TRACK FRIENDLY FREIGHT BOGIE

GLOBAL BENCHMARKS

Axle Load

- USA & Canada 32.5t
- BHP/Australia 40t/37.5t
- South Africa 26t
- China 25t

Trailing Loads

- Australia Max. 99734t Avg 7500t
- South Africa Max.20800t Avg 8000t

Speed potentials

- France 120 kmph
- South Africa 120 kmph
- USA 120 to 160 kmph

BOGIES PRIOR TO CC+8+2
(DIFFERENCES)

Description	22NLB	22HS	22 HS (Mod-1)
Secondary suspension	Outer 12 Inner 8 Snubber 4	Outer 12 Inner 8 Snubber 4	Inner 8 Inner 8 Snubber 4
CCSB	a) Rubber to metal bonded b) Polyurethane	Polyurethane	Polyurethane
Friction wedge	35 degree	35 degree	27 degree
Gib clearance	9.0 mm	12.5mm	12.5mm
Max. Speeds	75 (L) 80 (E)	100 (L &E)	100 (L &E)

Note: 1.Secondary suspension springs for these bogies are not interchangeable with each other because of stiffness value, coil diameter, numbers of coil, height etc.

2. Stiffness values of CCSB of 22 NLB and 22 HS/22 HS (Mod-I) are different.

Presently Permitted Speeds in CC+8+2 Configuration for major wagons

S.No	Type of Wagon	Bogie type	Speed (Empty) In Kmph	Speed (Loaded) In Kmph
2.	BOXNM1	NLB	80	60
3.	BOXNM1 (GZB – MGS)	NLB	80	75
3.	BOXNHSM1	HS	90	60 (Prov.)
4.	BOXNHSM1 (GZB – MGS)	HS	90	75
5.	BCNHSM1	HS	90	75
6.	BCNAHSM1	HS	100	75
	BOXNHL	HS	100	75

TRACK FRIENDLY BOGIE

- IR is procuring 4000 track friendly bogies with TOT from ASF KEYSTONE INC, USA
- Special features of this bogie are:-
  - Called Swing Motion Bogie
  - Designed for 25 tonnes Axle load
  - Same bogie can be used for 32.5 tonnes axle load in future by addition of suspension springs
  - Speed potential of 110 KMPH
  - Weight of bogie is approximately same as that of present CASNUB bogies

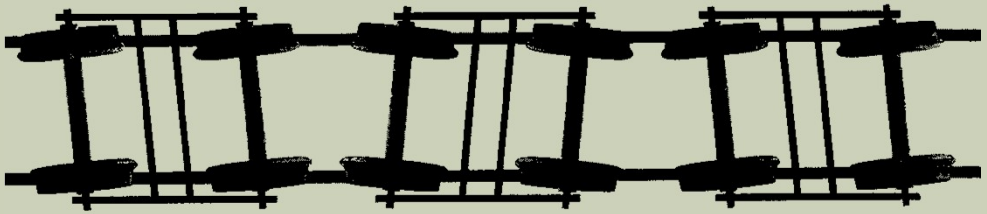


THEORETICAL PREVIEW TO SUSPENSION SYSTEM DESIGN CRITERIA

POTENTIAL SOLUTIONS

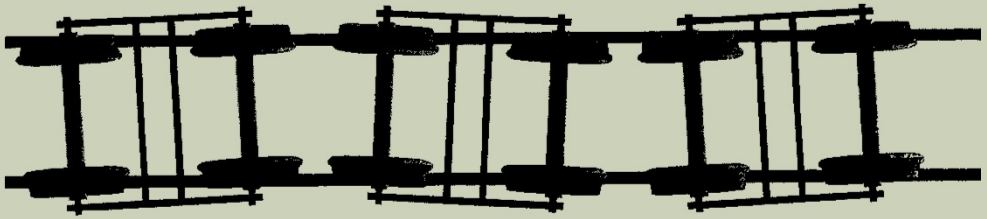
- Improve squaring / warp stiffness
  - ⇩ Ability for axles to hunt (but not entirely…)

