CHAPTER 9

DRAW AND BUFFING GEAR

901. GENERAL

There are two main arrangements of draft and buffing gear in use on Broad Gauge. The older arrangement, which is found on few wagons, consists of a screw coupling with side buffers. In this design the draft load is transmitted through the screw coupling, draw hook and draw hook springs while the buffing force is borne by the side buffers. The conventional screw coupling (WA/BD-125) has a working load of 22.5t. The restrictions of size and weight limit the extent to which the draft capacity of this coupling can be improved. Recognizing this fact, the other arrangement on BG wagons is that of a Centre Buffer Coupler (CBC) which transmits both draft and buffing loads. The knuckle type centre buffer coupler was adopted for BOX, BOXN and other new design of wagons. Later on, a smaller knuckle type coupler, known as the Alliance-II coupler, was introduced for four wheeler wagons. The working strength of CBC and Alliance-II coupler is 120 tonnes and 54 tonnes respectively. CBC also has a transition version called “Transition Coupler” which incorporates a screw coupling and a pair of side buffers to permit attachment with wagons fitted with screw coupling.

902. CONVENTIONAL BUFFING GEAR

The buffing gear plays a vital role in protecting the entire wagon against damages due to impacts. The buffing springs have to perform the basic function of absorbing buffing impacts received in service and to transmit these gradually to the underframe. Hence the working capacity of these buffing springs should be adequate to meet these requirements.

The buffing gears are of two types viz. "Long Case" & "Short Case". Long case buffers are higher capacity buffers. These are provided on bogie stock to protect the head stock and underframe from damages. It has a capacity of 1030 kg-m as the momentum of bogie stock in marshalling/shunting is greater than that of four wheeler stock.

The short case buffers were used on four wheeler stock and has a capacity of 515Kg-m. It was decided to replace the 515 Kg-m (20 inch-ton) side buffers of four wheeler stock by 1030 Kg-m (40 inch-Ton) capacity side buffers with a view to minimise incidence of damages to Four wheeler underframe as was found inadequate.

The main components of the buffing gear sub-assembly are as under:-

- Plunger
- Buffer casing.
- Spindle
- Outer coil spring.
- Inner coil spring
- Centre washer.
- Washer
- Nut
- Cotter
- Plug.

903. BUFFING GEAR REPAIRS

For POH of buffing gear, IRCA Pt. III Rule No. 2.13 should be followed.

The shop repair practices for various components of the sub-assembly are described below:-

A) **Plunger**- The plunger generally wears on the buffing face or at the portion of the body where it rubs against the casing. It is sometimes patched by means of a M.S. plate secured by six countersunk rivets to provide proper thickness. The wear on the plunger body that occurs due to rubbing against the casing should be rectified by welding.

B) **Buffer Casing** - This item is also subjected to bending owing to heavier shocks in hump shunting or severe jerks during train running. The casings are also subjected to cracking under these conditions. The minor cracks are repaired by heating, straightening and welding using electric arc welding.

C) **Spindl**e – Any damage to the threads is rectified by re-threading and a suitable step size nut. Wear on the portion that moves in the cover washer, buffer casing and head stock is rectified by plaster welding followed by machining and normalizing. The spindle is also subjected to bending. In this case, it becomes necessary to detach the spindle from the plunger by oxy-cutting the plug and straightening. Sometimes, the spindle is also found cracked at the cotter way. Such spindles are to be scrapped.

D) **Outer and Inner Coil Springs-** The springs are subjected to load deflection test and repaired before reuse, if necessary. The other items are generally reused unless found defective or broken.

904. BUFFER PROJECTION

Buffer projection from the headstock on broad gauge wagons should be within limits shown below:

	For Long Case	For Short Case
Maximum	635 mm	456 mm
Minimum	584 mm	406 mm

After POH, the projection shall not be less than 625 mm and 445 mm for long case and short case buffers respectively.

905. BUFFER HEIGHT

Buffer height in B.G. stock shall be within limits given below on level track:

Empty	Loaded
1105 mm (max.)	**1030 mm (min.)**

906. B.G. DRAW GEAR

The draw gear helps in transmitting the tractive effort of the loco to the individual wagons. It has to perform this function smoothly without causing any damage to the wagon structure.

The draw gear arrangement has to be of robust construction and adequately sprung to minimize the impact loads owing to the starting jerks reaching the wagon underframe. The draw gear provides a continuous link between different vehicles comprising the train and failure of any of these can lead to train parting which can cause damages to wagons.

The main components of BG conventional draw gear are as under:-

- Draw Hook
- Draft Key
- Draft link
- Cotter
- Helical Springs
- Washer
- Nut
- Bent Pin
- Screw coupling

The parts of the screw coupling are as under:-

- Shackle
- Links
- Trunion nut
- Ferrule
- Screw
- Washer

The following procedure may be followed for repair of the BG Draw gear and screw coupling components in the workshops.

907. PROCEDURE FOR RECLAMATION OF B.G. DRAW BARS IN WORKSHOP

A. SCREENING DRAW BARS FOR RECLAMATION

For reconditioning by welding/stamping or forging, the maximum permissible wear at the different locations are as follows:-

Location.	Max. permissible wear in mm.
(a) Root of hook near point of contact with screw coupling shackle.	12.7
(b) Shackle pin hole	6.35
(c) Underside of sq. portion of shank	12.7
(d) Cotter hole	12.7

The hooks on which wear is more than above should not be considered for reconditioning.

B. METHOD OF RECONDITIONING

For wear at: -

Location (a)	Reconditioning should be done only by stamping or forging.
Location (b)	For reconditioning of shackle pin hole, bush to be fitted in position.
Location (c) and (d)	Reconditioning should be done by building up with weld deposition.

C. RECONDITIONING BY WELDING

a. The worn out portions to be reclaimed should be ground or filed in order to remove scales, rust, work hardened layers and cracks, if any.

b. The draw bar should be uniformly preheated in a suitable furnace to a temperature between 200 to 250 deg. C before welding and soaked for at least one hour at the preheating temperature.

c. Welding should be carried out in down-hand position following the sequence in accordance with RDSO Sketch No. SK 69075.

d. Low hydrogen type of electrodes approved under class D or class E of the approved list of electrodes issued by RDSO should be used. Class E electrodes are preferred. The electrodes should be preheated between temperature 120 and 150 deg. C for atleast one hour immediately before use.

The usual precautions for using low hydrogen type electrodes should be carefully followed i.e. use of shortest possible arc, avoiding weaving as far as possible etc. The polarity and current range recommended for the particular brand of electrode by the electrode manufacturer should be strictly adhered to.

I. Stray arcing on the portions which are not covered by weld deposits should be avoided.

II. The number of layers to be deposited varies according to wear. Either 4 mm or 5mm dia. electrodes should be used.

III. Inter pass cleaning in case of multi-run deposits should be carried out properly to avoid slag entrapment.

e. After welding, the draw bar should be heated to hardening temperature of 840-860 deg. C, soaked at the rate of 1/2 hr. per 25 mm of thickness and quench in oil Temper at the temperature between 550-600 deg. C (soaking period atleast 1/2 hr. per 25 mm of thickness) and then allow to cool in air.

f. The reclaimed portion should be dressed smooth and flush with contour of the portion built up.

g. The weld metal and heat-affected zone after the cleaning should be tested with magnetic crack detector/surface penetrant.

D. RECONDITIONING BY STAMPING/FORGING

a. Make sure that sufficient material is available in the hook portion of the worn out draw bar for carrying out stamping or forging for reconditioning. Where sufficient material is not available, drawbars should be condemned.

b. For stamping/forging, the draw bar should be soaked at a temperature of 1050-1100 deg. C for three hours. No stamping/ forging should be continued when the temperature falls below 900 deg. C.

c. After forging, the draw bar should be cooled and fins removed.

d. Heat to hardening temperature of 840 - 860 deg. C, soak at the rate of ½ hr. per 25 mm of thickness and quench in oil. Temper at a temperature between 560 - 600 deg. C (soaking period at least 1/2 hr. per 25 mm of thickness) and allow to cool in air.

e. **Proof load Test-** Each reconditioned draw hook shall be subjected to a proof load of 36 tonnes and must not show any signs of permanent set under that load as indicated in IRS specification No. R-11-67 Clause 7.1.

f. All drawbars reclaimed should be stamped with the shop code initials, date, month and year for easy identification and reference in case of failures.

908. PROCEDURE FOR RECLAMATION OF B.G. SCREW COUPLING IN WORKSHOPS

A. TRUNION, TRUNION NUT AND SHACKLE PINS

The wear on the trunion nut and worn shackle should not be repaired by welding and these should be discarded when worn to permissible limits. The maximum permissible wear at trunion pin (nut) as well as for shackle pin is 3.17 mm.

B. PROCEDURE OF RECONDITIONING SHACKLES OF SCREW COUPLINGS BY WELDING

The shackle of screw coupling develop wear at both the EYES and on the bend where it rubs against the hook of draw bar. The worn out shackle can be repaired by welding. The reconditioning procedure is detailed below:

a. The worn out portions to be reclaimed should be ground or filed in order to remove scales, rust, work-hardened layers and cracks, if any.

b. The job should be uniformly preheated to 200 deg. C to 250 deg. C prior to welding.

c. An approved brand of low hydrogen type of electrode classified under class 'E' by R.D.S.O. should be used.

I. The low/hydrogen type electrodes to be used should be heated 130 deg. C to 150 deg. C for at least one hour immediately before use.

II. The usual precautions for using low hydrogen type electrodes should be followed i.e. use of shortest possible arc, avoiding weaving as far as possible etc.

d. After welding, the shackle should be hardened heating to 840 - 860 deg. C (soaking at the rate of 1/2 hr. per 25 mm of thickness) and quench in oil. Temper at 550-600 deg. C soaking at the rate of 1/2 hr./25 mm of thickness and allow to cool in air.

e. The welded portion should be dressed smooth by filing / grinding.

f. While repairing transition coupling, it should be ensured that trunion washers used in the assembly are according to R.D.S.O. Drg. No. SK-69503. The washers should preferably be riveted properly on the trunion lugs.

g. Heat Treatment - All screw coupling assemblies, spare shackles, trunion nuts ,screws, links and pins shall be suitably oil quenched and tempered as per the following procedure-

"Heat to hardening temperature of 840 - 860 deg. C soak at the rate of 1/2 hr. per 25 mm of thickness and quench in oil. Temper at a temperature between 550 - 600 deg. C soaking period at least 1/2 hr. per 25 mm thickness and then allow to cool in air.

909. MAINTENANCE OF DRAW GEARS DURING RE-PACKING AND NORMAL REPAIRS IN SICK LINE

A) Check all draw gear components for correctness and ensure that they are properly assembled.

B) Pay special attention to draw bar assembly to prevent excess play.

C) Correct type and size of draw bar springs, sufficient plain washers of 13 mm thickness beyond the spring and inside the nut must be provided which must be tightened sufficiently to clear the cotter slot and a correct size of cotter used and properly split to avoid slackening.

D) Use of non-standard material such as shackles and pins manufactured locally in sick line should be avoided.

E) Repair to drawbar, screw couplings and their components are prohibited in sicklines as they are not provided with stress relieving facilities. It must be ensured that only metric size nuts are used on metric size drawbars.

F) Screw couplings of wagons passing through sick lines should be oiled and greased.

G) When re-packing is done on M.G, the draw gears components should be checked. The main draw bar nut is to be removed and refitted to ascertain if the fit of the thread is tight.

910. REPAIR & REJECTION RULES

The staff in workshops and maintenance depots should strictly follow repair practices embodied in IRCA Part III Rule No. 2.14.1 to 2.14.16.3 for BG and MG. Rejection rule No. 4.9.1 to 4.9.17 for BG and Rule No. 4.10.1 to 4.10.13 for MG.

911. CENTRE BUFFER COUPLER & DRAFT GEAR

A) Indian Railway uses AAR type centre buffer couplers having E-type head and F-type shank for freight stock on Broad Gauge system. These couplers are generally as per requirements of AAR specifications M-201, M-205 and M-211.

B) The draft capacity of the AAR coupler depends on the strength of knuckle, which is weakest link in the assembly. The yield strength of knuckle of material AAR M-201 Grade `C' & Grade `E' is 132t and 180t respectively.

