



# SCDF

The Life Saving Force

... for a safer Singapore

SINGAPORE CIVIL DEFENCE FORCE



## Submission requirements for Solar PV installations on Roof

1. Solar PV system installation that comes with any new building project shall be submitted together with all other fire safety works to SCDF for approval.
2. For existing buildings where solar PV system is to be installed, the plan can be submitted under the Minor Additions and Alteration (MAA) Lodgement Scheme.
3. Fire safety plan submission is exempted for residential detached, semi-detached and terrace houses each of which —
  - (a) does not exceed 3 storeys or 3 levels, including basement and attic; and
  - (b) does not share any facility with any other building.
4. Please refer to the circular “Fire Safety Requirements For Solar Photo-Voltaic (PV) Installations On Roof” and “Amendments To Fire Code 2018 - 2nd Batch Of Amendments” on the fire safety requirements for Solar PV.



## **SCDF – A member of the Home Team**

HQ SINGAPORE CIVIL DEFENCE FORCE, 91 UBI AVENUE 4, SINGAPORE 408827  
TEL: 68481457 EMAIL: Tan\_Chung\_Yee@scdf.gov.sg

**Your Ref** :

**Our Ref:** CD/FSSD/12/02/03/01

**Date** : 31 December 2015

Registrar, Board of Architects  
Registrar, Professional Engineers Board  
President, Singapore Institute of Architects  
President, Institution of Engineers, Singapore  
President, Association of Consulting Engineers, Singapore

Dear Sir/Mdm

## **FIRE SAFETY REQUIREMENTS FOR SOLAR PHOTO-VOLTAIC (PV) INSTALLATIONS ON ROOF**

As part of global drive for greater use of green energy, Singapore has taken active steps in adopting solar photovoltaic system as alternative means of electricity generation. In anticipation of the proliferation of projects and increasing scale incorporating solar PV systems in buildings, SCDF has formulated a set of Fire Safety Requirements (FSR) to facilitate its installation on the roof (see attached **Annex A** - FSR 13: 2015). These requirements were formulated together with relevant stakeholders and after extensive consultations with the industry. This FSR shall take effect from 1 July 2016.

2. Please convey the contents of this circular to members of your Institution/Association/Board. The circular is also available in CORENET-e-Info: <http://www.corenet.gov.sg/einfo>
3. For any inquiry or clarification, please contact the following officers:
  - (a) Mr Pang Tong Teck (Tel. No. 68481403)
  - (b) LTC Vincent Ho (Tel. No. 68481418)
  - (c) MAJ Tan Chung Yee (Tel. No. 68481457)



**SCDF – A member of the Home Team**

Yours faithfully,

(transmitted via e-mail)

MAJ Tan Chung Yee  
Fire Safety and Shelter Department  
for Commissioner  
Singapore Civil Defence Force

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# **FIRE SAFETY REQUIREMENTS FOR SOLAR PHOTO-VOLTAIC INSTALLATIONS ON ROOF**

**FSR 13 : 2015**

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**Effective Date: 1 July 2016**

*Issued by :*

**Fire Safety & Shelter Department  
Singapore Civil Defence Force**

**(Total 4 pages)**

## **FSR 13 : 2015**

# **FIRE SAFETY REQUIREMENTS FOR SOLAR PHOTO-VOLTAIC (PV) INSTALLATIONS ON ROOF**

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## **1 SCOPE**

This set of Fire Safety Requirements (FSR 13: 2015) shall be applicable to roof mounted PV installations.

## **2 GENERAL**

- 2.1 This FSR shall be read in conjunction with the prevailing Code of Practice for Fire Precautions in Buildings, namely the Fire Code.
- 2.2 This FSR shall take precedence over similar requirements (if any) stipulated in the prevailing Fire Code.

## **3 FIRE SAFETY REQUIREMENTS**

### **3.1 Means of Access**

- 3.1.1 For PV installations on the roof, at least one exit staircase shall be provided. Where the area of non-habitable roof is large and one-way travel distance to the exit cannot be met, an additional cat ladder or ship ladder adequately separated in accordance with Cl.1.2.60 of Fire Code and leading to the circulation area of the floor below shall be provided.
- 3.1.2 For existing buildings which are carrying out the installation of PVs on the roof level where the provision of single exit staircase is not feasible, a portable sturdy ladder to the roof access is required. Single storey buildings with roof height not more than 12m or inaccessible pitch roof up to 24m from grade level are not required to provide the sturdy ladder if there is adequate fire engine access way fronting this installation.
- 3.1.3 The computation of travel distance for roof areas which are open to the sky for any Purpose Group (except Purpose Group 1) can be based on the sprinkler-protected requirement.
- 3.1.4 All access hatches, if provided, shall be readily accessible from the roof. Access hatch opening shall have a minimum clear width of 1000mm in diameter.

