

Bogie and Suspension (Freight Stock)



Topics to be covered

❖ Suspension System and it's Mechanism

❖ CASNUB Bogie

- Requirements
- Force transmission
- Different versions
- Some salient features
- Important components
- Must change items

Definition of Bogie (Trolley)

❖ *As per* **REVISED CONFERENCE RULES PART – III**

The term “Bogie” is used for the assembly comprising the structure including the side frame, bolster, centre pivot and side bearers, suspension components, wheels and axles etc., which support the wagon body at each end.

Suspension System and it's Mechanism

Spring Mechanism

- ❖ Linear or Step/Non linear
- ❖ Bumps (Limiters)
- ❖ Progressive spring characteristics
- ❖ Dampers

Criteria for Selection of Stiffness

❖ Space

- Floor height
- Accommodation at bolster level

❖ Tare and gross weight

- Deflection in two stages
 - Free to tare: Maximum buffer height is 1105 mm.
 - Tare to gross: Permissible maximum buffer drop is 75 mm.

❖ Residual Deflection

- Must not go 'home' under the adverse condition
- Kept at least 15 % of the total deflection

❖ Handling and maintainability

❖ Natural frequency to avoid resonance

Spring Types

❖ Coil Springs

❖ Flexi coil springs

- A larger height to mean coil diameter (H/D) ratio.
- Required more space to accommodate.
- Used in secondary suspension of **LHB Coach**.

❖ Air springs

- Offer optimum stiffness at all loads.
- Must needed in case of **DEMU**.

❖ Solid Springs

- Rubber pads.
- PU pads.
- Used in **buffers**.

Dampers/ Shock Absorbers

- ❖ Hydraulic dampers
- ❖ Friction dampers
 - Friction wedge block arrangement in CASNUB bogie
 - BSS hanger and block arrangement in ICF bogie
- ❖ Pneumatic dampers
 - Use of 60 litres capacity Aux. Reservoir in coaches fitted with Air Suspension.
- ❖ Rubber/ composite
 - Silent blocks..

Bogie of IR Freight Stock

Requirements from a Bogie

- ❖ Linear/Curving requirement.
- ❖ Energy transmission and control:
 - Linear: vertical, lateral, longitudinal.
 - Rotational.
- ❖ Roll prevention requirement.
- ❖ Ability to filter out the irregularity between track and bogie.
 - Concept of offloading.
- ❖ Ability to bear the static load..

Vertical Force Transmission

Wagon Body → Centre pivot + Side Bearer → Bogie bolster→

→ Secondary suspension → Spring Plank → Bogie side Frame →

→ E M Pad → Adopter → Bearing → Axle → Wheel Disc → Track .

Tractive Force Transmission

Wagon Body → Center pivot → Bogie bolster → Bogie frame →
→ Pedestal jaw → Adopter → Bearing → Axle

Versions of Wagon Bogie

- ❖ CASNUB :22W (not in use)
- ❖ CASNUB :22W (Retrofitted)
- ❖ CASNUB :22W(M) first modification
- ❖ CASNUB :22NL, **22NLB**, 22 NLM and **22 NLC**
- ❖ CASNUB :22HS, 22HS (Mod:I) and 22HS (Mod:II)
- ❖ IRF: 108 HS
- ❖ LCCF 20 (C)

CASNUB 22W

- ❖ Wide jaw adapter category without elastomeric pad.
- ❖ IRS type centre pivot
 - **No locking at Centre pivot and bolster pin.**
- ❖ Clearance type side bearer with two rollers.
- ❖ The brake beam “pocket/sliding type”.
 - The brake head, integral part of the brake beam, slides in the pocket provided in the side frame.
- ❖ Maximum speed 75 KMPH.

