Rail coach Factory Kapurthala

MD 35131 **Dated -As signed**

Subject -Corrigendum to Spec . MDST-108 Rev.01 dated 06.02.2023

SN	Specification Number	Para	Earlier	Revised as
1	MDST : 108 Rev: 01 Dated 06.02.2023	Para 1 general Clause 1.4	The fitting shall be of single bite type fitting , primarily consist of body ,single bite ferrule and nut. The body ,nut and ferrule shall be of carbon steel to material grade SAE-1018 to ASTM-A311/A311M-04 OR alternate material grade C15 to EN10277-2-1999 with chrome free coating. The body and nut can be manufactured either by forging or machining from forged bar.	The fitting shall be of single bite type fitting , primarily consist of body ,single bite ferrule and nut. The body ,nut and ferrule shall be of carbon steel to material grade SAE-1018 to ASTM-A311/A311M-04 OR alternate material grade C15 to EN10277-2-1999 **/** **11SMnPb30+C material number 1.0718+C as per DIN 3859-1:2005-09 & technical delivery conditions as DIN EN 10277-3 :1999** with chrome free coating. The body and nut can be manufactured either by forging or machining from forged bar

This is for kind information And further necessary action please

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Dy.Cme/D-II

CQM-I,II CPLE CWE/Fur CMM/ HSQ CMM/TKJCWE/Shell

Dy.CMM/LHB/HSQ Dy.CMM/G CMT Dy. CPLE-I,II Dy.CMM/Fur

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Issue/Rev.	Details of changes	Date
01	In para 1.4 material grade of carbon steel added.	06.02.2023

1. General:

1.1. This specification covers the general design, technical and infrastructure requirements for single bite type ferrule fitting for Mainline Coaches on Indian Railways. The infrastructure requirements shall be complied by the tenderer at their premises or as specified in this specification in working order.

1.2. Operating air pressure may be as high as 8.5 Kg/ cm^2 Normal air pressure is 6 Kg/cm^2.

1.3. Fitting shall not have sharp edge and all parts of the fittings shall be thoroughly cleaned to get rid of burrs, dirt, grease, etc. to get a clean matt finish.

1.4. The fittings shall be of single bite type fitting, primarily consist of body, single bite ferrule and nut. **The Body, Nut and Ferrule shall be of carbon steel to material grade SAE-1018 to ASTM-A311/A311M-04 or alternate material grade C15 to EN10277-2-1999 with chrome free coating**. The body and nut can be manufactured either by forging or machining from forged bars.

1.5. Once ferrule bite the pipe it should not have any radial movement or longitudinal movement and each fitting should be re-usable after dismantling & assembling for at least 25 times excluding ferrule.

1.6. The fitting shall be able to produce a **leak** proof joint in either Pressure on vacuum service.

1.7. The ferrule shall have hardness more than the stainless steel tubes. The ferule shall be case hardened to a depth of 27 microns (Min.) through suitable case hardening process to achieve a minimum hardness of 500 to 700 Vickers point number HV (0.05).

1.8. Coating shall be Zinc-Nickel Cr-6 free in three layers in sequence: Zinc- Nickel base coating (8 microns), transparent passivation (500 nano microns) and transparent siliceous sealing coating (2 microns). The thickness of the entire coating amounts to 10-15 microns. Corrosion resistance should be more than 720 hrs. Type of colour of coating shall be Metal Grey-Mat finish.

1.9. All tube fittings when bite with the recommended Stainless steel tubes shall be capable of withstanding the following types of forces:

1.9.1. Internal pressure.

1.9.2. Tension or Axial pull.

1.9.3. Compression or Axial push.
1.9.4. Torque or Twist.
1.9.5. Vibration
1.9.6. Temperature variation
1.9.7. Any combination of the above

1.10. The fittings shall have the following features:

1.10.1. There shall be no axial movement of ferrules after bite.
1.10.2. There shall be no radial movement of ferrule after bite.
1.10.3. Shall not create torque or leave residua! strain on the tubes.
1.10.4. Shall not significantly reduce flow area.
1.10.5. Shall have enough tube support ahead of the seal to resist any vibration.

