthala

1. Environmental Friendly Green Toilets in Indian Railways:

Indian Railways are making endeavors for environmental friendly green toilet in passenger coaches. Ministry of Rural Development has announced policy, which envisages total sanitation and elimination of open defecation all over the country. Green toilets aim at zero-defecation on the ground. Thus, not only making it a likable sight at stations but also preventing damage to bogie parts and tracks by way of corrosion. Fecal matter on tracks is one of the biggest causes of corrosion.



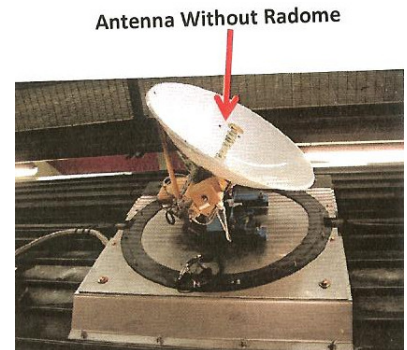
IR and DRDO have signed a MoU for development of Bacteria for Green toilet. This new toilet-technology also promises to keep up with not-so-disciplined Indian toilet habits, separating before disposal the non-degradable waste that passengers mostly flush in toilets. RCF has developed environmental friendly green toilets and turned out 571 coaches equipped with 1390 green toilets.

For current production plan 2013-14, all ICF design coaches shall be turned out fitted with bio-toilets as per RDSO approved plan. Design and development for bio tanks in LHB coaches is at final stage and first coach is expected to be turned out soon.

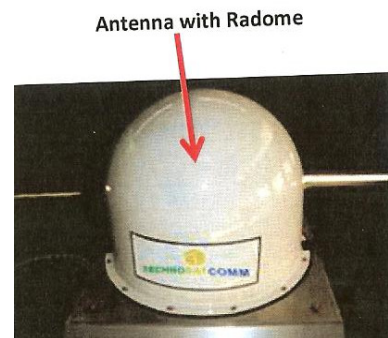
2. Satellite based Wi-Fi system over a train

To provide Wi-fi system over the train, provision of satellite antenna and other associated equipments has been made in the power car. The system will provide Broadband internet connections over running train using two-way Satellite Communication in Ku Band. System

will provide Broadband internet connection to upto 250 users simultaneously in a running train. System can be upgradable to provide Broadband internet connection to more than 250 users simultaneously in a running train without affecting its performance. The system will provide a minimum of 2 Mbps data connection (Download) from internet to each running train with BER (Bit Error Ratio) of 1 in 10^6 for 99.5% of time duration in a complete year. The system will provide a minimum of 512 Kbps data connection (Upload) from each running train to internet with BER of 1 in 10^6 for 99.5% of time duration in a complete year. The system will provide broadband internet coverage for minimum 98% of train route. The system will not require any inter coach cabling on the train set for broadcasting of internet traffic to passenger coaches.

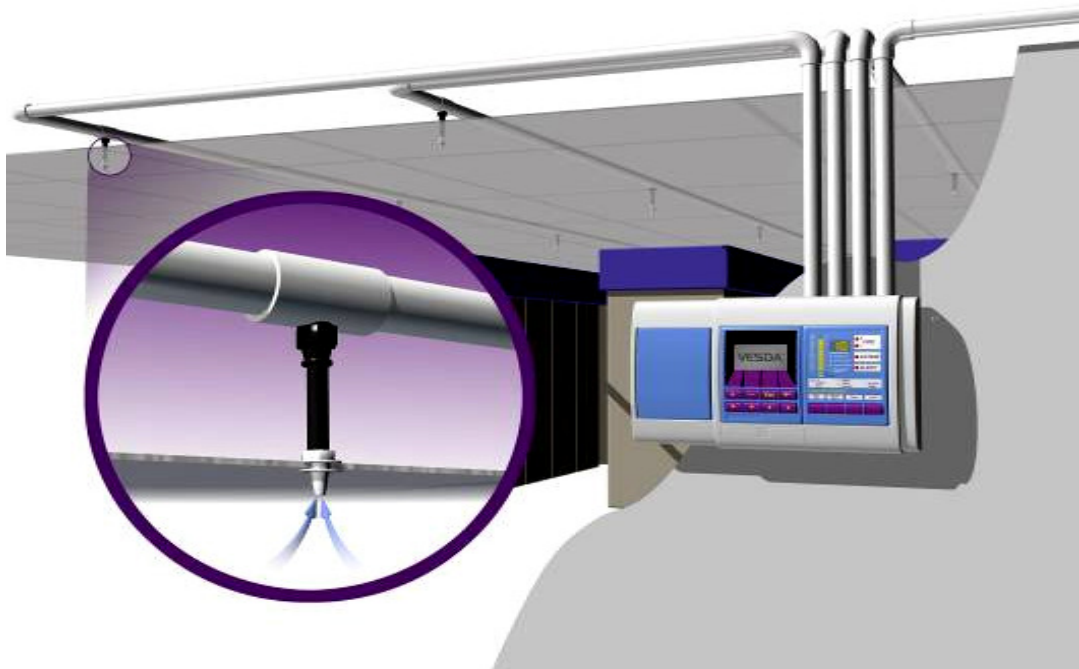


03 power cars fitted with above equipments have been turned out by RCF for Howrah New Delhi Rajdhani Express.