CASNUB 22W (Retrofitted)

- ❖ Elastomeric pad retrofitted with modified wide jaw adapter
- ❖ Lower diameter wheel sets to retrofit E M Pad.
- ❖ Modified Wide jaw adapter
- ❖ Constant contact side bearer

CASNUB 22W(M)

- ❖ EM pad introduced along with the wide jaw adapter.
- ❖ Side frame with negative camber
 - For getting same buffer height while using EM pad.
- ❖ UIC type Spherical type centre pivot
 - **fitted with bolster pin with castle nut and split pin.**
- ❖ Constant contact type side bearer
 - metal bonded housed in modified housing.
- ❖ Suspended hanger type Brake beam introduced
 - **Discontinued in the later versions of the bogie.**

CASNUB 22NL

- ❖ The side bearer, centre pivot, bolster
 - similar to 22W(M) version.
- ❖ “Narrow jaw” category introduced.
 - **the adapter used of smaller size for all further later versions.**
- ❖ Side frame modified to accommodate
 - sliding type b/beam hanger similar to 22W version
- ❖ **Centre pivot pin is locked by shackle lock.**

CASNUB 22NLB

- ❖ Similar to 22NL version, except for bolster.
- ❖ The shape of the bolster is “fish belly” at the centre to reduce the weight of bogie.
- ❖ However only a marginal weight reduction compared to NL type has been possible.

CASNUB 22NLM

- ❖ Similar to NLB version in relation to dimension.
- ❖ Material of the side frame and bolster is changed.
 - Resulted in reduction of the bogie weight.
- ❖ The weight of the NLM version bogie is 5.125T where as the weight of NL version is 5.5T.

CASNUB 22HS & IRF 108HS

- ❖ UIC type spherical centre pivot/ Flat centre pivot.
- ❖ Developed for operation at speed 100 Kmph.
- ❖ Almost same as NLB type except
 - Outer gib opening increased to 241 from 234 mm.
 - higher diameter spigot for the spring seat.
- ❖ The side bearer used was spring loaded type.
 - **Now PU type used.**
- ❖ Two stage suspension is
 - Softer in tare and
 - Stiffer in gross.
- ❖ Higher lateral clearance between frames and bolster.

CASNUB 22NLC

- ❖ 25 t axle load
- ❖ Same as CASNUB 22 NLB, except modification in suspension.
- ❖ Used in BOBRNEL, BOYEL, BOXNEL, BOBSNM1 (iron ore side discharge)

LCCF 20(C)

- ❖ Suitable for low platform BG Container Flat
- ❖ Fitted with 840 mm dia. wheel sets
- ❖ Cartridge bearings with wide jaw adapter, side frame keys with key bolt
- ❖ Spring loaded side bearers
- ❖ Top centre pivot, retaining ring, centre pivot pin with shackle lock & pin.
- ❖ Spring loaded side bearers

SALIENT FEATURES of Bogie

Axle Load

❖ Modified CASNUB 22HS (Mod: I)	: 22.32 t
❖ CASNUB 22HS (Mod: II)	: 22.32 t
❖ CASNUB 22NLC	: 25.0 t
❖ IRF 108HS	: 23.5 t

All other bogies: 20.32 t,

However can be upgraded to CC+8t+2t with certain changes in the suspension.

