LHB COACH

SALIENT FEATURES

NEW GENERATION COACHES

LHB DESIGN COACHES

NEED FOR NEW TECHNOLOGY- I

INDIAN RAILWAY HAS BEEN MANUFACTURING PASSENGER COACHES OF "SCHLIRIEN" DESIGN FOR MORE THAN LAST 50 YEARS.

ALTHOUGH CONTINUOUS EFFORTS WERE BEING PUT TO UPGRADE THESE COACHES, BUT A NEED WAS ALWAYS FELT TO IMBIBE TECHNOLOGY IN-USE DEVELOPED COUNTRIES SO AS TO AFFECT A QUANTUM JUMP IN QUALITY OF COACHES.

NEED FOR
NEW TECHNOLOGY - II

THIS WAS THE BASIC REASON BEHIND SETTING UP OF "RAIL COACH FACTORY" AT KAPURTHALA.

EXTENSIVE STUDIES WERE DONE TO LOCATE THE RIGHT TECHNOLOGY FOR INDIAN CONDITIONS.

TWO CONTRACTS FOR TRANSFER OF TECHNOLOGY AND SUPPLY OF FIRST TWO RAKES (24 COACHES) WERE SIGNED WITH M/S LINKE HOFFMAN BUSH(LHB) (NOW ALSTOM LHB), GERMANY IN 1995.

ALSTOM -LHB, GERMANY

"M/S ALSTOM LHB" ARE ONE OF THE LEADING MANUFACTURER IN TRANSPORT SECTOR HAVING PRESENCE IN MOST OF THE EUROPEAN COUNTRIES.

COACHES MANUFACTURED BY THEM ARE RUNNING IN MANY COUNTRIES ACROSS THE GLOBE.

FOR THIS CONTRACT THE BOGIES WERE DESIGNED AND MADE BY M/S FABRICA ITALIANA d e AUTIMOBELE TORINO (FIAT), SWITZERLAND WHICH IS NOW A PART OF ALSTOM GROUP.

SUPPLY CONTRACT

COVERED SUPPLY OF

- **19 SECOND CLASS AC CHAIR CAR COACHES.**
- **2 EXECUTIVE CLASS CHAIR CAR COACHES.**
- **3 GENERATOR CUM BRAKE VANS**

CONTRACT FOR TRANSFER OF TECHNOLOGY -I

COVERED THE FOLLOWING :

- TRANSFER OF TECHNOLOGY FOR ALL COACHES SUPPLIED BY THEM i.e. CHAIR CAR AND POWER CAR
- DEVELOPMENT OF LAYOUTS AND KEY DESIGNS FOR CARBODY SHELLS FOR
  - AC FIRST CLASS
  - AC TWO TIER SLEEPER
  - AC HOT BUFFET CAR

CONTRACT FOR TRANSFER OF TECHNOLOGY -II

IT ALSO COVERED

- ASSISTING RCF IN
  - DEVELOPING AND MANUFACTURING ALL ABOVE COACHES
  - DEVELOPING "SG" VERSION OF FIAT BOGIE
  - ESTABLISHING INDIGENOUS SOURCES OF BOUGHT-OUT ITEMS.
- PROVIDING TRAINING TO "IR" PERSONNEL IN MANUFACTURE AND MAINTENANCE OF THESE COACHES.

LHB COACH EXTERIOR VIEW (IMPORTED)

HOW IT BENEFITS

RAILWAYS

A LONGER COACH

LHB COACHES ARE APPROXIMATELY 2-METERS LONGER THAN THE CONVENTIONAL ICF TYPE COACHES.

THIS MEANS "MORE TRAVEL SPACE" "INCREASED SEATING CAPACITY", "WIDER BAYS AND DOORWAYS" ETC.

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A LIGHTER COACH

PER METER LENGTH, WEIGHT OF LHB COACH IS APPROXIMATELY “10%” LESSER THAN THE CONVENTIONAL COACH.

THIS NOT ONLY MEANS LOWER HAULAGE COSTS BUT ALSO LESS WEAR AND TEAR OF THE COACHES AND TRACK.

A HIGHER SPEED COACH

LHB COACHES ARE DESIGNED TO RUN AT A MAXIMUM SPEED OF 180 KMPH.

EVEN FOR SPEEDS OF 200 KMPH, NO MAJOR CHANGES ARE REQUIRED

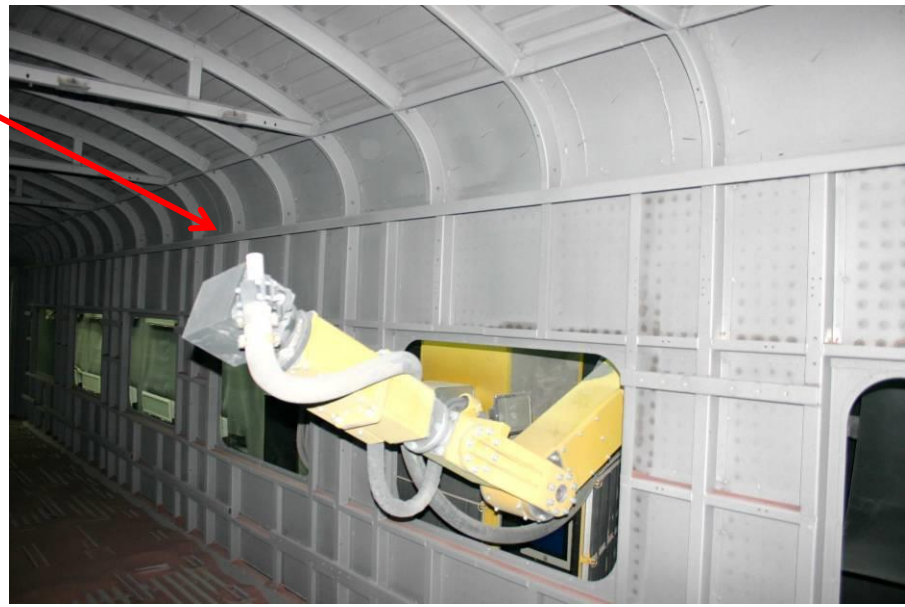
LESSER MAINTENANCE

- $ USE OF SUPERIOR MATERIALS WITH LONGER LIFE.
- $ SUPERIOR BRAKING WITH WHEEL SLIDE PROTECTION.
- $ BOGIE WITH LESS MOVING PARTS.
- $ ITEMS OF WEAR & TEAR SHALL NOT REQUIRE REPLACEMENT/RENEWAL BEFORE 10LAKH KMs.
- $ USE OF STAINLESS STEEL AND LESS BOGIE MOVING PARTS SHALL REDUCE MAINTENANCE REQUIREMENTS.
- $ ENTRANCE DOORS FLUSH WITH SIDE WALL ALLOWING AUTOMATIC CAR WASHING.
- $ CORROSION ALMOST FREE DUE TO EXTENSIVE USE OF STAINLESS STEEL AND SURFACE PROTECTION MEASURES.
- $ SHORTLY INTRODUCED BOI-TOILET, WHICH IS ABSOLUTELY MAINTE-NANCE FREE SYSTEM.


Stainless Steel Shell

MANUFACTURING TECHNIQUES

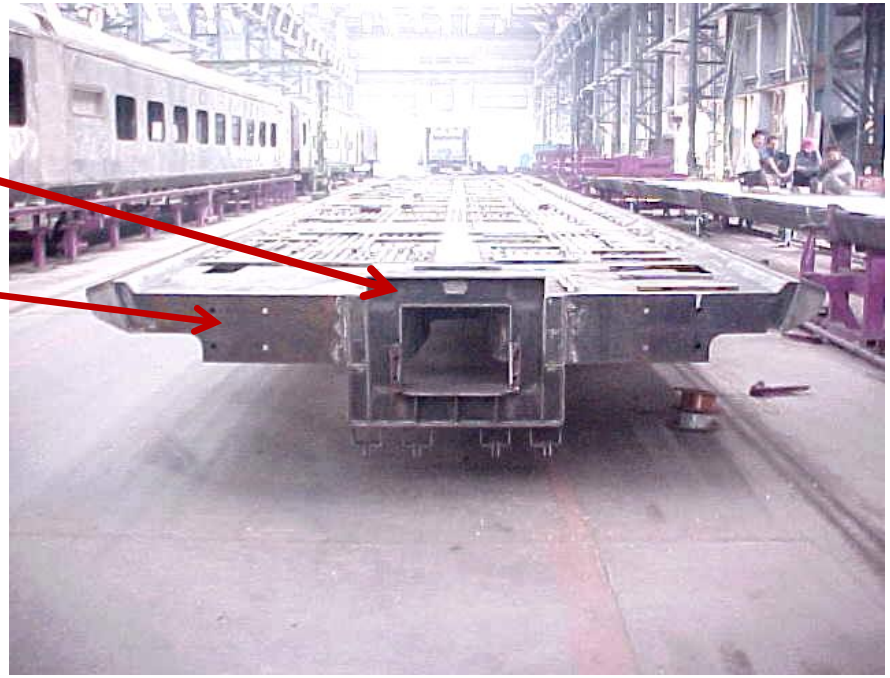
- Gluing of window frame to shell body
- Robotic garnet blasting of shell



Manufacturing Techniques

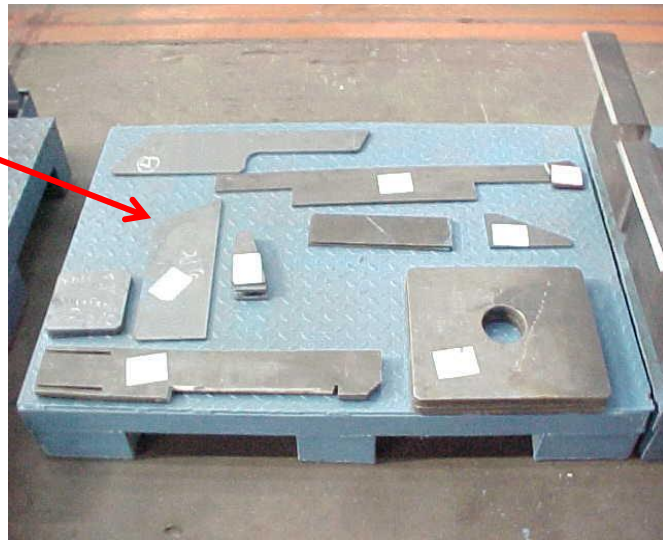
Flooring Support Members on Under-frame

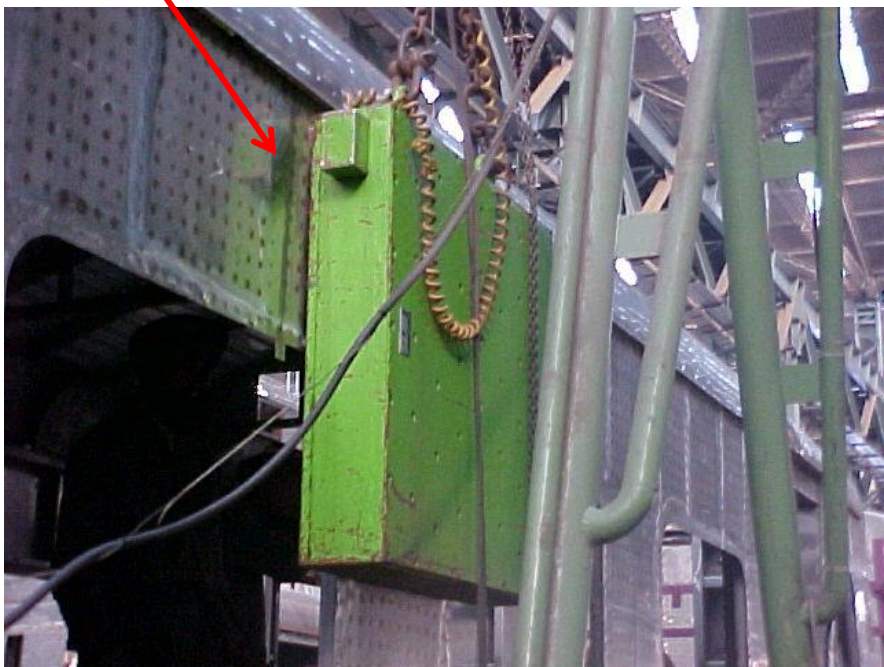
Provision for CBC as well a side buffer mounting in head stock



MANUFACTURING TECHNIQUES

- Laser Profile Cutting Of Components.
- Magnetic Skin Tensioning Of Shell.
- Side-Wall / Roof Spot Welding.

