Maintenance Instructions for Ferrule Fittings

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MAINTENANCE INSTRUCTIONS

FOR

FERRULE FITTINGS
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PART-A

INTRODUCTION OF DOUBLE FERRULE FITTINGS

1.0 Introduction :- Indian Railways has started using the Stainless Steel Tubes and Double Ferrule fittings (Compression Tube Fittings) in the Brake system in order to have a leak-proof joints. This type of joint will cut down POH down time and cost in long run. These kind of fittings are almost maintenance free and does not need any replacement during POH , unlike in case of MS joints which needs to be replaced because of high corrosion.

Earlier the Railways have been using IS:1239 seamless pipes with Mild Steel fittings having threads and welded joints and were installed by conventional methods. These were prone to periodical maintenance and replacement of pipes and fittings due to high rate of corrosion.

The use of Stainless Steel Double Ferrule fittings avoid the above and this pamphlet describe the various types of double Ferrule Fittings used and the methods of maintenance.

2.0 Working principle of Double Ferrule Fittings

The two ferrule system works on combination of geometry and metallurgy. Total action in the fitting is by an axial movement (thus avoiding torque transmission) along the tube instead of rotary motion to create the joint. No threading of pipe is required.

3.0 Disadvantages of screwed joints

➢ Needs thick walled pipes.
➢ Often causes high stressing of individual threads.
➢ Less withstanding capacity towards angular, torsional and linear vibrations.
➢ Replacement of fittings between overhauls are very high.

4.0 Disadvantages of welded joints

➢ Resistance to corrosion becomes less due to heat generation during welding.
➢ Testing of welded joints becomes laborious process.
➢ Less withstanding capacity towards angular, torsional and linear vibrations.

5.0 Advantages of Double Ferrule Fittings

➢ It is self aligning.
➢ Works on thin wall tubes. (no threads)
➢ Resists vibration.
➢ Easy to install.
➢ Re-usable (up to 25 times re-assembling - equal to codal life of coach i.e. 25 years).
➢ Does not require any special skill for assembly
6.0 Double ferrule fittings:- A double ferrule consist of four piece as following :
   a) Body
   b) Nut
   c) Back Ferrule
   d) Front Ferrule

The illustration below explains the parts

![Diagram of double ferrule fittings]
7.0 Assembly of double ferrule fittings:
The Fittings are assembled as follows:

Step 1:

**Pre-swaging**

The details without tubes are shown above, which are to be assembled in this sequence into the swaging machine.

Nuts are supplied with silver coating (anti-galling agent) on threads to avoid damage to threads when disconnected and retightened many times.

**Tube Preparation**

Cut the tubes at right angles (90°) and de-burr cut-edges

Check the tubes for ovality, smooth surface, remove the end caps and clean the inner passage by pressurized air to remove any unwanted particles (Dirt, Grease, Burrs, etc.)

7.1 Installation instruction:-

Insert the tubing into the Tube fittings. Make sure the tube rests firmly on the shoulder of the fittings and perpendicular to the axis of the tube.

The ferrules have to be pre-swaged using a swaging machine with proper dies.
Swaging machine shall only be used for swaging of ferrules onto the SS tube. In case of manual swaging, Swaging Die Block shall be used.

Step 2:
After pre-swaging of ferrules (both front & back) on to the tube along with nut, the nut has to be manually tightened with body to half a turn with appropriate tool to ensure leak proof joint.

In case of Manual Swaging

Step 1:
Insert the tubing in to the Tube fittings. Make sure the tubing rests firmly on the shoulder of the fitting and that the Nut is finger-tight.
Step 2:

Before tightening the Nut, scribe the nut at 6 o’clock position.

Step 3:

Hold the Fittings body tightly with the backup wrench and tighten the nut 1-1/4 turns. Watch the scribe mark, make one complete revolution and continue to 9 o’clock position.

By scribing the nut at the 6 o’clock position it appears to you, there will be no doubt as to the starting position. When the Nut is tightened 1-1/4 turns to the 9 o’clock position, you can easily see that the fitting has been properly installed.

7.2 Retightening instruction:-

The connections can be disconnected and retightened many times. The same reliable leak-proof joint can be obtained every time the connection is made.

1. Fitting shown in disconnected position.
2. Insert tubing with pre-swaged ferrules into the fitting body until front ferrule seats.

3. Tighten Nut by hand. Rotate Nut to original position with a wrench. An increase in resistance will be encountered at the Original position. Then tighten slightly with the wrench.

The tubing and fittings assembled can be tested for leak proof with soap solution. Any bubble appears indicate leak. Hold the body firm and tighten the nut slightly in order to arrest the leak.

8.0 Various types of fittings used in Pneumatic Line

1. Straight Union
2. Union Elbow
3. Union Tee
4. Swivel Elbow
5. Street Elbow
6. Male Connector
7. Female Connector
8. Male elbow Connector
9. Female Elbow Connector
10. Reducing Union Elbow
11. Reducing Union Tee
12. Reducing Union Run Tee
13. Male Branch Tee Connector
14. Female Branch Tee Connector
15. Male Run Tee Connector
16. Female Run Tee Connector
17. Male Elbow
18. Female Elbow
19. Female Tee
20. Flange Connectors
9.0 Periodical Maintenance

If the nut is found loose:
(1) Completely unscrew the nut, check for any dust/dirt particle etc.
(2) Re-assemble as explained earlier.

