CHAPTER 6

BOGIE MOUNTED AIR BRAKE SYSTEM

601 GENERAL

In order to overcome the problems of slack adjuster failure as well as problems associated with cast iron brake blocks, a design of brake system incorporating 8" size two cylinders on each bogie along with 'K' type high friction composite brake blocks has been introduced.

602 DESIGN FEATURES OF THE SYSTEM (refer figure 6.1)

This type of system is exactly similar to the standard air brake system except for the following:

a) External slack adjuster is removed/ eliminated

b) Four cylinder of 8" size is provided for each coach in place of two cylinders of **14"** in standard air brake system. These cylinders have built in single acting slack adjuster for taking the slack created between wheel and brake block on account of wheel / brake block wear. Mounting of cylinders is done on either side of the bogie frame in between central longitudinal members connecting the bogie transom to the headstocks. Each cylinder controls the braking on one wheel set. Each cylinder has a piston take up stroke of **32 mm** and adjustment capacity of **305 mm** (Ref. Drg. RDSO Sk- 81057)

c) High friction composite brake blocks of 'K' type have been used.

d) Bogie brake rigging has been modified to incorporate a total mechanical advantage of **7.644 per bogie** for non-AC coaches and **8.40 per bogi**e for AC coaches.

e) Curved profile pull rods have been used to interconnect levers controlling braking one wheel set. These pull rods provided with one additional hole for the adjustment of slack between wheel and block after specified amount of wear.

f) Since brake cylinders have been mounted on the bogie frame, 15mm. bore pneumatic pipeline has been laid over bogie frame to inter connect the brake cylinders of one bogie. Output pipe line of distributor valve has been connected to bogie pneumatic line through flexible hoses to provide flexibility to alround dynamic movement.

603 COMPOSITE BRAKE BLOCK

603a General

Low friction composite brake blocks have the following benefits:

- Reduced braking distance due to uniform co-efficient of friction.
- Reduced weight
- Reduction in the replacement of brake blocks vis a vis cast iron due to higher wear life in train operation.
- Reduced wear and tear of brake rigging.
- Reduced noise during braking.

603b Characteristics of composition brake blocks

i. Composition of material

The composition of material constituting the brake blocks must be chosen to give the best balance between :

- The braking characteristics
- The wear and service life of blocks
- Wear on the running surface of the wheels
- The effect on adhesion between the rail and wheel

ii. Requirement concerning friction

- The average coefficient of friction is **0.25**.
- As far as possible the coefficient of friction must be independent of the initial braking speed, the state of bedding-in of the brake block, the specific pressure also the temperature and atmospheric conditions.

