

Australian Standard™

Tilt-up concrete construction

This Australian Standard was prepared by Committee BD-066, Tilt-up Construction. It was approved on behalf of the Council of Standards Australia on 27th May 2003 and published on 23 June 2003.

The following are represented on Committee BD-066:

- Association of Consulting Engineers Australia
- Australasian Fire Authorities Council
- Australian Building Codes Board
- Australian Council of Trade Unions
- Australian Pre-Mixed Concrete Association
- Cement and Concrete Association of Australia
- Concrete Institute of Australia
- Construction, Forestry, Mining and Energy Union
- Crane Industry Council of Australia
- National Precast Concrete Association Australia
- National Tilt-up Association
- Steel Reinforcement Institute of Australia
- Tilt-up Association of Australia
- Tilt-up Contractors Association of Australia
- Victorian WorkCover Authority
- WorkCover New South Wales

Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about Standards can be found by visiting the Standards Australia web site at www.standards.com.au and looking up the relevant Standard in the on-line catalogue.

Alternatively, the printed Catalogue provides information current at 1 January each year, and the monthly magazine, *The Australian Standard*, has a full listing of revisions and amendments published each month.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at mail@standards.com.au, or write to the Chief Executive, Standards Australia International Ltd, GPO Box 5420, Sydney, NSW 2001.

This Standard was issued in draft form for comment as DR 00260.

Australian Standard™

Tilt-up concrete construction

Originated as AS 3850.1—1990, AS 3850.2—1990 and AS 3850.3—1992.
AS 3850.1—1990, AS 3850.2—1990 and AS 3850.3—1992 revised,
amalgamated and redesignated as AS 3850—2003.

COPYRIGHT

© Standards Australia International

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher.

Published by Standards Australia International Ltd
GPO Box 5420, Sydney, NSW 2001, Australia

ISBN 0 7337 5337 X

PREFACE

This Standard was prepared by the Standards Australia Committee BD-066, Tilt-up Construction, to supersede AS 3850.1—1990, *Tilt-up concrete and precast concrete elements for use in buildings Part 1: Safety requirements*, AS 3850.2—1990, *Tilt-up concrete and precast concrete elements for use in buildings Part 2: Guide to design, casting and erection of tilt-up panels* and AS 3850.3—1992 *Tilt-up concrete and precast concrete elements for use in buildings Part 3: Guide to the erection of precast concrete members* in response to the call from industry to update them and regulatory authorities to expand the requirements relating to safety. The Standard is to be read in conjunction with AS 3600, *Concrete structures*.

Although the Standard has been written primarily to address the construction of concrete buildings using ‘tilt-up’ panels, the rules may be appropriate for other forms of precast concrete construction.

A ‘Tilt-up’ panel is defined as ‘an essentially flat concrete panel; cast in a horizontal position, usually on-site; initially lifted by rotation about one edge until in a vertical or near-vertical position; transported and lifted into position if necessary; and then stabilized by bracing members until incorporated into the final structure’.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

In the Standard where the word ‘shall’ is used a mandatory requirement is implied and where the word ‘should’ is used the requirement is advisory.

This document includes commentary on some of the clauses of the Standard. The commentary directly follows the relevant clause, is designated by ‘C’ preceding the clause number and is printed in italics in a box. The commentary is for information and guidance and does not form part of the Standard.

