

## CHAPTER 11

### SPECIAL TYPE OF WAGONS

#### 1101. BOXNHA WAGON

##### a) SALIENT FEATURES

A BG Bogie Open wagon type `BOXN-HA' has been designed for carrying increased payload for bulk movement of Coal and Iron Ore over Indian Railways. The length and width of the wagon are same as those of existing BOXN wagon except the height of wagon, which is 3450 mm from rail level. Thus BOXNHA wagon is higher by 225 mm compared to BOXN wagon. The wagon is fitted with cast steel IRF 108HS, secondary suspension bogie, non-transition centre buffer coupler and single pipe graduated release air brake system.

The Salient Features of BOXNHA wagon are given below:

i.	Length over coupler faces	10,713 mm
ii.	Overall width	3200 mm
iii.	Overall Height	3450 mm
iv.	Estimated Tare Weight	23.17 tonnes
v.	Axle Load	22.1 tonnes
vi.	Gross Load	88.40 tonnes

These wagons are expected to run in close circuit initially on Hospet-Chennai section of Southern and South Central Railway.

##### b) WAGON SUPERSTRUCTURE

The wagon superstructure consists of the following sub- structures:

- Underframe
- Body sides
- Body Ends
- Side Doors

- i. Underframe :** The underframe is provided with two sole bars of ISMC 250 rolled channel section with centre sill of standard `Z' section alongwith ISMC 100 for stringers. To combat corrosion, corrosion resistant steel has been used. The body bolster is of box type construction fabricated by welding of plates and the cross bars are also of fabricated design made out of plate sections. The underframe is of all welded construction with material IS2062 Fe 410 CuWA. The floor plate is made out of Corten Steel to IRS-M41 and welded to the underframe. The details of underframe members are given in Table 11.1.

**TABLE 11.1**  
**DETAILS OF SUPERSTRUCTURE**

Description	Section	Material Specification
Sole bar	ISMC-250	IS:2062 Fe410CuWA
Centre Sill	Standard `Z' Section	-do-
Underframe Stringers	ISMC 100	-do-
Bolster	Fabricated Box Section using 12 mm thick plate.	-do-
Floor Plate	6 mm thick plate	IRSM 41
Side Stanchion	Fabricated with 8 mm Plate	IRS-M41
Top Coping	Fabricated with ISMC 100 +6 mm plate	IS:2062 Fe410 CuWA,
Inter Coping	ISMC 100	-do-
Body Side Sheet	5 mm Sheet	IRSM-41
End Stanchion	ISMC 150	IS:2062 Fe 410 CuWA
End Sheet	5 mm Sheet	IRSM-41
Door Frame	Fabricated IS:1079 Gr.0 Sheet	IS:2062 Fe 410 CuWA
Door Sheet	5 mm Sheet	IRSM-41

- ii. **Body Side:** The body side consist of box section stanchions with sturdy top coping and intermediate copings. Body side sheets are made out of corten steel and are welded to the underframe crib angle on top of solebar. Floor plates are manufactured from Corten Steel. The side stanchions are however, connected to underframe by riveting.
- iii. **Body-Ends:** Body- ends consist of end panels, end stanchions, top coping and intermediate coping. During assembly to the underframe, the end panels are welded to end floor-angles. End stanchions are, however, connected to the head stock by riveting.
- iv. **Side Doors:** Each side of BOXNHA wagon is provided with three side doors alternately between the dummy quarters. The doors have been provided to unload the material manually in case of emergency when mechanical unloading system is out of order. The side doors are hinged at the bottom similar to conventional doors of wagon. The doorplates are made of corten Steel and door frames are of fabricated design.
- v. **Use of IRSM 41 Steel:** Body panel of Coal Wagons like BOXNHA encounter corrosive environment due to presence of sulphur and other carbonic acid components in coal. Use of corrosion resistance steel to IRSM-41 will face the situation better due to formation of an adherent protective oxide film on the surface if it is left undisturbed. IRSM-41 steel has following properties-
  - Stronger than mild steel
  - Easily weldable
  - Develops its own protective film against corrosion.