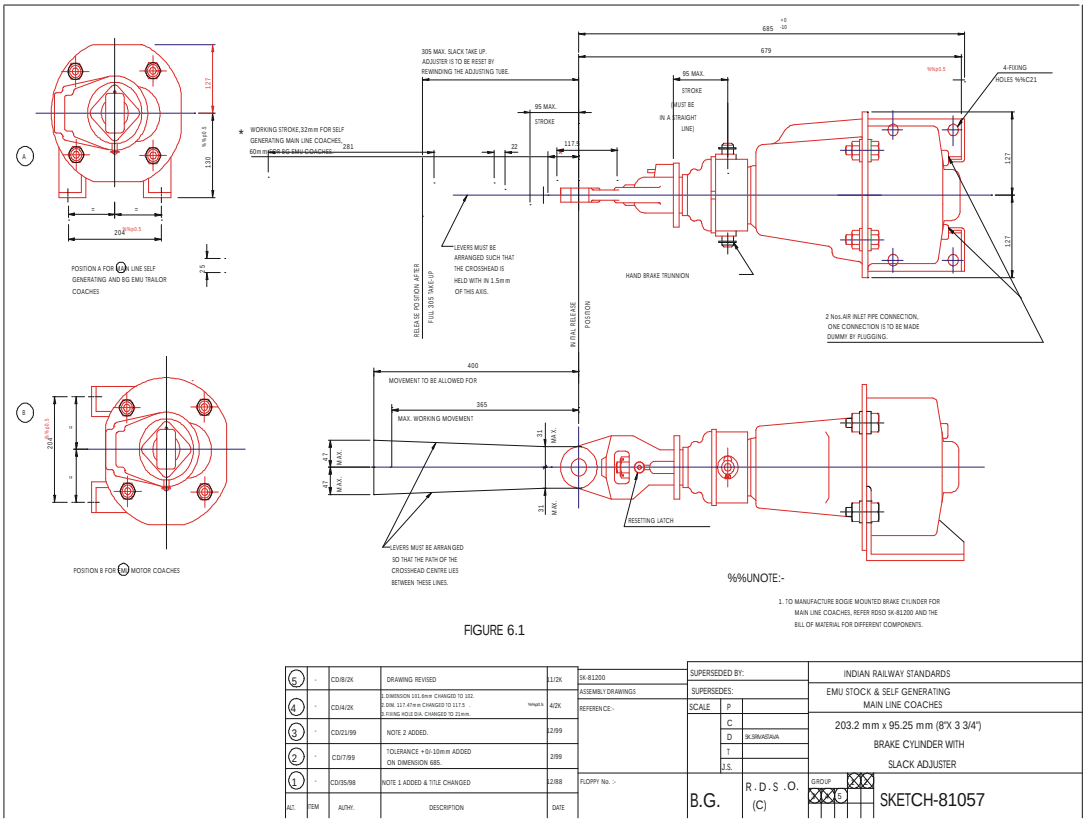


FIGURE 6.1

5	CD/B/2K	DRAWING REVISED	11/2K	SK-81200	SUPERSEDED BY:	INDIAN RAILWAY STANDARDS
4	CD/4/2K	1.DIMENSION 101.6mm CHANGED TO 102. 2.DIM. 117.47mm CHANGED TO 117.5 . 3.FIXING HOLE DIA. CHANGED TO 21mm.	4/2K	ASSEMBLY DRAWINGS	SUPERSEDES:	EMU STOCK & SELF GENERATING MAIN LINE COACHES
3	CD/21/99	NOTE 2 ADDED.	12/99	REFERENCE:-	SCALE P / C / D SK.SRINIVASAVA / T / J.S.	203.2 mm x 95.25 mm (8"X 3 3/4") BRAKE CYLINDER WITH SLACK ADJUSTER
2	CD/7/99	TOLERANCE +0/-10mm ADDED ON DIMENSION 685.	2/99			
1	CD/35/98	NOTE 1 ADDED & TITLE CHANGED	12/88	FLOPPY No. :-	B.G. / R.D.S.O. (C)	GROUP 6 SKETCH-81057
ALT.	ITEM	AUTHY.	DESCRIPTION	DATE		

- Under the effect of dampness, the average coefficient of friction must not vary, with the other condition remaining the same, by more than **±15%** in relation to the value obtained during braking when dry.
- After prolonged braking followed by braking to a stop, particularly high temperature occur. Even in the case of these temperatures (**maximum 400 ^{0}C** on the opposing friction surface) the average coefficient of friction must not vary with the other conditions remaining the same – by more than **±15%** in relation to the value obtained during braking in cold and dry state.

iii. Geometrical characteristics of the brake blocks

- The constructional features of the brake blocks must enable them to wear down to a thickness of **12 mm** including the back plate, without the latter coming into contact with the running surface of the wheel.

iv. Mechanical and physical characteristics

- The various elements making up the brake blocks must be spread uniformly in the body of the block. There must be no pitting, flaws or other defects. The material must not attack the opposing friction surface or give rise to the formation of metal inclusions.

  Composition brake blocks must not bring about more serious heat damage to the wheels (hot spots, cracks, flaking) than would be caused by cast iron blocks used in the same way on the same wheels.
- The values of specific weight, thermal conductivity, hardness, bending strength and the modulus of elasticity must be given for acceptance purposes.
- No method is laid down for fixing the composite material part to the back plate. The back plate must be designed to support the stresses likely to occur.
- The composition blocks must not affect to an unacceptable degree the adhesion values between wheel and rail obtained on vehicles braked with cast iron inserts.

603c **Non-asbestos 'K' type composition brake block**

- Non-asbestos 'K' type blocks shall generally conform to RDSO drawing No. 98066.
- The use of asbestos is prohibited.
- The use of lead or zinc in the metal state or in the form of compounds is not advised. The same applies to all other compounds, if in the form of powder, particles or gas produced during the used of the brake blocks, they may constitute a danger to health.

603d **Asbestos based 'K' type composition brake**

- Asbestos based 'K' type blocks shall generally conform to RDSO drawing No. 98146.

603e **Marking**

Each block must bear the following marks:-

- Name of manufacturer
- Date of manufacturer (month and year)
- Material code including 'KA' for asbestos type and 'KNA' for non-asbestos type.
- Type of service ML.

These marks, preferably punched, cut or stamped, must be applied so that the block can be identified, even after being fully worn in service.

603f **Comparison of properties/Usage of composition brake block Vs Cast Iron Brake block**

Parameters	Type of Brake blocks in use on main line coaches		
	'L' type CBB	'K' type CBB	CI
Applicability	All coaches with underframe mounted air brake system	All coaches with bogie mounted brake system	All coaches with vacuum brake and under frame mounted brake system
Speed	Upto 110 KMPH	upto 110 KMPH	Upto 140 KMPH
Coefficient of friction	0.12 to 0.14	0.25 max.	0.12 to 0.14
Weight	Approx. 3 kg.	Approx. 3 kg	Approx. 9 kg.

604 **WORKING PRINCIPLE**

There is no change in the overall brake system in bogie-mounted arrangement up to the action of distributor valve. Here the system will respond to action on A-9 valve in similar fashion as in the case of standard air brake system. Working of bogie mounted brake system beyond distributor valve is explained below.

604a **Application (see fig. 6.2)**

For application of brakes, driver moves the handle of A-9 valve in the application position. By this movement the brake pipe pressure is reduced which is sensed by distributor valve to operate brake cylinder (1). Pneumatic pressure in the brake cylinder causes piston assembly (2) to move outward thereby causing lever (3) to rotate about its fulcrum (a) thus bringing brake block (4) to come in contact with the wheel (5) through the brake beam (6). Since lever (3) is hung on the bogie frame through lever hangers, it will start moving forward about fulcrum (b) after brake block (4) has contacted wheel (5). This forward motion of the lever (3) about fulcrum (b) will cause pull rod (7) to move forward thereby causing lever (8) to swing about fulcrum (c) and hence resulting in contact of brake block (9) against wheel (5) through brake beam (10).

Extent of brake cylinder pressure developed in the brake cylinder will depend upon the extent of reduction in brake pipe pressure. Maximum brake cylinder pressure developed is **3.8 +/ - 0.1 kg/cm^2** as in the case of standard air brake.

