



INTRODUCTION
&
DESIGN ASPECTS
ON COACHING STOCK FITTED WITH
HIGH TENSILE TIGHT LOCK
AAR TYPE 'H'
CENTRE BUFFER COUPLER

STC/SBC

Objective

- **To increase passenger safety,**
- **To reduce risk factor on working personnel, and**
- **To enhance train capacity**

REFERENCE

- IR specification C – K 009
Rev 01, issued by RDSO.

CBC COACH IDENTIFICATION



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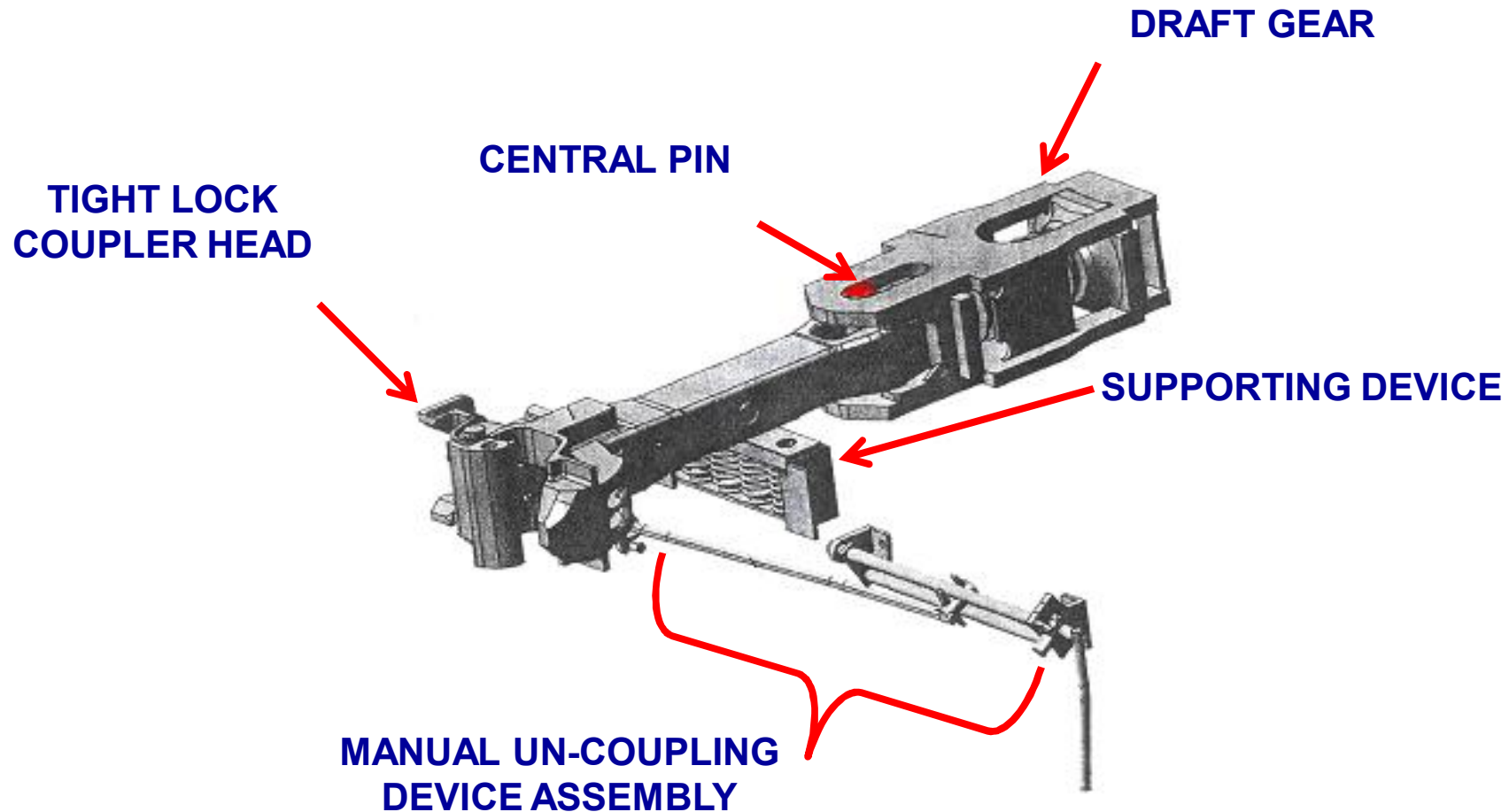
CBC MANUFACTURERS

■ FAIVELEY (SAB-WABCO)

■ AIKON (ASF-KEYSTONE)

■ ESCORTS

CBC COMPONENTS ARRANGEMENT (FAIVELEY MAKE)



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knuckle



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KNUCKLE PINS



LOCK



Knuckle pin diameter : 1-5/8` `

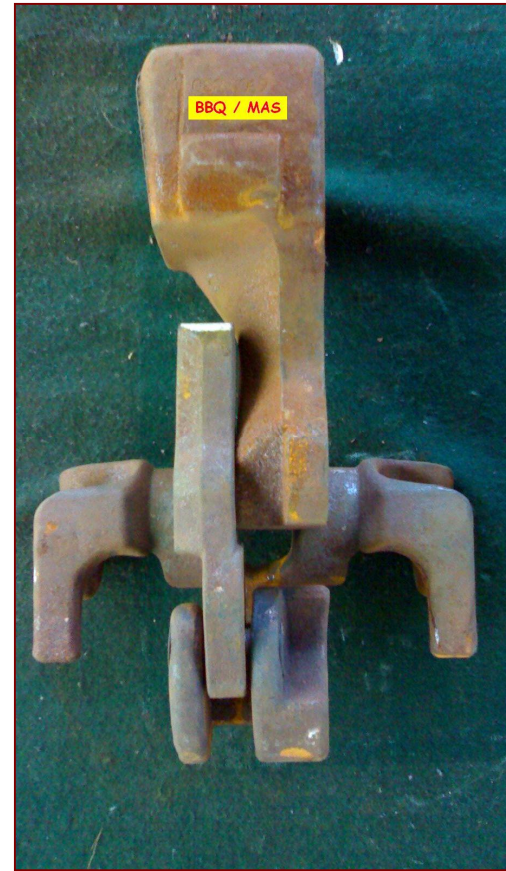
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Double Rotary Lever Lock Lift Assembly



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Lock with Lock Lift Assembly



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Toggle (Lock Lifter) on Wagon CBC



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Knuckle thrower



Knuckle Thrower



Yoke Pin – FAIVELEY



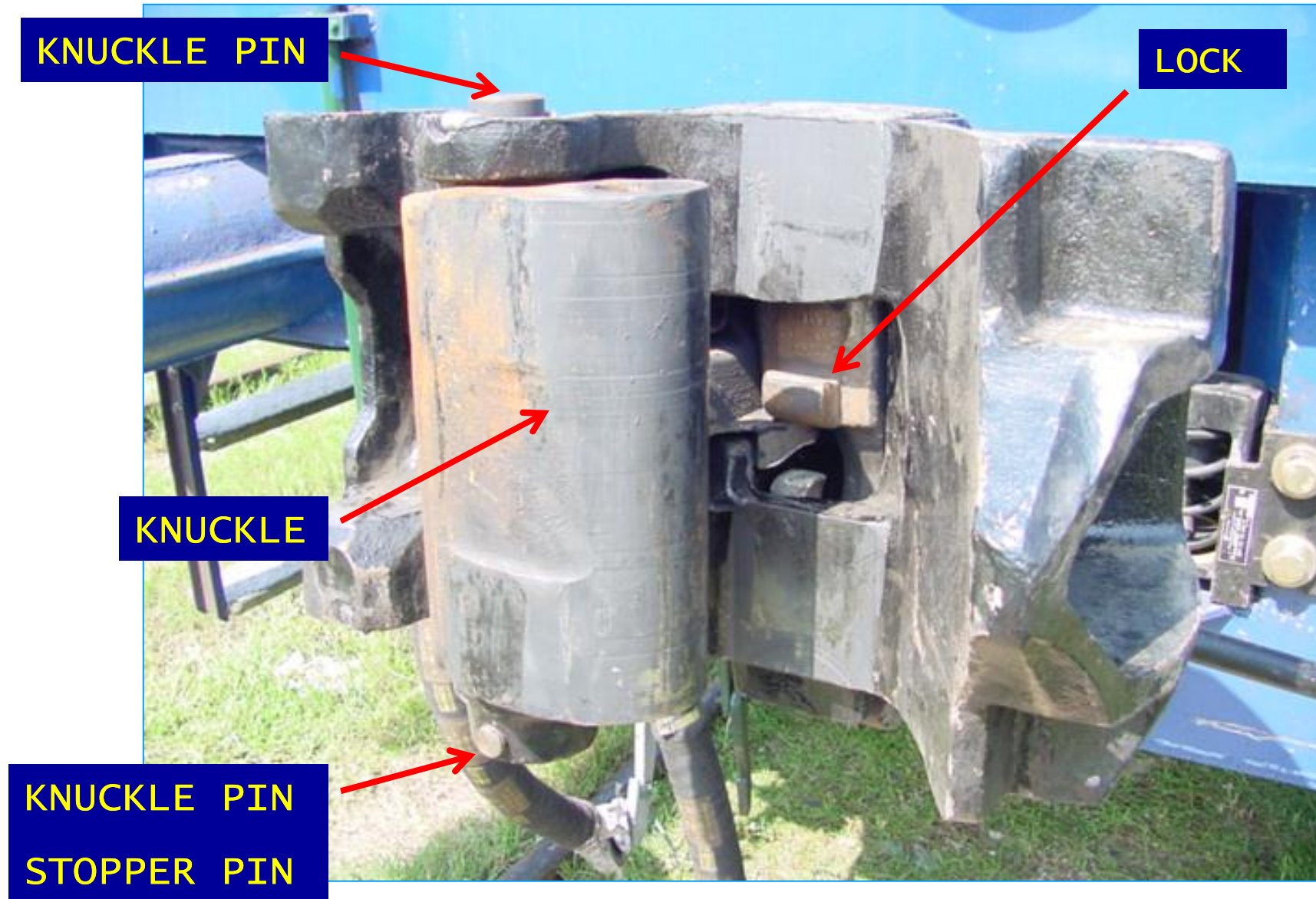
Diameter: 80mm



Height: 278±1mm

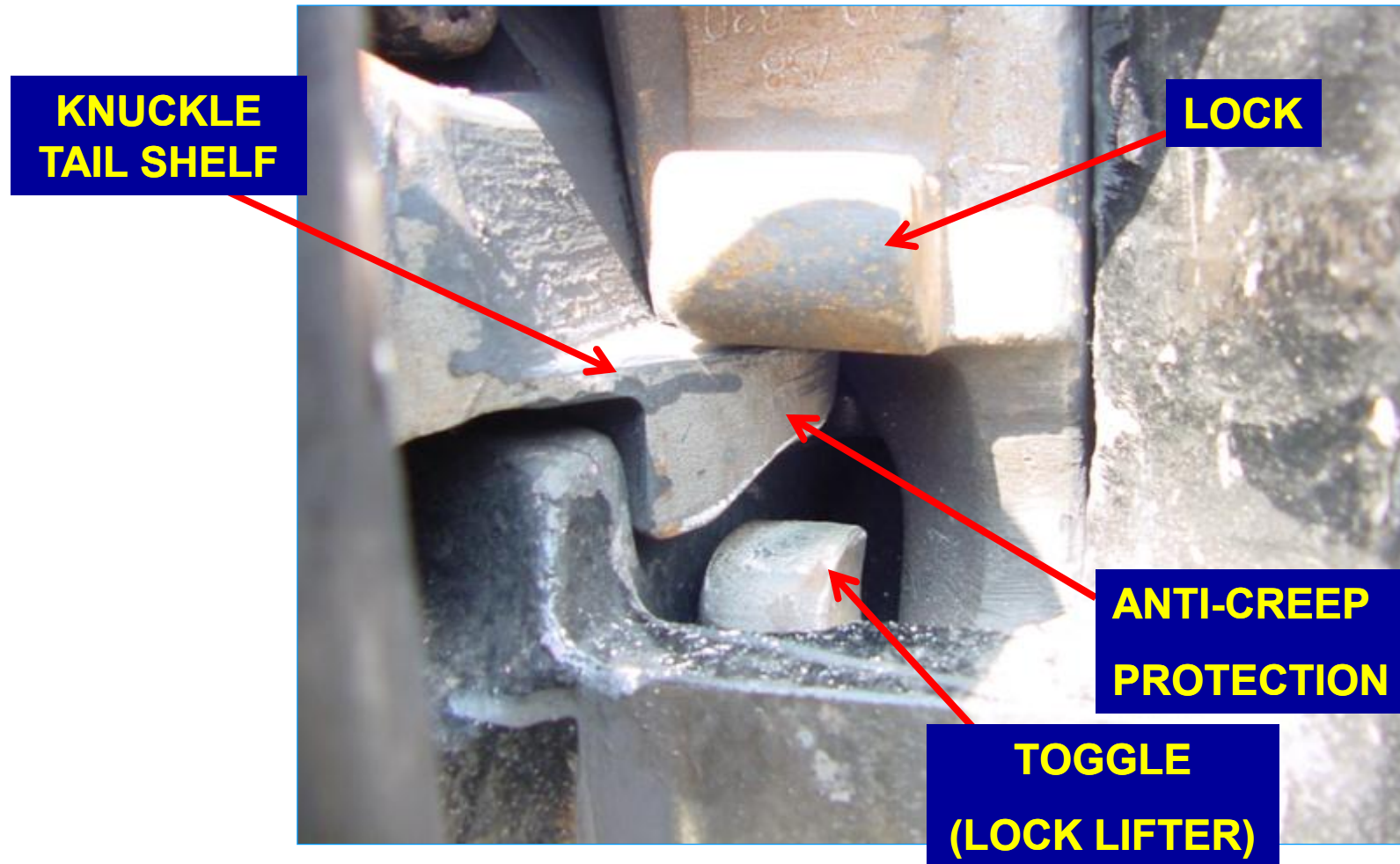
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CBC - Head Components



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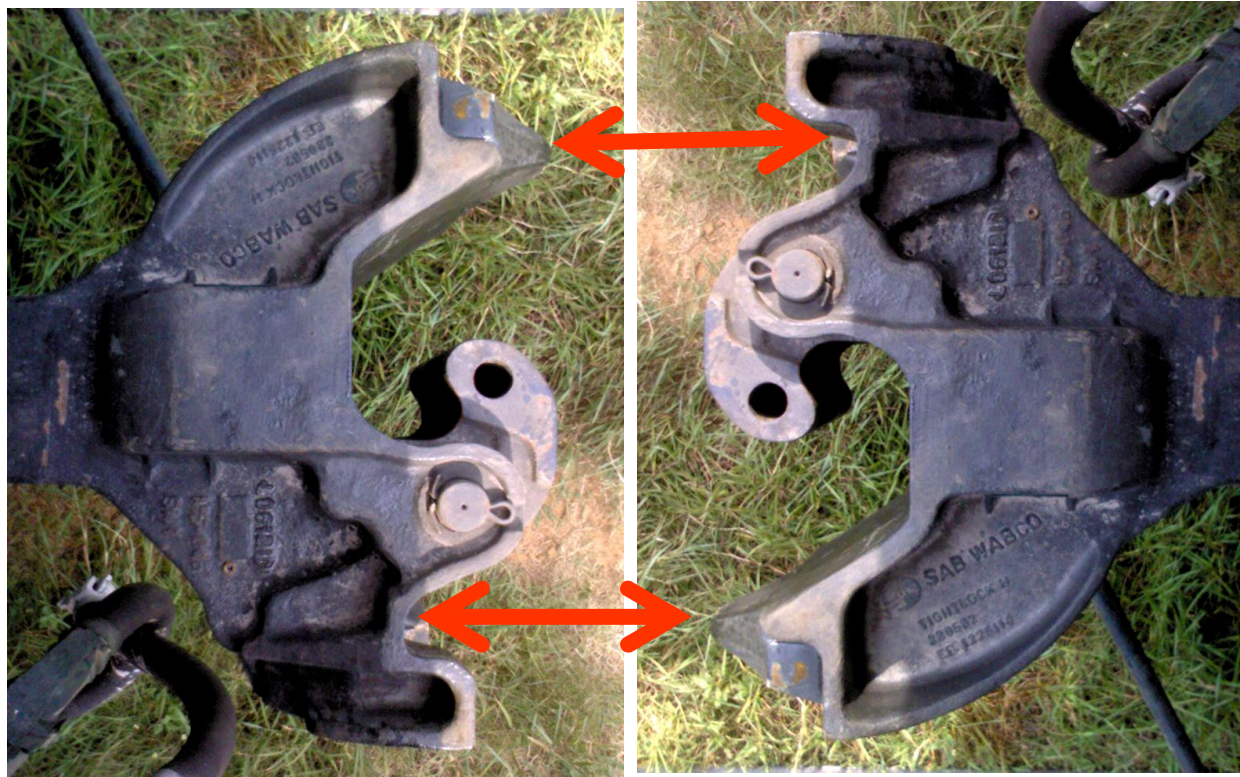
CBC HEAD CLOSER VIEW



SALIENT FEATURES OF CBC FITTED COACHES

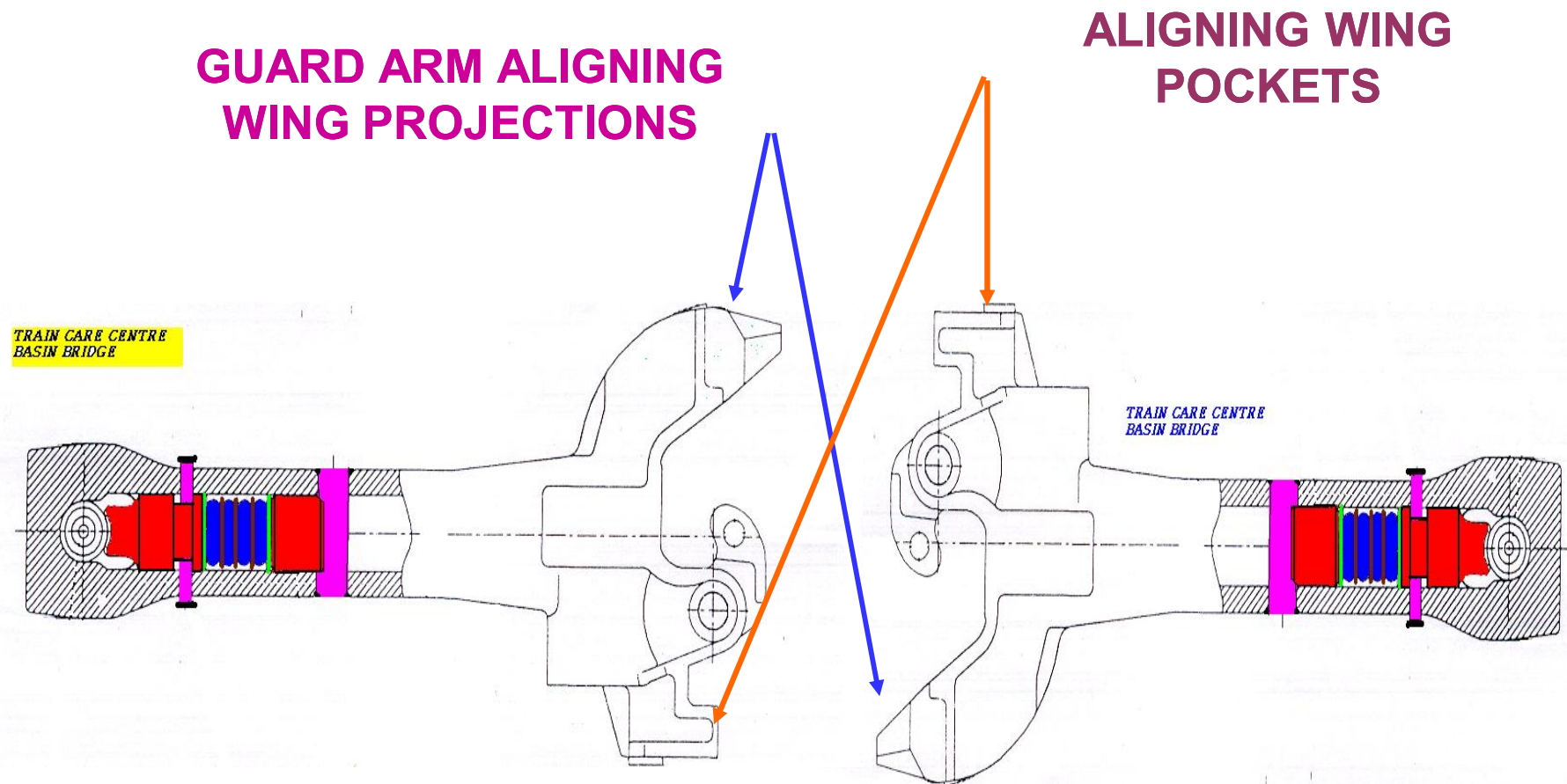


ANTI - CLIMBING FEATURE

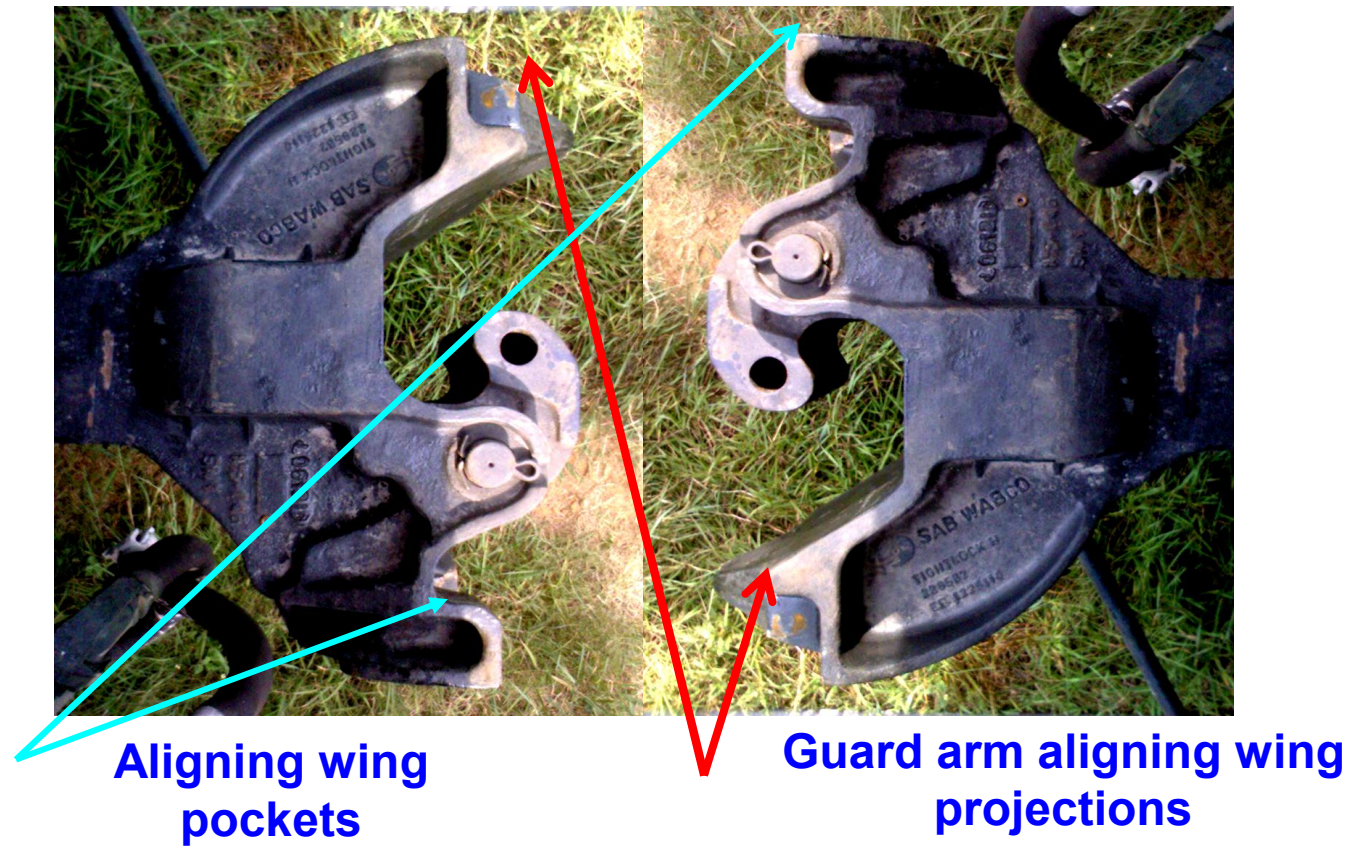


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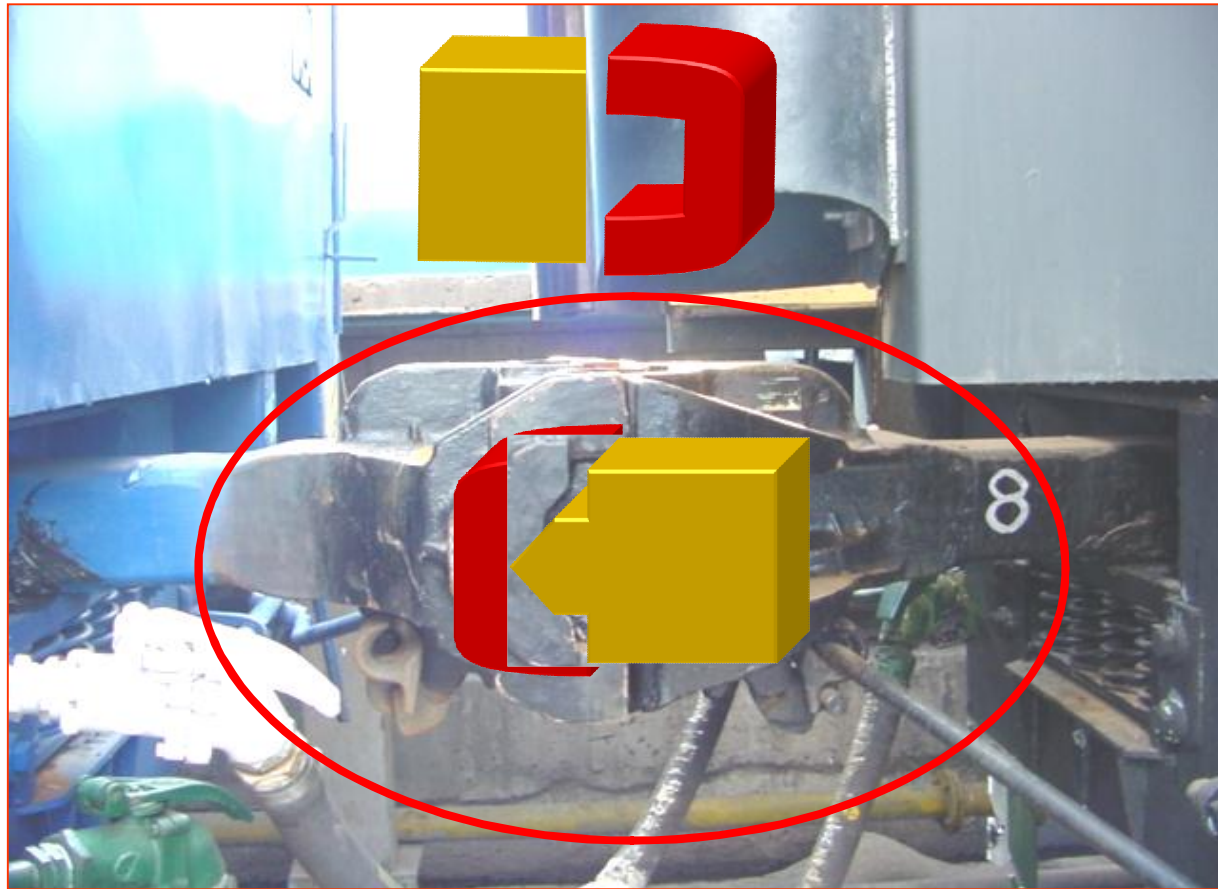
ANTI - CLIMBING FEATURE



Anti-Climbing Feature



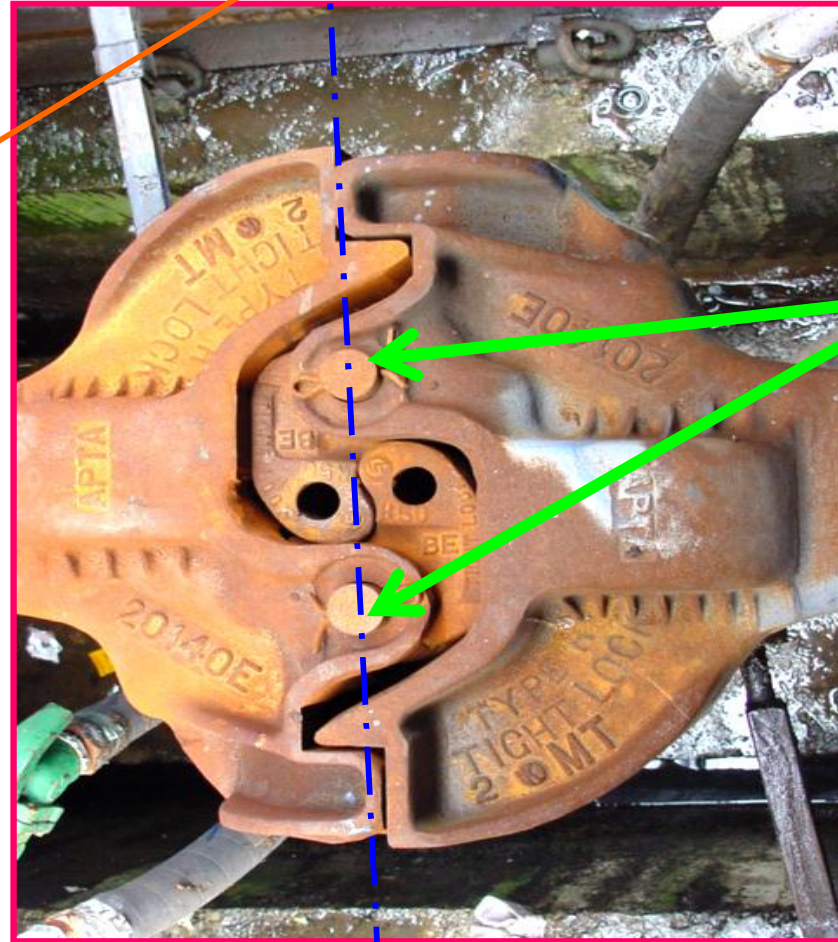
ANTI - CLIMBING FEATURE



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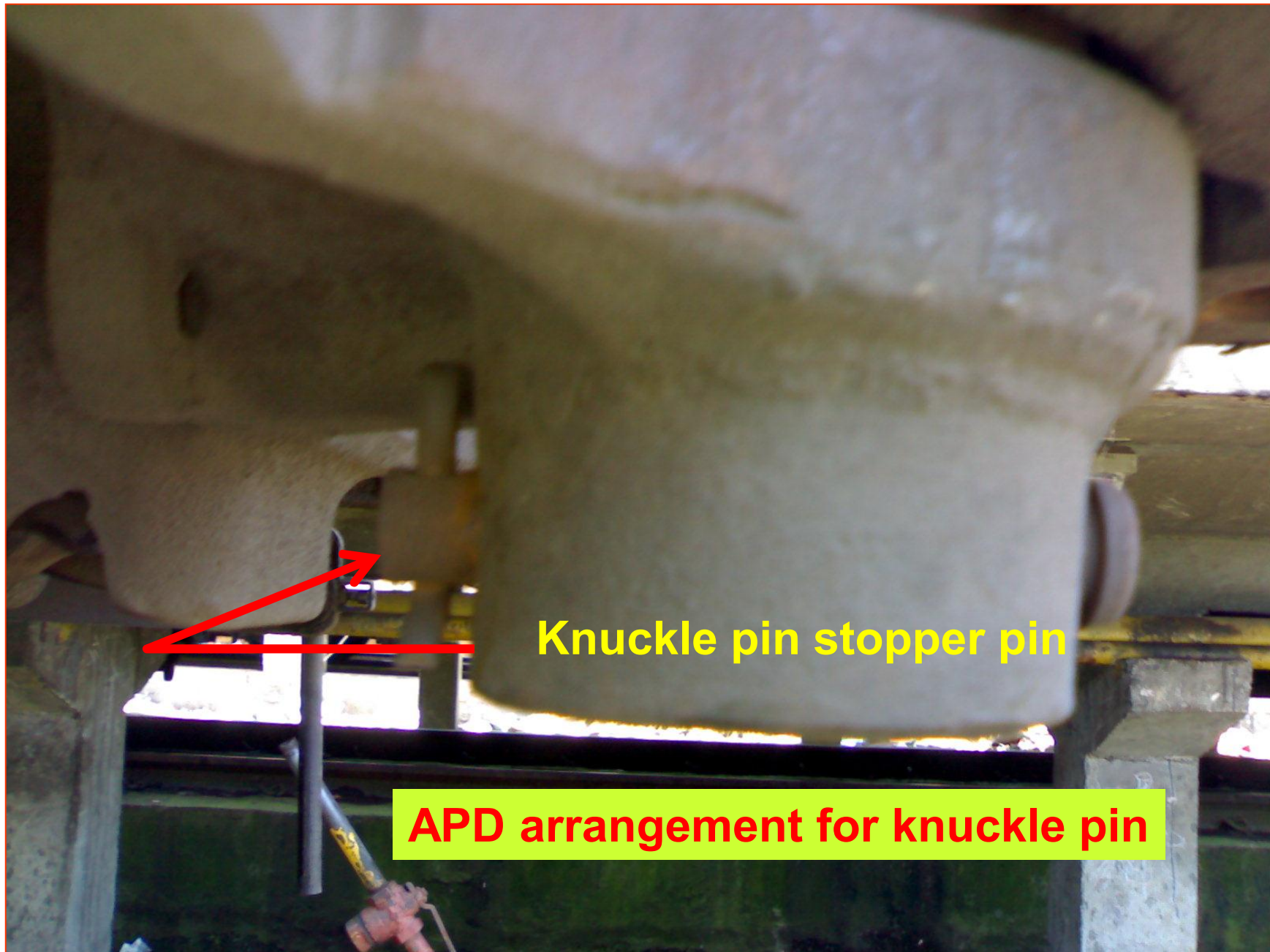
TOP VIEW OF COACH CBC'S IN COUPLED CONDITION