C) ADVANTAGES OF AAR CENTRE BUFFER COUPLER

- Coupler and buffing gear are both located together at the centre of the wagon.
- Centre buffer coupler is identical at either end of the wagon and hence wagon direction is immaterial.
- Coupling action between wagons is automatic.
- With transition arrangement, coupling with screw coupling is possible.

912. PARTS OF CENTRE BUFFER COUPLER ASSEMBLY

The main parts of Centre Buffer Coupler are as under:-

i) Coupler body
ii) Knuckle
iii) Knuckle pivot pin with washer
iv) Lock
v) Knuckle thrower
vi) Toggle
vii) Universal lock lift lever connector
viii) Lock lift lever hook
ix) Lock lift rivet
x) Lock lift lever rivet
xi) Top lifter hole cap
xii) Yoke pin
xiii) Yoke
xiv) Yoke pin support.
xv) Striker casting
xvi) Striker casting wear plate
xvii) Shank wear plate
xviii) Yoke support plate
xix) Draft Gear arrangement with front follower
xx) Safety bracket with anchor plate
xxi) Uncoupling gear arrangement
xxii) Back stop
xxiii) Clevis for Transition type coupler only
xxiv) Screw coupling for Transition type coupler only
xxv) Clevis pin for transition type coupler only

All parts of non-transition coupler are identical and therefore inter-changeable with those of the transition type coupler except striker casting with wear plate and coupler body with shank. In transition CBC coupler body with shank is longer and provided an arrangement to fit clevis with the help of clevis pin.

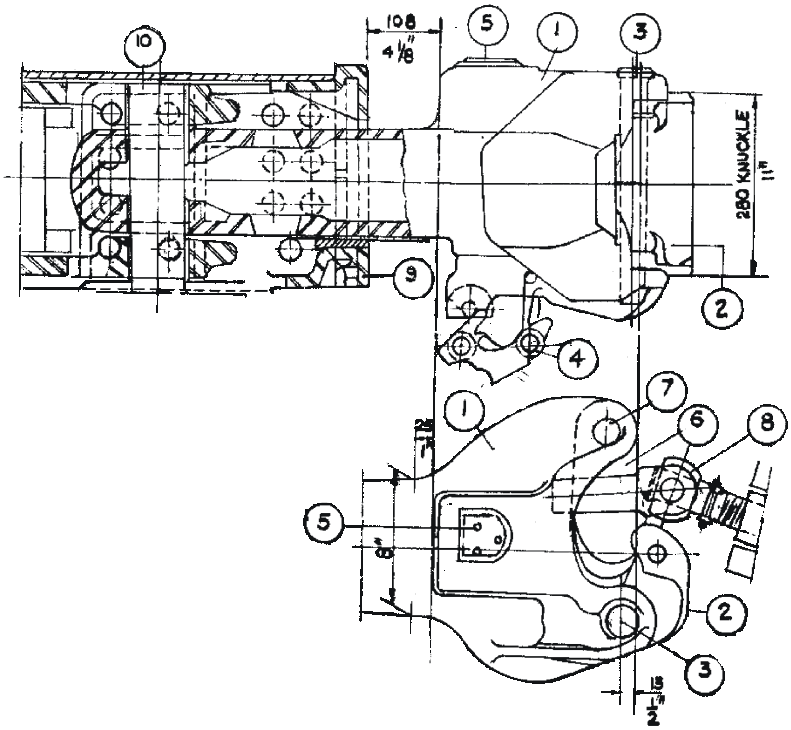


FIG 9.1 : TRANSITION COUPLER

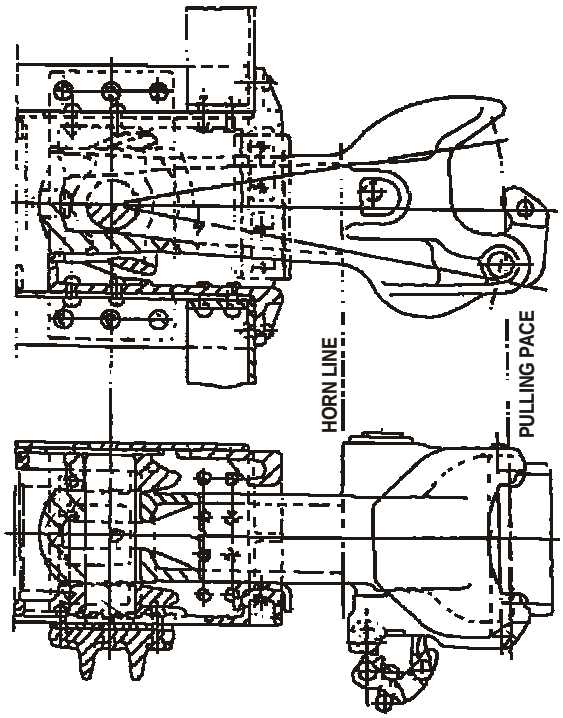


FIG 9.2 : NON-TRANSITION CBC

913. INSPECTION OF CBC

A) **Coupler and operating mechanism:** When inspection of coupler and coupler operating mechanism is made, it is important to check and make sure that when the coupler operating mechanism is operated to fully open the knuckle, the handle released and the knuckle slowly closed, the lock drops freely and the mechanism returns to fully locked position. The lock position is indicated by the toggle, which is clearly visible below the coupler head.

B) 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.

C) Only exposed surfaces of Coupler and Yoke shall be painted with Black quick drying paint in accordance with IRS R6. Paint must be applied to the inside of the Coupler or internal fittings. Painting shall be done after the completion of inspection of Coupler & Yoke of acceptable casting lot.

D) When in the transition Centre Buffer Coupler, the knuckle does not move freely, grind the top face of "top pulling lug" and "lock face" of knuckle in position. If still not free, remove knuckle and clean "pin protector guides" on coupler head. If, after attending to knuckle, the lock still does not fall, remove the lock and grind “locking face knuckle side” on lock so that the lock falls freely.

E) Inspection of couplers, whilst fitted to wagons, should be made to ensure that proper clearance is available to prevent interference in any position which it can assume during train operation. The procedure is as follows:-

a. Check correct operation in order to ascertain that full knuckle throw, lock set, lock-to-lock (anti-creep) and locking is obtained ,if any of these functions be unsatisfactory, they should be corrected by replacing the defective components.

b. Check that the shank is not bent out of alignment with the head. If defective, the coupler shall be removed for straightening of shank.

c. Examine shank wear plates (when fitted) and if worn through, the couplers shall be removed for fitting of new plates. Examine wear on shank (when wear plates not fitted) and if wear is approaching 6.5 mm (1/4"), the coupler shall be removed for building up of shank by welding.

d. Examine head for cracks in the knuckle side wall. If cracked, the coupler shall be removed for reclamation.

e. Check the distance between the nose of the knuckle and the guard arm with gauge No. 1. If it passes (which is 5.5/16" long), it indicates that the coupler has its condemning limit. In such a case the knuckle pivot pin, lock etc. should be replaced so that gauge No.2 does not pass. If this gauge passes, then the coupler should be removed for reclamation.

f. Examine the operating mechanism. If defective or deficient, the defective or deficient components should be replaced to ensure free movement.

g. Check knuckle pin & clevis pin to ensure that pin of correct size has been used. Check fastening arrangement of knuckle pin and clevis pin. The former has a welded washer while the later has a riveted head over a washer in position.

h. Coupler height should be checked in accordance with IRCA Part III Rule No. 2.13.7.

i. All defective/deficient components shall be replaced in CBC, clevis and screw coupling (in case of transition couplers).

914. INSPECTION OF DRAFT GEARS (HR-40-I & MF-400-I-IR)

A. Excessive slack in draft gears is not permitted and this should be either reduced or eliminated. The maximum permissible free slack in the draft gear is 25 mm(1") after which, it shall be removed and reclaimed or condemned. The free slack can be determined by first sledging the coupler back solid and then measuring the clearance between the coupler horn and the striker face. Next by inserting a long bar between the horn and striker face, pry coupler out as far as possible and again measure the space between the horn and the striker. The difference between these two measurements is the amount of free slack.

B. Visual examination of the rubber pads when the draft gear is in place in the wagon can be misleading and the draft gears shall therefore, be inspected at every POH of the wagon, irrespective of the amount of free slack existing.

915. REMOVAL OF COUPLER AND DRAFT GEAR FROM WAGON

A) Remove yoke pin support plate by conventional methods. Then remove the yoke pin if necessary by inserting two chisels where the front follower bears hard against striker casting at the draft lugs.

B) The coupler will now be loose and can be pulled out. Care must be taken to avoid personal injury as the coupler weighs over 200 Kg. and its head is heavier than the shank.

C) Remove the yoke support plate by conventional means When the gear is loose in the wagon pocket, the gear and yoke assembly must be supported by jacks or other means to avoid personal injury.

D) To remove the gear and yoke assembly when the gear is tight in the wagon pocket, first apply cross key through front of yoke and position in yoke pinhole. Then apply screw B in cross key A and turn until contact is made with front follower of draft gear. With wrench C, turn screw with the aid of a piece of 38 mm (1 1/2") pipe until gear is loose in the wagon pocket. Remove wrench and lower the gear and yoke assembly on supports from the wagon pocket.

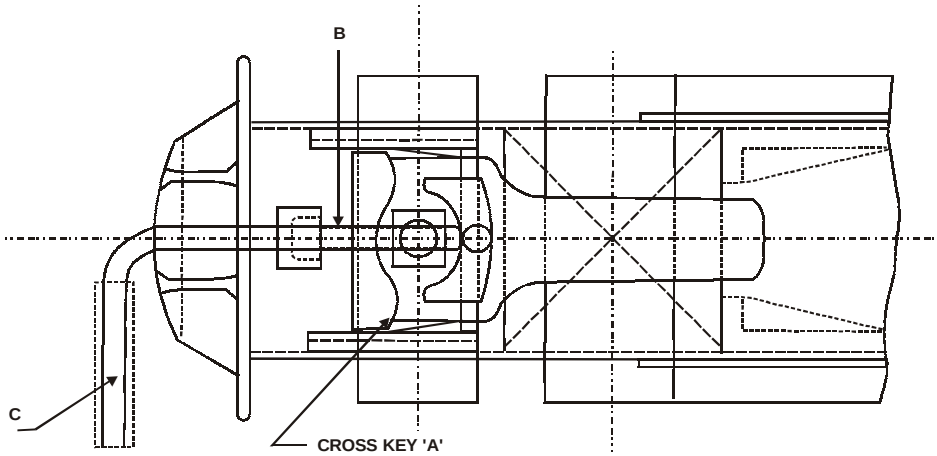


Fig. 9.3

REMOVAL OF DRAFT GEAR FROM WAGONS

E) To remove the draft gear from the yoke, compress the gear by means of screw and insert two pre-shortners as done during assembly. Then release the screw and remove draft gear.

916. COUPLER RECLAMATION PRACTICES

A. COUPLER BODY

a. Coupler body with broken or missing parts shall be scrapped. Building up of worn surfaces inside the coupler head such as pulling lugs, buffing shoulders, lock wall etc. is prohibited.

b. Cracks: Cracks on the coupler body may be repaired by welding, but the body shall be normalized after welding. Cracks in the guard arm of front face may be welded provided, they do not extend through the full thickness of the front face.

Note: After reclamation of coupler body and knuckle, check with gauge No 4 to ensure that contour has been properly restored.

B. SHANK

a. **Shank Length**: Shank length should be measured from the horn to the crest of the butt. It should conform to the dimensions shown in Fig. below.

