

SINGAPORE STANDARD
Specification for fire doors



Published by

**Enterprise
Singapore**

SS 332 : 2018

(ICS 13.220.50; 91.060.50)

SINGAPORE STANDARD

Specification for fire doors

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 978-981-48-3545-9

This Singapore Standard was approved on 3 December 2018 by the Building and Construction Standards Committee under the purview of the Singapore Standards Council.

First published, 1988
 First revision, 2000
 Second revision, 2007
 Third revision, 2018

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

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

The Technical Committee on Architectural Works appointed by the Building and Construction Standards Committee to oversee the preparation of this standard, consists of representatives from the following organisations:

	Name	Capacity
Chairman	: Ar. Benedict Lee	<i>Individual Capacity</i>
Deputy Chairman	: Ar. Lim Choon Keang	<i>Individual Capacity</i>
Secretary	: Ms Annie Lim	<i>The Institution of Engineers, Singapore – Standards Development Organisation</i>
Members	: Mr Chang Jun Biao	<i>Urban Redevelopment Authority</i>
	Ar. Cheah Kok Ming	<i>National University of Singapore</i>
	Er. Chua Chim Huee	<i>The Institution of Engineers, Singapore</i>
	Ar. Vivien Heng Cheng Sim	<i>Singapore Green Building Council</i>
	Ar. Lau Kwong Chung	<i>Singapore Institute of Architects</i>
	Mr Rodney Lee	<i>Singapore Manufacturing Federation</i>
	Mr Johnny Lim	<i>Singapore Contractors Association Ltd</i>
	MAJ Lim Lam Kwang	<i>Singapore Civil Defence Force</i>
	Er. Sivakumaran Murugesu	<i>Association of Consulting Engineers Singapore</i>
	Mrs Ong-Koh Wee Nah	<i>Land Transport Authority</i>
	Ms Phong Chong Teng	<i>JTC Corporation</i>
	Mr Rajendran Ramamoorthy	<i>Building and Construction Authority</i>
	Ms Tan Hwee Yong	<i>Housing & Development Board</i>
Co-opted Members	: Mr Chan Chee Keong	<i>Individual Capacity</i>
	Er. Koh Beng Thong	<i>Individual Capacity</i>
	Ar. Mok Kwong Wah	<i>Individual Capacity</i>
	Mr Wong Chung Wan	<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	: Mr See Sing Mun
Members	: Mr Cheong Soon Huat
	Mr Joseph Chng
	Mr Glen Copsey
	Ms Vivian Lam Yee
	Mr Rodney Lee
	Mr Tan Hong Choon
	Mr Thomas Tng
	MAJ Yam Yeow Kiat
	Mr Victor Yau

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

dormakaba Singapore Pte Ltd
Housing & Development Board
Land Transport Authority
SALTO Systems Asia Pte Ltd
Setsco Services Pte Ltd
Singapore Civil Defence Force
Singapore Manufacturing Federation
Singco (Private) Limited
Swiss+Locks
TÜV SÜD PSB Pte Ltd

Contents

	Page
Foreword _____	8
1 Scope _____	10
2 Normative references _____	10
3 Terms and definitions _____	11
4 Design requirements _____	16
5 Determination of fire resistance rating _____	21
6 Hardware requirements and test methods _____	22
7 Variation from prototype _____	23
8 Installation _____	28
9 Marking _____	31
10 Responsibility of building manufacturer/owner (or representative) _____	33
11 Maintenance information system _____	35