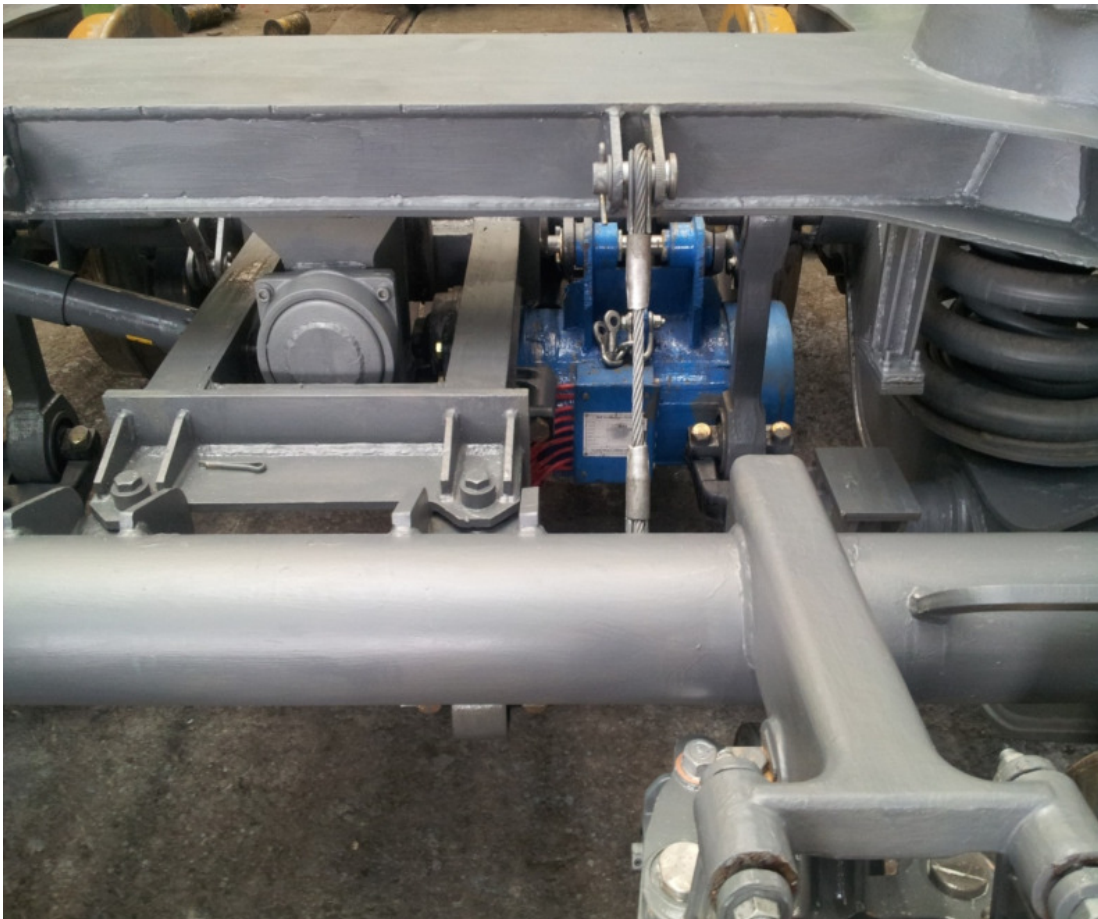
3. Fire and smoke detector system in coaches:

RCF has designed and developed very early warning fire and smoke detector system for installation in AC coaches as per RDSO specification. POs for 02 nos. of rakes have already been placed by RCF. Prototype approval for double decker rake and Rajdhani rake has been issued. Presently, the system is under installation in NZM-SC Rajdhani rake at RCF. Further procurement of the system with the revised specification is under process. The revised specification has provision of integration of alarm system with automatic brake application and public address system.



4. Self generating LHB coaches:

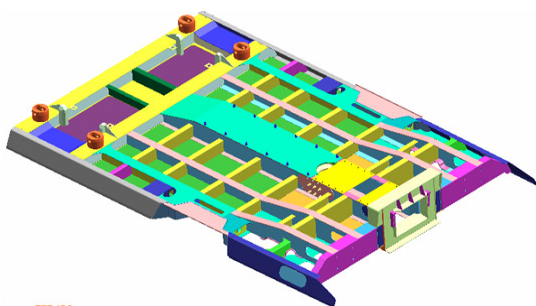
To eliminate the requirement of power cars in mixed type rake of LHB coaches, self generating AC coaches are being designed and developed at RCF. One SG coach fitted with 2x30 KVA permanent magnet has been turned out by RCF. The coach is under electrical trial at Northern Railway. The issues related with the change in the design of bogie and related maintenance issues have been referred to RDSO for study.



