

PROCESS SPECIFICATION CEPS 1019

OVERHAUL, TESTING, TRANSPORT, RE-ASSEMBLY AND STORAGE
OF ROLLING RING TYPE VACUUM BRAKE CYLINDERS

PART 1 OVERHAUL AND TESTING

PART 2 TRANSPORT, RE-ASSEMBLY AND STORAGE

C British Railways Board

July 1990

Director of Mechanical & Electrical Engineering
Railway Technical Centre
London Road, DERBY DE2 8UP

PROCESS SPECIFICATION CEPS 1019

OVERHAUL, TESTING, TRANSPORT, RE-ASSEMBLY AND STORAGE OF ROLLING RING TYPE VACUUM BRAKE CYLINDERS

GENERAL

This Instruction is applicable to all Contractors and BR Depots approved to undertake the overhaul of Rolling Ring Type Vacuum Brake Cylinders.

Vacuum cylinders may be dismantled and overhauled only at locations equipped with approved Testing Facilities, however, all BR Depots must observe Part 2 of the Instruction.

BR Cat. Numbers appended within the Instruction are given for the guidance of BR Depots only.

Rubber items to be used in the repair of vacuum brake cylinders must be stored away from excessive heat and out of direct sunlight. Rolling rings should, additionally, be unpacked upon receipt and stored, but not stretched, around drums of an appropriate diameter.

This Instruction supersedes all other instructions relating to Vacuum Brake Cylinder overhaul and testing, i.e.:-

CEPS 1019 issued June 1981
Engineering Instruction G/364

which must be withdrawn.

PART 1 OVERHAUL AND TESTINGOPERATIONS

1. Dismantle Brake Cylinder
2. Overhaul Components
3. Re-assemble Brake Cylinder
4. Test

1. Dismantle Brake Cylinder

- 1.1 Remove vacuum connections, release valve and cylinder from casing. Remove and discard piston rod sleeve. Unscrew rod from piston, remove and discard gland rubber and neck ring. Remove cylinder to casing joint ring and discard.
- 1.2 All lifting lugs must be removed from the dome casing and any eyebolt holes to be plugged and the surface made good.
- 1.3 Clean or wire brush all working parts and wipe clean with a dry lint-free cloth.
- 1.4 Hand scrape non-working parts as required, clean with a stiff wire brush and apply internally, as necessary, one coat of Iron Oxide Prefabrication Primer, BR Cat. No. 28/63042, and externally, one coat of Bituminous Solution, BR Cat No. 28/500.

2. Overhaul Components2.1 Vacuum Cylinder Casing

- 2.1.1 Check trunnions for diametral wear and attachment to casing for security. Maximum wear allowable on diameter 1/16in.
- 2.1.2 External and internal condition of casings to be checked for indentations and wall thickness. Any depressions should be knocked out and cracks be welded up.

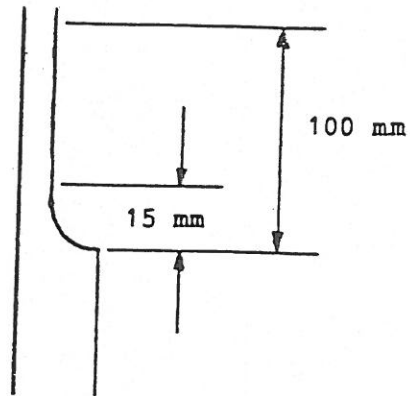
2.2 Vacuum Cylinder

- 2.2.1 From the bore of the cylinder, clean off any compacted debris and rust present, by using a stiff wire brush, then lightly rub with fine emery cloth to clean up the surface.

The effective bore of the cylinder can be increased by excessive use of emery cloth which must, therefore, be avoided.

Check cylinder bore for ovality which, at the locations shown in Fig 1, must not exceed 0.010in.

Fig. 1



The bore of the cylinder must be concentric to the bore of the piston rod bush. The surface finish of the cylinder in the working area of the rolling ring (the 110mm above the step) must be to Roughness Grade N11 (1000uin.) and not less than Roughness Grade N 10 (500uin).

