Name & Function of Coaching Shell(excluding furnishing)(LHB+ICF) Components

Objective

- At the end of the learning, the participants will be able to
  - List major components of the coach shell.
  - Describe functions of these components

IRS Coach

- First generation coaches(IRS coach)
  - Fully from timber
  - Steel bogies with riveted construction.
- After some improvement
  - Wooden body
  - Steel floor construction
  - IRS Bogie

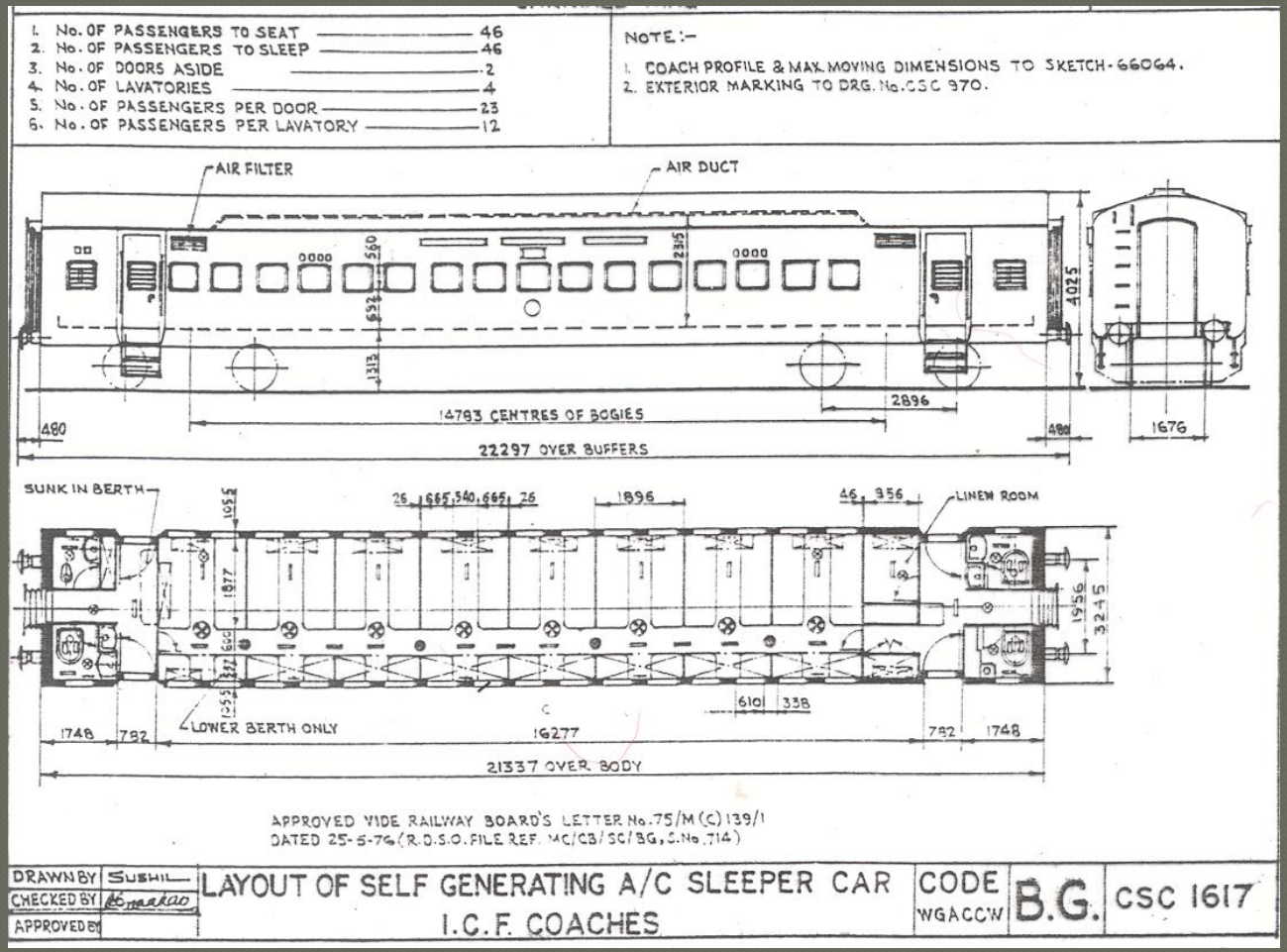
Shortcommings of IRS Coach

- Telescopic in nature
- Higher damages in accidents
- Low speed
- Vaccum brake
- Less passengers comfort

ICF Coach

- 1955 ICF was set up at Chennai for integral design
  - Complete steel body
  - Fabricated bogie
  - Coil primary springs
  - Laminated secondary springs
  - Speed potential of 96 kmph

ICF Coach Drg.