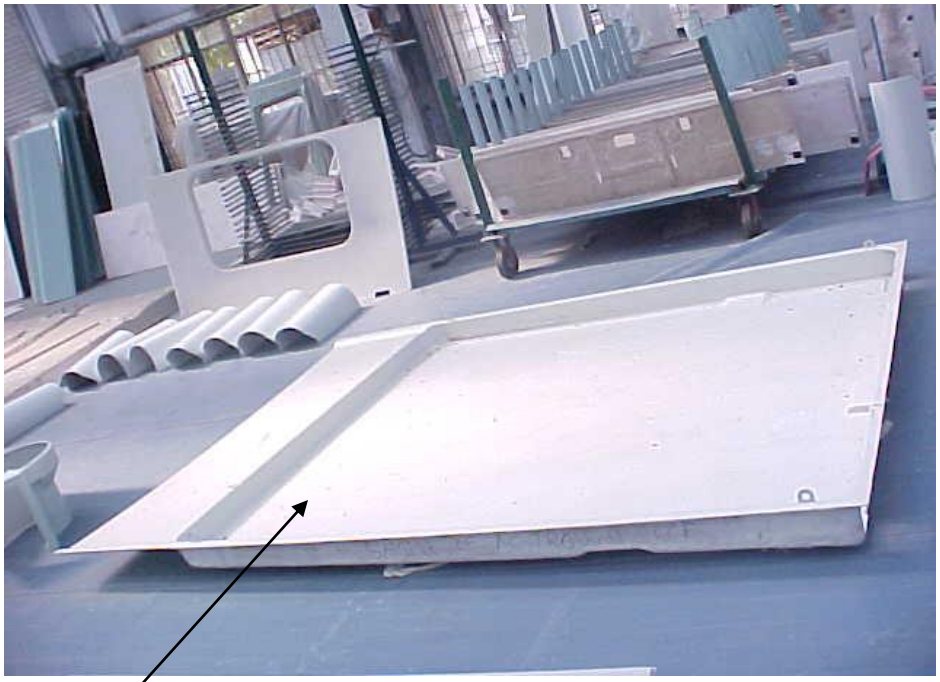




FRP ITEMS

- NO. OF FIRE RETARDENT FRP ITEMS HAVE BEEN USED IN THE INTERIORS FOR
  - IMPROVED AESTHETICS
  - ABILITY OF FRP TO BE MOULDED INTO INTRICATE SHAPES/CURVED SURFACES, AVOIDS JOINTS
  - BETTER STRENGTH TO WT RATIO
  - SCRATCH RESISTANCE
  - RESILIENCE TO SMALL DENTS
  - EASY REPAIREABILITY

FRP LAVATORY MODULE
(PVC FOAM SANDWICHED BETWEEN FRP)



FRP, AC UNIT TROUGH

FRP SIDE WALL PANEL

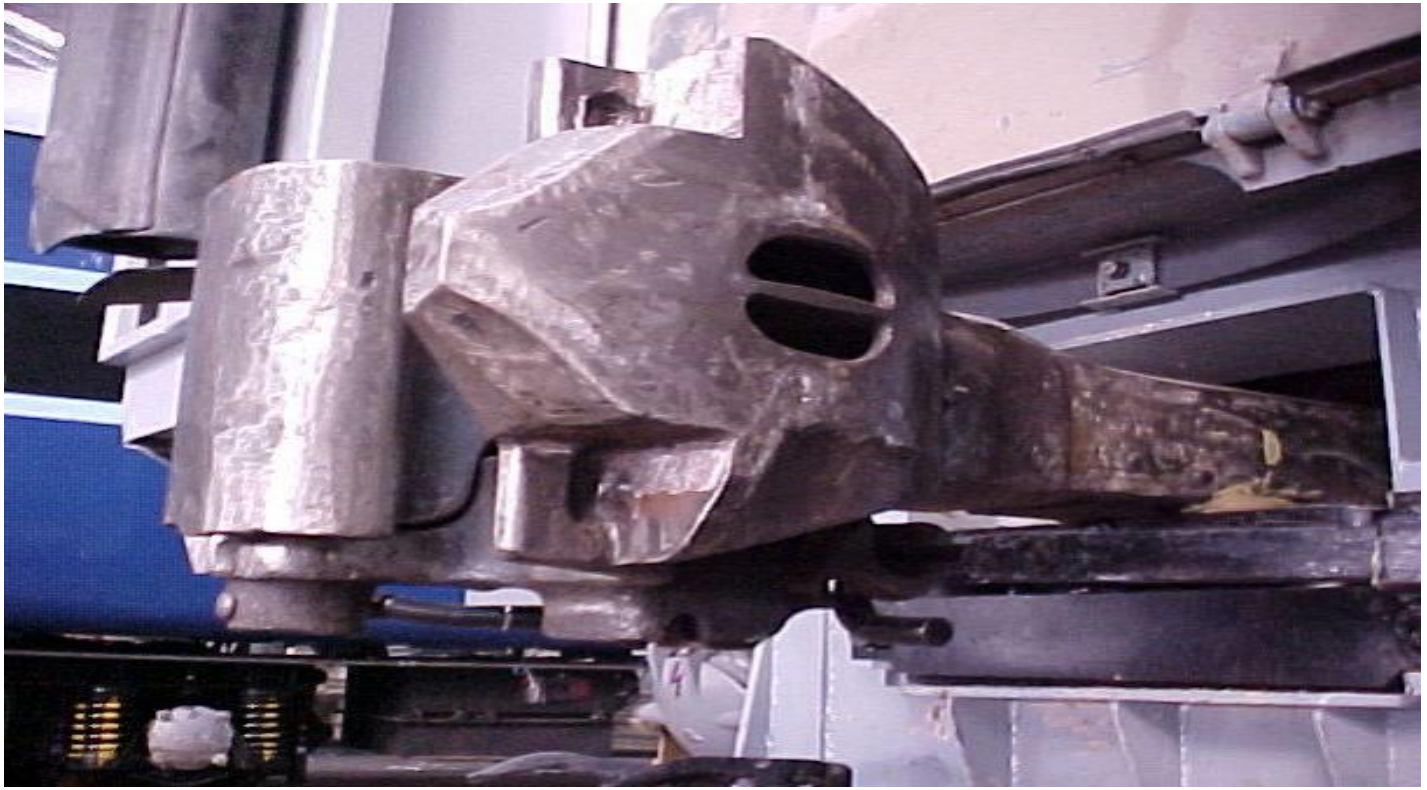
FIRE RETARDANT MATERIAL USED IN COACHES

Description	RDSO Spec No.
Wood based impregnated compressed laminates (compreg)	C-9407 (Rev.3)
Fire retardant upholstery cloth	C-9901
Fire retardant curtain fabric	C-9911
NFTC roof ceiling	C-K511
Decorative thermosetting synthetic resin bonded laminated sheets (LP sheets) for interior furnishing of coaches.	C-K514
Densified thermal bonded polyester blocks for use in railway coaches for seats and berths	C-K607
Flexible vinyl flooring (PVC) for use in coaching stock.	RDSO/2006/CG-12
Fibre glass reinforced plastic (FRP) windows of BG mainline coaches.	RDSO/2007/CG-02
UIC type elastomer flange connection between passenger coaches of Indian Railways.	RDSO/2007/CG-05

WINDOWS

TIGHT-LOCK CENTRE BUFFER COUPLER

- **AAR H-type coupler**
  - **Vertical interlocking provides anti climbing feature**
- **Adequate strength for hauling :**
  - **26 coaches at 110 kmph**
  - **18 coaches at 160 kmph**



HOW IT BENEFITS THE PASSENGER

BETTER RIDE QUALITY

- IMPROVED RIDE COMFORT - RIDE INDEX REDUCED FROM OVER 3. 0 TO 2. 5 AT A SPEED OF 160 KMPH.
- PLUSH INTERIORS OF INTERNATIONAL STANDARDS.
- IMPROVED AIR-CONDITIONING THROUGH BETTER DUCT DESIGNING & HUMIDITY CONTROL.
- BIGGER SIZE SEALED WINDOWS FILLED WITH "ARGON" GAS FOR A PANORAMIC VIEW & HEAT INSULATION.
- MODULAR "ORIENTAL" & "WESTERN" STYLE TOILETS WITH "CDTS" TO AVOID SOILING OF STATION PREMISES. GREEN TOILET SHORTY INTRODUCED SHORTLY.
- WELL EQUIPPED PANTRY WITH HOT CASES, DEEP FREEZER, BOTTLE COOLERS ETC.
- FLUSH TYPE SWIVELING BERTH READING LIGHT.
- POLYCARBONATE TRANSPARENT CENTRE TABLES.

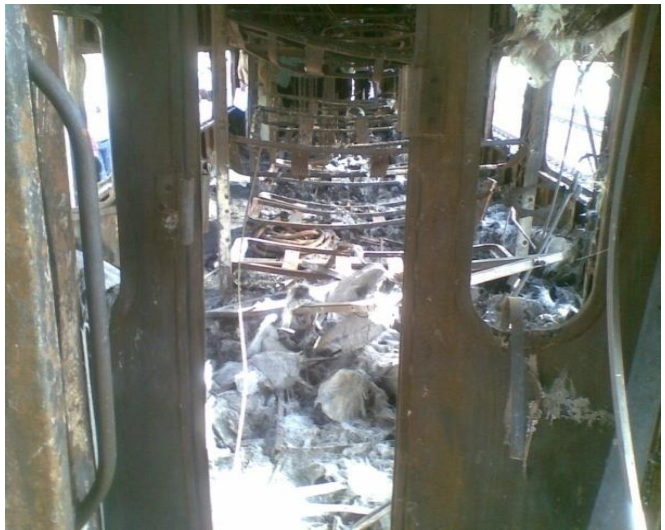
MORE SAFE

- **SAFETY OF PASSENGERS IS OF PARAMOUNT IMPORTANCE, SO A NUMBER OF PRECAUTIONARY MEASURES HAVE BEEN ADOPTED IN LHB DESIGN COACHES , LIKE :-**

