AS 1403—1985

Australian Standard®

DESIGN OF ROTATING STEEL SHAFTS

This Australian standard was prepared by Committee ME/5, Cranes. It was approved on behalf of the Council of the Standards Association of Australia on 5 April 1985 and published on 4 October 1985.

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- Association of Consulting Engineers Australia
- Australian Institute of Building
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First published (as AS B249) 1969
AS 1403 first published 1979
Second edition 1984
Third edition 1985

Incorporating:
Amdt 1—1986

PUBLISHED BY STANDARDS AUSTRALIA
(STANDARDS ASSOCIATION OF AUSTRALIA)
1 THE CRESCENT, HOMEBUSH, NSW 2140

ISBN 0 7262 3950 X

PREFACE

This edition of this standard was prepared by the Association's Committee on Cranes, to supersede AS 1403—1984.

The 1984 edition included a number of changes that were initiated by teaching institutions with a view to simplifying the standard and enable its use in their curricula. Those changes were as follows:

(a) A number of definitions were revised, added or detailed, while some definitions were omitted. In conjunction, notations were charged to align with the accepted conventions.

(b) Table 1 was presented in a completely different form. Instead of providing two general formulas and a note explaining their specific uses, Table 1 provides specific formulas for shaft torques in the first four shafts of a mechanism. It also separated them into driving systems and braking systems and whether the inertia was or was not significant. The establishment of a pattern of formulas was thought to be superior to that of a general formula.

(c) Data for high tensile steel was included in Appendix A.

(d) Appendix B, Iterative Method, was added; this addition reflected the wide use of programmable calculators.

(e) The existing worked example was expanded and two additional worked examples were included. Thus most possible cases, i.e. driving and braking, moments of inertia of components with rotating and linear motions, and their combinations were covered by examples.

(f) The appendix covering the corrosion fatigue strength of nickel-containing materials was deleted. However, the deleterious effect of certain conditions was brought to the attention of the user of this standard in Clause 7.2.

Additional changes in this edition are as follows:

(g) Corrections of a typographical and editorial nature and oversights.

(h) In Clause 6.3(b), the wall thickness is determined in relation to the minimum calculated diameter of shaft (*D*), and not the minimum calculated outside diameter of hollow shaft (*D*o).

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
for
DESIGN OF ROTATING STEEL SHAFTS

FOREWORD

The method of design in this standard is the same as that contained in the 1984 issue and is based on calculations for infinite life of the shaft.

It is noted that, as the result of extensive laboratory and/or field tests, shafts of diameters smaller than those resulting from calculations in this standard may be used.

Although the method is not theoretically precise, it gives results which are of sufficient accuracy for practical purposes. The method makes no allowance for corrosive or other abnormal conditions, such as the presence of buckling, ‘whipping’, cyclic vibrations and similar effects (see Clause 7.2).

In some cases, deflection may be the factor which determines the minimum value of the shaft diameter (see Clause 7.6).

Typical worked examples employing this method of shaft design are given in Appendices D, E and F.

A ‘trial’ diameter may be necessary in the application of the design method. The value may be assumed on the basis of the designer’s previous experience, or a simplified version of the method may be used to determine the order of magnitude of the shaft diameter, and the full method then applied to check the assumed trial diameter. A convenient quick method of estimating the ‘trial’ diameter is given in Appendix A, and an iterative method using programmable calculators is provided in Appendix B.

The process of carrying out an accurate and complete analysis of loadings applied to a shaft (see Clause 5) may involve much time and effort, and is warranted where it is desired to keep shaft diameters as small as possible. Where larger diameter shafts can be tolerated, it may be more appropriate to use approximations or to ignore inertia or other effects, but it is important to ensure that, where such inaccuracies are introduced, they result in increased rather than decreased margin of safety and stress-raising characteristics are avoided.

The effect of electric motors with high breakdown torque (also known as pull-out torque) or high locked-rotor torque (also known as starting torque) and the characteristics of motor controllers and torque-limiting devices are outlined in Appendix C.