COUPLING
LINE

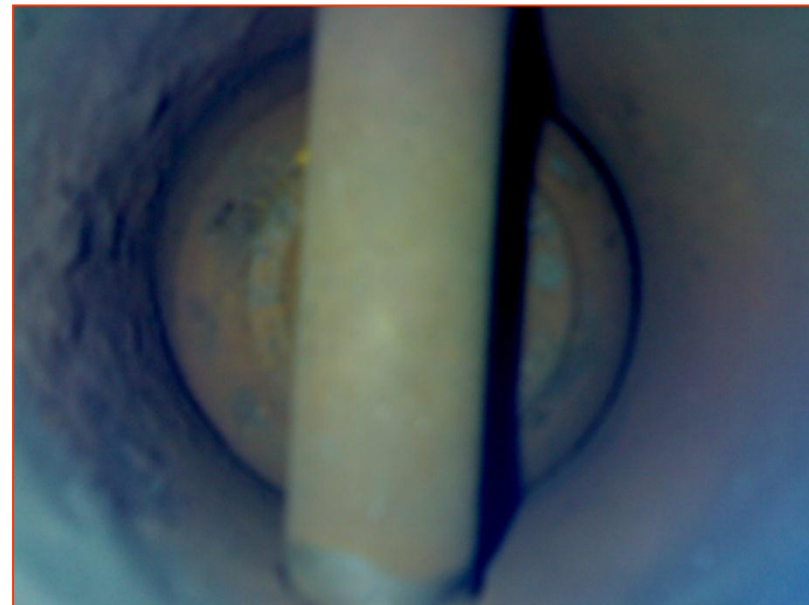
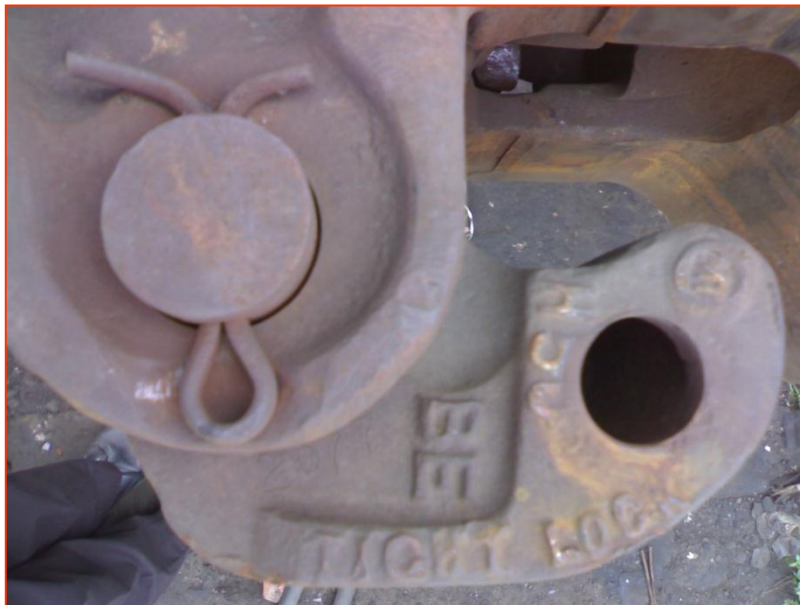


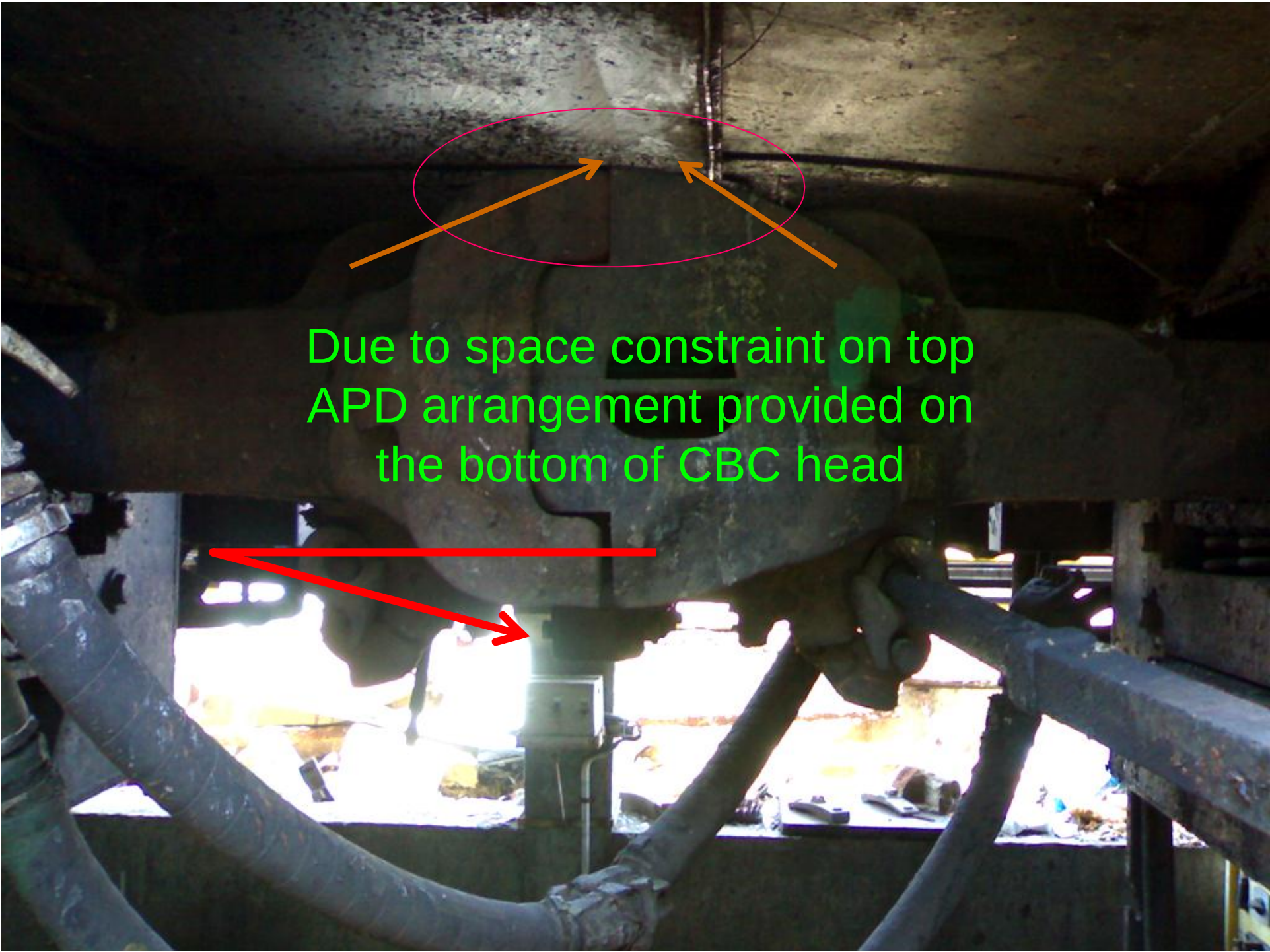
KNUCKLE PINS
ARE INSERTED
FROM
BOTTOM

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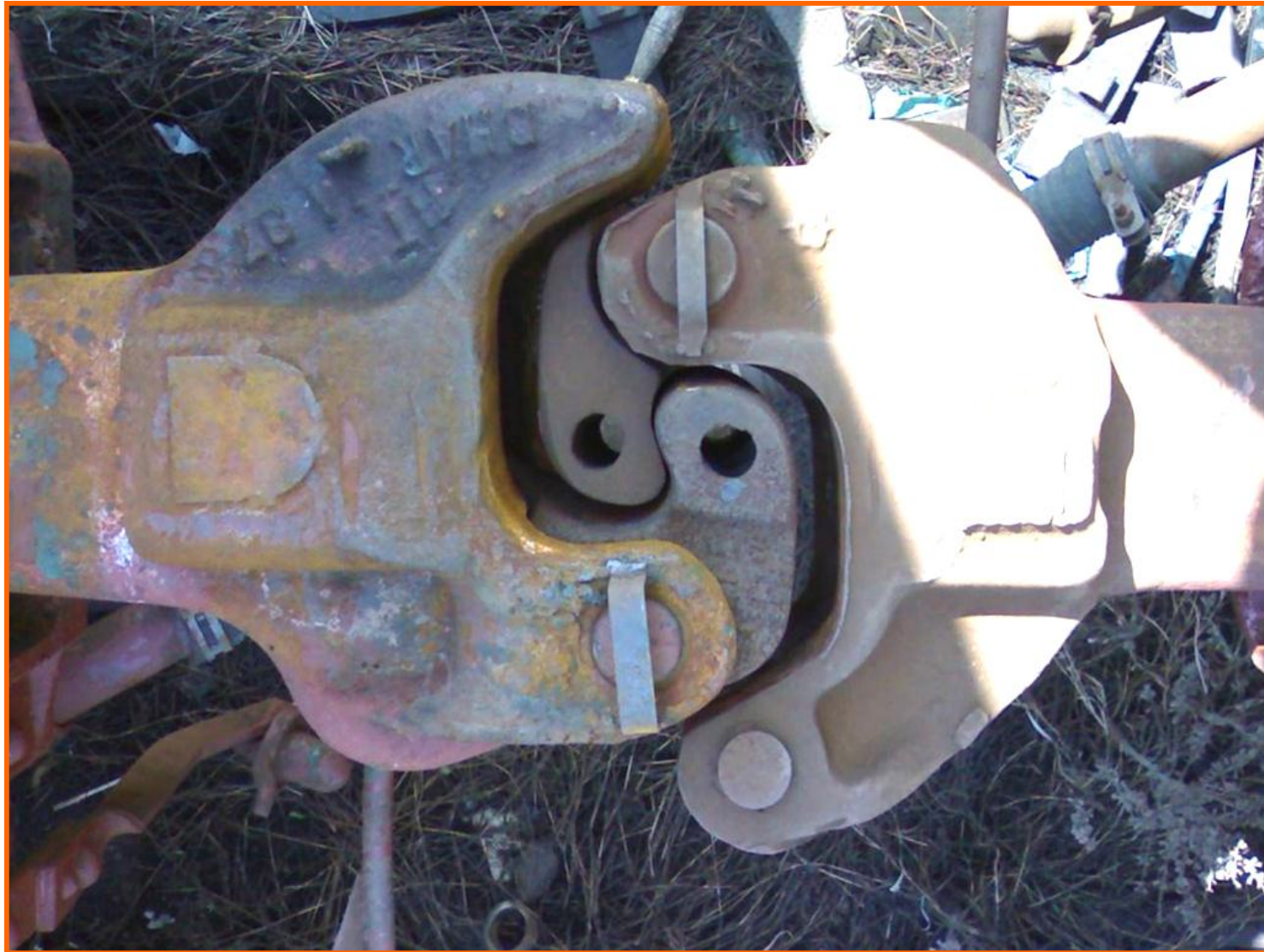
Knuckle Pin Arrangement





Due to space constraint on top
APD arrangement provided on
the bottom of CBC head

WAGON CBC



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- Coupler is of AAR type with tight lock (Anti - climbing feature) non - transition type and couplable with the existing AAR type- E couplers of locomotives.

Note: Recently SLRs are being fitted with modified AAR type with tight lock (Anti - climbing feature) transition type CBC, to accommodate IRS screw coupler coaches.

AAR type 'H' transition type CBC (developed by FAIVELEY)



Transition CBC Arrangement on FAIVELEY Make



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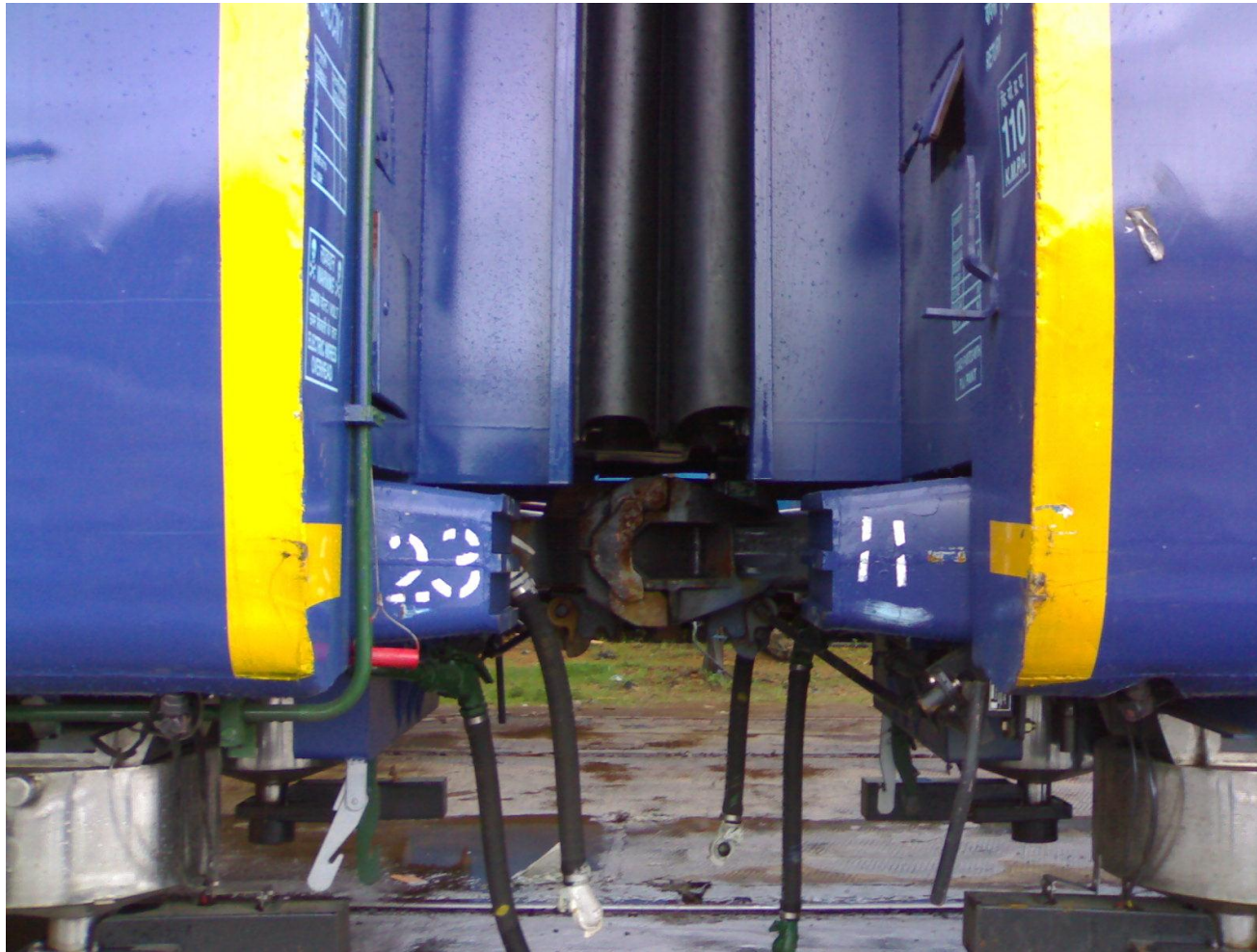
ANTI-TELESCOPIC FEATURE



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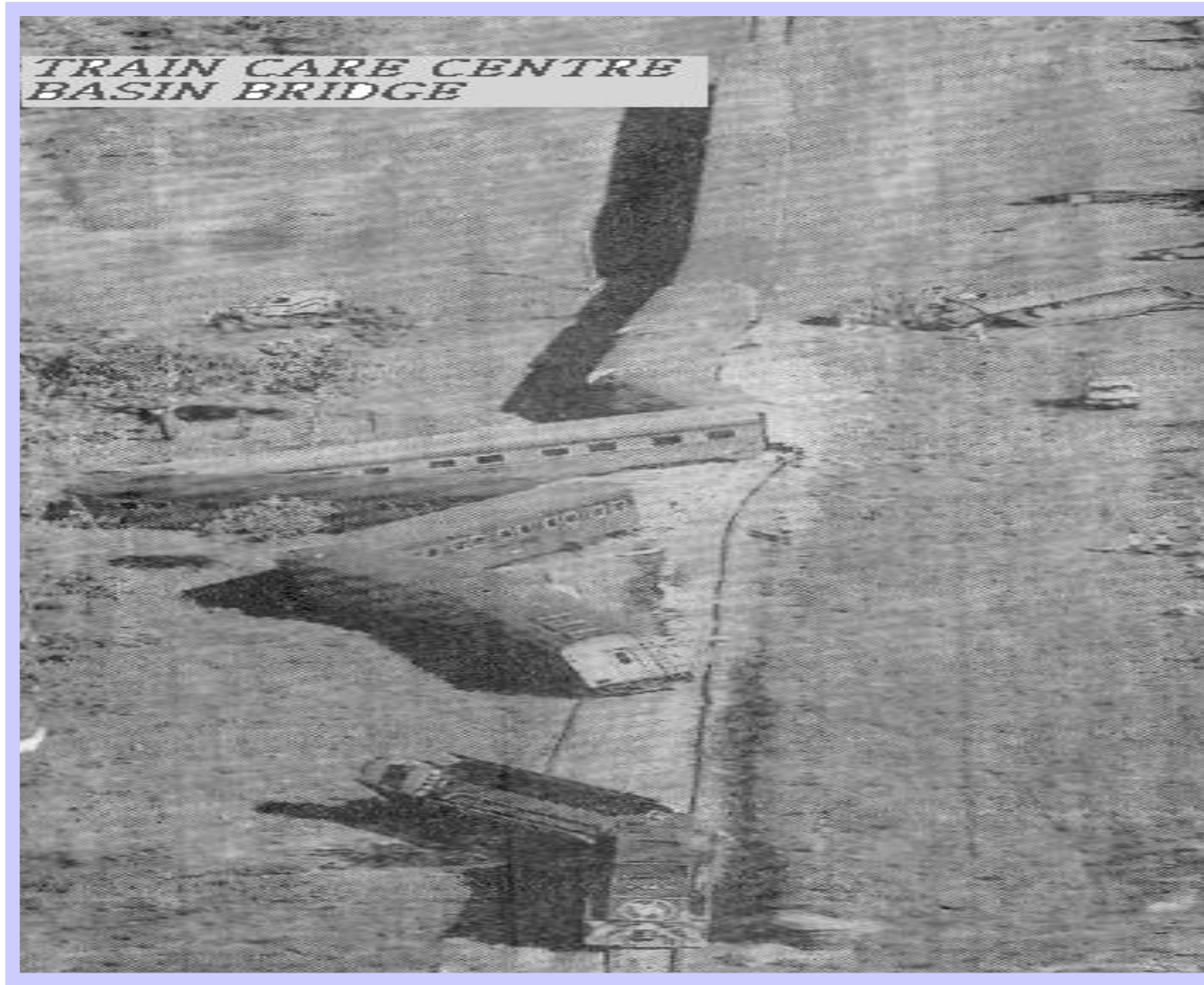
ANTI-TELESCOPIC INDICATION ON NEW BUILT COACHES (Anti-collision Device)





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DERAILMENT PHOTOGRAPH OF AUSTRALIAN RAILWAYS



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Coramandal Express



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Conventional Coaches



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Conventional Coaches



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Restrictor



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PARAMETERS OF LOCO & COACH CBC'S

LOCO

✓ TYPE OF COUPLER

: AAR 'E' / 'F'

✓ NOMINAL HEIGHT OF COUPLER
FROM RAIL LEVEL

: $1090^{+15/-5}$ mm

COACH

✓ TYPE OF COUPLER

: AAR 'H'

✓ MAXIMUM COUPLER HEIGHT

FROM RAIL LEVEL : 1105 mm

MINIMUM (EMPTY) : 1090 mm

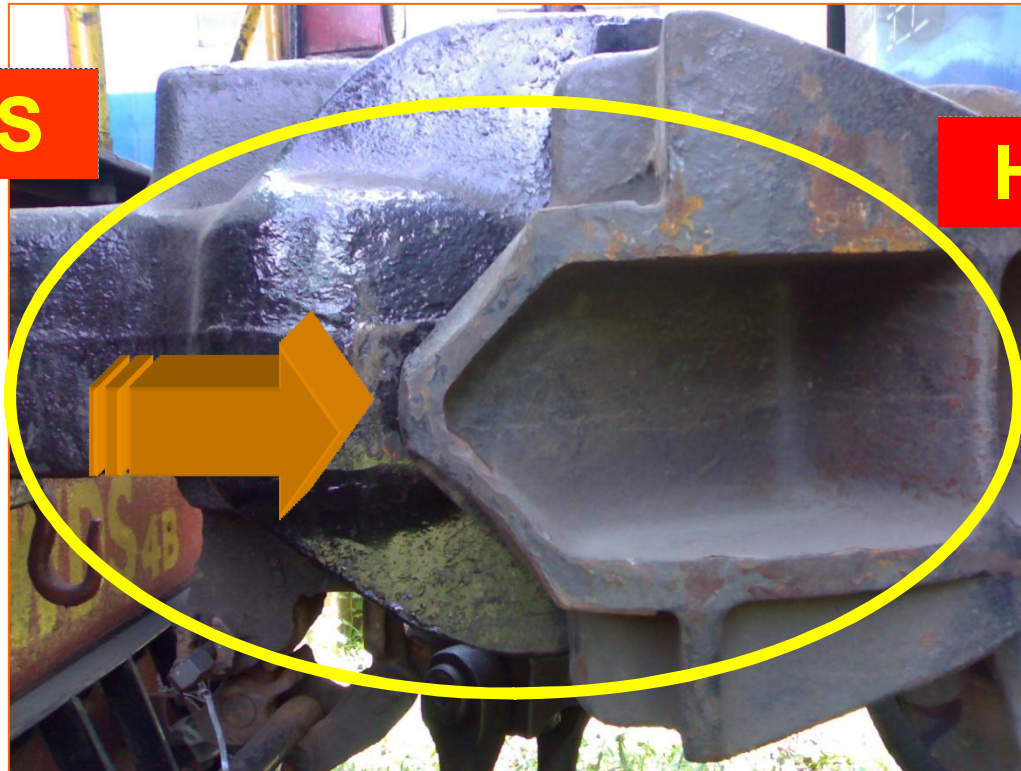
(LOADED) : 1030 mm

LOCO CBC

SLR CBC

E - CLASS

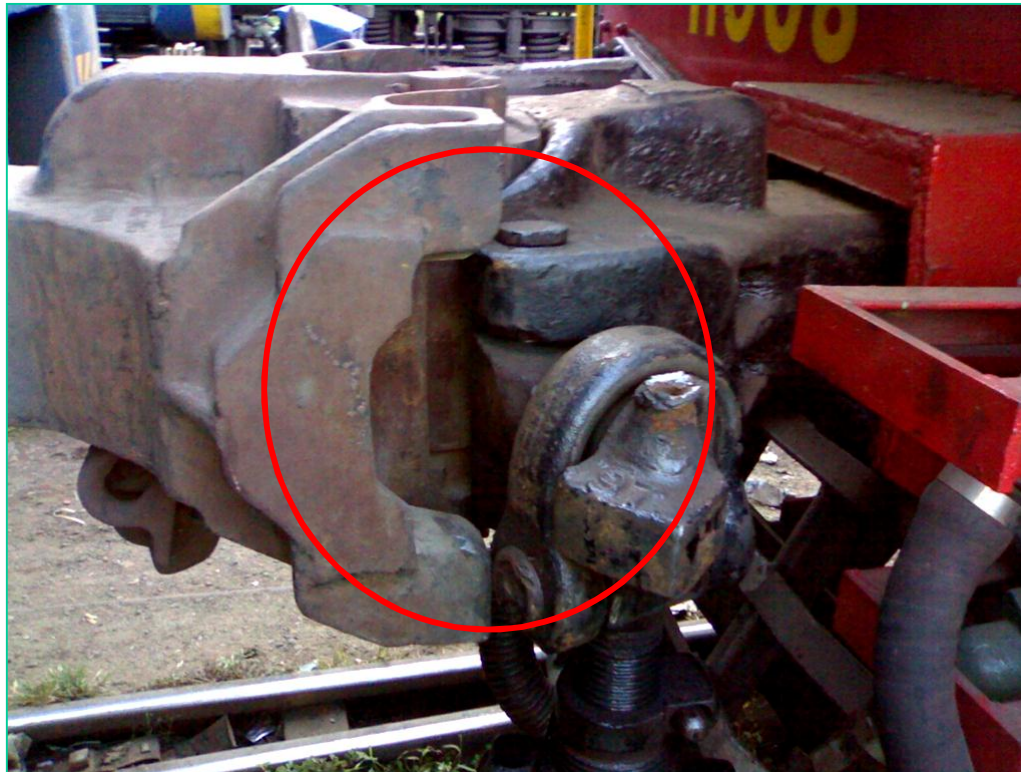
H - CLASS



Guard Arm Side View

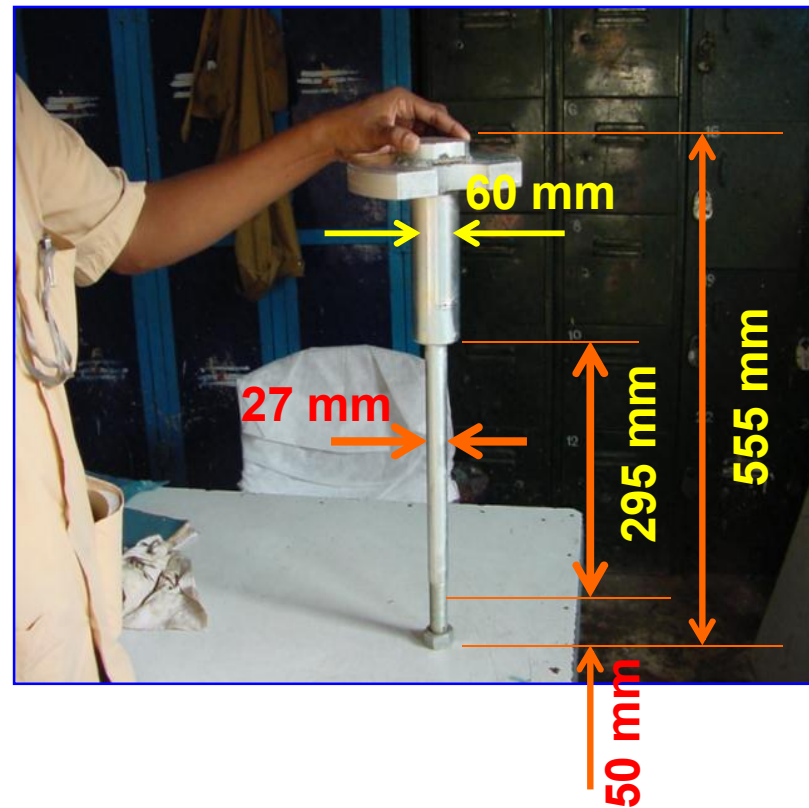
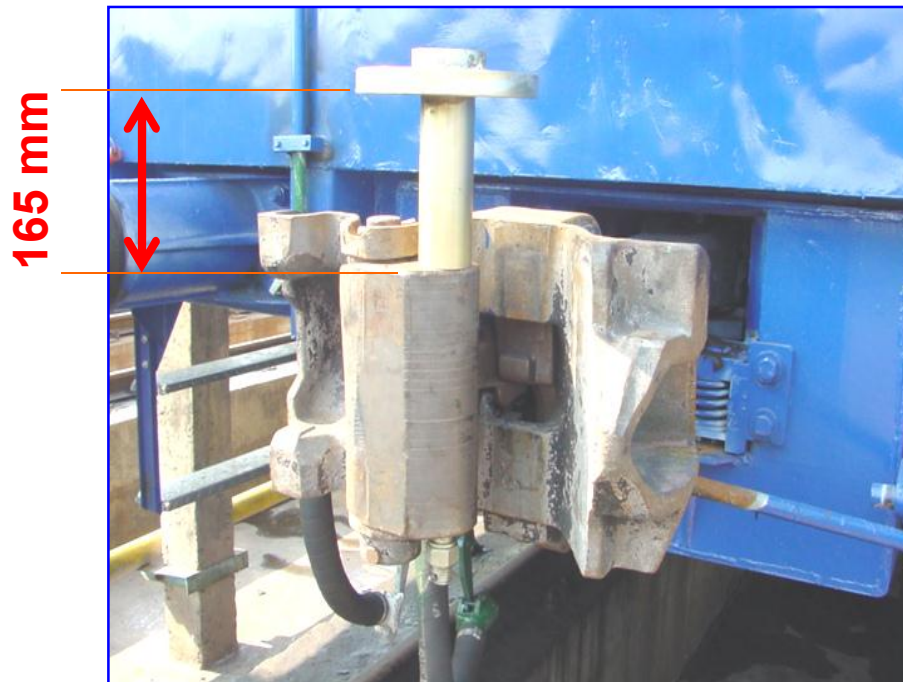
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Aligning Wing Side View



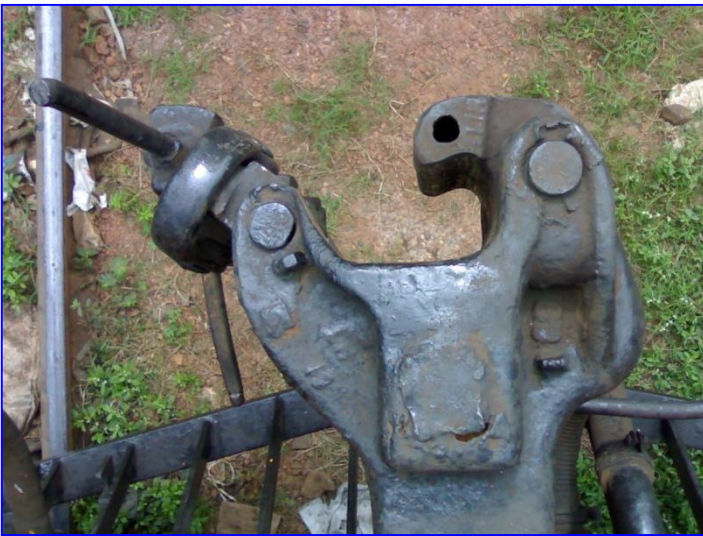
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RESTRICTOR ON CBC'S NEXT TO LOCO (SLR & VPH)

