See also Draft A2 DR 80081 of May 1980

Draft

TAS SEPTEMBER 1990

Amendment 1 - Sept 1983
" 2 - Oct. 1986

Under Revision See DR 84090 of April 1984

AS 1475, Part 1—1977
UDC 693.28
SfB (21) Ff1

OBSOLESCENT TAS NOV/DEC 1988

SUPERSEDED BY AS 3700 - 1988

Australian Standard 1475, Part 1—1977

WITHDRAWN

SAA BLOCKWORK CODE
Part 1—UNREINFORCED BLOCKWORK

STANDARDS ASSOCIATION OF AUSTRALIA
Incorporated by Royal Charter

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THE FOLLOWING SCIENTIFIC, INDUSTRIAL AND GOVERNMENTAL ORGANIZATIONS and departments were officially represented on the committee entrusted with the preparation of this standard:

Association of Consulting Engineers, Australia

Brick Development Research Institute

Cement and Concrete Association of Australia

City Councils

Concrete Masonry Association of Australia Co-op. Limited

CSIRO Division of Building Research

Department of Construction

Department of Public Works, N.S.W.

Departments of Local Government

Experimental Building Station

Master Builders Associations of Victoria and New South Wales

Uniform Standards Committee, New South Wales

University of Melbourne

This standard, prepared by Committee BD/55, Concrete Block Masonry, was approved on behalf of the Council of the Standards Association of Australia on 20 August 1976, and was published on 1 March 1977.

To keep abreast of progress in industry, Australian standards are regularly reviewed. Suggestions for improvements to published standards, addressed to the head office of the Association, are welcomed.

This standard was issued in draft form for public review as DR 73012.

STANDARDS ASSOCIATION OF AUSTRALIA
Incorporated by Royal Charter

AMENDMENT No 1
to
AS 1475, Part 1—1977
SAA BLOCKWORK CODE
PART 1—UNREINFORCED BLOCKWORK

REVISED TEXT

SUMMARY: This amendment applies to Rules 4.14.1, 4.14.2 and 5.4. It also includes a Commentary on Rule 4.14.1.

Published on 5 September 1983.

Page 17. Rule 4.14.1.

Delete existing Rule 4.14.1 and *substitute*:

4.14.1 Tensile Stresses Due to Bending.

4.14.1.1 *Notation.* The symbols used in this Rule have the following meanings:

F_v = permissible tensile stress perpendicular to the bed joints, in megapascals

F'_v = average ultimate bond strength perpendicular to the bed joints, in megapascals

F_h = permissible tensile stress perpendicular to the vertical joints, in megapascals

F'_t = average lateral modulus of rupture of the masonry unit, in megapascals

F_a = the applied axial force perpendicular to the bed joint divided by the bed area, in megapascals

γ = a factor, derived as indicated in Rule 4.14.1.2.

4.14.1.2 *Permissible tensile stress.* In circumstances other than those specified in Rules 4.14.2 and 4.14.3, tensile stresses due to bending shall not exceed either F_v or F_h, where—

$$F_v = \frac{F'_v}{\gamma}$$

and F_h is the least of the following three values:

(a) $F_h = 4.0 \dfrac{\sqrt{F_v}}{\gamma}$

(b) $F_h = 2.0 \dfrac{\sqrt{F'_v}}{\gamma}\left(1 + \dfrac{F_a}{F'_v}\right)$

(c) $F_h = \dfrac{1}{9\gamma}(4F'_t + 5F'_v)$

provided that the minimum bond overlap in the masonry is equal to or greater than the width of the masonry unit (stretcher bond construction).

If the bond overlap is zero (stack bonded construction), the value of F_h shall be zero.

For bond overlap between zero and the width of masonry unit the value of F_h shall be obtained by linear interpolation between the value zero and the value calculated from the above formulae.

For the purposes of this Rule, the following shall apply:

(i) It shall be permissible to assume a value of F'_v for the purposes of design, provided that the assumed value is subsequently achieved or exceeded by the average strength of three or more specimens of the appropriate brickwork tested in accordance with Appendix F. In no case shall the assumed value of F'_v exceed 0.8 MPa. If no subsequent testing is required by the Building Authority nor specified by the designer, a value of F'_v not exceeding 0.28 MPa may be assumed at the discretion of the designer.

(ii) γ shall be taken as—

(a) 3, when based on nine or more tests; and

(b) 4, when based on less than nine tests.

(iii) F_a shall be taken at the midheight of the wall or storey, except where the top edge of the wall or storey has no lateral support, in which case it shall be taken as zero.