CONTENTS

	<i>Page</i>
SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE.....	5
1.2 REFERENCED DOCUMENTS.....	5
1.3 DEFINITIONS.....	6
1.4 NOTATION.....	9
1.5 USE OF LIMIT STATES DESIGN	9
SECTION 2 MATERIALS, COMPONENTS AND EQUIPMENT	
2.1 GENERAL.....	10
2.2 WORKING LOAD LIMIT (WLL)	10
2.3 MATERIALS.....	11
2.4 LIFTING, BRACING AND FIXING INSERTS.....	11
2.5 RE-USABLE LIFTING EQUIPMENT	16
2.6 BRACES.....	16
2.7 LEVELLING PADS AND SHIMS	17
2.8 CRANE AND RIGGING EQUIPMENT	17
2.9 PROPRIETARY DOCUMENTATION	18
SECTION 3 DESIGN AND DOCUMENTATION	
3.1 GENERAL.....	19
3.2 PREPLANNING.....	19
3.3 DESIGN STAGES.....	19
3.4 BUILDING STABILITY.....	20
3.5 DESIGN OF PANEL	20
3.6 JOINT WIDTHS.....	24
3.7 FOOTINGS.....	24
3.8 CONNECTIONS	25
3.9 STRONGBACKS	25
3.10 DOCUMENTATION.....	26
3.11 TOLERANCES.....	29
SECTION 4 CASTING	
4.1 GENERAL.....	31
4.2 LAYOUT.....	31
4.3 CASTING BED	31
4.4 FORMWORK.....	31
4.5 COMPACTION OF CONCRETE.....	31
4.6 CURING AND RELEASE AGENTS	31
4.7 LIFTING, BRACING AND FIXING INSERTS.....	31
4.8 WELDING.....	32
4.9 TILT-UP PANEL IDENTIFICATION AND ORIENTATION.....	32
4.10 INSPECTION	32
SECTION 5 TRANSPORT, CRANAGE AND ERECTION	
5.1 TRANSPORT	33
5.2 STORAGE AND MULTIPLE HANDLING	34
5.3 CRANES AND RIGGING.....	35
5.4 ERECTION.....	38
5.5 DAMAGE AND REPAIR.....	43

	<i>Page</i>
SECTION 6 TEMPORARY BRACED CONDITION	
6.1 DESIGN OF TEMPORARY BRACING FOR PANELS	44
6.2 INSTALLATION AND INSPECTION OF TEMPORARY BRACING	45
6.3 SUPERIMPOSED LOADS.....	46
6.4 LEVELLING PADS AND SHIMS	46
6.5 GROUTING OF THE BASE	47
SECTION 7 INCORPORATION INTO FINAL STRUCTURE	
7.1 FIXING TO FINAL STRUCTURE	48
7.2 INSPECTION PRIOR TO REMOVAL OF BRACES	48
7.3 REMOVAL OF BRACES.....	48
APPENDICES	
A TESTING OF MATERIALS AND COMPONENTS USED WITH TILT-UP PANELS	49
B MEANS FOR DEMONSTRATING COMPLIANCE WITH THIS STANDARD	57

STANDARDS AUSTRALIA

Australian Standard
Tilt-up concrete construction

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard sets out the requirements for the planning, design, casting, transportation and erection of tilt-up panels. Tilt-up panels are essentially flat concrete panels; cast in a horizontal position, usually on-site; initially lifted by rotation about one edge until in a vertical or near-vertical position; transported and lifted into position if necessary; and then stabilized by bracing members until incorporated into the final structure.

This Standard does not apply to other precast concrete members such as columns, beams, flooring panels and façade panels that are not rotated about one edge and/or temporarily braced before being incorporated into the final structure.

CI.1 Tilt-up construction has traditionally involved casting flat concrete panels on-site adjacent to their final location in the permanent structure.

Panels for these buildings can also be cast off-site in which case the design and erection requirements including those for cast-in lifting and fixing inserts apply.

It is, therefore, the intent of this document to cover all panels that are cast in a horizontal position and initially lifted by rotation about one edge and stabilized by bracing members until incorporated into the final structure. The operative words in this definition are 'essentially flat' and 'stabilized by bracing members'.

Tilt-up panels may include elements with textured finishes, tapered edges or return corners.

The Standard has been written assuming any task or function specified in this Standard will be carried out by, or under the supervision of, a suitably experienced and competent person.

This Standard is intended to be read in conjunction with AS 3600.

This form of construction is most vulnerable during the period when the panels are erected and are in the braced position before being incorporated into the final structure: this Standard provides specific recommendations aimed at minimising failure/collapse during this time.

1.2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- 1100.501 Technical drawing—Structural engineering drawing
- 1012 Methods of testing concrete (all parts)
- 1110 ISO metric precision hexagon bolts and screws (all parts)