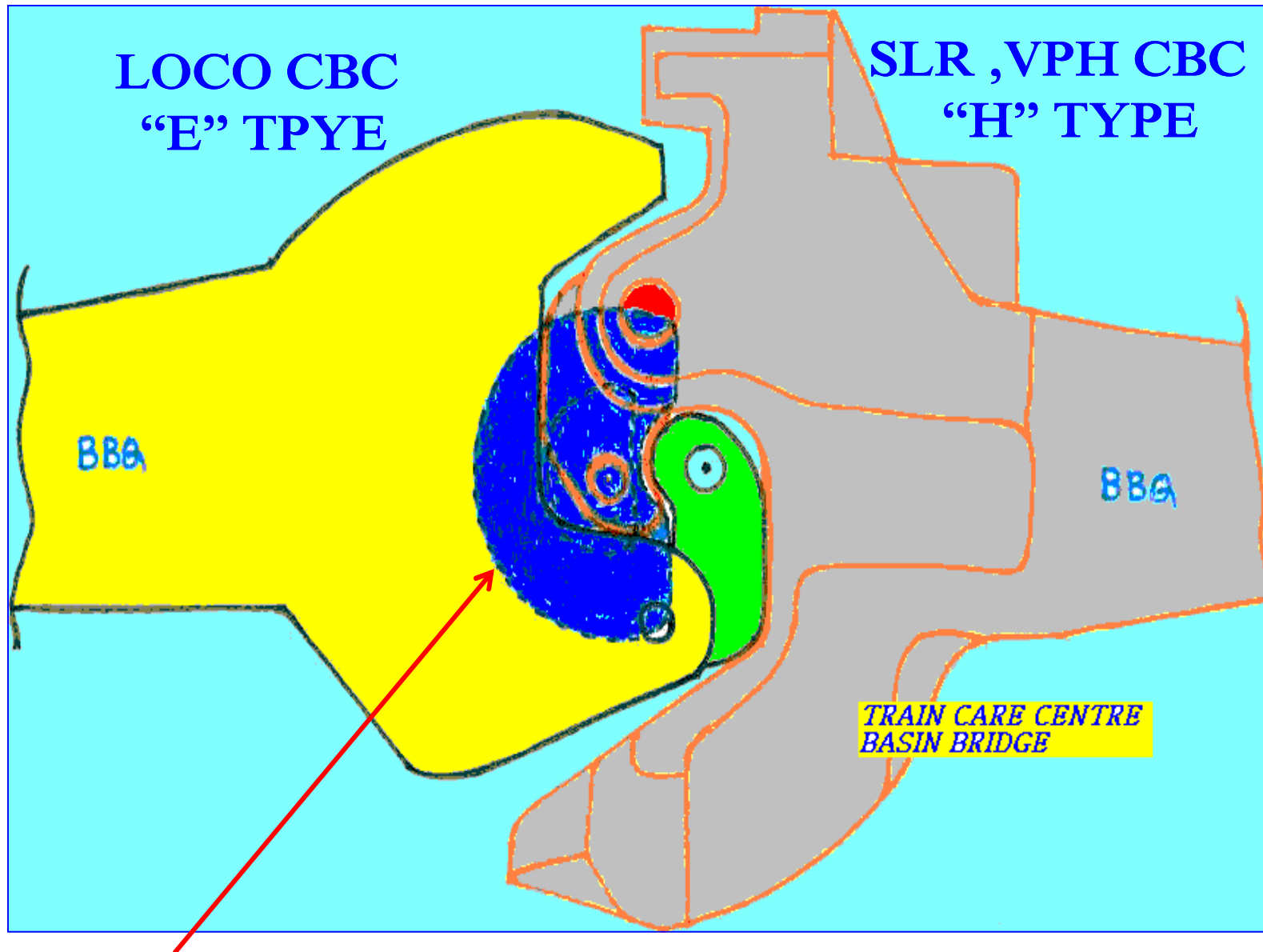


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PURPOSE OF RESTRICTOR



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RESTRICTOR

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Restrictor



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Shims



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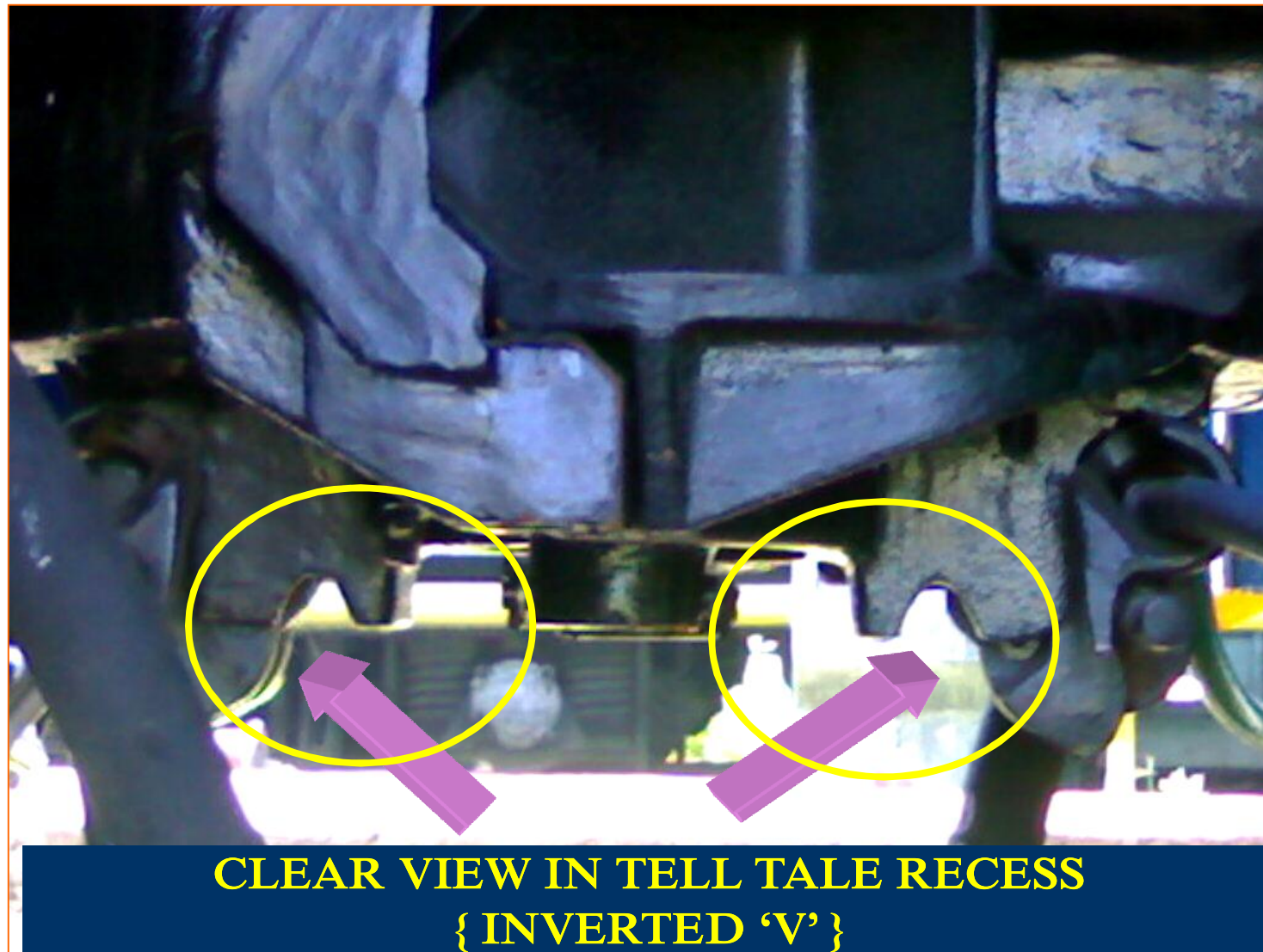


- Shims to be provided to fill up contour clearances if any after coupling of Loco with SLRD, between loco knuckle and coach coupler head face and coach knuckle and loco coupler head.
- This helps to reduce impact and damage on the coupler head.
Hammering sound also eliminated.

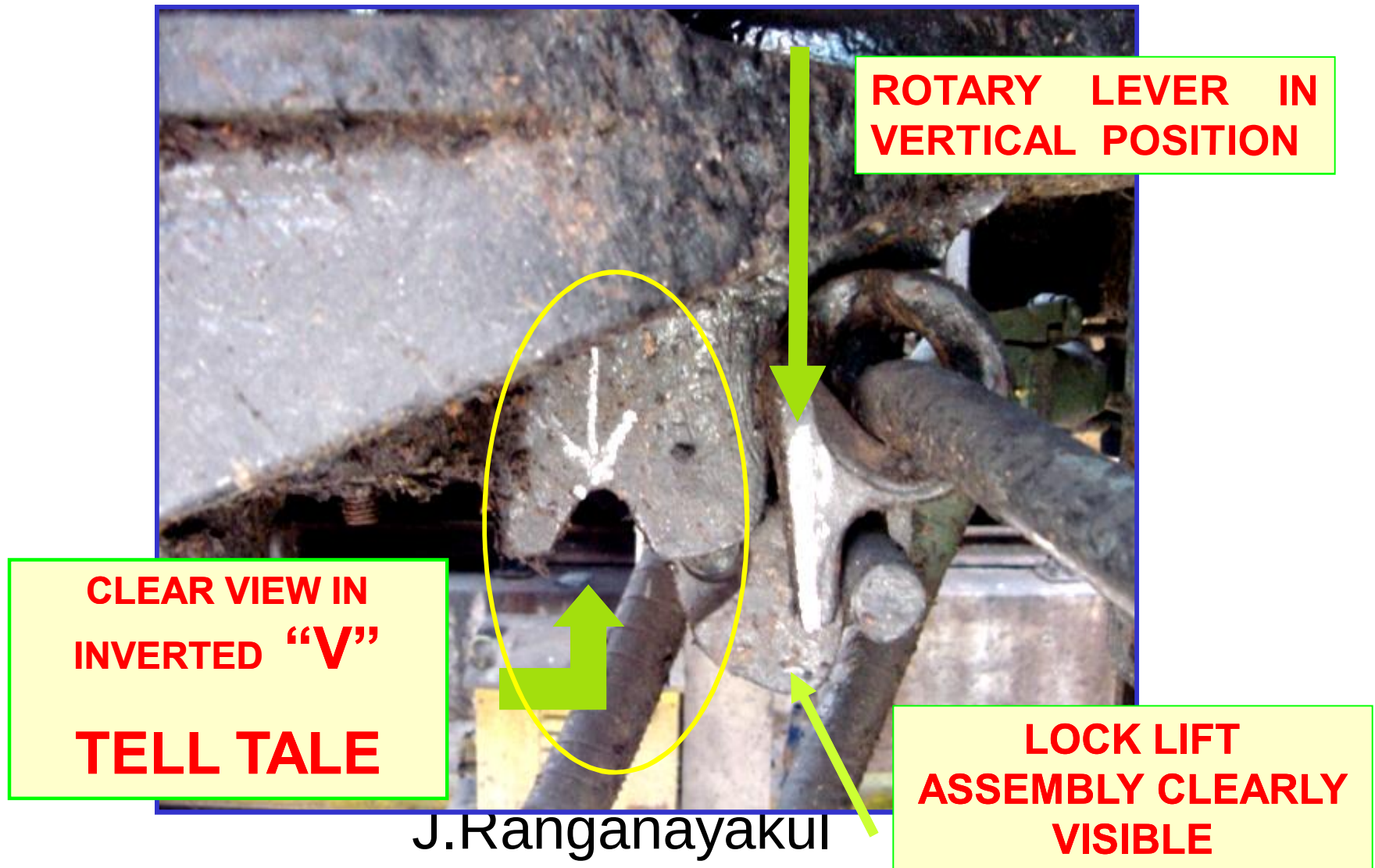
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Tell-tale mechanism

- Tell-tale (inverted V) mechanism provided on the CBC head at the bottom of the lock hole helps to ensure perfect locking of mating CBCs.
- If the tell-tale recess is clear, it indicates perfect locking.
- If tell-tale recess is not clear it is an indication of partial locking / not locked.

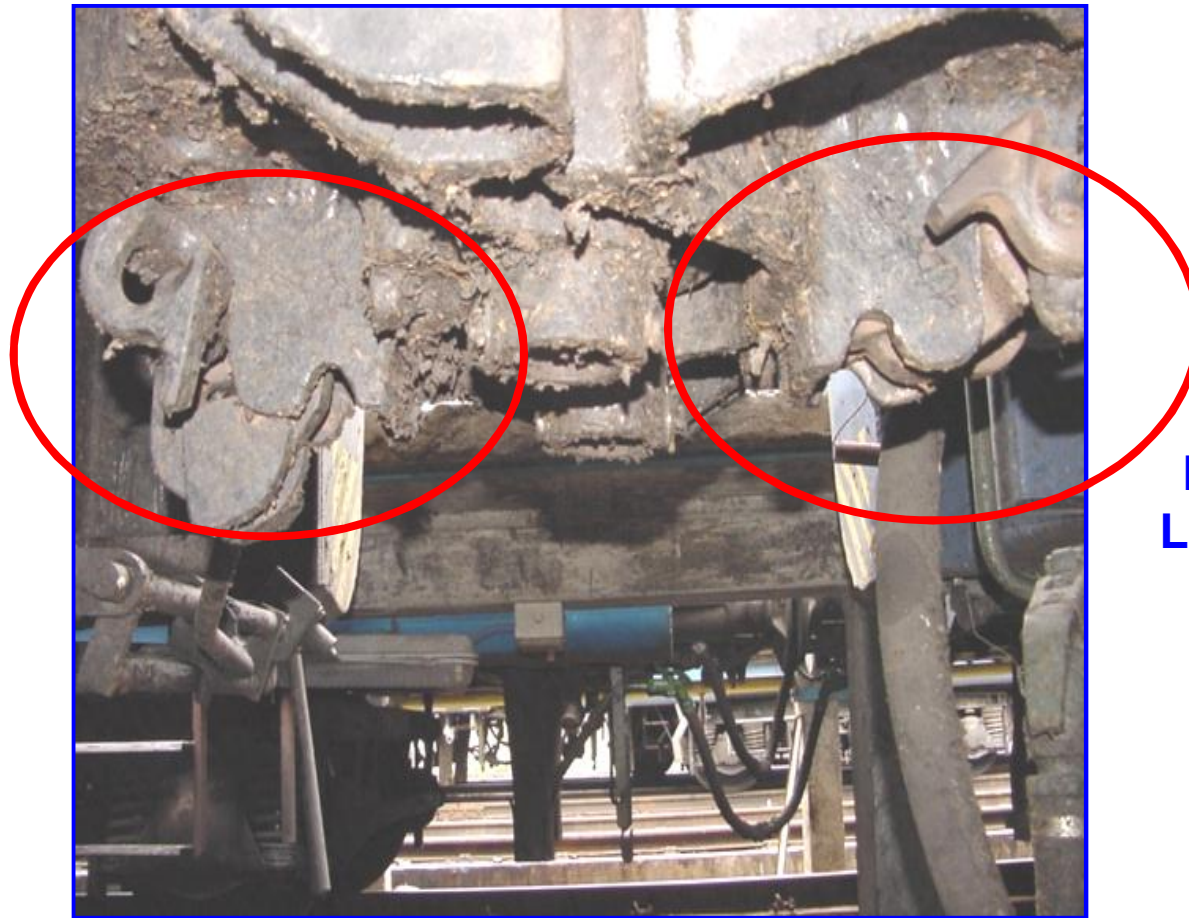


3 – THUMB RULES TO ENSURE PERFECT LOCKING



COACHES COUPLED WITH PARTIAL LOCKING

**PERFECTLY
LOCKED CBC**



**PARTIALLY
LOCKED CBC**

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CLOSER VIEW

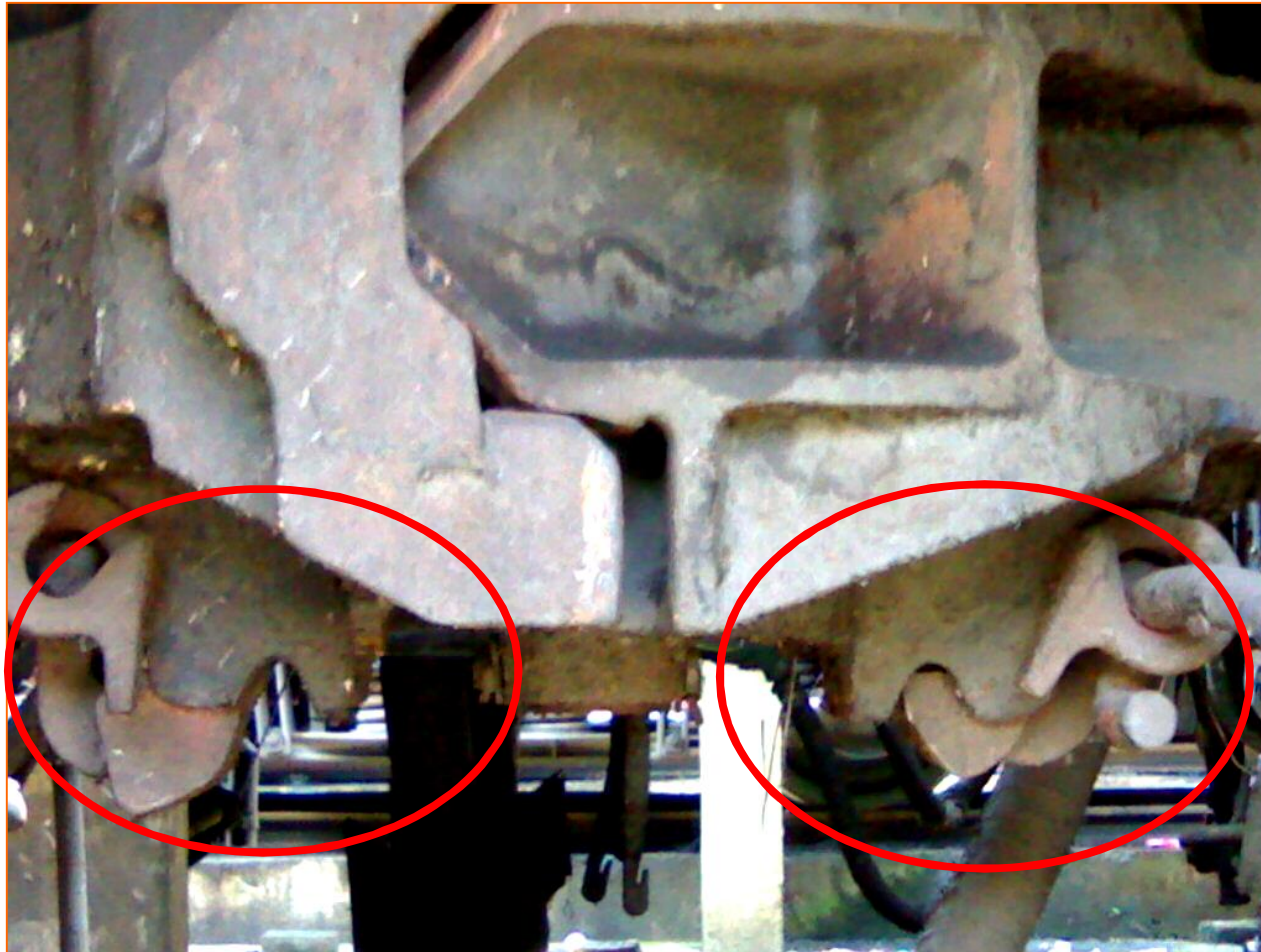
PERFECTLY LOCKED



PARTIALLY LOCKED



PARTIAL LOCKING

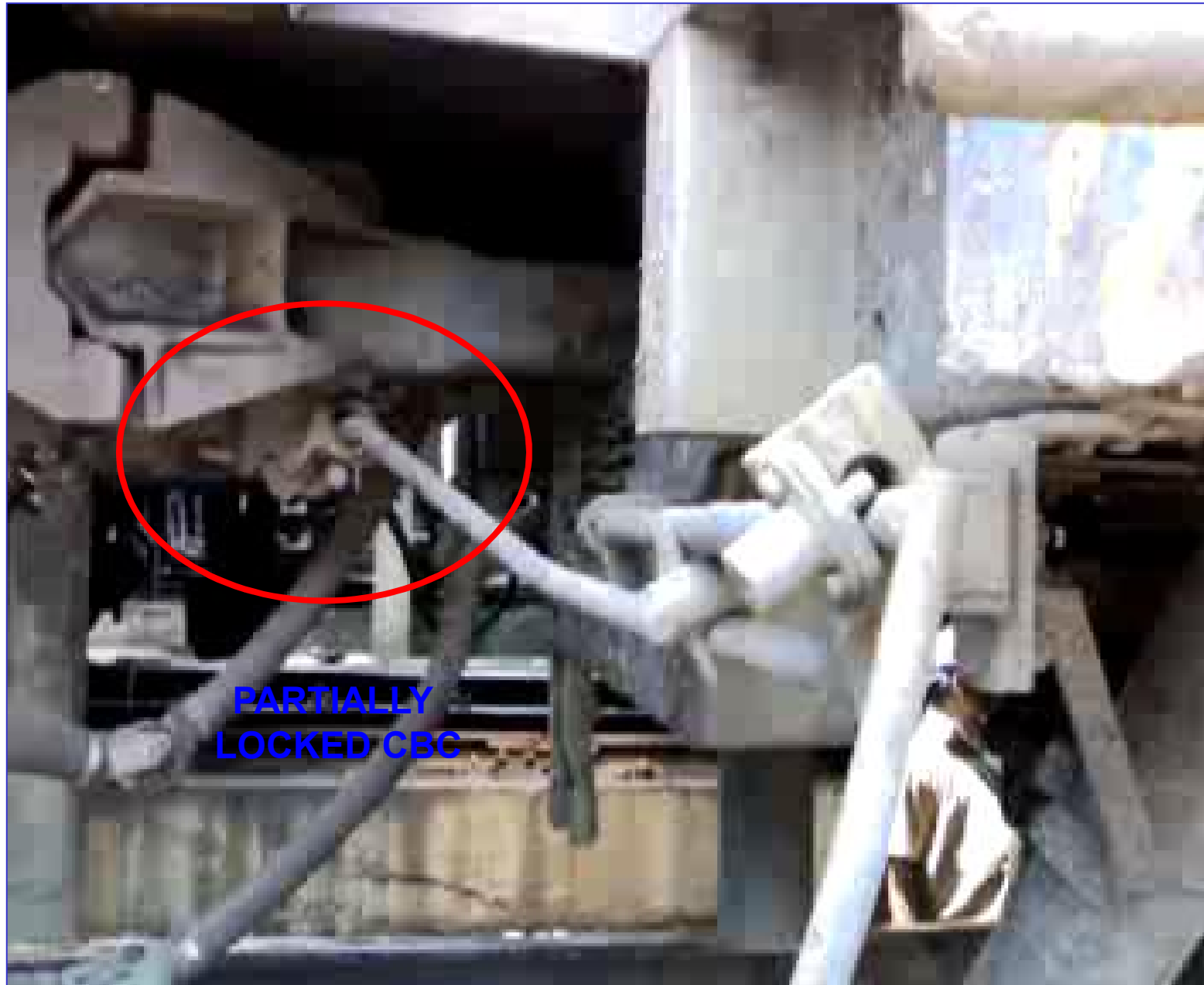


PERFECTLY
LOCKED CBC

PARTIALLY
LOCKED CBC

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Partially locked CBC on the rake



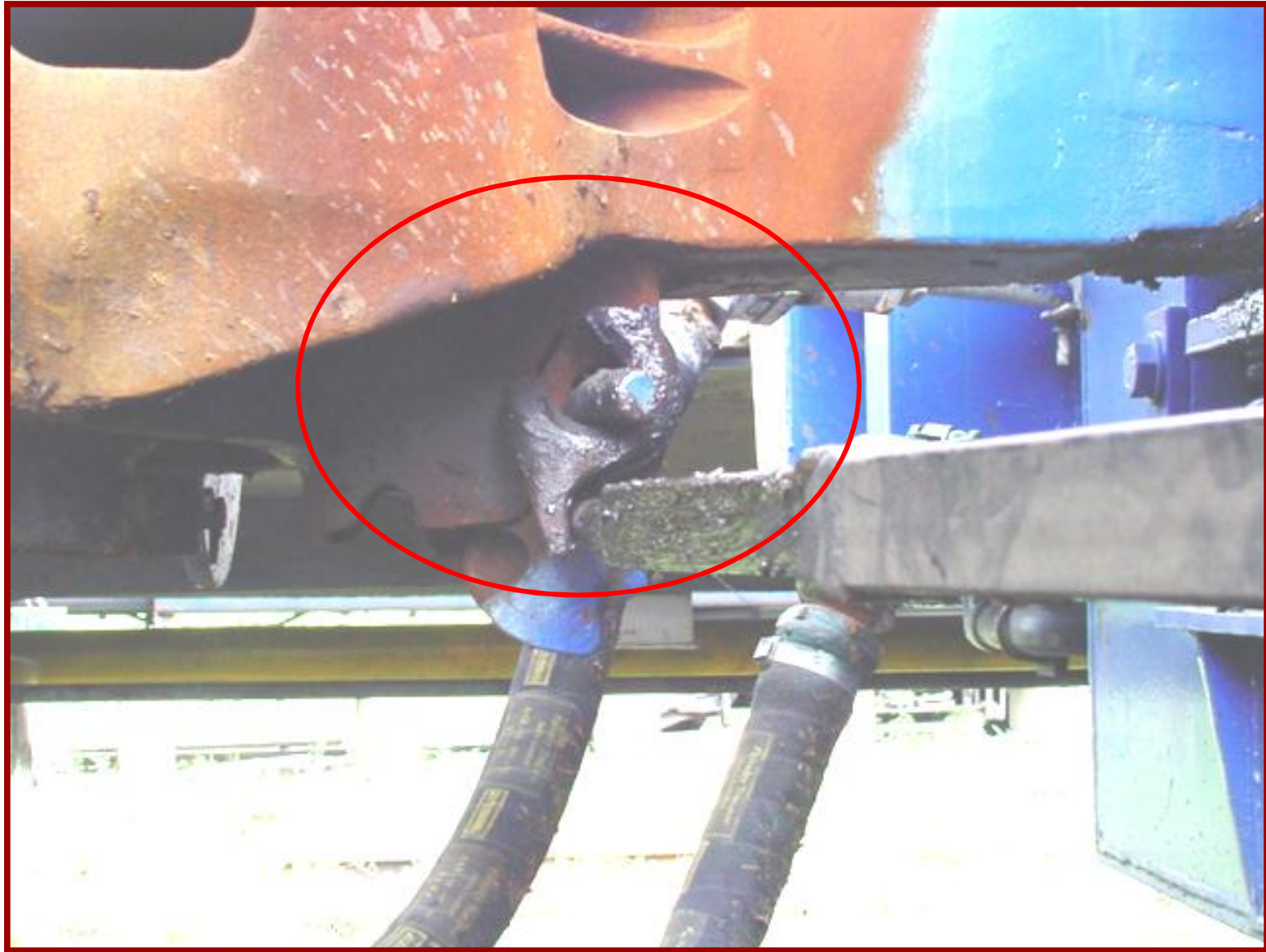
Position of the lock on the partially locked CBC



DEFECTIVE AIKON TYPE OPERATING ROD TUBE HOOK



WRONGLY FITTED AIKON TYPE OPERATING ROD TUBE HOOK

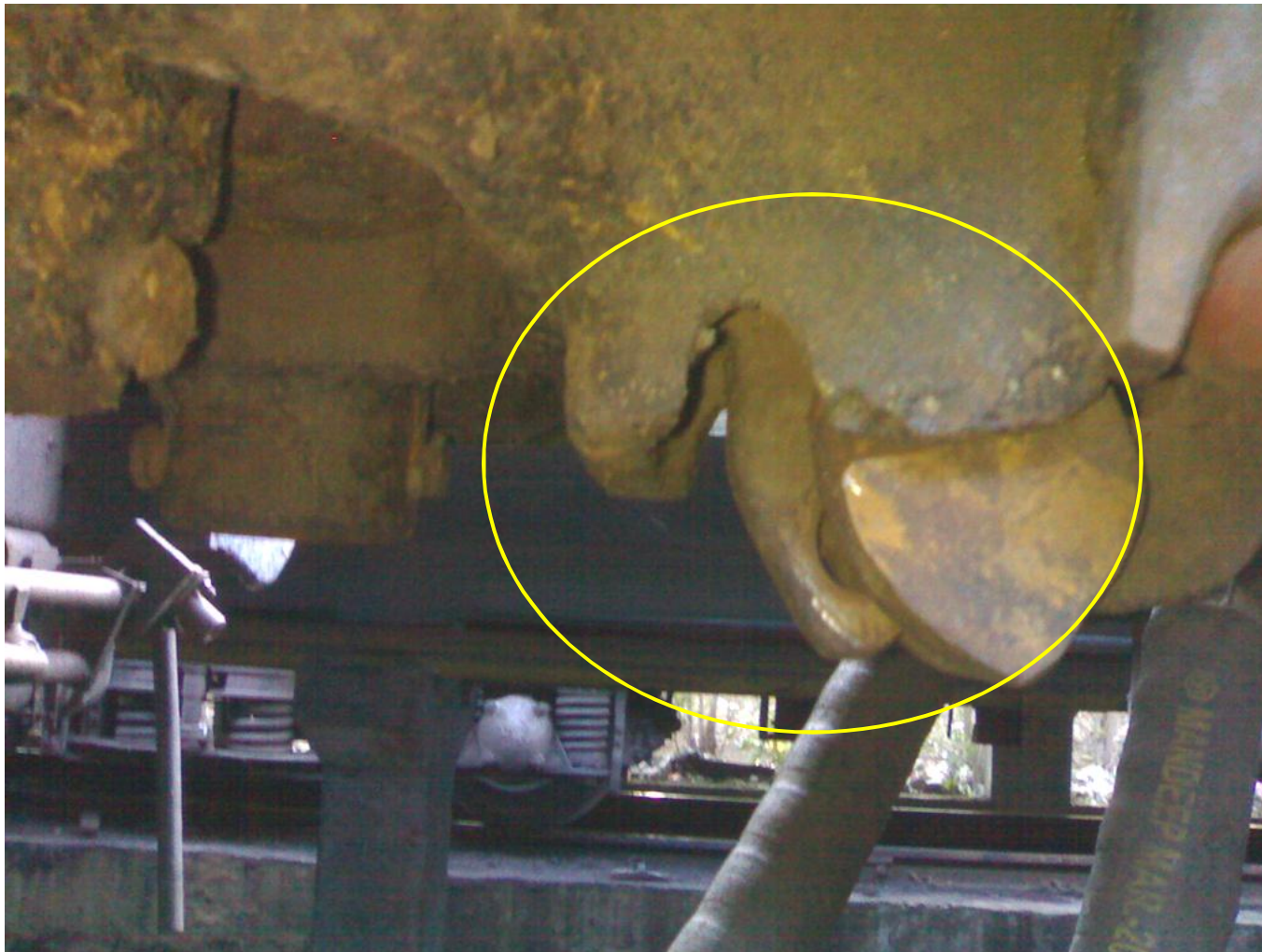


Sub-standard operating rod assembly

(on PWP turned-out coaches)



Tell-tale view is not clear and the lock in lifted condition (partial locking) on PWP turned-out coaches



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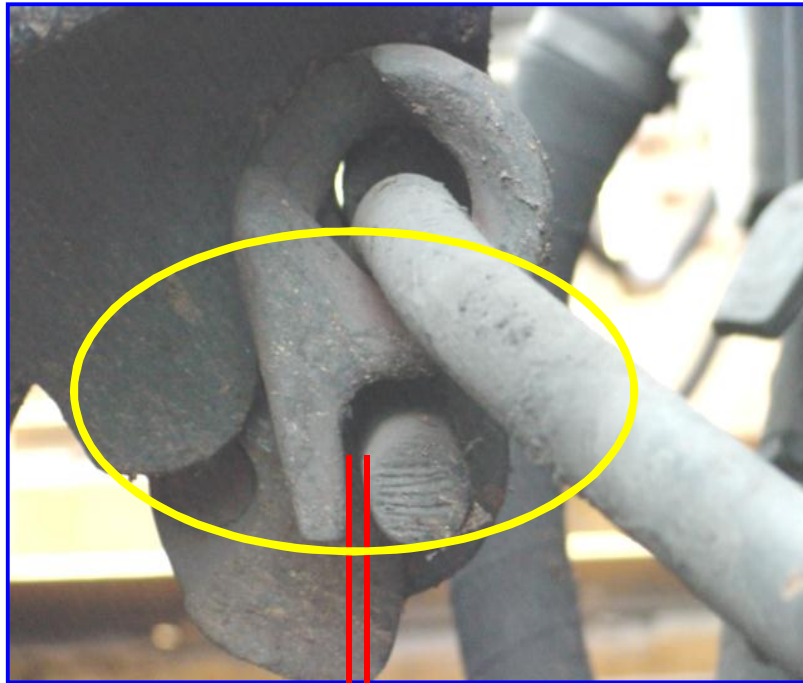
Sub-standard operating rod assembly