Older Designs



Low Warp Stiffness

Current Designs



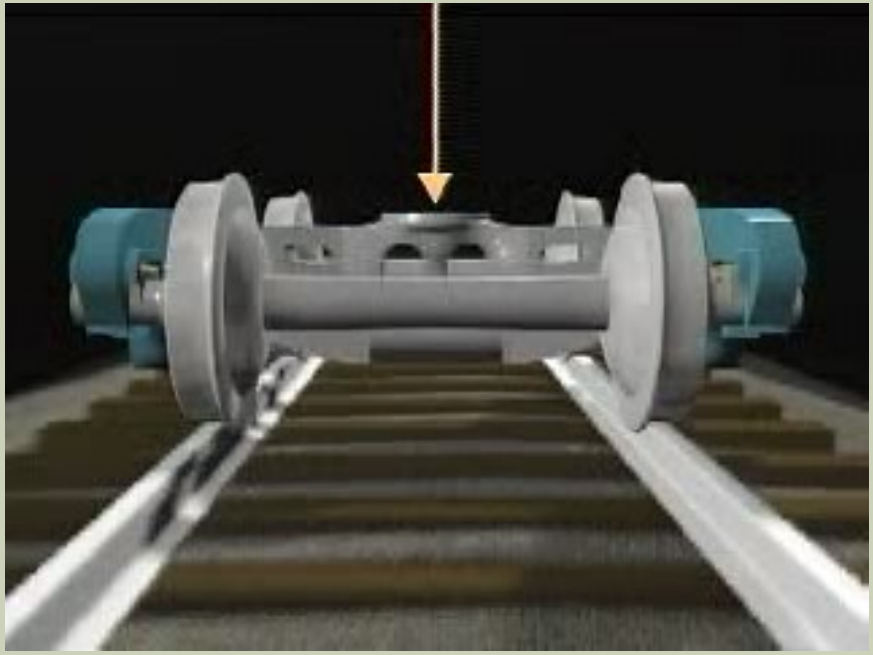
High Warp Stiffness

- Requires structural restraint (cross members, wider wedges, transom, external devices)
- Sensitive to component wear (rubber bushings for cross members, wedge friction surfaces)

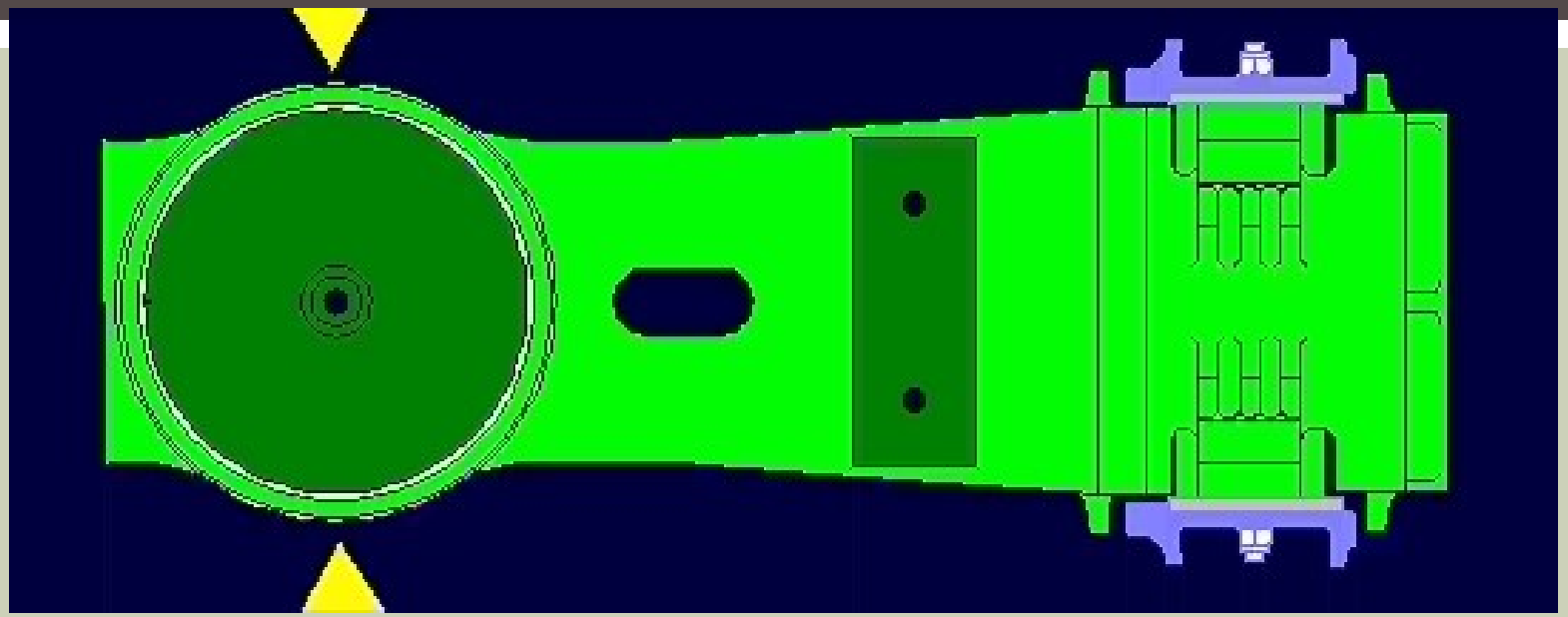
- Lateral dynamic forces due to high speed and track geometry errors
  - Can be dynamically high due to wheelset unsprung mass and bogie suspension forces from body motion.
  - Loaded wagons and locomotives produce higher lateral forces than empty wagons, even when empties are hunting violently
  - Because of lower vertical wheel loads, empties when hunting have very high wheel L/Vs .
  - *Vertical load* is the *stabilizing factor* which keeps track in place during lateral dynamic loading