## **3.2 Fire Resistance of PV Modules**

- 3.2.1 The standard IEC 61730-2: Photovoltaic Module Safety Qualification, Part 2: Requirements for Testing stipulates the fire test for PV modules. The characteristics assessed in the fire test establish the fundamental fire resistance of PV modules mounted over an existing roof.
- 3.2.2 A minimum fire resistance rating Class C shall be provided for any roof-mounted PV module.
- 3.2.3 System components associated with the PV modules such wirings, switchboard assemblies shall comply with the installation requirements as stipulated in SS CP5: Code of Practice for Electrical Installations.
- 3.2.4 The Solar PV components shall be listed under Class 2 of the Product Listing Scheme (PLS) and subject to annual surveillance test.

## **3.3 Design and Installation Criteria**

- 3.3.1 The sub-array for the PV installations shall be limited to maximum size of 40m by 40m.
- 3.3.2 A clearance of 3m around the access/hatch opening and in front of exit door (of exit staircase) shall be provided.
- 3.3.3 For roof without perimeter parapet / railing, a clear width of not less than 2.5m shall be maintained along the perimeter aisles / gangways. For roof with perimeter parapet / railing of height not less than 900mm, a clear width of not less than 1.5m shall be provided along the perimeter aisle / gangway.
- 3.3.4 There shall be a minimum of 1.5m separation between arrays.
- 3.3.5 There shall be no storage or services below the PV installation.
- 3.3.6 PV modules, wirings, switchboard assemblies and other equipment shall not cover any ventilation system on the roof (e.g. smoke control/ extraction systems or air well).

## **3.4 Emergency Disconnection**

- 3.4.1 Manual emergency shut-off system for the disconnection of the PV modules shall be provided on AC side (typically where inverters are placed) and switch room.
- 3.4.2 Operating instructions on the emergency shut off system shall be clearly displayed near to the emergency shut-off system. It shall be placed at a height between 1.5m to 2m from the floor.

- 3.4.3 A simplified site plan with the position of PV modules and systems circuit diagrams shall be displayed close to access openings or exit staircase to the roof. The site plan shall be placed at a height between 1.5m to 2m from the floor.

#### **4 SUBMISISION OF FIRE SAFETY PLAN**

- 4.1 Solar PV system installation that comes with any new building project shall be reflected in the building plans together with all other fire safety works for submission to SCDF for approval.
- 4.2 For existing buildings where solar PV system is to be installed, the plans may be lodged under the Minor Additions and Alteration (MAA) Lodgement Scheme.
- 4.3 The plan shall clearly contain the following:
- (a) Location of manual emergency shut-off system;
  - (b) Location of site plan indicating position of PV modules and systems circuit diagrams; and
  - (c) Location of fire extinguishers



# SCDF

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SINGAPORE CIVIL DEFENCE FORCE



**Date** : 2 Dec 2019

**Our Ref:** CD/FSSD/12/02/03/01

Registrar, Board of Architects  
Registrar, Professional Engineers Board  
President, Singapore Institute of Architects  
President, Institution of Engineers, Singapore  
President, Association of Consulting Engineers, Singapore

Dear Sir/Mdm,

## **AMENDMENTS TO FIRE CODE 2018 - 2<sup>nd</sup> BATCH OF AMENDMENTS**

SCDF is pleased to announce the latest round of updates to the Code of Practice for Fire Precautions in Buildings 2018 (Fire Code 2018). The changes which were deliberated and accepted by the Fire Code Review Committee are attached as Annex A of this circular.

2. In anticipation of the increasing trend of adopting Energy Storage System technology in Singapore, SCDF has included a preliminary set of fire safety requirements for these systems in the update. With the advancement of the technology and its applications, SCDF will continue to refine and formulate the fire safety requirements in consultation with the relevant stakeholders. The complete set of the fire safety requirements for Energy Storage Systems will be released at a later date. Other requirements, such as means of escape, compartmentation, setback distance of unprotected openings, fire suppression system, ventilation, signage, etc. which are not included in this release, shall comply with the relevant clauses of the prevailing Fire Code.