- 2.2.2 Renew the rod Guide Bush irrespective of condition. Fit new bush to BR Drawing No. SW/DE/77055, BR Cat No. 70/16093 and a new joint to BR Dwg. No. SW/DE/77054, BR Cat. No 19/34830 using jointing compound "Hermitite" Red, BR Cat. No. 7/60180 on both sides.
- 2.2.3 Clean gland joint face. Renew studs, if necessary, taking care to ensure air tightness of studs.
- 2.2.4 One gasket, 70mm O/D x 54mm I/D x 1.6mm, BR Dwg No. M-A3-9000686 Item 17, BR Cat No. 2/126549 can be used between gland cover and rubber gland if cumulative dimensional tolerances of gland cover recess, piston rod bush flange thickness, bush packing thickness and rubber gland flange thickness would permit leakage. If leakage still occurs with gasket fitted then the undersized components shall be renewed.

2.3 Piston Head

- 2.3.1 Clean piston head of compacted debris using a stiff wire brush on the working area. The surface finish must be to Roughness Grade N.11 (100µins) and not less than Roughness Grade N.10 (50µins). Surface finish may be assessed using suitable comparators, which may be obtained from Rupert and Co. Ltd., Demmings Road, Cheadle, Cheshire. SK8 2PG, or other approved source.
- 2.3.2 If surface finish is satisfactory, check the head diameter against the following, appropriate drawing:-

<u>Cylinder Type</u>	<u>Nominal Bore</u>	<u>Drwg. No.</u>
E & E1	15" dia.	BR SW/DE/45966
	18" dia.	BR SW/DE/45967
	21" dia.	BR SW/DE/45968
C	15" dia.	7432C
	18" dia.	851N
	21" dia.	7433C
	24" dia.	11324N
	24" dia.	Gresham & Craven 8812

Check also that the Rolling Ring Relief Groove is correct to profile shown in Fig. 2. If the groove is deeper than the maximum permitted, use of the piston would likely result in failure at the slow application test. If required, the piston may be recovered by the process shown in Clause 2.3.4.

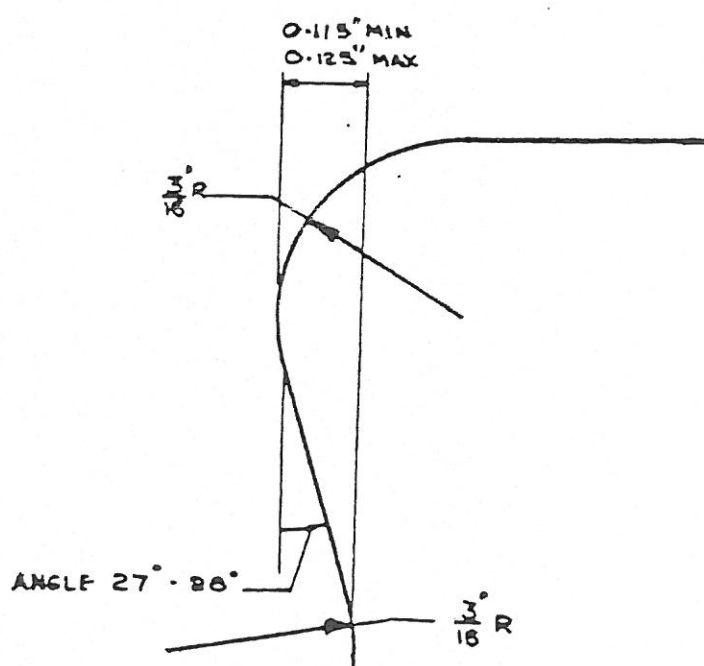


Fig 2

2.3.3 Dismantle the piston head ball valve(E & E1 type cylinders). Clean and examine all parts; repair or renew as necessary. If the ball valve seating chamfer width exceeds 1 mm then the air hole must be reamed out to produce a sharp edge. The ball valve seating must be made by lightly tapping the sharp edge with a stainless steel ball BR Cat No. kept especially for this purpose. Test for air tightness before assembly in piston. Check that air passages in piston are clean. When re-fitting the screwed-in items, jointing compound, "Hermitite" Red, must be used on the flange faces. When re-fitting the ball valve seat in E & E1 type pistons a new "O" ring seal, BR Cat. No. 10/48282 must be used.