(iv) F'_t shall either be determined by test or, in the absence of specific data, be assumed to be 1.8 MPa.

4.14.1.3 *Information to be shown on drawings.* The required values of F'_v and F'_t shall be stated on the drawings, together with the mortar mix expected to achieve this value of F'_v.

Page 17. Rule 4.14.2.

AMDT No 1 SEPT. 1983

Add the following Note after Rule 4.14.2.

NOTE: Wind is not considered a force regularly applied.

Page 19. Rule 5.4.

AMDT No 1 SEPT. 1983

First paragraph, fifth line—*delete* 'Appendix E' and *substitute* 'Appendix F'.

Second paragraph, third line—*delete* '0.28 MPa' and *substitute* 'F'_v'.

COMMENTARY
on
Amendment No 1 to
AS 1475, Part 1—1977
SAA BLOCKWORK CODE
PART 1—UNREINFORCED BLOCKWORK

Introduction

Apart from unavoidable drafting details, this amendment to the rules relating to tensile stresses is the same for both the SAA Unreinforced Blockwork Code (AS 1475, Part 1—1977) and the SAA Brickwork Code (AS 1640—1974). In this regard, the amendment reflects the decision taken by the Standards Association of Australia to develop a single, unified code for both brickwork and blockwork construction.

Bond Strengths

There is wide variability in the bond strengths actually achieved in masonry construction. More information is becoming available about the desirable types of mortar to be used with particular masonry units to give good bond, and about the bond strengths that are realistically achievable with particular masonry units and mortar types. Advice about the value of F'_v to be adopted for design purposes should first be obtained from the relevant industry organization or masonry unit manufacturer, and it is recommended that early site testing for bond strength should be carried out to confirm the design requirements.

The upper limit of 0.8 MPa for F'_v permitted by this amendment can be achieved with properly designed mortars and compatible masonry units but high values for F'_v should not be assumed for design purposes without supporting evidence from existing trade information or from preliminary testing, and with continuing site control testing for bond strength.

Some laboratory testing has shown that for concrete and calcium silicate units bond strengths tend to be improved with mortar consisting of 1 part portland cement, 5 parts clean washed sand and 0.003 to 0.005 parts carboxy methyl cellulose.

Design of Walls for Lateral Loading

There is evidence to show that the strength of masonry walls under lateral loading can be determined by an elastic analysis of the wall and the application of a principal stress criterion. This theory is not yet in a form suitable for design purposes.

At present an empirical approach is suggested whereby the allowable uniform lateral pressure on a single leaf unreinforced wall panel is given by—

$$w = \left[\frac{\alpha Z}{H^2}(F_v + 0.5\ F_a) + \frac{\beta Z}{L^2}\ F_h \right] \times 10^3$$

for L/H equal to or less than 2.0;

where—

w = allowable uniform lateral pressure, in kilopascals

F_v, F_h = stresses obtained from the permissible tensile stresses formulae, in megapascals

Z = section modulus of the wall per metre length, in metres^3 per metre

$= \frac{D^2}{6}$ for full-face beddding, or

$= DS - 2S^2 + \frac{4}{3}\frac{S^3}{D}$ for face-shell bedding,

where D = total wall thickness, in metres, and

S = face-shell thickness, in metres

H = height of panel, in metres

L = length of panel, in metres

α = vertical-span coefficient

= 8 for panels supported at top and bottom edges; or

= 2 for panels with top edge free

β = horizontal-span coefficient

= 0 for panels having an unsupported vertical side, or

= 8 for panels with both sides simply supported, or

= 10 for panels with one side simply supported and the other fixed or continuous across a side support, or

= 12 for panels fixed or continuous at side supports.

This empirical approach has been developed from extensive laboratory testing of masonry panels. On the basis of the test results, this approach is deemed applicable to panels with L/H ratio of 2 or less, and up to 20 m^2 in area. Caution should be exercised in applying this approach outside this range.

References:

Anderson, C. & Bright, N.J. (1976), 'Behaviour of Non-load-bearing Block Walls under Wind Loading', *Concrete*, Sep. 1976.

Baker, L.R. (1980), 'Lateral Loading of Masonry Panels'; Structural Design of Masonry, Clay and Concrete (published by Cement and Concrete Association of Australia, 1980). Also available as a Technical Note from Masonry Research Centre, Deakin University.