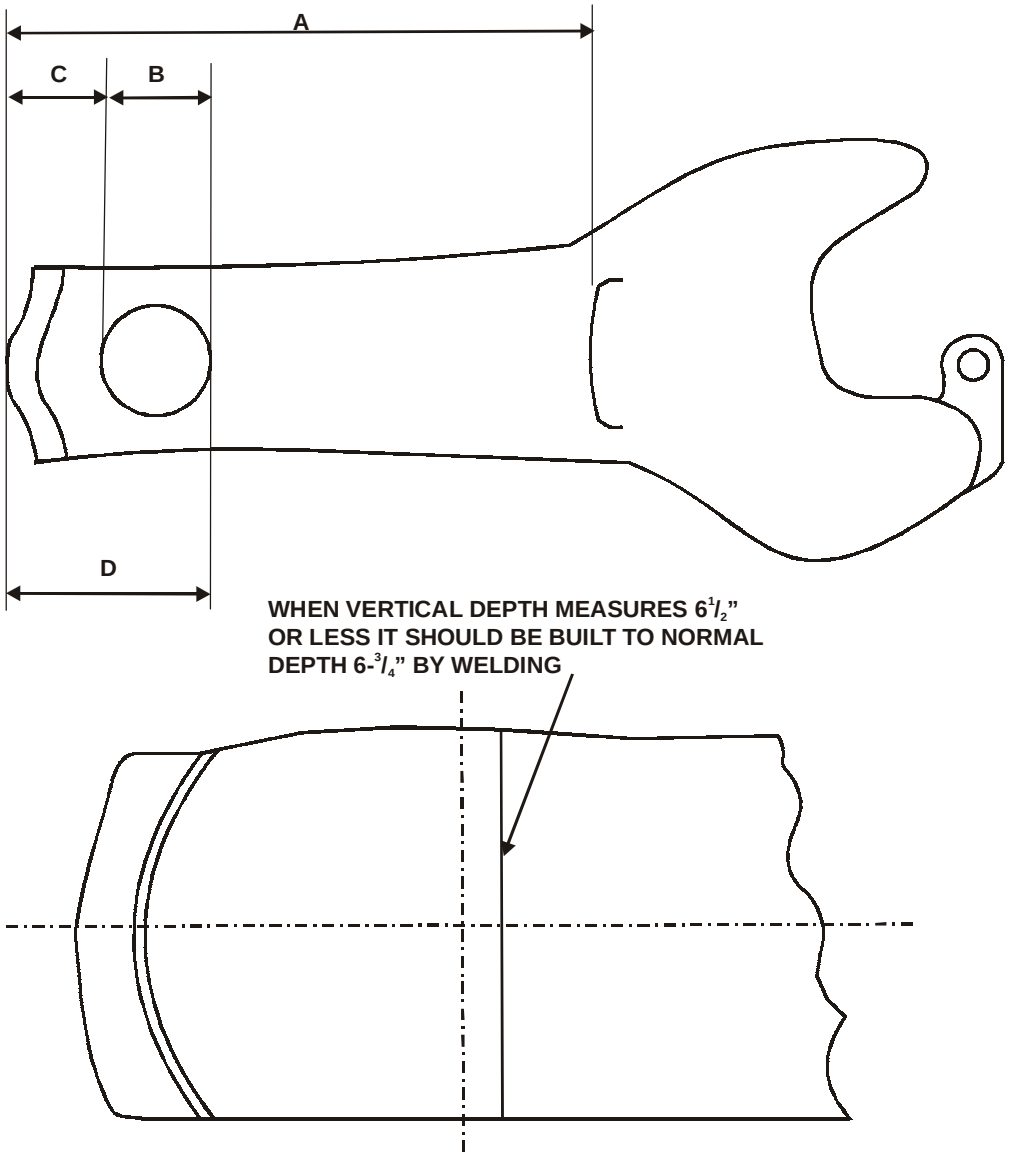


Fig. 9.4 : SHANK LENGTH

If the butt is worn it may be built up by welding using suitable electrodes. After welding, surface ground reasonably smooth to fit gauges. While building up it must be ensured that the shank length is increased only by the amount B necessary to restore the dimension "yoke pin hole to butt" but must not exceed the maximum. After welding, the coupler body shall be normalized in accordance with the instructions.

	Before Reclamation Min.	After Reclamation Min.	Max.
		TRANSITION	
A.	723.9mm(28 1/2")	733.4 mm(28-7/8")	739.8mm(29-1/8")
B*	98.4mm(3-7/8")	95.3+.051mm -.8	(3-3/4" + 0.002") - 1/32")
C.	74.6mm(2-15/16")	84.9mm(3-11/32")	88.9mm(3-1/2")
D.	173mm(6-13/16")	182.6mm(7-3/16")	185.7mm(7-5/16")
		STRAIGHT	
A.	546.1mm(21-1/2")	555.6mm(21-7/8")	562mm(22-1/8")
B.	98.4mm(3-7/8")	95.3+ 051mm - .8	(3-3/4" + .002") - 1/32")
C.	74.6mm(2-15/16")	94.9mm(3-11/32")	88.9mm(3-1/2")
D.	173mm(6-13/16")	182.6mm(7-3/16")	185.7mm(7-5/16")

* No reclamation for building up of wear on dia. is permitted. However, nominal dimensions is 95.3 (+0.051mm; -0.8 mm) or 3-3/4" (+ 0.002"; - 1/32")

b. **Shank depth**: When vertical depth of shank is 165 mm(6 1/2") or less, it shall be built up to the normal depth of 171 mm (6-3/4") by welding and then normalized.

c. **Yoke pin hole in shank** :Building up of yoke pin hole is prohibited. However, the coupler may be used until the yoke pin hole diameter reaches 98 mm.

d. **Shank wear plate**: When thickness of shank wear plates is 5 mm, it should be replaced by new shank wear plate.

e. **Bent Shank:** A bent shank may be straightened under a press after heating to 845 deg.C. Care should be taken to bring the head into proper alignment within limits and then allowed to cool in still air. Before use, the coupler body shall be carefully examined for cracks that may have developed as a result of the straightening.

C) **Guard arm** : Coupler body with distorted guard arm may be restored either in a press or with light hammer blows after heating. Care should be taken to heat only a small area to prevent distortion of the opening in the front face of the coupler. After rectification the coupler body shall be normalize and then checked by Guard Arm Distortion on Gauge No.67.

D) **Knuckle**: (Nose wear stretch and cracks) Building up of nose wear on knuckles is hitherto prohibited. All knuckles exceeding the limits of gauge No. 3 for nose wear stretch shall be condemned.

a. Knuckle Pivot Pin:- Pins having steps or cracks or which have a diameter less than 40 mm at any point shall be condemned.

Bent pins may be reclaimed by heating, then straightened and allowed to cool in still air. Finally the pins shall be heat-treated to a hardness of 250-305 Brinell.

b. Knuckle Thrower:- Knuckle thrower excessively worn, broken, bent or otherwise distorted, shall be condemned.

E. Hub Wear: When hub height is less than 202.4 mm (7- 31/32"), it may be built up by welding the bottom hub face to the maximum height allowed by gauge No.8. After welding, knuckle shall be normalized and tempered in accordance with the heat treatment instructions.

F. Pulling lug and pin protector wear. Worn pulling lugs and pin protector bosses may be built up by welding within the limits of gauges 10 (top) and 11 bottom).Top and bottom pin protector gauge No.12 (Refer RDSO's Technical Pamphlet No. G-80 for Figures of gauge) shall be used to check the pin protector bosses separately after welding. After building up, the knuckle shall be normalized and tempered in accordance with heat treatment instructions.

G. Lock

a. Lock engagement surface wear: Wear on lock engagement surface may be built up by welding to the limits of gauge No. 9. After building up, normalizing or tempering is not required.

b. Depressions found on lock as a result of contact with the knuckle or coupler body lock engagement surfaces may be built up by welding. The building up shall only be to the level of the surrounding surface of the lock face. Normalize and quench/temper in accordance with the heat treatment instructions.

c. **Lock lift assembly**:- Lock lift assembly excessively worn, broken bent or otherwise distorted shall be condemned.

H. Clevis and Clevis Pin:- Clevis shall not be built up by welding. If worn more than 3 mm it shall be condemned. Pins having steps or cracks or which have a diameter less than 37 mm at any point shall be condemned. Bent pins may be reclaimed by heating, then straightened and allowed to cool in still air. Finally the pins shall be heat-treated to give a hardness of 250-305 Brinell.

I. The reclamation practice for screw couplings is similar to IRS WA2 screw coupling.

917. DRAFT GEAR RECLAMATION PRACTICES FOR CARDWELL WESTINGHOUSE (HR-40-I) DRAFT GEAR

A. YOKE

Building up wear on straps or in the yoke pin hole is prohibited. However, if yoke strap is worn 3 mm or less at contact with support plate, it may be inverted and reused. If yoke strap is worn more than 3 mm, the yoke shall be condemned. Maximum wear of 1.6 mm (1/16") on diameter is permitted in yoke pin hole. If wear exceeds this limit, the yoke shall be condemned.

B. YOKE PIN

Pins bent or having steps or cracks or if diameter is reduced by 3 mm at any point, they shall be condemned.

C. HOUSING

Building up of wear on housing is prohibited but a wear upto a maximum of 3 mm in depth on either side is permitted. Housings having excessive wear or cracks shall be condemned.

D. INTEGRAL FOLLOWER

Building up of wear to a depth of 3mm is permitted.

E. RUBBER PADS

Rubber pads may be reused provided no pads are bent, worn, broken or have rubber separation in excess of 38 mm deep x 127 mm wide. Damaged pads may be replaced by used serviceable pads removed from other gears. New pads should not be used as far as possible with old pads as fitting will not be satisfactory.

F. RUBBER PACK

a. The pack with 11 Nos. of rubber pads and 10 Nos. of spacer plates, when assembled in the housing with follower, shall not be less than 632 mm (24-7/8"). Slack more than 13 mm (1/2") below 619 mm (24-3/8"), shall be built up by use of either spacer plates or one rubber pad. For stability reasons the use of not more than one additional pad is recommended. Any worn pad shall not be replaced by steel shims. During reconditioning, precautions be taken to prevent oil or grease coming in contact with rubber pads as these substances shorten the life of the pads.

b. When draft gear is removed for causes other than lateral misalignment of pads and there is less than 6.35 mm(1/4") slack in the front unit, this unit may be reused. Prior to reusing, measure height of unit. If less than 187 mm (7-3/8") but not less than 168 mm (6-5/8"),a steel shim, 216 x 267 of sufficient thickness to restore the height to 187 mm (7-3/8") may be stitch-welded all around intermediate follower. Units measuring less than 168 mm (6-5/8") shall be scrapped.

c. When the front unit of pads is broken or damaged or found tight in the intermediate follower, it can be pressed out by using a 12.7 mm (1/2") steel pusher plate 203 x 179 m.(The width is required to bear on all 7 rubber pad steel inserts and still clear the followers). The intermediate follower must be blocked upto a height 229 mm or more (9" or more) that will allow the unit of pads to clear. Retaining tabs on both end pads must be straightened prior to pressing out the unit.

G. REAR CUSHIONING UNIT

a. The rear unit of rubber pads can be reused provided no pads are bent, worn, broken or have rubber separation in excess of 38 mm deep x 127 mm width. Replacement of the pads can be made with used serviceable pads removed from other gears. The use of new pads with used pads is not recommended as fitting between such pads will not be satisfactory.

b. Prior to re-application of a used rear unit of pads, measure its height. When the unit measure 188.9mm (7-7/16") or less but not less than 171.5 mm(6-3/4") a steel shim 216 x 305 mm of sufficient thickness to restore the height to 188.9 mm(7-7/16") can be used.

H. WAGON POCKET

Prior to re-application of the reconditioned gear to the car pocket measure the pocket. If greater than 628.6mm (24-3/4") build upto 625.5 mm (24-5/8") (+ 0-1/16" tolerance) by applying steel shims to back steps. To avoid unequal loading the pocket shall be kept square within 1.6 mm (1/16").

918. RECLAMATION PRACTICES FOR NATIONAL RUBBER (TYPE MF 400-I-IR) DRAFT GEAR

A. YOKE AND YOKE PIN

The yoke and yoke pin shall be reclaimed as detailed in 917 A and 917B above.

B. FOLLOWERS

Building up of wear on follower casting is prohibited. Normally, there is very slight wear and wear up to a depth of 3.2 mm (1/8") is permitted.

