

Page 1 of 6	Specification No. M&C/PCN/116/2020	Effective from : Sep-2020	Rev. 1.0
RDSO Specification for Cleaning of Copper Tubes & Fins of Condensers of Air-conditioned Coaches.			

**RDSO SPECIFICATION NO.
M&C/PCN/116/2020
(Rev 1.0)**



**SPECIFICATION FOR CLEANING OF COPPER TUBES
AND FINS OF CONDENSERS OF AIR-CONDITIONED
COACHES**

**RESEARCH DESIGNS & STANDARDS ORGANISATION
MANAK NAGAR,LUCKNOW – 226 011**

Page 2 of 6	Specification No. M&C/PCN/ 116 /2020	Effective from : Sep-2020	Rev. 1.0
RDSO Specification for Cleaning of Copper Tubes & Fins of Condensers of Air-conditioned Coaches.			

RDSO SPECIFICATION NO. M&C/PCN/116/2020

SPECIFICATION FOR CLEANING OF COPPER TUBES AND FINS OF CONDENSERS OF AIR- CONDITIONED COACHES

FOREWORD:

This standard was initially prepared in the year 1997 and revised in 2004 by incorporating certain changes and amendments, covering the procedure of cleaning and the loss in weight parameter in the corrosion test. Further it was observed that specification does not cover the performance test. In this revision performance test has also been incorporated.

1. SCOPE

- 1.1 This standard covers the requirements for the testing of chemicals required for the cleaning of copper tubes and fins, of condensers of air conditioned coaches which get contaminated with dirt, dust, scale, oil, & carbon deposits leading to the formation of cake like cement, resulting in the in-effective working of the air conditioned unit and thereby necessitating periodical cleaning.

NOTE: “Firm should comply Make in India Policy and Public Procurement (Preference to Make in India) Order-2017 under this specification” and subsequent Amendment done time to time.

2. TERMINOLOGY

2.1 For the purpose of this standard, the Glossary of Terms given in IS: 1448 and IS: 101 (Relevant Part/Section) or their latest versions revised shall apply.

3. PROCEDURE OF CLEANING

3.1 PROCESS OF CLEANING OF CONDENSERS IN-SITU CONDITION (When coach is available for a short period)

For the cleaning of copper tubes & fins of condensers of AC coaches, the following sequence of operations shall be adopted:

- (i) Spray water on the contaminated surfaces of the condenser with the help of jet connected to a water pump (Approx. pressure 70 - 80 psi) to remove dirt and dust.
- (ii) After wetting the condenser thoroughly from both sides, apply a suitable non flammable descaling compound with inhibitor conforming to the requirements of the standard given in TABLE-I of the specification on individual fin through a small capillary tube connected to a tank kept at a height of Approx. 6 feet. The feed of this descaling compound should be by gravity only and no pressure should be applied to ensure removal scale.

Page 3 of 6	Specification No. M&C/ PCN/ 116 /2020	Effective from : Sep-2020	Rev. 1.0
RDSO Specification for Cleaning of Copper Tubes & Fins of Condensers of Air-conditioned Coaches.			

- (iii) After a gap of 10 minutes, spray water on the condenser as mentioned at (i) above and repeat the process as mentioned at (ii).
- (iv) After the above treatment, apply suitable decarbonizing solution with the help of a jet at a pressure of (70-80) psi conforming to the requirements of the standard given at Table-2 of the specification to ensure complete removal of oil, grease and carbon deposits.
- (v) After 10 minutes, wash the condenser with water jet for removal of the chemicals to ensure that the treated surface is neutral.
- (vi) Repeat the process as mentioned at (iv), if required.
- (vii) Finally rinse the condenser with water jet to get bubble formation to see through and through both the sides of the condenser to ensure thorough cleaning of the condenser. The appearance of the true colour of copper shall be taken as the end point of the treatment.

3.2 PROCESS OF CLEANING AT THE TIME POH

The process of Cleaning shall be based on the following sequence of operation:

- (i) Immerse the condenser unit in a M.S. Tank having acid resistance lining containing the descaling chemical for 2 - 3 hrs.
- (ii) After descaling, wash the condenser with water jet at a pressure of (70-80) psi.
- (iii) Immerse the condenser unit for one hour in a M.S. Tank containing decarbonizing solution to ensure removal of grease, oil, and carbon deposits.
- (iv) After above process, water jet the condenser with pressure of (70-80) psi to ensure that the treated surface is neutral.

NOTE: The size of the tanks shall be commensurate with the number of condensers to be treated.