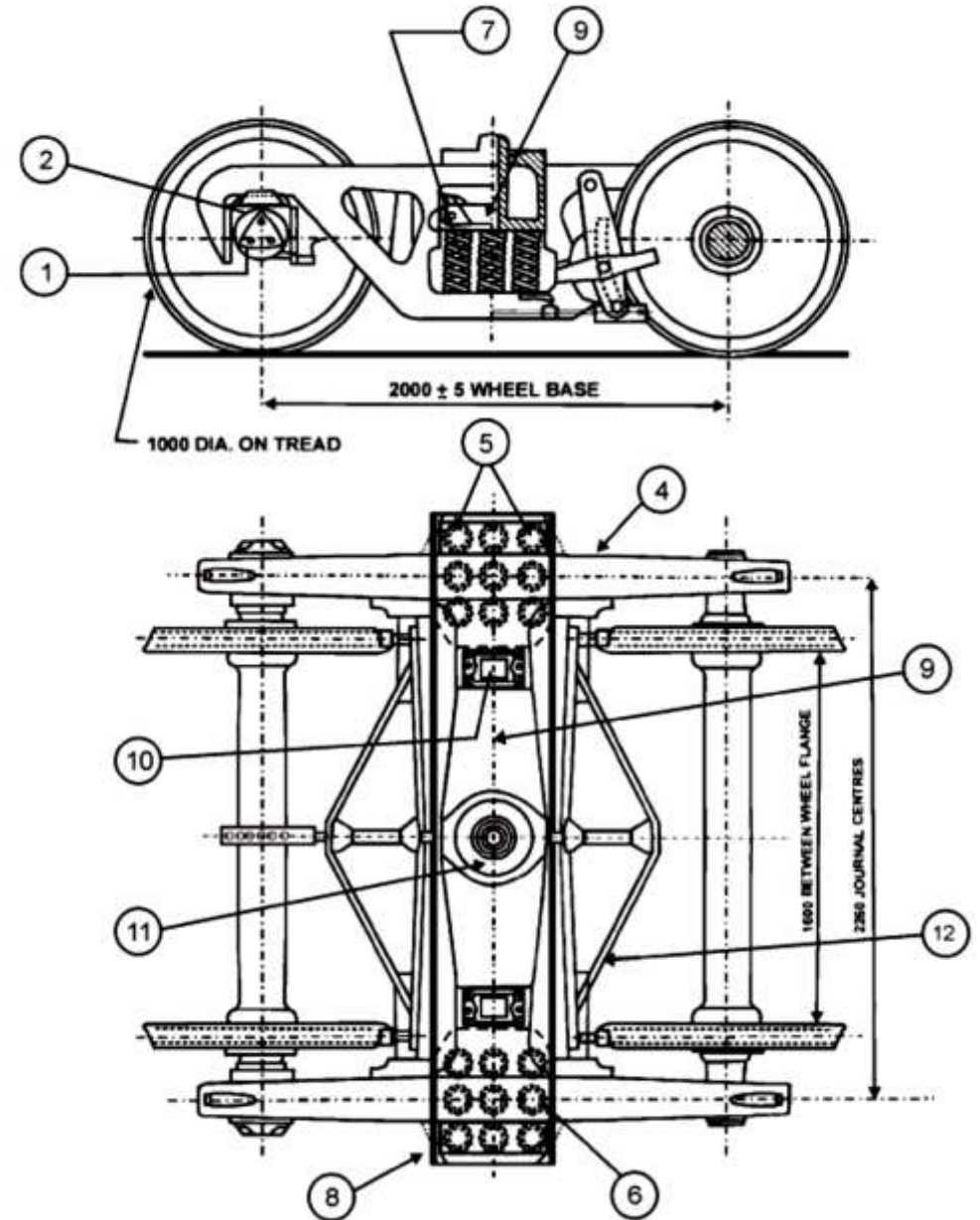
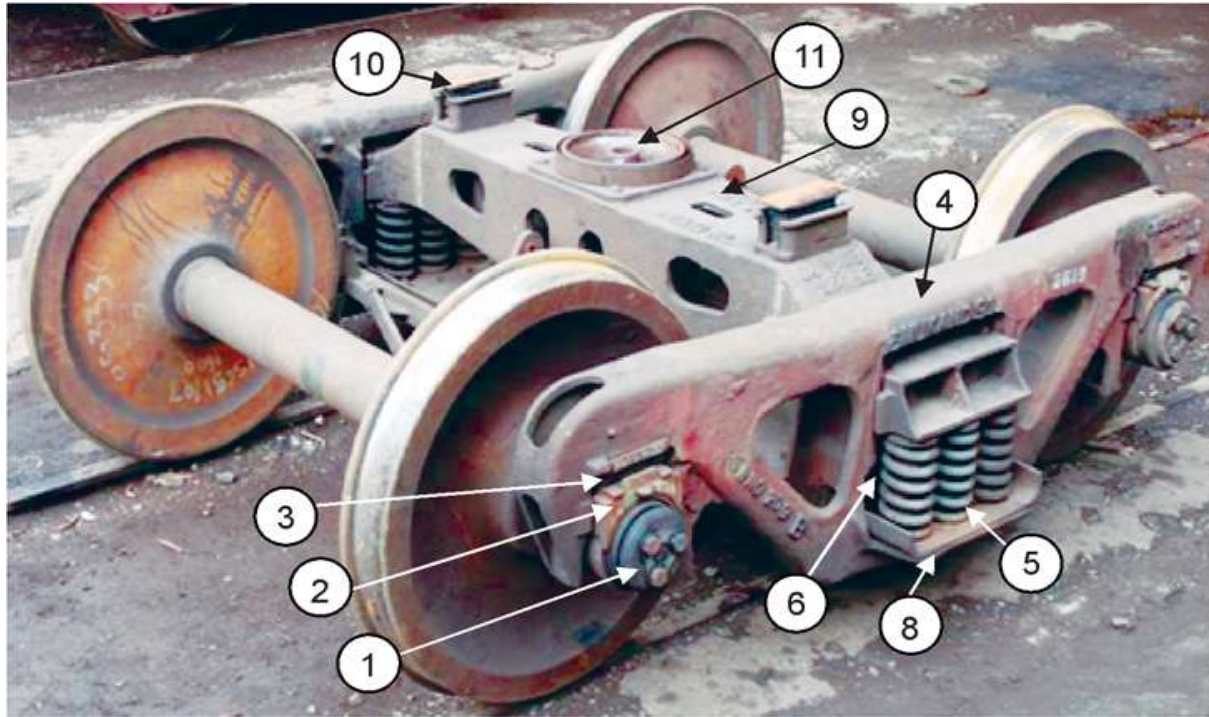
Some Salient Features