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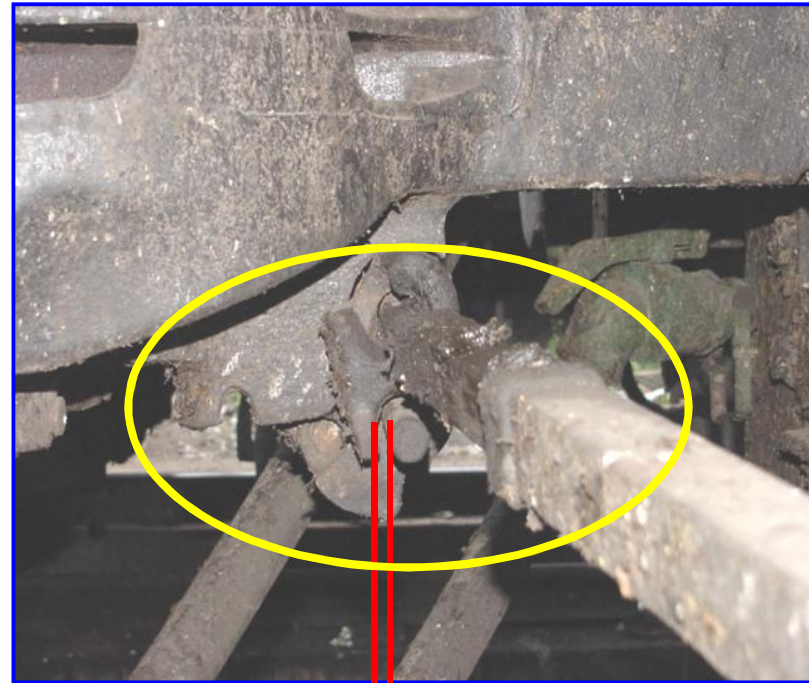
ENSURE GAP BETWEEN ROTARY LEVER AND OPERATING LEVER HOOK

FAIVELEY



3 to 8 mm → ←

AIKON

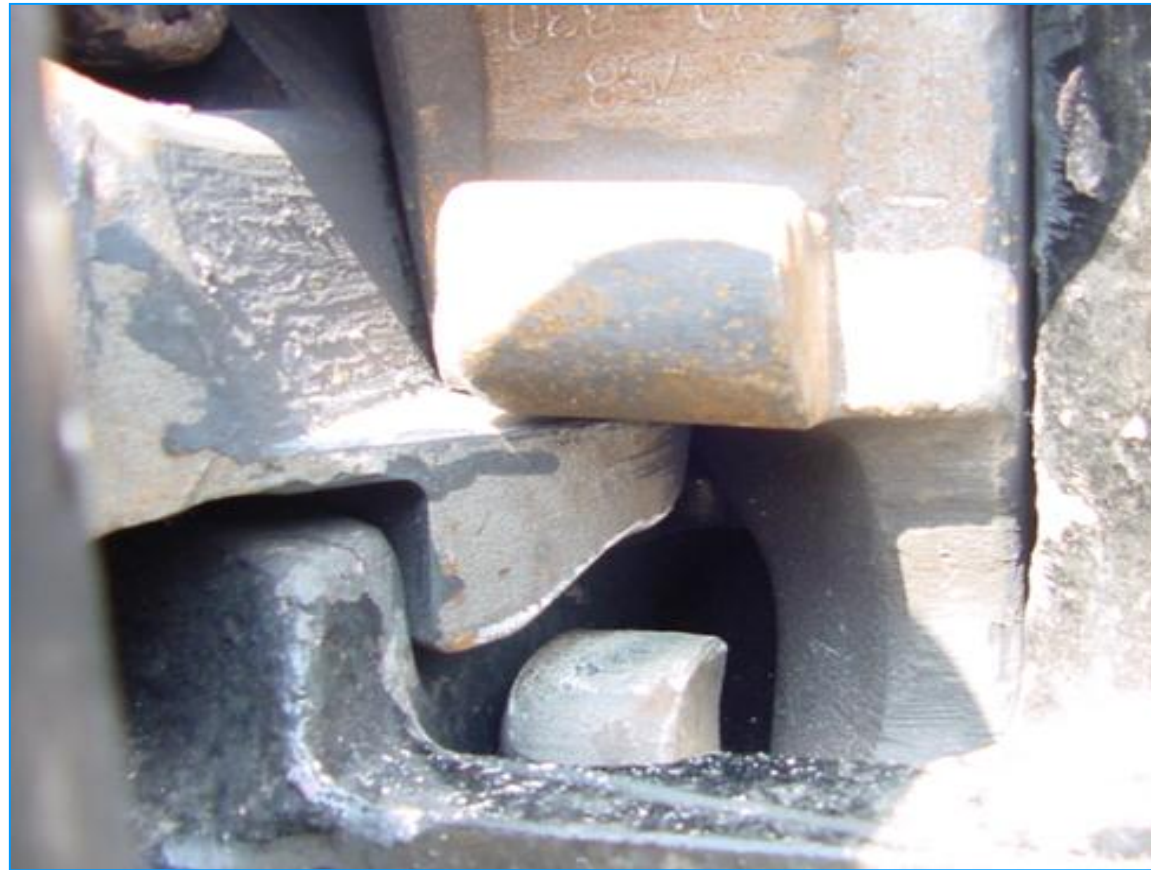


3 to 8 mm → ←

NOTE: The coach should be on level straight track and the CBC shank should be at the centre of the supporting device

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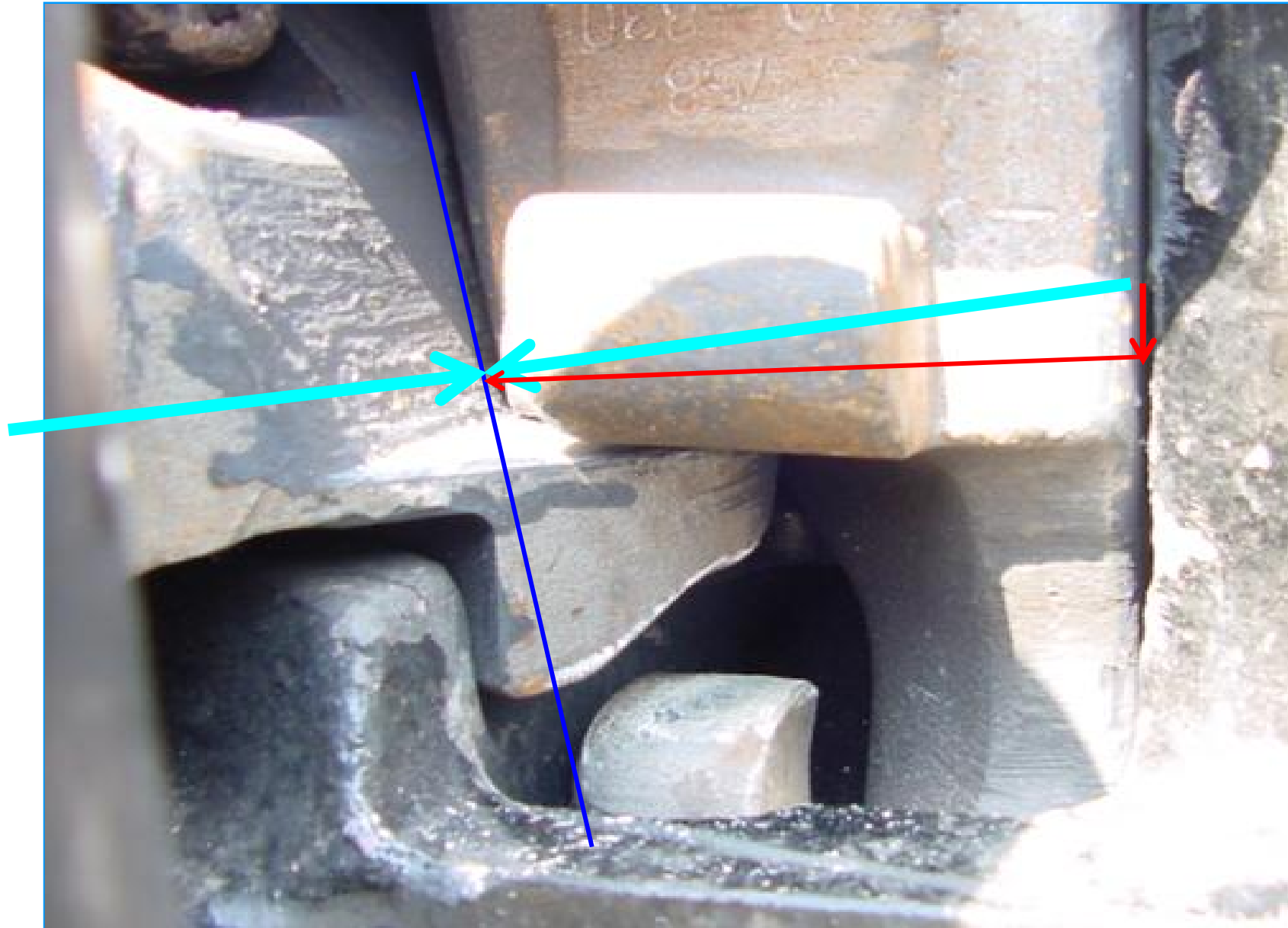
Taper surface on lock and locking face of the knuckle



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- The lock and the locking face of the knuckle tail are provided with taper surfaces.
- Due to this feature the lock forces the knuckle tail against the side wall of the coupler head and controls the position of the knuckle in relation to the coupler head.

FORCES ACTING ON THE LOCK



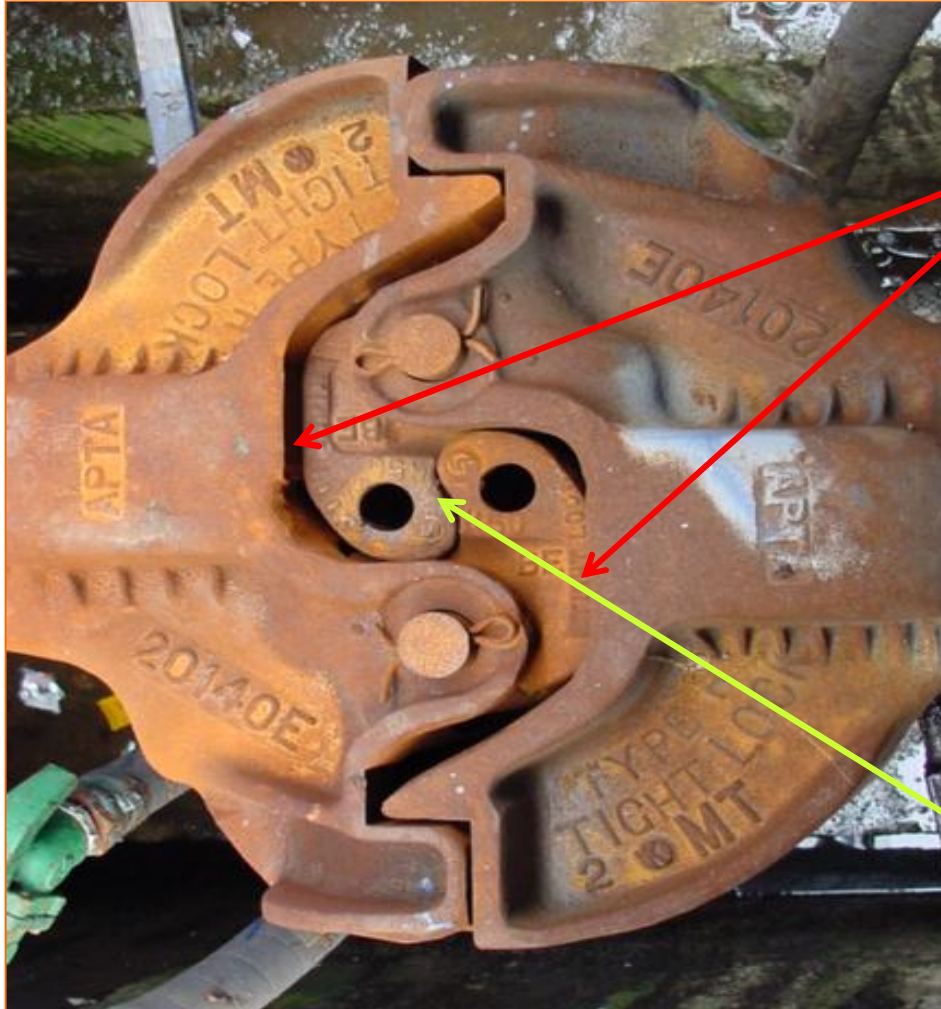
Contour clearance



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- **The contour slack when two couplers are coupled together should not be more than 3.5 mm in new condition.**

Contour clearance



No contour clearance between the coupler head and buff face of the knuckle when the couplers are new

No contour clearance between the draw faces of the knuckles when the couplers are new

Gathering Range

Gathering range:

within this range coaches are couplable.

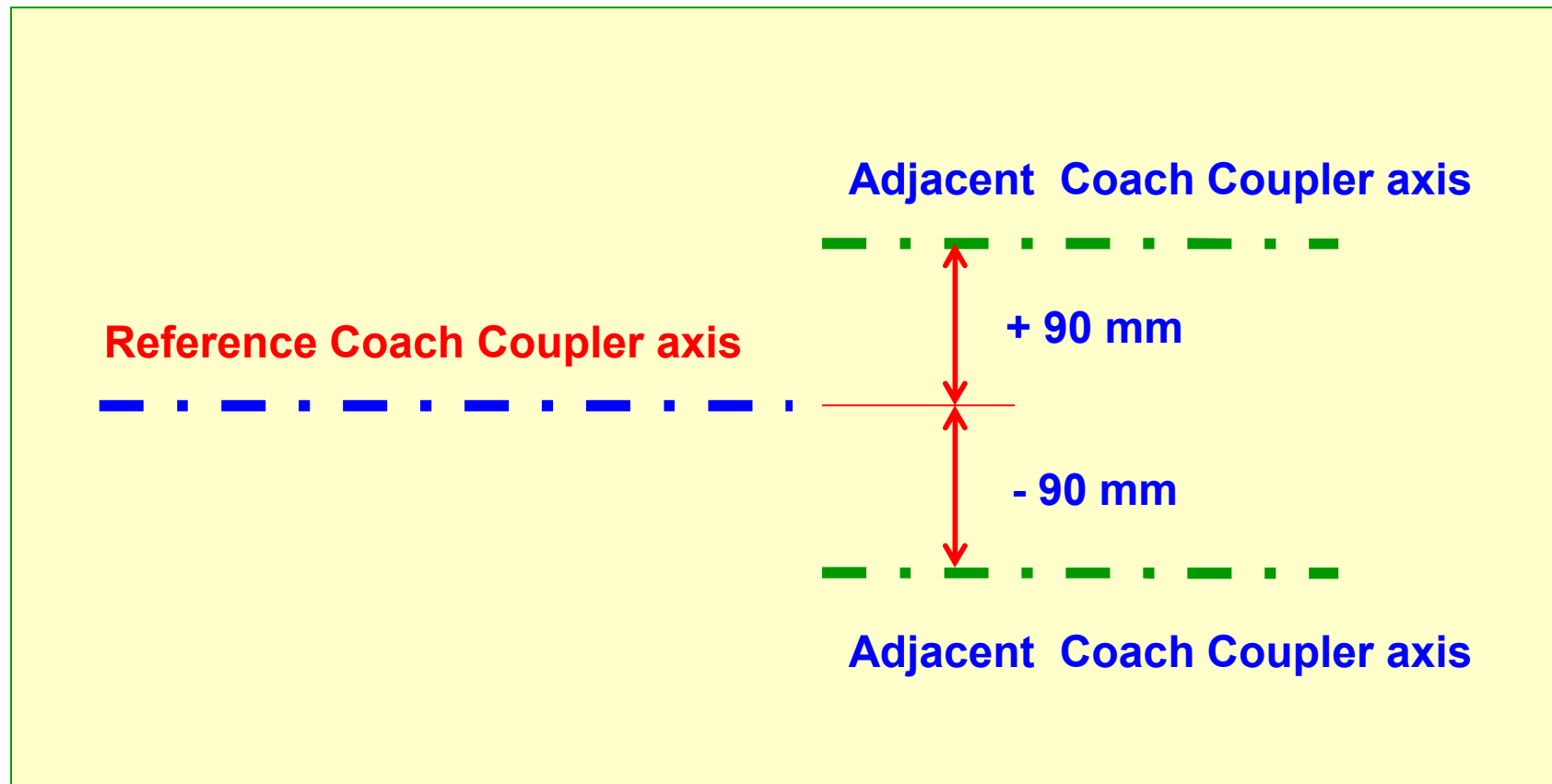
Vertical gathering range : +/- 90 mm

Horizontal gathering range : +/- 110 mm

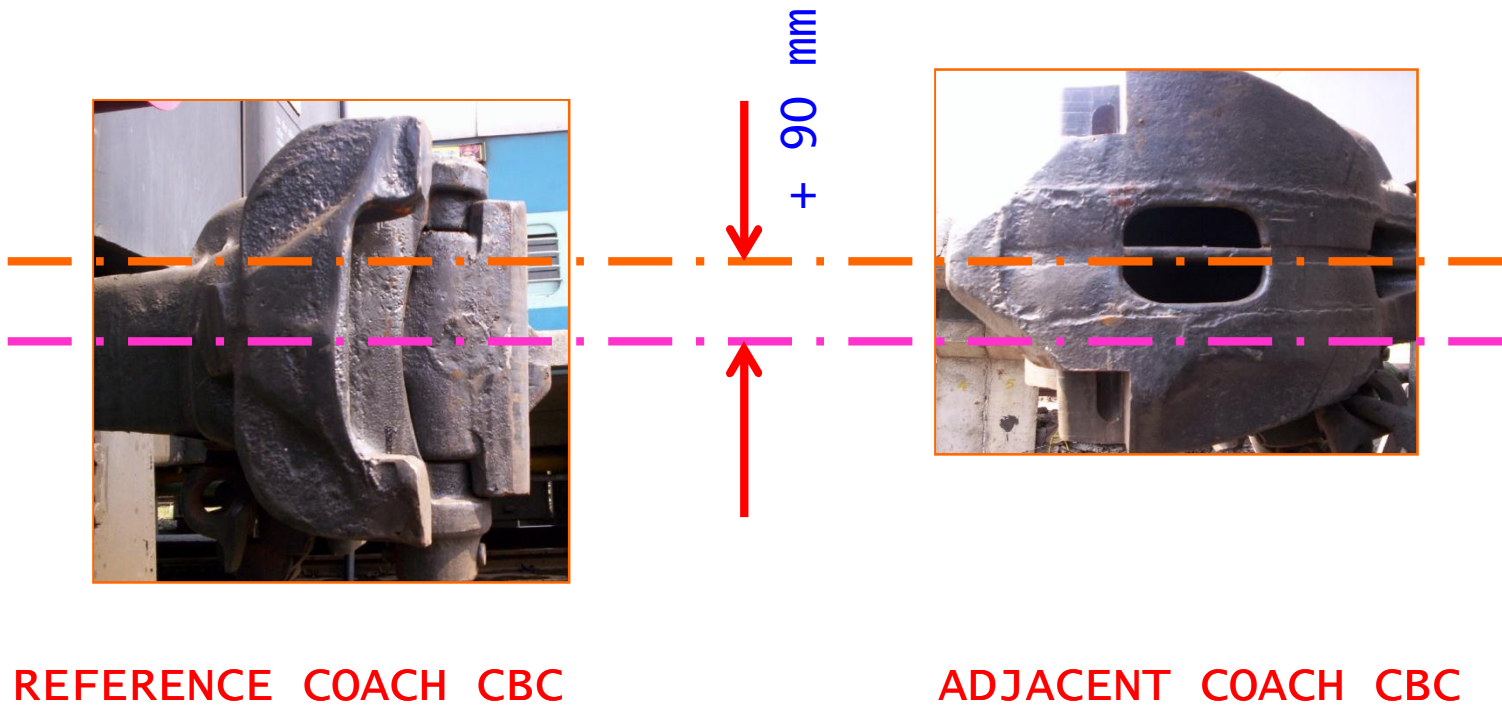
Note: - The above values of coupler offsets are strictly valid when the coupler axes are parallel.

- Beyond this range coupling will be difficult.
- To perform shunting operation it is always preferable shunting to be done on a straight and level track.
- When couplers are beyond the gathering range the guard arms hits with each other and hence coupling operation is not possible.

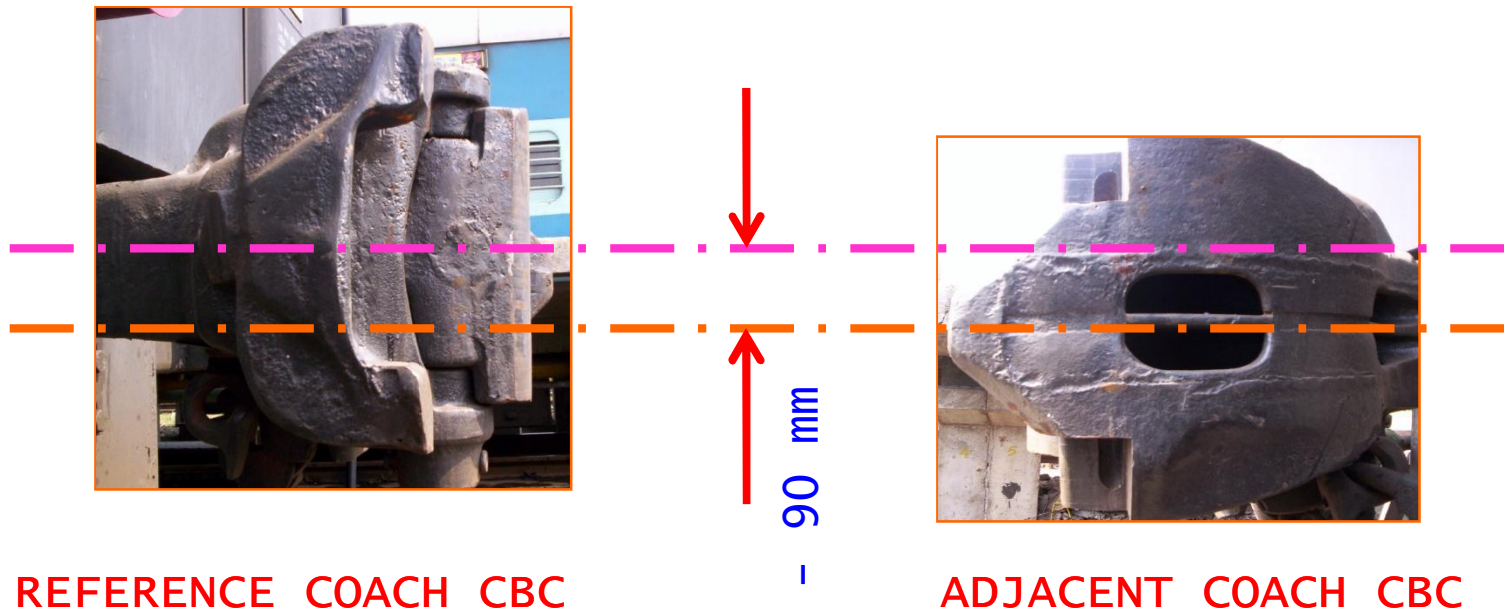
VERTICAL GATHERING RANGE

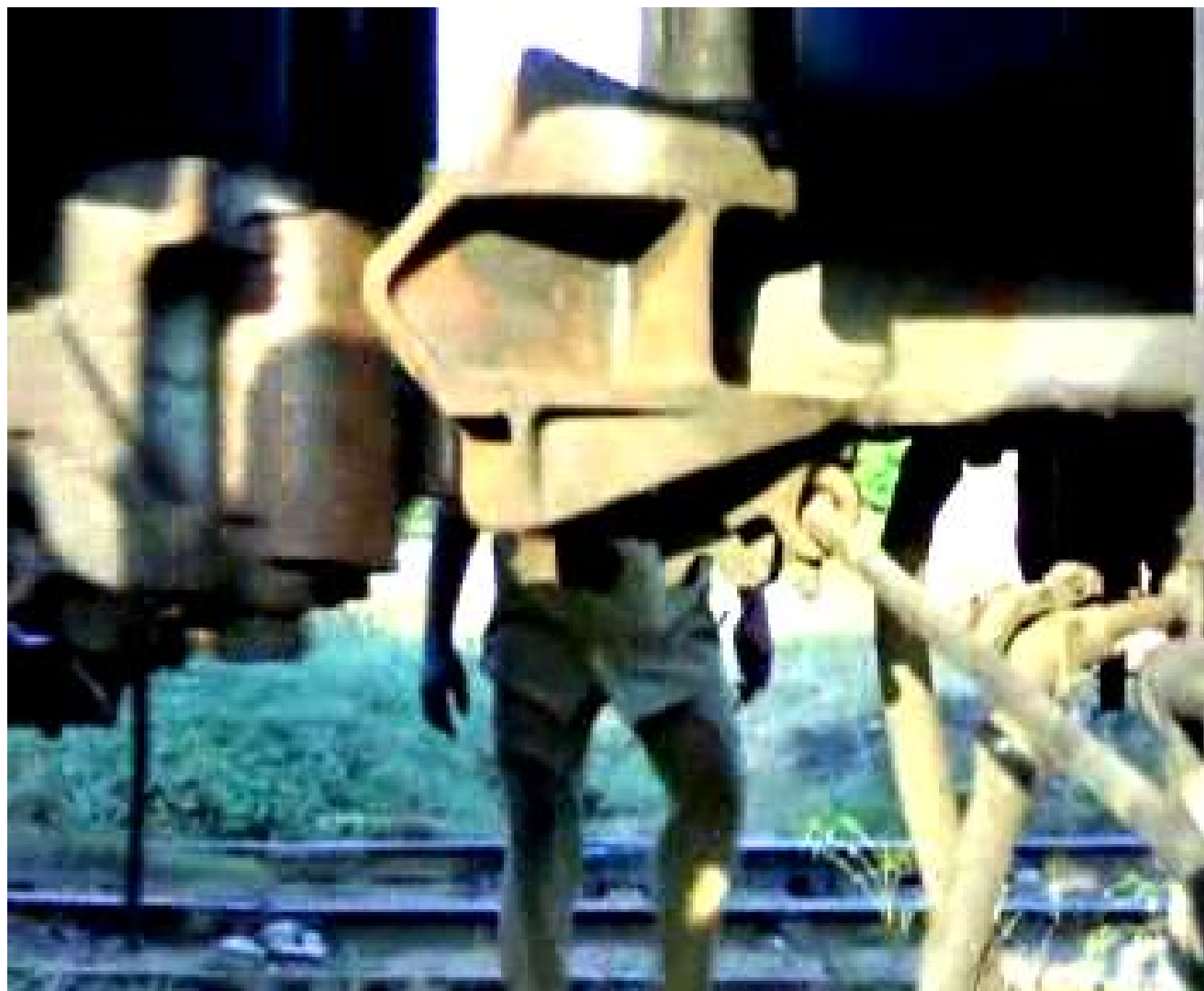


VERTICAL GATHERING RANGE



VERTICAL GATHERING RANGE











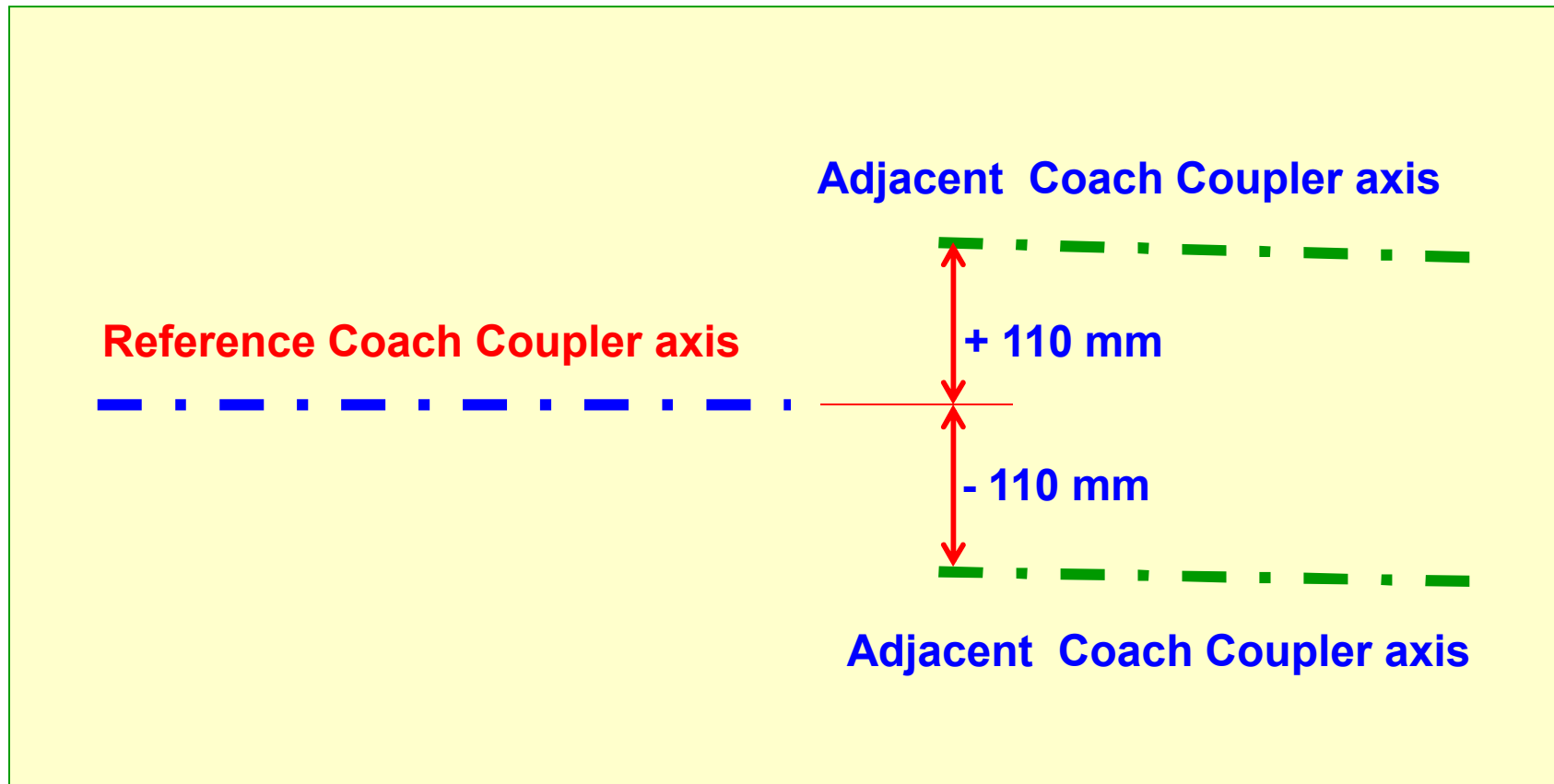




Vertical gathering range and ensuring perfect locking



HORIZONTAL GATHERING RANGE





Canalway Gateway Station





on the right side of the image



on kangaroo ark





on kanggaya akan



on kangaroo skin



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Horizontal gathering range

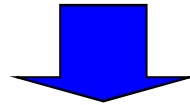


COUPLING PROCEDURE

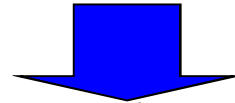
KEEP THE COACHES ON STRAIGHT & LEVEL TRACK



**ENSURE COUPLERS KNUCKLES ARE IN OPEN
CONDITION & COUPLERS ARE IN GATHERING RANGE**



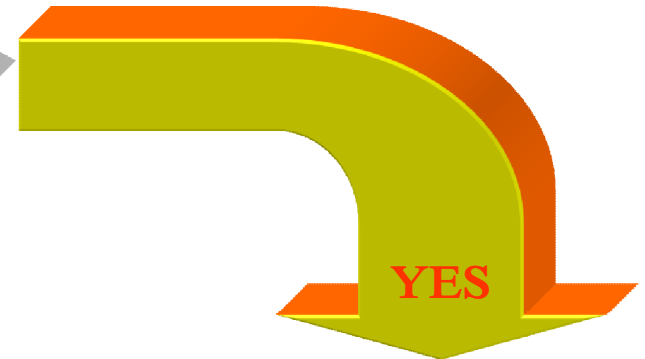
**PERFORM COUPLING (SHUNTING) OPERATION
AT SLOW SPEED 3 km/h**



**TELL TALE
(INVERTED "V")
RECESS CLEAR**



NOT LOCKED



LOCKED



CAUTION...

After coupling reverse the power to pull (snatch) the vehicles apart. This test to be done to reconfirm a positive coupling.

UN-COUPLING PROCEDURE

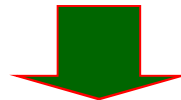
UNLOCK THE OPERATING LEVER



PUSH THE VEHICLES TOGETHER SLIGHTLY TO
RELIEVE FROM (TENSILE LOAD) EXCESSIVE BINDING



LIFT UP & TURN OPERATING LEVER IN
CLOCK WISE DIRECTION Min.OF 90°



PULL THE COACHES APART

UN-COUPLING PROCEDURE



UNSCREW THE LOCKING SCREW



LIFT UP OPERATING ROD



ROTATE OPERATING ROD IN CLOCK-WISE
DIRECTION MINIMUM OF 90°

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Degree Of Freedom

Degree of freedom:

CBC shank can tilt about yoke pin / central pin.