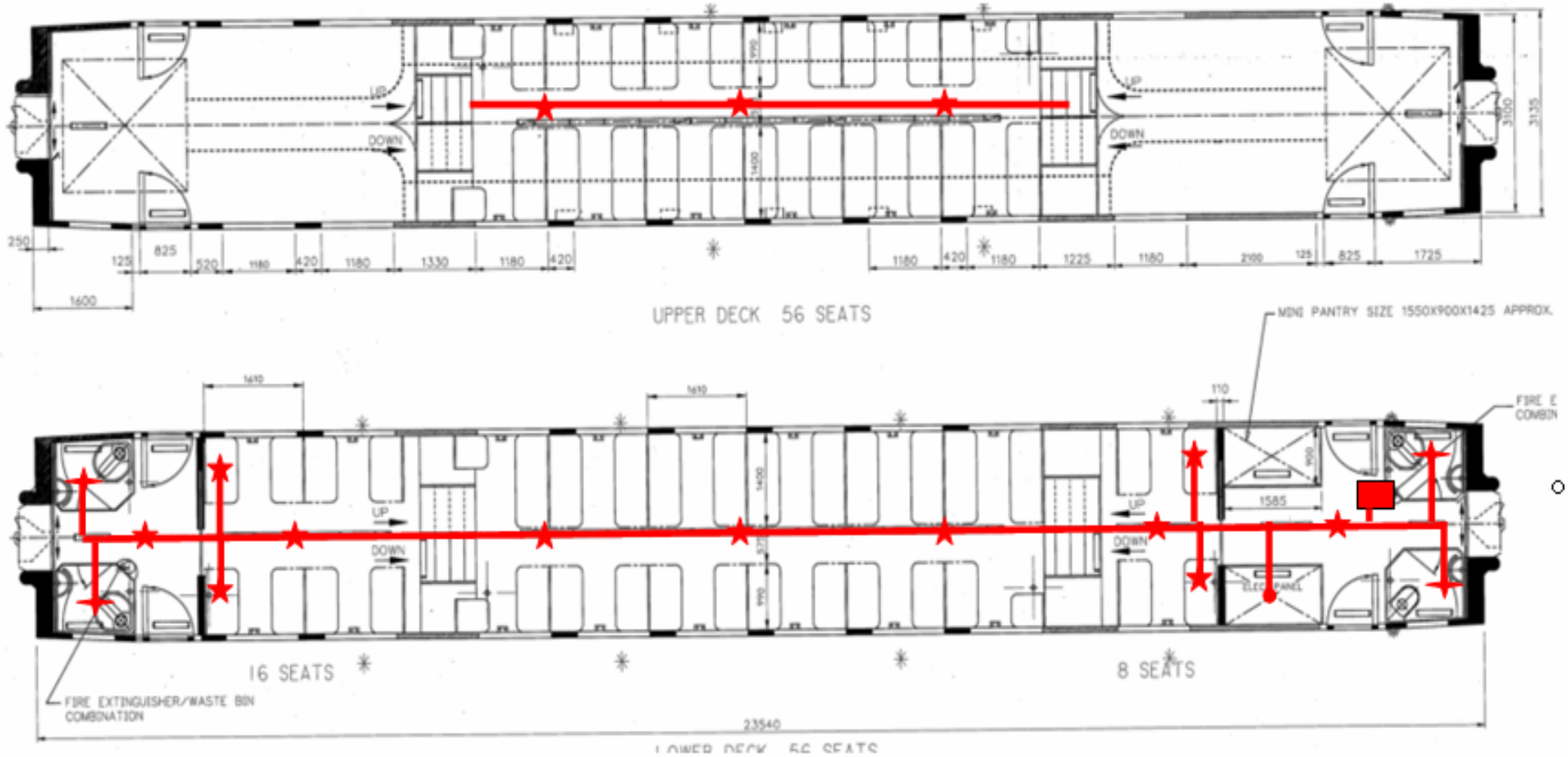
- **FOUR EMERGENCY EXIT WINDOWS FOR FASTER PASSENGER EVACUATION DURING EMERGEN-CIES.**
- **WIDER VESTIBULE DESIGN FOR SMOOTH INTER COACH MAVEMENT.**
- **CONVENIENT TO OPERATE EMERGENCY ALARM PULL OPERATION AND FIRE RETARDANT FURNISHING.**
- **TIGHT LOCK CENTRE BUFFER COUPLER MAKES COACHES ANTI-CLIMBING.**
- **SUPERIOR BRAKING SYSTEM.**
- **FIRE RETARDANT MATERIALS.**
- **PROPER COACH EARTHING.**
- **PUBLIC ADDRESS SYSTEM.**
- **SMOKE & FIRE ALARM SYSTEM**
- **EMERGENCY ACCIDENT LIGHT**

EARLY FIRE AND SMOKE DETECTION SYSTEM

- Plan to provide Early Fire and Smoke Detection System on 20 rakes
- Coach unit will detect presence of smoke at very early stage by sampling air
- Will activate audio visual alarm
- Heat activated sensors for toilets
- Central Monitoring of all the coaches



FIRE & SMOKE DETECTION & EARLY WARNING SYSTEM



★ VESDA Capillary Sampling Point (15 Nos.)

✦ VESDA Heat Activated Sampling Point (4 Nos.)

• VESDA Sampling Hole (1 No.)

■ VESDA Detector – VLC 505 (1 No.)