4. REQUIREMENTS

- 4.1 The non-flammable, descaling compound with inhibitor shall meet the requirement given in TABLE-1.

Page 4 of 6	Specification No. M&C/PCN/116/2020	Effective from : Sep-2020	Rev. 1.0
RDSO Specification for Cleaning of Copper Tubes & Fins of Condensers of Air-conditioned Coaches.			

TABLE-1

REQUIREMENTS FOR THE DESCALING COMPOUND

SN	Characteristics	Requirements
1.	Appearance	Liquid/powder (mixing ratio as recommended by the supplier)
2.	Consistency	Homogenous free flowing liquid without any lumps
3.	Colour	As per Consignee's requirement
4.	Odour	Free from any objectionable or rancid odour
5.	Specific gravity	1 - 1.20
6.	pH value	Below 2
7.	Flash point	Above 60 ⁰ C
8.	Corrosion test for 24 hrs (as per the procedure at Annexure A)	Shall show no sign of corrosion on the panels and the loss in weight shall not be more than 70 mg/dm ² /day.
9.	Keeping Property	Shall be stable for not less than one year

4.2 The Decarbonizing compound shall meet following requirement given in Table-2.

Page 5 of 6	Specification No. M&C/PCN/116/2020	Effective from : Sep-2020	Rev. 1.0
RDSO Specification for Cleaning of Copper Tubes & Fins of Condensers of Air-conditioned Coaches.			

TABLE 2

REQUIREMENTS OF DECARBONIZING COMPOUND

SN	Characteristics	Requirements
1.	Appearance	Liquid/powder (mixing ratio as recommended by the supplier)
2.	Consistency	Homogenous free flowing liquid without any lumps
3.	Colour	As per consignee requirement
4.	Odour	Free from any objectionable or rancid odour.
5.	Specific gravity	1-1.20
6.	pH max.	12.0
7.	Flash point	Above 60 ⁰ C
8.	Rinsability/Miscibility	Rinses/Mixes freely with hot/cold water
9.	Corrosion test for 24 hrs (as per the procedure at Annexure A)	Shall show no sign of corrosion on the panels and the loss in weight shall not be more than 5 mg/dm ² /day.
10.	Keeping property	Not less than one year

4.3 Performance Test: The material shall give satisfactory performance result for cleaning of copper tubes and fins of condenser of AC coaches as per clause no. 3, at any Workshop or Lab. of Indian Railway. This is an optional test and is to be decided between purchaser & supplier. However, this is mandatory during approval.

Page 6 of 6	Specification No. M&C/PCN/ 116 /2020	Effective from : Sep-2020	Rev. 1.0
RDSO Specification for Cleaning of Copper Tubes & Fins of Condensers of Air-conditioned Coaches.			

ANNEXURE – A

METHOD FOR CORROSION TEST:

1. COPPER STRIPS:

Use strips 12.5 mm (1/2 inch) wide, 1.5 mm (1/16 inch to 1/8 inch) thick 75mm (3 inch) long from smooth surfaced, hard temper, cold-finished copper of 99.9% purity.

2. POLISHING MATERIALS:

Silicon Carbide Grit Paper of varying degrees of fineness including 65 μ m (240 grit) Paper or Cloth, also a supply of 105 μ m (150 mesh) Silicon Carbide grain and Pharmaceutical Grade absorbent cotton.

3. WASH SOLVENT:

Volatile sulphur-free Hydrocarbon Solvent may be used provided that it shows no tarnish at all when tested at 50⁰ C.

4. PREPARATION OF STRIP:

Remove all surface blemishes from all sides of the strip with silicon carbide paper of such degrees of fineness as are needed to accomplish the desired results efficiently. Finish with 65 μ m (240 grit) silicon carbide paper or cloth, removing all marks that may have been made by other grades of paper used previously.

5. PROCEDURE:

Weigh the copper strips (Three to Four specimens) to the nearest 0.1 mg. Immerse the copper strips in the test solution at ambient temperature for 24 hrs. The copper strips should be completely immersed in the test solution. To prevent touching the strip with fingers, wear disposable Polyethylene Gloves.

6. CLEANING OF TEST SPECIMENS:

At the end of the test period, remove the strips and brush very lightly with a soft bristle brush and water to remove loosely held corrosion products. To remove the more tenacious corrosion products and films, the copper strips are dipped in a 1+1 mixture of concentrated HCl (Sp Gr. 1.19) in water for 15 seconds to remove tarnish films. Rinse with tap water to remove acid and scrub with a wet bristle brush and fine pumice powder. Then dry the copper strips and weigh to the nearest 0.1 mg.