Horizontal plane:

18° either side of the coupler axis.

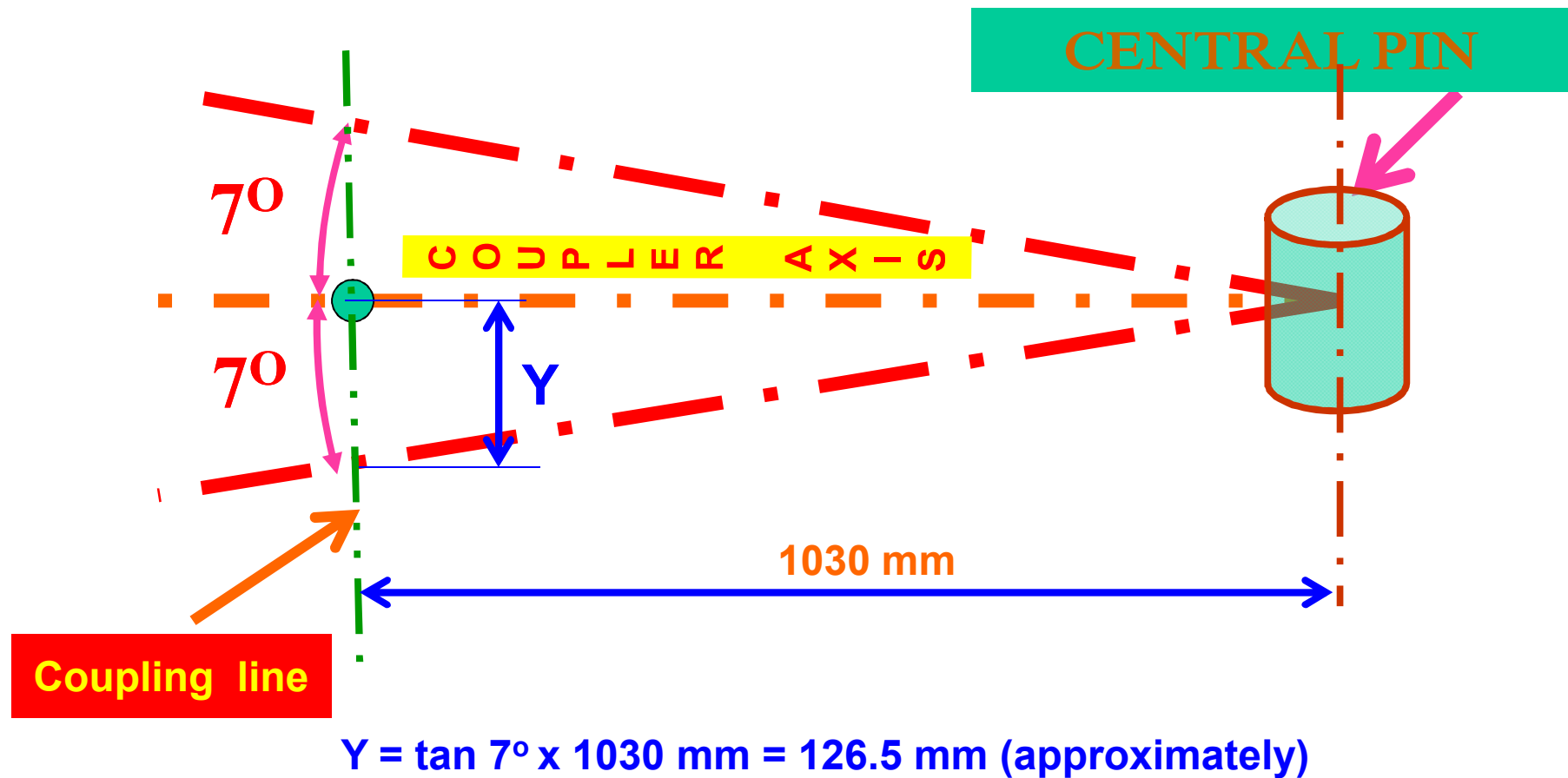
This helps the vehicle while negotiating curves (lateral flexibility).

Vertical plane:

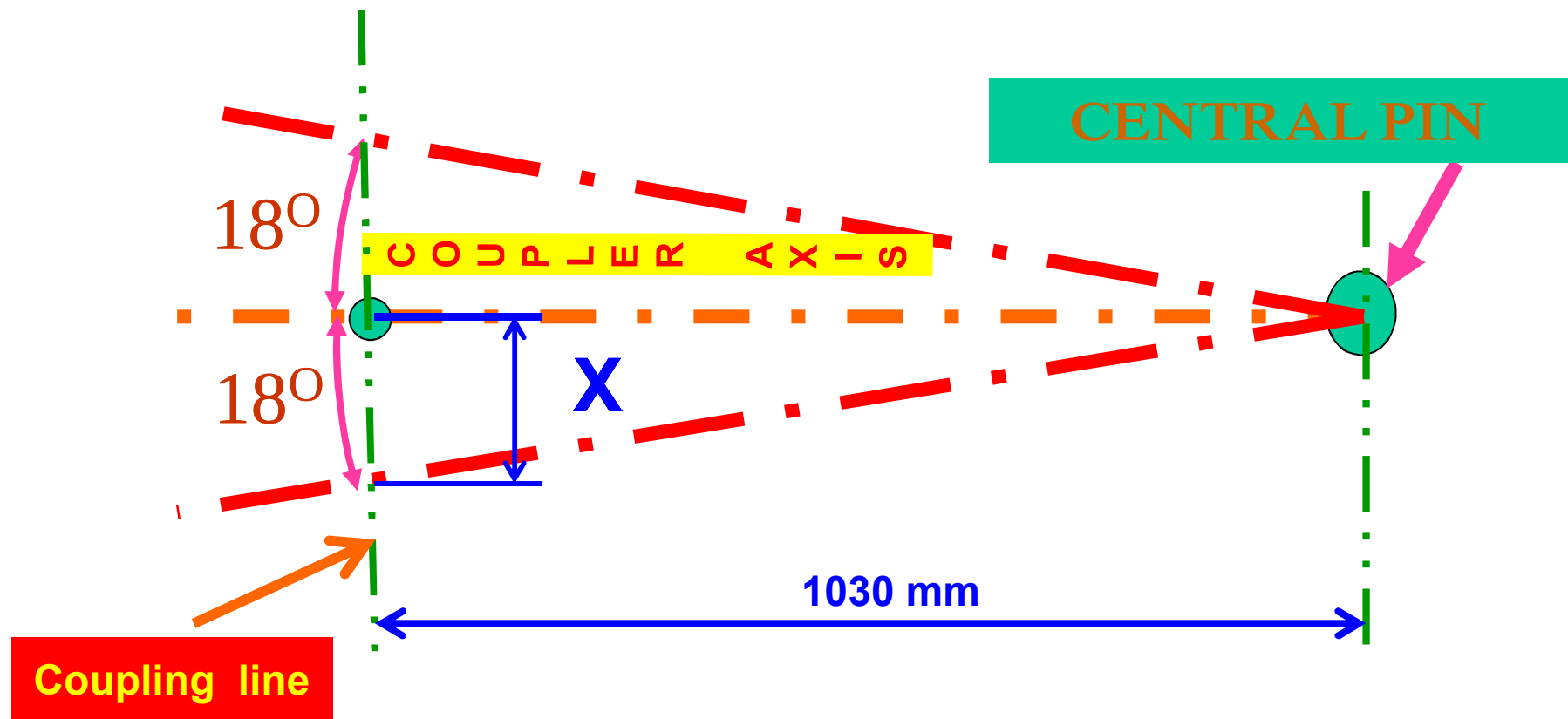
7° either side of the coupler axis.

This helps the couplers to rise and fall freely (vertical flexibility) during brake application.

DEGREE OF FREEDOM FOR THE COUPLER HEAD IN THE VERTICAL PLANE



DEGREE OF FREEDOM FOR THE COUPLER HEAD IN THE HORIZONTAL PLANE



$$X = \tan 18^\circ \times 1030 \text{ mm} = 334.7 \text{ mm (approximately)}$$

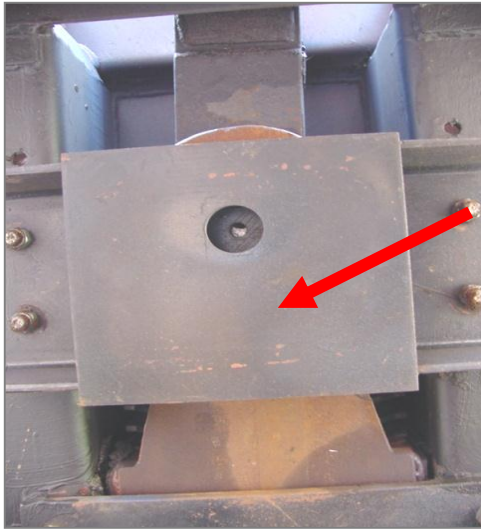
Draft gear and yoke pin
support plates are
fastened with Nylock M16
bolts and nuts

- **Draft gear and yoke pin support plates are fastened with Nylock M16 bolts and nuts.**
- **So replacement of defective bolt and nuts are easy when compared to riveting.**
- **Torque value for M16x55 mm bolts (yoke pin support plate and draft gear support plate bolts):**
200+50 Nm

Nylock M16 nuts

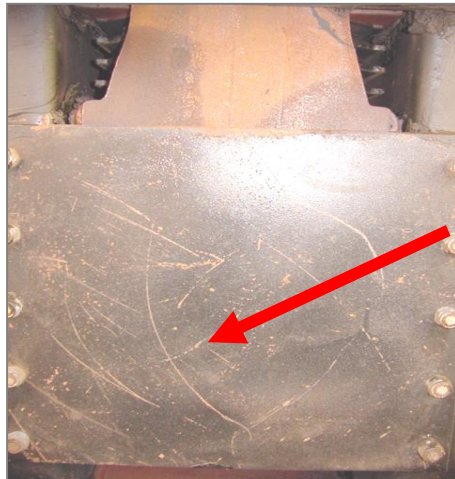
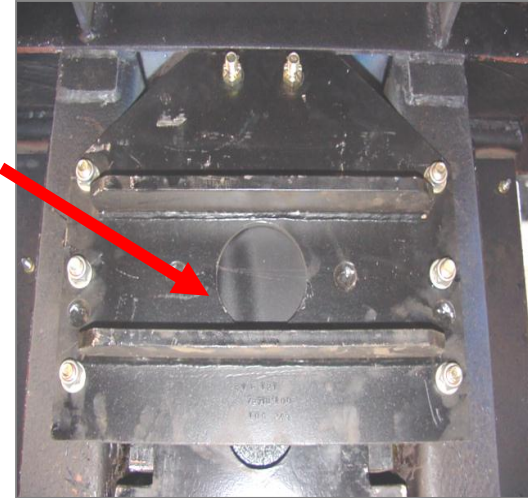


AIKON

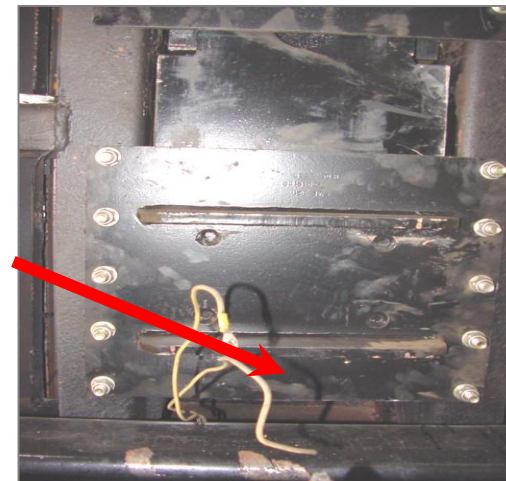


**YOKE /
CENTRAL PIN
SUPPORTING
PLATE**

FAIVELEY



**DRAFT GEAR
SUPPORTING
PLATE**



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Front and Rear Stoppers

- **Front and Rear Stoppers are welded to the draft gear**

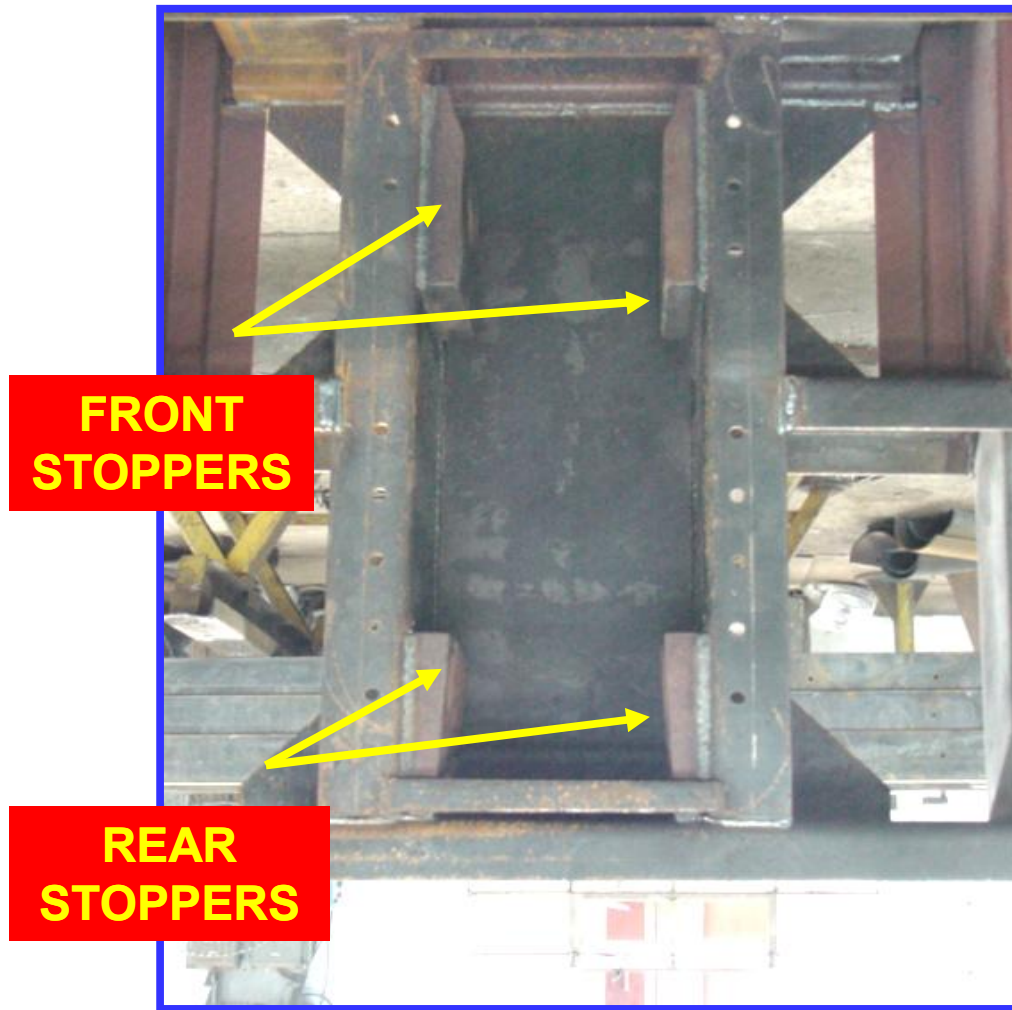
pocket longitudinal channels by longitudinal and circumferential welding.

- **Hence chances of stopper failures will be less .**

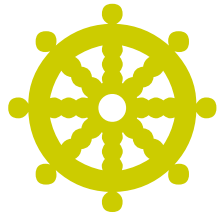
- **Recently rear stoppers are fastened with bolts and nuts on**

RCF &ICF coaches.

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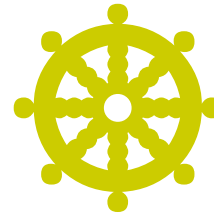


DIFFERENCE BETWEEN RCF& ICF CBC STOPPERS



RCF

**FRONT & REAR
STOPPERS ARE
OF **LHB** DESIGN**

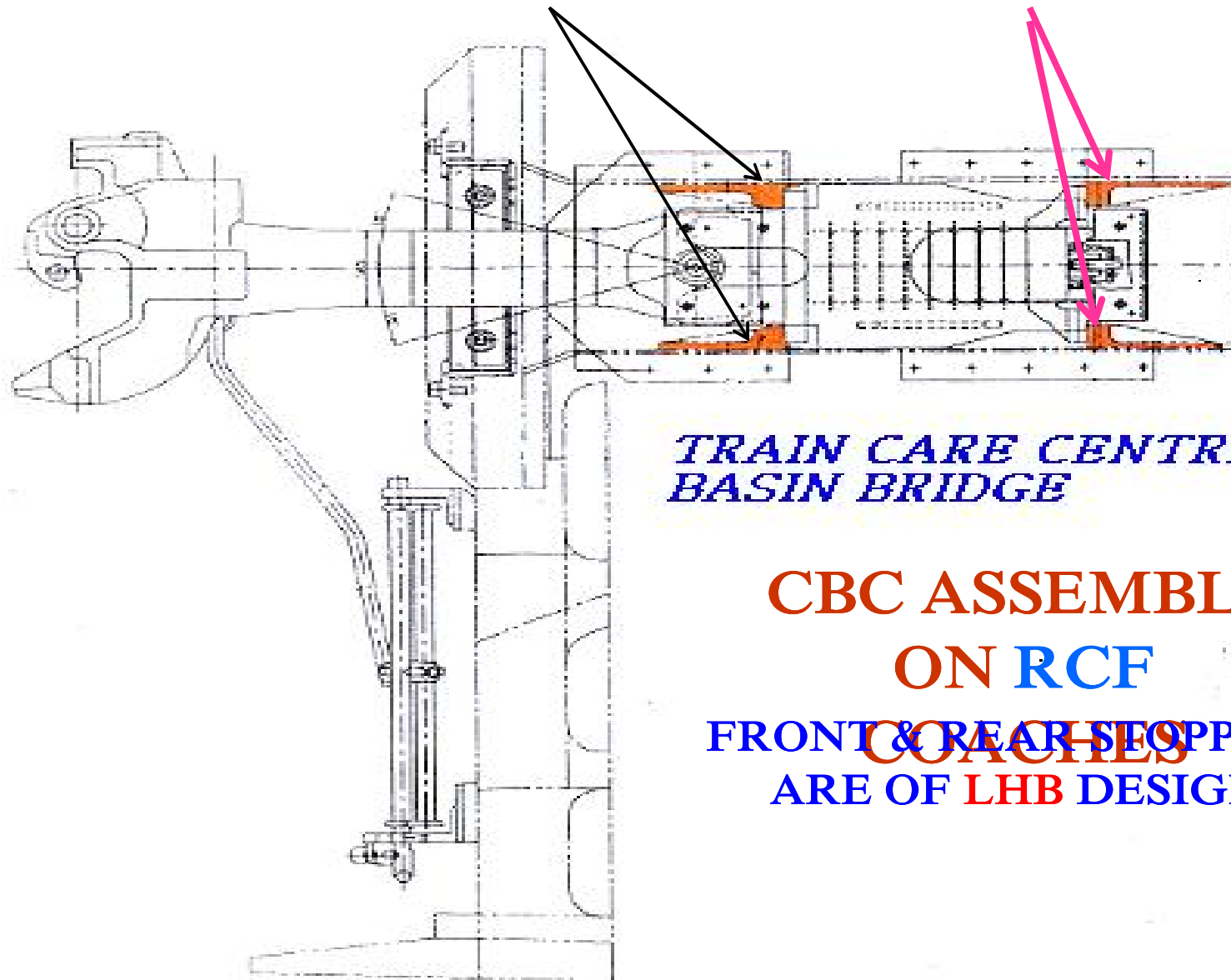


ICF

**FRONT & REAR
STOPPERS ARE
OF **UIC** DESIGN**

FRONT STOPPERS

REAR STOPPERS

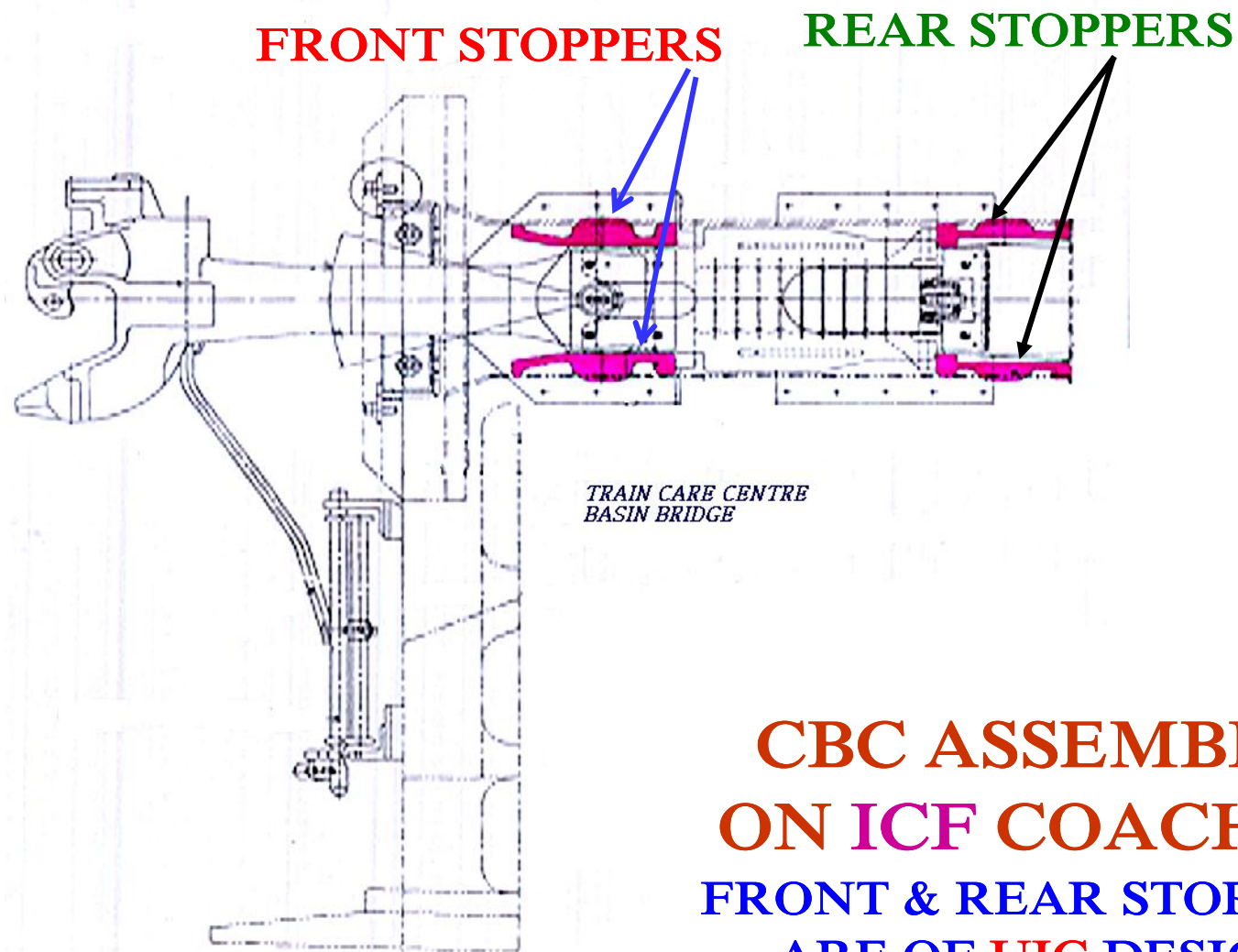


*TRAIN CARE CENTRE
BASIN BRIDGE*

**CBC ASSEMBLY
ON RCF**

**FRONT & REAR STOPPERS
ARE OF LHB DESIGN**

COACHES



**CBC ASSEMBLY
ON ICF COACHES
FRONT & REAR STOPPERS
ARE OF UIC DESIGN**

2-stage manual un-coupling device

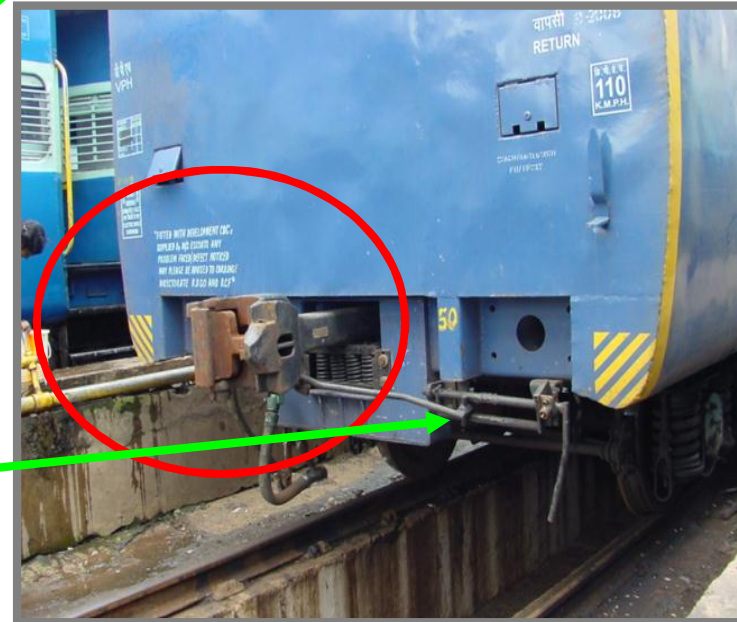
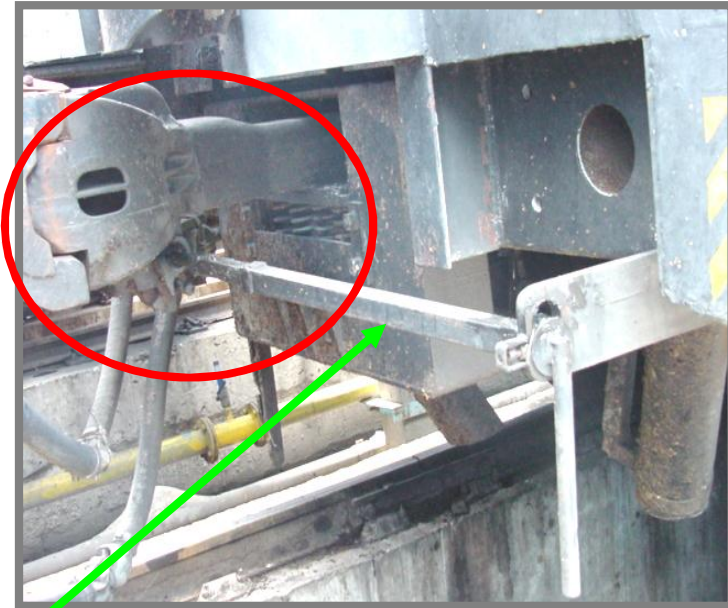
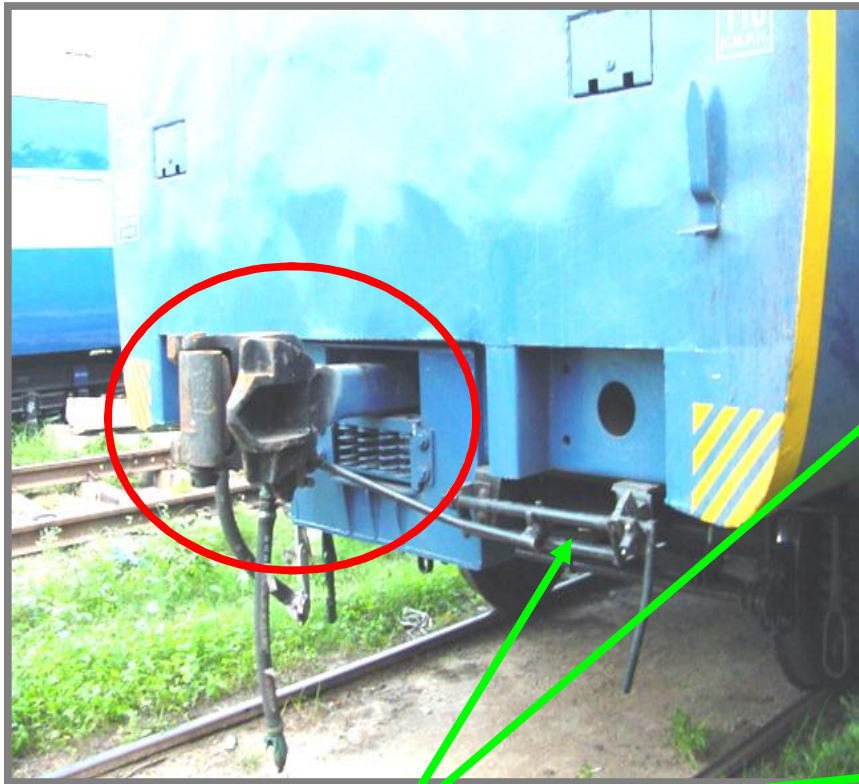
- 2-stage manual uncoupling device is used to facilitate sliding rod/tube to slide within coach limits.

- Thus infringement of operating rod with fixed structures while negotiating curves eliminated.