- ❖ Distance between journal centres : 2260 mm
- ❖ Distance between side bearers : 1474 mm
- ❖ Wheel Base : 2000 + 5 mm (Provision of Buttons on side frame)
- ❖ Wheel Diameter
 - Standard : 1000 mm for all except LCCF 20 (C)
: 840 mm for LCCF 20 (C)
 - Condemn : 906 mm for all except LCCF 20 (C) and CASNUB 22 NLC
: 955 mm for CASNUB 22 NLC
: 780 mm for LCCF 20 (C)
- ❖ Type of Centre Pivot
 - Spherical type : CASNUB 22W(M), 22 NL, NLB, NLM, NLC, 22 HS, and IRF-108HS
 - Flat type : CASNUB 22HS, HS(Mod-I), HS(Mod-II), LCCF 20 (C)

Main Components

- ❖ Centre pivot arrangement
 - Comprising of Centre pivot top, Centre pivot Bottom, Centre pivot pin, Centre pivot retainer & locking arrangement
- ❖ Side Bearers and Bolster with wear liners
- ❖ Load bearing springs and snubber springs, Friction shoe wedges
- ❖ Spring plank, fit bolts & rivets
- ❖ Side frames with friction plates and brake wear plates
- ❖ Elastomeric Pad, adapter, retainer bolt & side frame key assembly
- ❖ Wheel set with Cartridge Bearing
- ❖ Bogie Brake Gear and Brake Beam

View of CASNUB Bogie

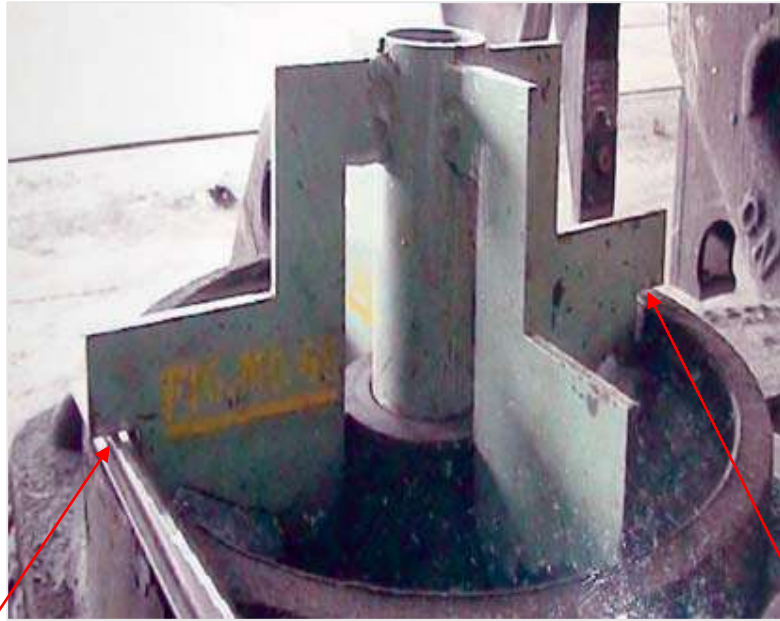


Types of Centre Pivot Arrangement

Centre Pivot Arrangement	Drawing No
CASNUB 22W(M),NL,NLB, NLM,NLC, CASNUB 22 HS bogies	WD-85079-S/2
CASNUB 22HS,HS(Mod-I),HS(Mod-II)	WD-97049-S/3
IRF 108HS	WD-98014-S/4
LCCF 20(C)	Integral part of Bolster



