

**SINGAPORE STANDARD**

# **Code of practice for electrical installations**

[Formerly CP 5]



Published by

**Enterprise  
Singapore**

**SS 638 : 2018**

(ICS 29.020; 91.140.50)

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SINGAPORE STANDARD

**Code of practice of electrical installations**

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ISBN 978-981-48-3515-2

This Singapore Standard was approved on 17 September 2018 by the Electrical and Electronic Standards Committee under the purview of the Singapore Standards Council.

First published as CP 5, 1977

First revision, 1988

Second revision, 1998

Third revision and re-designated as SS 638, 2018

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*Energy Market Authority*

*Housing & Development Board*

*Institute of Technical Education*

*JTC Corporation*

*Land Transport Authority*

*Ngee Ann Polytechnic*

*Singapore Electrical Contractors and Licensed Electrical Workers Association*

*Singapore Electrical Trades Association*

*Singapore Polytechnic*

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## National Foreword

This Singapore Standard was prepared by the Working Group on Electrical Installations appointed by the Technical Committee on Power System and Utilisation under the direction of the Electrical and Electronic Standards Committee.

This Code is a revision of Singapore Standard CP 5 : 1998 “Code of practice for electrical installations” and has been re-designated as SS 638 : 2018. It is a modified adoption of BS 7671 : 2008 “Requirements for electrical installations” incorporating Amendments 1, 2 and 3 and is reproduced with permission from BSI Standards Ltd and the Institution Engineering and Technology (IET). Neither BSI nor IET takes responsibility for the accuracy of the BSI/IET licensed materials reproduced in this Code.

The following modifications have been made to suit local conditions, practices and regulations:

- Replaced Foreword, Introduction and Notes with the National Foreword.
- Amended references from BS to SS or IEC where applicable.
- Restricted TN system to TN-S system only.
- Deleted the requirements not applicable in Singapore, mainly requirements on caravans, IT systems, PEN conductors, fault voltage devices, electric fences, TN and TN-CS systems, floor and ceiling heating systems, marinas and similar locations, certification, periodic inspection and testing.
- Deleted Section 708 “Electrical installations in caravan / camping parks and similar locations”, Section 709 “Marinas and similar locations”, Section 711 “Exhibitions, shows and stands”, Section 717 “Mobile or transportable units”, Section 721 “Electrical installations in caravans and motor caravans”, Section 753 “Floor and ceiling heating systems” and Appendix 9 “Definitions – Multiple source, D.C. and other systems” as they are either not applicable in Singapore or there are separate Singapore Standards for these special installations or locations.
- Expanded the section on special installations or locations to enhance electrical safety.
- Deleted Chapter 44 “Protection against voltage disturbances and electromagnetic disturbances” and Annex A444 “Measures against electromagnetic disturbances (informative)” and moved Section 710 “Medical locations” to Annex A(L) as these are not normative requirements.
- Replaced Appendix 6(L) “Model forms for certification and reporting” with prescribed forms under our local regulations (see Chapter 63 “Certification and reporting”).
- Added an informative national annex (Annex B(L) “Revised cable colour code”).

Where an amendment has been made to suit local conditions, it is indicated by ‘L’ or ‘(L)’ immediately after the clause number, term or table.

This Code has been drawn up to ensure safety, especially from electric shock and fire in the use of electricity and relates principally to the design, selection, erection, inspection and testing of electrical installations. It is not intended to take the place of detailed specification or to instruct untrained persons or to provide for every circumstance. For installations of a special or complex character, e.g. measures against electromagnetic disturbances, the advice of a suitably qualified professional engineer and consultation with the relevant authorities will be necessary.