2. Eligibility Criteria:

2.1. The tenderer must submit detailed clause-wise comments on the specification specifying the availability of infrastructure with them along with the capacity and make. In absence of above, offers shall be deemed as incomplete and may not be considered.

2.2. Since, Railways are facing problems of leakages and corrosion on bite type fittings, leading to train detention and punctuality lose, bulk or regular procurement orders shall only be given to the firms who have infrastructure as mentioned In Para #3, 4 and 5 of this specification. Firm will be assessed by CDE/RCF wherever required for ascertaining the infrastructure.

3. Infrastructure Requirements:

3.1. Separate covered area for storage of raw material. e.g. billets, bars, forgings etc. The covered area should have display board showing different colour shades nominated to different grades of steel to avoid mix up of materials. Arrangement of painting the billets, bars etc. with particular paint shade previously nominated according to the grade of steel should be available.

3.2. Firm should have forging facilities in-house or have tie-up with reputed forging unit. Forging unit should be ISO certified and firm shall have documented vendor approval process and control on quality of the forged

components. Firm has to submit the details of forging unit Including its machinery and plant. Firm has to get the approval of out-sourced forging unit from CDE/RCF.

3.3. Firm should have facility for PMI testing (Positive material testing) and UT testing (Ultrasonic testing) for on line checking of raw material.

3.4. Firm should have at least two high precision CNC machines for manufacture of fitting components i.e. Body, Nut and Ferrule.

3.5. Firm should have laser printing or dot matrix printing or roller printing machine for marking particulars on finished components to have proper identification and traceability.

3.6. Well-equipped design center for designing the fittings. Design team should be aware of current National and International Standards along with their requirements. Firm should have 2-D/3-D Modeling and analysis softwares along with technically trained, experienced designers capable of performing such analysis. Firm should have wide range of standards/references at design center. Design validation of fittings should be done by theoretical calculation, 3-D Modeling and experimental analysis in testing laboratory.

3.7. Firm should have well equipped Heat Treatment facilities for ferrule hardening of bite type fittings in-house or the same shall be outsourced from a .firm having expertise for the same. Firm has to get the approval of facilities of outsource firm from CDE/RCF. The process adopted for case hardening (Heat Treatment) shall not cause any depletion affecting the corrosive properties of parent material. Internal test certificate along with the Export/Import documents if any, issued by the firm conducting the case hardening shall also be submitted.

3.8. Firm should have well equipped facilities for chrome free surface treatment in-house or the same shall be outsourced from a firm having expertise for the same. Firm has to get the approval of facilities of out-sourced firm from COE/RCF.

3.9. Firm should be ISO: 9001certified.

4. **Performance Test Facilities for tube fittings:** Following type test facilities should be available at firm premises and shall be conducted by manufacturer and shall be witness by CDE/RCF or by inspecting agency prior to approval:

4.1. Hydraulic test: The test assembly loop shall be ma.de as per Clause-7.7 of BS: 4368 (Part-4)- 1984. The loop shall consist of 3 fittings and 2 tubes of different sizes and tightened 1 ¼ turn past snug. The hydraulic media shall be water. The loop is pressurized up to 100 kg/cm2 and to be held at pressure for 5 minutes. If no leak is found the fittings are to be dismantled and to be inspected for formation of fatigue cracks at thread roots, damage to ferrules, damage to sealing faces, damage or cracking of tubes.

4.2. Pneumatic Pressure Test: After the completion of hydraulic test, assemble the test assemblies tightened 1 ¼ turn past snug and pressurize each test assembly to 40 kg/ cm2 {Pneumatic {air/02) pressure) and to be held at the pressure for 5 minutes. If no leak is found the fittings are to be dismantled and to be inspected for formation of fatigue cracks at thread roots, damage to ferrules, damage to sealing faces, damage or cracking of tubes.