HINDI CONTENT

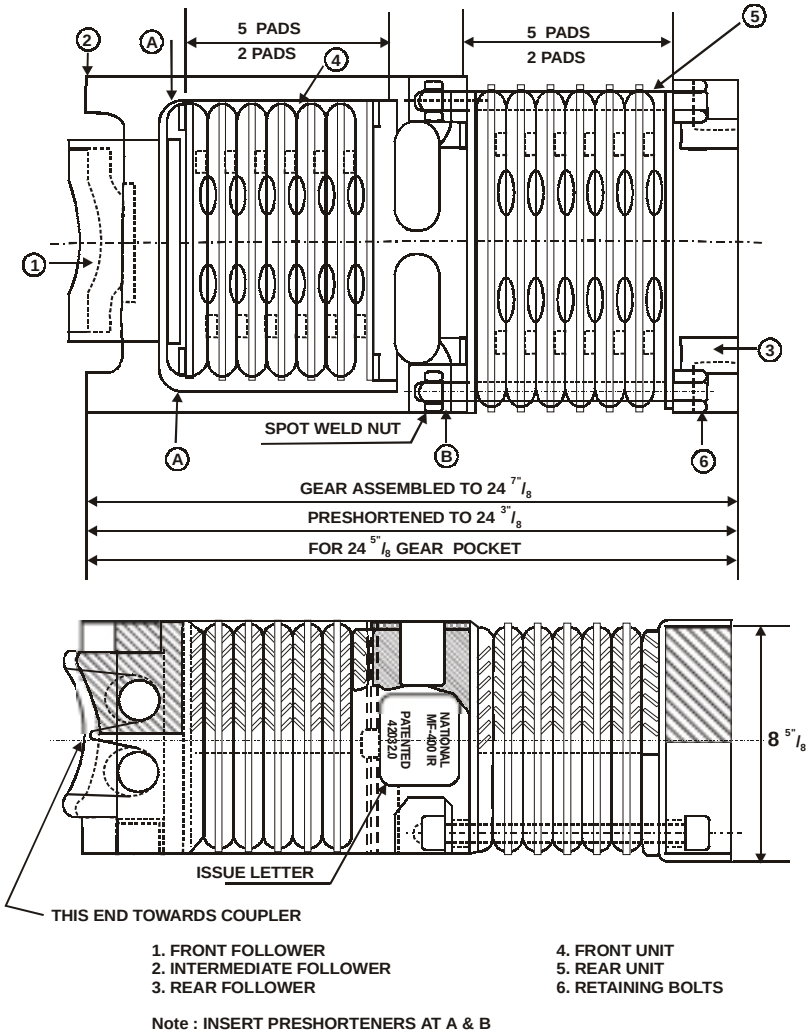


Fig. 9.5 : RELEASED DRAFT GEAR

C. FRONT COMPENSATING UNIT

a) The front unit of rubber pad is to be replaced with a new unit when either of the following conditions is found:
   I. More than 6.35 mm (1/4") slack in the unit length less than 168 mm (6-5/8").
   II. Lateral displacement of pads to the extent where pads are being damaged.

b) Pads bent ,broken or having rubber separation from steel insert in excess of 38 mm deep by 127mm in width be stitch-welded all around to gear of the intermediate follower. Units measuring less than 171.5 mm (6-3/4") must be scrapped.

c) In either the front unit or the rear unit, rubber pads shall not be replaced by steel shims as it affects the characteristics. Similarly more than the original number of pads should not be provided. During reconditioning precautions shall be taken to prevent oil or grease from contacting the rubber pads, as these substances will shorten the life of pads.

d) Wagon Pocket

Prior to re-application of the reconditioned gear to the wagon pocket, measure pocket and if greater than 628.6 mm (24-3/4") built upto 625.5 mm (24-5/8") (+0-1/16 tolerance) by applying steel shims to back steps. To avoid unequal loading the pocket shall be kept square within 1.6mm (1/16").

919. DEVELOPMENT OF HIGH TENSILE COUPLER & HIGH CAPACITY DRAFT GEAR

On BG system, to minimize the maintenance problem and to run heavy hauled freight train, the existing grade `C' type coupler have been replaced to grade `E' type coupler known as high tensile coupler. A comparative chart of grade `C' and grade `E' coupler is given below:

	Material AAR M-201 & AAR M-211		Ultimate Tensile strength (in tonnes)		Yield strength (in tonnes)	
	STD.	HT.	STD.	HT.	STD.	HT.
Coupler body	Gr.B	Gr.E	290	330	169	205
Knuckle.	Gr.C	Gr.E	251	295	132	180

Standard CBC and high tensile CBC are identical in dimension hence no problem to couple each other. Draft capacity of the high tensile coupler also depends on the weakest link i.e. knuckle. The yield strength of the knuckle is 180t compared to 132t in standard coupler. The draft capacity of HT coupler is 36% higher.

The standard draft gears are to be replaced by high capacity draft gears vide Rly. Board`s letter No.84/M(N)/172/3 Vol. I dt. 11.1.90 and 84/M(N)/172/3 dt. 5.7.90. And new freight stocks would be fitted with high capacity draft gears.

- **Mark-50) These are the high capacity draft gears.**
- **RF-361)**

A. COUPLER

i. All bogie wagons manufactured prior to 1984-85 are fitted with HR-40-I or MF-400-I - IR draft gears.

ii. At present freight stock are fitted with high capacity draft gear i.e. **RF-361** & **MK-50**.

B. DESIGN FEATURES OF HIGH CAPACITY DRAFT GEARS

Type of Draft Gear	Wt. (kg)	Capacity (kg.m.)	Travel (mm)	Reaction force (tonnes)	Performance efficiency (%)	Energy absorption (%)
MK-50	170.3	5385	81.5	269.0	23.7	86
RF-361	138.0	5725	67.8	232.3	36.6	79.6

920. RF-361 DRAFT GEAR

This type of draft gear is a fully enclosed, self-contained unit assembled with pre-compression force of rubber pads, so that all parts are tight in relation to one another. Under normal service condition the draft gear is tightly fitted in yoke with front follower plate.

Note :- All the drawing no., part no. and gauge no. mentioned hereunder are as per literature of Burn Standard Co. Ltd., Howrah Works, titled "***INSPECTION AND MAINTENANCE MANUAL FOR HIGH CAPACITY DRAFT GEAR RF-361***"

A. COMPONENTS OF RF-361 DRAFT GEAR

- Housing (cylinder)
- Wedge
- Shoes 3 nos
- Bore inserts
- Top follower
- Rubber pads (Elastomer unit)
- Rear wall plate

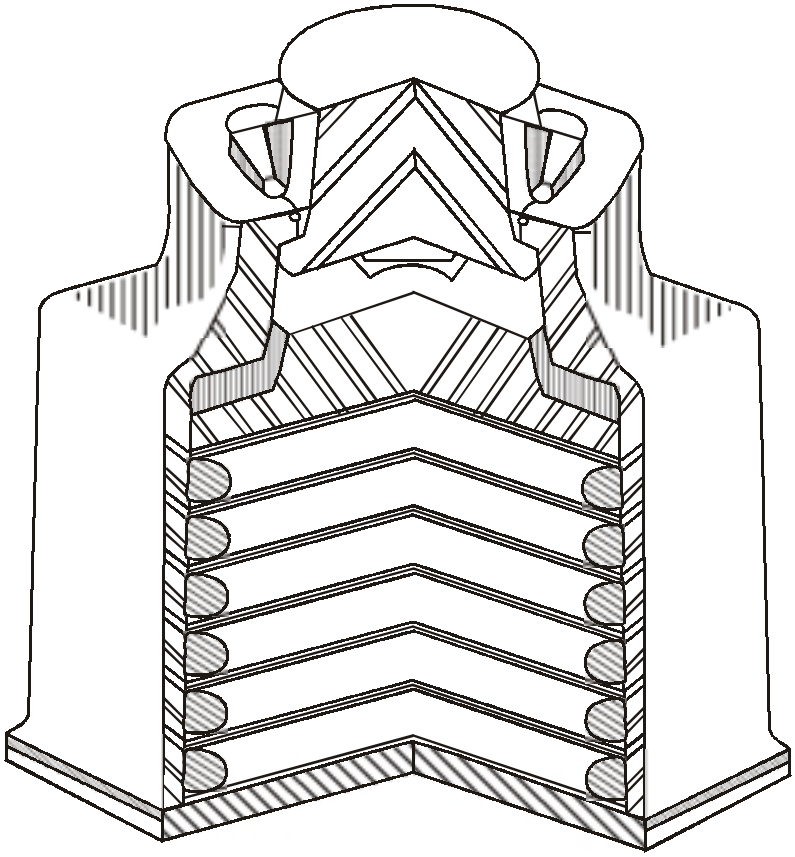


Fig. 9.6 : RF - 361 DRAFT GEAR

B. LIST OF GAUGES FOR RF-361 DRAFT GEAR

a. Gauges for housing:

- Gauge - 27200) Profile gauge.
- Gauge _ 27706)
- Gauge _ 27257 Flatness gauge.
- Gauge _ 27244 Height gauge (GO & NO-GO)

b. Gauges for Shoes

- Gauge - 27253
- Gauge _ 27254
- Gauge _ 27298
- Gauge _ 27716

c. Gauges for Wedge

- Gauge - 27215
- Gauge _ 27216
- Gauge _ 27266
- Gauge _ 27267

d. Final Inspection gauges

- Gauge - 27207 - Pre-shortened assembled gauge
- Gauge - 27739 - Box gauge

C. MAINTENANCE

a. The RF-361 draft gear will require complete reconditioning, i.e. removal and replacement of the rear wall plate only if the gear has loosed clutch components (shoes & wedges), a broken housing, or a cracked weld at the rear wall.

I. A loose clutch will normally mean that there is either a defective rubber springs package or excessive wear has taken place on the cylinder bore friction surfaces. With a loose clutch, the steel components will usually be moved by hand.

II. A cracked weld indicates poor welding practice during initial assembly causing a fatigue crack, or brittle weld which can fail under extremely high shocks loading etc.

III. If a loose clutch, broken housing, or a cracked weld are not present then only removal and replacement of clutch components is necessary. Normally, clutch disassembly and replacement is the only reconditioning needed in the RF-361 draft gear.

b. DISASSEMBLY PROCEDURE FOR RF-361 DRAFT GEAR

If either the shoes or wedge are broken and clutch is not loose, the following disassembly procedure can be used to replace the broken components.

(I) The following equipment & special tools will be required to remove the shoes and wedge from the draft gear;

i. 200 tonnes vertical open gap press
ii. Assembly block Drg. No.27051
iii. Assembly Ring

iv. A wooden taper wedge plug for the old style hollow wedge or a 76 mm or 3" diameter industrial strength magnet with special long handle for the new solid wedge.

(II) The press should be equipped with an appropriate ram press head to drg. no 27800 to facilitate removal operations.

III. Place the assembly ring over the top outside of the friction bore of the cylinder. Put the assembly block inside the assembly ring so that its three slegs evenly contact the three shoes. Place the magnet on top of the solid wedge, its handle protruding through the hole in the assembly block.

IV. Press down the assembly block compressing the shoes slowly into the gear. While continuing to press on the shoes grasps the magnet or wooden plug handle and rotate the wedge clockwise until the wedge lugs are completely clear of the housing lugs. The top of the shoes need to be almost even with the bottom of the housing lugs before the rotation can be accomplished. Once the lugs are clear to each other compression can be released and wedge and shoes can be removed.

c. INSPECTION OF COMPONENTS

I. SHOES

The shoe, which have to be reused must be free from the following defects.

- No concave wear on any friction surface
- No cracks or spalls
- No wear more than 0.8 mm or 1/32" on any friction surface

II. WEDGE

The wedges which have to be re-used must be free from the following defects.

- No crack or spall of the carburized case on the friction faces or the top of the wedge.
- No wear more than 0.8 mm or 1/32" on the friction surface.
- No indication of broken or any cracks on any of the locking lugs.

III. HOUSING OR CYLINDERS

- The inside friction bore walls must be worn symmetrical and the wall thickness must not be less than 20.6 mm or 13/16"
- There must not be any bottom ridging in the bore.
- Bore taper should be smooth and any concavity must not be exceed 0.8 mm or 1/32". There should not be broken lugs or cracks in the housing.
- The housing should not be bulged outside.
- The housing must pass through profile gauges No. 27706 and 27200.
- Housing base flatness must meet gauge No. 27257.