A summary of the main changes with respect to SS CP 5 : 1998 is given below:

- The revision adopts the new BS decimal point numbering system to make it easier to embody future changes and additions.
- The scope, object and fundamental principles set up in Part 1 are updated and enhanced.
- Definitions in Part 2 have been expanded and modified to provide a broader understanding of the local installation requirements.
- Part 3 adds requirements of safety services.
- In Chapter 41 “Protection against electric shock”, the terms “protection against direct contact” becomes “basic protection” and “protection against indirect contact” becomes “fault protection”.
- Chapter 42 “Protection against thermal effects” includes new sections on “Protection against fire caused by electrical equipment” and “Precautions where particular risks of fire exist”.
- Chapter 43 “Protection against overcurrent” includes requirements previously listed in Chapter 47, Section 473 “Protection against overcurrent” of SS CP 5 : 1998.
- In Chapter 52 “Selection and erection of wiring systems”, requirements of cables concealed in a wall or partition are added.
- In Chapter 53 “Protection, isolation, switching, control and monitoring”, simplification means that requirements previously in Chapter 46, Section 476 “Isolation and switching” and Chapter 53, Section 537 “Isolating and switching devices” of SS CP 5 : 1998 are now in this single chapter. Devices for protection against risk of fire, overvoltage and monitoring devices are also included.
- In Chapter 55 “Other equipment”, new requirements are added for low voltage generating sets, luminaries and street furniture are considered together with a new Section 557 “Auxiliary circuits”.
- In Chapter 56 “Safety services”, requirements for emergency escape lighting and fire protection applications are introduced.
- The previous Part 6 “Special installations or locations” has now become Part 7 “Special installations or locations particular requirements”. Special locations are areas of increased shock risk for which more stringent requirements are necessary for electrical safety. The Code includes additional sections and updates on special installations or locations as follows:
  - Locations containing a bath or shower (Section 701L).
  - Construction and demolition site installations – deleted and will be considered in the revision of SS CP 88.
  - Solar photovoltaic (PV) power supply systems (Section 712L).
  - Outdoor lighting installations (Section 714).
  - Extra-low voltage lighting installations (Section 715).
  - Operating and maintenance gangways (Section 729).
  - Medical locations (Annex A(L)).
  - Section 607 in SS CP 5 : 1998 relating to high earth leakage currents has been incorporated into Chapter 54.

– Changes to Appendices. Appropriate changes have been made to the existing Appendices 1 to 7. In addition, the following new Appendices are included:

- Appendix 8(L) Current-carrying capacity and voltage drop of busbar trunking system.
- Appendix 10(L) Protection of conductors in parallel against overcurrent.
- Appendix 13 Methods for measuring the insulation resistance / impedance of floors and walls to earth or to the protective conductor system.
- Appendix 14(L) Measurement of earth fault loop impedance: Consideration of the increase of the resistance of conductors with increase of temperature.
- Appendix 16 Devices for protection against overvoltage.

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.*

## **Notes on the Plan of the SS 638 : 2018**

This edition is based on the plan agreed internationally for the arrangement of safety rules for electrical installations.

In the numbering system used, the first digit signifies a Part, the second digit a Chapter, the third digit a Section, the subsequent digits the clause number. For example, the Section number 413 is made up as follows:

PART 4 – PROTECTION FOR SAFETY  
CHAPTER 41 (first chapter of PART 4) – PROTECTION AGAINST ELECTRIC SHOCK  
Section 413 (third section of CHAPTER 41) – Protective measure electrical separation

Part 1. sets out the scope, object and fundamental principles.

Part 2. defines the sense in which certain terms are used throughout this Code, and provides a list of symbols used.

The subjects of the subsequent parts are indicated below:

<b>Part No.</b>	<b>Subject</b>
-----------------	----------------

- |    |   |
|----|---|
| 3. | Identification of the characteristics of the installation that will need to be taken into account in choosing and applying the requirements of the subsequent parts. These characteristics may vary from one part of an installation to another, and should be assessed for each location to be served by the installation. |
| 4. | Description of the measurement that are available, for the protection of persons, property and livestock and against the hazards that may arise from the use of electricity.  |
| 5. | Precautions to be taken in the selection and erection of the equipment of the installation.   |
| 6. | Inspection and testing.   |
| 7. | Special installations or locations particular requirements.   |

The sequence of the plan should be followed in considering the application of any particular requirements of this Code. In addition, Annexes and Appendices are appended after Part 7. The general index provides a ready reference to particular clauses by subject, but in applying any one clause the requirements of related clauses should be borne in mind. Cross-reference are provided, and index is arranged to facilitate this.