604b **Release**

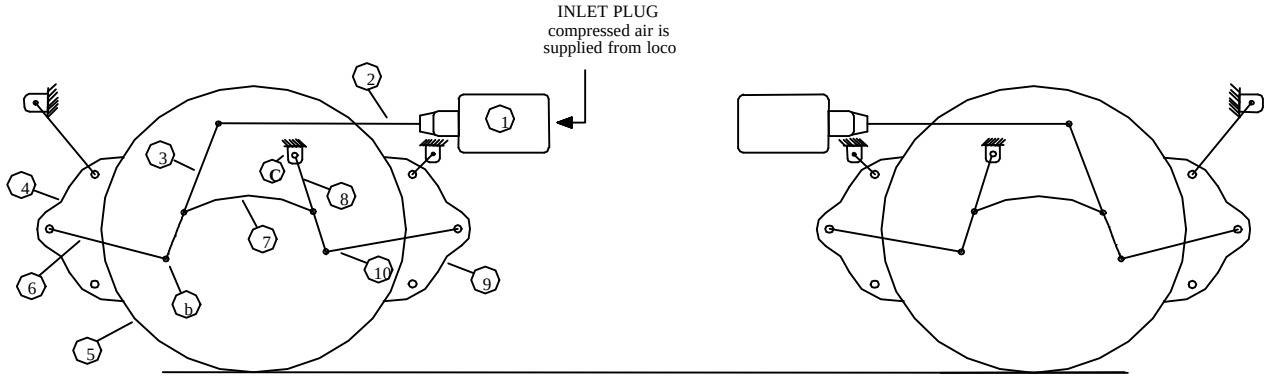
For release of the brakes, driver moves handle of A-9 valve to release position. By this movement, the brake pipe is charged to the required pressure **of 5 kg/cm^2.** This actuates the distributor valve and brake cylinder is cut off from the auxiliary reservoir. The air from brake cylinder is exhausted to atmosphere and brakes are released.

604c **Slack up Action**

Cylinders of bogie mounted brake system are provided with automatic slack take up features. As soon as the piston stroke exceeds a pre determined value (on account of either brake block or wheel or both) a ratchet with adjusting screw fitted inside the cylinder turns thereby increasing the length of the piston rod automatically. During return stroke, the adjusting movement takes place. A red paint mark on the adjusting tube assembly indicates that piston unit has extended over its full range and requires resetting of pull rod (7).

605 **COMPARISION OF IMPORTANT PARAMETERS**

In the underframe mounted brake gear arrangement, it is seen that there are 51 pin joints per bogie in the system. To reduce the number of pin joints, levers, pull rods and push rods, bogie mounted brake system for mainline coaches have become a viable alternative. Comparison



SCHEMATIC BOGIE BRAKE GEAR ARRANGEMENT FOR BOGIE MOUNTED BRAKE SYSTEM FIGURE 6.2

of bogie brake system with conventional air brake system for various parameters is as follows:-

Table 6.1

Item	Convent-ional Air Brake System	Bogie Mounted Brake System
Weight reduction (as compared to conventional air brake system)	-	492 kg.
Braking distance at 110 kmph (18 coaches)	905 m	800 m
No. of pins and bushes	102	84
Brake block wear rate	3 cc/kwh	1.325 cc/kwh

606 MAINTENANCE INSTRUCTIONS

As explained above, bogie mounted brake system from maintenance point of view is exactly same as the standard air brake system except for brake cylinder, which are different than the existing system. Therefore, to maintain the system, instructions contained in the Air Brake System (chapter 4) will have to be followed in addition to those which are indicated in the maintenance manual for brake cylinders supplied by manufacturers.

607 SPECIAL PRECAUTIONS TO BE TAKEN DURING MAINTENANCE

The maintenance of underframe equipments and fittings should be done as per underframe mounted air brake system. Following special precautions must be taken to ensure proper working of the bogie mounted brake system.

i) It shall be ensured that only high friction composition brake blocks 'K' type are used with this arrangement.

ii) It shall be ensured that levers of non-AC coaches (13T bogies) are not mixed with those on AC coaches (16T bogies) under any circumstances.

iii) It is very important to ensure that curved profile pull rods (item '6' of ICF Drg. No. T-3-2-802 which is meant to be used for 13T bogies is not intermixed or replaced with pull rod (item 4) of ICF Drg. No. WTAC4-3-2-402 which is designed for 16T bogies.

iv) While fitting curved profile/pull rods as per Para (iii) above, it shall be ensured that they are fitted as shown in the bogie brake arrangement drawings and not reversed under any circumstances.

v) Curved profile/pull rods as per Para (iii) have been provided with a single hole at one end and two holes at other end, for initial fitment, when wheel as well as brake blocks are new, connection of levers through pull rod will have to be made using extreme holes/strictly. When wheel diameter reduces to 839 mm. and 38 packing is provided at axle box to compensate for the wheel wear, connection of pull rod must be shifted to adjacent hole.

vi) Under new condition of wheel (**dia. 915 mm**) and brake block, gap between brake block and wheel (with brake block in released condition) be maintained at about 5 mm. This will ensure that piston stroke (without utilizing the slack take up capacity) of brake cylinder remained within the value of **32 mm**.

vii) Design of brake rigging has been done in such a way that up to wheel diameter of **839 mm**. and brake block in full worn condition, red paint mark on the adjusting tube sub assembly will not appear (indicating condition that piston unit has extended fully and requires resetting). However, if due to some reasons, this mark appears, worn brake blocks must be replaced by new ones. Failures to observe this condition will result in increased gap between wheel and brake blocks. Procedure for resetting is explained in the maintenance manual of brake cylinder supplied by the manufacturers.

viii) Once the brake block has worn to condemning limit (shown by the mark on the block) it must be replaced by a new one.

ix) The rocker from position of Brake Cylinder should be kept in horizontal axis of cylinder before fitment.

x) Adequate size of pins and bushes as indicated in the drawing of the system must be used in the rigging to get effective working of the system.

xi) All flexible hose pipes should be tested in every POH.