- vi. **Welding of IRSM-41:-** Barring a few riveted joints, wagon structure is an all welded assembly of plates and rolled section. Extensive repair by welding is, therefore done during maintenance/rectification of defects.
- vii. **Precautions during welding of IRSM-41**

For welding fabrication of IRSM 41, following precautions should be taken-

- Electrodes to IRS D2 shall be used.
- Edge preparation shall be done as per IS:9595.
- Electrodes shall be preheated as per recommendation of manufacturer.
- Interpass runs shall be cleaned properly.
- Welders should be qualified.

### c) **NATURE OF REPAIRS IN BOXNHA**

BOXNHA wagons are used extensively for transportation of Coal/Iron ore in bulk. Due to mechanised loading/unloading, these wagons are subjected to heavy shock loads due to which following defects may develop:-

- Bulging of Body Structure
- Puncturing of panels due to improper loading
- Corrosion of panels
- Slackening of rivets
- Failure of welded joints
- Distortion of doors
- Wear on door hinges

### d) **MAINTENANCE & REPAIR PROCEDURE**

- i. **Body Building:** Body normally bulges out on the sides due to improper handling at tippers during unloading of commodity. Similarly, the end structure bulges out due to shunting forces. If there is no serious damage on side/end structure other than bulging, bulges can be effectively removed without dismantling. When bulging of the structure is more than 25 mm, it should be rectified by pulling with the help of chain & screw coupling. Bulging of all welded body sides can be rectified by spot heating and pulling by chain and screw coupling. In case of end bulging, two wagons with bulged end are coupled together and hydraulic jack is applied between them at the bulges. Suitable packing can be interposed between jack and wagon body. For all welded ends spot, heating can be applied for straitening.
- ii. **Puncturing of Panels:** Body side/end panels are punctured due to improper loading and shunting. Punctured end side panels are repaired by welding of panel patches as per standard practice.

**iii. Corrosion of panels :** Corrosion of body and floor takes place due to the following:-

- Water logging
- Accumulated dust and refuse which retain moisture for long period
- Spillage of corrosive fluid due to defective packing
- Inadequate protection due to poor painting.

The current practice is not to paint the wagon from inside because the painting on inside wall can not withstand the constant scrubbing action of commodity during mechanized unloading. The following measures should be undertaken-

- a) Most important measure to be taken in day to day working is to ensure that the wagon is kept thoroughly cleaned after unloading. It should receive attention in this respect after it has transported a corrosive or hygroscopic commodity.
  - b) While attending to repairs and panel patching, it is important to ensure that surfaces in contact are well fitted to avoid water pockets. Due care should be taken to clean and paint the affected surface to prevent corrosion.
  - c) The table below indicates the sizes of panel patches to be used for repairs of corroded panels. If area of the patch extends beyond 260 mm from floor height, either two standard patches of 5 mm thick seat should be used one above another or a single patch of 5 mm thick and 520 mm width should be used. In case two or more adjacent panels require patching at the same time, the complete length of corrosion can be covered by a straight patch which must extend from stanchion to stanchion.
- iv. Slackening of Rivets for BOXNHA wagon:** Rivets are provided at the bottom of the side stanchions to join them with underframe structure. These rivets sometime get loosened due to combined effect of shock, corrosion and wear. Loose rivets can be identified by gentle hammering on rivets which will produce dull sound. The loose rivets shall be cut by chisel and then holes shall be set/repared by welding. Re-drill to size and put new rivets.
- v. Door Defects:** The main defect in doors is distortion due to mishandling, wedging or jammed hinges. The distorted doors shall be taken down and straighten to ensure proper fitment. Worn out /damaged hinges should be replaced by reconditioned/new hinges. After repair, doors must sit flush against striking plates with adequate overlap between levers. Graphite grease should be applied on all the hinges.
- vi. Repairs to Door and Fittings:** The main defects which arise in side doors of these wagons are distortion due to mis-handling, jamming of engine and Bulging of door panels due to improper handling during unloading on tippers. Distorted or bulged doors must be taken down and straightened to ensure proper fitment. The worn out hinges, which

are responsible for sagging/gaping of doors, shall be replaced with new or reconditioned ones. The corroded frame of door must be cut out and replaced by welding after repairs. The doors must sit flush against the wagon structure with proper support.