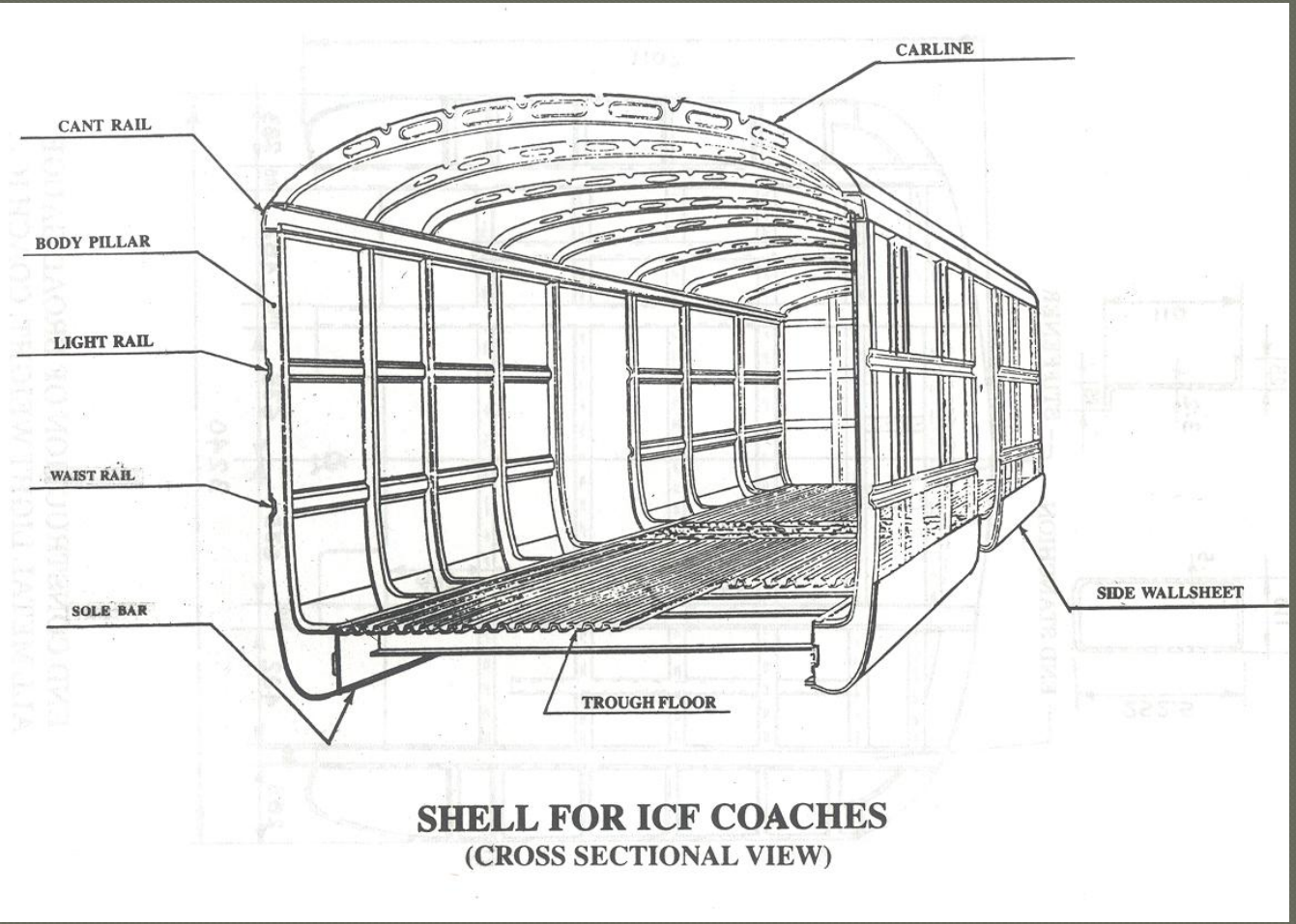
Salient Features-ICF Coaches

- All metal
- All welded
- Integral Structure
- Skin stressed
- Anti-Telescopic
- Better bogie design