Centre Pivot Gauge



For Vertical Side Wear:
Max. Gap 7 mm is
observed

For Seat Wear:
no touching is
observed

- To measure Seat Wear
 - Wear Limit 4 mm
 - Place the gauge in position.
 - Rotate the gauge.
 - No touching is observed.
- To measure Vertical Side Wear
 - Wear Limit 4 mm
 - Place the gauge in position.
 - Measure the gap.
 - Max. limit 7 mm

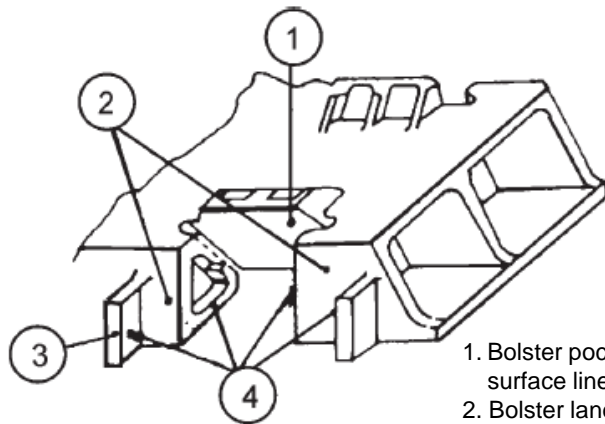
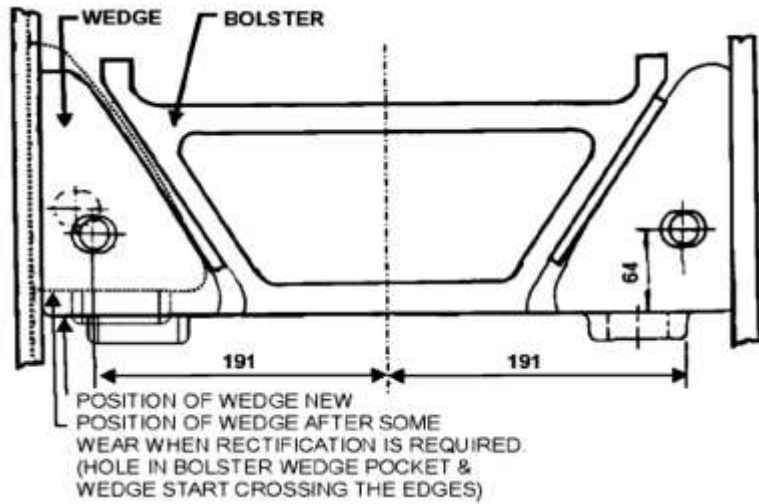
Side Bearers



- Takes the eccentric load during oscillations.
- Provides smooth horizontal motion to rotating bogie While negotiating curve.

Type	Free Height	Condemning Height
Metal bonded Rubber pad	114.0 + 3.0/ - 0.0 mm	109.0 mm
PU side bearer (Three Rings)	142.5 ± 1.6 mm	137.0 mm
PU side bearer (Two Rings)	134.0 ± 1.5 mm	128.5 mm

Bolster with Wear Liners



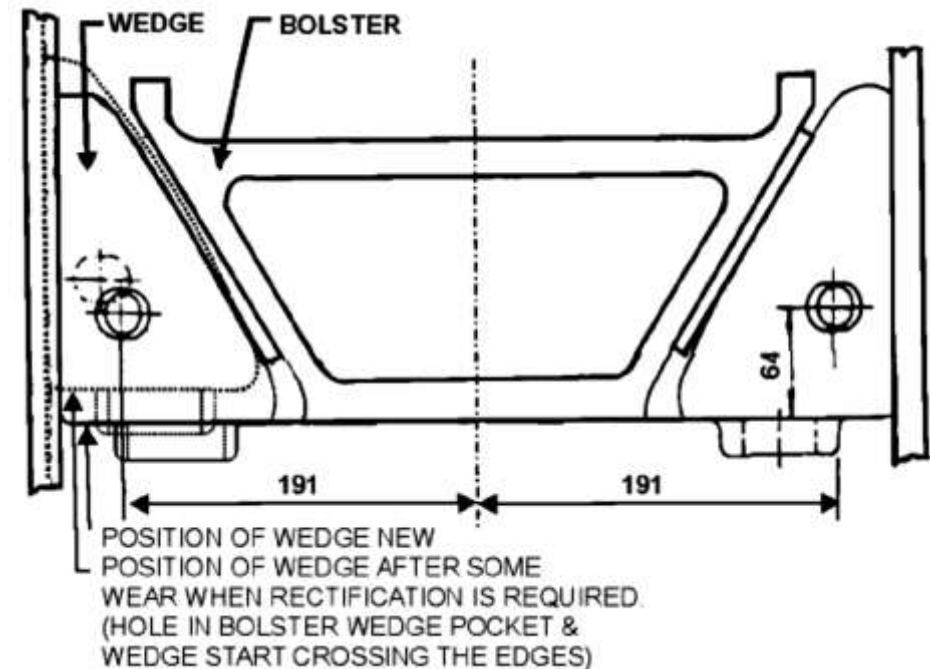
1. Bolster pocket slope surface liner
2. Bolster land surface/ liner
3. Rotation Stop Lugs/ Liner
4. Bolster Columns Gib (Inner and Outer)