3. Amendments stipulated in Annex A of this letter, including the aforesaid preliminary set of amendments, shall take effect from the dates specified therein. For those amendments that are to take effect at future dates as specified in Annex A, Qualified Persons are encouraged to comply with the requirements at any time before the effective dates.



## **SCDF – A member of the Home Team**

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4. Please convey the contents of this circular to members of your Board/ Institution/ Association. This circular is also available in CORENET's e-Info: <http://www.corenet.gov.sg/einfo>.

5. For any queries, you may contact Mr Randy Tan at DID: 68481461 or Mr Tan Yi Yang at DID: 68481734. With regard to issue relating to Energy Storage Systems, please contact CPT Tan Ping Hao at DID: 68481410 or Email: [TAN\\_Ping\\_Hao@scdf.gov.sg](mailto:TAN_Ping_Hao@scdf.gov.sg).

Yours faithfully

(transmitted via email)

LTC Tan Chung Yee  
Fire Safety & Shelter Department  
for Commissioner  
Singapore Civil Defence Force

#### Distribution list

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Manager (Fire Safety & Building Control Unit), DSTA



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SCDF Fire Safety Standing Committee  
Fire Code Review Committee  
TUV SUD PSB  
Setsco Services Pte Ltd  
Singapore Test Services



## SCDF – A member of the Home Team

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**Annex A**

Clause No	Amendment Date	Effective Date	Clause Status	Clause Before Amendment	Clause After Amendment
All relevant clauses	2 Dec 2019	1 Jun 2020	Revised	All relevant clauses with “smoke-stop lobby” terminology.	The term “smoke-stop lobby” to be replaced with “smoke-free lobby”.
4.2.2k.	2 Dec 2019	1 Jun 2020	New	-	<p>k. Ancillary usage of fire engine accessway/fire engine access road</p> <p>Fire engine accessway/fire engine access road shall not be turned into other usages such as pond, water features, car parking lots (including loading &amp; unloading), etc.. Turfing of fire engine accessway/fire engine access road is only permitted on the straight stretch of the fire engine accessway/fire engine access road with gradient not exceeding 1:15.</p>
6.3.1b.	2 Dec 2019	1 Jun 2020	Revised	<p>b. PG II mixed occupancy</p> <p>For PG II mixed occupancy buildings where an automatic sprinkler system and/or electrical fire alarm system is provided to the non-residential part of the building:</p> <p>(1) Alarm sounders shall be installed within the non-residential units, at the common areas of the non-</p>	<p>b. PG II mixed occupancy</p> <p>For PG II mixed occupancy buildings where an automatic sprinkler system and/or electrical fire alarm system is provided to the non-residential part of the building:</p> <p>(1) Alarm sounders shall be able to produce a minimum sound level of 65dBA, or 5dBA above the ambient noise level,</p>

				<p>residential floors and extended to the immediate two residential floors above the non-residential floor.</p> <p>(2) The alarm sounders shall be able to produce a minimum sound level of 65dBA, or 5dBA above the ambient noise level in all parts of such areas.</p> <p>(3) Connection of the fire alarm system to an approved alarm monitoring company stipulated under <i>Cl.6.3.8</i> is not required if the number of non-residential floors is not more than one storey.</p>	<p>whichever is greater but not more than 120dBA, at all parts of the following areas:</p> <p>(a) the non-residential units;</p> <p>(b) the common areas of the non-residential floors; and</p> <p>(c) the common areas of the immediate two residential floors above the non-residential floor.</p> <p>(2) Connection of the fire alarm system to an approved alarm monitoring company stipulated under <i>Cl.6.3.8</i> is not required if the number of non-residential floors is not more than one storey.</p>
10.2.4	2 Dec 2019	1 Jun 2020	Revised	<p>Design and installation criteria</p> <p>a. The sub-array for the PV installations shall be limited to a maximum size of 40m by 40m.</p> <p>b. A clearance of 3m around the access/hatch opening and in front</p>	<p>Design and installation criteria</p> <p>a. Each array of a PV installation shall not exceed the maximum dimensions of 60m x 40m.</p> <p>b. A clearance of 3m around the access/hatch opening and exit doors shall be provided.</p>