Major Constructional Asslys

- Coach
  - Shell(Coach Body)
- Running Gear
  - Bogie
  - Braking
- Furnishing(Provision of amenities)
- Train Lighting & Air Conditioning

ICF Shell



SHELL FOR ICF COACHES
(CROSS SECTIONAL VIEW)

Coach Components

- Side wall
  - Body pillar, , waist rail,light rail,cant rail
- End wall
  - End Stanchion, Stiffener
- Under frame
  - Cross member,sole bar,Trough floor, Head Stock
- Roof
  - Car Line,Per Line

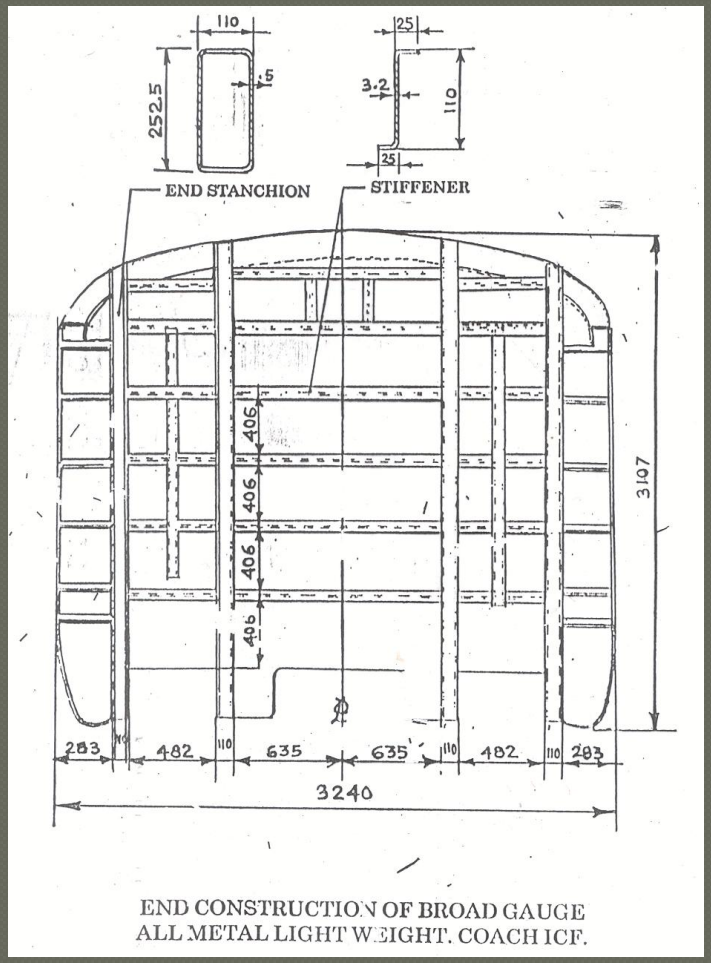
Design & Construction

- Static hollow tubes formed of
  - Side wall,Under frame,Roof
- Bracing the tube by a series of hoops made of
  - Side pillars,Carlines,Floor cross bearers
- Hoop rings are connected together by
  - Sole bar,waist rail,cant rail & stiffeners longitudinally.

Side Wall



End Wall



END CONSTRUCTION OF BROAD GAUGE
ALL METAL LIGHT WEIGHT. COACH ICF.

Under Frame



Roof



Steel Sheets Used in ICF Shell

- 2 mm thick corten steel(IRS-M-41)on the side walls.
- 1.6 mm thick corten steel on the roof
- 2 mm thick corten steel corrugated trough floor

Methods to reduce weight of Coach

- Integral construction
  - Floor,side walls & the roof are welded into single integral unit.
- Stressed skin construction
  - By giving them grooves or bends(in shell construction)
- By providing stiffners or welded ribs(used in bogie construction)

Basic Assumptions of Integral Shell

- Tare loads are equally distributed..
- Horizontal squeez load at the buffer centre line taken by the trough floor & side longitudinal.
- Shell treated as thin walled hollow girder.

Advantages of Integral Design

- Withstand high dynamic forces.
- Reduction in weight.
- Resistance against torsion & bending stresses.
- Higher compression rigidity.

Design Characteristics- Coach Body

- End wall absorbs collision energy before damaging any other parts of the coach.
- Cambering in sole bar.
- Corrugatted trough floor
  - Absorb a large portion of buffing forces.

