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NZS 3101.1&2:2006 Concrete structures standard. The design of concrete structures

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Abbreviation NZS 3101.1&2:2006 Amendment Amendments 1, 2, 3 - incorporated. Valid from 16/03/2006

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Description

Part One, The Design of Concrete Structures, specifies minimum requirements for the design of reinforced and prestressed concrete structures. It is applicable only to structures and parts of structures complying with the materials and workmanship requirements of NZS 3109: 1987.

Part Two, Commentary on The Design of Concrete Structures, explains the provisions of Part One, summarises technical background and suggests approaches which satisfy the intent of the Standard. This revision of NZS 3101 has been written with the objective of producing a concrete design standard which is compatible with the loading standards AS/NZS 1170 and NZS 1170.5, and other referenced loading standards. It is organised in component focused sections, for ease of use.

Scope

This Standard sets out minimum requirements for the design of reinforced and prestressed concrete structures. This Standard does not cover the design of brittle elements. A brittle element is defined as a structural member that does not satisfy the minimum requirements specified in this Standard. Where this standard has provisions that are in non-specific or unquantified

terms then these do not form part of the verification method for the New Zealand Building Code and the proposed details must be submitted to a building consent authority for approval as part of the building consent application. This includes but is not limited to where the standard calls for special studies, a rational analysis, for engineering judgement to be applied or where the Standard requires tests to be suitable or appropriate.

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• B2/AS1 (Second edition, Amendment 8)

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• B1/VM1 (First edition, amendment 15)

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• B1/VM1 (First Edition, Amendment 12.)

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• B1/VM1 (First edition, Amendment 13)

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• B1/VM1 (First edition, Amendment 10)

NZS 3101.1&2:2006 is cited by Verification Method B1/VM1: Structure - General from 30/09/2010

• B1/VM1 (First Edition, Amendment 18)

NZS 3101.1&2:2006 is cited by Verification Method B1/VM1: Structure - General from 31/03/2018

• AS/NZS 2327:2017

NZS 3101.1&2:2006 is cited by AS/NZS 2327:2017 Composite structures - Composite steel-concrete construction in buildings

• CP01:2011 (Errata 1 January 2015)

NZS 3101.1&2:2006 is cited by Code of Practice for Weathertight Concrete and Concrete Masonry Construction

• NZS 1170.5:2004

NZS 3101.1&2:2006 is cited by NZS 1170.5:2004 Structural Design Actions - Part 5: Earthquake design actions - New Zealand

• NZS 3106:2009

NZS 3101.1&2:2006 is cited by NZS 3106:2009 Design of concrete structures for the storage of liquids

• NZS 3604:2011

NZS 3101.1&2:2006 is cited by NZS 3604:2011 Timber-framed buildings

• NZS 4229:2013

NZS 3101.1&2:2006 is cited by NZS 4229:2013 Concrete masonry buildings not requiring specific engineering design

NZS 4230:2004

NZS 3101.1&2:2006 is cited by NZS 4230:2004 Design of reinforced concrete masonry structures

• NZS 4520:2010

NZS 3101.1&2:2006 is cited by NZS 4520:2010 Fire resistant doorsets

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New Zealand Standards

• <u>AS/NZS 1170.0:2002</u>

NZS 3101.1&2:2006 cites AS/NZS 1170.0:2002 Structural Design Actions - General principles

• AS/NZS 1170.1:2002

NZS 3101.1&2:2006 cites AS/NZS 1170.1:2002 (R2016) Structural Design Actions - Permanent, imposed and other actions

• <u>AS/NZS 1170.2:2002</u>

NZS 3101.1&2:2006 cites AS/NZS 1170.2:2002 Structural Design Actions - Wind Actions

• AS/NZS 1170.3:2003 (Reconfirmed in 2016)

NZS 3101.1&2:2006 cites AS/NZS 1170.3:2003 Structural Design Actions - Snow and ice actions

• <u>AS/NZS 1554.3:2002</u>

NZS 3101.1&2:2006 cites AS/NZS 1554.3:2002 Structural steel welding - Welding of reinforcing steel

• <u>AS/NZS 2699.3:2002</u>

NZS 3101.1&2:2006 cites AS/NZS 2699.3:2002 Built-in components for masonry construction - Lintels and shelf angles (durability requirements)

• <u>AS/NZS 3582.3:2002</u>

NZS 3101.1&2:2006 cites AS/NZS 3582.3:2002 Supplementary cementitious materials for use with portland and blended cement - Amorphous silica

• <u>AS/NZS 4548.1:1999</u>

NZS 3101.1&2:2006 cites AS/NZS 4548.1:1999 Guide to long-life coatings for concrete and masonry - Wall coatings - Latex extensible

• <u>AS/NZS 4548.2:1999</u>

NZS 3101.1&2:2006 cites AS/NZS 4548.2:1999 Guide to long-life coatings for concrete and masonry - Latex finish coatings - High-build, low profile

• <u>AS/NZS 4548.3:1999</u>

NZS 3101.1&2:2006 cites AS/NZS 4548.3:1999 Guide to long-life coatings for concrete and masonry - Latex - Textured coatings - Non-aggregate

• <u>AS/NZS 4548.4:1999</u>

NZS 3101.1&2:2006 cites AS/NZS 4548.4:1999 Guide to long-life coatings for concrete and masonry - Latex - Textured coatings - Aggregate filled

• <u>AS/NZS 4548.5:1999</u>

NZS 3101.1&2:2006 cites AS/NZS 4548.5:1999 Guide to long-life coatings for concrete and masonry - Guidelines to methods of test