4.3. Pressure Impulse cum Vibration Test: After the completion of Pneumatic Test, assemble the test assemblies tightened 1 ¼ turn past snug. Each test assembly shall be subjected to vibration frequency of 23-47 Hz with amplitude of 5 mm, simultaneously pressure cycling from 0 to 100 Kg/cm2, at 30-40 Impulse/minute for a minimum of 5 x 105 impulses/ 20 x 106 Vibration cycles. The equipment shall have a suitable counter for counting the impulses and the vibrations. The impulse and vibration frequencies may be so chosen that they conclude simultaneously. On completion of tests the assemblies must successfully pass the Hydraulic test as mentioned in Para-4.1 and pneumatic test as mentioned In Para-4.2. If no leak is found the fittings are to be dismantled and to be Inspected for formation of fatigue cracks at thread roots, damage to ferrules, damage to sealing faces, damage or cracking of tubes.

4.4. Vacuum Test: After the completion of pressure impulse cum vibration Test, assemble the test assemblies tightened 1 ¼ turn past snug. Vacuum test shall be conducted at 750 milli bars with a test volume of I litre of water capacity. The deterioration of vacuum shall not exceed 20 milli bars over a period of 20 minutes. If no leak is found the fittings are to be dismantled and be inspected for formation of fatigue cracks at thread roots, damage to ferrules, damage to sealing faces, damage or cracking of tubes.

4.5. Make And Break Hydrostatic Test: After the completion of pressure impulse cum vibration test and Vacuum test, assemble the test assemblies, tightened 1 ¼ turn past snug and then: Assembled torque to be recorded. Dismantle and re-assemble the fitting to the original torque. Repeat make

and break for 6 times. After sixth assembly pressurize the assembly with suitable hydraulic media to 100 Kg/cm2 and hold the pressure for 5 minutes and observe leak. If no leak is found, release the pressure and continue the make and break test for 25 cycles. After the end of 25 cycles, pressurize the test assembly to 100 kg/cm2 and hold the pressure for 5 minutes. If no leak is found the fittings are to be dismantled and to be inspected for formation of fatigue cracks at thread roots, damage to ferrules, damage to sealing faces, damage or cracking of tubes. Any specimen exhibiting damage or leakage shall be considered as failure.

4.6. Temperature Cycling Test: After completion of test above (4.1 to 4.5), temperature cycling test is to be conducted. Assemble one test assembly for each size of tube tightened 1 ¼ turns past snug and then subject the assemblies to temperatures from ambient to 200 degree centigrade in approximately 90 minute cycles, i.e. raise gradually to 200 degree centigrade over 30 minutes, hold for 30 minutes and cool over the next 30 minutes to ambient/minimum possible temperature gradually. Repeat this cycle for total three cycles. On completion of three cycles, repeat hydraulic test as per Para-4.1 and Pneumatic test as per Para-4.2 above respectively. If no leak is found the fittings are to be dismantled and to be inspected for formation of fatigue cracks at thread roots, damage to ferrules, damage to sealing faces, damage or cracking of tubes. Any specimen exhibiting damage or leak shall be considered as failure.

4.7. Measurement of surface Hardness and case depth of ferrule or can be out-sourced to an agency or which approval is obtained from CDE/RCF.

4.8. Burst Test: as per IS: 10103-1982.

4.9. Salt spray test for surface treatment.

5. Measuring Instruments: Firm should have following measuring instruments, duly calibrated, at firm's premises traceable to National, International standard:

5.1. Profile projector
5.2. Rockwell hardness testing machine
5.3. Plating thickness gauge
5.4. Digital Vernier Calipers (O mm to 50 mm minimum).
5.5. S.S. Inside & outside Micrometers (0 to 50 mm minimum).
5.6. Bore dial gauge (150mm max.).
5.7. GO and NO-Go plain plug gauges
5.8. Profile gauges or profile projector
5.9. Filler gauges
5.10. Thread ring and plug gauges

6. Testing and Approval Of Prototype:

6.1. Tenderer must submit and get approval of Quality Assurance Plan from CDE/RCF before taking up prototype manufacture.

