Singapore Standards Council

SS 637 : 2018
(ICS 91.120.30)

SINGAPORE STANDARD

Code of practice for waterproofing of reinforced concrete buildings

[Formerly CP 82]

Published by
Enterprise Singapore

SS 637 : 2018
(ICS 91.120.30)

SINGAPORE STANDARD

Code of practice for waterproofing of reinforced concrete buildings

ISBN 978-981-47-8495-5

This Singapore Standard was approved by the Building and Construction Standards Committee on behalf of the Singapore Standards Council on 26 March 2018.

First published as CP82, 1999
First revision and re-designated as SS 637, 2018

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

		Name	Capacity
Chairman	:	Ar. Chan Kok Way	*Individual Capacity*
Deputy Chairman	:	Er. Clement Tseng	*Building and Construction Authority*
Secretary	:	Ms Amy Sim	*The Institution of Engineers, Singapore – Standards Development Organisation*
Members	:	Mr Bin Chee Kwan	*National Environment Agency*
		Er. Chan Ewe Jin	*The Institution of Engineers, Singapore*
		Mr Shawn Chan	*Singapore Manufacturing Federation*
		Er. Chee Kheng Chye	*Housing & Development Board*
		Mr Chng Chee Beow	*Real Estate Developers' Association of Singapore*
		Mr Dominic Choy	*Singapore Contractors Association Limited*
		Er. Paul Fok	*Land Transport Authority*
		Mr Goh Ngan Hong	*Singapore Institute of Surveyors and Valuers*
		Mr Desmond Hill	*Individual Capacity*
		Prof Ho Puay Peng	*National University of Singapore*
		Ar. William Lau	*Individual Capacity*
		Er. Lee Chuan Seng	*Individual Capacity*
		Ar. Benedict Lee Khee Chong	*Singapore Institute of Architects*
		Assoc Prof Leong Eng Choon	*Nanyang Technological University*
		Mr Darren Lim	*Building and Construction Authority*
		Dr Lim Lan Yuan	*Association of Property and Facility Managers*
		Er. Lim Peng Hong	*Association of Consulting Engineers Singapore*
		Er. Mohd Ismadi	*Ministry of Manpower*
		Ms Kay Pungkothai	*National Parks Board*
		Er. Yvonne Soh	*Singapore Green Building Council*
		SAC Christopher Tan	*Singapore Civil Defence Force*
		Er. Tang Pei Luen	*JTC Corporation*
		Mr Young Joo Chye	*PUB, Singapore's National Water Agency*

The Technical Committee on Architectural Works, 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	:	Ar. Benedict Lee Khee Chong	*Individual Capacity*
Deputy Chairman	:	Ar. Lim Choon Keang	*Individual Capacity*
Secretary	:	Ms Annie Lim	*The Institution of Engineers, Singapore – Standards Development Organisation*
Members	:	Mr Chang Jun Biao	*Urban Redevelopment Authority*
		Ar. Cheah Kok Ming	*National University of Singapore*
		Er. Chua Chim Huee	*The Institute of Engineers, Singapore*
		Ar. Vivien Heng Cheng Sim	*Singapore Green Building Council*
		Ar. Lau Kwong Chung	*Singapore Institute of Architects*
		Mr Rodney Lee	*Singapore Manufacturing Federation*
		Mr Johnny Lim	*Singapore Contractors Association Ltd*
		MAJ Lim Lam Kwang	*Singapore Civil Defence Force*
		Mrs Ong-Koh Wee Nah	*Land Transport Authority*
		Ms Phong Chong Teng	*JTC Corporation*
		Mr Rajendran Ramamoorthy	*Building and Construction Authority*
		Er. Sivakumaran Murugesu	*Association of Consulting Engineers Singapore*
		Ms Tan Hwee Yong	*Housing & Development Board*
Co-opted Members	:	Mr Chan Chee Keong	*Individual Capacity*
		Er. Koh Beng Thong	*Individual Capacity*
		Mr Mok Kwong Wah	*Individual Capacity*
		Mr Wong Chung Wan	*Individual Capacity*

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	:	Mr Goh Chun Hee
Members	:	Mr Glen Copsey
		Mr Gilbert Lau
		Mr Alfred Lim
		Mr Salim Suwignjo
		Mr Tan Tian Hoe
		Mr Wong Chee Hong
		Mr Danniel Yong Kuan Hoong

The organisations in which the experts of the Working Group are involved are:

Building and Construction Authority
Fast Flow Systems Pte Ltd
Housing & Development Board
Land Transport Authority
SETSCO Services Pte Ltd
Singapore Contractors Associated Ltd
TUV SUD PSB Pte Ltd
Waterproofing Trades Association Singapore

Contents

Foreword

This Singapore Standard was prepared by a Working Group appointed by the Technical Committee on Architectural Works under the direction of the Building and Construction Standards Committee. It is a revision of CP 82:1999 – "Code of practice for waterproofing of reinforced concrete buildings". CP 82 has been re-designated as SS 637.

Leakages in buildings could affect the functional use of buildings and cause inconvenience to the occupants. Particularly under the local climatic conditions where there is high relative humidity and heavy rainfall, the building components that are prone to water seepage need to be adequately protected against rainwater penetration and ingress of water. Careful considerations during the building design and construction stage are therefore essential to ensure watertightness of the building.