In many cases a group of associated clauses is covered by a side heading which is identified by a two-part number, e.g. 544.2. Throughout this Code where reference is made to such a two-part number, that reference is to be taken to include all the individual clause numbers which are covered by that side heading that include the two-part number.

Numbering system      This Code introduced a new decimal point numbering system adopted in BS 7671: 2008 + A3: 2015 and clause numbering may not be in running sequence, e.g. 702.3 after 702.1 and 705.41 after 705.1L etc.

Where an amendment has been made to suit local condition, it is indicated by the letter 'L' or '(L)' immediately after the clause number, term or table where definition of the clause, term or table is provided. Reference elsewhere in this Code to the clause, term or table will be made without such indication.

## PART 1

### SCOPE, OBJECT AND FUNDAMENTAL PRINCIPLES

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**PART 1**

**SCOPE, OBJECT AND FUNDAMENTAL PRINCIPLES**

**CHAPTER 11**

**SCOPE**

**110.1 General**

**110.1.1L** This Code applies to the design, erection and verification of electrical installations other than those excluded by 110.2L.

Particular requirements are included for electrical installations of:

- (i) residential premises
- (ii) commercial premises
- (iii) public premises
- (iv) industrial premises
- (v) agricultural and horticultural premises
- (vi) prefabricated buildings
- (vii) external lighting and similar installations
- (viii) photovoltaic systems
- (ix) low voltage generating sets
- (x) highway equipment and street furniture
- (xi) medical locations
- (xii) operating and maintenance gangways.

NOTE – “Premises” covers the land and all facilities including buildings belonging to it.

**110.1.2L** This Code includes requirements for:

- (i) circuits supplied at nominal voltages up to and including 1000 V a.c. or 1500 V d.c. For a.c., the preferred frequency which is taken into account in this Code is 50 Hz
- (ii) circuits, other than the internal wiring of equipment, operating at voltages exceeding 1000 V and derived from an installation having a voltage not exceeding 1000 V a.c., e.g. discharge lighting, electrostatic precipitators
- (iii) wiring systems and cables not specifically covered by the standards for appliances
- (iv) all consumer installations external to buildings
- (v) fixed wiring for information and communication technology, signalling, control and the like (excluding internal wiring of equipment)
- (vi) additions and alterations to installations and also parts of the existing installation affected by an addition or alteration.

**110.1.3L** This Code is intended to be applied to electrical installations generally but, in certain cases, they may need to be supplemented by the requirements or recommendations of other Singapore Standards or British Standards or Harmonised Standards or by the requirements of the person ordering the work.

Such cases include the following:

- (i) Electric signs and high voltage luminous discharge tube installations – BS 559 and BS EN 50107
- (ii) Design, installation and maintenance of emergency lighting and power supply systems in building – SS 563
- (iii) Electrical apparatus for explosive gas atmospheres – IEC 60079
- (iv) Electrical apparatus for use in the presence of combustible dust – BS EN 50281
- (v) Installation and servicing of electrical fire alarm systems – SS CP 10
- (vi) Telecommunications systems – BS 6701
- (vii) Electric surface heating systems – IEC 60335-2-96
- (viii) Electrical installations for open-cast mines and quarries – BS 6907
- (ix) Life safety and firefighting applications – BS 8519.

#### **110.2L Exclusions from scope**

This Code does not apply to the following installations:

- (i) Systems for the distribution of electricity to the public
- (ii) Railway traction equipment, rolling stock and signalling equipment
- (iii) Equipment of motor vehicles
- (iv) Equipment on board ships covered by BS 8450
- (v) Equipment of mobile and fixed offshore installations
- (vi) Equipment of aircraft
- (vii) **Reserved for future use**
- (viii) Radio interference suppression equipment, except so far as it affects safety of the electrical installation
- (ix) Lightning protection systems for buildings covered by the SS 555 series
- (x) Those aspects of lift installations covered by SS 550
- (xi) Electrical equipment of machines covered by IEC 60204
- (xii) **Reserved for future use**

#### **111 Reserved for future use**

#### **112 Reserved for future use**