10.0 Approved Sources

*The Following are the approved sources for SS Tubes & Double Ferrule Fittings as on date*

2. EXCEL HYDRO PNEUMATICS Pvt. Ltd. Mumbai.
3. FLUIDTEQ SYSTEMS, Mumbai.
4. MARS RAIL FIT ENGINEERS, Chennai.
5. PANAM ENGINEERS Ltd., Mumbai.
7. VIPAL ENTERPRISES Pvt. Ltd., Mumbai.

11.0 Swaging Machine

The Swaging machine can be procured from M/s Swagelok, Chennai, (or) the machine can be procured through the approved sources for SS Tubes & Double Ferrule Fittings

12.0 Specification

For Technical Information/clarification, Please refer to Specification ICF/MD/SPEC-166 (with Latest Revision/Amendment) available with ICF.

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PART-B

1.0 Retro fitment of twin air brake pipe arrangement at coach ends of LHB coaches in place of four air brake pipes at coach ends of LHB coaches.

(Ref: Coach Alteration Instruction No. CAI/RCF/MECH/R-SS/054 circulated vide RCF letter No. RCF MD 46131 Dated 22.03.2015).

Zonal Railway have reported incidents of working out of ferrules at hoses and T-locations in Power Cars resulting into train destination and punctuality loss and have proposed to provide flange connections and to increase thickness of brake pipe. This problem has been studied in detail by RCF and it has been found that the problem is not isolated to power car coaches only. Necessary modifications as per drawing no: MI005769 alt-b have been done in brake piping of all types of LHB coaches. There will be only two brake pipes at coach ends instead of four and there is no T-connection. This design is universal which can be adopted immediately both in manufacturing of LHB coaches at Production Units and can also be retrofitted on in-service coaches in IOH/POH or even in sickness. It has following features:

(1) The height of coach end brake pipes has been raised upwards and made at par with the height of conventional coaches. The hose pipes are same as being used in conventional coaches.

(2) It has only two brake pipes at coach ends instead of four.

(3) The coach end pipes are same as that of conventional coach with regard to thickness and material.

(4) There is no ferrule joint at end of pipes. The hoses are screwed on brake pipe similar to conventional coaches.

(5) There is no T-connection in the brake pipe. The end pipes are connected by screw joint of bite type fittings.

1. Coach type: All LHB/EOG & SG variant Coaches may be provided with this modification.

2. To be carried out: in POH or whenever found feasible.
3. **Special Instruction:**

I. Two nominal bore pipes at ends as per specification: RDSO/spec 04ABR-02 ASTM-A312 Sched-40s, in place of 04 numbers of Seamless pipes to Specification: DIN2391C X5CrNi1810 DIN 17456 Gr-1.4301 NBK 3.1B.

II. Threaded joints for Angle Cocks have been made at ends of coach.

III. T- Joints have been replaced by Female connector (GAI28LRCF ).

IV. For Clamping of pipes two angles have been welded on front plate of under frame and two U-clamps to drg no-CC36923 have been used for clamping at both ends.

V. One hole of dia 50 has made on front plate on both ends.

VI. Four clamps to Drg. No. LW63111 item-10 are required for clamping of NB pipes at both ends.

VII. Two angle cocks and two hose couplings to Drg. No. WD-81027-S-01 (FP) and RDSO/SK-73547 are required in place of four angle cocks and four hose couplings at both ends.

VIII. Two additional welded angles on front plate are required at both ends for clamping of end pipes.

**Note:** Drawing No. MI005769 alt-b should be followed for this modification.
PART-C

1.0 Procedure in practice for maintenance of ferrule joints in open line coaching Depots in LHB rakes:

1. Ferrule joints are leaking due to hitting of ballast etc. enroute. The concerned BP pipe is dummied in enroute by Escorting staff itself and continuity is maintained.

2. On arrival of Rake in Coaching Complex, the 28 mm nut is opened and angle cock unit uncoupled, damaged ferrule removed and new ferrule is fitted.

3. 28 mm nut is tightened with the help of pipe wrench and BP pressure leakage is checked from joint.

4. The ferrules are being provided in rake formation without any coach detachment and sufficient 28 mm ferrules are being procured by Coaching depot.

5. Securing of T of BP & FP is also being ensured by rake maintenance staff during primary maintenance.

6. On duty SSEs have suggested that retro-fitment of T-joints may be done in the workshops only and flange connections be provided in LHB Coaches.

7. Threaded BP pipes may be used for fitment of BP angle cock in workshops in place of ferrule joints.

8. Safety instructions should be prepared by coaching depots for routine attention of leaky ferrule joint on rake and sufficient ferrules should be made available to nominated fitters during primary maintenance.

Note:-Long ferrule punch (8”) should be available in tool box/bag of fitter gang for maintenance of ferrule joints. (Ref.-Railway Board’s letter No. 2014/M/(C)141/2 dt. 28.04.2014).

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