6.2. Type test/routine test shall be carried out by CDE/RCF or inspecting agency as under:

6.2.1. Type Tests: The Type Test shall be conducted for approval of the firm and as a part of audit check/modified specification when required by the purchaser at any point of time. Report of 'TYPE TEST' results witnessed by CDE-RCF/RITES, shall be submitted by the firm before executing first supply. One assembly as per Cluase-4.1, drawn at random shall be subjected to the test as specified In the Clause-4.1 to 4.6 In case any assembly fails, one more assembly shall be drawn at random and subjected to the tests as mentioned in the Clause-4.1 to 4.6. The assembly shall pass the test specified or else the entire lot shall be rejected. The lot shall be accepted if the sample passes the tests. In the event of rejection fresh lot shall be offered for type tests. One test piece from each item viz. body, nut & ferrules shall be tested as per relevant specification, including microstructure of forged steel at NABL accredited lab. Hardness and case depth for ferrule shall be done at NABL accredited lab/designated Govt. lab such as NML./Jamshedpur Or, the same shall be outsourced to a firm having expertise for the case hardening. The process adopted for case hardening shall not cause any chromium depletion affecting the corrosive properties of parent material. The hardness and case depth shall be measured by using Knoop micro hardness tester. Internal test certificate along with the Export/Import documents if any, issued by the firm conducting the case hardening shall also be submitted.

6.2.2. Routine Tests: Five percent test pieces of a lot for each fitting, selected at random shall be subjected to the tests as specified above (4.1 to 4.7) In case the item/assembly falls, one more assembly shall be drawn at random and subjected to the tests mentioned above. The assemblies shall pass the tests specified or else the entire lot shall be rejected. The lot shall be accepted if the sample passes the tests. In the event of rejection fresh lot shall be offered for tests.

7. Code of Practice for Quality Control and Inspection:

7.1. Regular inspection shall be done by inspecting agency as per approved Quality Assurance Plan.

7.2. The raw materials should be procured from the authorized distributor of original manufacturer along with their test certificates. These test certificates shall be co-related with the stamping on the raw material taken up for manufacture, prior to commencement or with any other adequate alternate system to ensure proper traceability with the raw material.

7.3. Wherever test certificates are not available, sample shall be drawn and tested both for chemical composition and physical properties in the presence of Inspecting Agency. All records of physical and chemical tests shall be made available to Inspecting Agency.

7.4. The manufacturers shall furnish to the purchasing/ inspecting authorities information in respect of quality control systems in force at their works on various materials used In the manufacture of components.

7.5. The manufacturers shall furnish to the Purchasing/ Inspecting authorities the details of tests and inspection records and other relevant records as required under the quality control systems in force.

7.6. These records and reports shall be maintained by the Competent Technical Authority of the manufacturer and shall be open to examination by the Purchasing/ Inspecting Authorities at all reasonable time.

7.7. Purchasing/ Inspecting Authorities at their discretion may select samples of products at any stage of production for conformity tests of raw material at the works of the manufacturer or in an approved laboratory. In case the samples do not conform to the requirements of the specification, double the number of samples from the same lot/batch shall be drawn for re-tests. If any of the re-test samples do not conform to the requirements, the entire lot/batch shall be rejected.

8. Identification Marking:

Each fitting shall have the following marking clearly on the body for the ease of identification and trace-ability:

1. Manufacture's Name/logo
2. Size
3. Material
4. Part/Drawing No.
5. Year of Manufacture.

9. Packing:

The packing shall be such that all the machined surfaces shall be properly protected against rubbing/ impact/scratches during transportation. The contractor, before actual supply, shall ensure that exposed threaded portions of fittings are suitably covered with air tight protection caps to prevent ingress of foreign matter, formation of moisture and damage to threads during handling, transportation and storage. The protection caps shall be fitted in such a manner that they should not fall off on their own during transit, storing and handling. Contractor shall also ensure that fittings are properly packed with necessary anti-rust/anti-galling treatment in sealed carton boxes. Each package shall be of convenient mass for easy handling.

10. Warranty:

The manufacturer shall warrant the fitting for conformance to quality for a period of 30 months from date of supply or 24 months from date of Installation which ever shall be sooner, as per IRS conditions.

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