आपात निकास
EMERGENCY EXIT

Vestibule door

Pantry door

Fire Extinguisher

Antiskid PVC flooring

FIRE EXTINGUISHER PROVIDED IN THE ENTRANCE AREA

SUPERIOR AESTHETICS

LHB COACH INTERIOR

SWITCH BOARD CABINET

LUGGAGE RACK

European Style Toilet

Indian Style Toilet

COAT HOOK PROVIDED IN LAVATORY

PASSENGER

COMFORTS

BACK SIDE OF SEAT

ATTENDANT SEAT

Reading lights provided in Lugagge Rack

Sliding Coat hooks provided in Luggage Rack

PASSENGER CONVENIENCE

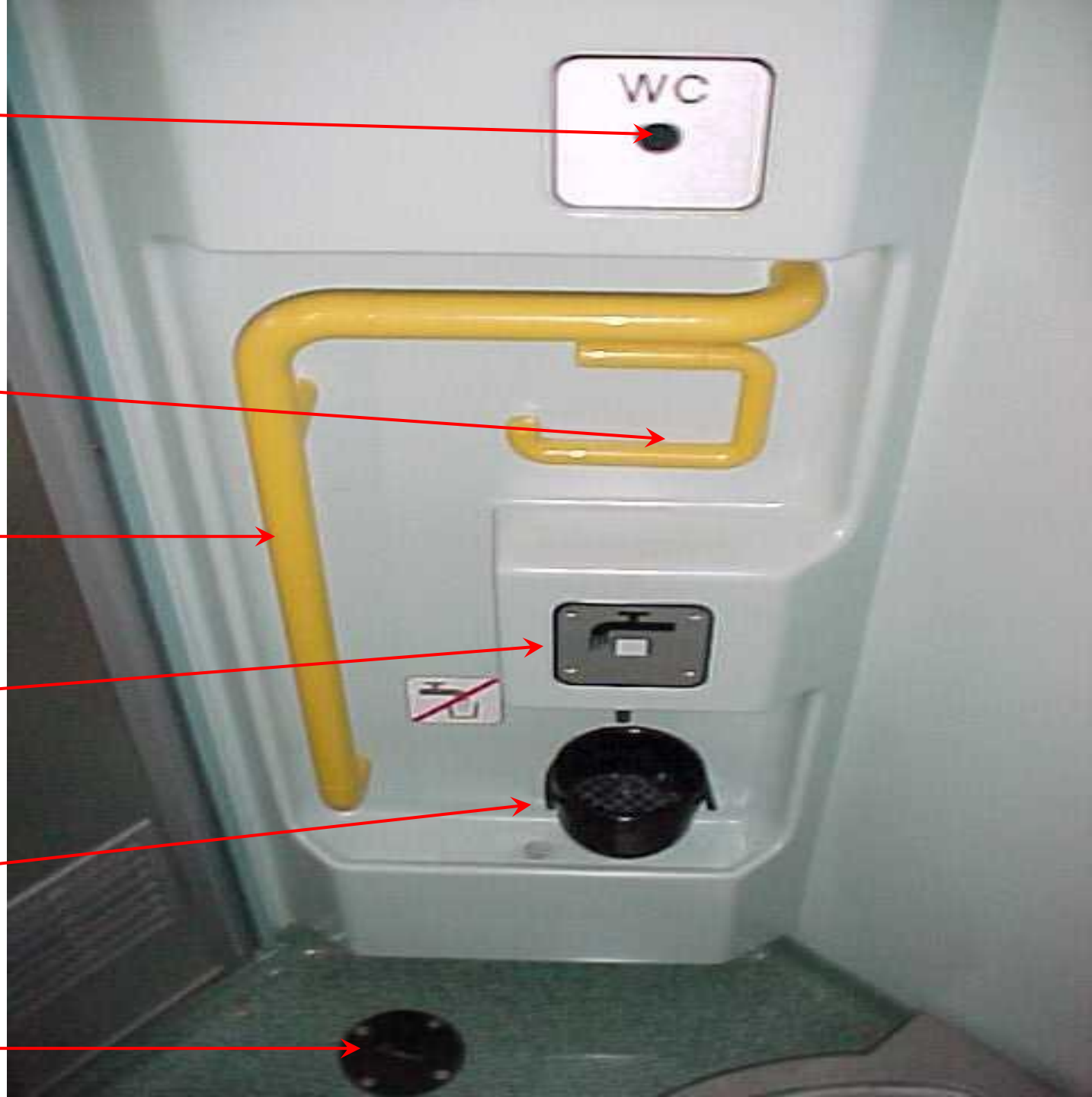
SPACIOUS ENTRANCE AREA

AIR DIFFUSER PROVIDED IN CEILING OF LAVATORY

LAVATORY ENGAGED INDICATOR IN PASSENGER AREA

WIDER PASSENGER COMPARTMENT DOOR

WITH BIGGER GLASS UNIT



Flush Button/ Switch

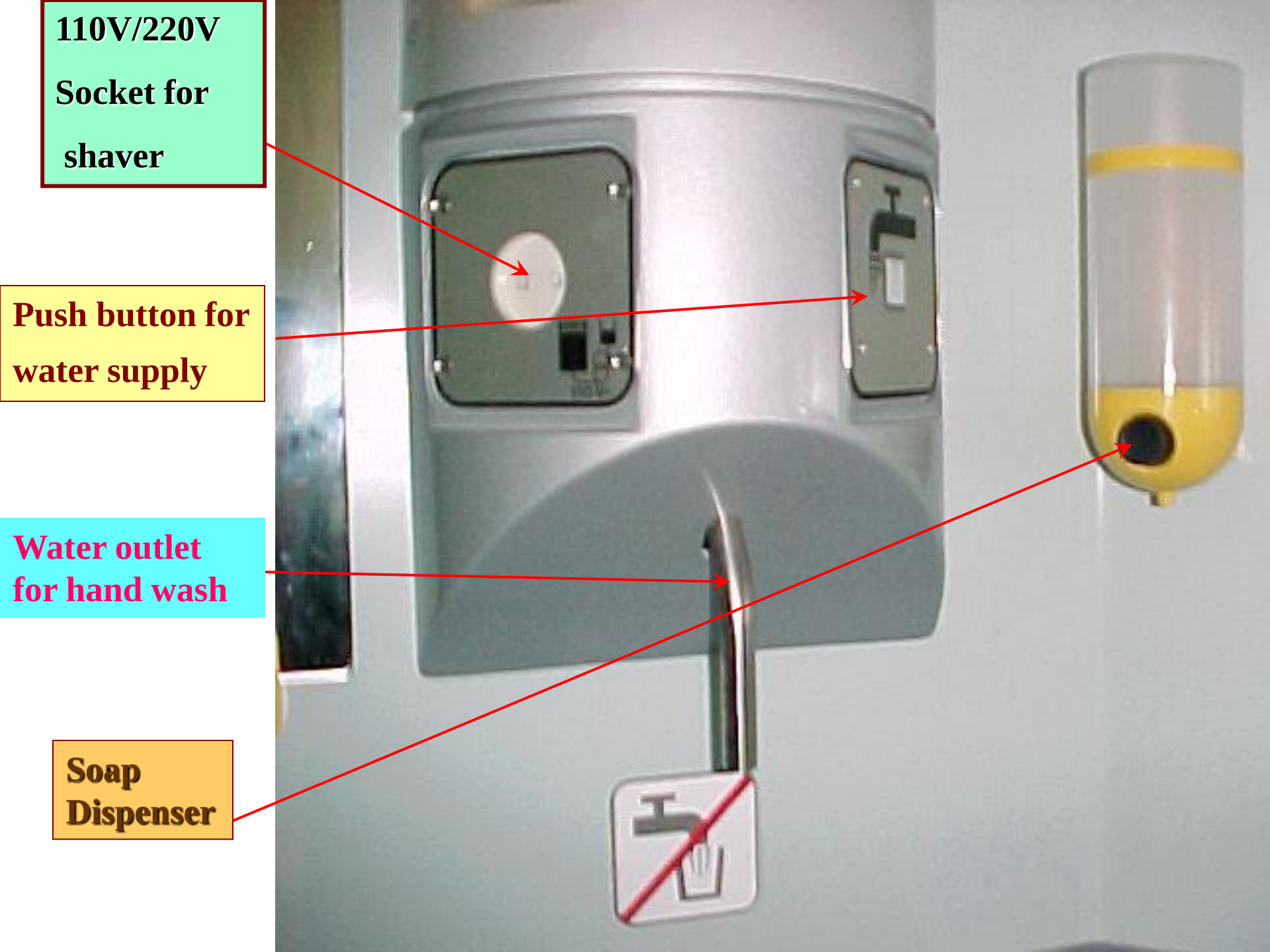
Toilet Paper Holder

Hand Grip

Water for toilet use

Ashtray or Lotah

Drain


110V/220V
Socket for
shaver
Push button for
water supply
Water outlet
for hand wash
Soap
Dispenser


AIR DIFFUSER
MIRROR
FLUORESCENT LIGHT
ASH TRAY
WASH BASIN

DETAILED DESIGN FEATURES OF

LHB

COACH

LHB COACH DESIGN

MAJOR FEATURES

- LENGTH OVER BODY = 23540 mm (21337mm)
- MAX. DISTANCE BETWEEN INNER WHEELS = 12345 mm (11887mm)
- MAX. BUFFER DROP = 75 mm
- MAX. TARE WEIGHT = 40.287 t
- NO OF PASSENGERS = 78 (2ND AC C.CAR)
  = 56 (EXEC. AC C.CAR)
- TEST SPEED POTENTIAL = 180 KMPH
- RIDE INDEX OF COACH = 2.5 BUT NOT EXCEEDING 2.75
- FLOATING FLOOR = DUE TO D-COUPLING ELEMENT
- REDUCED SPACE BETWEEN COACHES = LOWER WIND RESISTENCE
- MAINTENANCE CRITERION = ITEMS OF WEAR & TEAR SHAL NOT REQUIRE REPLACEMENT RENEWAL BEFORE 1 MILLION KMs.

USE OF STAINLESS STEEL AND LESS BOGIE MOVING PARTS SHALL REDUCE MAINTENANCE REQUIREMENTS

AT A GLANCE COMPARISON OF WEIGHT AND CAPACITY

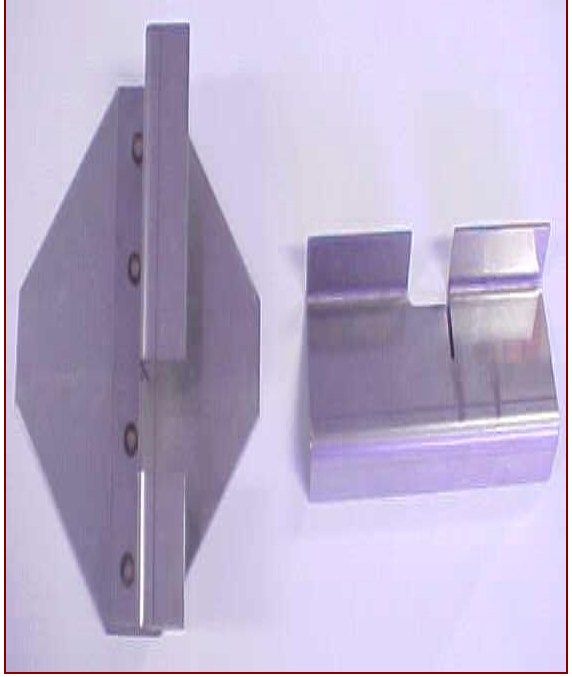
	Weight (T)	Capacity		Weight (T)	Capacity
LHB/EOG			ICF/EOG		
FAC	43.3	24	FAC	46.2	18
ACCW	44.6	52	ACCW	44.8	48
ACCN	45.6	72	ACCN	48.3	64
CB	40.9	0	CB	47.9	0
WLRRM	53	0	WLRRM	60	0

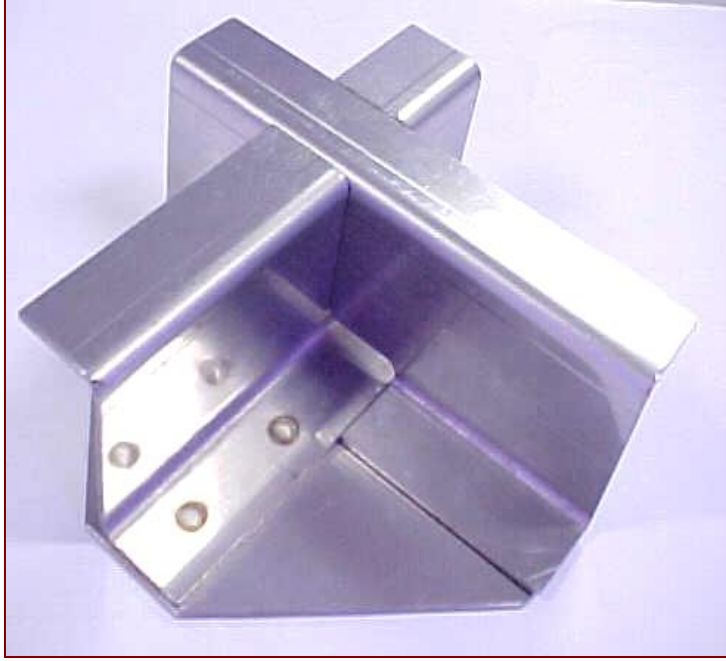
LHB WEIGHS LESS BY 50.6 TONNES

CAPACITY MORE BY 78 PASSENGERS

COACH SHELL

- **STAINLESS STEEL MATERIAL**
  - SIDEWALL & ROOF STRUCTURAL MEMBERS IN FERRITIC STEEL
  - SIDEWALL AND ENDWALL SHEETS OF FERRITIC STEEL
  - ROOF SHEET & TROUGH FLOOR IN AUSTENITIC STEEL
  - IRSM-41 STEEL FOR ALL OTHER STRUCTURAL MEMBERS. 6 MM SOLE BAR.
- **STRUCTURAL JOINTS**
  - INTER-LOCKING JOINTS OF VERTICAL & HORIZONTAL MEMBERS

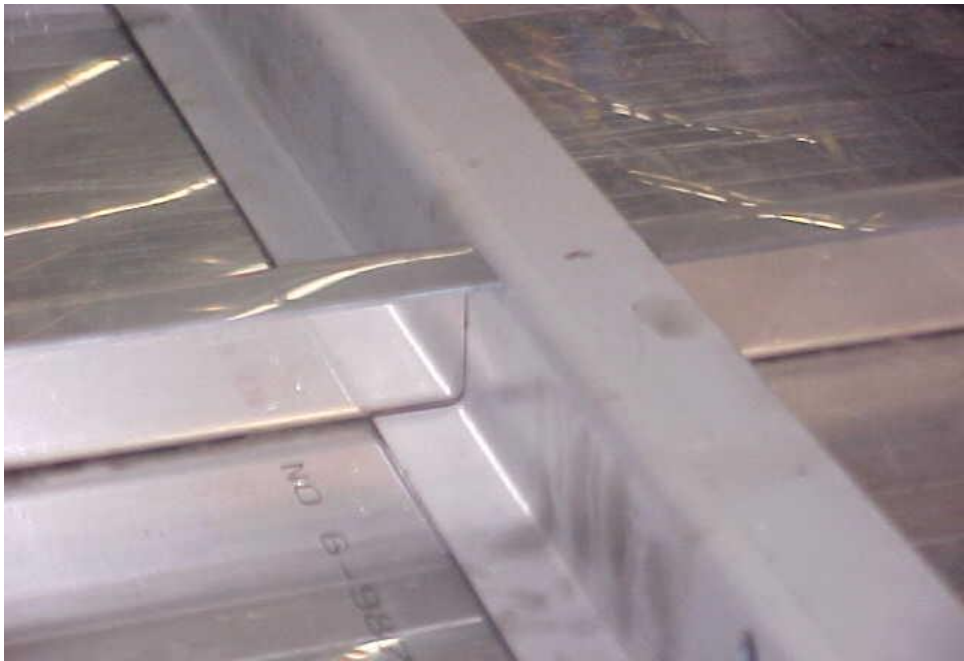




- INTERLOCKING BETWEEN THE HORIZONTAL AND VERTICAL STIFFENING MEMBERS OF SUB ASSEMBLIES LIKE SIDE WALL, END WALL,UNDER FRAME, ETC.
- ALIGNED STRESS FLOW
  - ***BETTER STRENGTH***
- REDUCTION OF SIDE WALL WIDTH FROM 90 MM TO 60MM
- BETTER GEOMETRICAL INTEGRITY

