ANNEXURE A

ENGINEERING: ENGINEERING SYSTEMS ENABLEMENT

QUALITY MANAGEMENT SYSTEM

HEAT-TREATMENT OF AAR M201 GRADE E CAST COMPONENTS

TECHNICAL SPECIFICATION

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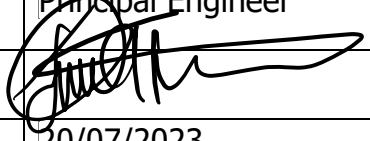
Approver Signature	
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1 DOCUMENT VERSION

This specification supersedes all previous specifications for the supply of heat-treatment services of AAR M201 grade E cast components.

2 PURPOSE

The purpose of this document is to specify the heat treatment requirements of cast AAR M201 Grade E steel.

3 SCOPE OF SPECIFICATION

The request calls for the heat treatment of cast products in a variety of sizes. The bidder must ensure that the optimal heat treatment regime for AAR M201 Grade E steel is chosen. Each heat-treated batch will be accompanied by a test certificate demonstrating compliance with AAR M201 Grade E steel specification.

The castings will be supplied with at least two testing keel block, of which one keel block will be used by the bidder to certify the heat treated batch. The other keel block shall be returned with the castings.

4 REFERENCE DOCUMENTATION

None

5 DEFINITIONS AND ABBREVIATIONS

AAR – Association of American railroads.

MPa – Megapascal

J – Joules

BH – Brinell hardness

RFQ – Request for quotation

6 TECHNICAL REQUIREMENTS

Suppliers are required to conduct the heat treatment of AAR grade E steels of various size from 5 to 300 kg. The temperature and times below serve as a

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guideline, the supplier is required to design an optimum cycle according to stipulated properties in section 6.4.

6.1 Austenitize

Heat to the optimum uniform temperature above the transformation range and hold for the proper time to refine the grains.

Temperature > 860ºC
Soaking time > 1hr

6.2 Quenching

Withdraw the castings from the furnace while castings are still above the transformation temperature and rapidly cooling them with a suitable liquid medium to an optimal temperature below the transformation range.

6.3 Tempering

Reheating the castings to the optimum tempering temperature below the transformation range, holding for the proper time and allowing them to cool properly.

6.4 Mechanical properties

Table 1 below shows the minimal tensile properties and hardness range was tested from the keel block.

Table 1: Mechanical properties requirements

Properties	**Specification**
Tensile strength (MPa)	827 min
Yield strength (MPa)	689 min
Elongation (%)	14 min
Reduction in area (%)	30 min
Impact at -40ºC (J)	27 min
Hardness (BH)	241 - 311

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6.4.1 The supplier will be required to perform Brinell hardness testing on all the castings.

7 QUANTITY

As per RFQ.

8 POST PURCHASE SUPPORT

- In the event of noncomplying castings due to the heat treatment process, the remedy will be carried out free of charge.
- The heat-treated components must be accompanied by a test certificate for each heat-treatment batch. If the castings fail to satisfy the requirements laid out owing to heat treatment and the resultant outcome cannot be reversed, the supplier will bear the production cost as well as the cost of impacted components.

9 DOCUMENTATION REQUIRED

- Signed heat treatment chart showing temperatures and times.
- Signed mechanical testing certificate.

9.1 Procurement stage

- Valid ISO 9001 2015 certificate
- Reference letters from previous heat treatment clients

9.2 On delivery

- Delivery note
- Copy of the purchase order
- Heat treatment chart
- Signed test certificate.

10 DELIVERY

The foundry will be responsible for transportation of castings to and from supplier.

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11 TIME FRAME

As per RFQ

12 ACCEPTANCE CRITERIA

It is the responsibility of the supplier to ensure the understanding of the requirements/technical requirements of a required product or service. It is also the responsibility of the supplier to enquire and seek clarity on areas that may be unclear.

Upon the delivery of a product/service, the product/service shall be evaluated for conformance to specification requirements, using the specification in

Table 1.

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