## 1102. BOXNCR WAGON

### a) SALIENT FEATURES

Bogie open wagon type BOXNCR is similar to BOXN wagon except the following:-

- i. Barring rolled sections, the wagon body is manufactured from steel to IRSM M-44 instead of steel to IS:2062 Fe410CuWA or IRSM-41.
- ii. Crib angles side to ISA 50x50x6 is manufactured from IRSM- 44 steel instead of IS:2062 Fe 410 CuWA steel.
- iii. Sole bar is manufactured from IRSM-41 instead of IS:2062 FeCuWA steel.

Other features like overall dimensions, bogie couplers and draft gear, brake gear, brake system, etc. are exactly same as BOXN wagon.

### b) MAINTENANCE & REPAIR

- i. Since BOXNCR wagon is similar to BOXN wagon, the maintenance schedule and repair procedure shall be similar to BOXN wagon. However, since the wagon body is made from IRSM-44 steel, the body panels, when corroded, shall be replaced with IRSM-44 steel panels only. The IRSM-44 steel panels/plates shall be cut either by shearing machine or by plasma cutting machine but not by oxy-cutting. The welding electrodes to be used for repairs are indicated in table 11.2.

**TABLE 11.2 ELECTRODES FOR WELDING**

S. No	Material to be welded	Electrodes/filler wire to be used
1.	IRS M-44 to IRS M-44	IRS class M1 with IS code E19. 9LR16 (as per IS:5206-83) or 3081 (MIG) as per AWS.
2.	IRS M-44 to IS:2062/5986/1079	IRS class C2 basic coated low hydrogen type having IS code EB5426H3JX or EB5424H3JX as per IS:814-91.
3.	IRS M-44 to IRS M-41	IRS class D2 with high deposition.
4.	IS:2062/5986/1079 to IS:2062/5986/1079	Same as indicated in (2) above or CO2 filler wire as per IRS class I and IA.
5.	IRS M-41 to IRS M-41	Same as indicated in (3) above or CO2 filler wire as per IRS Class-III.
6.	IRS M-41 to IS:2062/5986/1079	Same as indicated in (5) above.

- ii. The edge preparation should be done as per IS:9595 for both “V” butt as well as fillet joints. Electrodes and filler wires should be procured from any RDSO approved sources and the parameters like current, voltage, etc. should be as per IS code and manufacturers recommendations. Preheating of electrodes of IRS class C2 & D2 at 250 deg. C for 2 hours, 350 deg. C for one hour or as recommended by the manufacturer be done prior to use. After heating, electrodes are to be kept in an electrode oven at 110° C to avoid any moisture pick up.

**c) PRECAUTIONS FOR WELDING STAINLESS STEEL**

- i. Since Stainless steel has high coefficient of thermal expansion and less heat conductivity, it is advised to use low welding currents with the recommended range and smaller gauge electrode to minimize heat input and reduce distortions.
- ii. Surface to be welded must be clean, dry and free from dirt, oxide film, oil, grease etc.
- iii. Electrodes should be re-dried before use.
- iv. Always maintain short arc to minimize the loss of alloying elements.
- v. Avoid weaving and make stringer beads.
- vi. After finishing welding, lift electrode slowly and fill the crater before breaking the arc. This will avoid crater cracks.
- vii. Use stainless steel wire brush for cleaning welds.
- viii. Use electrode preferably with DC(+).
- ix. Every bead should be properly cleaned before further welding on it.
- x. Welding should be preferably carried out in flat position.
- xi. Correct electrode size, recommended current, arc length, travel speed and electrode angle must be followed.
- xii. Any defect like crack, blowhole etc. must be properly gouged out and re-welded.
- xiii. Do not strike arc adjacent to the weld.
- xiv. Tack the welded area correctly to ensure proper gap.
- xv. Proper welding sequence must be followed to reduce internal stresses and hence reduce warpage of structure.
- xvi. Always weld towards the free ends.