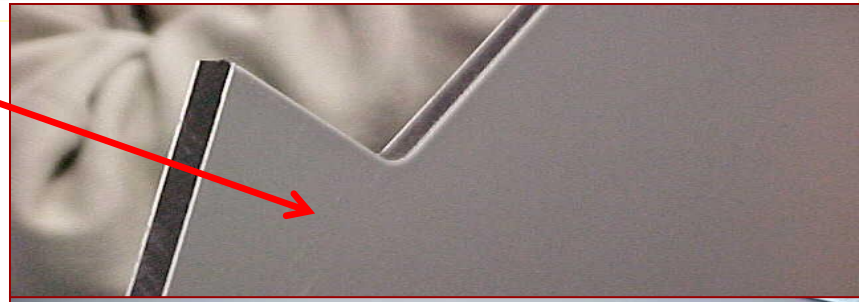
RESISTANCE TO DISTORTION

INTERLOCKING OF JOINTS

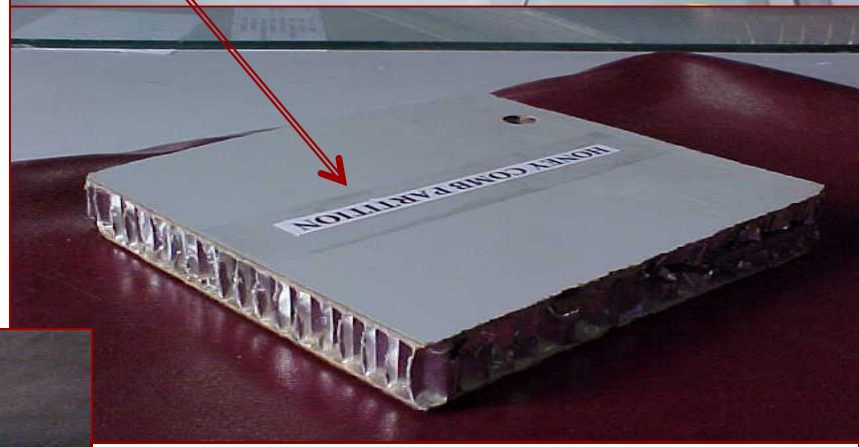


USE OF COMPOSITE MATERIALS

"ALUCOBOND" LAVATORY CEILING PANEL & ALUMINIUM HONEY COMB PARTITION PANELS

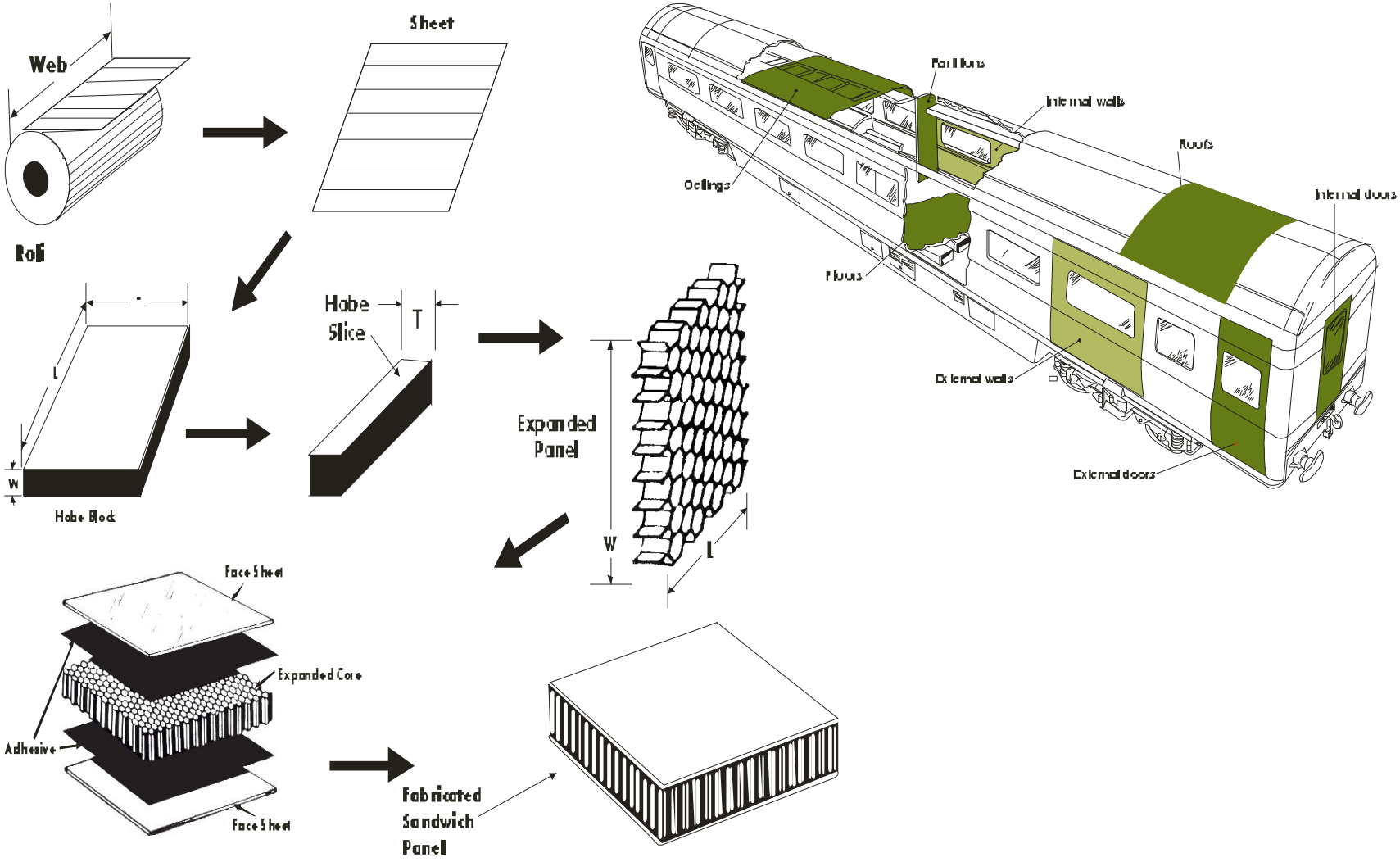


- IMPROVED AESTHETICS
- VERY GOOD SURFACE FINISH
- CORROSION RESISTANCE
- BETTER RIGIDITY
- HIGHER STRENGTH TO WEIGHT RATIO
- CAN UNDERGO PROCESSES SUCH AS ROLLING, BENDING, CUTTING, WELDING ETC. WITHOUT LOOSING OUT ON IT'S PROPERTIES

