

SINGAPORE STANDARD

Code of practice for supervision of structural works



Published by

Enterprise
Singapore

SS 515 : 2005
(ICS 91.080)

SINGAPORE STANDARD

Code of practice for supervision of structural works

All rights reserved. Unless otherwise specified, no part of this Singapore Standard may be reproduced or utilised in any form or by any means, electronic or mechanical, including photocopying and microfilming, without permission in writing from Enterprise Singapore. Request for permission can be sent to: standards@enterprisesg.gov.sg.

ISBN 981-4154-16-4

This Singapore Standard was approved by Building and Construction Standards Committee on behalf of the Standards Council of Singapore on 30 September 2005.

First published, 2005

The Building and Construction Standards Committee appointed by the Standards Council consists of the following members:

	Name	Capacity
Chairman	: Mr Goh Peng Thong	<i>Member, Standards Council</i>
1st Dy Chairman	: Dr Tam Chat Tim	<i>Member, Standards Council</i>
2nd Dy Chairman	: Mr Tan Tian Chong	<i>Member, Standards Council</i>
Secretary 1	: Mr Kenneth Lim See Khoon	<i>SPRING Singapore</i>
Secretary 2	: Ms Lee Hiok Hoong	<i>SPRING Singapore</i>
Members	: Mr Boo Geok Kwang	<i>Singapore Civil Defence Force</i>
	Mr Chan Kok Way	<i>Individual Capacity</i>
	Dr Jimmy Chen Wie Ying	<i>Individual Capacity</i>
	Mr Chin Jen Chyi	<i>Building and Construction Authority</i>
	Mr Chong Kee Sen	<i>Institution of Engineers Singapore</i>
	Mr Paul Fok	<i>Land Transport Authority</i>
	Mr Desmond Hill	<i>Singapore Contractors Association Limited</i>
	Mr Joseph Lai Kuong Kiu	<i>JTC Corporation</i>
	Mr Benedict Lee Khee Chong	<i>Singapore Institute of Architects</i>
	Assoc Prof Leong Eng Choon	<i>Nanyang Technological University</i>
	Mr Larry Ng Lye Hock	<i>Urban Redevelopment Authority</i>
	Assoc Prof Gary Ong Khim Chye	<i>National University of Singapore</i>
	Er. See Sing Kok	<i>Singapore Manufacturers' Federation</i>
	Er. Shum Chee Hoong	<i>Housing & Development Board</i>
	Dr Tan Guan	<i>Association of Consulting Engineers, Singapore</i>

The Technical Committee on Construction Management appointed by the Building and Construction Standards Committee and responsible for the preparation of this standard consists of representatives from the following organisations:

	Name	Capacity
Chairman	: Mr Desmond Hill	<i>Member, Building Construction Standards Committee</i>
Secretary	: Ms Lee Hiok Hoong	<i>SPRING Singapore</i>
Members	: Assoc Prof Prof Chan Weng Tat	<i>National University of Singapore</i>
	Mr Hashim Bin Mansoor	<i>Ministry of Manpower</i>
	Er. Low Kam Fook	<i>Institution of Engineers Singapore</i>

Members	:	Mr Ng Ek Cheong	<i>Defence Science & Technology Agency</i>
		Er. Ng Say Cheong	<i>Housing & Development Board</i>
		Mr Tan Boon Kee	<i>Building and Construction Authority</i>
		Mr Tan Yew Meng	<i>Singapore Polytechnic</i>
		Assoc Prof Robert Tiong Lee Kong	<i>Nanyang Technological University</i>
		Mr Yap Boon Leong	<i>Land Transport Authority</i>
		Mr Yeang Hoong Goon	<i>CPG Corporation Pte Ltd</i>
Co-opted member	:	Mr Chan Kok Way	<i>Individual Capacity</i>

The Working Group appointed by the Technical Committee to assist in the preparation of this standard comprises the following experts who contribute in their *individual capacity*:

	Name
Convenor	: Er. Lim Kim Cheong
Immediate past Convenor	: Assoc Prof Lim Ewe Chye
Secretary	: Mr Christopher Ow
Members	: Mr Lee Chian Heng
	Er. Ng Ah Hiap
	Ms Phua Hui Chun
	Er. Shum Chee Hoong
	Mr Tan Swee Hong
	Er. Tham Poh Kuan
	Mr Wasis Haji Jamil

The experts of the Working Group are nominated / recommended by the following organisations:

Association of Consulting Engineers, Singapore

Building and Construction Authority

Nanyang Technological University

Housing & Development Board

Institution of Engineers Singapore

Land Transport Authority

L & M Concrete Specialists Pte Ltd

Lim Kim Cheong Consultants

Singapore Contractors Association Ltd

Contents

	Page
Foreword _____	9

CLAUSES

Section One – General	
1.1 Scope _____	10
1.2 Statutory requirements _____	10
1.3 Normative reference _____	10
Section Two – Shallow foundation	
2.1 Scope _____	10
2.2 Pre-condition survey _____	10
2.3 Setting out _____	11
2.4 Safety of excavation _____	11
2.5 Trial pits _____	11
2.6 Inspection of founding soil layer _____	11
2.7 Soil bearing pressure tests _____	11
2.8 Existing structures and services _____	11
2.9 Over excavation _____	12
2.10 Dewatering _____	12
2.11 Excavated materials _____	12
2.12 Standard checklist for shallow foundation _____	12
2.13 Backfilling _____	12
Section Three – Piling works	
3.1 Scope _____	13
3.2 General _____	13
3.3 Setting performance criteria and tolerances _____	13
3.4 Pile schedules and drawings _____	13
3.5 Ground conditions _____	13
3.6 Setting out _____	13
3.7 Piling method _____	13
3.8 Safety, nuisance and damage _____	13
3.9 Noise nuisance _____	14
3.10 Damage to adjacent structures _____	14
3.11 Damage to piles _____	14