				<p>of exit door (of exit staircase) shall be provided.</p> <p>c. For a roof without perimeter parapet/railing, a clear width of not less than 2.5m shall be maintained along the perimeter aisles/gangways. For a roof with perimeter parapet/railing of height not less than 900mm, a clear width of not less than 1.5m shall be provided along the perimeter aisle/gangway.</p> <p>d. There shall be a minimum of 1.5m separation between arrays.</p> <p>e. There shall be no storage or services below the PV installation.</p> <p>f. PV modules, wirings, switchboard assemblies and other equipment shall not cover any ventilation system on the roof (e.g. smoke control/ extraction systems or air well).</p>	<p>c. Access aisles of minimum clear width of 1.5m shall be provided such that no part of any PV array is more than 20m from any of them. Where the access aisle abuts the edge of the roof, the clear width of the access aisle shall be at least 2.5m unless a perimeter parapet/railing of height not less than 900mm is provided.</p> <p>d. Storages or services located below PV arrays shall be separated from the PV panels as follows:</p> <p>(1) for sprinkler-protected space below arrays, by providing a non-combustible separation, or</p> <p>(2) for non-sprinkler-protected space below arrays, by providing a 1-hr fire-rated separation.</p> <p>e. PV modules, wirings, switchboard assemblies and other equipment shall not cover any ventilation system on the roof (e.g. smoke control/extraction systems or air well).</p>
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10.3	2 Dec 2019	1 Jun 2020	New	-	<p><b>ENERGY STORAGE SYSTEMS</b></p> <p>10.3.1 General</p> <p>a. Energy Storage System refers to one or more devices, assembled together, capable of storing energy in order to supply electrical energy at a future time to the local power loads, to the utility grid, or for grid support.</p> <p>b. This set of fire safety requirements need not be applicable to Energy Storage System installations where the total stored energy is less than the Threshold Stored Energy listed in <u>Table 10.3.1</u> below.</p> <p>c. All Energy Storage System installations shall be located at the same storey as the fire engine accessway/fire engine access road.</p> <p>d. The allowable Maximum Stored Energy for the various battery technologies in each compartment shall be as listed in <u>Table 10.3.1</u>.</p>
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<b>TABLE 10.3.1: STORED ENERGY CAPACITY OF ENERGY STORAGE SYSTEM</b>		
<b>Type</b>	<b>Threshold Stored Energy<sup>a</sup> (kWh)</b>	<b>Maximum Stored Energy<sup>a</sup> (kWh)</b>
Lead-acid batteries, all types	70	600
Nickel batteries <sup>b</sup>	70	600
Lithium-ion batteries, all types	20	600
Sodium nickel chloride batteries	20	600
Flow batteries <sup>c</sup>	20	600
Other batteries technologies	10	200

Notes:

<sup>a</sup> It shall refer to an aggregated stored energy capacity per compartment. For battery rating in Amp-Hours, kWh is equal to maximum rated voltage multiplied by amp-hr rating divided by 1000.

<sup>b</sup> Nickel battery technologies include nickel cadmium (Ni-Cad), nickel metal hydride (Ni-MH), and nickel zinc (Ni-Zn).

<sup>c</sup> Includes vanadium, zinc-bromine, polysulfide-bromide, and other flowing electrolyte-type technologies.

**Typo correction & clarification for the following clauses:**

2.3.9	2 Dec 2019	2 Dec 2019	Typo	Exit doors and exit access doors h. Door located in a path of travel Exception	Exit doors and exit access doors h. Door located in a path of travel Exception
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				<p>(c) Sliding doors &amp; roller shutters</p> <p>Sliding door and roller shutter as listed in <i>Cl.2.3.9h.(2)(a) to (d)</i> below are permitted to be installed across the exit access leading to exits, including the exterior door openings, except in areas stipulated under <i>Cl.2.3.9c.(1) and (3)</i>. These doors shall not form part of the fire compartment integrity.</p>	<p>(c) Sliding doors &amp; roller shutters</p> <p>Sliding door and roller shutter as listed in <i>Cl.2.3.9h.(2)(a) to (e)</i> below are permitted to be installed across the exit access leading to exits, including the exterior door openings, except in areas stipulated under <i>Cl.2.3.9c.(1) and (3)</i>. These doors shall not form part of the fire compartment integrity.</p>
6.4.7	2 Dec 2019	2 Dec 2019	Typo	<p>b. Water supply</p> <p>(2) Inlets to storage tank</p> <p>The inlets to the storage tank shall be fitted with a non-modulating type of pilot float valve listed by the SCDF.</p>	<p>b. Water supply</p> <p>(2) Inlets to storage tank</p> <p>The inlets to the storage tank shall be fitted with a non-modulating type of pilot float valve listed by the <del>SCDF</del> authority having jurisdiction.</p>
8.2.1	2 Dec 2019	2 Dec 2019	Typo	<p>b. For all buildings belonging to PG III, IV, V, VI, VII, and VIII of more than 24m in habitable height.</p>	<p>b. For all buildings belonging to PG III, IV, V, VI, VII, and VIII of more than 24m in habitable height; or</p>