LHB Coach



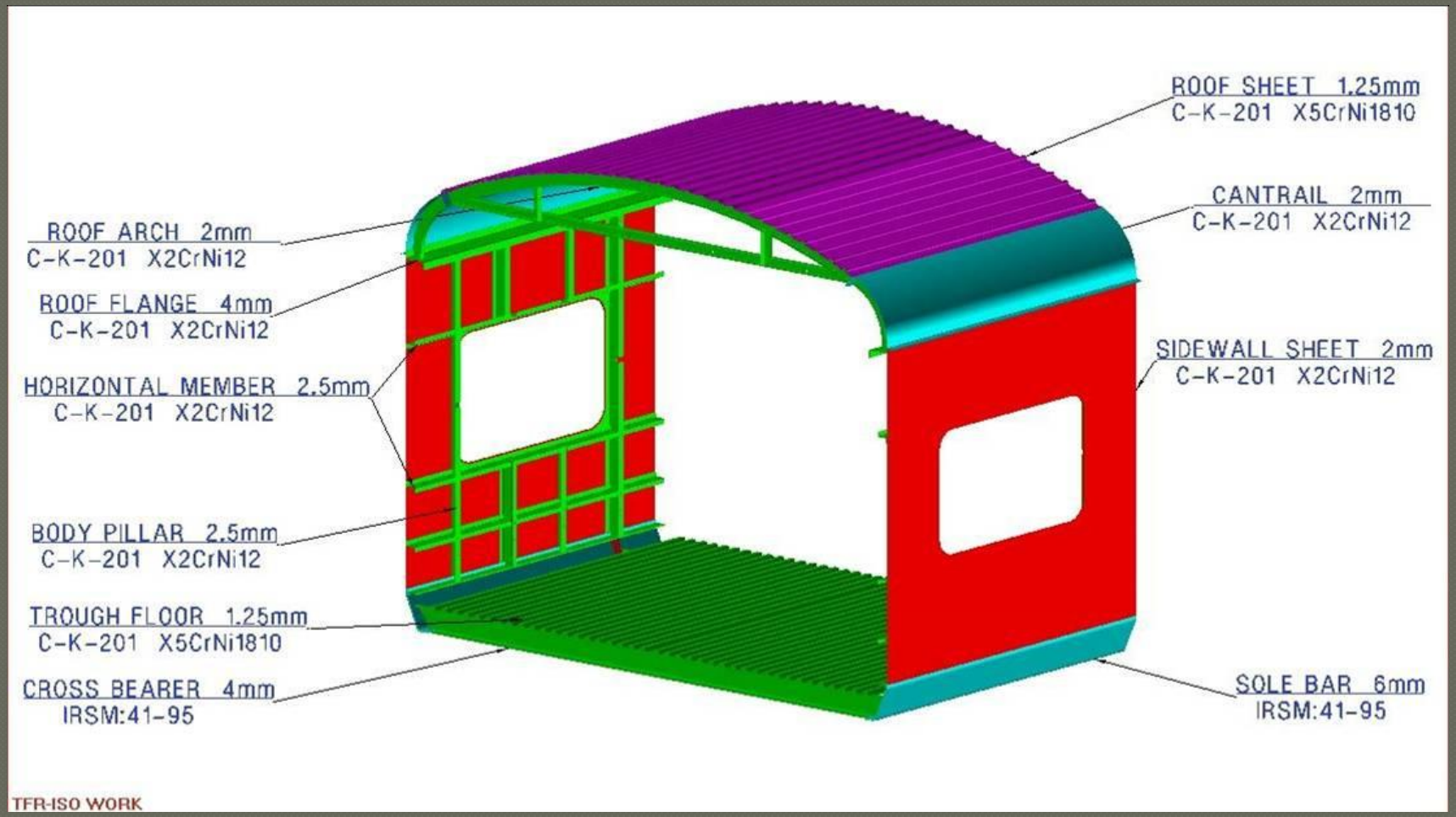
Salient Features-LHB Coach

- Corrosion free coach
  - Extensive use of Stainless Steel.
- Light weight
  - 10% lesser wt. per metre length.
- Longer Coach
  - Length increased by 2.2 m approx.
- Better Acoustic & Vibration measures.
- Control Discharged Toilet System.