Annexes

A Fire doors and their hardware _____	37
B Fire resistance test: Requirements and test methods – BS EN 1634-1 _____	42
C Controlled door closing devices: Requirements and test methods – BS EN 1154 _____	43
D Locks and latches – Electromechanically operated locks and striking plates: Requirements and test methods – BS EN 14846 _____	45
E Door coordinator devices: Requirements and test methods – BS EN 1158 _____	47
F Door bolts: Requirements and test methods – BS EN 12051 _____	49
G Building hardware – Lever handles and knob furniture: Requirements and test methods – BS EN 1906 _____	51
H Mechanical locks and latches: Requirements and test methods – BS EN 12209 _____	53
I Emergency exit devices: Requirements and test methods – BS EN 179 _____	55
J Panic exit devices: Requirements and test methods – BS EN 1125 _____	60
K Single-axis hinges: Requirements and test methods – BS EN 1935 _____	66
L Electrically powered hold-open devices for swing doors: Requirements and test methods – BS EN 1155 _____	68
M Cylinders for locks: Requirements and test methods – BS EN 1303 _____	71
N Mechatronic cylinders: Requirements and test methods – BS EN 15684 _____	73
O Calculation for the forces of closing sliding doors _____	75
P Methods of fixing fire door frames to existing walls _____	76
Q Identification tags _____	82

		Page
R	An example of a fire door certificate _____	83
S	An example of a schedule of evidence of compliance _____	84
T	Maintenance logbook _____	85

Tables

1	Recommended door size _____	19
2	List of standards for hardware use on fire door _____	23
3	Limitation to size variations _____	24
A.1	Fire door hardware requirements for typical applications _____	39
L.1	Test requirements _____	69

Figures

1	Terms relating to side-hung fire doors _____	13
2	Terms relating to locksets in side-hung fire doors _____	14
3	Terms relating to sliding fire doors _____	15
4	Clearance between door leaf and frame or finished floor _____	18
5	Form of directional arrow for sliding fire doors _____	21
6	Fire door frames fixed during wall construction _____	31
C.1	Illustrations of door closing devices _____	44
D.1	Illustrations of electromechanically operated locks and striking plate _____	46
E.1	Illustrations of door coordinators _____	48
F.1	Illustrations of single point door bolts _____	50
G.1	Illustrations of lever handles and knob furniture _____	52
H.1	Illustrations of mechanical locks and latches _____	54
I.1	Illustration of a Type A emergency exit device _____	56
I.2	Illustration of a Type B emergency exit device _____	57
I.3	Illustrations of emergency exit devices _____	59
J.1	A panic situation _____	60
J.2	Type A panic exit device _____	61
J.3	Type B panic exit device _____	61
J.4	Type A and Type B panic exit devices _____	61
J.5	Overall projection of panic exit device from door face _____	62
J.6	Illustrations of panic exit devices _____	63
K.1	Illustrations of single-axis hinges _____	67
L.1	Illustrations of hold-open devices and hold-open mechanisms _____	69
M.1	Illustrations of cylinders for locks _____	72
N.1	Illustrations of mechatronic cylinders for locks _____	74

	Page
P.1 Fixing of frames using hairpin anchors _____	78
P.2 Fixing of frames using threaded anchors _____	79
P.3 Fixing of frames using weld anchors for single-leaf door _____	80
P.4 Fixing of frames using weld anchors for double-leaf door _____	81
T.1 An example of logbook details _____	85

Foreword

This Singapore Standard was prepared by the Working Group appointed by the Technical Committee on Architectural Works which is under the purview of the Building and Construction Standards Committee.

It is a revision of SS 332 : 2007, "Specification for fire doors".

This standard covers the installation and construction of the fire door assemblies. The requirements specified in this standard generally refer to materials and assemblies, which, through field experience, have been found acceptable for such application.

The major revisions made in the standard are as follows:

- a) The test standards for various hardware are extended to include mechatronic cylinder and electromechanical lockset. All hardware tests are in accordance to European Standard (EN).
- b) The fire resistance test is in accordance to BS EN 1634-1.
- c) The inclusion of a clause for double acting glazed doorset to incorporate fire seals around perimeter of door panels, except the bottom edge.
- d) The inclusion of maximum force requirement for door closer to facilitate door opening.

