Government of India
Ministry of Railways
Research, Designs & Standards Organisation
Manak Nagar, Lucknow - 226 011

No.EL/3.2.7 Dated 24.02.1995.

MODIFICATION SHEET NO. RDSO/WAG5/18 , (New No. MS 231)

DESIGH IMPROVEMENTS FOR CLW EP LINE CONTACTORS

1. OBJECT

1.1 On review of the performance of CLW make EP contactors, it is observed that some failures are occuring after short time lapse mainly because of certain design deficiencies. The contactor was originally developed by CLW based on Alsthom design data. Because of considerable change in the conditions of traction service, overheating of various components are being observed at number of interfaces such as:

- between main contacts.
- between fixed contact and its support block;
- between mobile contact and the supporting lever.

1.2 The overheating is mainly due to oxidation at high current densities and in-adequate contact force.

1.3 Apart from the over-heating problems, certain other less frequent problems on interlock levers, piston buckets, electro valves and nylon rollers have also been observed.

1.4 In order to ensure improved reliability of CLW make EP line contactors, the improvement measures indicated in Annexure 01 should be implemented by production Units and POH shops.

2. WORK TO BE CARRIED OUT

As per details given in Annexure-1.

3. APPLICATION

All 25 KV ac electric locomotives fitted with CLW make EP line contactors.

4. MATERIAL REQUIRED

As per details given in para 7 of Annexure-1.

5. MATERIAL RENDERED SURPLUS

As per details given in para 8 of Annexure-1.

6. AGENCY OF IMPLEMENTATION

Improvement measures as per Annexure-1to be implemented by CLW and POH shops.

7. DISTRIBUTION

i) GM/Elect./CLW/CRJ

ii) CEEs of Electrified Railways for informing workshops.

(R.N.LAL)
for Director General /Elect.

Encl: Annexure-I,IIand II/I

Annexure I

ENCLOSURE TO MS NO. WAG5/18

DESIGN IMPROVEMENTS OF CLW MAKE EP LINE CONTACTORS

1.0 FLEXIBLE SHUNT

1.1 The current density in the flexible in CLW make EP line contactors namely L1 and L2 is excessive particularly in 2S-3P combination on WAM4 locos. At continuous rated operation, the operating conditions are as follows:-

Motor current= 840 A in 2S-3p combination

Current in L1-L2 = 1260 A in 2S-3p combination

Hence,current density in flexibles= 8.4 a/mm sq. This current density of 8.4 A/mm sq. may be compared with these values recommended in standard electric handbooks for bare solid rods/tubes as under:-

OD	Area	Current	Current density
12.5mm	125mm sq.	340 A	2.72
10.3mm (ID=7.1 mm)	43 mm sq.	175 A	4.06

These current densities are for a temp. rise of 30 deg. C over an ambient of 40 deg. C.

1.2 It can be seen that temp. rise at 4A/mm sq. is 30 deg. C and as the heat generated is proportional to the sq. of the current, the temp. rise at 8.4 A/sq.mm is likely to be around 130 deg. C. Keeping in view the maximum ambient temperature of 60 deg. C in the vicinity of flexible leads total temp. may be around 190 deg. C. This is excessive for standard flexible conductors subject to constant flexing.

1.3 It is therefore recommended to increase the total cross section of the flexible conductors between the mobile contact lever and bottom bus bar.

1.4 WORK TO BE CARRIED OUT

To increase the cross section of flexible conductor from 50 sq. mm to 85 sq. mm, the revised diameter of stranded conductor will be 13.0 mm. The standard wire composition may be as follows:

- Standard dia+ 0.90 mm
- Number of strands = 19x7= 133
- Area = 84.6 sq. mm
- overall dia = 13.6 mm

1.4.1 The new flexible conductor can be accommodated in a tube of ID 14 mm and OD 18 mm. This shall be crimped or compressed to a dia of 14 mm.

1.4.2 Increase the diameter of the hole in the palm of the mobile contact lever to 14.5 mm. Palm fimensions shall be slightly increased as shown in the figure 1 Annexure-II.

1.4.3 During assembly following precautions are required to be taken.

- The sleeve or sockets at the end of each flexible terminal should have bell mouth to pervent their edges rubbing on the stranded or braided conductors.
- There should be no brazing or soldering at the bell mouth end. Brazing may be done at the other end as shown in fig. 2- Annexure-II.
- The sleeve or socket should be pressed or crimped to a cross section of about 95% of the total section of conductor plus sleeve (or socket).
- The sleeves at the ends of the leads shall be brazed into the mobile contact lever at at one end and the connector block at the other end.
- A brazing alloy of melting point of about 600 deg. C. should be used eg. Rupatam-14.
- The mobile contact lever should be partly immersed in water upto the level of the central pivot, so that only the palm is exposed during brazing. This will ensure that the central portion which is subject to highest mechanical stresses is not exposed to a temperature exceeding 650 deg. C.

2. MOBILE CONTACT LEVER

2.1 The section of the mobile contact lever just under the mobile contact is rather thin. This increases the current density. Mechanical strength at this section is also not as high as would be iesirable in with of the impact in this regin. The mobile contact lever should be modified as shown in the figure 3-Annexure II 1.

3. FIXED/MOBILE SCREWS/BOLTS

The problems of screws bolts broken in service are mainly due to use of mild steel fasteners and to inadequate tightening. It is therefore proposed to replace the mild steel screws holding the fixed contact by high tensile steel nuts and bolts.

3.1 WORK TO BE CARRID OUT

3.1.1 Drill out the taped hole in the support block on the blow out coil and braze head of the bolt to it.

3.1.2 This arrangement is better that si simple replacement of the screws by high tensile steel. In this way steel nuts and bolts cab be tightened better.

