

20. Nationale Photovoltaik-Tagung

Swiss fire safety framework on BIPV – new fire test procedures

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SWISS FRAMEWORK

The Swiss confederation is an extra European country but it has undersigned mutual recognition agreements (MRAs) with the European Community.

BUILDING MATERIALS COULD BE CLASSIFIED

- according to the EN standard (SN EN 13501-1:2009; SN EN 13501-5:2009; SN EN 13501-6:2014)
- or according to VKF/AEAI carried out on the basis of the provisions determining for the recognition of the VKF/AEAI (Fire protection standard, fire fighting directive, fire fighting support publication, solar systems firefighting memorandum)

BUILDING REQUIREMENTS

- Construction Products Regulation (CPR)
- EN 50583 “Photovoltaics in buildings - Part 1/2: BIPV modules/systems”

ELECTRICAL REQUIREMENTS

- Low Voltage Directive (LVD) (2014/35/EU)
- Electromagnetic Compatibility Directive (EMCD) DIRECTIVE 2014/30/EU

The EU regulation 305/2011 (CPR) has been adopted by Swiss legislation



MISSING GAPS ON BIPV FIRE SAFETY STANDARDS

- Electrical and building separation
- Harmonised standards leakage
- Test procedures only for non-active products only

NEW REFERENCE AND TEST PROCEDURES ARE DEVELOPING

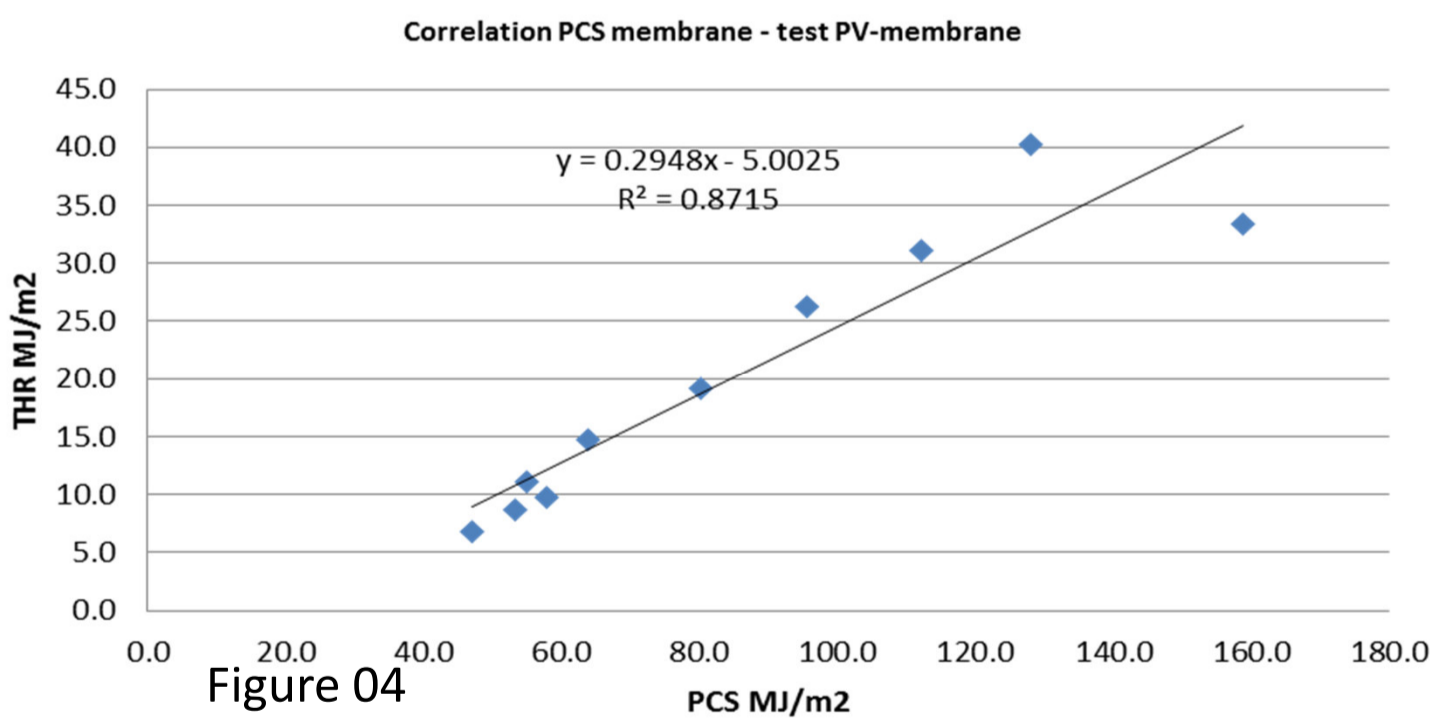
CEI TR 82-89:2021 – PV ON ROOF

Today fire tests are based on separate tests results which are carried out separately on photovoltaic modules and on roof element and not on real assemblies made of PV module and roof portion.