Salient Features

- Superior insulation.
- Damping elements in bogie.
- Axle Mounted Disc Brakes with WSP.
- Centre Buffer Coupler.
- Use of fire retardent materials.

LHB Shell


ROOF SHEET 1.25mm
C-K-201 X5CrNi1810
CANTRAIL 2mm
C-K-201 X2CrNi12
SIDEWALL SHEET 2mm
C-K-201 X2CrNi12
SOLE BAR 6mm
IRSM:41-95
ROOF ARCH 2mm
C-K-201 X2CrNi12
ROOF FLANGE 4mm
C-K-201 X2CrNi12
HORIZONTAL MEMBER 2.5mm
C-K-201 X2CrNi12
BODY PILLAR 2.5mm
C-K-201 X2CrNi12
TROUGH FLOOR 1.25mm
C-K-201 X5CrNi1810
CROSS BEARER 4mm
IRSM:41-95
TFR-ISO WORK

Shell Interior

BEFORE FURNISHING



UNDER FURNISHING

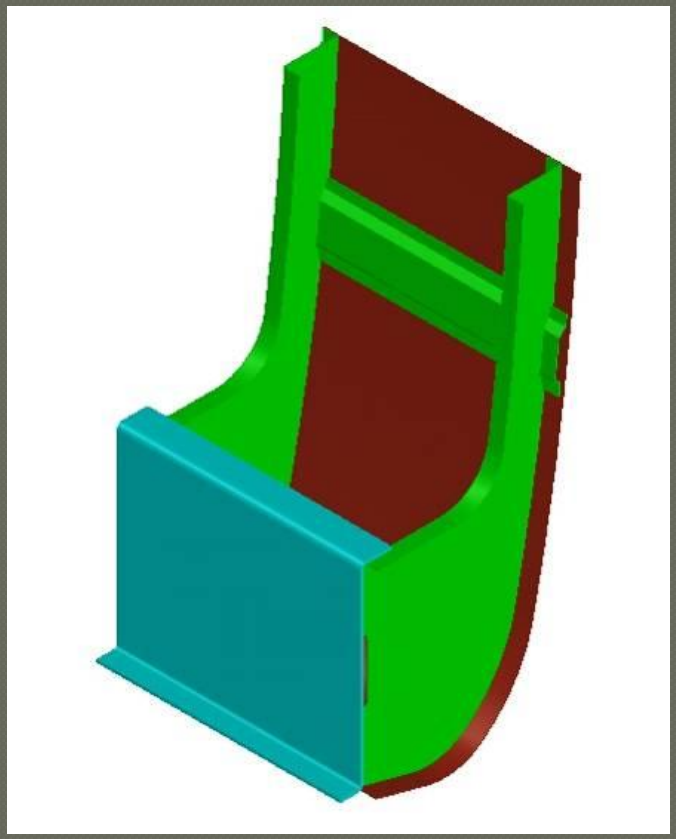


Steels Used in LHB Coach

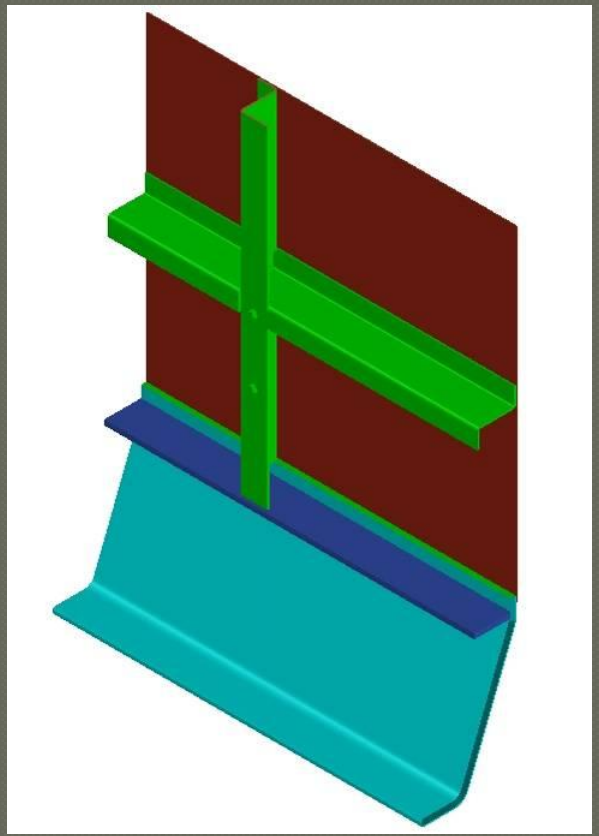
Shell Assemblies	Steels used and their %age compositions	UTS N/mm^2	Yield Stress N/mm^2
Side wall, End wall and Roof structure	X2 Cr11 Ferritic Steel (C < .03%, Cr 10-12%, Si 1%, Mn 1.5%)	450-600	320
Roof sheet and Trough floor	X5 CrNi 18 10 Austenitic Steel (C < .07%, Cr 18%, Ni 10 % Si 1%, Mn 2%)	700-850	235
Underframe	IRS M-41 / CortenSteel (C < .01%, Cr .35 -.6%, Ni .2 - .4% Cu .3 - .6% Si .3 - .7%, Mn .25%)	440-480	320