608 **DESCRIPTION AND MAINTENANCE OF BOGIE MOUNTED BRAKE CYLINDERS (REFER RDSO SKETCH- 81200 & 81204)**

608a Figure 6.3a & figure 6.3b (RDSO sketch. 81200) gives the details of brake cylinders and the part number list is indicated in the table 6.2.

608b Detail of 203 mm Air Brake Cylinder (with slack adjuster) is given in **figure 6.4** (RDSO sketch-81204)

608c **Hand Brake Attachment**

On the Piston trunk of brake cylinder hand brake trunions are fitted whenever it is required. During the service application the hand brake trunion does not move. The maximum hand brake stroke required at the trunion corresponds to maximum brake cylinder stroke.

608d **Re-Setting**

A red paint mark on the Adjusting tube sub-assembly indicates that the piston unit has extended over its full range and requires re-setting. The design of brake rigging unit is done in such a way that range of slack adjuster covers the life of brake blocks so that resetting and replacing the brake blocks will be done at the same time. While keeping the adjusting screw stationary, by turning the adjusting tube sub-assembly in clock wise direction the distance between piston to cross head is reduced to minimum level. The resetting of unit takes place at position.

608e **Procedure for Re-setting**

Hold the latch out of engagement with the resetting plate. The adjusting tube should be turned in clockwise direction by means of the lugs until it reaches the inner end. Then reengage the latch.

608f **Dismantling**

i) Unscrew cross head and adjusting tube sub-assembly.

ii) Loose jubilee clips and remove dust excluder and bush.

iii) Admit compressed air in brake cylinder, unscrew grub screw. Vent compressed air and unscrew collar by using C-spanner. remove hand brake trunion.

iv) Unscrew hex nuts M12 slowly. Please note that release spring compressed with force of **60 kg**. **Note:** The release spring exerts severe force while dismantling the unit, the front cover should be removed very carefully. The dismantling can not be done by a single person. Atleast two persons are necessary.

v) Remove front cover, release spring, piston trunk sub-assembly with trunion body and ratchet with adjusting screw.

vi) Remove split pin, pin and rocker arm.

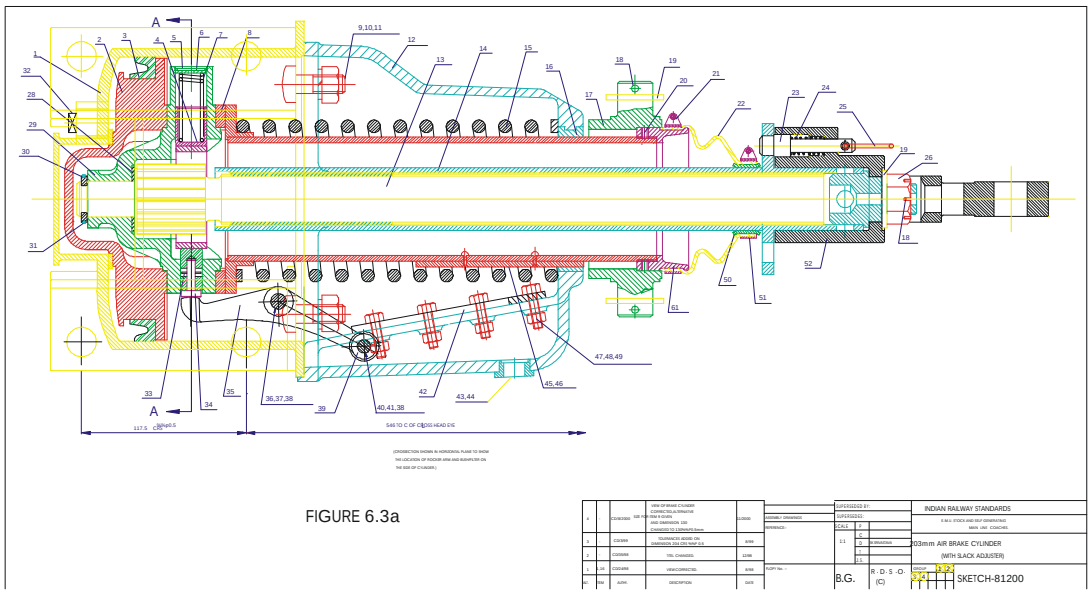
vii) Remove allen bolts and piston and piston trunk sub-assembly. Please not that piston and piston trunk sub-assembly are matched pair and are not interchangeable. Always put some identification mark.

viii) Remove circlip, collar , ratchet with adjusting screw, pawl, pawl spring, Plunger, turnion body, thrust washer.

ix) Remove Piston packing from piston.