In Italy, the technical report **CEI TR 82-89:2021** has been published. The document's aim is the development of specific tools for the fire rating of PV modules placed, with different technical solutions, on the building roof performing tests on the **complete system** (PV module system plus a representative portion of the roof covering) to get the fire behavior of the complete assembly.



Source: Istituto Giordano S.p.A.



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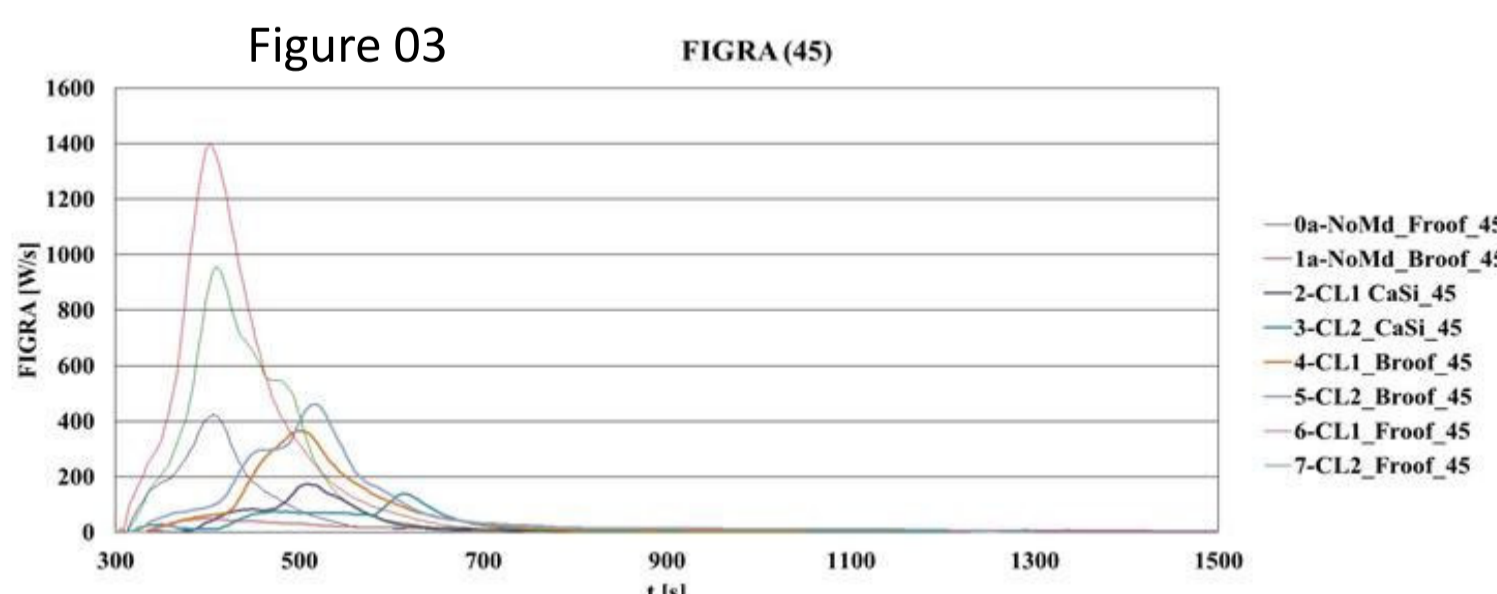
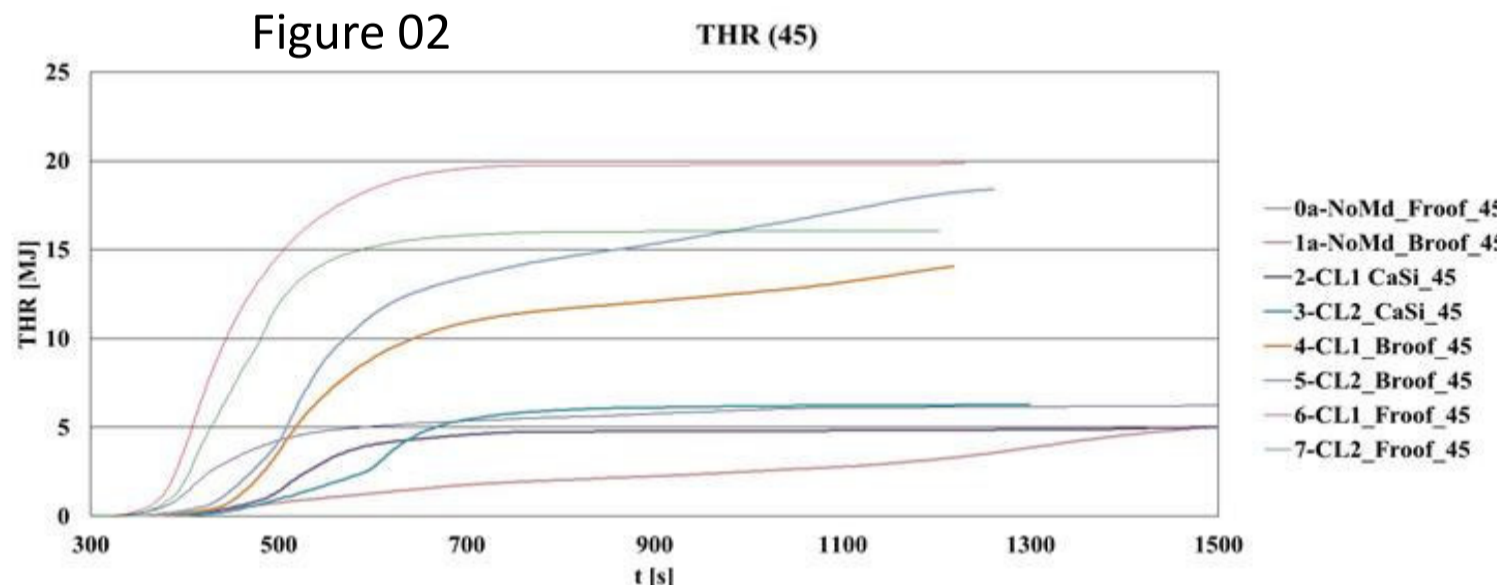
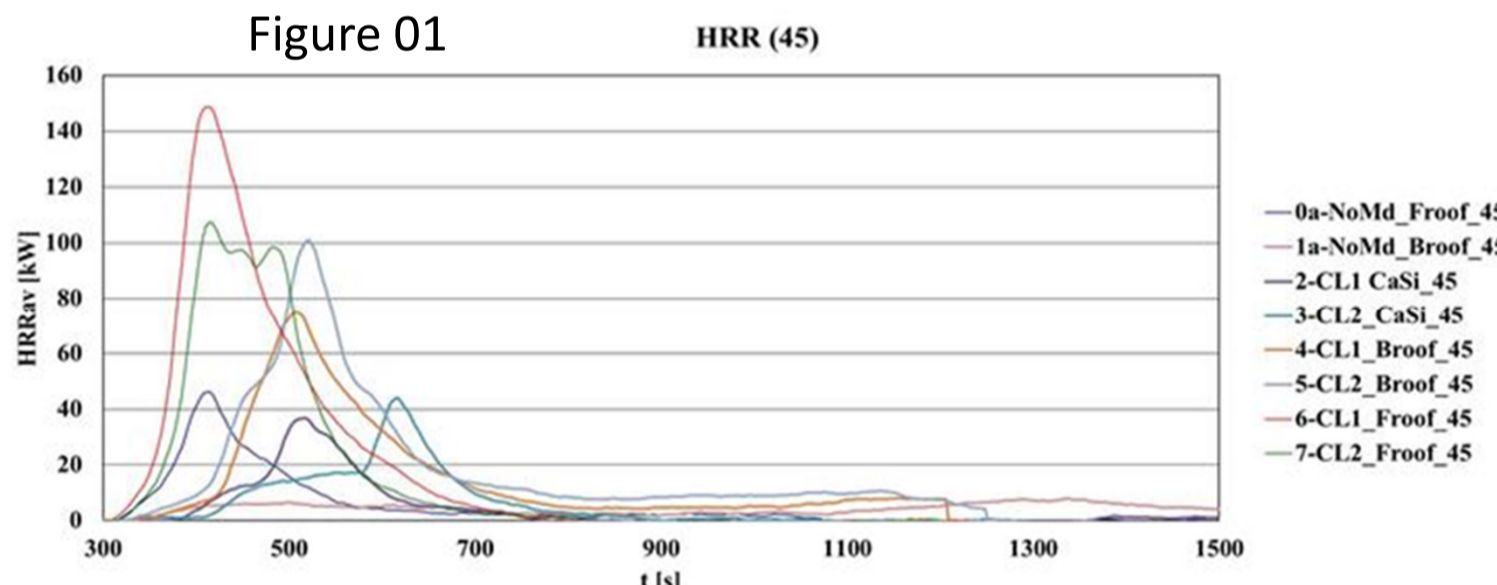
CEN EN 13501-1  
CEN EN 13823  
CENELEC TR 50670