In preparing this standard, reference was made to the following publications:

AS 1530.4	Methods for fire tests on building materials, components and structure – Part 4: Fire-resistance tests of elements of construction
BS 476-4	Fire tests on building materials and structures – Part 4: Non-combustibility test for materials
BS 476-11	Fire tests on building materials and structures – Part 11: Method for assessing the heat emission from building materials
BS 476-22	Fire tests on building materials and structures – Part 22: Method for determination of the fire resistance of non-loadbearing elements of construction
BS EN 1363-1	Fire resistance tests – Part 1: General requirements
BS EN 1363-2	Fire resistance tests – Part 2: Alternative and additional procedures
BS EN 1634-1	Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware – Part 1: Fire resistance test for door and shutter assemblies and openable windows
BS EN 13637	Building hardware – Electrically controlled exit systems for use on escape routes – Requirements and test methods
ISO 3008:2007	Fire-resistance tests – Door and shutter assemblies

Permission has been sought for the reproduction of materials from the following organisations:

Standards Australia Limited

1. AS 1905 Components for the protection of openings in fire-resistant walls – Fire-resistant doorsets

Copyright remains with Standards Australia Limited.

CEN – European Committee for Standardization

2. EN 179 Building hardware – Emergency exit devices operated by a lever handle or push pad, for use on escape routes – Requirements and test methods
3. EN 1125 Building hardware – Panic exit devices operated by a horizontal bar, for use on escape routes – Requirements and test methods
4. EN 1634-1 Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware – Part 1: Fire resistance test for door and shutter assemblies and openable windows

Copyright remains with CEN.

Acknowledgement is made for the use of information from the above organisations.

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.*

Specification for fire doors

1 Scope

This standard specifies requirements for the construction and installation of fire-resistant doorsets used to protect openings in walls and partitions, which are required to resist the passage of fire. Manufacturers of fire-resistant doorsets are strongly encouraged to implement a quality control system in accordance with ISO 9001 / ISO 9002.

This standard also applies to transom panels over 0.5 h fire-rated doors, where the panels are contained within the door frame and form part of the doorset. A panel above a doorset, which is not contained within the door frame, is considered as being part of the wall and is therefore subject to the stability, integrity and insulation requirements set out in accordance with applicable statutory and regulatory requirements. A transom within a door frame may be permanently fixed to the side members of the frame or may be removable by means of mechanical fixing.

This standard does not apply to lift-landing doors.

Materials for floor coverings that extend through a fire-resistant doorset opening are not within the scope of this standard.

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.

BS 476-4	Fire tests on building materials and structures – Part 4: Non-combustibility test for materials
BS 476-11	Fire tests on building materials and structures – Part 11: Method for assessing the heat emission from building materials
BS EN 179	Building hardware – Emergency exit devices operated by a lever handle or push pad, for use on escape routes – Requirements and test methods
BS EN 1125	Building hardware – Panic exit devices operated by a horizontal bar, for use on escape routes – Requirements and test methods
BS EN 1154	Building hardware – Controlled door closing devices – Requirements and test methods
BS EN 1155	Building hardware – Electrically powered hold-open devices for swing doors – Requirements and test methods
BS EN 1158	Building hardware – Door coordinator devices – Requirements and test methods
BS EN 1303	Building hardware – Cylinders for locks – Requirements and test methods
BS EN 1634-1	Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware – Fire resistance test for door and shutter assemblies and openable windows

BS EN 1906	Building hardware – Lever handles and knob furniture – Requirements and test methods
BS EN 1935	Building hardware – Single-axis hinges – Requirements and test methods
BS EN 12051	Building hardware – Door and window bolts – Requirements and test methods
BS EN 12209	Building hardware – Locks and latches – Mechanically operated locks, latches and locking plates – Requirements and test methods
BS EN 14846	Building hardware – Locks and latches – Electromechanically operated locks and striking plates – Requirements and test methods
BS EN 15684	Building hardware – Mechatronic cylinders – Requirements and test methods