**d) SURFACE PREPARATION & PAINTING**

- i. The surface preparation and painting schedule for underframe of the wagon shall be as per standard specification No.G-72 (Rev.1) read with latest amendments.

**ii. Surface preparation of the wagon body**

Degreasing with petroleum hydrocarbon solvent to IS:1745-1978 (low aromatic grade 145/205) or any other degreaser (applicable for both SS,MS and corten steel).

**iii. PAINTING OF WAGON BODY****For stainless steel**

- Apply thin coat of etch primer to IS:5666-1970.
- Two coats of IS:2074-1992, ready mixed paint, air drying, red oxide zinc chrome priming to minimum DFT of 50 microns.
- Two coats of IS:123-1962, ready mixed paint, red oxide, brushing, finishing, semigloss to ISC:446 to IS:5-1994 to a DFT of 80 microns.

**For mild steel and corten steel**

- Remove dust, loose rust and mill scale etc. manually by scrapping, chipping and wire brushing to at least St.2 of IS:9954.
  - Two coats of IS:102-1962, ready mixed paint, brushing, red lead, priming to minimum DFT of 80 microns.
  - Two coats of IS:123-1962, ready mixed paint, red oxide, brushing, finishing, semi-gloss to ISC:446 to IS:5-1994 to a DFT of 80 microns.
- iv. The painting of bogies, couplers and air brake equipment shall be done as given in para 11.2.5 of General Standard Specification No. G-72 (Rev.1) read with latest amendments.

**1103. BOGIE LOW PLATFORM CONTAINER FLATS (BLC)**

Bogie container flat wagons have been designed for transportation of 2896 mm high Series-I, ISO containers for a gross payload of 61t at an operating speed of 100 km/h. These containers, when loaded on the earlier flat wagon caused infringement to the X-class MMD, resulting in constraints in their free movement.

In order to ensure that the wagons loaded with 2896 mm containers lie within the X- class MMD, a low platform height of 1009 mm has been achieved with the use of hybrid design of bogie frame and bolster and with the use of smaller diameter wheels (840mm).

The wagons have all welded construction and are mounted on two cast steel bogies. The flats are formed into units of five wagons, each unit having two “A” car at ends and three intermediate “B” cars. One end of “A” car is fitted with centre buffer couplers to ensure proper coupling with the locomotive while the other end has slackless draw bar to couple with “B” cars. “B” cars are coupled together and to “A” cars by slackless drawbars.

The length of A car is 1362 mm while the length of B car is 12212 mm. The coupler of A car for attaching to loco or other stock is at 1105mm. The coupler in the B car at both ends is at 845 mm from rail level. The wagons are equipped with Air Brake. The diameter of new wheel is 840 mm and the condemning size is 780 mm.