Sole Bar & Side Wall connection

ICF COACH



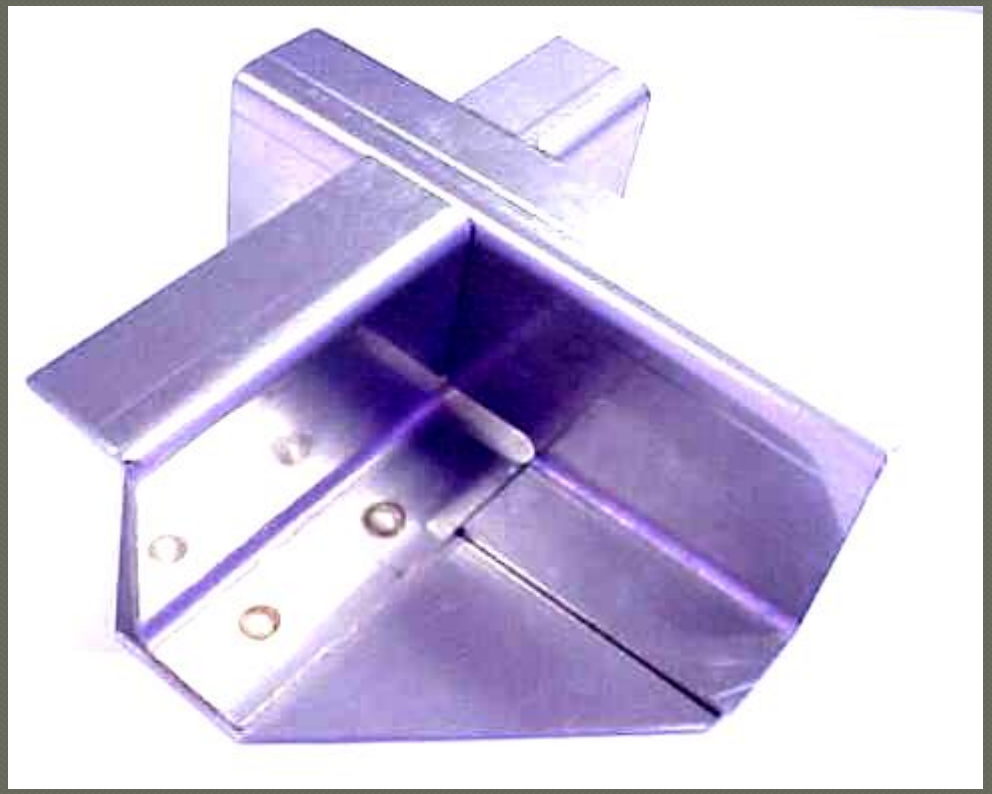
LHB COACH



Side wall Interlocking

- Interlocking between the horizontal & vertical stiffening members.
- Better strength.
- Reduction of sidewall width from 90 to 60 mm.
- Resistance to distortion.

Interlocking



Side wall-LHB



Tig Welding



ROOF

- Uniform height of arches along its length corrugated roof sheet spot welded to z- section roof arches
- Spot welded Aus. Steel cladding
- Roof weighs only about 1000 kg



End Wall

- Holes provided in all stiffeners to reduce weight.
- Endwall overhangs beyond head stock.
  - Releasing more space inside
  - Reducing space & hence wind resistance due to turbulence between coaches.