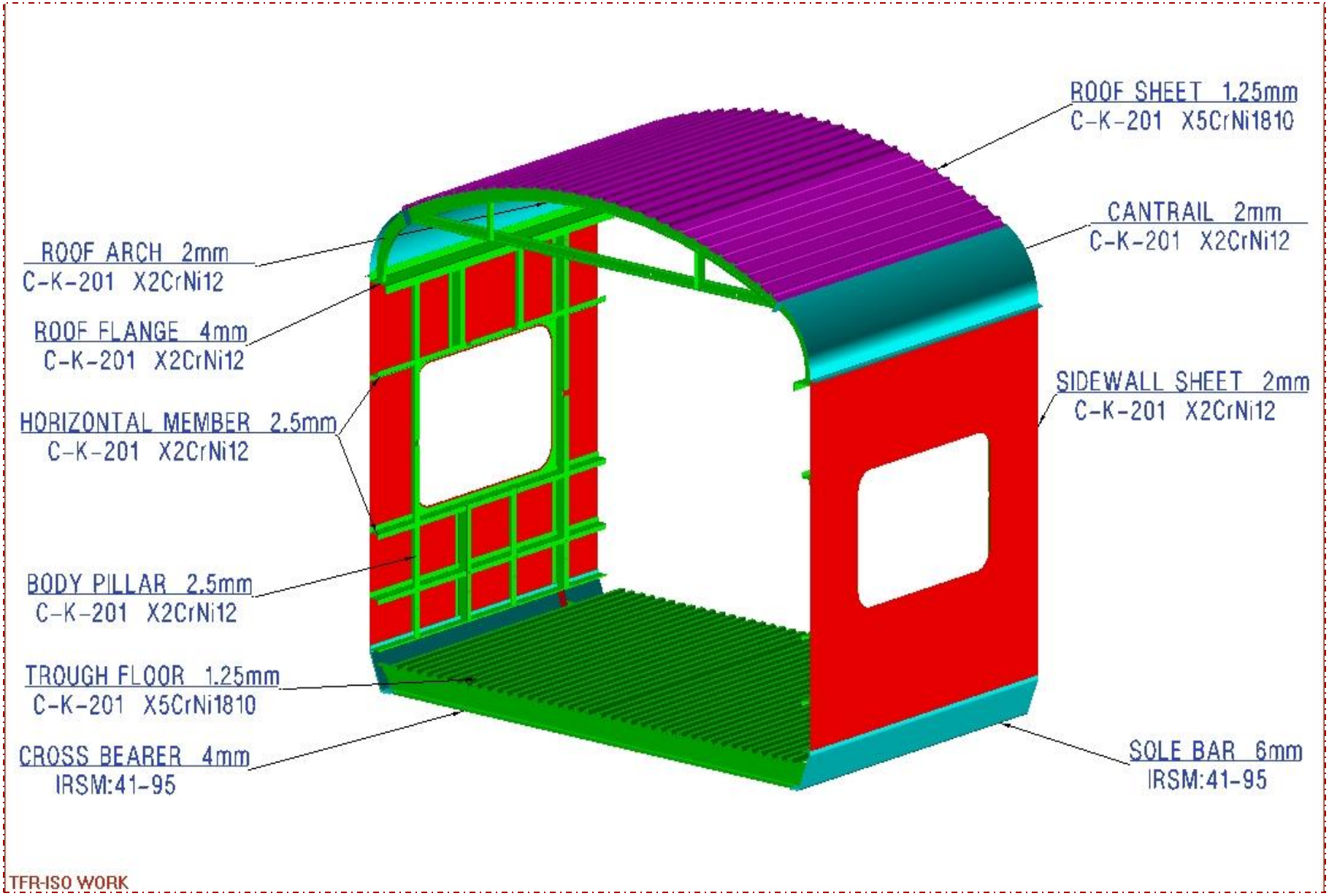


FLOOR BOARDS 4 MM CORK SANDWICHED BETWEEN COMPREG TO ABSORB NOISE

Manufacture of Honeycomb Panel

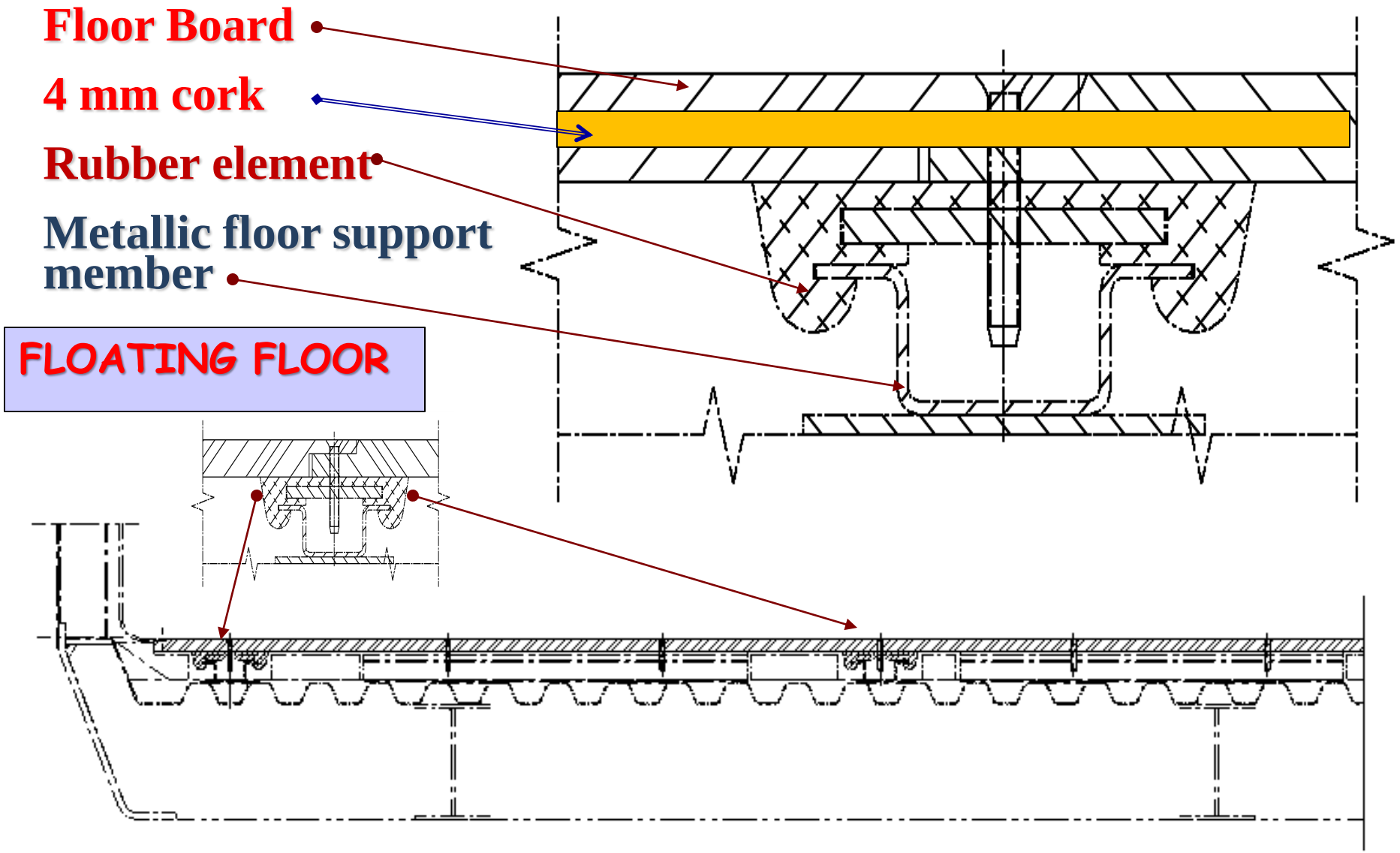


SHELL STRUCTURE



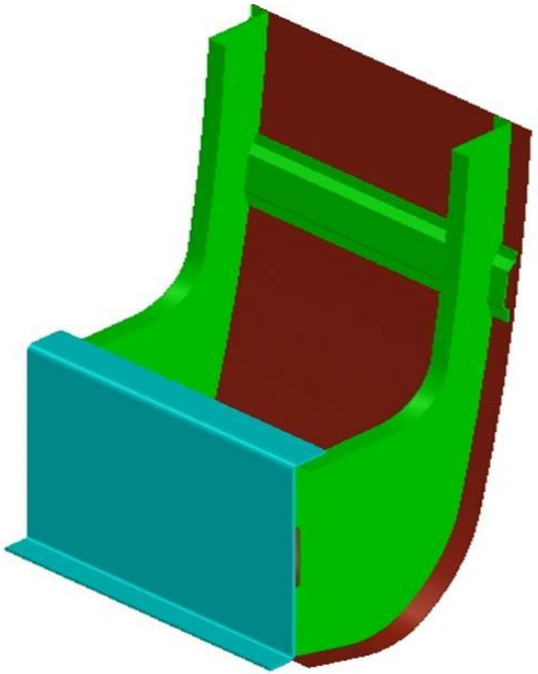
TFR-ISO WORK

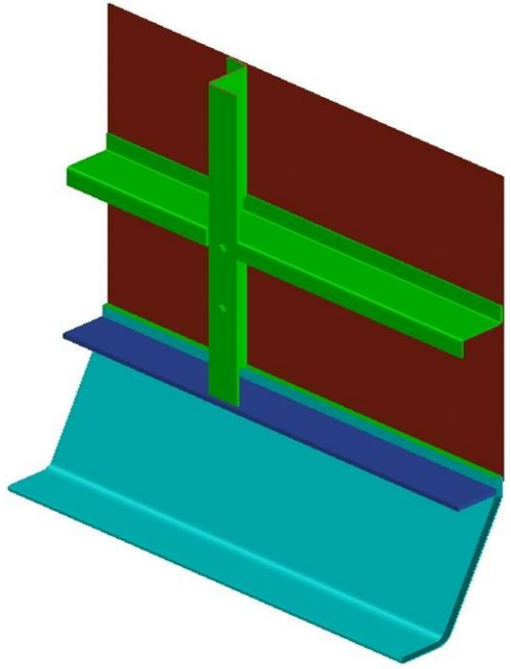
RUBBER DE-COUPLING ELEMENTS IN FLOORING RESULT IN SUPERIOR NOISE AND VIBRATION ABSORPTION



SIDEWALL TO UNDER FRAME JOINT

CONVENTIONAL VS. LHB



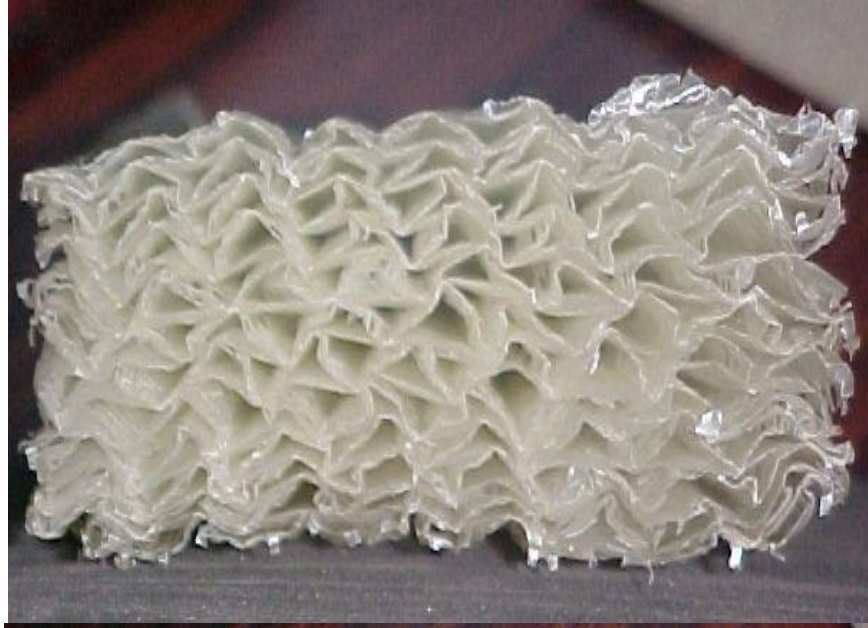


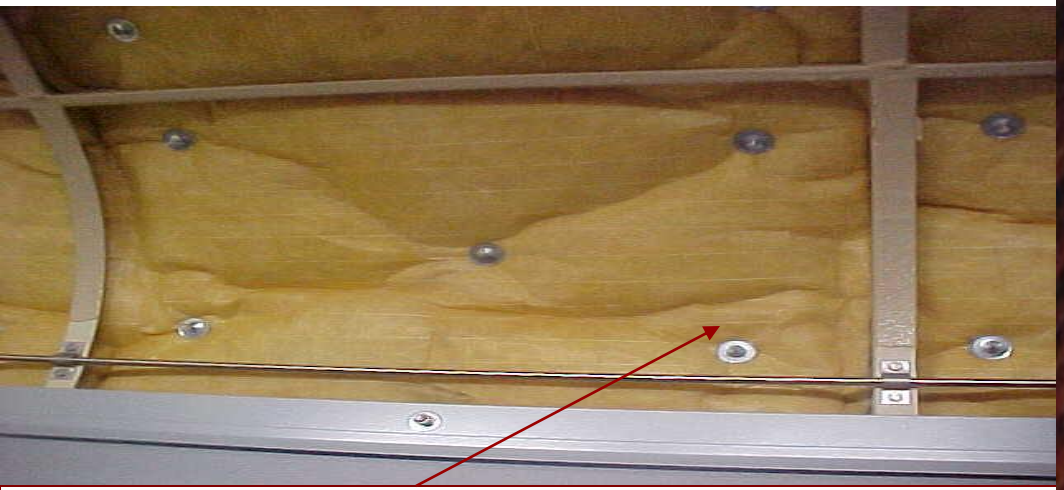
- **TURN UNDER HAS BEEN ELIMINATED**
- **CLEAR APPROACH FOR SAND BLASTING AND PAINTING**
- **NO ACCUMULATION OF WATER AND MUCK**
- **PILLAR RESTS ON SOLEBAR AS COMPARED TO LOAD TRANSFER THROUGH A VERTICAL WELDED JOINT IN CONV. COACHES**

SHELL CORROSION PROTECTION

- WELDABLE ALUMINIUM PAINT TO AVOID BI-METALLIC CORROSION
- SAND BLASTING AND IMMEDIATE PAINTING
- NOISE & CORROSION PROTECTION COAT “BARYSKIN V60DB” SPRAYED ON SHELL INTERIOR
- “RESONAFLEX ALU” OR RUBBER FOAM INSULATION AVOIDS WATER COLLECTION

USE OF "RESONAFLEX" (DIAGONALLY GLUED PLATED CELLULOSE ACETATE FILM, LIGHT WEIGHT, HIGH THERMAL RESISTANCE) ON SIDE WALL & FLOOR AND GLASS WOOL ON ROOF AND SIDE WALL (ABOVE WINDOW) PROVIDE HEAT INSULATION. RESONAFLEX ON UNDER FRAME PREVENTS WATERABSORPTION / RETENTION





GLASS WOOL PADS HELD BY PINS, WELDED ON THE ROOF

RESONAFLEX THERMAL INSULATION

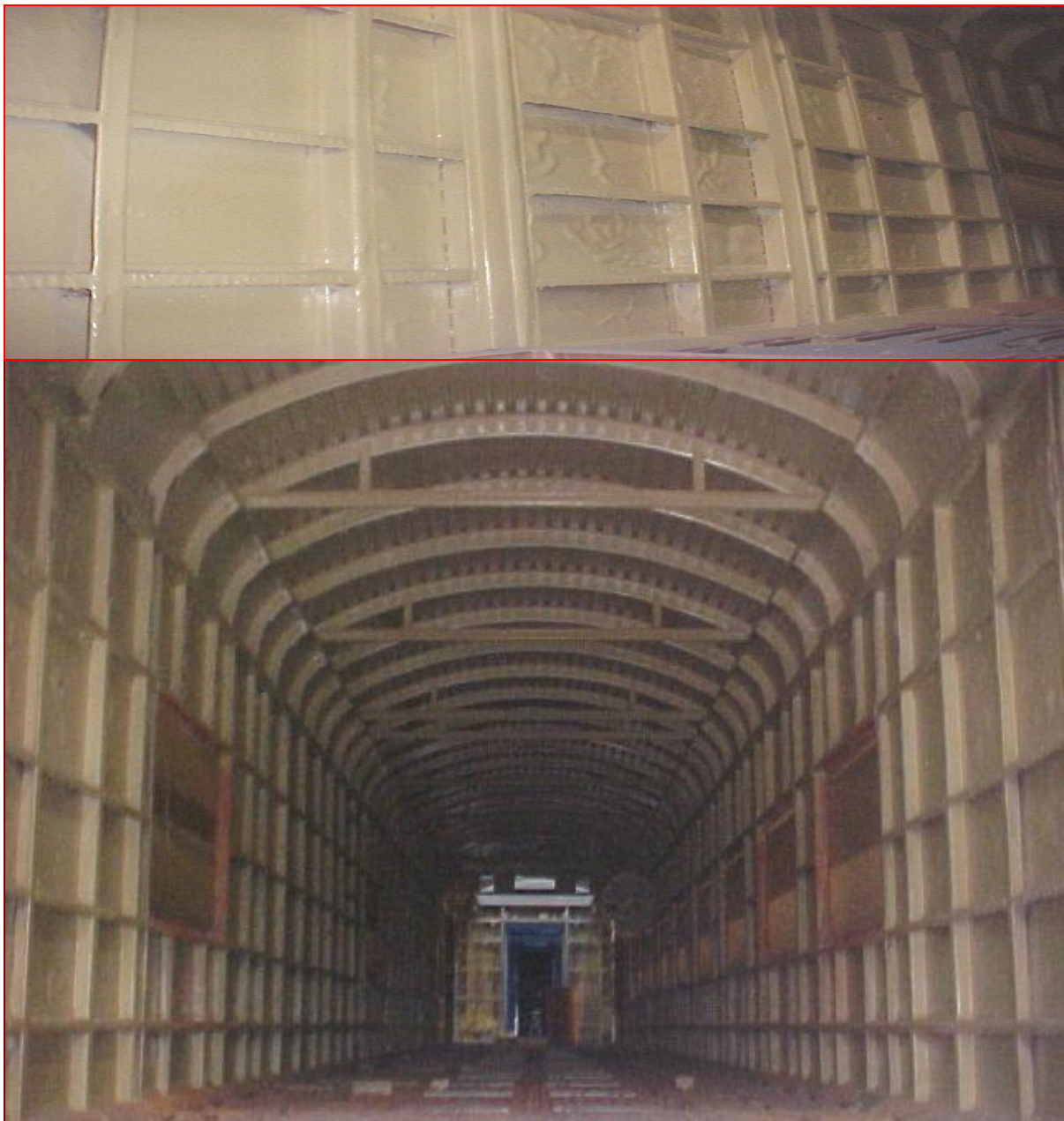
SUPERIOR INSULATION

"BARYSKIN V60DB" OR EQ. SOUND INSULATION PU PAINTS ON FULL COACH SHELL INTERIOR, PROVIDE ANTI DRUMMING SOUND INSULATION AS WELL AS CORROSION RESISTANCE.