608g **Cleaning and Inspection**

Wash all the parts in suitable cleaning fluid and wipe them carefully. Inspect pawls, Pawl housing ring, ratchet, tooth rollers, roller plate, thrust washer for wear and damage. Inspect threads of ratchet with adjusting screw and adjusting tube for the possible damage. Replace packing. Check all the springs for possible corrosion and distortion. It is advisable to change the springs on every POH. Give all other parts a thorough visual inspection to detect apparent defects. Replace worn or damaged parts.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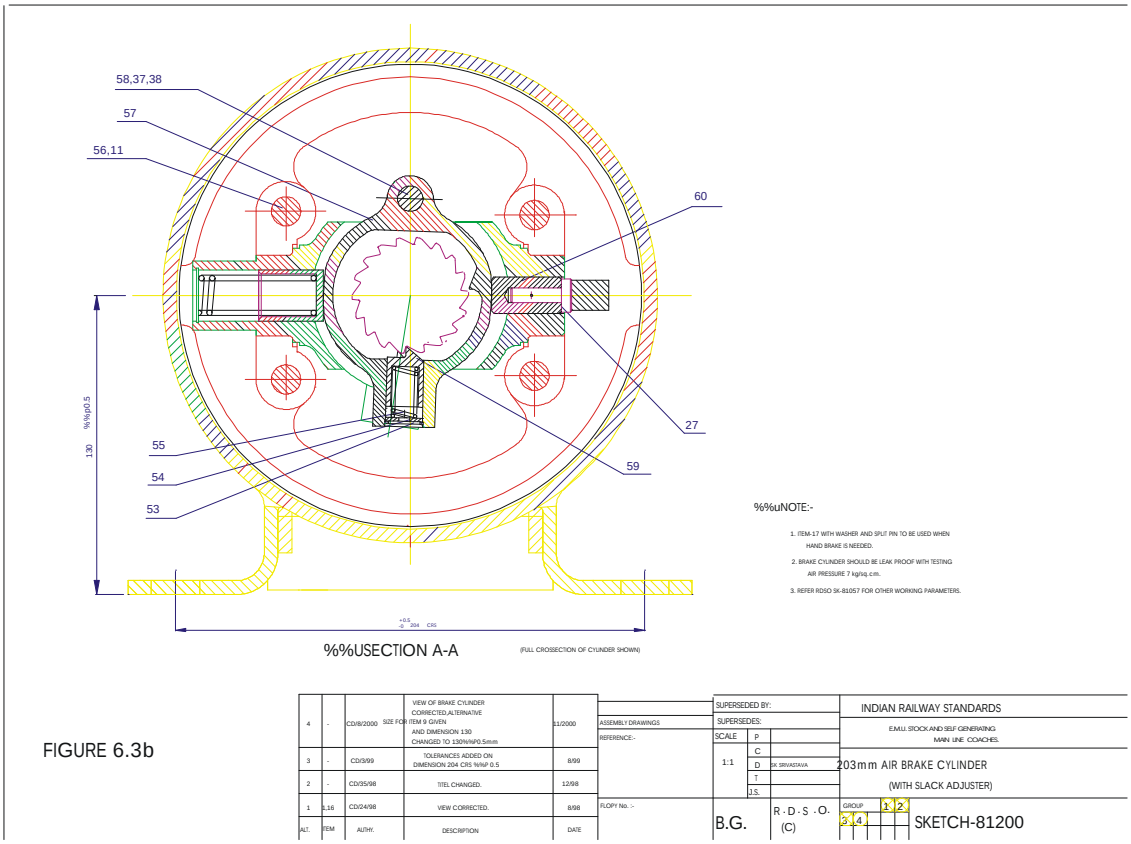
INDIAN RAILWAY STANDARDS
403mm AIR BRAKE CYLINDER
(WITH SLACK ADJUSTER)
B.G.
SKETCH-81200

FIGURE 6.3a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27
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%%p0.5
130
%%USECTION A-A
(FULL CROSSECTION OF CYLINDER SHOWN)
%%uNOTE:-
1. ITEM-17 WITH WASHER AND SPLIT PIN TO BE USED WHEN HAND BRAKE IS NEEDED.
2. BRAKE CYLINDER SHOULD BE LEAK PROOF WITH TESTING AIR PRESSURE 7 kg/sq.cm.
3. REFER RDSO SK-81057 FOR OTHER WORKING PARAMETERS.
4 - CD/8/2000 VIEW OF BRAKE CYLINDER CORRECTED,ALTERNATIVE SIZE FOR ITEM 9 GIVEN AND DIMENSION 130 CHANGED TO 130%%P0.5mm 11/2000
3 - CD/3/99 TOLERANCES ADDED ON DIMENSION 204 CRS %%P 0.5 8/99
2 - CD/35/98 TITEL CHANGED. 12/98
1 1.16 CD/24/98 VIEW CORRECTED. 8/98
ALT. ITEM AUTHY. DESCRIPTION DATE
ASSEMBLY DRAWINGS
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C
D SK SRIVASTAVA
T
J.S.
B.G.
R · D · S · O.
(C)
INDIAN RAILWAY STANDARDS
E.M.U. STOCK AND SELF GENERATING MAIN LINE COACHES.
203mm AIR BRAKE CYLINDER
(WITH SLACK ADJUSTER)
GROUP 1 2 3 4
SKETCH-81200