IV. To function properly, every part of the assembly must be free of oil, grease and moisture. The parts should be kept properly during storage, handling and re-assembly.

V. Wedge and shoes are to be shot-peened to remove rust and dirt before assembly. Shot-peening also allows better visual examination. No sharp edges are to be permitted on these parts, since they could cause cutting and gouging.

VI. For re-assembly, the assembly ring is first placed over the housing. The three shoes are put into position in the bore, and the wedge (with magnet placed over the shoes) with each wedge lug resting on the angled shoulder of a shoe. Next, the assembly block is put over the wedge carefully, pushing the shoes into the housing. When the top of the wedge lug has cleared the bottom of the housing lug, clockwise, the wedge will fall into place and the compression can be released, completing the assembly.

D. COMPLETE RECONDITIONING

a. If complete reconditioning of the gear is required either because of a loose clutch or a broken weld, the shoes and wedge must be removed from the gear in the manner that has been described above. This reduces the internal spring force of the gear stated above.

b. The rear wall plate must be removed from the gear housing for complete dis-assembly. The gear should be mounted in a holding fixture incorporating a hydraulic press acting axially on the housing ends. Lock the hydraulic ram about ¼” (6 mm) longer than the housing length so that the rear plate will be able to separate from the housing during cutting. The press ram must be capable of resisting a force of 10 tons exerted by the rubber pad spring stack.

c. Cutting of the rear wall plate can be done by an abrasive cut-off wheel, sawing or flame cutting. Make the cut just less than the 1 ¼" (32 mm) thickness of the rear wall plate.

NOTE

If the flame cutting is used, adequate ventilation and air movement during the cutting must be provided. If there is a shortage of air during rubber burning, the rubber pyrolysis could create an explosive mixture.

d. Release the hydraulic ram to free the gear. Remove the rubber pads and internal follower from the housing.

e. Inspect the housing and also the housing wall thickness at the bottom which must not be less than 11.9mm (or 15/32") and 19.8mm (or 25/32") respectively.

f. **Inspection of Rubber pads**

I. Reject pads which show tears, large material chunks, large bond failures, or extreme wear into the steel plate edges.

II. Pads are gauged and must not be less than 2 $^{1}/_{8}$" (54 mm) as measured by a gap gauge at the middle of each side.

III. Bent (but not broken or cracked) steel plates are acceptable as these will straighten during assembly.

IV. Creases and folds are normal and are acceptable for reconditioned gears.

V. **VISUAL INSPECTION OF RUBBER PADS**

i. Full bonding to each of the metal is required.
ii. Top and bottom surfaces of plates must be free of elastomer films or drops.
iii. Inspection sprues must be 3.18 mm or 1/8" min. below the steel plate surface.
iv. Pad must be free from cracks.
v. Parting line flash should not exceed 0.78mm or 1/16".
vi. Elastomeric material should be free from foreign material i.e., trapped air etc.
vii. Check for proper markings.

VI. STATIC TEST

i. Rubber pads must be inspected carefully. Hundred percent pads are inspected visually. Squeeze each pad to a height of 36.8 mm or 1.45" and check for bond failure, chunks cracks and bubbles. These defects are causes for rejection.

ii. Check pads for bulge. Elastomer should not extend beyond the steel plates when squeezed to solid height.

iii. Pad must be returned to minimum free height of 60.96 mm or2.4" within one minute after load is released.

iv. Pads must not be skewed after the load is released.

g. INSPECTION OF INTERNAL FOLLOWER

I. Outside profile dimension must be at least $11^{1}/_{4}$" x 7" (286mmx178 mm).

II. Base must be flat within 1/16" (1.6mm) across the diagonals.

III. Base and show support boss must be parallel within 1/16" (1.6mm).

IV. Shoe wear indentations on the boss must not exceed 1/16" (1.6 mm).

h. INSPECTION OF FORGED ITEMS

I. Parts will be visually inspected for seams laps, scale pits, improper grinding and other defects.

II. All items should be checked for proper and distinct markings which should be legible.

III. Parts are to be gauged for dimensional checking.

IV. Some dimensions are checked with calipers scales or other measuring instruments as required if gauges do not exist or not available.

i. INSPECTION OF HOUSINGS (CYLINDERS)

I. Housings or cylinders must not have excessive porosity, surface discontinues shrinkage and inclusions.

II. proper gauges should be used to ensure sufficient yoke clearance and for checking rear wall flatness.

j. PREPARATION OF HOUSING PRIOR TO RE-ASSEMBLY

I. The housing is placed bore end down on a flat metal work table next to a flame cutting fixture. An accurate flame cut may be achieved by using either a guided torch nozzle which moves along the stationary housing length at a fixed height, or by moving the housing past a fixed torch nozzle.

II. The housing is to be cut to a length of 463.6 mm + 21.6 mm (18 ¼" ± 1/16"). It is important to regularly clean the torch tip to help ensure a clean and accurate cut.

III. After each side is cut, the housing is hit with a hammer to remove slag. The work table and guides should be swept clean of slag after each cut to ensure a level cutting surface and proper height position for the following cuts. The housing can be rotated by hand before cutting on a new side.

IV. Check the finished housing (cylinder) height using gage no 27244.

V. Grind after cutting with a hand grinder to;
- Remove flame cutting marks back to clean steel
- Remove slag deposits on the housing
- Bring correct size to the finished length.

E. RE-ASSEMBLY OF RE-CONDITIONED RF-361 DRAFT GEAR

a. Tools required

- 50t vertical press
- Draft Gear assembly ring support fixture.

b. For re-assembly, the assembly ring is first placed over the housing. The three shoes are put in position in the bore and the wedge is placed over the shoes, with each wedge lugs resting on the angled shoulder of the shoes. Next, the assembly block to drg. No.27051 is put over the wedge, so the legs of the assembly block contact the top of the shoes. Press down very slowly and carefully, pushing the shoes into the housings. When the top of the wedge has cleared the bottom of the housing lugs by either tapping the handle or slightly rotating it clock- wise, the wedge will take its position in place and the compression can be released.

F. INSPECTION OF RECONDITIONED DRAFT GEARS RF-361

Draft gear shall be visually inspected for the following characteristics:-

- Inserts - one insert per leg properly located and intact in position.
- Shoes - must be properly positioned with respect to the wedge.
- Housing- must be free from cracks lumps and other defects. Components must be properly seated. Clutch components must be tight.

G. WELDING OF REAR PLATE AFTER ASSEMBLY

a. After the weld zones of the housing and rear wall plate have been suitably preheated, the heating gas is to be turned off, and the heating ring is to be removed from the housing.

b. Place the remaining two RF-8 rubber pads on the pad stack These pads will be projecting above the rear of the housing.

c. Place the preheated rear wall plate on top of the rubber stack and position it as closely as possible so the edges of the plate align with the edges of the housing.

d. Position on draft gear assembly so that it is centered directly under the ram of the press (50 tonne vertical press). This is done to ensure even loading and square closure.

e. Compress the rear wall plate down until it is firmly and squarely in contact with the housing base. Check the alignment of the rear wall plate sides in relation to the housing base sides. If necessary, release the press pressure, reposition the plate and compress again until the sides of the two pieces are aligned. It may be necessary to do this a number of times, depending on the skill and experience of the operator, till the proper alignment is obtained.

H. ROOT RUN WELDING

a. With the rear wall plate firmly held in place under the press, a root run, approximately 6.4 mm-7.9 mm (1/4"-5/16") in depth is made completely around all four sides. It is very important to obtain complete fusion and penetration into the full depth of the weld preparation.

b. MIG welding with AWS A5.18-69 class E70S-1B, 1.14 mm (0.45”) diameter, 100,000 psi tensile wire is used. Preferable shielding is a 75% Argon and 25% CO_2 gas. Wire feed speed is 45.7-50.8 cm (18-20 inches) per minute and the welding machine to be set for 250 - 280 amps. 26-32 volts.

c. When the root run has been completed, the gear is removed from the press and moved aside. Inspect, to be sure that it is free of any visible defects. A total of three to four gears can be accumulated in this manner before filler pass welding is done.

I. FILLER PASS WELDING

a. The accumulated root run welded gears are placed side by side on a holding table, which is either flat or slightly tilted up to permit down hand welding of the filler pass.

b. Use MIG welding with the same wire as used in the root run. 100% CO_2 shielding gas is used in the fill pass. The wire feed is 2300mm-3540mm (90-100 inches) per minute, at 250-280 Amp and 26-32 Volts.

c. Weld one side of each of the accumulated gears.

d. Turn each of the gears 90 degree and weld the second side of each gear. Continue this process till all 4 sides have been welded. The fill pass should leave a weld bead that protrudes just above the housing surface.

e. All welds are to be ground flush. The finished gear assemblies are then box gauged with Gage 27200 for dimensional acceptability.

J. PRE-SHORTENING & PAINTING

The assembled RF-361 draft gear must be pre-shortened to facilitate installation into the yoke and draft pocket.

a. Place the gear under a 200 ton open gap press, position the pre-shortening block (Drg. no 25658) on the shoes and apply a load. Compress the gear until there is sufficient vertical clearance between the housing and wedge lugs to insert standard powdered metal. Attach tap to 3 inserts (cube) using taps lower inserts through openings.

b. Check the pre shortened length (using gauge 27207)

c. After pre-shortening the external surfaces of the draft gear is to be painted with black or blue paint.

921. MAINTENANCE OF MARK-50 DRAFT GEAR

Note :- All the drawing no., part no. and gauge no. mentioned hereunder are as per literature of M/s BESCO.

A. INSPECTION

a. The draft gear shall be inspected whenever wagons are coming in ROH depot. The following instructions shall be followed to determine whether draft gear is in normal released condition or in stuck condition.

b. A normally released draft gear would appear as shown in Fig 9.3, where the follower plate is against the front lugs, the housing is against the rear lugs and the components of the friction clutch are fully returned to their neutral position. The internal spring forces in a normal fully released Mark 50 draft gear will be from 7,000 kg to 10,000 kg.

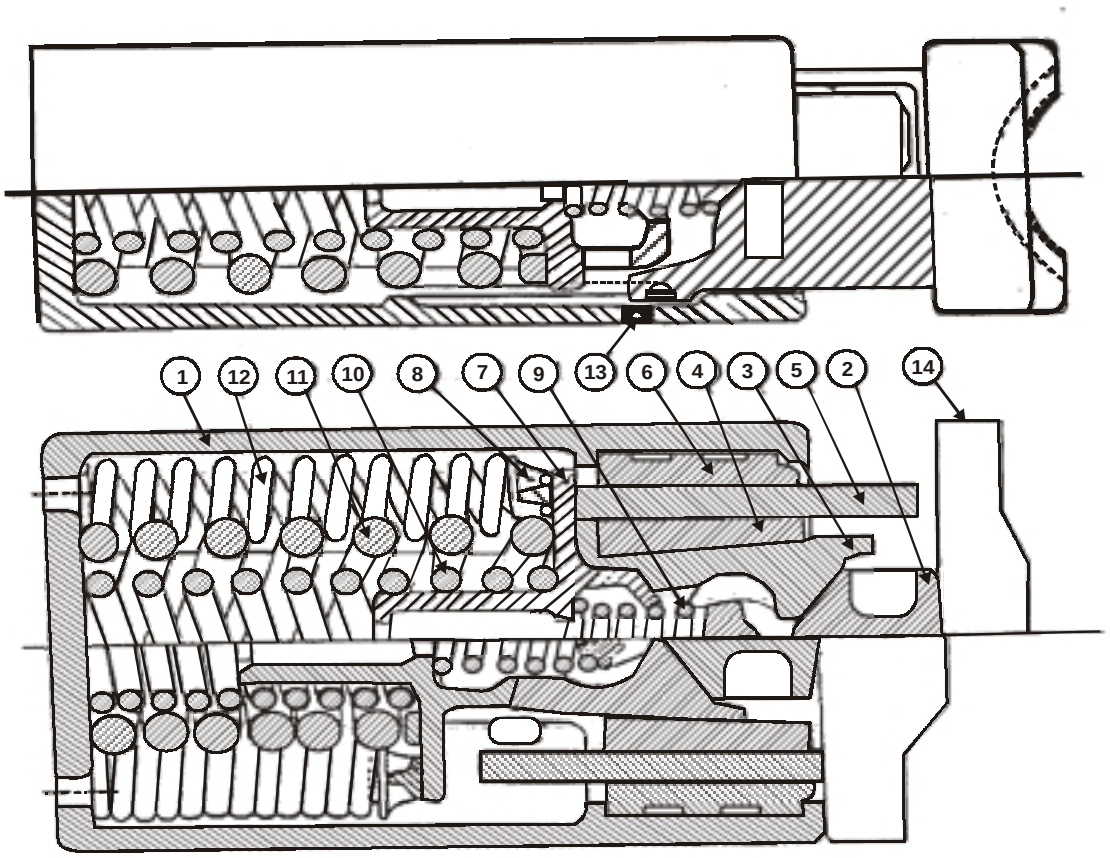


Fig. 9.7: RELEASED DRAFT GEAR

1. HOUSING
2. CENTRE WEDGE COMPLETE
3. WEDGE SHOE COMPLETE
4. TAPERED STATIONARY PLATE
5. MOVABLE PLATE
6. OUTER STATIONARY PLATE
7. SPRING SEAT
8. CORNER SPRING SEAT
9. RELEASE SPRING
10. INNER COIL SPRING
11. OUTER COIL SPRING
12. CORNER COIL SPRING
13. SHORTING DEVICE
14. FOLLWER

c. It is possible for a slight gap to be seen at either the front or rear draft lugs when the draft gear is in a normal fully released position, e.g. in an enlarged draft gear pocket.