Description	New	Worn	Wear Limit
Bolster Pocket Liner	8 mm	3 mm	5 mm
Bolster land surface	444 mm	438 mm	3 mm
Rotation Stop Lug	518 mm	512 mm	3 mm
Bolster Column Gib (outer)	234 mm/ 241 mm	244 mm/ 251 mm	5 mm
Bolster Column Gib (Inner)	136 mm	146 mm	5 mm

Friction Shoe Wedges

- ❖ The suspension is provided with load proportional friction damping arrangement
- ❖ Made of manganese steel cast wedge
 - Vertical surface of the wedge is in contact with side frame
 - Slope surface is in contact with bolster pocket liners.
 - Base is supported on the snubber springs under compression and, in turn, it presses the wedge upwards.



Load bearing springs and snubber springs

Spring Arrangement

Type of Bogie	Axle Load (in tonnes)	Number of Springs		
		(O)	(I)	(S)
22W(M), NL, NLB, NLM	20.32	12	8	4
Modified 22W(M), NL, NLB, NLM	22.82 CC+8+2	14	10	4
22HS	20.32	14	12	4
Modified 22HS	22.82 CC+6+2 & CC+8+2	14	14	4
22HS(Mod-I)	20.32	12	12	4
22HS(Mod-II)	22.32	12	12	4
22NLC	25	14	14	4
IRF-108HS	22.82/23.5	14	14	4
LCCF20(C)	20.32	14	12	4
LCCF20(C) Modified	22	14	14	4

Nominal Free Height

Type of Bogie	Spring Free Height Nominal (mm)		
	(O)	(I)	(S)
22 W(M), NL, NLB, NLM & NLC	260	262	294
22HS	260	243	293
22HS(Mod-I)	253	225	304
22HS(Mod-II)	253	222	304
IRF-108HS	264	246	296
LCCF-20(C)	260	243	288

- **± 3 mm for new spring**
- **15 mm less than nominal is the Condemning limit.**
- **Group Bands: Less than 3 mm free height variation (Total 3 Bands for new springs and 5 Bands for in-service springs.**
- **Mixing of new and old spring must be avoided.**