FIGURE 6.3b

TABLE 6.2

Item	Description & dimensions	No. off	Ref. Drg.	Mtl. & spec.	Remarks
1	Cylinder Body	1	SK-81201		Item 1, 3,4 & 5
2	Piston	1	SK-81203		Item - 1
3	Piston packing	1	SK-81204		Item -10
4	Plunger	1	SK-81206		Item - 2
5	Circlip Light B22	1	-	IS:3075	Galv.
6	Special Washer	1	SK-81206		Item-14
7	Plunger Spring	1	SK-81206		Item-18
8	Piston Trunk	1	SK-81204		Item-1 & 2
9	Tee bolt M12x35 Alternatively M12x45	4	-		Galv.
10	Hex. head nut M12	4	-	IS:1363	Galv.
11	Spring washer M12 type A	8	-	IS:3063	Galv.
12	Dome cover	1	SK-81202		Item-1
13	Ratchet with adjusting screw	1	SK-81204		Item-9
14	Adjusting tube	1	SK-81204		Item-6, 7 & 8
15	Release Spring	1	SK-81206		Item-20
16	Guide bush	1	SK-81202		Item-2
17	Hand brake trunion	1	SK-81205		Item-12
18	Split pin ϕ5 x 40	3	-	IS:549	Galv.
19	Washer M22 type -C	3	-	IS:2016	Galv.
20	Slotted head grub screw 'C' M6x6	2	-	IS:2388	Galv.
21	Jubilee clip size-5	1	-		Galv.
22	Dust excluder	1	SK-81204		Item-11
23	Latch	1	SK-81206		Item-3
24	Latch spring	1	SK-81206		Item-21
25	Ring	1	SK-81206		Item-23
26	Slotted Nut 7/8" B.S.W. (20 mm high)	1	-		Galv.
27	Shims for plunger	As required	SK-81206		Item-16
28	Special washer	1	SK-81206		Item-12
29	Trunion Body	1	SK-81205		Item-1
30	Coller	1	SK-81206		Item-4
31	Circlip light A32	1	-	IS:3075	Galv.

Contd… on next page

Item	Description & dimensions	No. off	Ref. Drg.	Mtl. & spec.	Remarks
32	Plug ½" B.S.P.	1	-		Galv.
33	Solid Taper pin ϕ 2 x14	1	-	IS:2393	Galv.
34	Plunger pin	1	SK-81206		Item-11
35	Rocker arm	1	SK-81206		Item-1
36	Rocker arm pivot pin	1	SK-81206		Item-10
37	Special washer	2	SK-81206		Item-9
38	Split pin ϕ 3.2x18	3	-	IS:549	Galv.
39	Roller	2	SK-81206		Item-5
40	Rocker arm roller pin	1	SK-81206		Item-9
41	Washer	1	SK-81206		Item-5
42	Roller Plate	1	SK-81201		Item-2
43	Bush	1	SK-81202		Item-3
44	Filter	1	SK-81202		Item-4
45	Guide bar	1	SK-81204		Item-3
46	Snap Head rivet ϕ 2.5x8	2	-	IS:2155	Galv.
47	Hex. head bolt M6x25	8	-	IS:2155	Galv.
48	Hex. nut M6	8	-	IS:1363	Galv.
49	Spring washer M6 type A	8	-	IS:3063	Galv.
50	Bush	1	SK-81206		Item-17
51	Jubilee clip size 2	1	-		Galv.
52	Cross head	1	SK-81203		Item-2
53	Circlip light B16	2	-	IS:3075	Galv.
54	Special washer	2	SK-81206		Item-15
55	Pawl spring	2	SK-81206		Item-19
56	Alen screw ½" BSFx 2"x7/8" TD. length	4	-		Galv
57	Pawl housing ring	1	SK-81206		Item-6
58	Pivot pin	1	SK-81205		Item-3
59	Pawl	2	SK-81206		Item-8
60	Plunger	1	SK-81206		Item-7
61	Retaining nut	1	SK-81206		Item-24

