

APPROVED

By James A Markowitz at 8:42 am, Jul 20, 2020

Approved by:

Owner

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By Paul Janicke at 8:44 am, Jul 20, 2020

Approved by:

Q.A. Team Member

Purchasing Specification: MPS-QUAL Revision 0

1.0 Scope

- 1.1 This specification is intended to provide the requirements for quality characteristics of raw material (to be supplied in the form of lengths of ingot, bar, or billet) to McInnes Rolled Rings.
- 1.2 Any deviation from this specification must have prior approval from McInnes Rolled Rings or a shipment may be considered rejectable and subject to return at the expense of the material supplier.

2.0 Dimensional Quality Requirements

- 2.1 Material must be provided to the nominal diameter indicated on the purchase order, within the following tolerances (unless a specific tolerance is indicated on the purchase order, which would take precedence over this specification).
 - a. The diameter of as-cast bottom-poured ingot product must be within +/- 0.50" of the nominal ordered diameter throughout its length, including any taper condition.
 - b. The diameter of as-forged billet product must be within +/- 0.50" of the nominal ordered diameter throughout its length.
 - c. The diameter of billet product ordered to be provided in the fully surface ground condition must be within +/- 0.25" of the nominal ordered diameter throughout its length.
 - d. The diameter of as-cast strand-cast ingot product must be within +/- 0.25" of the nominal ordered diameter throughout its length.
 - e. The diameter of rolled, ground, or turned bar product must be within +0.25"/-0.00" of the nominal ordered diameter throughout its length.
- 2.2 Material may be provided to random lengths, within the following limits. Shorter cut or cropped lengths may be accepted with prior agreement, depending on material availability.
 - a. The lengths of as-cast bottom-poured ingot product (cropped or uncropped) must be 120" minimum and 200" maximum.
 - b. The lengths of as-forged or ground billet product must be 100" minimum and 240" maximum.
 - c. The lengths of as-cast strand-cast ingot and rolled, ground, or turned bar product must be 150" minimum and 240" maximum.
- 2.3 Lengths may be bundled (strapped together) for shipment, but no more than two lengths may be bundled together, and the total shipped weight of an individual length or the combined weight of bundled lengths must not exceed 30,000 pounds.

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2.4 Lengths must be straight within the following limits.

- a. As-cast bottom-poured ingot product must be straight within 0.50" per 60" of length.
- b. As-forged or ground billet product, or as-cast strand-cast ingot product must be straight within 0.38" per 60" of length.
- c. Rolled, ground, or turned bar product must be straight within 0.25" per 60" of length.

3.0 Surface Quality Requirements

3.1 Material must be provided with surface quality that is suitable for saw cutting and forging. Surfaces must not contain defects that will adversely affect material handling or saw cutting, or introduce the likelihood of the formation of defects during the forging process. Unacceptable surface conditions may include, but are not limited to, the following:

- a. splitting or cracking (either visible upon receipt or evident after saw cutting or other processing)
- b. areas of excessive grind depth (grinding can be as deep as 3.5% of the nominal bar diameter as measured from adjacent surfaces, but must not exceed a maximum depth of 0.50" for bars with nominal diameters above 14.00") or any abrupt grind marks (grinding must be gradually tapered or flared, not notched or gouged)
- c. the presence of mold flux on as-cast ingot surfaces
- d. protrusions from hot tops of uncropped as-cast ingots that extend beyond the diameter of the ingot
- e. excessive dirt or oil on material surfaces.