B. REMOVAL OF DRAFT GEAR FROM WAGON POCKET

When a draft gear with follower plate is installed into the pocket of a wagon, it has ample initial spring load to provide a tight fit into the draft gear pocket. While removing the draft gear from the wagon pocket, it is necessary to compress the draft gear approximately 6.35 mm (1/4”). In order to clear the front and rear stops, a suitable device can be used to compress the draft gear so that the draft gear and Yoke assembly may be free to be lowered from the wagon.

a. NORMAL CONDITION

I. Remove yoke pin support. Drop yoke pin down and draw coupler out of wagon.
II. Place suitable lifting/lowering jack under yoke support plate. Holding yoke support in position with centre-sill, cut and take out rivets.
III. Insert nut (Ref: RDSO manual G 80) in the yoke pin hole. Apply screw from the mouth and compress by rotating screw by means of wrench so that the draft gear with follower is clear of the pocket length by about 6 to 8 mm.
IV. Lower support at yoke support plate and take out yoke with draft gear and screw.
V. Unscrew and remove nut. Now draft gear, follower is loose in yoke and they can be taken out separately.

b. FOLLOWER BROKEN

A broken follower will remain within pocket only if it is cracked at centre and split in two at centre vertically or horizontally.

If cracked but not split, follow procedure as in 23.3.1 above. When cracked and split jerk by hammer or by pulling yoke forward to loosen the follower in the pocket.

c. PARTIALLY STUCK GEAR

In a partially stuck draft gear, the draft gear is loose in the pocket and the draft gear travel will be less than 82.55 mm (3-1/4”) .

d. FULLY STUCK DRAFT GEAR

A fully stuck draft gear is one where the components of the friction clutch are jammed and flush with the open end of the housing. A large gap would appear at the front or rear stops or at both stops.

The internal spring forces between 11,000 kg and 23,000 kg would propel the friction parts outward if the gear was to suddenly release.

e. REMOVAL OF STUCK OR DAMAGED DRAFT GEAR

WARNING:

WEAR SAFETY EQUIPMENT INCLUDING HARD HAT, SAFETYGLASSES, SAFETY SHOES, GLOVES AND BODY PROTECTION

I. When follower is not missing

.

DO NOT STAND OR WORK DIRECTLY IN FRONT OF COUPLER

i. First move another wagon against the couple, forcing follower and draft gear against rear stops. Do not remove the yoke support plate. Securely weld draft gear housing and follower.
ii. Cut gear housing in spring area to expose coil springs and cut each coil of every spring to eliminate the compressive force or the springs.

II. Where yoke is broken and follower is missing

i. First move another wagon against coupler forcing draft towards the stops as for as possible.
ii. Remove a section of the yoke straps with the torch to permit installation of a follower and bracket

IMPORTANT: The follower with the bracket must be installed with a lift table or fork truck to eliminate any one putting their hands near the open end of this stuck draft gear. Once fitted into place,

i. Securely weld the bracket to the draft gear housing.
ii. Remove coupler.
iii. Position lift table or other lowering means under the support plate, yoke and draft gear.
iv. Remove rivets from yoke support plate. Slowly lower down the assembly unit on the ground.
v. Scrap draft gear, yoke and follower.

C. REMOVAL OF STUCK DRAFT GEAR SO AS TO REUSE

In case it is desired not to gas cut and scrap stuck draft gear as above, the following procedure may be adopted:-

a. Place the stuck draft gear in front of a wall or 50 to 75 mm facing another working draft gear with follower. Force compressed air to clean any dust or mud from draft gear.

b. Give sledge hammer blows with 8-10 kg hammer on the top front, side fronts, edges and rear wall. The inside components will be forced out. Re-examine this draft gear for any broken or unserviceable part. Re-use or reclaim the draft gear for use.

D. INSPECTION OF MARK-50 DRAFT GEAR FOR RECONDITIONING

Mark-50 draft gears have a built in wear life gauge. This is known as "plate clearance" and can be observed by looking up at the gear while it is in the wagon When the draft gear is out of the wagon a straight edge can be placed on the centre wedge of draft gear. Both movable plates should be driven or forced down until solid before measurement is made. The plate clearance is an indicator of the total surface wear of the friction components. When the plate clearance reduces to zero, the draft gear loses its effectiveness to cushion. Once the draft gear reaches this stage, some of the parts will start wearing on the housing and cause considerable damage, rendering it impossible to recondition. Cardwell recommended that Mark-50 draft gear should be inspected whenever wagon is in shop or under repair or when the draft gears are removed from the wagon.

E. SUMMARIZED GUIDE TO DISMANTLE MARK-50 DRAFT GEAR

- A press of 40 tonnes is required.
- Press down with fixture D and insert the two pins.
- Remove movable plate one side.
- Remove wedge shoe same side.
- Remove movable plate other side.
- Remove wedge, shoe other side.
- Turn and remove centre wedge.
- Remove release spring.
- Remove both tapered stationary plates.
- Remove both outer stationary plates.
- Apply fixture C and press to remove pins.
- Remove spring seat.
- Remove all coil springs and corner spring seats.
- Reverse procedure for assembly.

F. List of Gauges For Mk-50 Draft Gear

a. Housing Gauges For Initial Inspection
   - I. Housing reconditioned gauge No. BE-91/62-2 (No-Go Gauge to check minimum length of housing)
   - II. Housing reconditioned Gauge No. BE-91/62-1 (GO Gauge to check maximum housing for Yoke and Sill clearance).
   - III. Housing reconditioned Gauge No. BE-92/62-6 (No GO Gauge to check minimum housing wall thickness)
   - IV. Housing reconditioned bottom flatness check

b. Housing Weld Repair Gauges
   - I. Reconditioned gauge No. BE-91/62-5 (No-Go Gauge to check to centre wedge stop area)
   - II. Reconditioned gauge No. BE-91/62-3 (Go, No-Go Gauge to check movable plate area)
   - III. Reconditioned gauge No. BE-91/62-4 & 5 (Go, No-Go Gauge to check on the wedge area)
   - IV. Centre wedge gauging gauge No. BE-91/61-1
   - V. Spring seat gauging gauge No. BE-91/61-5
   - VI. Gauging centre wedge and spring seat for sorting gauge No. BE-91/72-1.
   - VII. Tapered stationary plate gauge No. BE-91/61-4
   - VIII. Outer stationary plate gauge No. BE-91/61-3
   - IX. Wedge shoe gauge No.BE-91/61-2.
   - X. Gauging springs inner coil, corner coil & release gauge No. BE-91/61-7 & 8
   - XI. Outer coil gauge No. BE-91/61-6
   - XII. Corner spring seat reclamation.
   - XIII. Movable plate gauging gauge No. BE-91/61-10

922. M.G. BUFFING AND DRAW GEAR

A sketch of a MG Buffing and Draw gear is given at Fig 9.4. Unlike the conventional BG buffing and draw gear comprising of two separate sub-assemblies, a centre buffer coupler with combined functions of buffing as well as taking the draw load is provided on MG.

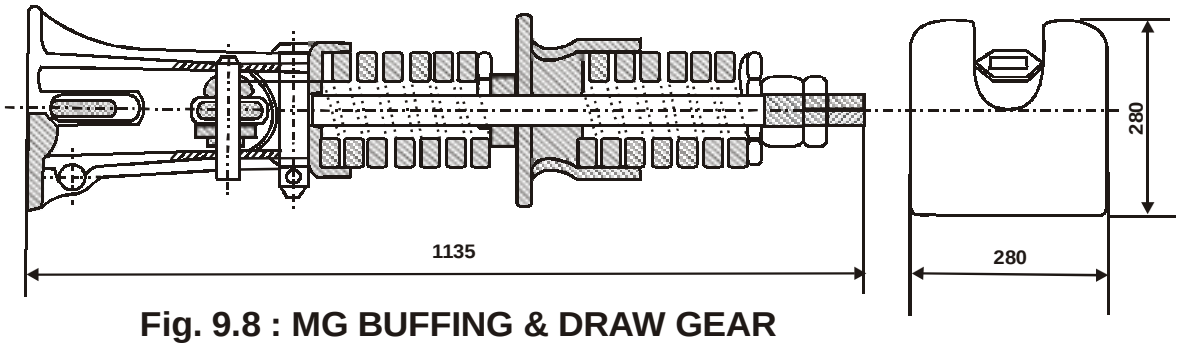


Fig. 9.8 : MG BUFFING & DRAW GEAR

MG buffer height

Empty	585 max
Loaded	535 min

To enable the coupling of two wagons on one end, a buffer with hook is provided while at the other end, a buffer, yoke and a screw coupling arrangement is provided. This is a very important sub-assembly linking all the goods wagons and transmitting the tractive effort through the draw bars, it also absorbs the jerks occurring during running and shunting. Hence proper repair as well as inspection and maintenance on line is very important. The parts which constitute these sub-assemblies are as under:-

A. HOOK

The bite of the hook is very important as any excessive wear at this point can result in train parting. When these hooks are taken out at the time of POH in the workshops, the wear on the bite is made good . The radius and the distance from the hook bolt hole to the bite are corrected. This is a drop stamp item manufactured from class IV steel to IS:1875 & IRS R-12. These hooks after repairs, are normalized and tensile tested before use. The test is carried out at 24.5 tonne.

B. HOOK HEAD

This is a cast steel item and develops the following defects:-

a. The hook head face thickness is reduced due to the constant wear.
b. The head cracks at the corner of the face are sometimes even below the `U'. As per IRCA Rule Nos.4.10.3 any crack below the `U' is rejectable defect.

C. HOOK BOLT

This is forged on a bolt forging machine to provide hexagonal head and at the end threads are provided to take the hook bolt and nut and there is a provision for a rivet/split pin hole as a securing arrangement. This item is manufactured from class IV steel to IS:1875 or IRS M4 & R.12.