POTENTIAL SOLUTION

- Lateral isolation of truck bolster/car structure from wheel inputs
  - ⇩stress in structure
  - ⇩ wear of components
  - ⇩ sensitivity to fit / wear of components



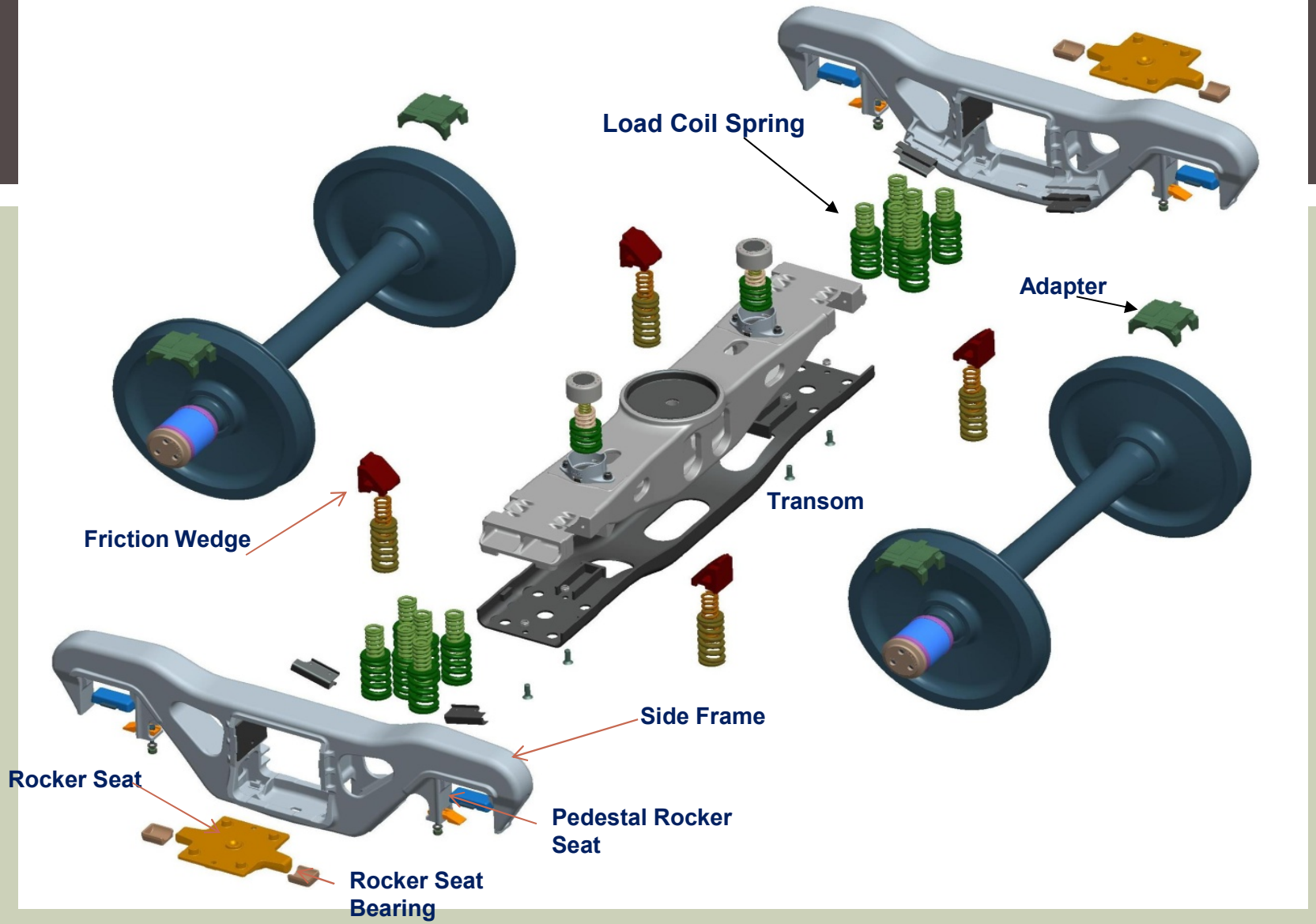
LATERAL ISOLATION



- Older 3-piece and Cross-brace designs provide limited adequate lateral isolation