Gairns, D.A. & Scrivener, J.C. (1981), 'Local Research into Concrete Masonry Subject to Lateral Loads'; Seminar on Structural Masonry (University of Melbourne/Cement and Concrete Association).

Lawrence, S.J. (1980), 'Design of Masonry Panels for Lateral Loading—Some Interim Recommentations'; Technical Record 460, Experimental Building Station, Sydney.

AUSTRALIAN STANDARD

RULES FOR
CONCRETE BLOCKWORK IN BUILDINGS

known as the

SAA BLOCKWORK CODE

Part 1—
UNREINFORCED BLOCKWORK

AS 1475, Part 1—1977

First published (as AS CA32)	1963
Revised	1967
Revised and issued as AS 1475, Part 1	1977

PUBLISHED BY THE STANDARDS ASSOCIATION OF AUSTRALIA
STANDARDS HOUSE, 80 ARTHUR STREET, NORTH SYDNEY, N.S.W.

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PREFACE

This standard was prepared by the Association's Committee on Concrete Block Masonry as a revision of AS CA32—1967, which it accordingly supersedes.

The SAA Code for Concrete Block Masonry was first published in 1963 to establish standard rules for the use in buildings of concrete blocks complying with AS A87.* A revised edition in 1967 attempted to simplify and clarify the rules previously established.

The 1967 edition had several shortcomings. No attempt was made to encompass the design of steel-reinforced masonry, which has now become a common form of multi-storey building construction, and the 1967 rules were often difficult to interpret.

This latest edition is in two parts, based on the report, 'Concrete Masonry Structures—Design and Construction', which was prepared by Committee 531 of the American Concrete Institute. The format of the standard follows that of the SAA Brickwork Code, AS 1640.

Part 1 of the standard covers the design of buildings having unreinforced walls of concrete blocks. Requirements for protection against fire are not specified but some notes on fire resistance are included in Appendix C.

Part 2† will provide rules for the design of steel-reinforced blockwork structures.

Attention is drawn to AS 1640 for the use of concrete bricks complying with AS 1346, Concrete Building Bricks.

This standard does not necessarily apply to the design and construction of concrete masonry screen walls and fences. Reference may be made to — Chapters 21 and 22 of the Report of ACI Committee 531, 'Concrete Masonry Structures — Design and Construction.' Title No 67-23b. *ACI Journal*, Proceedings, vol. 67, no 6, June 1970, pp 442-460.

This standard may require reference to the following standards:

AS 1012	Methods for the Testing of Concrete (Metric Units) Part 3 — Determination of the Consistency of Concrete (Slump Test)
AS 1170	SAA Loading Code Part 1 — Dead and Live Loads Part 2 — Wind Forces
AS 1316	Masonry Cement (Metric Units)
AS 1397	Hot-dipped Zinc-coated Steel Coil and Cut Lengths
AS 1480	SAA Concrete Structures Code
AS ~~1500~~ 2733	Concrete Building Blocks PRE AMENDMENT 2
AS 1530	Methods for Fire Tests on Building Materials and Structures Part 4 — Fire-resistance Test of Structures
AS 1566	Copper and Copper Alloy Plate, Rolled Bar, Sheet, Strip and Foil for General Engineering Purposes
AS 1640	SAA Brickwork Code
AS 1734	Wrought Aluminium and Aluminium Alloy Flat Sheet, Coiled Sheet and Plate for General Engineering Purposes
AS 1804	Soft Lead Sheet and Strip
AS A123	Mortar for Masonry Construction
AS B128	Methods for the Verification of Testing Machines
AS	Methods for Field and Laboratory Measurements of Airborne and Impact Sound Transmission†
SAA Int. 324	Metal Wall Ties for Brickwork
SAA Int. 326	Bituminous Damp-proof Courses with Metal Centre
SAA Int. 327	Bituminous Damp-proof Courses with Fibre Felt Base
BS 493	Air Bricks and Gratings for Wall Ventilation (Part 2 — Metric Units)
BS 849	Plain Sheet Zinc Roofing
BS 874	Methods for Determining Thermal Insulating Properties with Definitions of Thermal Insulating Terms
BS 1239	Cast Concrete Lintels
BS 1243	Metal Ties for Cavity Wall Construction
BS 3798	Coping Units
BS 4374	Sills of Clayware, Cast Concrete, Cast Stone, Slate and Natural Stone.

* Superseded by AS 1500, Concrete Building Blocks.
† In course of preparation.