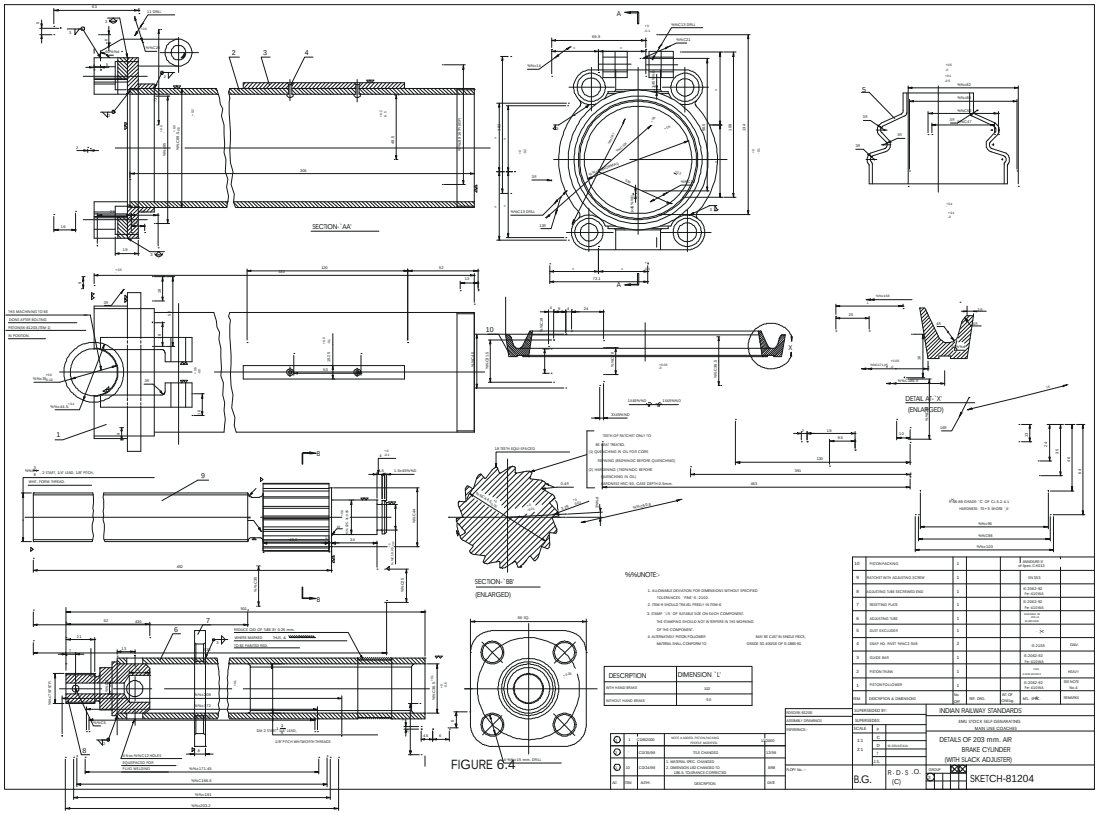

SECTION- AA
SECTION - BB
(ENLARGED)
DETAIL AT 'X'
(ENLARGED)
%%UNOTE:-
DESCRIPTION
DIMENSION 'L'
WITH HAND BRAKE
WITHOUT HAND BRAKE
INDIAN RAILWAY STANDARDS
DETAILS OF 203 mm. AIR
BRAKE CYLINDER
(WITH SLACK ADJUSTER)
SKETCH-81204
B.G.
Maintenance Manual for BG ICF Coaches
Bogie Mounted Air Brake System
Chapter 6, Page 11 of 14

FIGURE 6.4

608h **Assembly**

After cleaning and inspection of all the parts and before re-assembly apply uniform layer of grease Esso Becon 2 on all the moving parts. Grease cylinder body and piston packing liberally with Esso Becon 2.

i) Put washer and insert ratchet with adjusting screw in turnion body. Put two collars in the groove of ratchet with adjusting screw and lock it with circlip.

ii) Insert spring retaining cup plunger spring, washer and internal circlip with circlip plier in the longer side of trunion body.

iii) Insert pawl (ensure proper position) pawl spring in the square hole of the trunion body and lock it with strip. Bend the ends of the strip.

iv) Place pawl housing ring on trunion body so that it pivots on the pivot pin of turnion body. Check that tooth of pawl housing ring matches with teeth of ratchet with adjusting screw. If required, tooth of pawl housing ring may be filed.

v) Insert plunger pin with required No. of shims. Insert this sub-assembly in the shorter side of trunion body.

vi) Place the above sub-assembly (consisting of all the above parts) on piston (ensure proper position as indicated in the assembly drawing. Place piston trunk sub-assembly on it and lock it with piston by 4 Nos. allen screw and spring washer with a tightening torque of **200 kg.cm**. Insert packing on piston.

vii) Insert rocker arm roller pin in roller and then insert it in rocker arm. Insert roller and washer on the roller side of roller pin and lock it with split pin.

viii) Place rocker arm sub-assembly within two shackles of piston trunk ring sub-assembly and insert rocker arm pivot pin and washer and lock it with split pin.

ix) Tighten roller plate with front cover with 8 Nos. hex. bolts spring washers and hex. nuts .

x) After applying grease Esso Becon 2 on all the moving parts, piston packing, cylinder body, insert the above sub-assembly (consisting of piston trunk sub-assembly, piston in cylinder body.

xi) Place release spring on piston trunk sub-assembly.

xii) Place front cover in required position A,B,C on the release spring and compress the spring with a force of 60 kg approximately. Tighten front cover with body with 4 Nos. hex. head bolts, spring washer and hex. nut with a tightening torque of 200 kg cm.

xiii) Place hand brake trunion sub-assembly on piston trunk sub-assembly. Screw collar on piston trunk sub-assembly and screw in grub screw. Put latch spring and latch in cross head. Insert ring in the latch.

xiv) Put cross head sub-assembly on adjusting tube sub-assembly consisting of adjusting tube, adjusting tube screwed and resetting plate). Lock cross head with adjusting tube sub-assembly by washer, hex. slotted nut and split pin.

xv) Clamp dust excluder on bush with jubilee clip and insert adjusting tube sub-assembly in bush. Screw adjusting tube sub-assembly in bush. Screw adjusting tube sub-assembly on ratchet with adjusting screw till it reaches its dead end.

xvi) Clamp dust excluder on collar with jubilee clip.

xvii) Screw 1/2” plug with O-ring in body.

608i **Testing Procedure**

The testing procedure of brake cylinder is given below

PREPARATION FOR TEST

The test layout is shown in the attached **figure 6.5** (RDSO's Sk 98108). A special pin will be required to locate the cross head between the angle iron slots. During testing cock 2 must be opened slowly whenever the cock is used to admit air under pressure to the cylinder. Connect the air supply to the cylinder body. Commence with all cocks closed

TEST NO. 1 Leakage:

Open Cock 1 to charge the MR to **7 kg/cm2** pressure
Open Cock 2 to charge the cylinder **0.7 kg/cm2** pressure

The piston stroke must be limited to 32mm, wait for one minute for settlement and there must be no drop in pressure shown in the leakage volume gauge for a further minute. Also observe that leakage does not exceed **0.1 kg/cm2 in 10 minutes.**

Repeat this test with the cylinder charged to **3.8 kg/cm2** pressure and with cock 3 closed limiting the maximum piston stroke to **95 mm**. Observe that the leakage does not exceed **0.1 kg/cm2 in 10 minutes.**

Open Cock 3 to exhaust the cylinder pressure to zero.