The code recommends good engineering practice for the design, selection and installation of suitable types of waterproofing systems for reinforced concrete buildings in tropical climate. It covers prevalent waterproofing practices, systems and materials with due consideration given to the ease of application and site control.

The code recognises that the durability and effectiveness of the waterproofing of a building depends not only on the design and workmanship of appropriate waterproofing systems but also the design and construction of the building. The code therefore highlights relevant considerations in design and construction, which would enhance the watertightness and durability of the waterproofing system.

With the advent of new and improved waterproofing systems and products, the code hence intentionally provides the recommendations to be of sufficient detail and allow flexibility for adopting new and improved waterproofing practices.

The recommendations given in this code are not necessarily comprehensive. Particular project documents may need to cover recommendations not dealt with by this code. Relevant publications or standards may also be referred to for waterproofing of special areas and structures not covered by this code.

Included in Annex A (informative) is a list of commonly available materials referred to in this code.

This revision brings the standard up-to-date and comprehensive by incorporating recommendations made in the latest relevant local and overseas standards. The main revisions are

a) Waterproofing system datasheet outlining the important criteria in specification and selection of waterproofing system has been added to the standard.

b) Waterproofing ponding test requirement has been extended from 12 hours to 24 hours.

c) Considerations of water table and sub-surface drainage requirements have been added.

d) Good practices on waterproofing for external walls have been added to the standard.

e) The section on waterproofing for pre-cast concrete elements has been simplified as this topic is covered in CP 81:1999 – "Code of practice for precast concrete slab and wall panels".

f) Recommendations on waterproofing for green roof and roof top garden have been added.

Acknowledgement is made to the following organisations for their permission to reproduce materials from their publications:

BSI Standards Limited	BS 8102:2009 Code of practice for protection of below ground structures against water from the ground (Figure 2, Figure 3, Table 1, Table 2, and Clauses 6.2.3 and 6.4 into Figures 2 to 5, Table 2, and Clauses 5.3 and 5.4 of SS 637) Permission to reproduce extracts from British Standards is granted by BSI Standards Limited (BSI). No other use of this material is permitted.
Building and Construction Authority	BCA CONQUAS Enhancement Series – Good industry practices – Waterproofing for external wall (Clauses 2.2, 2.4.1, 2.4.4, 2.4.6, 2.4.7, 2.5.3 and 3.3 into Clauses 8.1, 8.2.1, 8.2.5, 8.2.6, 8.2.7 and 8.3.1 of SS 637)
Centre for Urban Greenery and Ecology (CUGE) of National Parks Board	CS E05:2012 Guidelines on waterproofing layer for rooftop greenery (Clauses 1.3, 1.4, 1.4.1 to 1.4.3, 2.1.5, 2.1.6 and 2.2.1 into Clauses 11.1, 11.2, 11.2.1 to 11.2.6 and 11.4.1 to 11.4.3 of SS 637)
© IHS Markit	GBG 72 Basement construction and waterproofing, Part 1 : Site investigation and preparation (Figure 4 as Figure 6 of SS 637)

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 waterproofing of reinforced concrete buildings

0 Introduction

Concrete is not always completely impermeable to water and may develop cracks after placement. It is sometimes necessary to cover the concrete surface with a waterproofing material.

Many waterproofing systems are available in the market. The decision whether to use a specific waterproofing system and its selection should be made when the concrete structure is being designed.

There are many factors that affect the performance of waterproofing systems, including the method of placement, consolidation and curing of concrete. Surface cleanliness is also a major factor affecting adhesion and subsequent performance. Weather conditions such as rain, humidity and temperature can affect the quality of the application and subsequent performance.

It is important to recognise that the selection, placement, installation and inspection of a waterproofing system can be dominated by economic considerations. There may be a tendency to select and install a waterproofing system that has the lowest initial cost. This may result in a poorer performance. In addition to initial cost, attention should be paid to the cost of repairing or replacing the waterproofing system, should it fail prematurely, and other costs associated with such a failure.

The application of a waterproofing system requires extreme care and strict adherence to the manufacturer's recommended procedures. Poor or careless workmanship can result in leaks that are difficult and costly to repair.

Waterproofing works should be carried out by a competent applicator. Care should be taken to ensure that the surface preparation and application of waterproofing systems are done in accordance with the manufacturer's specifications. Where a barrier system is used, inspection should commence before the barrier is installed and the final inspection should be made after the barrier has been placed.

1 Scope

This Code of Practice covers systems commonly used for waterproofing of reinforced concrete buildings. It contains sections on waterproofing of basement, floor, wall, roof and precast concrete element.

It provides guidance on waterproofing against water with or without hydrostatic pressure and against moisture from the ground.

2 Normative references

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

SS EN 1992 Series	Eurocode 2 – Design of concrete structures
SS EN 1992-1-1	Eurocode 2 – Design of concrete structures – Part 1-1: General rules and rules for buildings
SS EN 1992-3	Eurocode 2 – Design of concrete structures – Part 3: Liquid retaining and containment structures