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FAIVELEY

AIKON

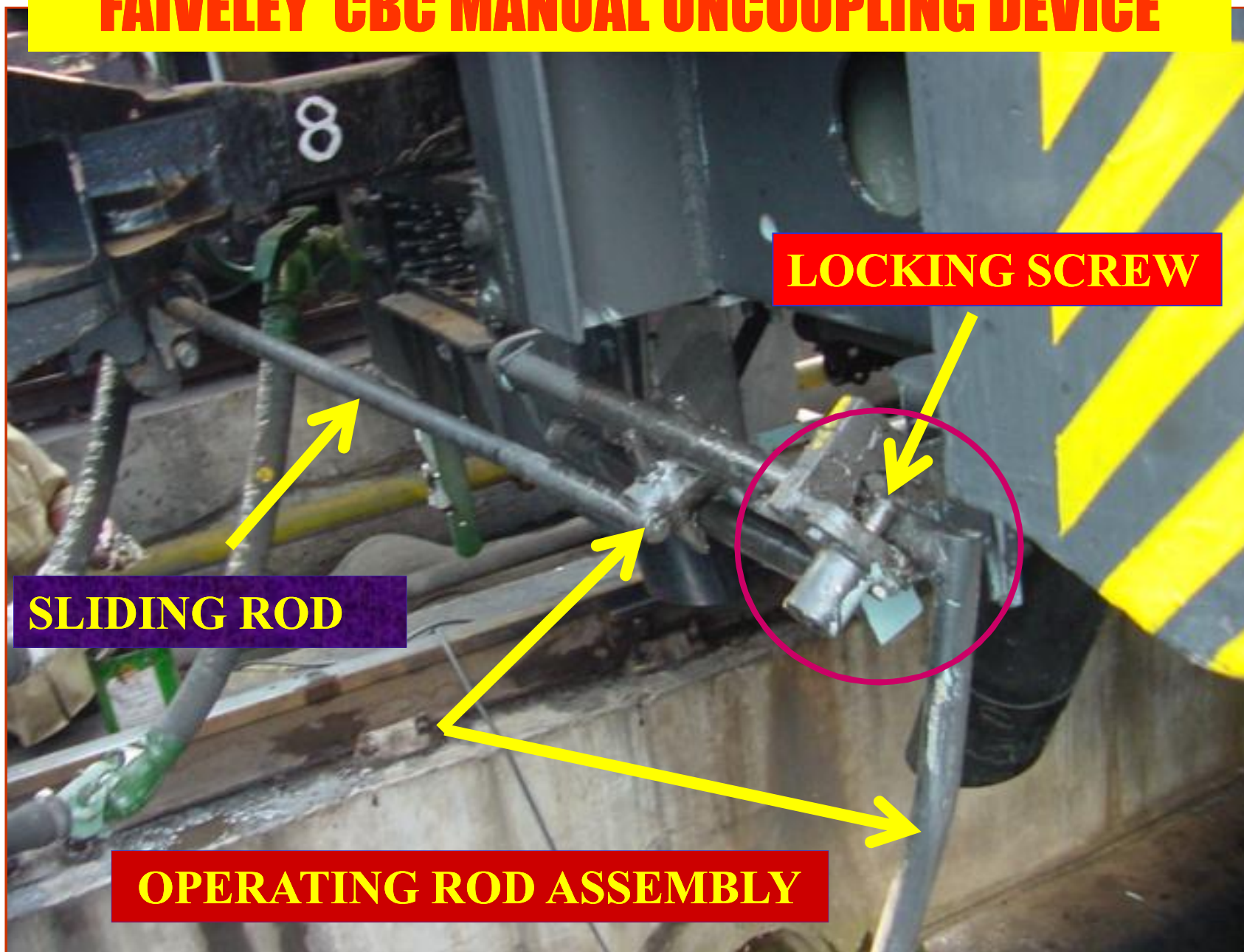


2 - STAGE MANUAL
UNCOUPLING DEVICE

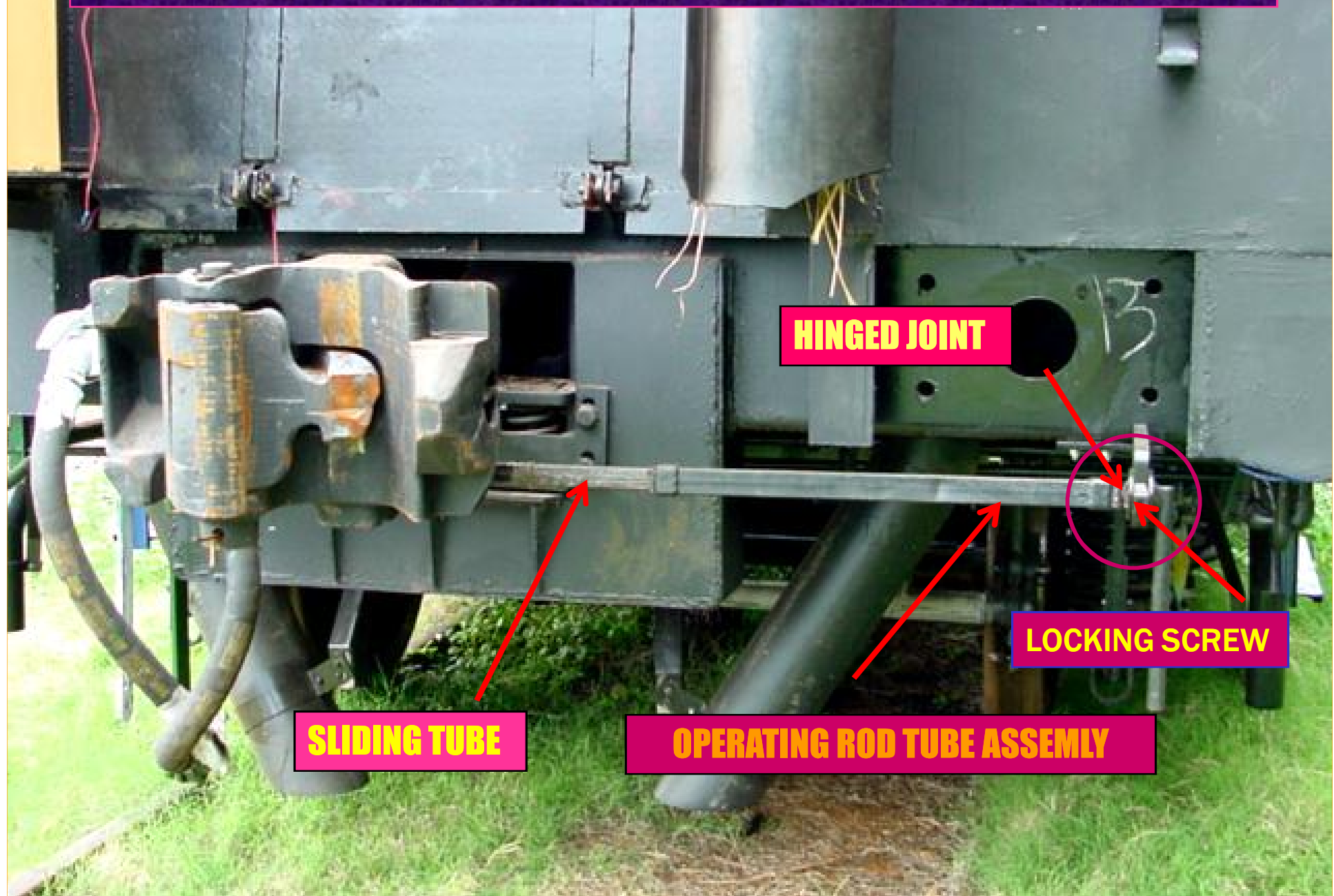
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ESCORT

FAIVELEY CBC MANUAL UNCOUPLING DEVICE



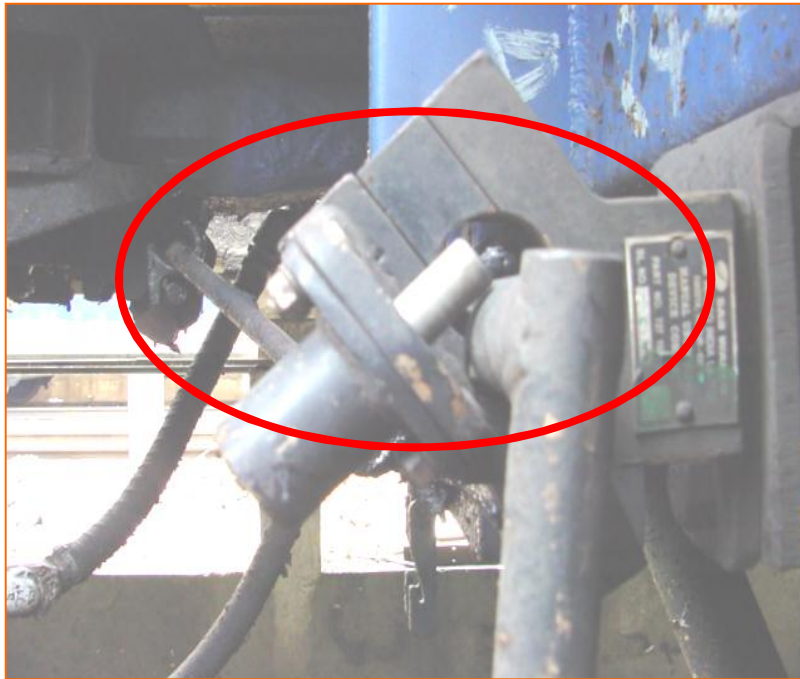
ASF-KEYSTONE (AIKON) CBC UNCOUPLING MANUAL DEVICE



Locking arrangement on manual un-coupling device operating lever

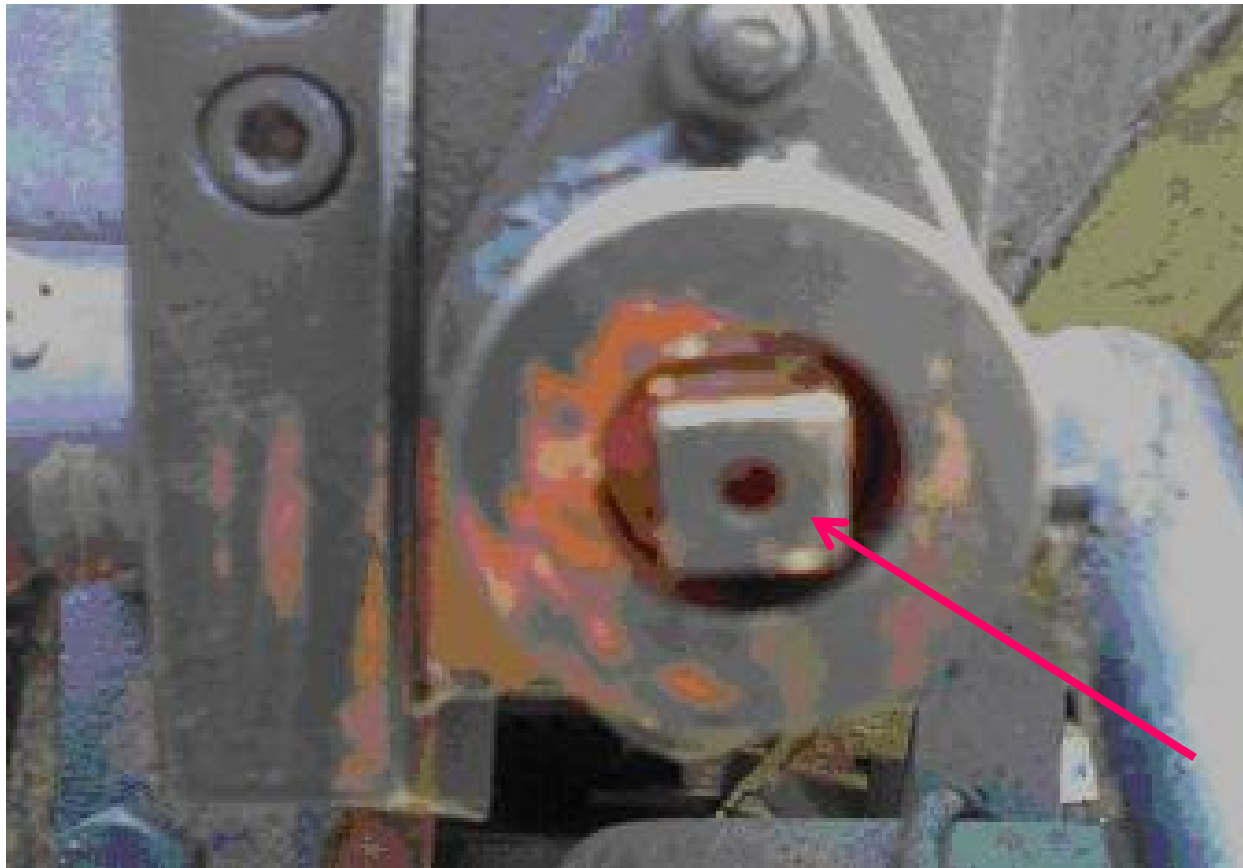
- **CBC operating rod is provided with locking arrangement to protect from un-authorized usage.**

**FAIVELEY / ESCORTS CBC OPERATING ROD LOCKING
ARRANGEMENT TO PROTECT FROM UN-AUTHORISED
USAGE**



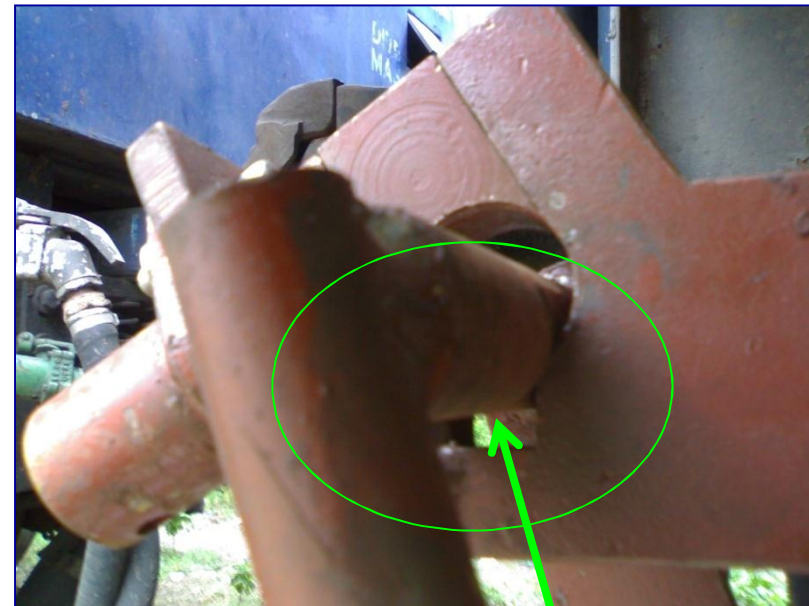
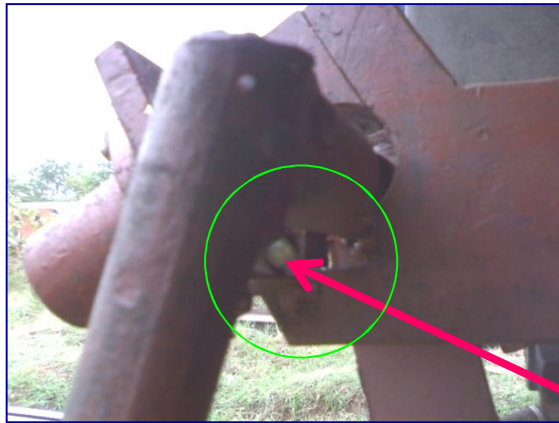
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Sub-standard operating rod locking screw (on PWP turned-out coaches)



Over size
square
head

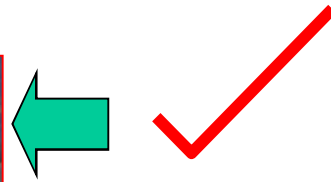
Sub-standard operating rod locking screw (on PWP turned-out coaches)



operating rod not
seated in the slot

Socket head screw obstructing the operating rod

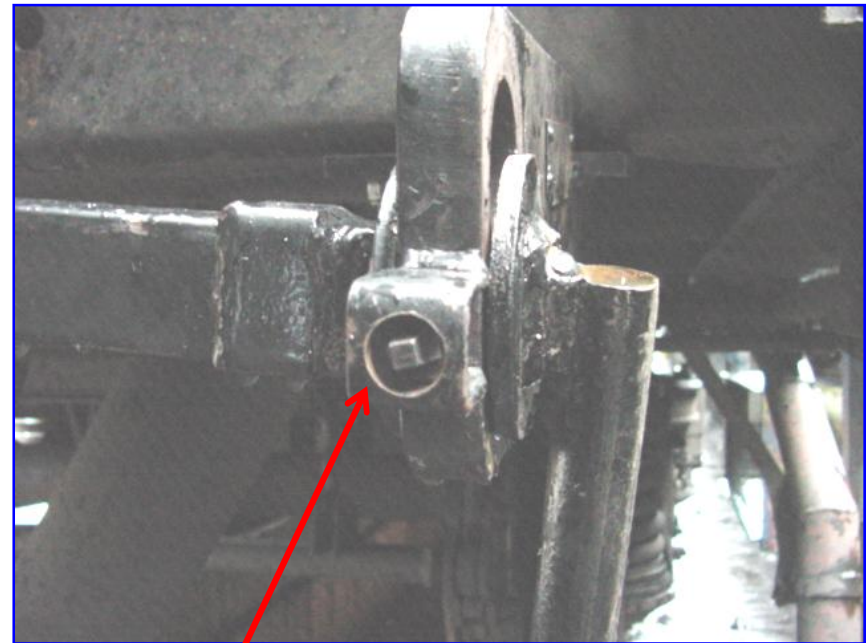
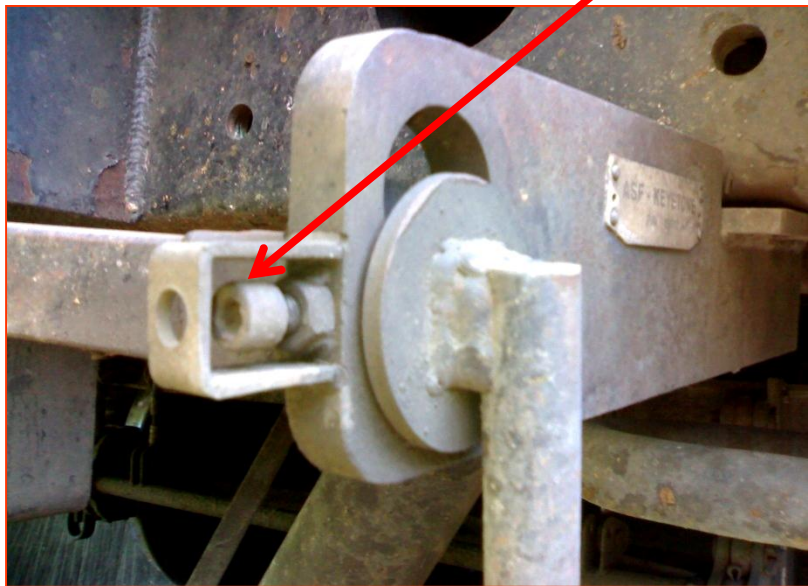
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LOCKING ARRANGEMENT ON AIKON OPERATING LEVER

INITIAL DESIGN
SOCKET HEAD LOCKING SCREW 8mm



MODIFIED LOCKING SCREW HEAD



SOCKET TYPE UNLOCKING KEY FOR
FAIVELEY TYPE & MODIFIED AIKON
TYPE OPERATING LEVER

ALLEN KEY FOR UNLOCKING UN-
MODIFIED AIKON TYPE OPERATING
LEVER

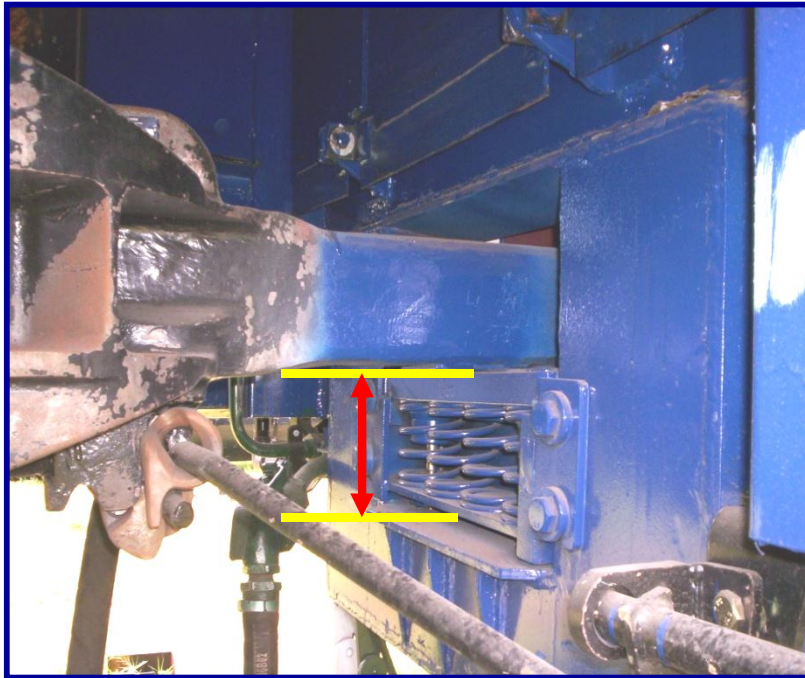


PRE-LOADED SPRING SUPPORTING DEVICES

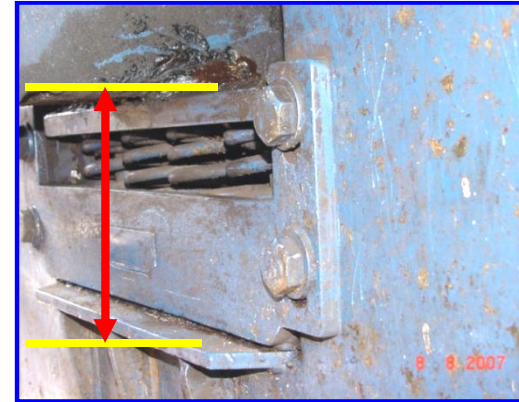
- CBC shank supporting devices are provided with pre-loaded open coil springs to dampen the unusual noises developed by the CBC shank during brake application.

PRE-LOADED SPRING SUPPORTING DEVICES

FAIVELEY

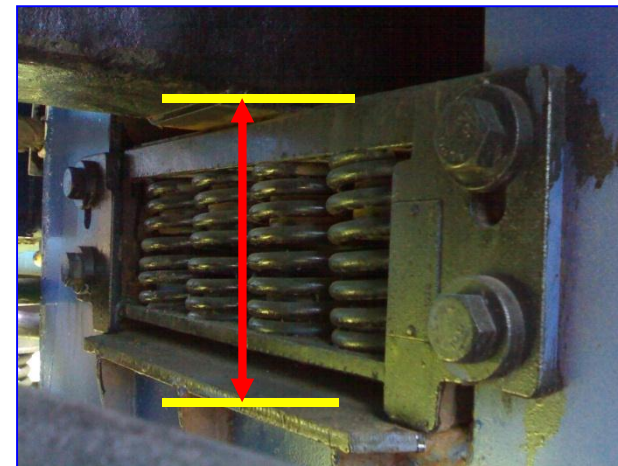


HEIGHT : 187.5 mm



AIKON

HEIGHT : 172.0 mm

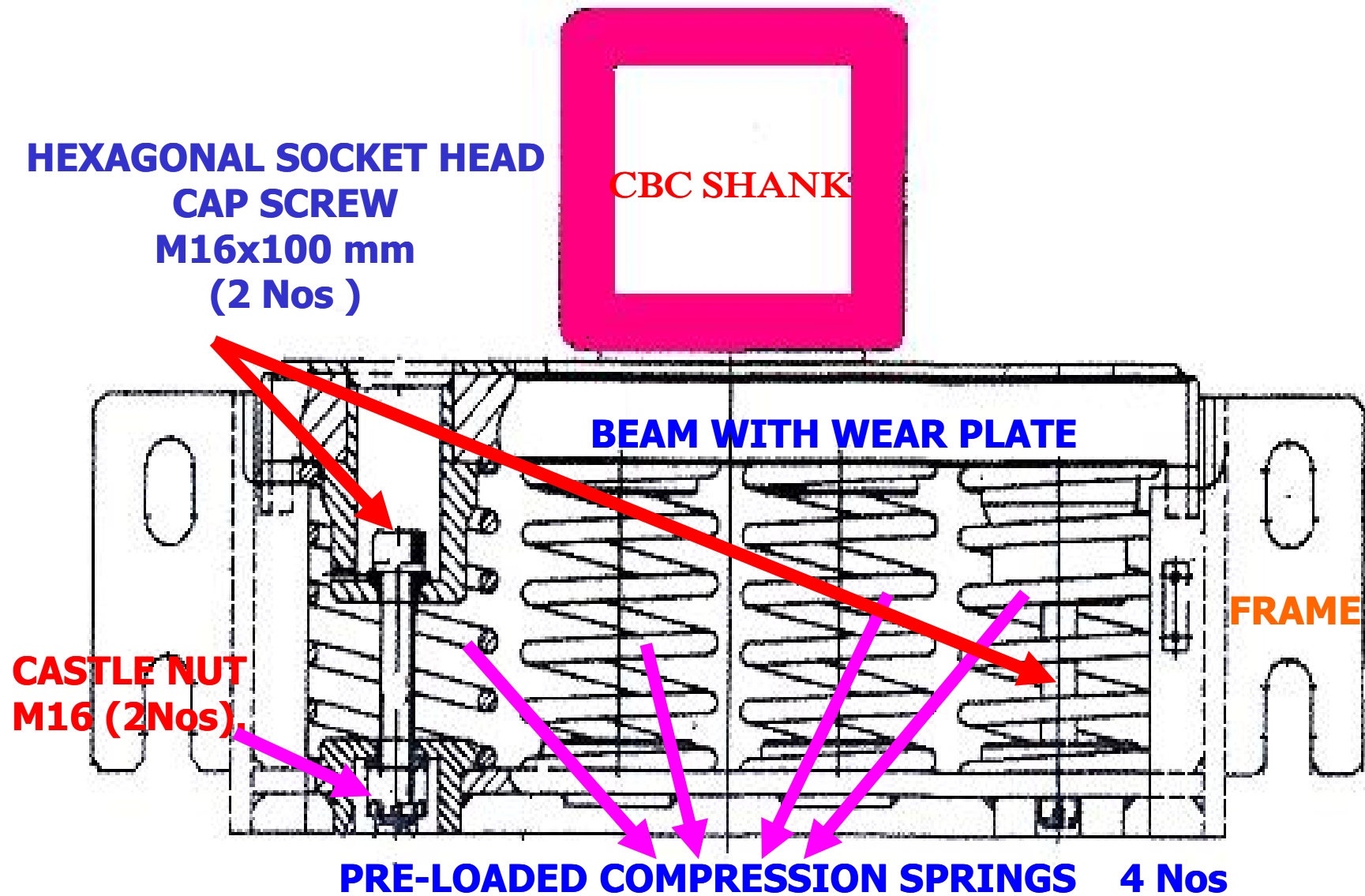


ESCORT

HEIGHT : 187.5 mm

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SUPPORT DEVICE ASSEMBLY (FAIVELEY)





FAIVELEY M16



HEXAGONAL SOCKET HEAD CAP SCREW
M16x100 mm (2 Nos)

AIKON CBC SUPPORTING DEVICE

PRE-LOADED COMPRESSION SPRINGS 4

No

WEAR PLATE

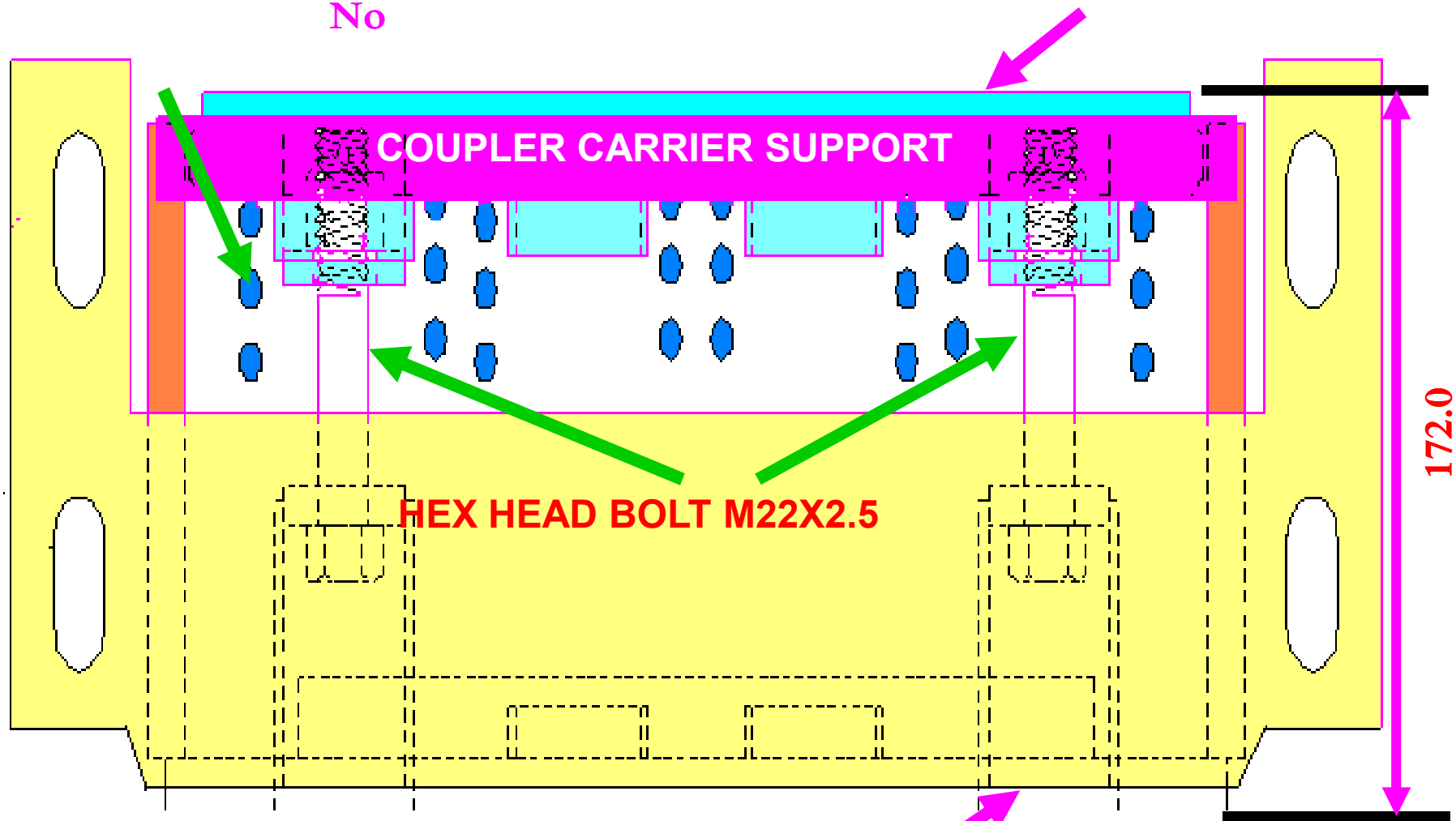
COUPLER CARRIER SUPPORT

HEX HEAD BOLT M22X2.5

SPRING SUPPORT CARRIER

172.0

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AIKON M 22

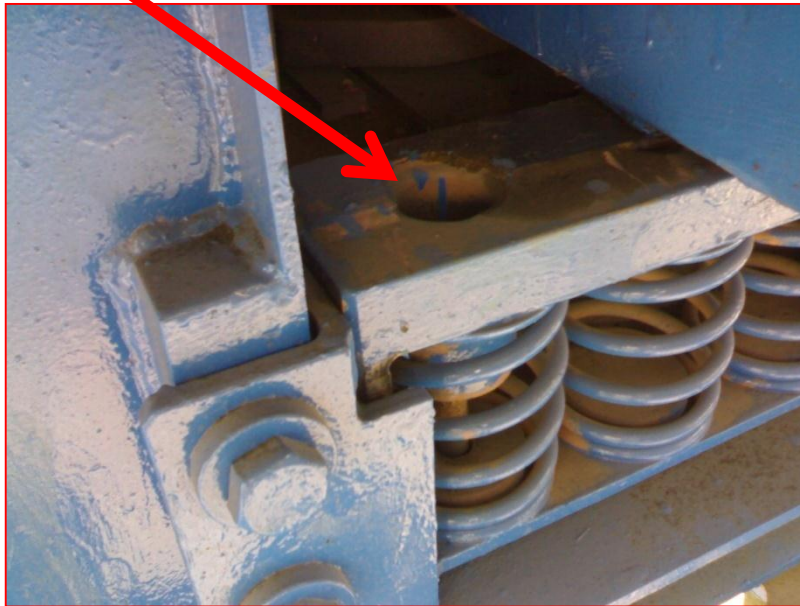


o.kanganayaku

Wearing plate welding

(on PWP turned-out coaches)

Provision for inserting & tightening
M16×100 socket head bolt



No Provision

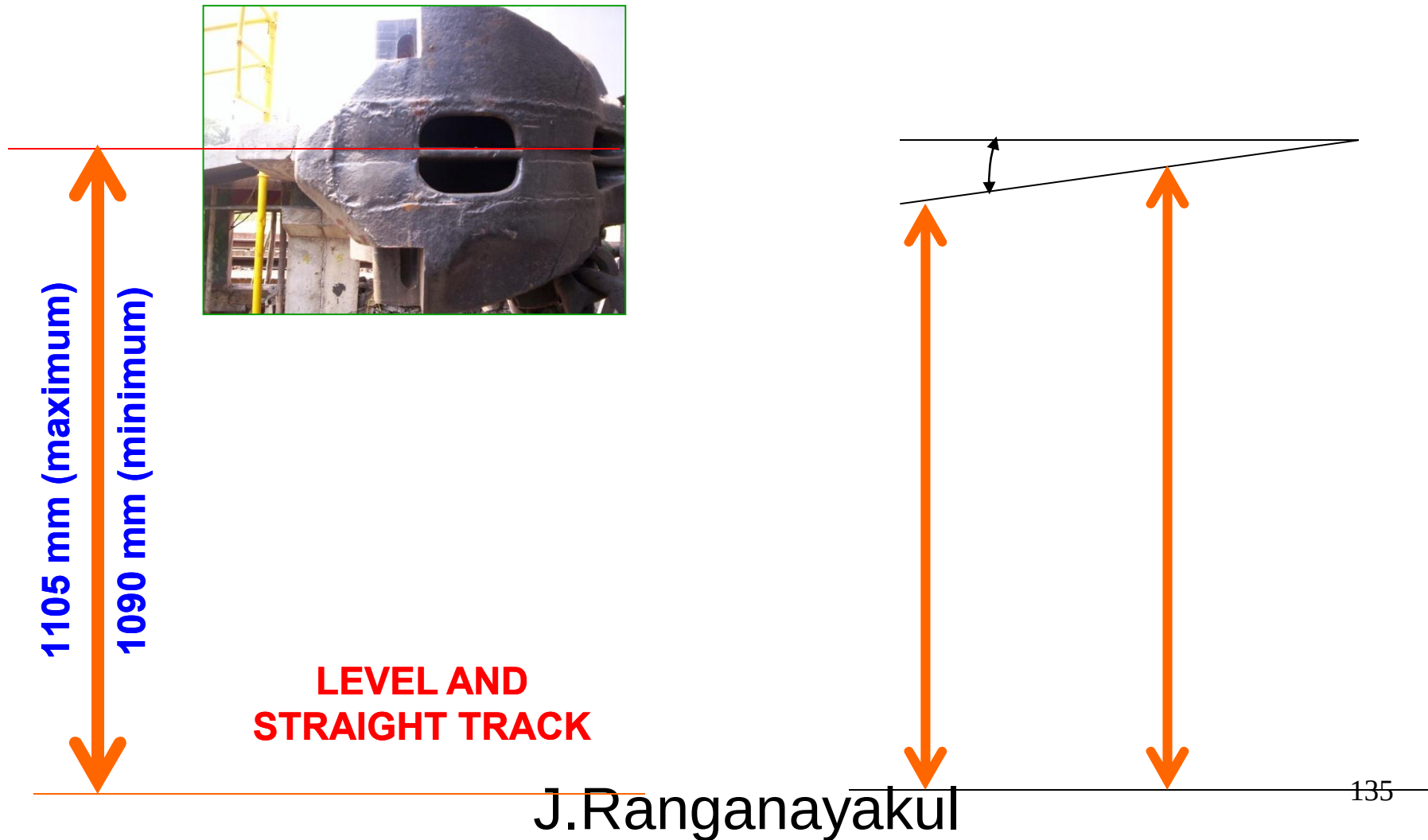


FAIVELEY CBC supporting device height adjustment



BUFFER HEIGHT MEASUREMENT

Note: - follow the same procedure as that of conventional coaches to maintain buffer height