- Bolster “gibs” impact sideframe columns

SWING MOTION BOGIE

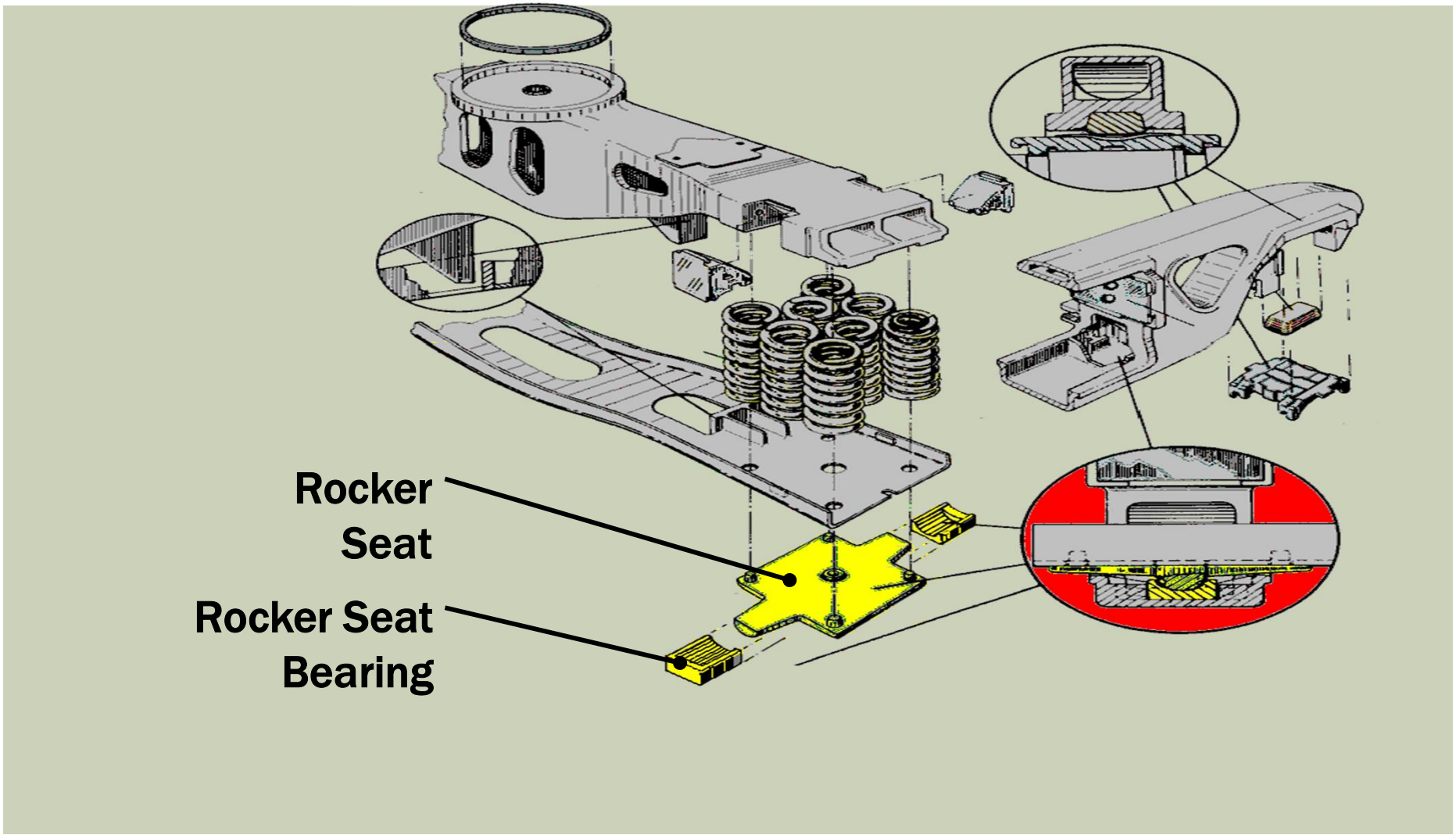
- The Swing Motion Bogie is a two-axle three-piece bogie of cast steel construction with credentials of-
- low maintenance
- reduced wheel to rail wear
- high speed operation without hunting
- Swing Motion Bogie.pps