HRR (Heat Release Rate) [kW] (figure 01)  
THR (Total Heat Release) [MJ] (figure 02)  
FIGRA (Fire Growth Rate) [W/s] (figure 03)  
SPR (Smoke Production Rate) [m²/s],  
TSP (Total Smoke Production) [m²],  
SMOGRA (SMOke Growth Rate) [m²/s²],  
LSF (Lateral Spread of Flame) fire towards the side “far” from the sample burner) [mm];

RESULTS

Different tests have been performed according to the new procedure by the partners

- National classification is inconsistent with the classification resulting by tests
- Dependence of the fire behavior and fire rating from the substrate
- HHV (high heating value) correlation with fire rating (figure 04)

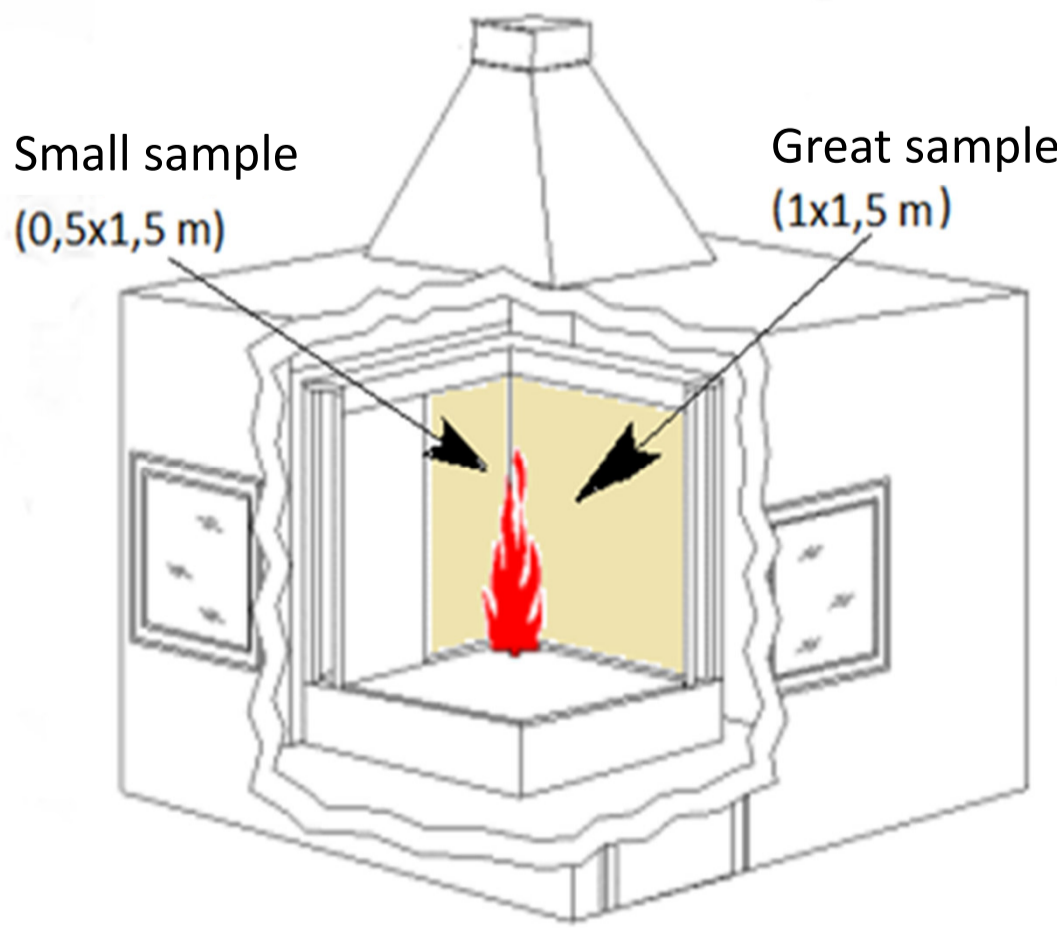


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NEW TESTING PROCEDURES UNDER DEVELOPING

- Combination of building and electrical requirements
- Interference of the active part (PV)
- fire behavior changing with aging

Instrument	Reference
SBI Platform	EN 13823 test
Small Flame attack	EN ISO 11925-2 / EN 61730-2
Calorimetric bomb	ISO 1716
Cylindrical furnace	ISO 1182
Flammability Classification	IEC 60695-2-11 / = UL 94



ELECTRICAL INSULATION DURING THE TEST APPLYING AN ELECTRICAL LOAD

E.G. - Test Voltage applied between the PV circuit (+/- shorted) and a ground reference – Insulation mode



HV Power supply (or Insulation tester)  
TEST VOLTAGE= Max System Voltage of the PV module (i.e. 1000 V or 1500V) to be applied continuously during the test.

- Case a): if the array is exposed to the light, the PV circuit will carry a current (up to Isc if G=1000W/m²)
- Case b): if the array is in the dark or quasi dark conditions, the flowing current will be nearly =0