Checking levelness



The maximum distance no more than $\frac{1}{4}$ inch
(while setting at workshops)

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string

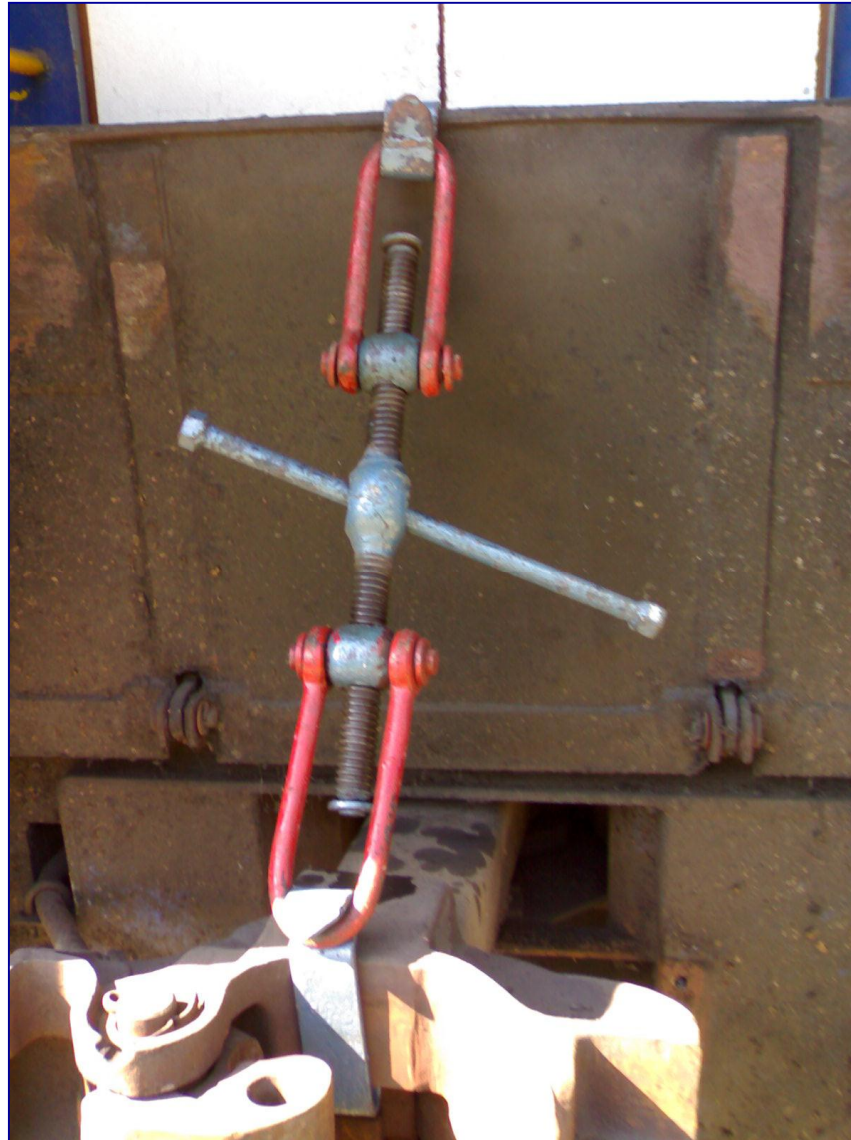
weight

Check levelness (at shops)

- To restore to level position, first slacken the coupler carrier securing bolts to the coach head stock and then lift the coupler carrier to the required position and secure to the head stock. Note that required thickness shims to be tack welded on the striker support and ensure the coupler carrier rests on the shims.
- Now check the level.
- If the level is not maintained with the above method of adjustment , to restore to level position , add shims on the coupler carrier. (note: - it is the last resort)

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**Gadget Developed at BBQ Depot to lift CBC head without
use of jack on coaches except GS, SLR & VPH**



**Gadget Developed at BBQ Depot to lift CBC head without
use of jack on coaches except GS, SLR & VPH**

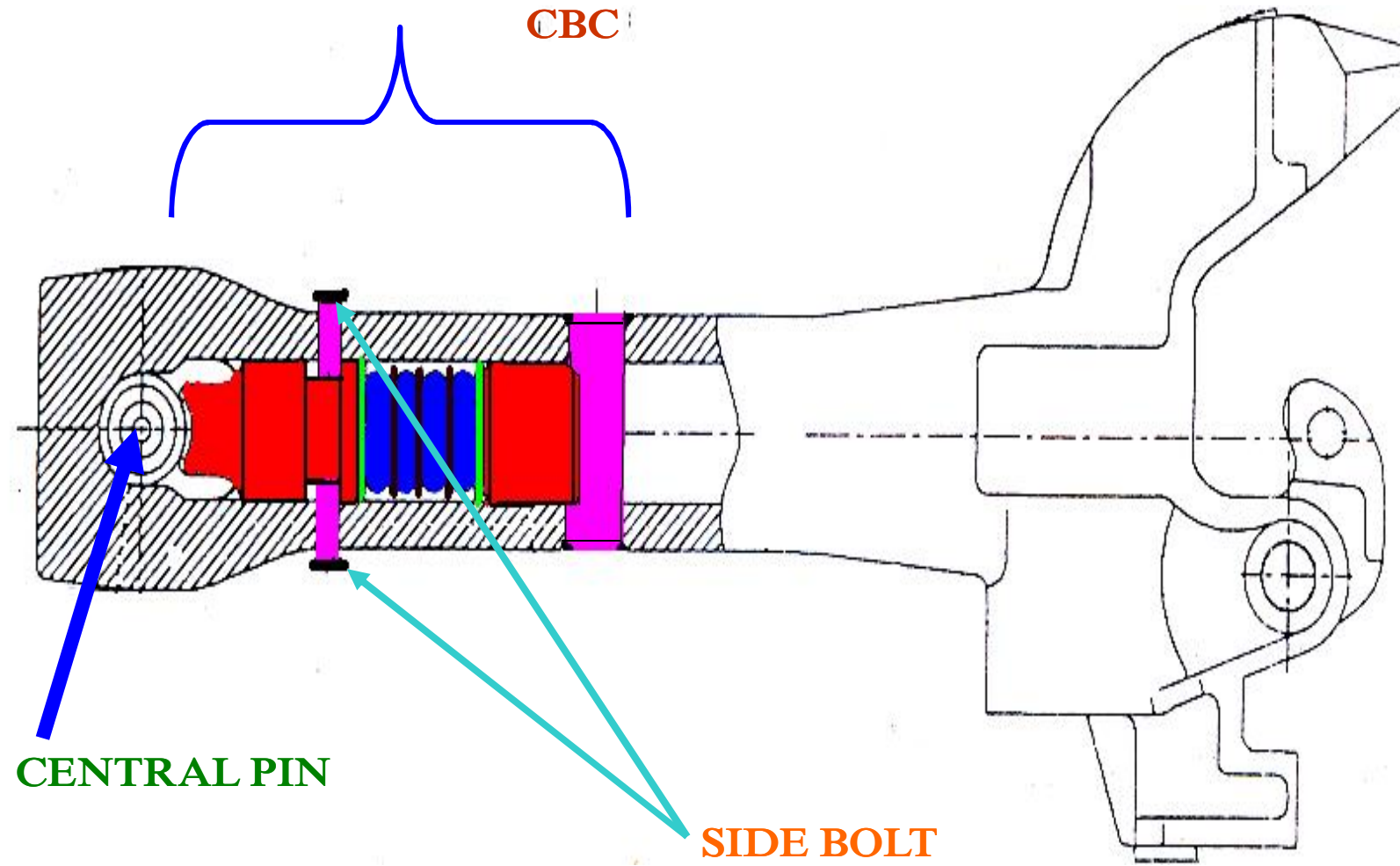


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BACK LASH COMPENSATION DEVICE IN FAIVELY CBC

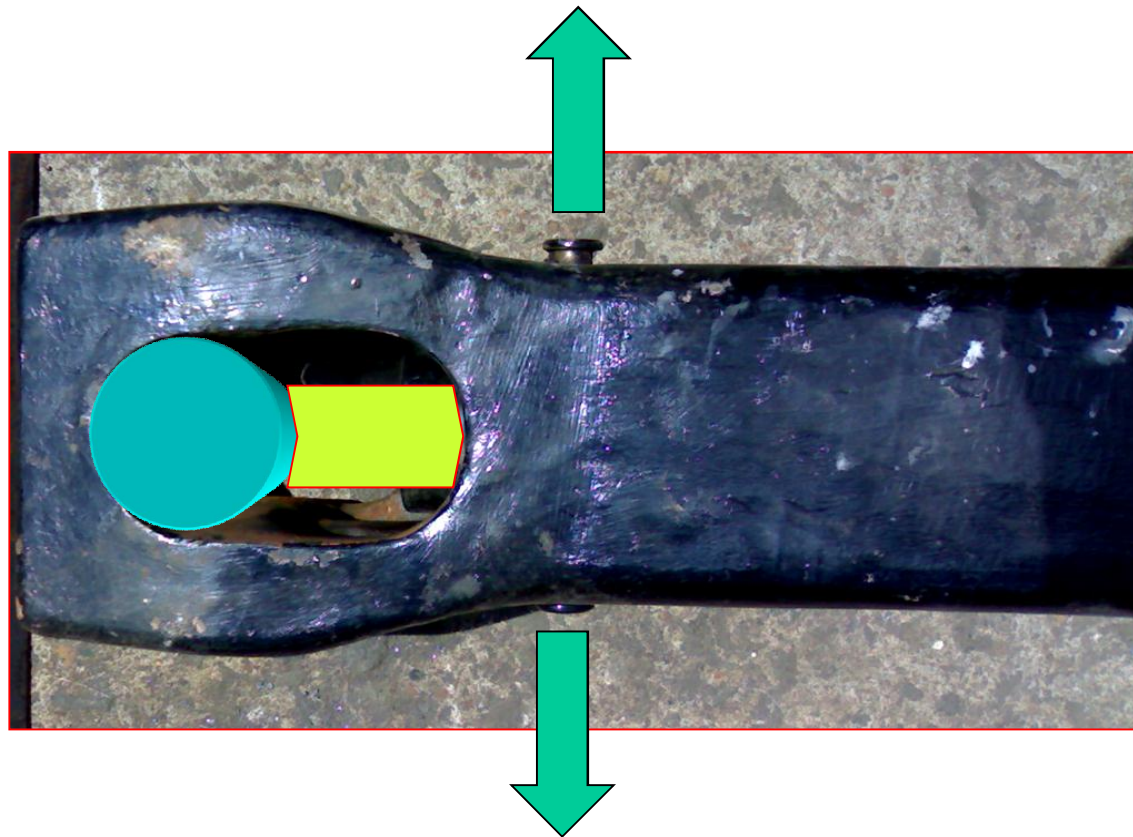
BACK LASH MECHANISM FAIVELEY

BACK LASH COMPENSATION DEVICE IN FAIVELY CBC



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BACKLASH COMPENSATION MECHANISM ON FAIVELEY CBC SHANK



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STABILISING SPRING ELEMENT



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BACKLASH COMPENSATION DEVICE (UIC LINKAGE ASSEMBLY)

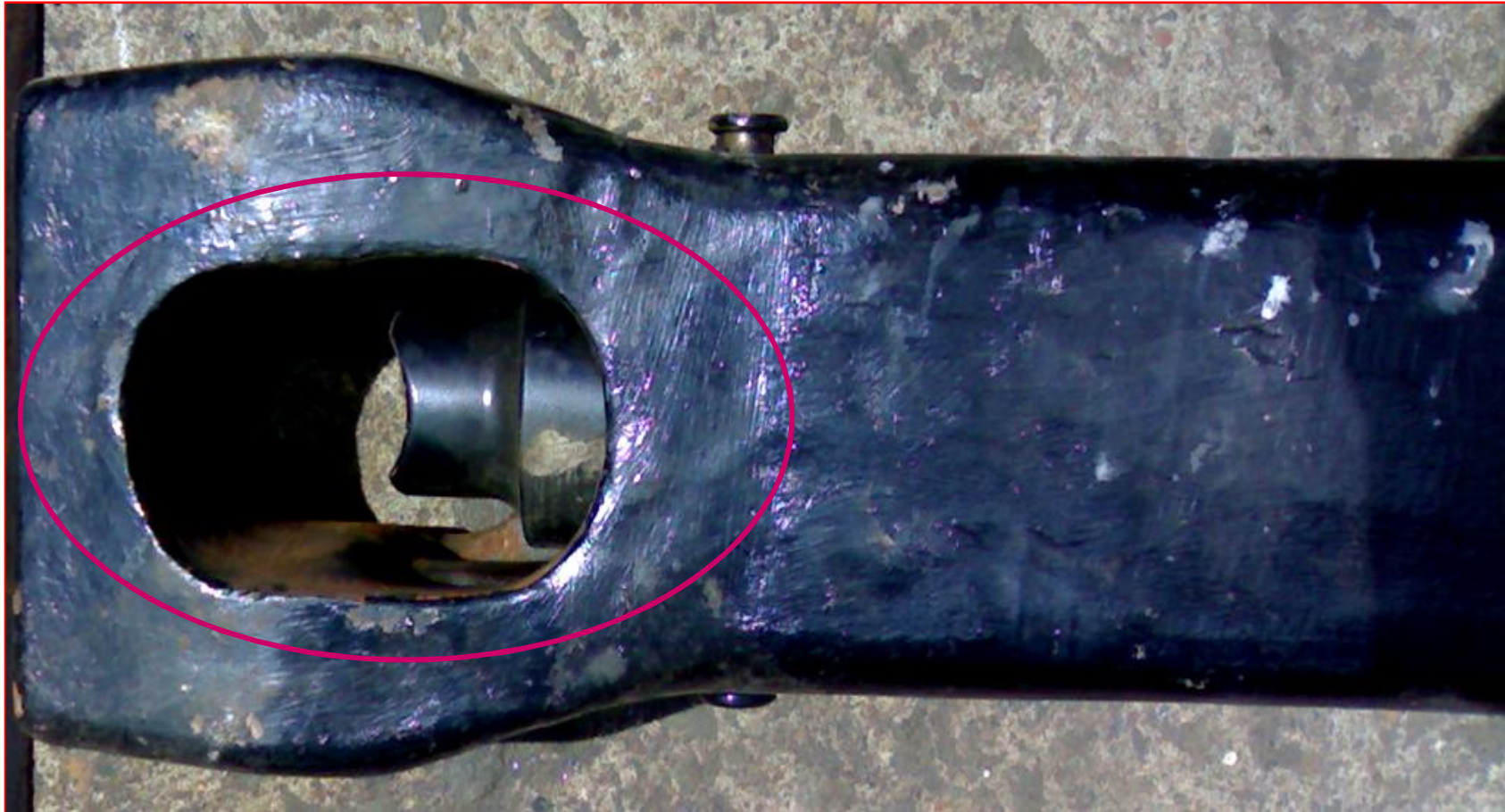
- Backlash compensation device assembly consists of stabilizing spring element and UIC stabilizing linkage.
- Assembled at the tail end of the coupler head.
- It takes up the clearance between central pin and the tail end of the coupler head hole.

- It is held in position by two side bolts that are to be removed only after installation on the coach.
- It helps central pin to maintain constant contact with the tail end of the coupler head hole. Thus impact load on central pin can be minimized.

DIFFERENCES IN YOKE PIN ASSEMBLY

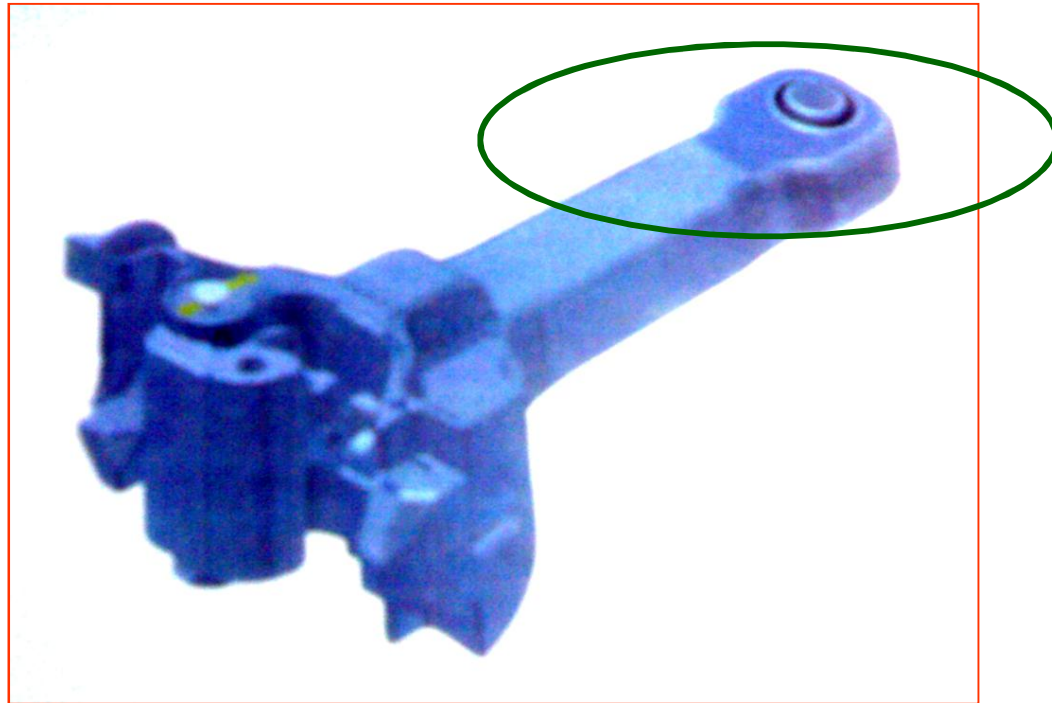
- In **Faiveley** CBC central pin is assembled in the shank hole with the help of back lash mechanism.
- In **Escorts** CBC central pin is of silent block type.
- In **Aikon** CBC yoke pin is inserted into the shank hole through yoke. Yoke pads serve the purpose of back-lash compensation device mechanism.

Faiveley



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ESCORTS CBC SHANK WITH CENTRAL PIN (silent block type)





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AIKON CBC SHANK



S. K. Gangadhar

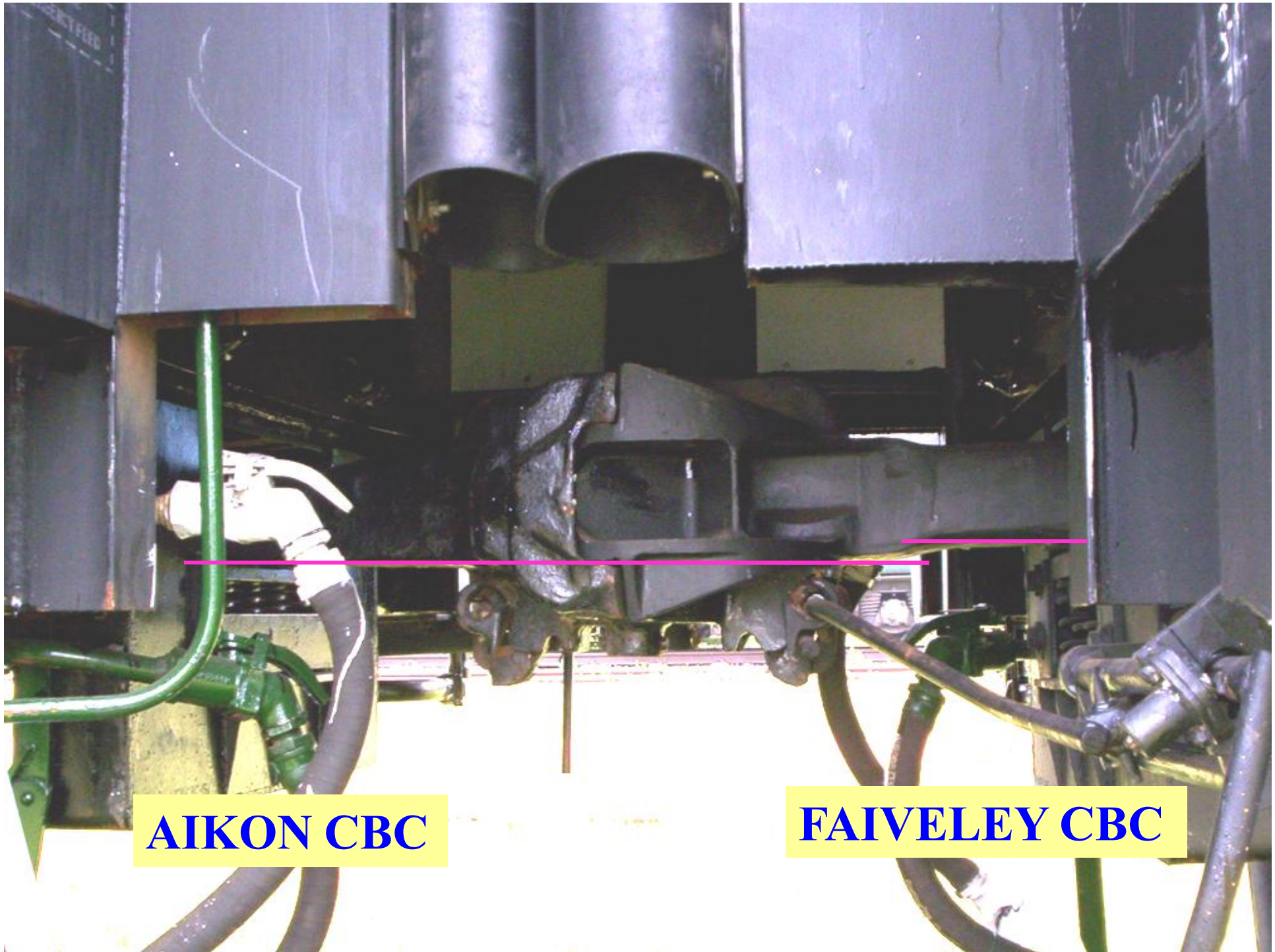
INTERCHANGEABILITY

CBC HEAD COMPONENTS

- CBC head components like knuckle, lock, knuckle thrower, and toggle are interchangeable.
- After every change, the coupling, uncoupling and the working of anti-creep mechanism shall be ensured.

CBC SHANK SUPPORTING DEVICES

- Faiveley and Escorts supporting devices are interchangeable because their heights are equal (187.5 mm).
- Where as Aikon supporting device is not interchangeable because of the height difference (172.0mm).



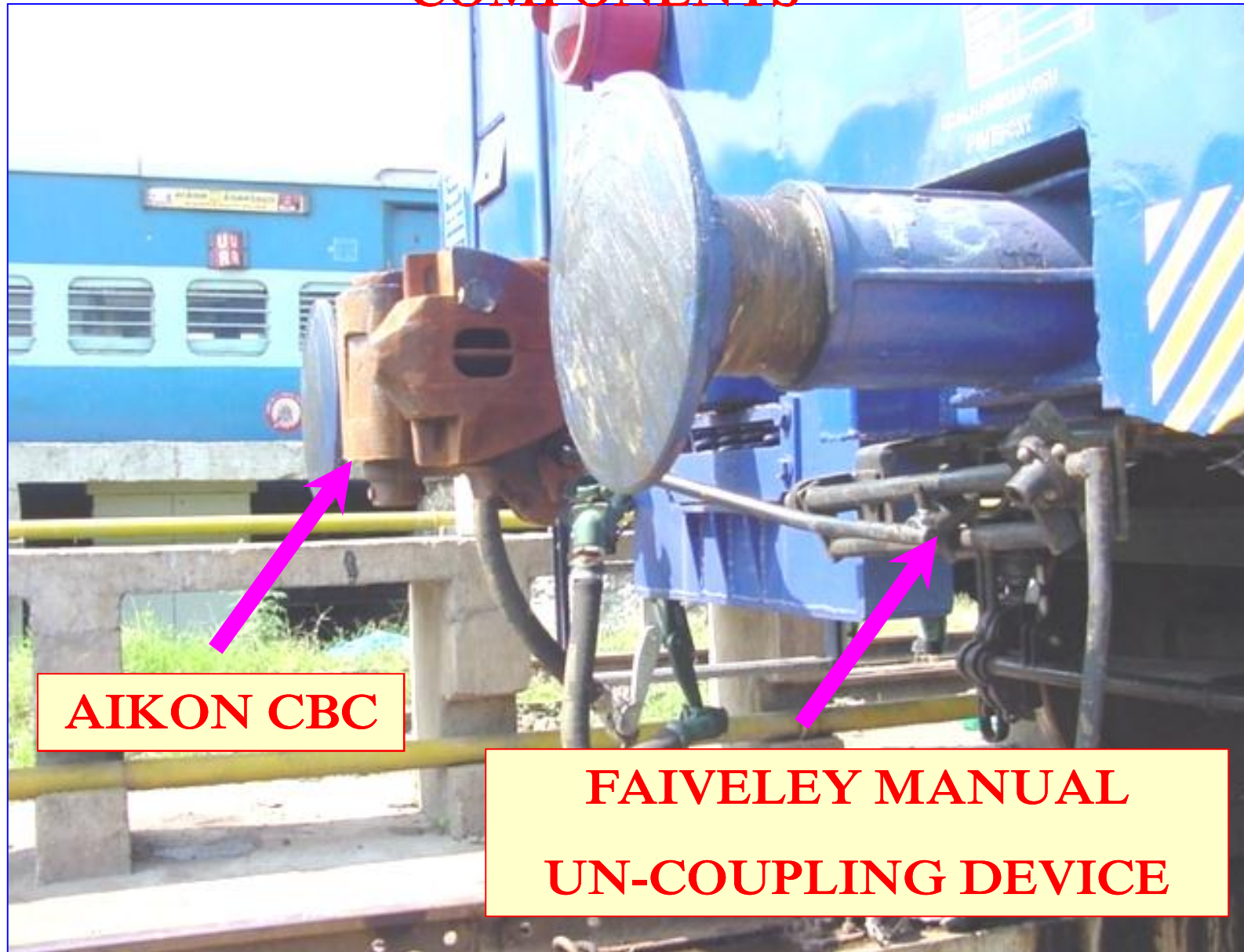
AIKON CBC

FAIVELEY CBC

Manual un-coupling device

- Manual un-coupling device are interchangeable with different makes.
- Head stock provided with holes to mount manual un-coupling devices of different makes (on coaches turned out from the year 2006 onwards).

COMBINATION OF AIKON & FAIVELEY COMPONENTS



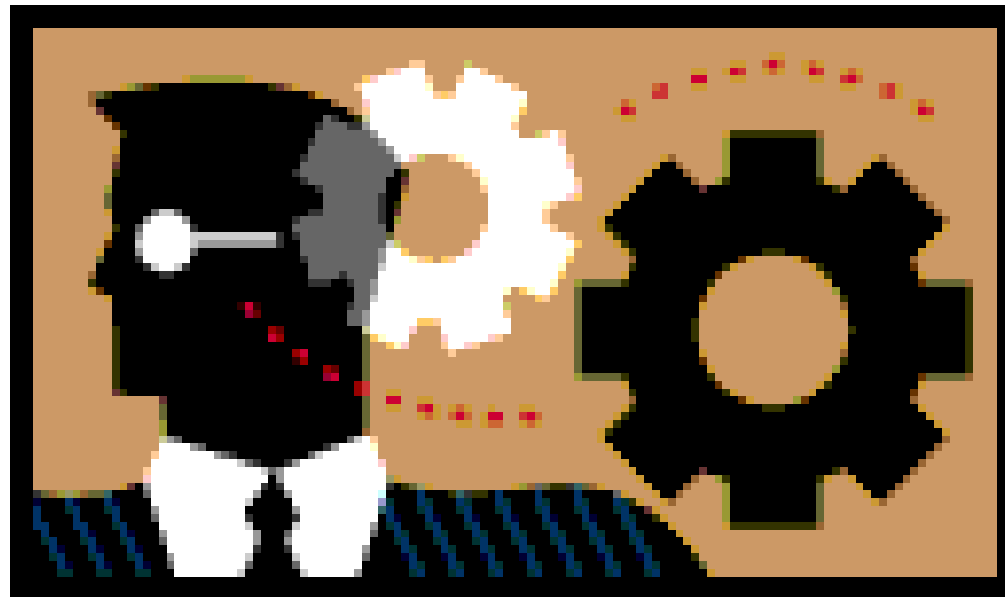
AIKON CBC

FAIVELEY MANUAL
UN-COUPLING DEVICE

Remember

- CBC shanks of different makes can not be interchanged with draft gears of different makes.
- Same make CBC shank and draft gear are to be interchanged.
- Draft gear pocket in the coach head stock is designed to accommodate different CBC makes.

LUBRICATION



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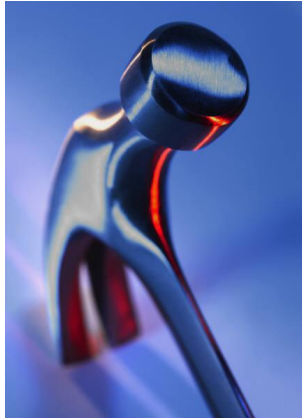
- Only dry lubricant shall be applied to the coupler head or the coupler head fittings. This lubricant may be applied using water, alcohol, or other non petroleum based carrier.
- Do not lubricate or paint CBC head components like knuckle, lock, knuckle thrower, toggle, rotary lever, etc., as it will facilitate uncoupling and hence is dangerous.

- **Lubricate** at tail end, shank of coupler head having relative movement with supporting device and manual uncoupling device sliding areas, central pin and draft gear.
- **Adequate greasing** of surfaces of draft gear and surface of front stoppers on coach having relative motion has to be ensured during mounting.
- **Apply kerosene** on operating lever locking screw / rod & un-screw and screw again.

DO NOT APPLY GREASE ON COUPLER HEAD
COMPONENTS



IMPORTANT



HAMMERING

- No hammering should ever be done on any part of the lock lift assembly. This may cause distortion and result in faulty operation of the coupler.

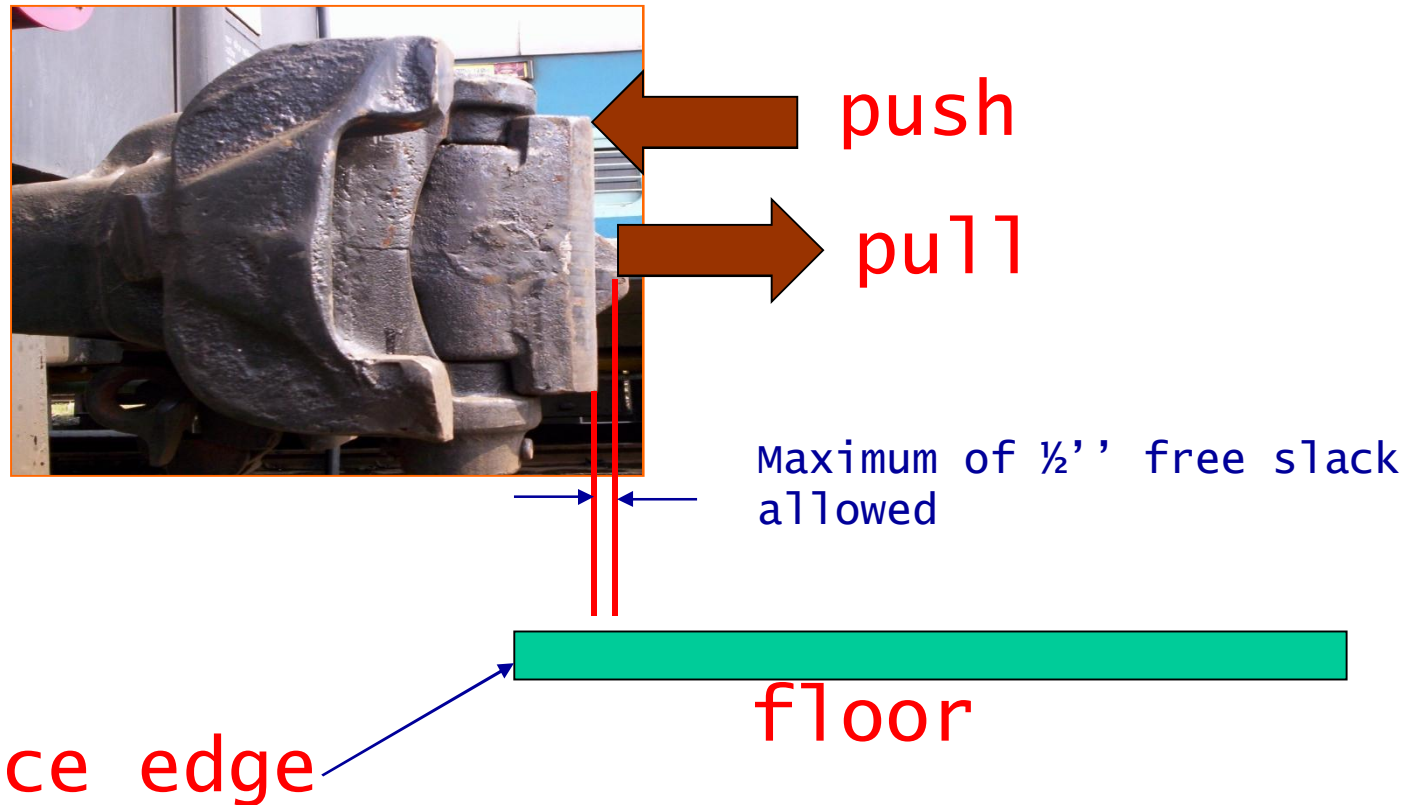


WELDING

- In case of replacement wear plate on coupler shank with new wear plate, weld with intermittent fillet welding along the length of the shank only.
- Wear plate thickness max.5mm & min.2.5mm.
- Wear plate made of manganese steel.