2.3.4 Recovery of undersize piston heads.

If the relief groove depth is greater than the maximum permitted, it may be built-up by use of a metal spraying process such as Eutectic Rototec followed by re-machining. The surface to be coated must be clean, gease free and before spraying be lightly abraded using emery cloth. Gas pressures are 5 lbf/in² for acetylene and 15 lbf/in² for oxygen. The rotational speed of the piston head is 15 to 20 r/min., the amount of build-up being determined by the spraying time. The first coating is of Xuperband powder sufficient to cover the area to be built-up followed by a coating of Frixtec 19850 to the required depth using for both processes a slightly carburising flame, the end of the torch nozzle being held 5 to 8 inches from the surface to be coated. The required profile can be achieved by using smooth files and emery cloth to attain a Roughness Value of N8 (125µin.)

Use of other similar processes must first be approved by the D.o M.& E.E.

Care must be taken throughout not to damage the roughened working surface adjacent to the relief groove.

2.4 Piston Rod

2.4.1 Clean, examine and check for straightness. Change rod if out of true by more than 1/32" in 12". No bruising of the piston rod is permissible since this can damage the neck ring and/or rubber gland seal.

2.4.2 Check the rod for diametral wear and when the maximum allowance of .003in. on diameter has been reached it must be re-plated and ground to "as new" rod limits with a minimum plating deposit of .006in. Finished diameter after grinding and polishing to be 1.500in. +.0in. -.001in. to a Roughness Value of N5 16 micro inches, or better.

2.4.3 Check that screw threads are a good fit in the piston head nut. With the rod assembled in the piston, check concentricity of piston working diameter which must be within .008in. Mark on the upper face of the piston the position of the eye of the piston rod. Remove piston rod prior to assembly of piston into cylinder.

2.5 Release Valve

- 2.5.1 Dismantle release valve, clean and examine all parts which shall be repaired or renewed as necessary. If a ball valve is integral with the valve then the ball seating chamfer width shall not exceed 1mm and if it does the hole must be reamed to an appropriate size to give a sharp edge. The seating must be remade by lightly tapping into the sharp edge a stainless steel ball BR Cat No 11/657 kept specially for this purpose. All dirt and contaminants must be removed before re-assembly and the seating screw threads shall be sealed using jointing compound "Hermatite" Red, BR.Cat.No. 7/60180.

The valve spindle, containing the ball space which is closed by a spindle guard screw, has a bearing end opposite to the fork end which must not be less than .375in. wide and each leg thickness not less than .156in. The pin hole in each leg must not be worn by more than .030in. on diameter.

The brass bush in the valve body cap and valve lever, where fitted, must be replaced when wear exceeds .015in. on diameter. The valve spindle end brass bush located in the body must not be worn by more than .060in. on diameter.

A new rubber diaphragm and/or rubber seating must be fitted.

The lever pin should not be worn more than .060in. on diameter and the brass bush should not be worn more than .012in. on diameter, unbushed holes must not be worn more than .060in. on diameter.

Stainless steel balls must be replaced when indentations are made on their surface.

3. Re-assemble Brake Cylinder

3.1 Cleaning

- 3.1.1 Before re-assembly all loose debris and contamination must be removed using a vacuum cleaner.
- 3.1.2 The piston head and cylinder bore must be left clean and dry i.e. they must not be treated with paint, graphite, etc. This is particularly important in the area of the rolling ring relief groove and machined serrations in the working area.

3.2 Assembly

- 3.2.1 New rolling rings to BR Drawing No. 8003255 must be selected and fitted to pistons so that no initial twist is present. Twist can be eliminated by "snapping" the ring from several places around the periphery and then rolling it up and down the piston head several times. Ensure after this, that the spew mould line is constant around the outer periphery of the ring.

In the case of 18 & 21 inch cylinders, oversize rolling rings to Items 4 & 5 of the above drawing may be required in place of the standard rings, Items 2 & 3 respectively.

- 3.2.2 Fit the temporary guide rod and, using a hoist, position the piston so that it is just entering the cylinder and is in the correct location relative to the release valve drilling.
- 3.2.3 Roll the rolling ring down the piston to the position where it also is about to enter the cylinder. Detach piston from the hoist and allow the piston to move downwards taking the rolling ring with it.