D. DRAW BAR

a. This is the most important component in the sub-assembly as any failure of this item leads to train parting. This item is manufactured out of class IV steel IS:1875 & IRS R-12. The Draw bar has a rated capacity of 16.3 tonnes and is tested to a proof load of 24.5 tonnes

b. The subject of high incidence of train parting on MG due to breakage of the draw bars to Drg. No. W/BD-651 was discussed in the 47th C.W.S.C. meeting. The committee recommended that existing drawbar when these need replacement be replaced by modified drawbar as shown in RDSO Sk-72543. This was approved by Railway Board and standard drawings for modified draw bar No. W/BD-418 and nut to Drg. No. W/BD-419 were issued in 1974. The main feature of the modification is that the dia of the threaded portion has been increased from M 52 to M 60.

c. The draw bars are provided with nut and split cotter as an additional fastening device. However, for old draw bars a split pin is also permissible as an alternative security fastening when a check nut is used. This is in terms of IRCA Part III Rule No. 4.10.12.

d. At the time of train examination, Junior Engineer (C&W) and his staff should check that these nuts are properly tightened and the cotter is in position as and properly split to ensure that no train parting takes place on this account.

e. As an anti-pilferage measure, a spot weld is provided between the split end of the cotter to make its removal difficult as well as to prevent dropping down during service.

f. The continuous pull and push loads result in rubbing against the head-stock due to which the outer and inner buffer casings, draw bars gets worn out in service.

g. To reclaim such draw bars, Railway Workshops should follow the process sheet issued by RDSO vide their letter No. MW/CBC, dated 23/28-6-1977.

h. Draw bar Pivot Pin: This is manufactured out of class IV steel IS:1875 or IRS M-4 & R-12. Since these pins have to bear all the buffing draw and shock loads in service in addition to wear, these are renewed at the time of POH. The pins are secured by a cotter and a spot weld between the split ends.

i. Springs: Helical spring are provided one each for draft and buffing, one outside the head stock and other inside the head stock. These springs are heated and brought to the original free height and hardened during POH to give the required load characteristic and the free height for which they are designed. The inner coil spring is provided with a collared bush before fitting the draw bar nut and the cotter.

j. At the time of train examination, Junior Engineer (C&W) or his staff should see that:-

- These springs are not broken
- They have not lost their free height or become dead
- They have not lost their spring action which will be apparent from the looseness of the buffer

E. YOKE END

In the yoke end, all other items i.e. draw bar, draw bar nut, draft and buffing springs, draw bar pin and the buffer head (only the design is modified to take screw coupling arrangement instead of a hook) are the same as in the hook head.

F. Block

This item enables the tight coupling of the two vehicles and is manufactured out of class IV steel of a tensile strength of 118 - 134 Kgs/mm2 (& Spec. R-12) and is a drop stamp item. Normally, this is a trouble free item.

G. Link

This item is either of cast steel or fabricated out of mild steel plates with a spacer bush operated together. The function of this item is to link the block and the yoke in the screw coupling sub-assembly.

H. Yoke

This item is a steel casting which acts as a fulcrum and is held in the yoke head by a pin. As an anti- pilferage measure, the following two alternative methods have been devised for adequate fastening.

- Providing 8 mm riveting to be bent over.
- Welding of the mild steel washer and the spilt pin.

I. Screw

This is drop stamp item made out of the class IV steel IS:1875 & R-12. The central portion has a hole to take other screw coupling handle with two knobs at the ends.

Since the proper functioning of this sub-assembly has to be ensured for the safe running of the trains, RDSO has laid down the shop issue sizes and condemning size for various components which have to be followed at the time of POH as given in Table 9.1.

Table 9.1
SHOP ISSUE & CONDEMNING SIZES FOR MG COUPLER COMPONENTS

Component	Nominal size in mm	Shop Issuing in mm	Condemning size in mm
1. WA/BD-27 Hook end			
Hook Head W/BD-659			
Buffer face	176.5	175	173.5
Hook bolt hole	41	41.8	42.5
Hook WA/BD-640			
Hook-Bite	334.5	336.0	337.5
Hook bolt hole	41	41.8	42.5
Hook bolt W/BD-649	40	39.2	38.6
2. WA/BD 28-YOKE END			
Hook head W/BD-658	258.5	257	255.5
Yoke Pin hole	29	29.8	30.5
3. Coupling Block W/BD-643			
Block face	73	71.5	70.5
Link pin hole	26	26.8	27.5
4. Yoke WA/BD-642			
Yoke pin hole	29	29.8	30.5
Link pin hole	26	26.8	27.5
Yoke nut hole	64	64.8	65.5
5. Coupling link W/BD-642			
Link pin hole	27	27.8	28.5
Link pin hole	27	27.8	28.5
6. Link pins W/BD-648			
Pin	25	24.2	23.5
Pin	25	24.2	23.5
7. Yoke pin W/BD-646	28	27.2	26.5
8. Yoke Nut W/BD-647	63	62.2	61.5

923. REPAIR AND MAINTENANCE IN SICKLINE & ROH DEPOT

A) Ensure that the draw bars and their components are free from defects. Special attention should be paid to draw bar assembly to prevent excessive play.

B) Repair to draw bars, screw coupling and their component are prohibited in sick lines as they are not equipped with normalizing facilities. Use of non-standard material such as shackles and pins manufactured locally in sick lines should be strictly avoided.

C) Screw couplings must be so tightened that the gap between buffers is not left. Buffer projection to be maintained as given in para 904.

D) Screw couplings must be oiled and greased.

E) Correct type and size of draw bar springs, sufficient plain washers of 13 mm thickness after the spring and inside the nut to be provided, sufficiently clearing the cotter slot. The correct size of cotter should be used, properly splitting the same to avoid slackening.

F) It must be ensured that the `U' shape securing pins of the draft key is fitted and bent correctly ensuring that this pin is in proper position.

G) IRCA Part III (2000) Rule No. 4.9 for BG stock and Rule No. 4.10 for MG stock should be followed.

H) In case of CBC on BOX/BCX/BOXN/BCN etc., staff must carefully check the clearance between the lock lift lever and the bottom of the CBC casting. If the clearance is less than 19 mm, it indicates improper locking of CBC which may cause a train parting.

I) In order to satisfy that the CBC knuckles are correctly engaged and locked, the same should be checked by operating the lever handle ensuring that the lock lever falls automatically by its own weight.

J) Maintenance of draw gear to be done as given in para 909.

K) The staff in maintenance depots should strictly follow repair practices embodied in IRCA Part III (2000) Rule No. 2.14.

L) The condition of wear in the knuckle, guard arm and other concerned components affecting the coupler head opening in closed position should be checked with Gauge No. 1, 2 and 3 as given in G-80 and corrective action to be taken as indicated therein.

M) Check that there is free movement and articulation at the joints between the various components of rotary lock lifting gear. They are sometimes wrongly welded at the joints which makes them rigid. In such cases, welding to be cut out and proper riveting with proper clearance to be done to ensure free articulation.

924. REPAIR AND MAINTENANCE IN WORKSHOP DURING POH

A) Drawbar of all stock coming to workshops for repairs must be invariably examined for wear on the hole, neck shank and screwed portion for cracks. Unless drawbar can be rectified to the correct sizes, they should not be used.

B) All drawbars must be stress relieved and subjected to the specified proof load test. Meticulous care should be taken to ensure proper heat treatment in all cases.

C) Screw couplings should be stress relieved and tested to the specified proof load test.

D) Draw bar springs should be thoroughly inspected and changed, if found distorted or damaged. Steel springs to be given a deflection test.

E) All draw bars manufactured by shops should be stamped with the shop code initials, date, month and year for easy identification and reference in case of failures.

F) IRCA Pt. III (2000) Rule No. 2.13 should be followed for buffing gear repair.

G) The shop repair practices for various components of the sub-assembly to be followed as given in para 903.

H) Buffer projection from the head-stock on broad gauge wagons should be within limits as mentioned in para 904.

I) For reclamation of the sub assemblies, the procedure given in para 907, 908 & 909 to be followed.

J) Inspection of CBC to be done as given in para 913.

Note: There are two maintenance publications i.e. G-76 for lines staff and G 80 for workshop staff issued by RDSO on "Inspection and Maintenance of Centre Buffer Couplers BG stock". For Alliance No. 2 CBC, RDSO has issue G 62 for inspection and maintenance by Train Examining and Workshop staff.

VENDOR LIST

(as on 31.10.2000)

(CENTRE BUFFER COUPLER)

1. HIGH TENSILE CBC COUPLER & ITS COMPONENTS FOR FREIGHT STOCK (SPEC-48-BD-94)

1.	BESCO Ltd. 7B &C Poonam, 5/2 Russel Street, Calcutta-700001
2.	Bhilai Engg. Corp. Ltd. PostBox No. 31, Industrial Area, Hathkhoj Village, Bhilai-490001
3.	Braithwaite & Co.Ltd. Angus works, P.O. Angus Distt-Hoogly-712221
4.	Burn Standard Co. Ltd. Nityadhan Mukharjee Road, Howrah-711101
5.	Datre Corporation Ltd. Falta industrial growth centre, sector 3rd South, 24 Pargana-743504 (WB)
6.	Hindustan Development Corp. Ltd. 27, Sir R.N. Mukharjee Road, Calcutta-700002
7.	Mukand Ltd. Lal Bahadur Shashtri Marg, Kurla, Mummbai-400070
8.	Orient Steel Industries Ltd. 2, Brabourne Road, Calcutta-700001
9.	Renuka Industries Ltd. Plot No. 17, Sector III, Sagore, Pithanm pur, Distt. Dhar M.P.
10.	Texmaco Ltd. Belgharia , 24 Paragana, Calcutta-700 056
11.	Titagarh Industries Ltd. 113, Park Street, Calcutta-700 016.

2. HIGH TENSILE CBC COUPLER & ITS COMPONENTS FOR LOCOMOTIVE (SPEC-56-BD-96)

1.	BESCO Ltd. 7B &C Poonam, 5/2 Russel Street, Calcutta-700001
2.	Burn Standard Co. Ltd. Nityadhan Mukharjee Road, Howrah-711101
3.	Hindustan Development Corp. Ltd. 27, Sir R.N. Mukharjee Road, Calcutta-700002
4.	Mukand Ltd. Lal Bahadur Shashtri Marg, Kurla, Mummbai-400070
5.	Orient Steel Industries Ltd. 2, Brabourne Road, Calcutta-700001
6.	Renuka Industries Ltd. Plot No. 17, Sector III, Sagore, Pithanm pur, Distt. Dhar M.P.
7.	Texmaco Ltd. Belgharia , 24 Paragana, Calcutta-700 056
8.	Titagarh Industries Ltd. 113, Park Street, Calcutta-700 016.

3. ALLIANCE II COUPLER & ITS COMPONENTS (SPEC-24-BD-79)

1.	BESCO Ltd. 7B &C Poonam, 5/2 Russel Street, Calcutta-700001
2.	Burn Standard Co. Ltd. Nityadhan Mukharjee Road, Howrah-711101
3.	Mukand Ltd. Lal Bahadur Shashtri Marg, Kurla, Mummbai-400070
4.	Renuka Industries Ltd. Plot No. 17, Sector III, Sagore, Pithanm pur, Distt. Dhar M.P.
5.	Titagarh Industries Ltd. 113, Park Street, Calcutta-700 016.

4. HIGH CAPACITY DRAFT GEAR (SPEC-49-BD-94)

1.	BESCO Ltd. 7B &C Poonam, 5/2 Russel Street, Calcutta-700001	MK 50 Caedwell design
2.	Burn Standard Co. Ltd. Nityadhan Mukharjee Road, Howrah-711101	RF-361 Miner design
3.	Hindustan Development Corp. Ltd. 27, Sir R.N. Mukharjee Road, Calcutta-700002	RF-361 Miner design
4.	Mukand Ltd. Lal Bahadur Shashtri Marg, Kurla, Mummbai-400070	MK 50 Caedwell design
5.	Titagarh Industries Ltd. 113, Park Street, Calcutta-700 016.	RF-361 Miner design

5. MG ENHANCED AND ABC COUPLER

1.	BESCO Ltd. 7B &C Poonam, 5/2 Russel Street, Calcutta-700001
2.	Burn Standard Co. Ltd. Nityadhan Mukharjee Road, Howrah-711101
3.	Renuka Industries Ltd. Plot No. 17, Sector III, Sagore, Pithanm pur, Distt. Dhar M.P.