TEST NO. 2 - OPERATION:

A. Full Stroke

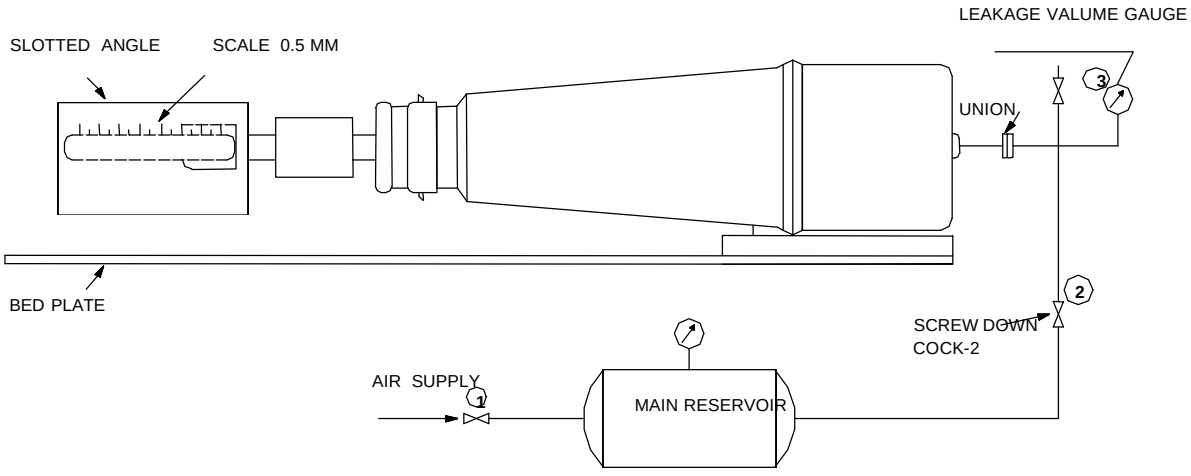
- Close cock 3 and open cock 2.
- Observe the full stroke of the piston.
- This must be within **± 1.0 mm** of the maximum stroke value.

B. Take-up Stroke

- Close cock 2 and open cock 3 to exhaust the cylinder pressure to zero.
- Close cock 3.
- Open cock 2 and allow the piston to move out slowly until the operating pawl is heard to "click over" then close cock 2.
- Measure the take up stroke .
- This must be 32 mm for main line self generating coaches of 95 mm stroke.
- Close cock 2 and open cock 3.
- As the cylinder returns to release the locking pawl must be heard to click into position

Note:

1. Operate the piston at full stroke at least 18 times to test all ratchet teeth.
2. Observe that the adjuster operates at each release and the adjusting tube and cross head being 'inched' out along the stroke.
3. The movement of the Piston must be smooth without any tendency to stick at any part of the stroke.



TEST LAYOUT FOR BRAKE CYLINDER WITH BUILT IN SLACK ADJUSTER
FIGURE 6.5

C. Take-up Length (without Quick Resetting Gear)

- Close cock 2 and open cock 3.
- Remove the pin from the cross head and unscrew the adjusting tube until the red resetting mark on the adjusting Tube is visible.
- Disengage resetting latch and screw in the Adjusting Tube.
- Re-engage resetting latch.
- Check that the Dust Excluder Collar is free and does not twist when the Adjusting Tube is being rotated.
- Close cock 1 and open cock 2.
- Close all cocks when the system is at atmospheric pressure.

D. Take-up Length (With Quick Resetting Gear)

- Close cock 2 and open cock 3.
- Remove the pin from the cross head and turn the resetting screw until the red resetting mark on Adjusting tube is visible.
- Screw in the Adjusting Tube with the resetting screw.
- Check that the Dust Excluder Collar is free and does not twist when the Adjusting tube is rotated . Close cock 1 and open cock 2.
- Close all cocks when the system is at atmospheric pressure

608j **Important Instructions for Reassembling the Brake Cylinder at the Workshops**

i) While fixing the Roller plate with front cover 4 pairs of hex. Bolts M 6x25 along with spring washer A6 and hex nut M6 are required. Before fixing the roller plate, the inner surface of front cover should be checked for perfect plane. At the time of fixing the roller plate with front cover 2 Nos. of spring washers are kept inside in between them (one each side) in first two bolts, so that the rollers can move smoothly in the cover plate in angular position.

ii) While matching the holes of plunger and plunger pin number of shims are added (say 2 or 3) as per the requirement, in the plunger pin so that spring Dowel pin Ø2X14 easily locks the plunger and plunger pin by inserting the dowel pin in the holes.

iii) At the time of re-assembly check that the tooth of pawl housing ring matches with the teeth of Ratchet with adjusting screw. The pawl housing ring must go smoothly inside the teeth of Ratchet. If it is not matching then the notch portion of the tooth of pawl housing ring should be filed till it matches with the teeth of Ratchet screw.

iv) Before final assembly of piston and piston trunk sub-assembly ensures that the threads of adjusting tube (turns in clock wise direction) smoothly matches with the threads of Ratchet screw.

v) Before fixing the front cover in the cylinder body check visually the red paint mark appears in the Adjusting tube. If it is not visible then repaint.

608k **Special Tools**

Table 6.3

Description	No. off
Ball peen hammer 1/2 kg	1
Screw driver big	1
Screw driver small	1
Double end spanner to tighten/loosen M6 nut	1
Press machine to apply 60 kg force for assembling front cover with body	1
Scriber to remove Split pin	1
5 mm Allen key	1
Torque wrench with 200 kg cm	1

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