If the correct combination of Cylinder, Piston and Rolling Ring has been selected, the piston will move smoothly down the cylinder under its own weight until it reaches the working area of the cylinder bore, from where it should be possible to push the piston down to the bottom of the cylinder without great force.

If a standard rolling ring was originally selected and the piston falls to the bottom of the cylinder under its own weight, the cylinder will probably fail the slow application test. Return to Clause 3.2.1 and select an oversize rolling ring.

If an oversize rolling ring was originally selected and the piston will either not move down the upper part of the cylinder bore under its own weight or, requires excessive force applied to move to the bottom of the cylinder, the cylinder will probably fail the creepage test. Return to Clause 3.2.1 and select a standard size rolling ring.

- 3.2.4 Remove the temporary guide rod. Fit a new gland packing BR Cat. No.19/26500 and plastic neck ring BR Cat No.70/16198 having ensured that there is no excessive friction when tried on the new/reconditioned piston rod, previously fitted to and tested with the piston in Clause 2.4.3, above. If it cannot be moved freely up and down the piston rod prior to fitting, another gland assembly must be tried.
- 3.2.5 Fit the new/reconditioned piston rod. **IMPORTANT** ; Do not overtighten. If the piston is rotated at this stage the rod will be out of alignment with the casing trunnions when finally assembled, resulting in the cylinder having to be stripped and re-assembled.
- 3.2.6 Invert the cylinder several times to check that the assembled piston will move smoothly up and down the cylinder bore, indicating that the rolling ring is functioning correctly.
- 3.2.7 Fit a new casing to cylinder joint ring and place the outer casing over the cylinder, aligning the casing trunnions with the eye of the piston rod. Secure the casing, tightening the nuts diagonally to a torque loading of 25 lbf.ft.

4. Test Brake Cylinder

- 4.1 The following tests must be applied, in full, to all cylinders after overhaul and again after strip down and re-assembly due to failure at any stage of testing. Cylinders must be complete except for the release valve, and be supported on their trunnions in the normal working position. The required test rack schematic with a cylinder in position is shown in Figure 3.

Note 1

To carry out these tests, provision must be made for connecting a vacuum gauge to the "topside" of the cylinder. This can be achieved by using a suitably modified release valve or by an adaptor piece between release valve and cylinder body.

Note 2

When testing "C" type cylinders, a connection incorporating a check valve must be fitted between the topside of the cylinder and vacuum source so that the topside can be isolated.

4.1.1 Test for creepage

Attach a 56 lb (25 kg) weight to the cylinder piston rod ensuring that there is "free lift" of at least 7/8in. (22mm) but not more than 1in. (25mm) before the attached weight is engaged when the piston moves upwards. Create a vacuum of 20/21in.Hg. on both sides of the piston, then isolate the cylinder from the vacuum source by means of an air-tight isolating valve. Then using an application valve with associated pipework of 1/2in. bore, opening to atmosphere and using full piston stroke, make six applications and releases. The release valve lever shall not be operated, nor shall vacuum in the cylinder be destroyed to assist the piston to move down. During this test the vacuum available for release shall not be permitted to rise higher than the vacuum at the commencement of test. On completion of the test, when the piston has stopped moving after the sixth release, measure the length of the piston rod extending below the cylinder. Piston stroke is measured from the gland cover to the shoulder of the piston rod crosshead. Nominal piston strokes are as follows:-

"E" & "E1" types - 8 1/2in (216mm)
 "C" type - 9in (229mm).

(Note: Some type "C", 21in. separate reservoir cylinders have a 7 1/2in. (191mm) stroke.)

Should the measured length be less than the nominal piston stroke, creepage has occurred, the fault must be rectified and the cylinder be re-tested.

4.1.2 Test for leakage

Place a sleeve on the piston rod to limit the stroke of the piston to about 4in.(102mm). Create a vacuum of 20/21in Hg. on both sides of the piston, then isolate the cylinder from its vacuum source. Make a brake application to reduce the vacuum below the piston by 4in.Hg allowing the piston rod to rise against the sleeve. After the vacuum has settled there shall not be a loss of vacuum of more than 1/2in.Hg. either above or below the piston during a period of 15 minutes. Leakage in excess of this rate must be corrected and the cylinder be re-tested.