	Page
3.12 Damage to underground services _____	14
3.13 Displacement piles _____	14
3.14 Non-displacement piles and support fluids _____	15
3.15 Testing piles _____	15
3.16 Instrumentation for piles _____	15
 Section Four – Insitu concrete	
4.1 Scope _____	23
4.2 Production of concrete _____	23
4.3 Transportation and placing of concrete _____	24
4.4 Compaction of concrete by vibration _____	24
4.5 Curing and protection of concrete _____	24
4.6 Reinforcement _____	25
4.7 Formwork and temporary supports _____	25
 Section Five – Precast concrete	
5.1 Scope _____	28
5.2 Safety requirements _____	28
5.3 Definitions _____	28
5.4 Planning _____	29
5.5 Materials, components and equipment _____	30
5.6 Design and construction of precast element _____	30
5.7 Transport to site _____	31
5.8 Unloading and erection _____	31
5.9 Drawings _____	34
5.10 Tolerances and clearances _____	35
5.11 Connections _____	36
5.12 Grouts, mortars and drypack _____	36
5.13 Delivery of precast members _____	37
5.14 Erection of members _____	37
5.15 Waterproofing _____	41
5.16 Completion of works _____	41
 Section Six – Prestressing of concrete	
6.1 Scope _____	43
6.2 Construction drawings _____	43
6.3 Shop drawings _____	43
6.4 Equipment _____	44
6.5 Materials delivery and site storage _____	44

	Page
6.6 Prestressing works _____	44
6.7 Safe work procedure _____	44
Section Seven – Structural steelworks	
7.1 Scope _____	48
7.2 Quality of structural works _____	48
7.3 Copies of orders _____	49
7.4 Marking of steel _____	49
7.5 Manufacturer's mill certificate _____	49
7.6 Storage, handling and transportation _____	49
7.7 Shop drawing and quality plan _____	49
7.8 Fabrication _____	50
7.9 Assembly and erection _____	50
7.10 Welding _____	51
7.11 Bolting _____	52
7.12 Riveting _____	53
7.13 Inspection _____	53
7.14 Inspection and Testing Agency (ITA) _____	53
7.15 Load testing _____	53
7.16 Protection against corrosion _____	54
7.17 Surface preparation _____	54
7.18 Fire protection _____	54
Section 8 – Structural timber	
8.1 Scope _____	56
8.2 Types of structural timber _____	56
8.3 Defects _____	56
8.4 Preservative treatments _____	57
8.5 Storage and handling _____	57
8.6 Site assembly and erection _____	59
8.7 Joints and fasteners _____	60
ANNEX	
A Normative reference _____	61

CHECKLISTS

1	Displacement pile _____	16
2	Driven pile record _____	17
3	Non-displacement pile record _____	18
4	Static pile load test using kentledge stack _____	19
5	Pile load test record _____	22
6	Inspection before concreting _____	26
7	Precast component erection _____	42
8	Inspection before concreting of prestressed concrete structures _____	45
9	Inspection before stressing of tendons _____	47
10	Steel work inspection _____	55

TABLE

7.1	Performance requirements of structural steel _____	48
-----	--	----

FIGURE

1	Timber defects _____	58
---	----------------------	----

Foreword

This Code of Practice was prepared by the Working Group on Supervision of Structural Works under the direction of the Technical Committee on Construction Management. The Technical Committee is under the purview of the Building and Construction Standards Committee.

This Code provides guidance on the supervision of structural works. It covers good practices in supervision of shallow foundations, piling works, insitu concrete, precast concrete, prestressing of concrete, structural steelworks and structural timber. Adequate and proper supervision of structural works can minimise construction errors and improve productivity at construction worksites.

This code does not preclude the adherence to the relevant Authorities' Acts and Regulations. Compliance with this Code does not imply compliance with the relevant Authorities' Acts and Regulations.

Attention is drawn to the possibility that some of the elements of this Singapore Standard may be the subject of patent rights. Enterprise Singapore shall not be held responsible for identifying any or all of such patent rights.

NOTE

1. *Singapore Standards (SSs) and Technical References (TRs) are reviewed periodically to keep abreast of technical changes, technological developments and industry practices. The changes are documented through the issue of either amendments or revisions.*
2. *An SS or TR is voluntary in nature except when it is made mandatory by a regulatory authority. It can also be cited in contracts making its application a business necessity. Users are advised to assess and determine whether the SS or TR is suitable for their intended use or purpose. If required, they should refer to the relevant professionals or experts for advice on the use of the document. Enterprise Singapore shall not be liable for any damages whether directly or indirectly suffered by anyone or any organisation as a result of the use of any SS or TR.*
3. *Compliance with a SS or TR does not exempt users from any legal obligations.*

Code of practice for supervision of structural works

Section One – General

1.1 Scope

This code of practice provides guidance on the supervision of structural works at construction sites. It gives the minimum requirements for supervision of structural works. For specific projects, more stringent requirements may be set by the Project PE. The Project PE is the Professional Engineer in-charge of structural works for Design and / or Supervision.

This code covers the supervision of shallow foundations, piling works, insitu concrete, precast concrete, prestressing of concrete, structural steelworks and structural timber. It does not cover temporary works. Compliance with this code does not imply compliance with relevant statutory and legal requirements.