• AS/NZS 4671:2001

NZS 3101.1&2:2006 cites AS/NZS 4671:2001 Steel reinforcing materials

• <u>AS/NZS 4672.1:2007</u>

NZS 3101.1&2:2006 cites AS/NZS 4672.1:2007 Steel prestressing materials - Part 1: General requirements

• AS/NZS 4680:1999

NZS 3101.1&2:2006 cites AS/NZS 4680:1999 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles

• NZS 1170.5:2004

NZS 3101.1&2:2006 cites NZS 1170.5:2004 Structural Design Actions - Part 5: Earthquake design actions - New Zealand

• NZS 3112.1:1986

NZS 3101.1&2:2006 cites NZS 3112.1:1986 Methods of test for concrete - Tests relating to fresh concrete

• NZS 3112.2:1986

NZS 3101.1&2:2006 cites NZS 3112.2:1986 Methods of test for concrete - Tests relating to the determination of strength of concrete

NZS 3122:1995

NZS 3101.1&2:2006 cites NZS 3122:1995 Specification for Portland and blended cements (General and special purpose)

• NZS 3152:1974

NZS 3101.1&2:2006 cites NZS 3152:1974 Specification for the manufacture and use of structural and insulating lightweight concrete - Metric Units

• NZS 3404 Parts 1 and 2:1997

NZS 3101.1&2:2006 cites NZS 3404 Parts 1 and 2:1997 Steel structures standard

Australian Standards

• AS 1012.10-2000 (R2014)

NZS 3101.1&2:2006 cites AS 1012.10-2000 (R2014) Methods of testing concrete - Determination of indirect tensile strength of concrete cylinders ('Brasil' or splitting test)

• AS 1012.11-2000 (R2014)

NZS 3101.1&2:2006 cites AS 1012.11-2000 (R2014) Methods of testing concrete - Determination of the modulus of rupture

• AS 1012.13-1992

NZS 3101.1&2:2006 cites AS 1012.13-1992 Methods of testing concrete - Determination of the drying shrinkage of concrete for samples prepared in the field or in the laboratory

• AS 1012.16-1996 (R2014)

NZS 3101.1&2:2006 cites AS 1012.16-1996 (R2014) Method of testing concrete - Determination of creep of concrete cylinders in compression

• <u>AS 1012.20-1992</u>

NZS 3101.1&2:2006 cites AS 1012.20-1992 Methods of testing concrete - Determination of chloride and sulfate in hardened concrete and concrete aggregates

• <u>AS 1214:1983</u>

NZS 3101.1&2:2006 cites AS 1214:1983 Hot-dip galvanised coatings on threaded fasteners (ISO metric coarse thread series)

• <u>AS 1311-1987</u>

NZS 3101.1&2:2006 cites AS 1311-1987 Steel tendons for prestressed concrete-7-wire stress-relieved steel strand for tendons in prestressed concrete

• <u>AS 1313-1989</u>

NZS 3101.1&2:2006 cites AS 1313-1989 Steel tendons for prestressed concrete - Cold-worked high-tensile alloy steel bars for prestressed concrete

• AS 1478.1-2000 (Reconfirmed in 2018)

NZS 3101.1&2:2006 cites AS 1478.1-2000 (R2018) Chemical admixtures for concrete, mortar and grout - Admixtures for concrete

• <u>AS 1530.4-1997</u>

NZS 3101.1&2:2006 cites AS 1530.4-1997 Methods for fire tests on building materials components and structures - Fire-resistance test of elements of building construction

• <u>AS 3582.1-1998</u>

NZS 3101.1&2:2006 cites AS 3582.1-1998 Supplementary cementitious materials for use with portland and blended cement - Fly ash

• AS 3582.2-2001

NZS 3101.1&2:2006 cites AS 3582.2-2001 Supplementary cementitious materials for use with portland and blended cement - Part 2: Slag - Ground granulated iron blast-furnace

• <u>AS 4072.1-1992</u>

NZS 3101.1&2:2006 cites AS 4072.1-1992 Components for the protection of openings in fire-resistant separating elements - Service penetrations and control joints

- Other
 - <u>355.2-01 / 355.2R-01</u>

NZS 3101.1&2:2006 cites ACI 355.2-01 / 355.2R-01: Evaluating the Performance of Post Installed Mechanical Anchors in Concrete and Commentary

• ACI 210R-93

NZS 3101.1&2:2006 cites ACI 210R-93: Erosion of Concrete in Hydraulic Structures (Reapproved 2008)

• <u>ACI 318-02</u>

NZS 3101.1&2:2006 cites ACI 318-02 Building Code Requirements for Structural Concrete (including Historical ACI Building Code Requirements from 1908 to 2005)

<u>Approved Code of Practice</u>

NZS 3101.1&2:2006 cites Approved Code of Practice for The Safe Handling, Transportation and Erection of Precast Concrete

• ASTM C1152-04e1

NZS 3101.1&2:2006 cites ASTM C1152-04e1 Standard test method for acid-soluble chloride in mortar and concrete

• ASTM C512-02

NZS 3101.1&2:2006 cites ASTM C512-02 Standard test method for creep of concrete in compression

• Bridge Manual (SP/M/022)

NZS 3101.1&2:2006 cites Bridge Manual (SP/M/022) Second Edition - 2003

• <u>DIN 4102-2:1977-09</u>

NZS 3101.1&2:2006 cites DIN 4102-2:1977-09 Fire Behaviour of Building Materials and Building Components; Building Components; Definitions, Requirements and Tests

• ISO 834.1:1999

NZS 3101.1&2:2006 cites ISO 834.1:1999 Fire resistance tests-Elements of building construction-General requirements

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