4.1.3 Slow application test

Remove the sleeve from the piston rod and leave the 56lb weight still attached but without "free lift". Create a vacuum of 20/21in.Hg. vacuum on both sides of the piston, then isolate the cylinder from its vacuum source. Make a slow brake application by using an application valve fitted with a 1/32in.(0.80mm) choke. The rate of application must be in the range 0.01/0.02 in.Hg/second. The piston must move smoothly upwards immediately the valve is opened and stop moving as soon as it is closed. Close the application valve when the piston has moved 2in(51mm) upwards. Return the piston to its bottom position by re-creating vacuum. Repeat this test twice more (three times in total). If the piston fails to respond correctly the fault must be rectified and the cylinder be re-tested (from 4.1.1).

4.2 Only cylinders which have passed all tests in the order given may be fitted to vehicles. Following successful completion of the tests, each cylinder must have a metal tab attached indicating the Repairer's Works Code, Serial No. and Warranty Expiry Date.

4.3 Tests for Release Valve

The small port in the fixing flange shall be connected to a reservoir of 60 cu.in. capacity. The large port in the fixing flange and the connection to the train pipe(nipple) are to be blanked off by air-tight seals. The reservoir must be connected to a vacuum source and be provided with an air-tight isolating valve and vacuum gauge. The following tests shall then be made:-

- a) With the reservoir connected to the vacuum source and hand lever on release valve in 'open' position evacuate air from both chambers of the body casting. When 21in.Hg. vacuum is obtained, shut the isolating valve, retaining the lever in the 'open' position. After allowing 60 seconds for settlement there must be no further loss of vacuum.
- b) With the release valve and reservoir still isolated remove air-tight seal from the train pipe connection and release the hand lever. The valve and hand lever should remain in the 'open' position.
- c) Open the isolating valve and re-create vacuum by partially blanking the train pipe branch. The hand lever should be automatically drawn back to the 'shut' position and the valve be re-seated before vacuum reaches 10in.Hg.
- d) To test for leakage past the valve, leave the connection to train pipe orifice open to atmosphere and create 21in.Hg. vacuum in the reservoir. Close the isolating valve and, after allowing 60 seconds for settlement, there shall not be a subsequent loss of vacuum of more than 1in.Hg.

After test, suitable protection must be applied to the release valve flange, ports and connection.