Load Coil Spring
Adapter
Friction Wedge
Transom
Side Frame
Rocker Seat
Pedestal Rocker Seat
Rocker Seat Bearing

UNIQUE FEATURES OF SWING MOTION BOGIE

- Swing motion bogie design has two stage lateral suspensions
  - pivoting surface between the pedestal and the adopter
  - pivoting surface between the spring seat and the rocker assembly
- This arrangement increases lateral motion of the bolster

SUSPENSION SYSTEM

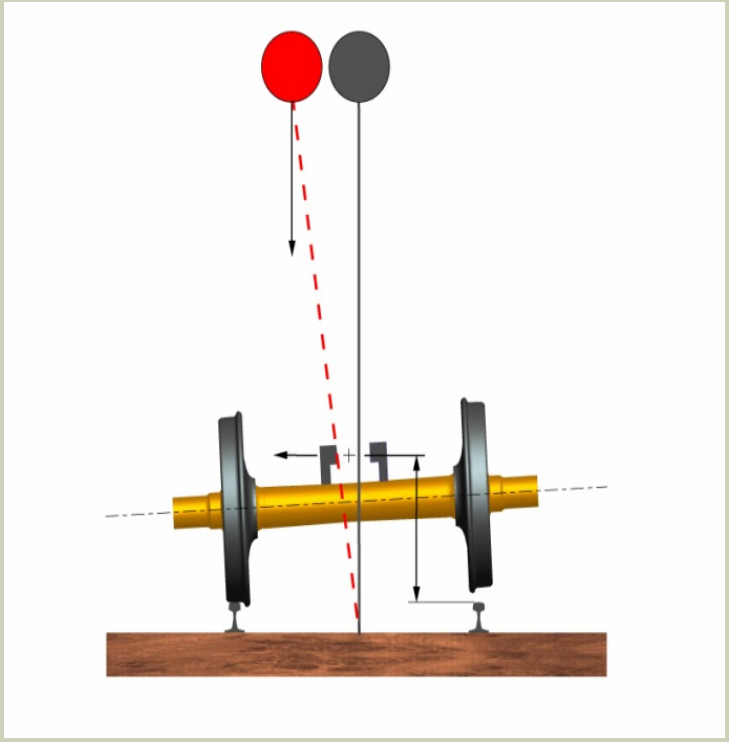


SWING MOTION CONCEPT

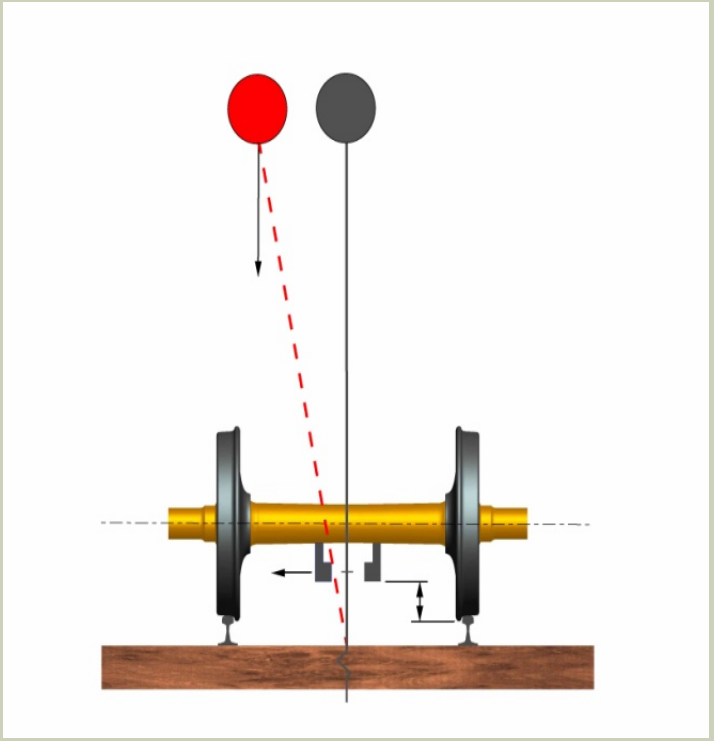
Lateral forces between wheel and rail and also wheel and rail wear get reduced considerably

Lateral Shift.pps

POINT OF APPLICATION OF LATERAL FORCES IS LOWERED FROM THE HEIGHT OF CONVENTIONAL BOLSTER GIBS TO THE HEIGHT OF SPRING SEAT, REDUCING THE WHEEL UNLOADING CONSIDERABLY



CASNUB BOGIE



SWING MOTION BOGIE

BROAD COMPARISON BETWEEN SWING MOTION AND CASNUB

	Swing motion	Casnub
Diameter of wheel	965 mm	1000 mm
Bearing	AAR Std. Class `M' 7"X9"	AAR Std. CTRB Class E 6''X11''
Wheel base	1880 mm	2000 mm
Height of CP top from R.L.	719.7/720.4 mm for BOXN25/BLC25	932 mm
Height of side bearer from R.L.	774.3 mm	921 mm
Spring plank	Seated on rocker	Riveted with side frame

COMPARITIVE ACCEPTANCE CRITERION

S. No.	Parameter	Specified Track Friendly Bogie Values		Existing Specified Values
		Empty	Loaded	
1	Derailment coefficient (Max.)	0.5	0.5	1
2	Lateral/transverse force lasting more than 2m (Hy2m) (tonnes).	Maximum 75% of Prud'homme Limit	Maximum 50% of Prud'homme Limit	Maximum 85% of Prud'homme Limit
3	Vertical ride index (maximum)	3.5	3.5	4.5
4	Lateral ride index (maximum)	3.5	3.5	4.5

BENEFITS

- Improved pay to tare ratio because of a lighter bogie. Same weight for 25t as that for current bogie at 22.82t
- Higher through put due to higher speed potential. 110kmph at 25t axle load
- Longer rail and rolling stock fatigue lives
- Reduced track maintenance efforts

…… BENEFITS

- wheel life of 1.6 million km under superior operating conditions
- swing motion bogie is expected to require POH at 8 year intervals
- potential wear items such as friction wedges, centre pivot etc guaranteed for 8 year life
- Reprofiling of wheels expected after 300,000 km. This raises possibility of ROH interval to at least two years

THANK YOU