End Wall





Under Frame

- U/F structure is made with corten steel.
- Trough fioor made of austenitic steel .
- corrugated sheet is spot welded with cross bearer.
- Aluminium based weldable primer used for welding corten steel to SS to prevent bi-metallic corrosion.

Under Frame

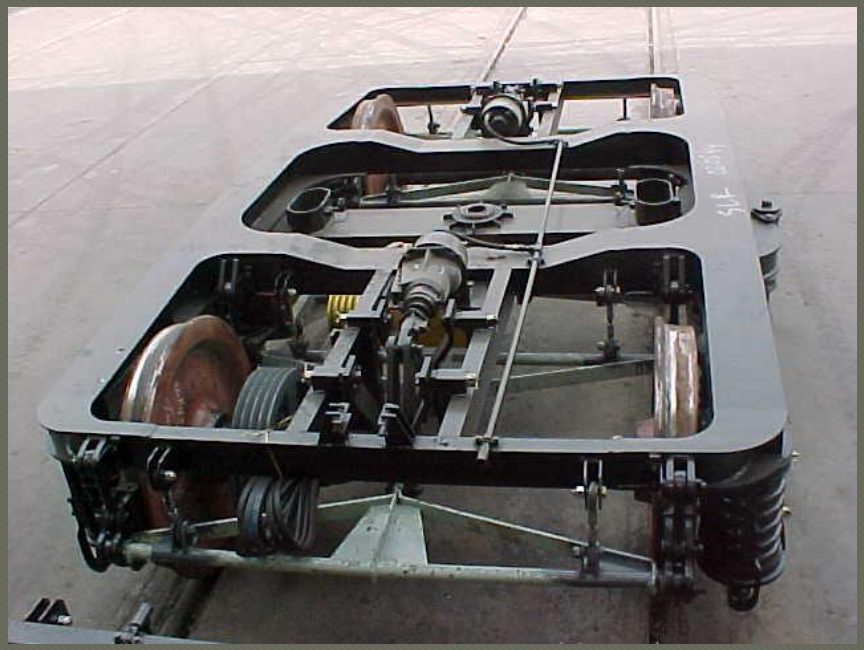


Head Stock



Bogie

ICF BOGIE

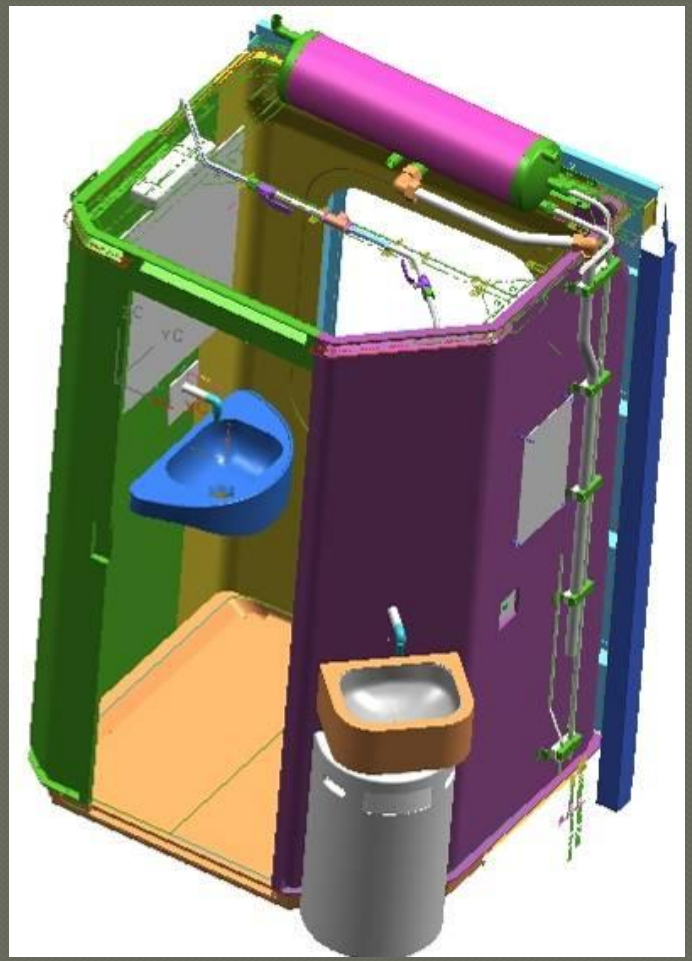


FIAT BOGIE



Modular Toilet





Transition Doors