SOUND INSULATION OF 31 DB .

COATING OF 2-3 MM THICKNESS IN THE COACH INTERIOR, 6-8 MM IN BODY BOLSTER AREA.

EXTREMELY GOOD FIRE RETARDANCY OF CLASS SR-4 TO DIN 5510



BOGIE

DESIGN FEATURES

- ADAPTATION OF EUROFIMA DESIGN FOR IMPROVED RIDE COMFORT.
- DESIGNED FOR OPERATING SPEED OF-160 KMPH , TESTED AT 180 KMPH AND HAS A POTENTIAL FOR OPERATION UPTO - 200KMPH.
- STRUCTURALLY SUPERIOR "Y- FRAME" BOGIE CONSTRUCTION MAKING IT LIGHTER AND YET STRONER.
- IMPROVED PRIMARY AND SECONDARY SUSPENSION FOR SMOOTH AND COMFORTABLE RIDING, OBTAINED BY USE OF FLEXICOIL SPRING.
- DIFFICULT TO MAINTAIN DASH-POT HAS BEEN ELEMINATED.
- EXTENSIVE USE OF ELASTOMERIC RUBBER-METAL COMPONENTS
- EQUIPPED WITH HYDRAULIC SHOCK ABSORBERS CONFORMING TO UIC STANDARD WITH HIGHER LIFE CYCLE RATING.
- AXLE GUIDANCE IS PROVIDED BY AN ARTICULATED CONTROL ARM THROUGH A RESILIENT BUSH WHICH WILL GIVE BETTER NEGOTIATION ON CURVES.

WHEEL, AXLE AND BRAKES

- FORGED WHEELS TO IRS R-19 OF 915 MM DIA. MAX USABLE WORN DIA 845 MM.
- FORGED AXLES.
- CARTRIDGE TAPER ROLLER BEARING FOR AXLES OF "TIMKEN MAKE".
- GRADUATED TWIN PIPE RELEASE AXLE MOUNTED DISC BRAKE WITH "ELECTRO-PNEUMATIC" FEATURE.
- PASSENGER ALARM SYSTEM AVAILABLE WITH 19 MM CHOKE.

COACH INTERIORS

- ⇨ ERGONOMICALLY DESIGNED SEATS AS PER INDIAN ANTHROPOMETRIC DATA.
- ⇨ LARGE WINDOWS WITH GOOD VISIBILITY.
- ⇨ ALUMINIUM LUGGAGE RACKS WITH INBUILT READING LAMPS.
- ⇨ INSULATION AGAINST NOISE.
- ⇨ USE OF FIRE- RETARDANT FRP FOR PANELLING.
- ⇨ HAND-SAFE FEATURE IN ALL AUTOMATIC SLIDING DOORS.
- ⇨ ANTI-SKID PVC FLOORING.
- ⇨ UIC VESTIBULES AND AUTO CLOSING VESTIBULE DOOR.

COACH INTERIORS

- SEATS HAVE POWDER COATED ALUMINUM FRAME. SEAT CUSHION & BACK-REST OF MOULDED "PU FOAM". GAS SPRING USED FOR RECLINING MECHANISM.
- 16 MM SANDWICH OF "MACORE WOOD & CORK" HAS BEEN USED AS FLOOR PANEL. THIS IS LIGHT WEIGHT, WATER & IMPACT RESISTANT.
- CONTROLLED DISCHARGE TOILET SYSTEM (CDTS) HAS A MICRO - PROCESSOR CONTROLLED INTERMEDIATE WASTE TANK WHICH DISCHARGES WASTE ONLY AT SPEEDS ABOVE 45 KMPH.
- INTRODUCED SHORTLY BIO - TOILET SYSTEM IN THE RAILWAY COACHES.

Doors

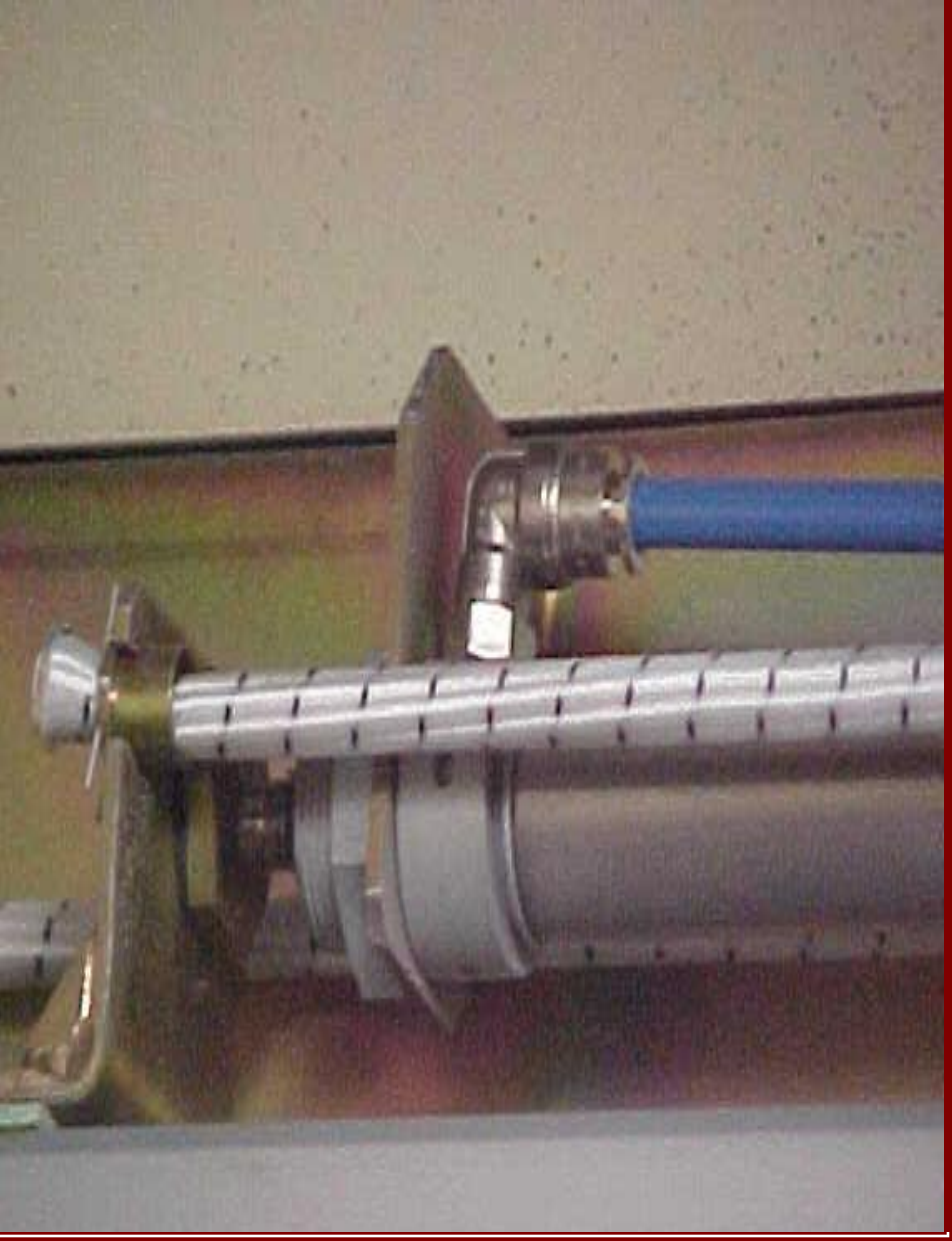
LHB coach has :

- # 4 body side doors
- # 2 compartment doors
- # 3 lavatory doors
- # 2 vestibule doors
- # 1 pantry door
- # 2 Roller shutters for pantry storage area

Doors

- Hinged type swing sandwich doors
- Stainless steel body filled with Phenolic resin for better heat insulation
- Provided with sealed window glass unit.

COMPARTMENT DOOR



SLIDING MECHANISM OF DOOR

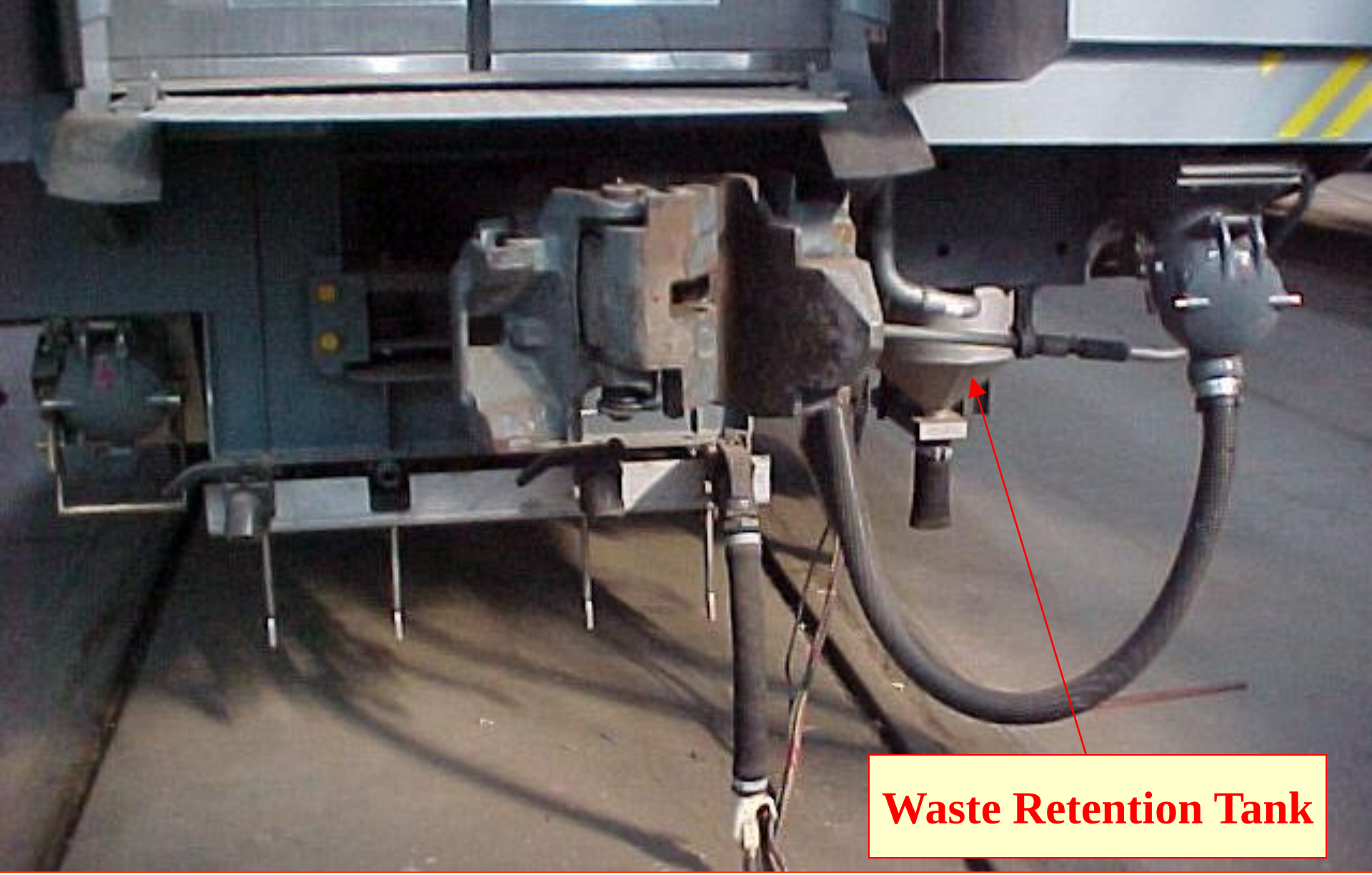

VESTIBULE DOOR
PANTRY DOOR

Storage area for Serving Trolley

Storage area for Pantry

LAVATORIES

- ***LHB COACHES HAVE BOTH ORIENTAL AND EUROPEAN TYPE OF LAVATORIES WITH CONTROLLED DISCHARGE TOILET SYSTEM (CDTS).***



CDTS WASTE RETENTION TANK

Side view of Luggage Rack

Reading lights provided in Luggage Rack

Passenger Emergency Alarm

- 5 passenger emergency alarms per coach have been provided at following locations:
  - 2 in passenger compartment
  - **3 in lavatories** (In earlier supplied coaches only)