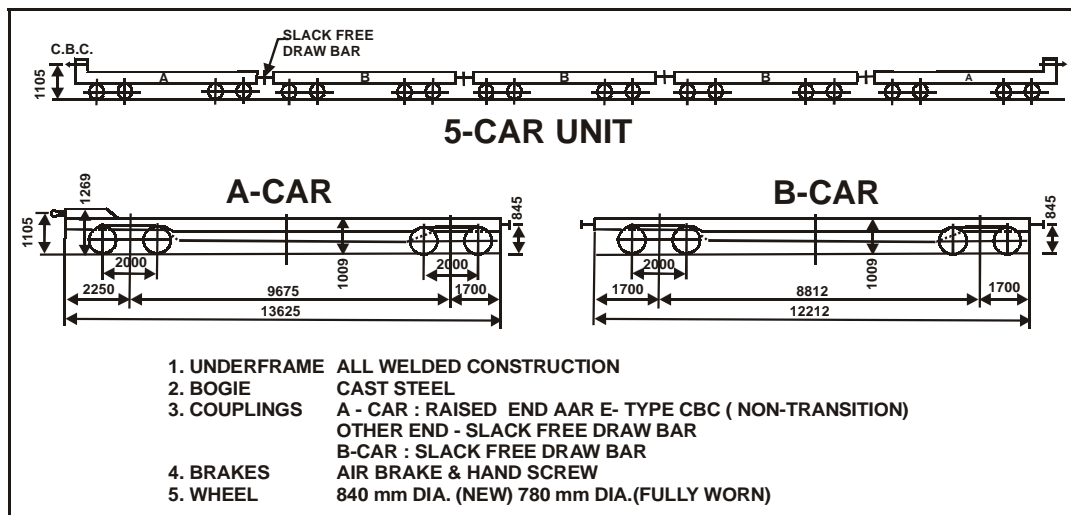


Fig 11.1 : BOGIE CONTAINER FLAT WAGON

TABLE 11.3 NEW WAGONS

S.No.	Stock	Description
1.	BLCA/BLCB (Holding = 1080)	Low platform container flat wagons, light weight, all welded skeleton design underframe for an optimum tare to payload ratio, 840 mm wheel dia, A&B cars with A AR 'E' type CBC on raised ends of 'A' cars and use of slackness draw bar system on the inner ends of 'A' cars and on all 'B' cars, tare weight 'A' cars 19.lt 'B' cars 18.01, pay load 6lt.Fit to run 100 Kmph.
2.	BOXNHA (Holding = 125)	Higher axle load wagon suitable for 22.lt axle load and 8.25t/m TLD for coal loading. Payload per rake shall increase to 3783t as against 3411t. In the existing BOXN wagon resulting in 11% increase in throughput per rake. Fit for 100 Kmph Tare weight=23.17, Payload = 23.17t Pay Load=65.13t
3.	BOXN (Holding = 580)	Use of corten steel in place of mild steel for the manufacture of BOXN wagons has resulted in arresting the problem of corrosion only to a limited extent. In order to reduce the problem of corrosion substantially, 3CR12 stainless steel has been used in the manufacture of BOXNCR



S.No.	Stock	Description
4.	BFKN (Holding = 580)	Air Brake CASNUB bogie container flat wagons owned by container corporation LTD. (being converted from BFKI) Another 175 are yet to be converted.
5.	BCCN (Holding=30)	Double Decker Bogie covered wagon for transportation of automobile cars, Low platform 840 mm dia, air brake, fit for high speed (100 Kmph) axle load = 10.5t, pay load = 10t, Gross load = 42t, No. of wagons per rake = 18
6.	BFNS	Special wagons for transportation of HR coil, Tare weight 23.6t, payload 57.7t suitable for accomodating various sizes of coils Adjustable stoppers have been provided for suitable placement of coil in the groove and preventing longitudinal shifting of coils. The length and width have been kept equal to BRN wagons to facilitate loading flat products as being done on BRN wagons, Fit to run at 100 Kmph, The commercial production is yet to start.
7.	BCW (Holding = 125)	It is privately owned by M/s. Bulk Cement Corporation India Ltd. and are based at Wadi, Sholapur Division of CR, to run between Wadi and Kalamboli (Mumbai Division). Axle Load = 20.32t. The wagon is fitted with Air Brake.
8.	BTPGL	Bogie liquefied petroleum gas tank wagon, tare 45.7t, CC 35.5 t, Gross 81.28t. The wagon is fitted with automatic vacuum brake, length over head stock 18000 mm, length over Coupler faces 19282 mm.
9.	BTPGLN	Bogie liquefied petroleum gas tank wagon, tare 41.60t, CC 37.6 t, Gross 79.20t. The wagon is fitted with Air brake system, length over head stock 18000 mm, length over coupler faces 19282 mm