8.2.2	2 Dec 2019	2 Dec 2019	Typo	<p>Two-way emergency voice communication system</p> <p>a. Two-way emergency voice communication system shall be provided for</p> <p>(1) buildings, which are required to be provided with one-way emergency voice communication system under Cl.8.2.1 a., b. and c.; and</p>	<p>Two-way emergency voice communication system</p> <p>a. Two-way emergency voice communication system shall be provided for</p> <p>(1) buildings, which are required to be provided with one-way emergency voice communication system under Cl.8.2.1 a., b. <del>and</del> <b>or</b> c.; and</p>
9.8.4	2 Dec 2019	2 Dec 2019	Typo	<p>d. Provision of fire engine accessway</p> <p>(2) At least one external wall of the warehouse shall be directly fronting an empty space (such as turf area) of minimum width 2m. One of the access doors provided along this external wall shall be placed not more than 300m (for type K1) or 15m (for type K2) from the fire engine accessway/ fire engine access road for ease of firefighting.</p>	<p>d. Provision of fire engine accessway</p> <p>(2) At least one external wall of the warehouse shall be directly fronting an empty space (such as turf area) of minimum width 2m. One of the access doors provided along this external wall shall be placed not more than <b>30m</b> (for type K1) or 15m (for type K2) from the fire engine accessway/ fire engine access road for ease of firefighting.</p>

All relevant clauses	2 Dec 2019	2 Dec 2019	Typo	All relevant clauses with SS CP 55.	All relevant clauses with SS CP 55 to be replaced with <b>SS 578</b> .
TABLE 1.4B	2 Dec 2019	2 Dec 2019	Clarification	Occupant load factor for “reading room” is missing.	Occupant load factor for “reading room” is <b>5m<sup>2</sup>/person</b> .
4.2.2a.(6)	2 Dec 2019	2 Dec 2019	Clarification	<p>(6) PG III, IV, V &amp; VII buildings exceeding 10m habitable height</p> <p>For buildings under PG III, IV, V and VII exceeding the habitable height of 10m, a fire engine accessway shall be located directly below the fire access openings to provide direct reach to the designated fire access panels. The required length of fire engine accessway shall be computed based on the largest Accessible Floor Area (AFA) of any aboveground floors as follows:</p> <p>(a) for interconnected floors, including basements connected to aboveground floors, the AFA shall be the aggregate areas of all the interconnected floors, or</p>	<p>(6) PG III, IV, V &amp; VII buildings exceeding 10m habitable height</p> <p>For buildings under PG III, IV, V and VII exceeding the habitable height of 10m, a fire engine accessway shall be located directly below the fire access openings to provide direct reach to the designated fire access panels. The required length of fire engine accessway shall be computed based on the largest Accessible Floor Area (AFA) of any aboveground floors as follows:</p> <p>(a) for interconnected floors, including basements connected to aboveground floors, the AFA shall be the aggregate <b>AFA areas</b> of all the interconnected floors, or</p>

				(b) for buildings with more than one group of interconnected floors, the AFA shall be taken as the largest of the aggregate floor areas among the groups of interconnected floors.	(b) for buildings with more than one group of interconnected floors, the AFA shall be taken as the largest of the aggregate floor areas among the groups of interconnected floors.
6.4.8	2 Dec 2019	2 Dec 2019	Clarification	<p>Combined sprinkler and wet riser systems</p> <p>a. Combining sprinkler and wet riser systems is permitted provided their design complies with the provisions stipulated in SS CP 52 and SS 575 respectively.</p>	<p>Combined sprinkler and wet riser systems</p> <p>a. Combining sprinkler and wet riser systems is permitted for buildings of ordinary hazard category classification provided their designs comply with the provisions stipulated in SS CP 52 and SS 575 respectively.</p>