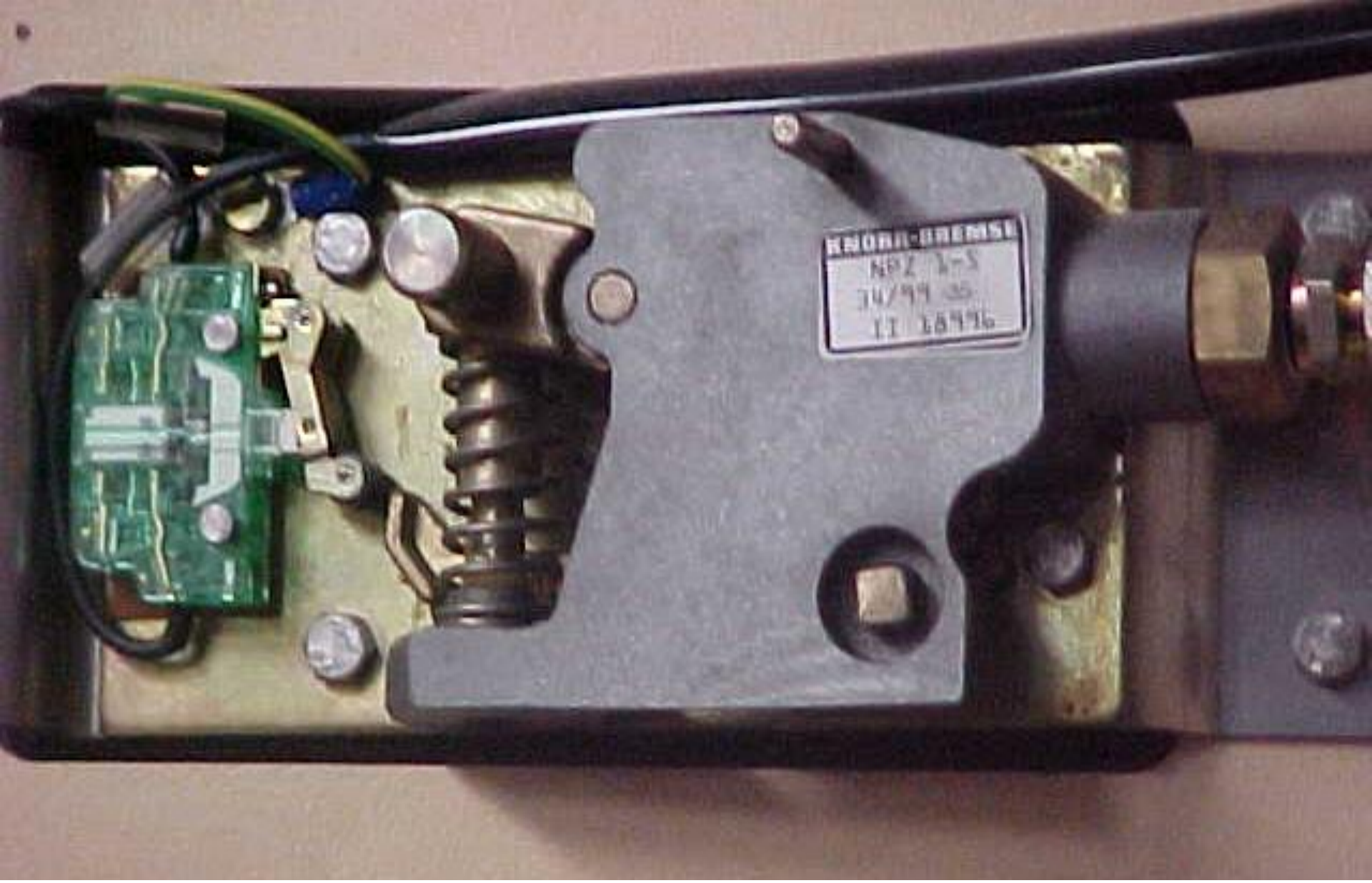
गाड़ी खड़ी करने के लिए हैंडिल खीचें

उचित एवं पर्याप्त कारण के बिना हैंडिल [illegible] खीचने पर सजा

1000 रुपये तक जुर्माना और / या दो [illegible] कैद ।

TO STOP TRAIN PULL HANDLE

PENALTY FOR USE WITHOUT REASONABLE AND SUFFICIENT CAUSE FINE UPTO Rs. 1000 AND / OR IMPRISONMENT UPTO ONE YEAR



Passenger Emergency Alarm

Window Units

Three types of windows have been used in LHB coaches:

- **Fixed window - 12 Nos.**
- **Emergency open-able window- 4 Nos.**
- **Hopper type window for lavatory - 3 per coach**

Emergency open able window

- It is similar to the fixed unit
- Four units are provided each coach to allow emergency evacuation of passengers
- A handle connected to the rubber profile opens the glass unit of the emergency window

EMERGENCY WINDOW

EMERGENCY OPEN ABLE WINDOW

HOPPER WINDOW FOR LAVATOTRY

Water tanks

3 types of water tanks are provided in LHB coach:

685 liters : 2 stainless steel water tanks of 685 liters capacity each. These tanks are installed in under frame in twos, are fixed with frames and are secured by safety belts. These tanks constitute the fresh water reserves in the passenger coaches. Water level indicator have been provided in these tanks.

450 liters : One stainless steel water tanks of 450 liters capacity. These tanks are installed in under frame, fixed with frames and is secured by safety belts.

3-stainless steel water tanks of 30 liters capacity installed one in each lavatory in the roof and are continuously fresh-water-fed by means of pumps. They maintain the good running of water supply of the barometrical capacitor at each station. These tanks are installed alone and are fixed with 2 supports which are equipped with belts.

FIXING DETAILS WITH USE OF RUBBER PACKING

DECALS

- APPROXIMATELY 50 DIFFERENT TYPES OF STICKERS HAVE BEEN USED IN LHB COACH.

DECALS STICKERS

AC 2 TIER

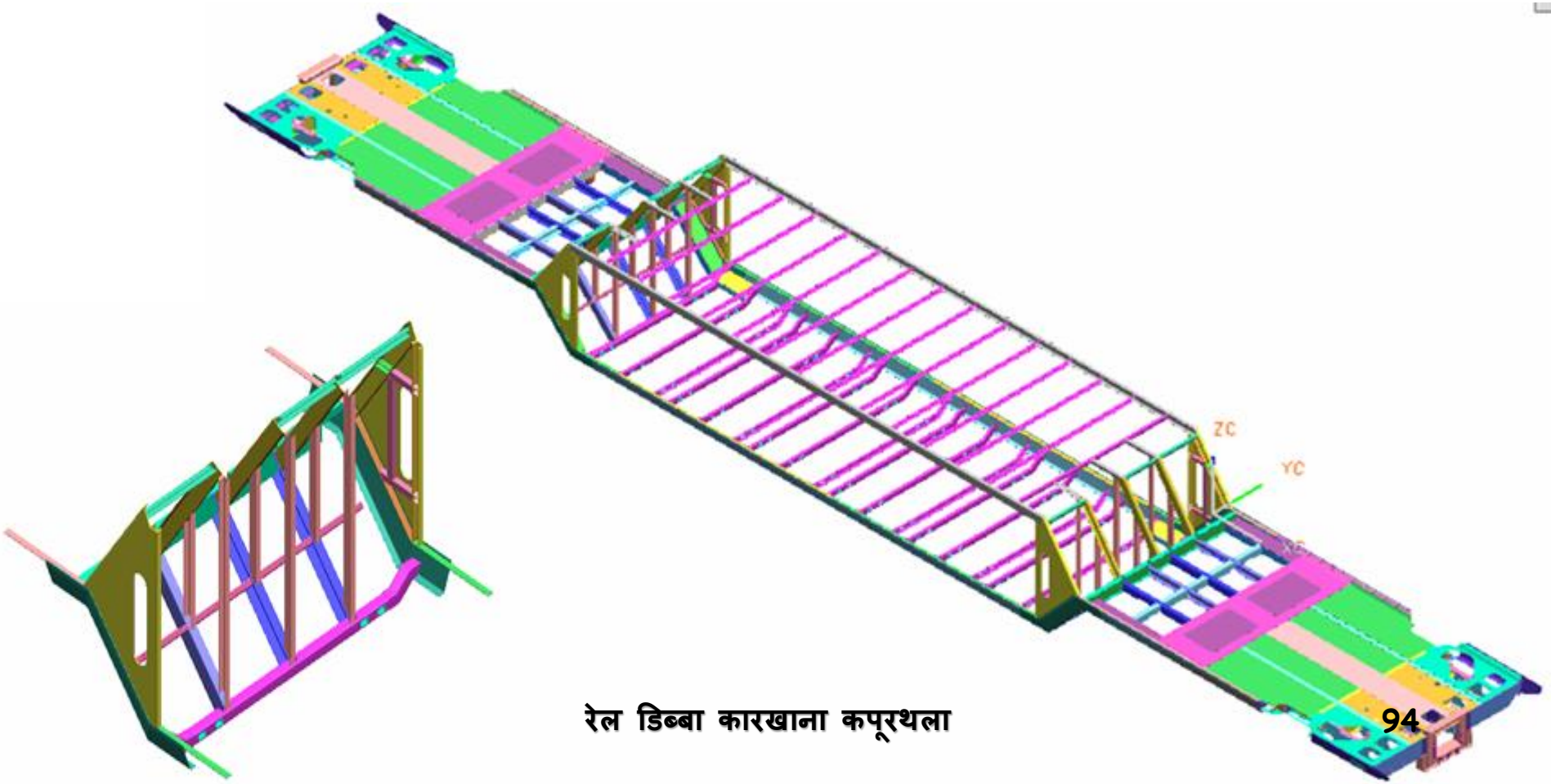
SEATING CAPACITY 120

SHELL INSIDE

SHELL READY

UNDER FRAME DESIGN

- Beyond front part diamond joint is connected with Upper deck & Lower deck underframe



SS AC DOUBLE DECKER (EOG)

FIAT BOGIE WITH AIR SPRINGS

THANK YOU

RIDE INDEX

The Quantative Measure of a Ride Quality is Interpreted as the Capability of Vehicle Suspension to Maintain the Motion within range of Human Comforts. It is Affected by Many Factors Such as Vibrations, Acoustic Noise,Smell,Temperature, Humidity and Seat Designing