Wagons and their Bogie Type

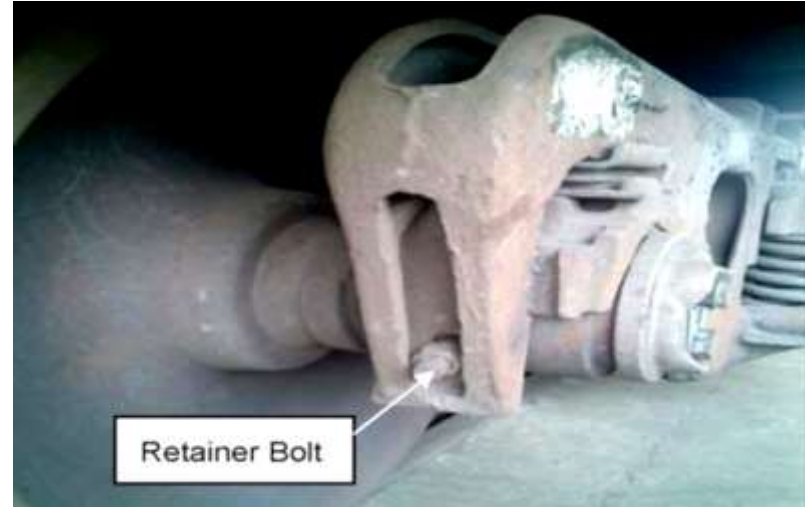
Bogie	Axle Load	Type of Wagon
CASNUB -22 NLB	20.32 t & 22.9 t	BOXN, BOXNM1, BCN, BCNM1, BCNA, BCNAM1, BOBR, BOBRM1, BOBRN, BOBRNM1, BRN, BRNA, BTPN, BTAP, BTPGLN, BOBYN, BOBSN, BOY, BCCW, BRSTN, BWTB, BOMN etc and M1 variant.
CASNUB -22HS	20.32 t & 22.82 t	BOXNHS, BOXNHSM1, BOXNLWM1, BCNHS, BCNHL, BCCW, BCNAHS BOBRNHS, BRNHS, BRN22.9, BRHNEHS, BOSTM1, BOBYN22.9, BOST, BOXNHL BOXNLW, BFNS etc and M1 variant of above.
CASNUB -22HS (Mod-I)	20.32 t & 22.32 t	BOSTHS, BOSTHSM1, BCBFG
CASNUB -22HS (Mod-II)	22.32 t	BOSTHS M2
CASNUB -22 NLC	25.0 t	BOBRNEL, BOYEL, BOXNEL, BOBSNM1
IRF-108HS	22.82 t	BOXNHAM, BOXNHA, BOXNR, BCCN
LCCF 20(C)	20.32 t & 22.0 t	BLLA/B, BLCA/B, BLCAM/BLCBM, BCACM, BCACBM

Side frames with friction plates brake wear plates

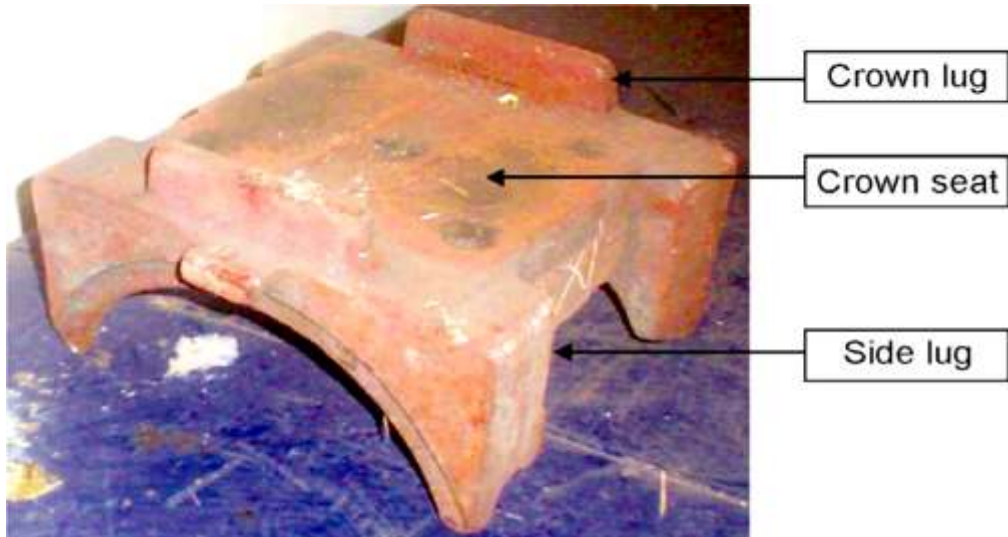
- ❖ Provided with liners
 - 10 mm thick permitted up to 6 mm.
 - Welding procedure recommended
 - New friction plate to be held tight against the column face
 - Down hand position
 - Start welding at diagonal ends of the plate and work towards the centre.
 - No paint or grease allowed.
- ❖ Wheelbase (distance between centre lines of the jaw openings): 2000 ± 5 mm.
- ❖ No difference between the numbers of buttons on the two-side frames.



EM Pad, Adapter, Retainer Bolt & side frame key



Adapter retainer bolt:
Provided in CASNUB 22W(M) bogie having wide jaw adapter



Must Change Items during ROH/ POH

❖ During ROH

- Side Frame Key nut bolt with washer (Since it is cut due to tach welded)
- Split Pin 12 x 110 mm of Brake Shoe key
- CTRB locking plate

❖ During POH

- All above items
- Pedestal Jaw Liners
- Land surface line
- Pocket slope liner
- Rotation stop lug liner
- E M Pad: If found serviceable, may be given to open line Maintenance Depot