5. Crashworthy LHB GS coach on FIAT bogie:

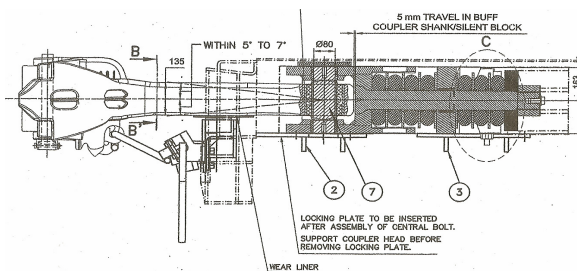
In order to validate the crashworthy feature in LHB variants, prototype LHB GS crashworthy coach has been manufactured by RCF. The coaches have been provided with honeycomb structure as primary energy absorber, secondary energy absorber and buckle initiators on underframe, sole-bar and cant rails. These elements absorb energy during collision so that the passengers sitting inside the coach are safer.

Based upon the results obtained in actual crash test conducted at RDSO, detailed manufacturing drawings for LHB GS coach have been prepared. Based upon this, RCF plans to manufacture LHB GS coaches with crashworthy features in future.



6. New Designed Center Buffer Couplers in passenger coaches:

In order to run longer trains and enhancing safety of traveling passengers and operational staff Indian Railways has adopted AAR tight lock center buffer couplers in passenger coaches since inception of LHB coaches. In spite of good riding behavior and aesthetics of these coaches jerk problem negate all the good features. Since then efforts are being made by Railways to address jerk problem and no significant gain was achieved. RCF in consultation with RDSO has developed balanced type draft gear, RCF has fitted balanced type draft gear in two rakes supplied by M/s Dellner, Sweden & M/s Escorts. The initial observations made by RDSO indicates that longitudinal behavior of these coaches at starting, breaking, transition and normal run is similar to that with screw coupling arrangement coaches. All future procurements will be as per latest RDSO specification no. RDSO/2011/CG-03 with AAR "H" type head and balanced draft gear.

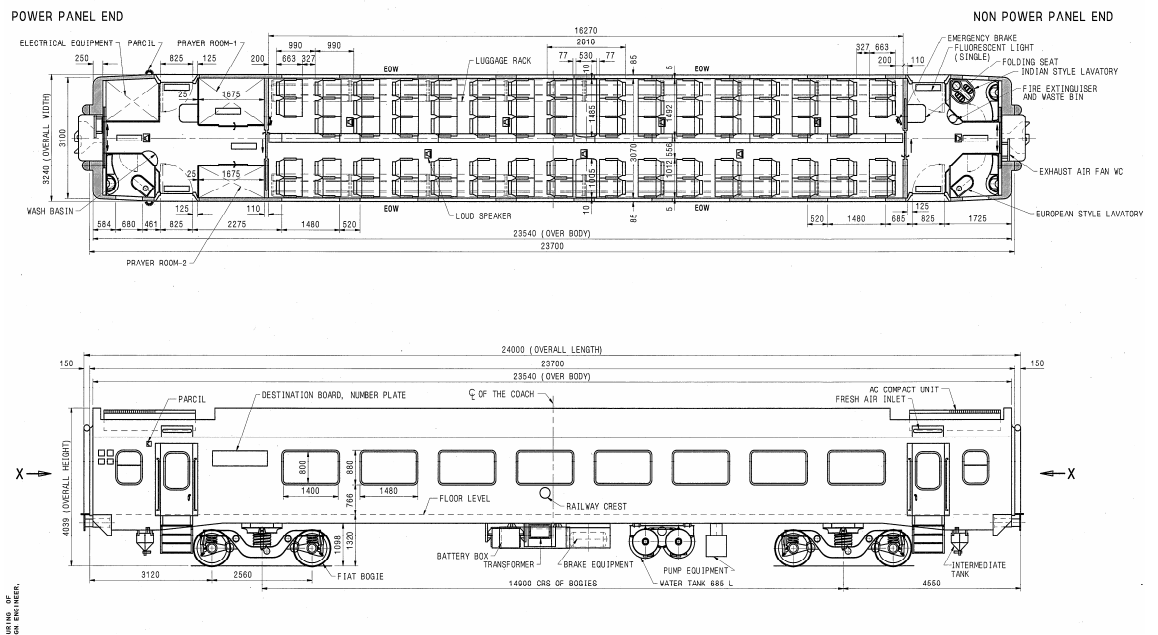


7. Development of new coaches designs:

8.1. Layout of LHB AC Chair Car with Prayer Room for Bangladesh Rly:

Layout for EOG LHB AC Chair car has been modified with following features:

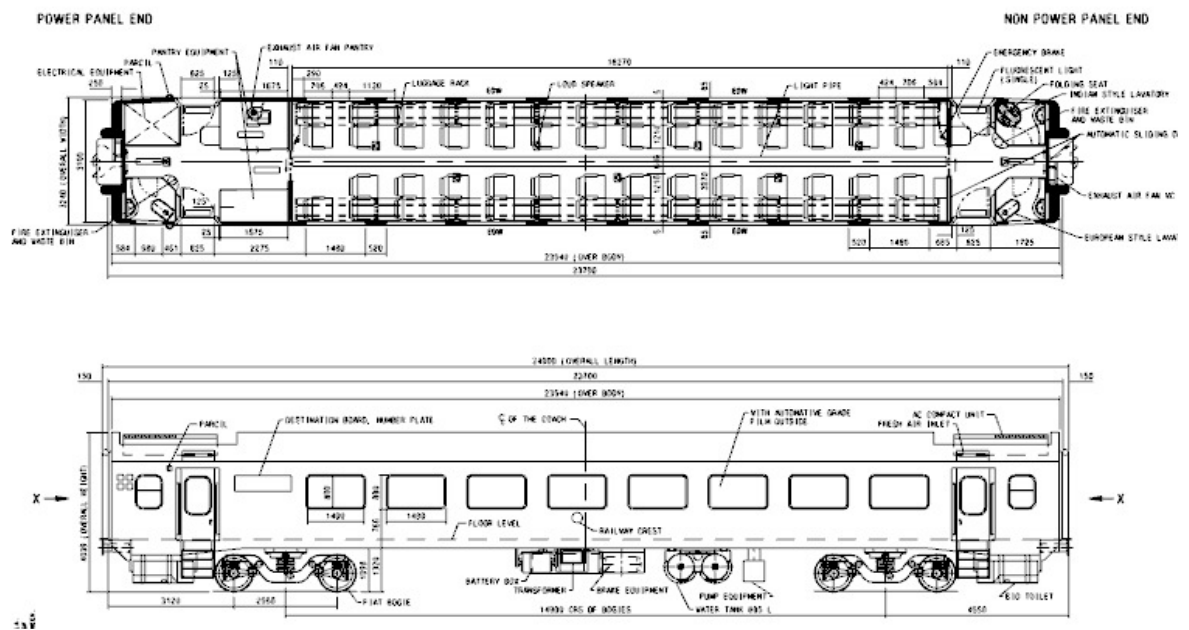
- a. Layout has been kept similar to IR Shatabdi chair car coaches with the exception of pantry & pantry store, which have been converted to Prayer rooms.



8.2. Layout of Anubhuti LHB Executive Chair car coach:

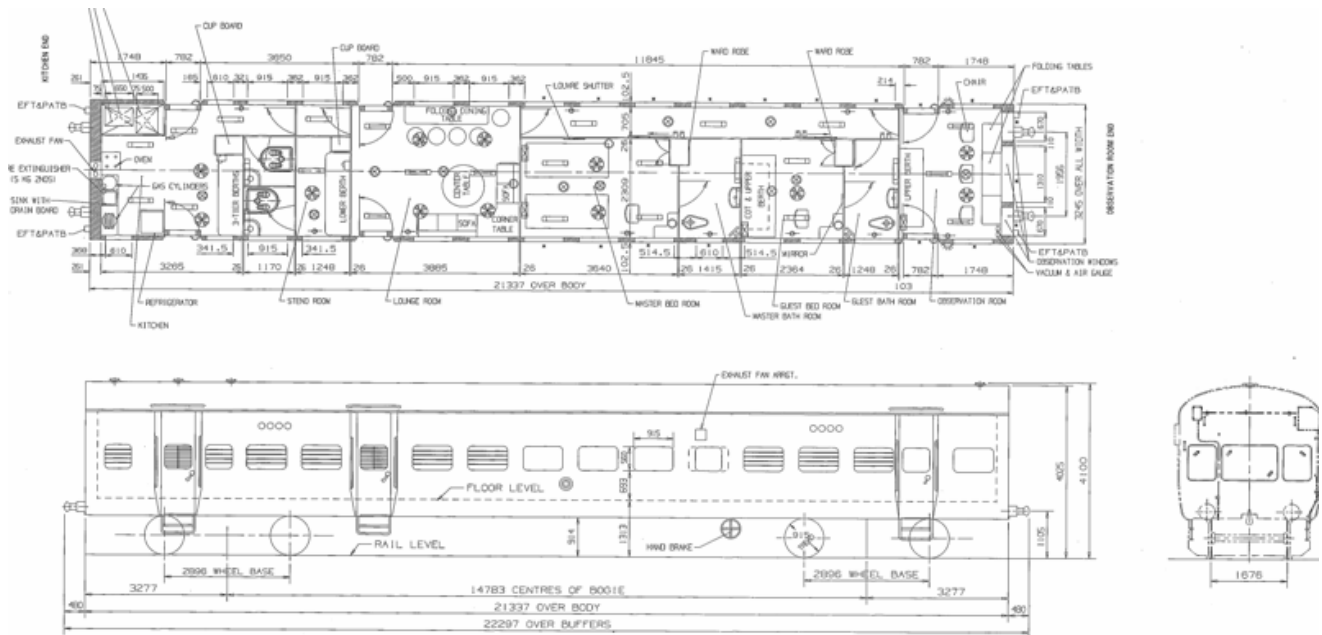
Layout for Anubhuti LHB Executive chair car coach has been prepared with following features:

- a. Number of seats has been kept as 55.
- b. All seats have been arranged in theater style facing one side.
- c. Ergonomically designed seats with on-board entertainment facility.
- d. Provision of diffused lighting.
- e. Bio-toilets provided.
- f. Automatic sliding doors provided at vestibule and compartment.
- g. Windows provided with automotive grade film outside.