Other features of CBC coaches

Coupler assembly free slack measurement



Coupler assembly free slack measurement

- **First ensure that there should not be any free slack in the draft gear assembly.**
- **Ensure the coupler in the locked condition and placed in the centre of the coupler carrier.**
- **Push the towards coupler pocket and measure the horizontal distance of the knuckle front face to a reference point on the end of the under floor.**
- **Pull the coupler out of the pocket to the fullest range and repeat the measurement.**
- **The difference between the two measurement is the amount of free slack in the coupler.**
- **Maximum of $\frac{1}{2}$ `` free slack is allowed.**
- **If the maximum free slack is exceeded, the knuckle support pin may have excessive wear. Replace knuckle support pin and repeat the measurement.**
- **If no excessive wear exists on the knuckle support pin but free slack still exists, replace the coupler.**

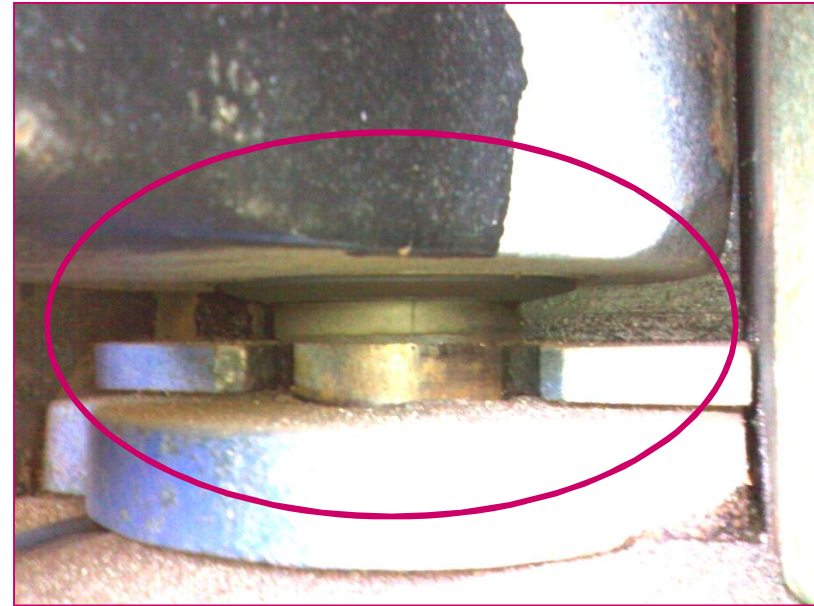
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FAILURE OF YOKE PIN SILENT BLOCK BUSH MECHANISM ON ESCORTS CBC

YOKE PIN ARRANGEMENT ON NEW ESCORTS CBC



VIEW AT TOP



VIEW AT BOTTOM



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PROBLEM WITH SILENT BLOCK BUSH

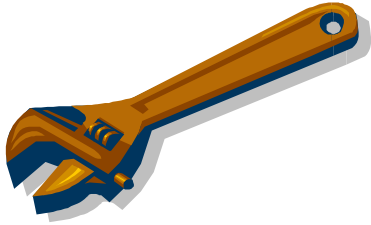


Modified ESCORTS yoke pin silent block bush (under study)



Technical Data

- Length is 1030 mm.
- The contour slack when two couplers are coupled together should not be more than 3.5 mm in new condition.
- Coupler material : high tensile , grade – ‘E’ steel per AAR specification M-201 Q & T.
- Maintenance of coupler head to be done as per the AAR manual “Standard for Periodic Inspection and Maintenance of Passenger Coaches APTA M-002-98”.



- Torque value for M16X55 mm Bolts (yoke pin support plate and draft gear support plate bolts) : 200+50 Nm
- Torque value for M20X50 mm Bolts (supporting device fixing bolts) : 450+50 Nm

- Knuckle height from the centre line : 140 ± 3 mm.
- Wear plate 5X220 mm.(cond. 2.5 mm)
- Supporting device inner bolts (Faiveley) hexagonal
socket head cap screws M16X100 mm.
- Central pin diameter (Faiveley) : 80 mm.

- Coupler is designed to take both draft and buffing force.
- Coupler capacity is about 200 t whereas the conventional screw coupler is of 75t. Number of coaches can be increased.
- Relative movement between mating knuckles in vertical direction eliminated due to interlocking feature of aligning wings. So, life of knuckles increase.

- Coupling is automatic and uncoupling can be done manually without entering in between the coaches.
 - Total weight of coupler head and draft gear is about 490 kg (Draft Gear 170 kg + Coupler body 220 kg).
 - Tubular section in the coach under frame is eliminated.
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Modified brake rigging arrangement

Problem faced with the existing brake rigging
arrangement:

**OUTER BMBC BRAKE RIGGING VERTICAL FLOATING LEVERS AND
Z-LEVERS ARE INFRINGING WITH HEADSTOCK INNER CROSS
MEMBER UNDER DYNAMIC CONDITION.**

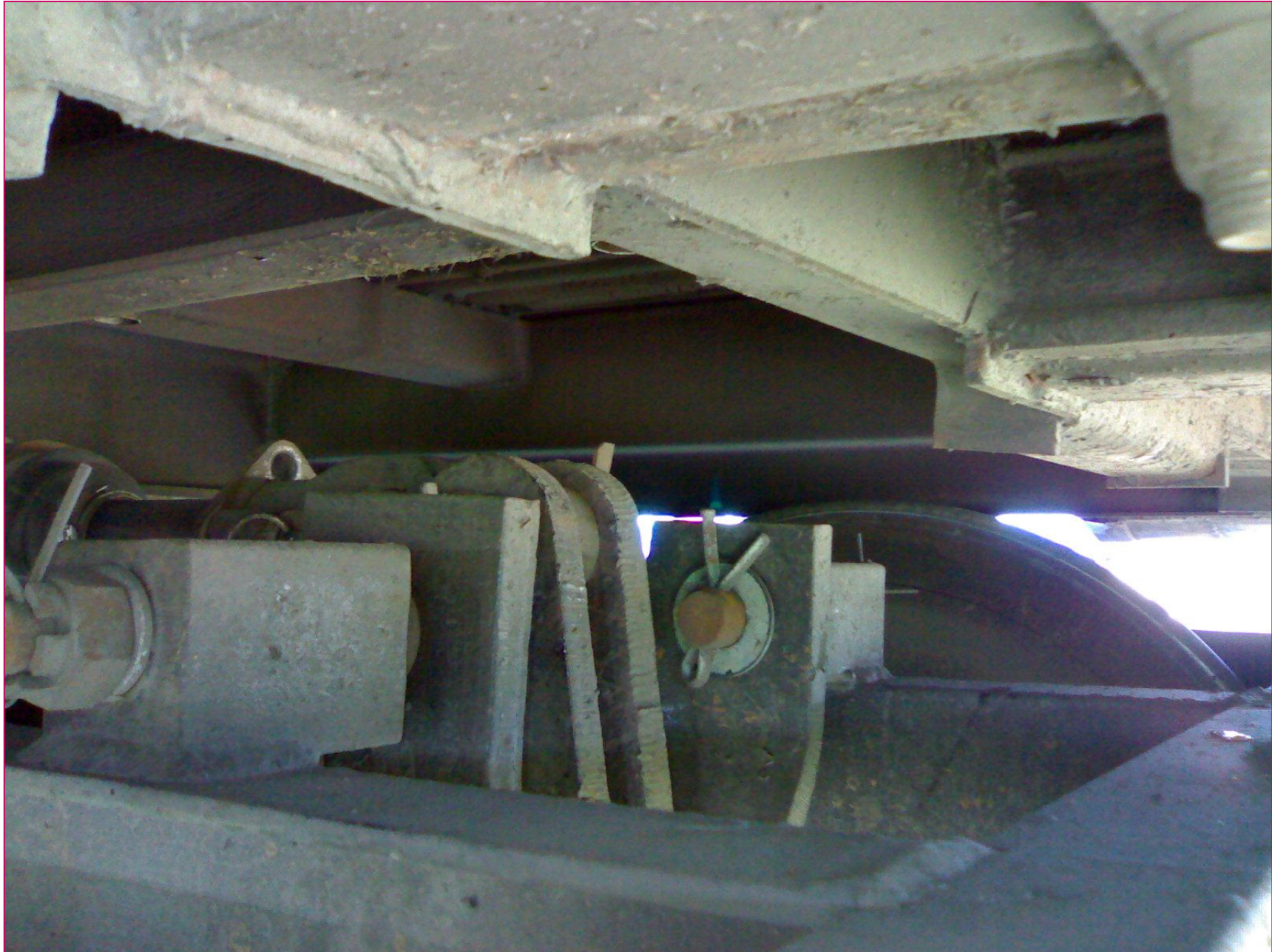
Infringement of floating lever with head stock inner cross member



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U. Kangandayaka



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Modified brake rigging arrangement



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KNUCKLE ACTUATING MECHANISM

- **Toggle (lock lifter) is provided inclined elongated hole, which helps to actuate knuckle thrower and in turn the knuckle during the operation of manual un-coupling device operating lever.**

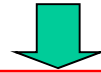
ROTARY LOCK LIFT ASSEMBLY

INCLINED ELONGATED
HOLE



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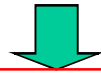
**LIFT & ROTATE MANUAL UN-COUPLING DEVICE OPERATING LEVER
IN CLOCK-WISE DIRECTION MINIMUM OF 90°**



ROTARY LEVER GETS ROTATION IN CLOCK-WISE DIRECTION



**TOGGLE ATTACHED TO THE ROTARY LEVER ASSEMBLY GETS LIFTED
& LOCK ALSO GETS LIFTED AND TOGGLE FALLS IN CLOCK-WISE
DIRECTION (gets this movement because of Inclined slots in the toggle)
ON TO THE RIGHT END OF KNUCKLE THROWER**



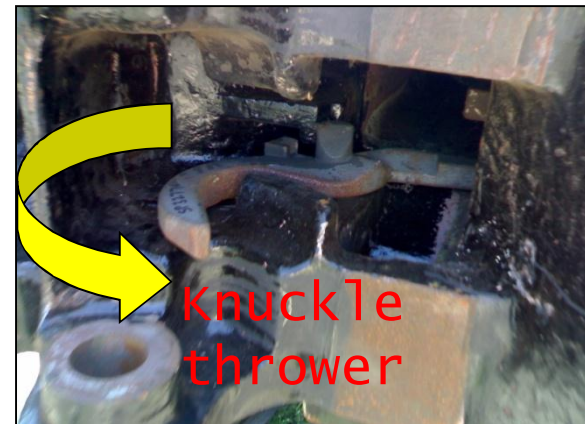
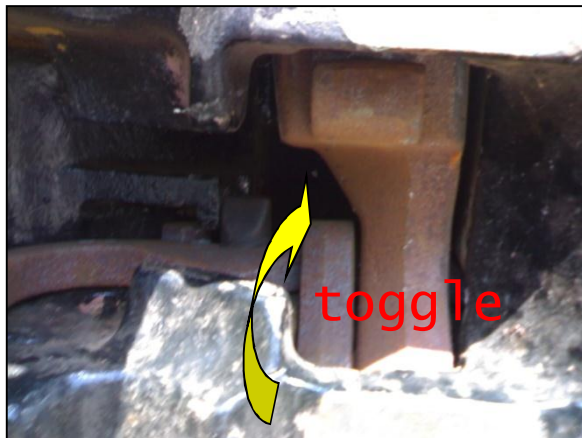
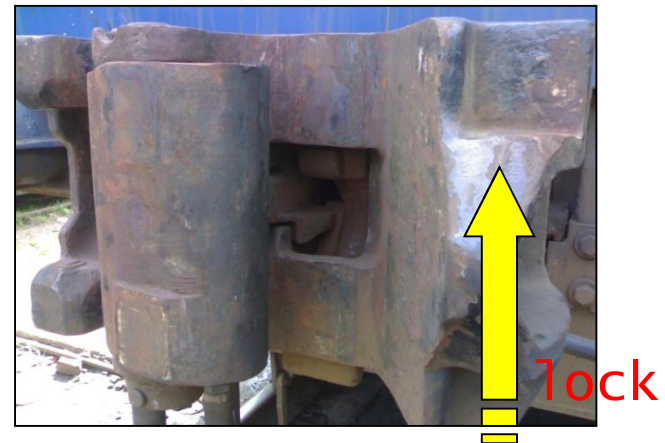
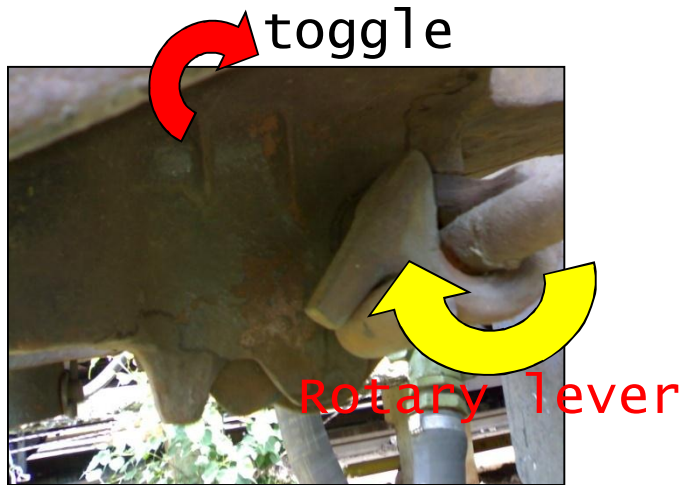
**KNUCKLE THROWER ROTATES IN ANTI CLOCK-WISE DIRECTION
THE HORIZONTAL PLANE AND LEFT END OF THE KNUCKLE THROWER
THROWS THE KNUCKLE AT BOTTOM RIGHT HAND SIDE OF
KNUCKLE PIVOT PIN**



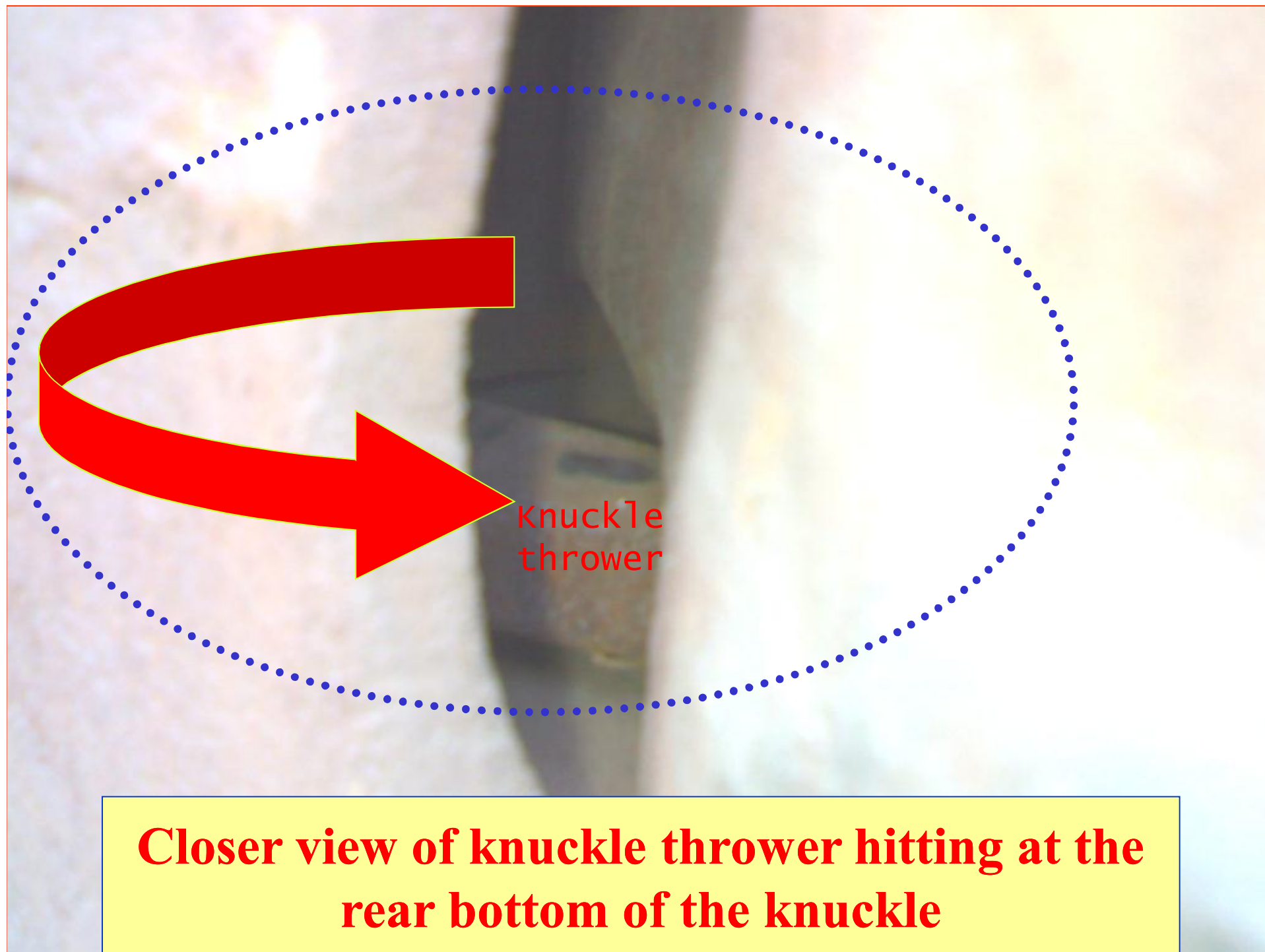
**KNUCKLE GETS ACTUATED AND OPENS IN
CLOCK WISE DIRECTION**

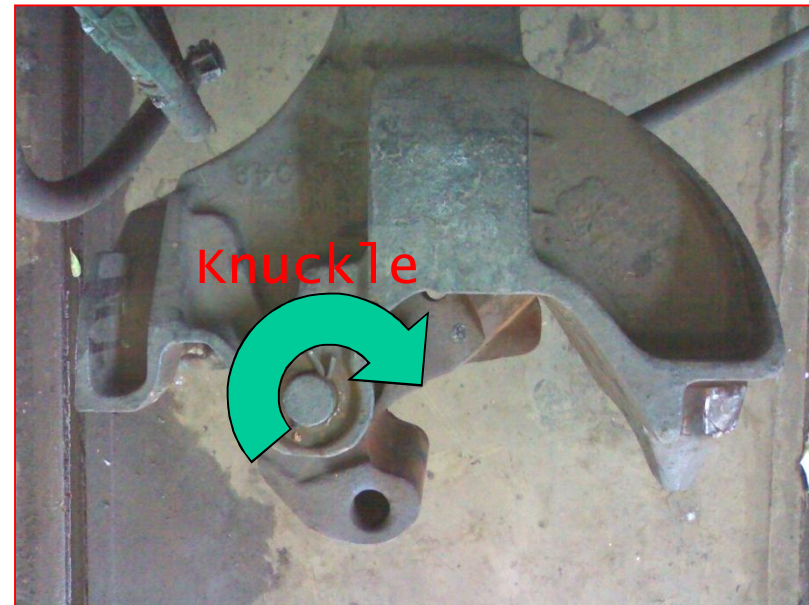
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KNUCKLE ACTUATING PROCESS DURING UNCOUPLING OF CBC



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KNUCKLE ACTUATING PROCESS DURING UNCOUPLING OF CBC

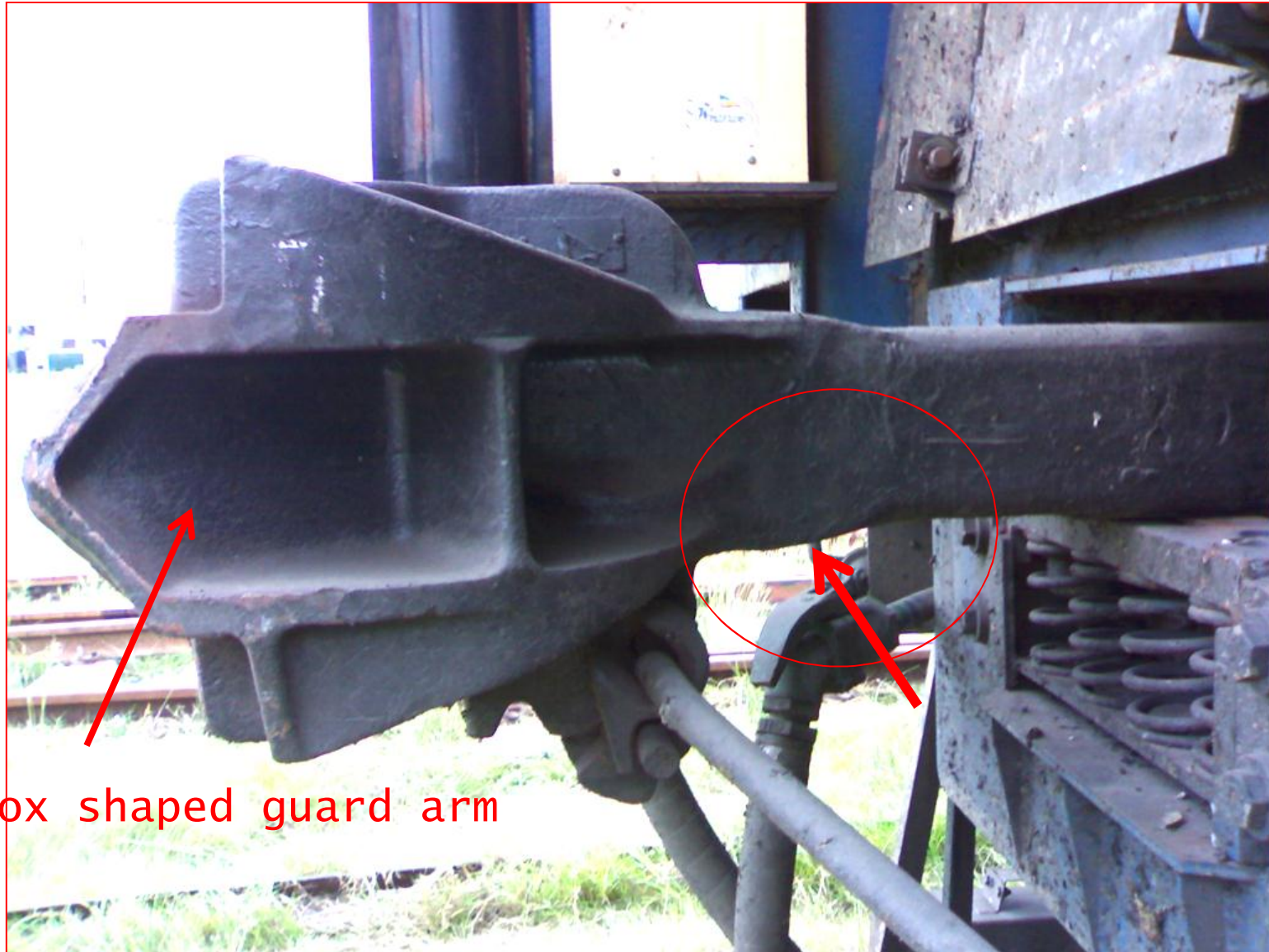


Operation of knuckle thrower



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FAIVELEY CBC SIDE VIEW

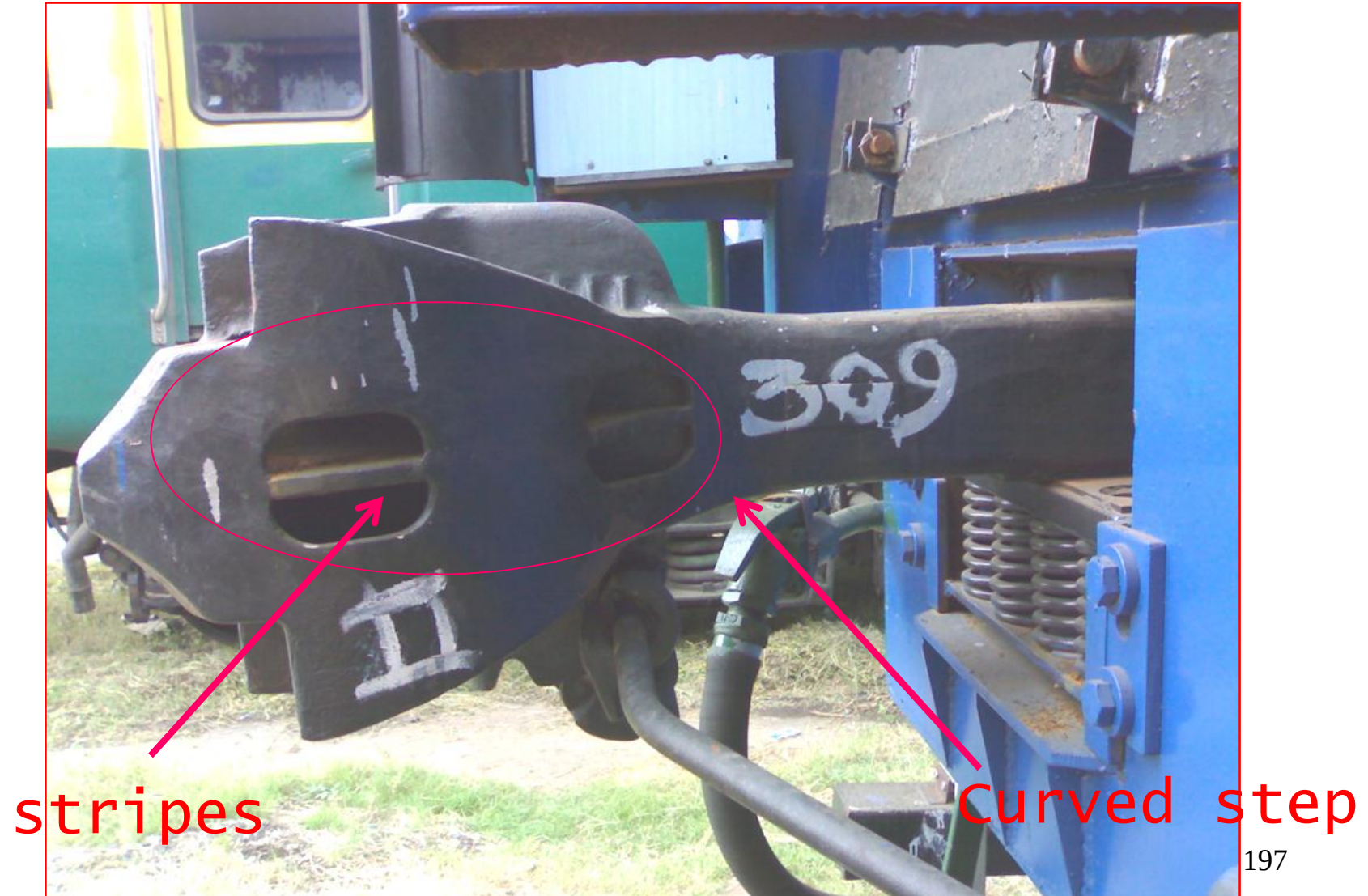


Box shaped guard arm

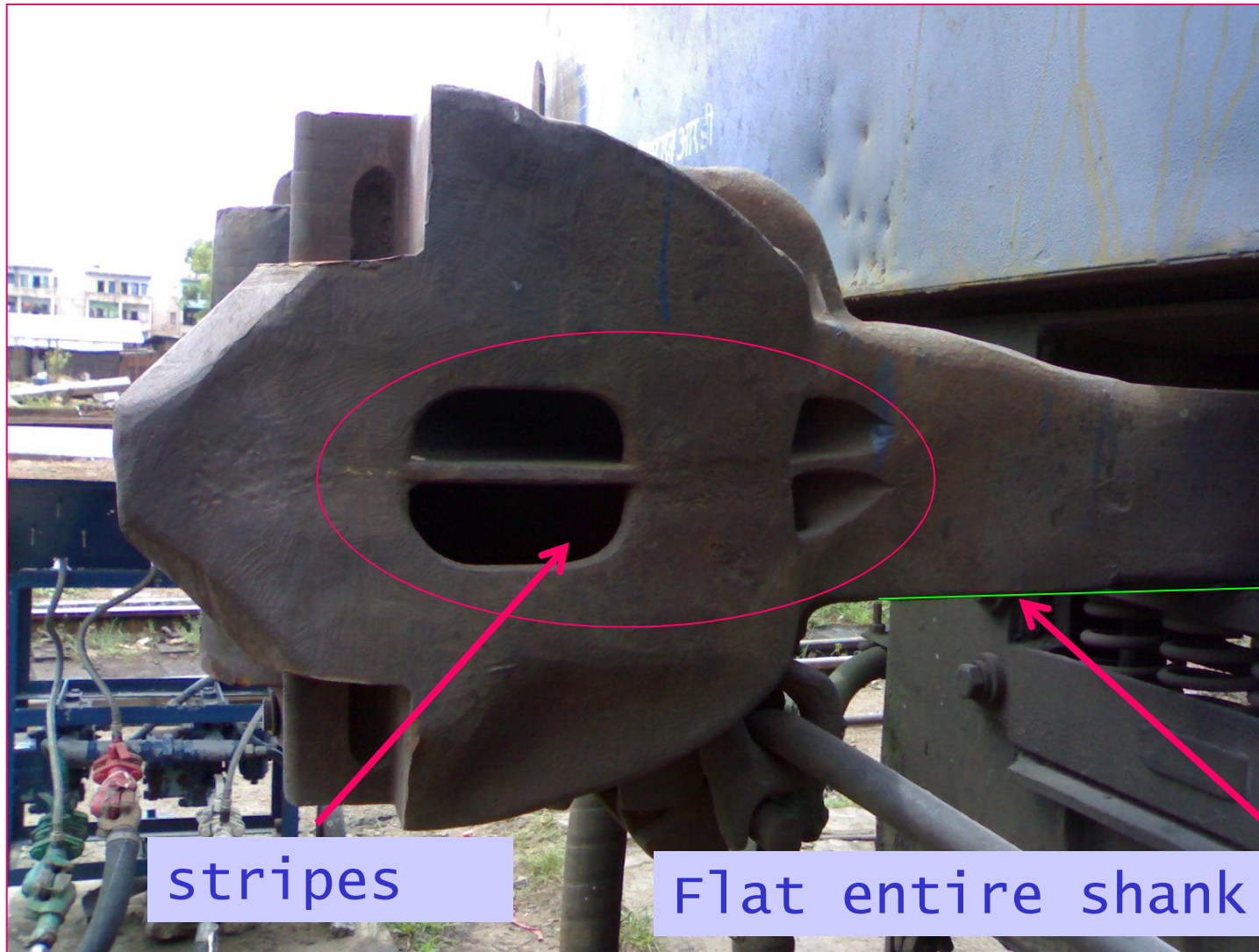
Stampings on the coupler head



ESCORTS CBC SIDE VIEW



AIKON CBC SIDE VIEW



stripes

Flat entire shank length

Stampings on the AIKON coupler head



End of module-I