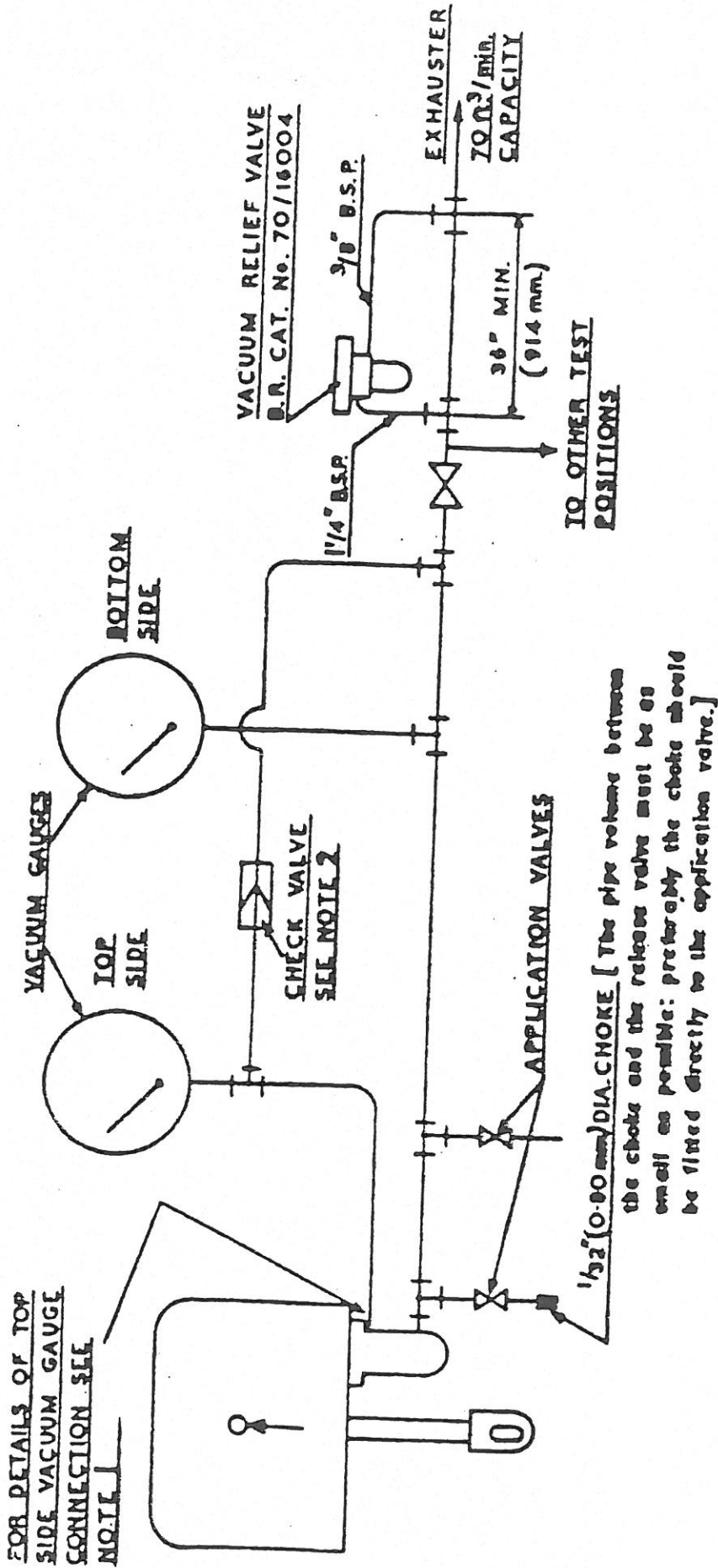


Fig 3

PART 2

TRANSPORT, RE-ASSEMBLY AND STORAGE OF VACUUM BRAKE CYLINDERS

GENERAL

It is most important that from the time a brake cylinder completes testing until it is safely attached to a vehicle, every care is taken in handling, refitting of the release valve and piston rod and during storage to avoid damage. Internal damage may not be evident but can cause mal-operation in service.

1. Transport

- 1.1 After satisfactory test, the piston rod must be removed and a Transit Screw to BR Drawing No. SW/DE/77090, BR Cat No. 19/34940 fitted in its place to secure the piston in the "brake released" position. The piston rod and release valve should be separately packaged, the cylinder, ports sealed and dome uppermost, are all be secured to a single pallet for transportation.
- 1.2 Cylinders being returned for repair should be fitted with the transit screw, removed from the new cylinder, and all components be secured and protected on a pallet as in Clause 1.1 above.

2. Re-assembly, Support and Storage

Re-assembly of the cylinder components, at depots, may be carried out with the cylinder mounted on storage trestles or on the vehicle supported by its own trunnions. In either case, the transit screw must only be replaced by the piston rod whilst the cylinder is supported, dome uppermost. When fitting the rod, care must be taken not to damage the neck ring and gland. The rod must be screwed into the piston hand tight only.

Note: Use of excessive force will result in turning of the piston, rendering the cylinder unusable since the rod will be no longer align with the vehicle rigging. No attempt must be made to forcibly rotate the piston as this will damage the rolling ring. Cylinders with mis-aligned rods must be returned for repair under warrenty.

Fit a new protective sleeve to the piston rod.

Remove all protective sealing coverings from the release valve and using a new rubber joint fit it to the cylinder.

PROCESS SPECIFICATION

OVERHAUL, TRANSPORT, RE-ASSEMBLY AND STORAGE
OF ROLLING RING TYPE VACUUM BRAKE CYLINDERS

PART 1 - OVERHAUL AND TESTING
PART 2 - TRANSPORT, RE-ASSEMBLY AND STORAGE

BR PUBLICATION No. CEPS 1019

REVISION LETTER No. 2

<u>LOCATION</u>	<u>ACTION</u>	<u>REASON FOR CHANGE</u>
Entire Contents	Destroy original issue dated 1981. Replace with Issue 3, dated July 1990.	Complete revision All reference to sliding band cylinders removed.

Note: Issue 2 was produced for tendering purposes and was not issued.

DATE: JULY 1990
Ref: SSS 220-6-2
Tel: 056-3560

Issued by:-
DM & EE, BRB
RTC DERBY.