4. PISTON BUCKET

The problem of piston bucket perishing is a common defect experienced by all sheds. CLW should tighten up the checks on the quality of the rubber and should only procure the rubber components from RDSO approved suppliers. Apart from this the acceptance test suggested by RDSO should also be followed.

5. AUXILIARY CONTACT LEVER

Two types of fractures are generally experienced as shown in the figure 4-Annexure II/I. These are due to stress concentraction and poor quality of material and workmanship.

5.1 WORK TO BE CARRIED OUT

The shape of the lever should be modified as shown in the figure-4 Annexure II/1. This will increase the critical section and also avoid stress concentration.

5.2 The material used for these levers should have the following minimum mechanical properties

- Ultimate tensile strength = 7.25 kg sq. mm
- Flexural strength = 10.9 kg. sq. mm
- Impact strength = 0.28 ft. 1b.

6. ROLLERS

Nylon rollers are very prone to rapid wear out and sticking of mechanism. It is recommended to replace these nylon rollers by bronze or stainlees steel on few units and after satisfactory feed back can consider its adoption as regular measure.

7. MATERIAL REQUIRED

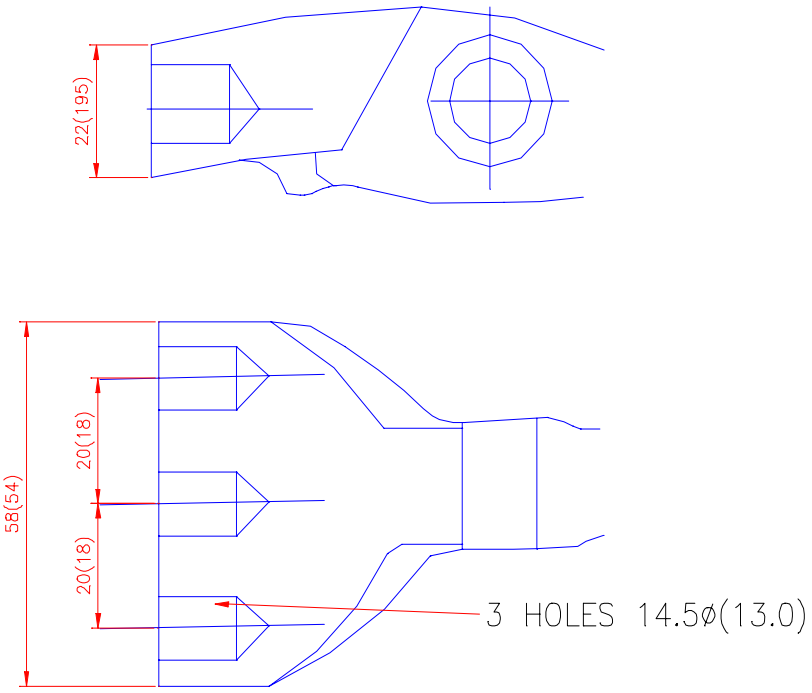
- Flexible shunt of cross-sectional area 85 sq.mm.
- Tube of ID=14 mm and OD= 18 mm for crimping the flexible shunt.
- Palm with revised dimension Fig: Annexure II

- Brazing alloy Ruptam-14
- Mobile contact lever with modified dimensions (Fig-3 Annexure-II).
- High tensile steel nuts and bolts for holding the fixed contact.
- Rubber components as per the recommendations of RDSO.
- Auxiliary contact lever with modified dimensions. (Fig-4 Annexure II)
- Bronze steel rollers.

8. MATERIAL RENDERED SURPLUS

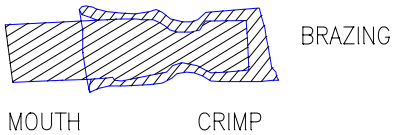
The materials referred in clause 7.0 shall be surplus depending upon the number of contactors modified.

ANNEXURE–2



(FIGURES IN BRACKETS GIVE EXISTING DIMENSIONS)

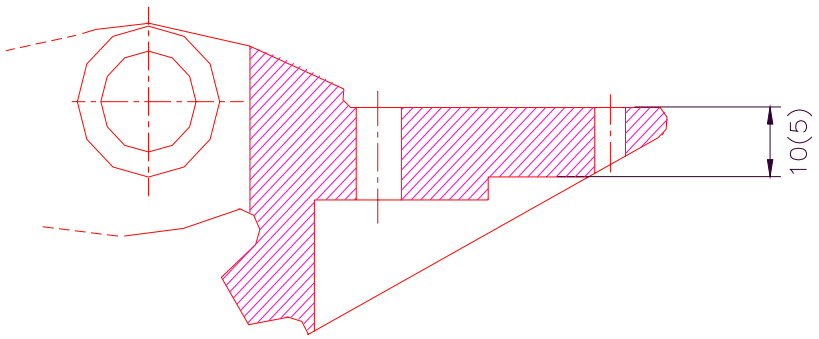
FIG–1



FIG–2

Annexure – 2/1

MOBILE CONTACT LEVER



THE FIGURE IN BRACKET (5) SHOWS
THE EXISTING DIMENSION

FIG. 3

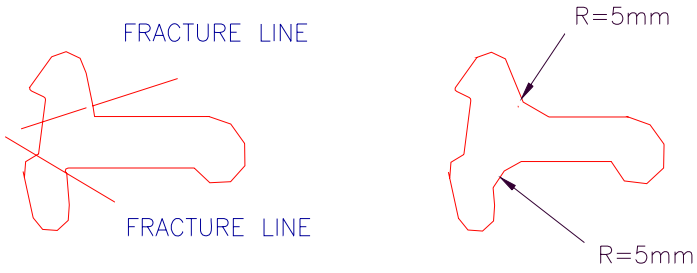


FIG. 4