



Designation: A 649/A 649M – 99

Standard Specification for Forged Steel Rolls Used for Corrugating Paper Machinery¹

This standard is issued under the fixed designation A 649/A 649M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This specification² covers two kinds of rolls used in machinery for producing corrugated paperboard. Rolls are fabricated of forged bodies and trunnions. The trunnions may be bolted or shrink assembled on one or both ends of the body. A seal weld may be made at the body/trunnion interface. Roll shells are made of carbon/manganese, or low alloy steel as hereinafter described, and are heat treated prior to assembly. Pressure rolls are surface hardened. Provision is made in Supplementary Requirement S1 for the optional surface hardening of corrugating rolls.

1.2 Corrugating and pressure rolls made to this specification shall not exceed 30 in. [760 mm] in inside diameter. The wall thickness of the roll body shall not be less than $\frac{1}{12}$ of the inside diameter or 1 in. [25 mm], whichever is greater, but shall not exceed 4 in. [100 mm]. The wall thickness of the corrugating roll is measured at the bottom of the corrugations in the location of the trunnion fit. The maximum operating temperature of the roll is 600°F [315°C] and the maximum allowable working pressure is 250 psi [1.7 MPa]. The minimum design temperature shall be 40°F [4°C] for roll wall thicknesses up to 3 in. [75 mm]. For roll wall thicknesses over 3 in. [75 mm] to 4 in. [100 mm], the minimum design temperature shall be 120°F [50°C]. The maximum stresses on the roll bodies from the combined internal and external loading are limited to 18 750 psi [129 MPa] for the Class 2 pressure roll bodies, and 20 000 psi [138 MPa] for Class 1A, 1B, or 5 pressure or corrugating roll bodies in Grades 1 or 2. For the trunnions, the maximum stresses from the combined internal and external loading are limited to 15 000 psi [103.4 MPa] for Classes 3 or 4, or 20 000 psi [138 MPa] for Classes 1A, 1B, or 5 in Grade 2 only. The Grade 1 strength level is not permissible for trunnions.

1.3 Referring to Table 1, material to Classes 1A, 1B, or 5 shall be used for the manufacture of corrugating or pressure roll shells, and Class 2 shall be used only for pressure roll shells. Trunnions shall be made from forgings in Classes 1A,

1B, or 5 in Grade 2 strength level as restricted by Footnote B in Table 2 or in forgings in either Class 3 or 4.

1.4 The values stated in either inch-pound units or SI [metric] units are to be regarded separately as standards. Within the text and tables, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must be used independent of the other. Combining values from the two systems may result in nonconformance with the specification.

1.5 Unless the order specifies the applicable “M” specification designation, the material shall be furnished to the inch-pound units.

1.6 Except as specifically required in this standard, all of the provisions of Specification A 788 apply.

2. Referenced Documents

2.1 ASTM Standards:

A 275/A 275M Test Method for Magnetic Particle Examination of Steel Forgings³

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products⁴

A 788 Specification for Steel Forgings, General Requirements^{3, 99}

E 165 Practice for Liquid Penetrant Examination^{5, 49m-99}

3. Ordering Information

3.1 Orders for material under this specification shall include the information required by Specification A 788. The purchaser should refer to Specification A 788 for other relevant information.

3.2 The additional ordering information given in Specification A 788 shall be specified as necessary to describe adequately the desired material.

4. Materials and Manufacture

4.1 Forging Process:

4.1.1 Roll body forgings may be made as solid forgings and subsequently bored.

4.1.2 Trunnions or gudgeons which are to be subsequently assembled to form the roll shall be made as a solid forging or where practical upset from segments cut from billets or bars.

¹ This specification is under the jurisdiction of ASTM Committee A-1 on Steel, Stainless Steel, and Related Alloys and is the direct responsibility of Subcommittee A01.06 on Steel Forgings and Billets.

Current edition approved Sept. 10, 1999. Published November 1999. Originally published as A 649-71. Last previous edition A 649/A 649M-98a.

² For ASME Boiler and Pressure Vessel Code applications see related Specification SA-649/SA-649M in Section II of that Code.

³ Annual Book of ASTM Standards, Vol 01.05.

⁴ Annual Book of ASTM Standards, Vol 01.03.

⁵ Annual Book of ASTM Standards, Vol 03.03.