6. TOP LOCK LIFT HOLE CAP (SPEC 48-BD-94)

1.	Annpurna Engg. Works, 89/1, Deshprn, Sasmai Road, Howrah-711 101
2.	Comet Technocom (P) Ltd. 37, Bhagwan Ganguly Lane, 3rd floor, Howrah-1

3.	Decon India, 9 Duffer Street, Liluah, Howrah-4
4.	Krishna Engg. Works, 57/9, Q Road, Netajigarh, (Belgachia) Howrah
5.	Nirmal Engg. Works 26/1, Benaras Road, Salkia, Howrah-711 106
6.	Raj Iron & Steel Company, 1A&3, Raghav Koley Lane, Bamungachi, Hawrah-6
7.	Shiv Engg. Woprks, 64/4, G.T. Road, Liluah, Howrah

7. KNUCKLE PIN WITH WASHER (SPEC 48-BD-94)

1.	Anand Sales Corporation 6 Poonamchand Bagaria Belly, Howrah-711005
2.	Annpurna Engg. Works, 89/1, Deshprn, Sasmai Road, Howrah-711 101
3.	Comet Technocom (P) Ltd. 37, Bhagwan Ganguly Lane, 3rd floor, Howrah-1
4.	Cosmic Engineers, 2, Duffer Road, Liluah, Howrah-711202
5.	Eastern Engineering Industries, 40 E road Belgachia Post Dasnagar, Howrah 711105
6.	Industrial Corporation, Ghoshpara, Baltipuri, Howrah
7.	Kaypee Industries D 108 Phase V, Focal Point, Ludhiana-141010
8.	Krishna Engg. Works, 57/9, Q Road, Netajigarh, (Belgachia) Howrah
9.	Laha Engg. Works, 157, Mahendra Bhattachaarjee Road, Santragachi, Howrah- 711 104
10.	Lal Baba Industrial Corporation 78, Lalababu Shir Road, Belur, Howrah- 711 202
11.	Melbro Engineering Works Pvt.Ltd., 1/1, “X” Road, Belgachia, Howrah
12.	Shiv Engg. Woprks, 64/4, G.T. Road, Liluah, Howrah

8. YOKE PIN (SPEC 48-BD-94)

1.	Anand Sales Corporation 6 Poonamchand Bagaria Belly, Howrah-711005
2.	Annpurna Engg. Works, 89/1, Deshprn, Sasmai Road, Howrah-711 101
3.	Comet Technocom (P) Ltd. 37, Bhagwan Ganguly Lane, 3rd floor, Howrah-1

4.	Cosmic Engineers, 2, Duffer Road, Liluah, Howrah-711202
5.	Eastern Engineering Industries, 40 E road Belgachia Post Dasnagar, Howrah 711105
6.	Excel Entreprises, 220 A, Naskapara Road, Ghusuri, Howrah
7.	Industrial Corporation, Ghoshpara, Baltipuri, Howrah
8.	Krishna Engg. Works, 57/9, Q Road, Netajigarh, (Belgachia) Howrah
9.	Laha Engg. Works, 157, Mahendra Bhattachaarjee Road, Santragachi, Howrah- 711 104
10.	Lal Baba Industrial Corporation 78, Lalababu Shir Road, Belur, Howrah- 711 202
11.	Melbro Engineering Works Pvt.Ltd., 1/1, “X” Road, Belgachia, Howrah
12.	N.F. Forging Pvt. Ltd., 72, Lalbabu Shiv Road, Brlur, Howrah- 711 202
13.	Pranay Engg. Co. Ltd., 19, R.N. Mukharjee Raod , Calcutta-1
14.	SBS Forging Pvt. Ltd., GI-140 to 143, Industrial Area, Behror, Phase –I ALWAR (Rajsthan)
15.	Shiv Engg. Woprks, 64/4, G.T. Road, Liluah, Howrah

9. KNUCKLE THROWER (SPEC 48-BD-94)

1.	Amar Forging Pvt. Ltd., 56-C, Industrial Area, Bammore, Distt Morena- 476444
2.	Annpurna Engg. Works, 89/1, Deshprn, Sasmai Road, Howrah-711 101
3.	Krishna Engg. Works, 57/9, Q Road, Netajigarh, (Belgachia) Howrah
4.	Lal Baba Industrial Corporation 78, Lalababu Shir Road, Belur, Howrah- 711 202

MARKING ON CBC (MANUFACTURERS INITIAL)

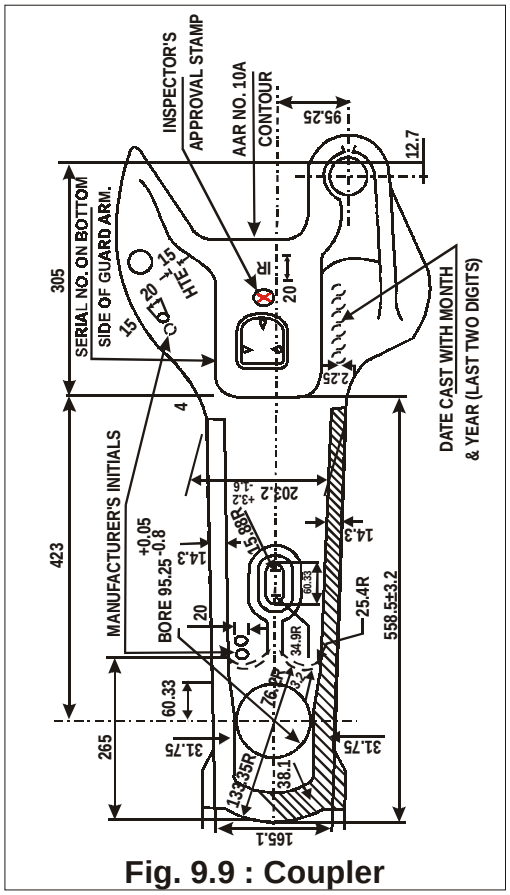


Fig. 9.9 : Coupler

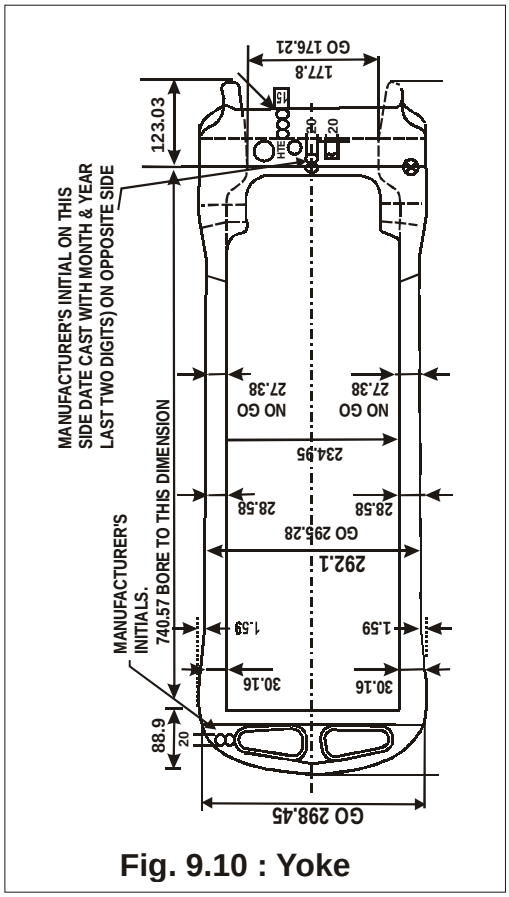


Fig. 9.10 : Yoke

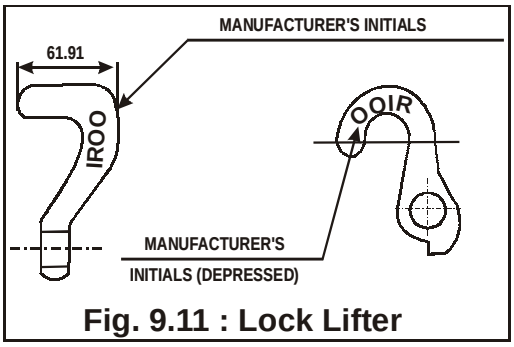


Fig. 9.11 : Lock Lifter

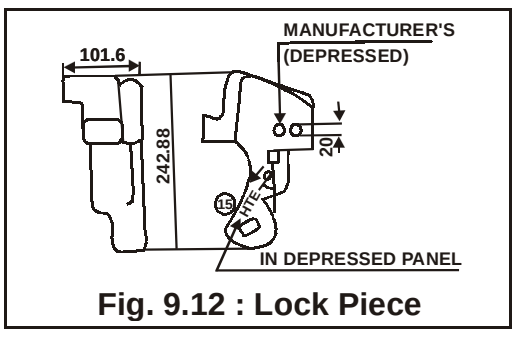


Fig. 9.12 : Lock Piece

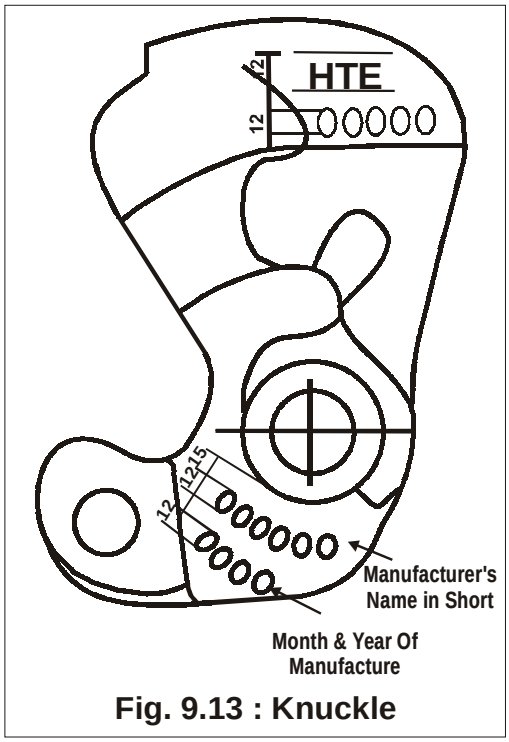
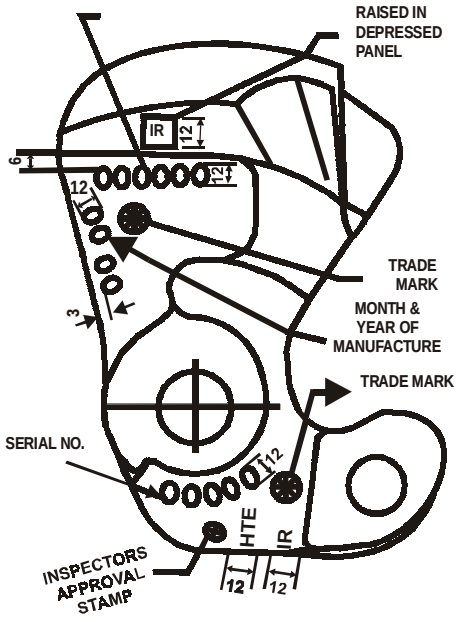
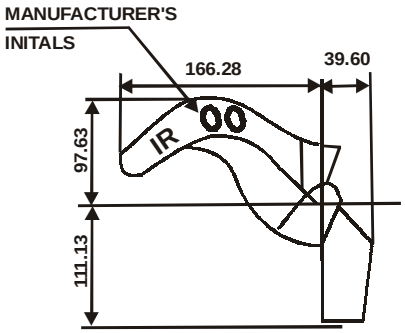
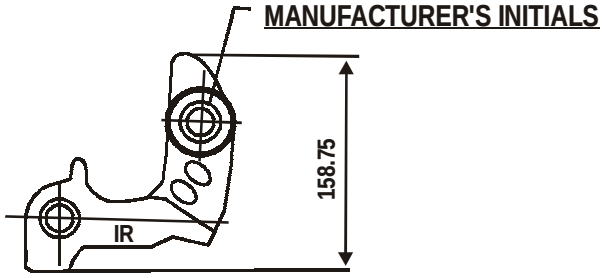


Fig. 9.13 : Knuckle







S.No.	Manufacturer's Name	In Short
1	Burn Standard Company Ltd.	BURN
2	Bhartia Electric Steel Company Ltd.	BESCO
3	Bhilai Engineering Corporation Ltd.	BECO
4	Hindustan Development Corp. Ltd.	HDC
5	Mukand Ltd.	MUKUND
6.	Orient Steel Industries Ltd.	Orient
7.	Sri Ranga Alloys Ltd.	Ranga
8.	Titagarh Industries ltd.	TITA
9.	Texmaco Ltd.	TEXMA
10	Datre Corporation Ltd.	DCL
11	Raneka Industries Ltd.	RIL
12.	Braithwate & Co. Ltd.	BWT

Fig. 9.14 : Marking of Parts