STANDARDS ASSOCIATION OF AUSTRALIA
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AMENDMENT No 2
to
AS 1475.1—1977
SAA BLOCKWORK CODE
PART 1—UNREINFORCED BLOCKWORK

REVISED TEXT

SUMMARY: References to AS 1500 are replaced by AS 2733 Concrete Masonry Units.

Published on 6 October 1986.

AMDT No 2 OCT. 1986

Substitute AS 2733 for AS 1500 (now withdrawn) in the following places:

a) page 2, Preface—right hand column, 5th line and in the footnote.

b) page 5, Rule 1.5.3—under BLOCK, 2nd line.

c) page 6, Rule 2.1.2—3rd line and in the footnote.
Rule 2.1.3—4th line.

d) page 26, Footnote to Table C1.

e) page 29, Paragraph E2—last line.

f) page 31, Paragraph F1.1, in the Note, 3rd and 4th line.

CONTENTS

STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard Rules for CONCRETE BLOCKWORK IN BUILDINGS

PART 1 — UNREINFORCED BLOCKWORK

SECTION 1. SCOPE AND GENERAL

1.1 SCOPE. These Rules (hereinafter referred to as 'the Code') apply to the design and construction of normal and structural concrete blockwork. The Code includes provisions that cover planning and lays down maximum permissible stresses.

The Code has been drafted so that it is unnecessary to put arbitrary restrictions on the height of concrete blockwork buildings for reasons of structural sufficiency.

The Code makes no allowance for loads due to earthquakes.

It is required in the application of the Code that blockwork will always be adequately supported laterally so that relative lateral displacement between the top and bottom of the blockwork will be prevented.

NOTE: Part 2 of the Code* covers the design of blockwork structures in which steel reinforcement is so embedded and bonded that the materials act together.

1.2 NEW MATERIALS AND METHODS.

1.2.1 General. The Code shall not be interpreted as preventing the use of materials or methods of design or construction that are not specifically referred to in the Code.

1.2.2 Use of New Materials or Methods. If it is desired to use materials other than those specified, or methods of design or construction not covered by the Code, details of these materials or methods may be submitted to the SAA Committee on Blockwork for an expression of opinion as to their compliance with the intention and spirit of the Code.

NOTE: The Building Authority must always make the ultimate decision on whether a material or method of design or construction may be used.

1.3 PRELIMINARY INFORMATION TO BE PROVIDED IN DRAWINGS FOR BLOCKWORK CONSTRUCTION. All plans submitted for approval or to be used on the job shall show clearly—

(a) *For all blockwork*—the type and strength or strength grade of the blocks, and the type or strength, or both of the mortars.

(b) *For structural blockwork* — in addition to the requirements of (a) above, the first flow and water retention of the mortar and, where applicable, the characteristic compressive strength, f'_m, of the blockwork as established in accordance with Rule 4.11.

1.4 DESIGN AND SUPERVISION.

1.4.1 Design.

1.4.1.1 *General.* The building as a whole shall be analysed by accepted principles of mechanics to ensure safe and proper functioning in service of its component parts relative to the whole structure.

All component parts of the structure shall be designed to sustain the forces resulting from the most adverse combinations of load to which the building may be subjected.

The structural integrity of the building shall be such that the probability of progressive collapse, following local failure under loads not specifically covered by the Code, is reduced to a level commensurate with good engineering practice.

1.4.1.2 *Buildings of more than four storeys.* Buildings of loadbearing blockwork incorporating a total of more than four storeys, including basements and carpark levels, shall be of structural blockwork.

Where loadbearing blockwork is combined with other types of loadbearing construction in buildings of more than four storeys, including basements and carpark levels, such blockwork shall be of structural blockwork except where it is used for single-storey penthouses, lift-machinery houses, and the like, at main roof level.

1.4.1.3 *Structural design of structural blockwork.* Structural design of structural blockwork, in accordance with the code shall be by a qualified practising structural engineer or a person having qualifications approved by the Building Authority.

1.4.2 Supervision.

1.4.2.1 *General.* All blockwork shall be subject to proper site control during construction to ensure that the requirements of the Code and the principles laid down herein are observed. Due notice shall be given to the persons responsible for exercising such control in order that inspections may be carried out when appropriate.

1.4.2.2 *Structural blockwork.* All structural blockwork shall be so supervised that all requirements of the design as contained in the specification and the structural drawings are achieved in the construction.

NOTE: The supervisor, where he is not the designer, should, if any doubt arises—

(a) concerning the adequacy of any part of the design, or

(b) in the interpretation of the documents,

refer the matter to the designer for a decision.

* In course of preparation.