8.3. Design of NAC RA coach with provision of split AC in Master Bed Room & Observation Room:

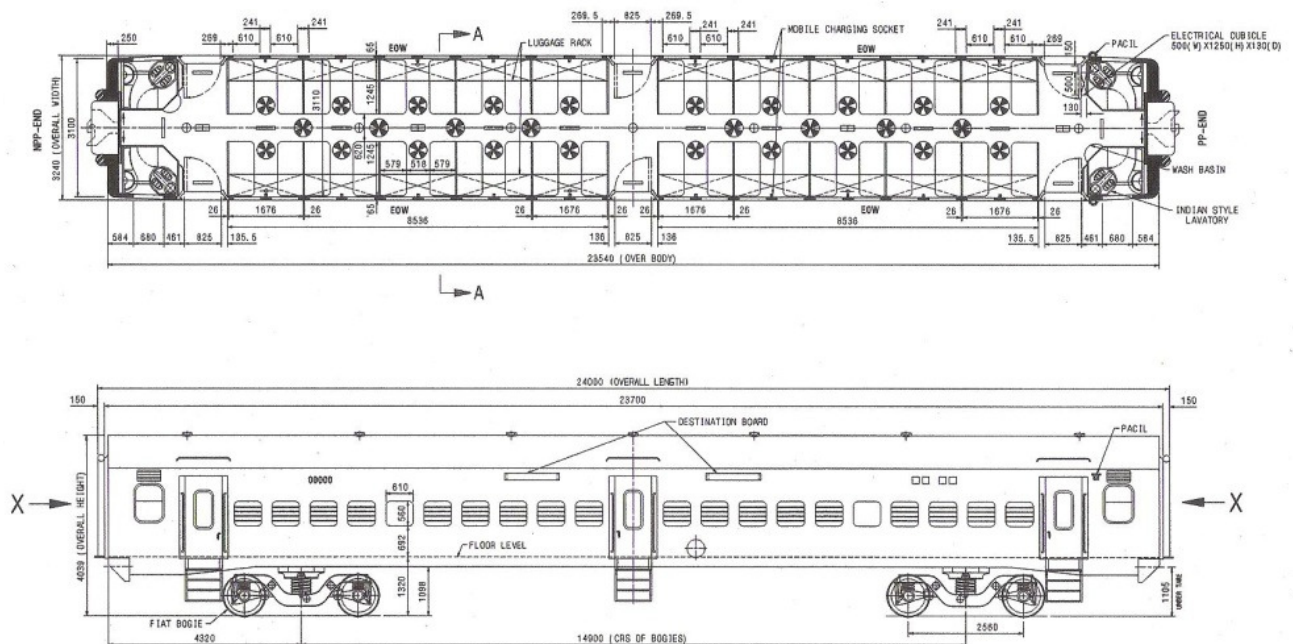
A new design of NAC RA coach has been developed where Master Bed Room, Observation Room & Corridor windows have been made sealed type for provision of split AC.



8.4. Layout of LHB EOG GS Day coach:

Layout for LHB EOG GS Day coach has been prepared with following features:

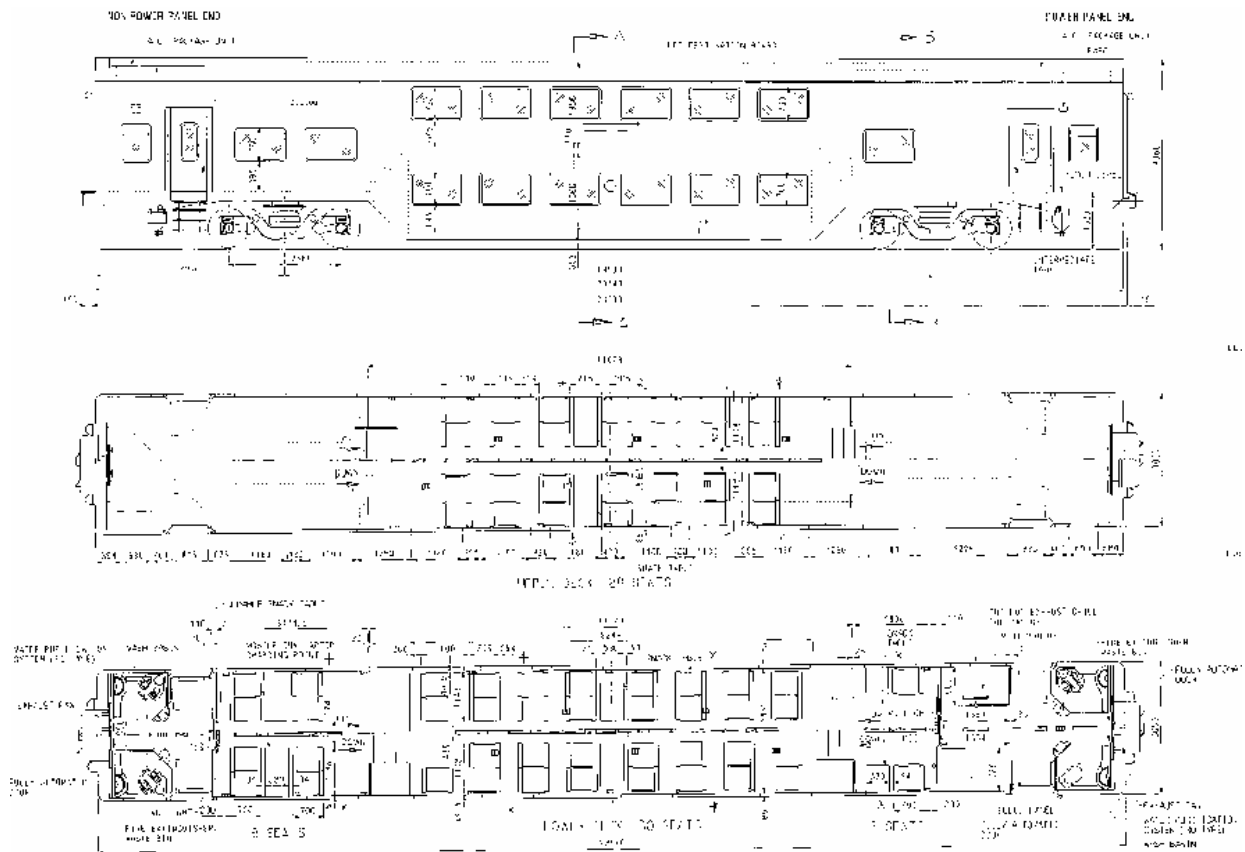
- Seats have been provided on pattern of Day coaches i.e. facing seats in composition of 3-seats facing each other on both sides.
- Total no. of seats are 120.
- Under-slung SBC with Electrical control panel adjacent to lavatory.
- 4 nos. of Indian style lavatories provided similar to LHB GS.
- Layout made in LHB GS shell.



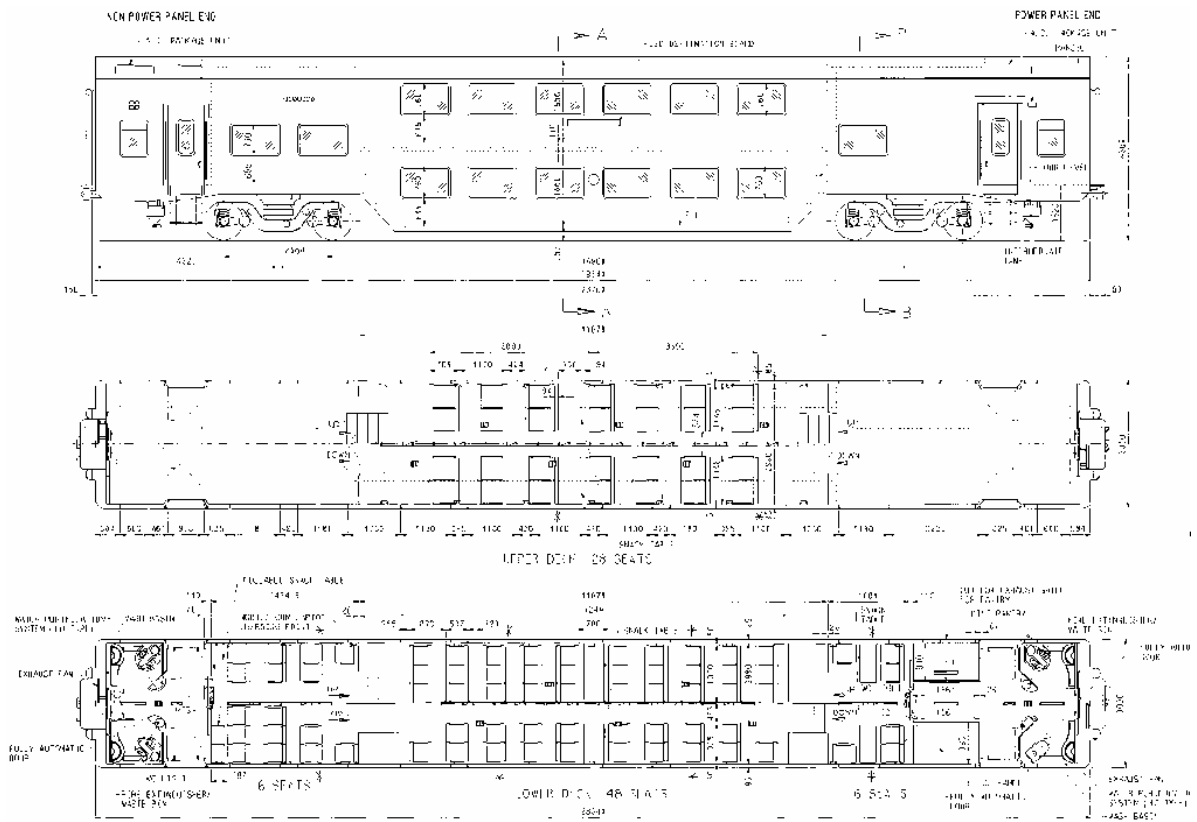
8.5. Layout of LHB Double Decker coach Executive Class:

Two nos. of layouts have been prepared for provision of Executive class chairs in Double Decker coach with following features:

- a. One layout has been prepared with executive chairs in full coach with capacity of 68 seats in all the decks:



- b. Another layout has 2nd class chairs in lower deck (70nos.) & platform area whereas executive chairs have been provided in upper deck (28nos.).



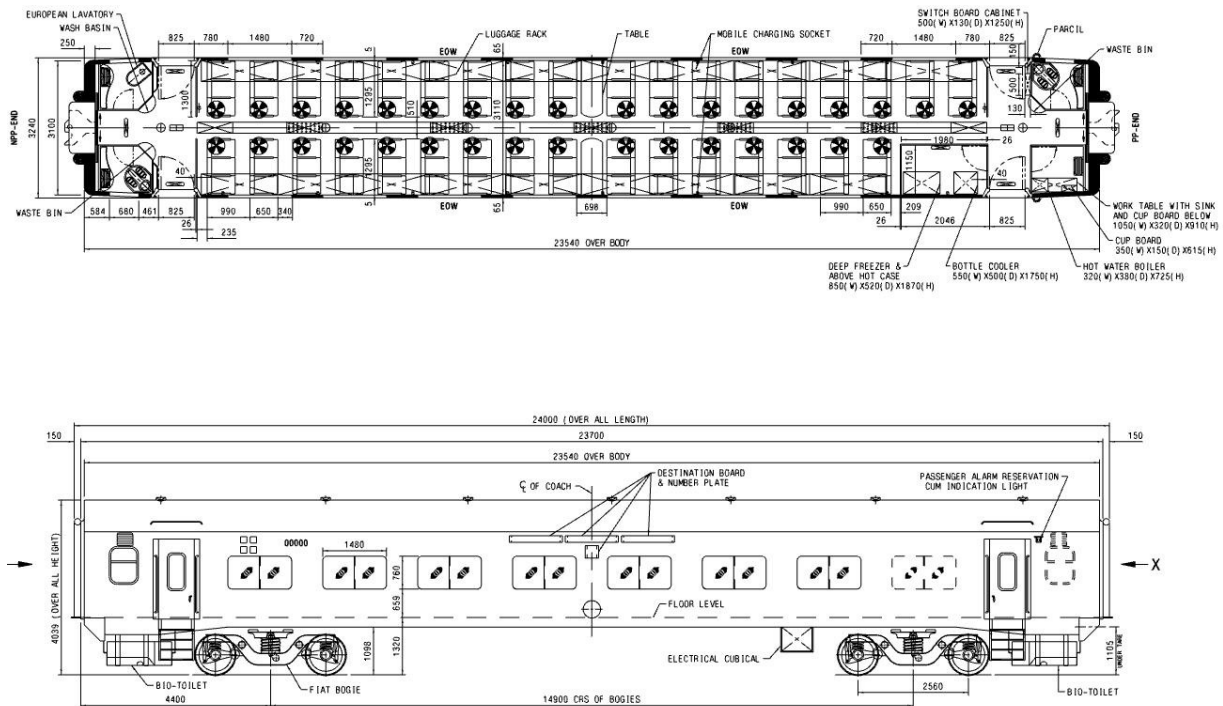
Layouts have been prepared and sent to RDSO for approval.

8.7. Development of new designs for LHB EOG non-AC Chair Car

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Layout for EOG LHB Non-AC Chair car has been modified with following features:

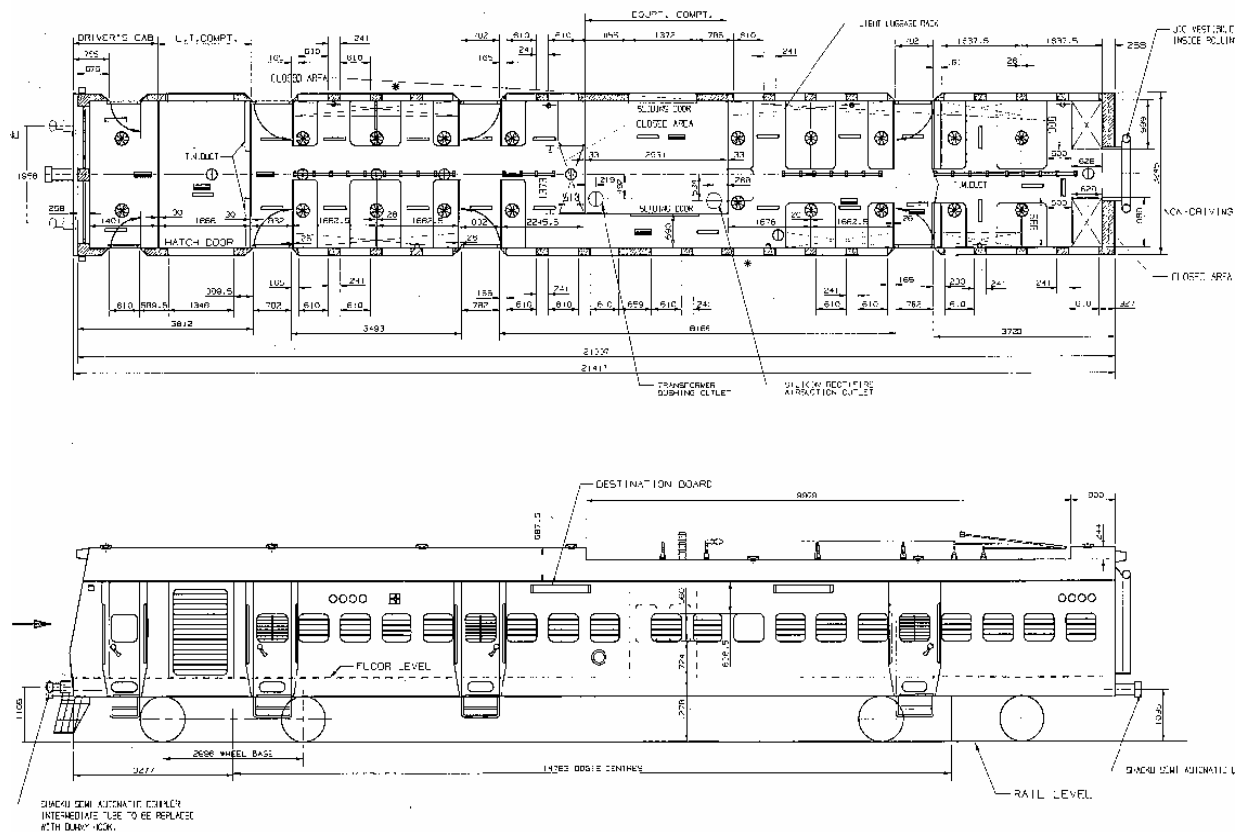
- Seating capacity has been maintained as 102
- Three lavatories provided.
- Pantry provided at the location of one lavatory on PP end and an additional Pantry room provided in the passenger area opposite the above pantry.
- Provision made for Bio-toilets.
- Under-slung electrical panel provided.
- Wider windows (Bus type) with horizontal sliding glass panes provided.



8.8. Layout of MEMU-DMC with 1550KVA transformer:

Layout for MEMU DMC with 1550KVA transformer has been modified to reduce the pay load of the coach due to increase in weight of transformer by reducing the standing passenger area.

- Number of seats has been kept similar to existing MEMU DMC.
- Standing passenger capacity reduced from 246 to 216 by blocking the open standing area.



8. LHB GS (LS) coach variants:

To counter the issue of overcrowding in LS coaches, different variants of LS coaches have been developed.

8.1 Features of LS2 variant:

To reduce the tare weight of LS coach, underslung water tank module 2x685 ltr capacity has been removed. The transverse luggage rack has been shifted upward by 400mm to avoid its occupancy by passengers. 32mm shim has been provided below rubber spring in secondary suspension to cater the additional suspension load. The vertical bump stock has been strengthened by provision of additional ribs to take extra sudden impact. With these modifications, the pay load capacity is increased from 11.6 T to 16 T and overcrowding capacity increased from 145 Nos. to 200 Nos. The coaches in the production year 2012-13 have been turned out with this variant.

8.2. Features of LS3 variant:

In addition to the features mentioned in LS2, further modifications have been carried out in this variant to increase the payload capacity. Shalimar design springs have been fitted in primary and secondary suspensions alongwith 32mm shim. This has increased the payload capacity to 18T and overcrowding capacity to 225 Nos. The oscillation trial of this variant has been carried out successfully by RDSO. All LS coaches under production plan 2013-14 would be manufactured as per this variant.

8.3. Features of LS4 variant:

LS4 variant has different layout configuration based upon day coach format. The partition frames have been lowered in heights and only longitudinal luggage rack arrangement on the both the side walls has been kept. Shalimar springs in primary suspension and secondary (outer) suspension have been provided. Stiffer spring in secondary (inner) suspension has been used. With these modifications, the payload capacity is expected to increase to 20.6 T and overcrowding capacity to 260 Nos. The oscillation trial for this configuration is to be conducted by RDSO. It is expected that LS coaches under production plan 2014-15 would be manufactured with this variant.

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