

University of Applied Sciences and Arts of Southern Switzerland

SUPSI

“Playing” with Fire

Tests Beyond the Standard

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22 marzo 2024



Source: SUPSI

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WHY ARE FIRE TESTING SO IMPORTANT?

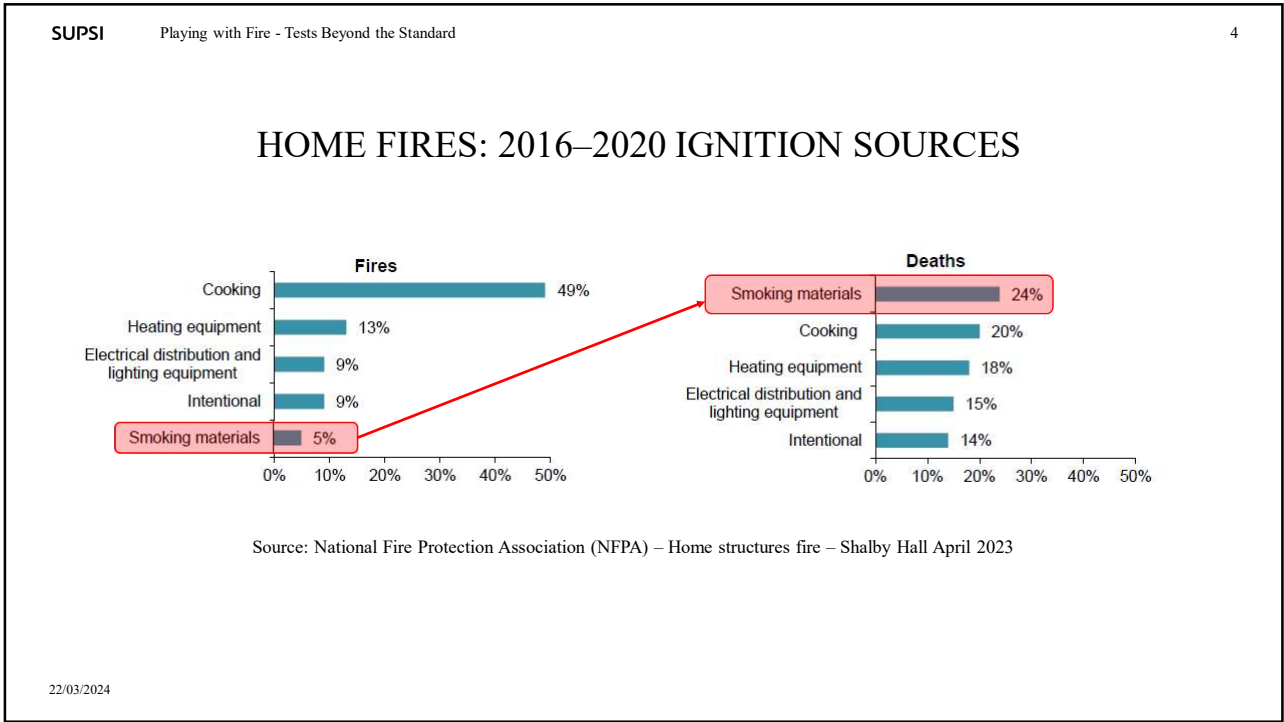
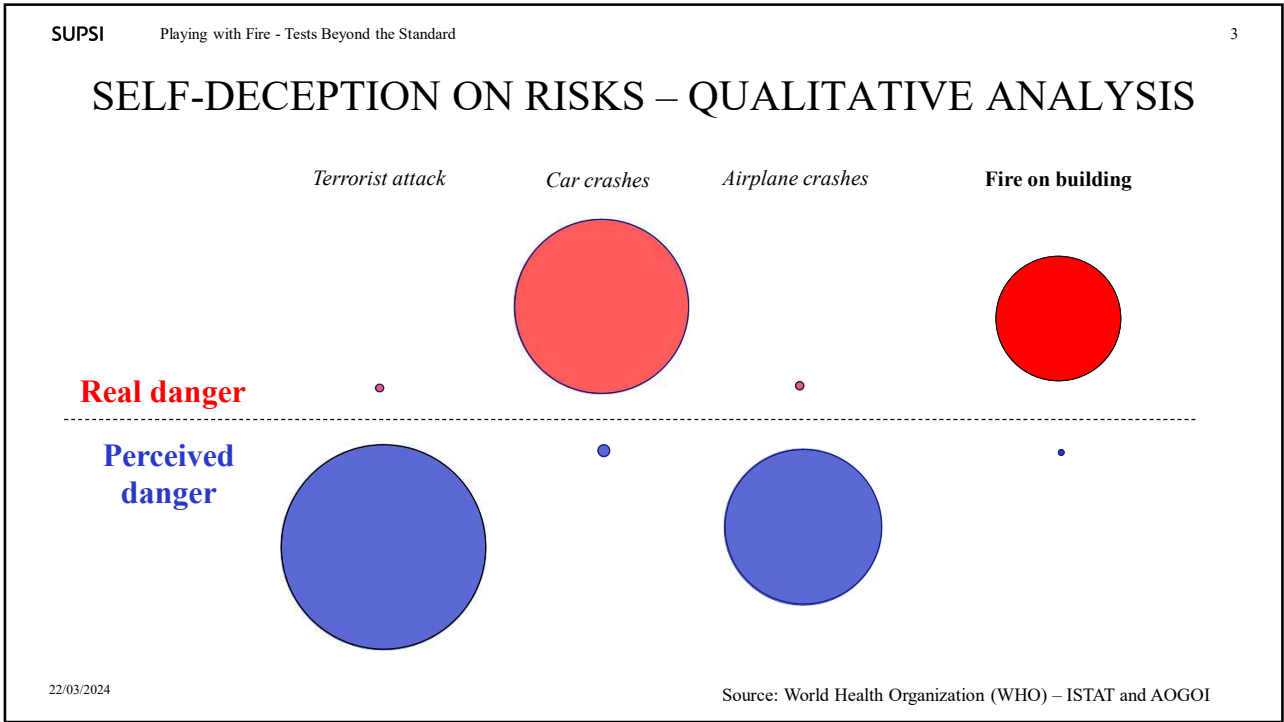


No BiPV façade

Source: rtve.es – 22 February 2024 - Valencia

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# RISING FREQUENCY OF FACADE FLAME SPREAD FIRES

Number of large facade fires worldwide every five years from 1990 to November 2019.

Period	Number of Facade Fires
1990-1994	4
1995-1999	5
2000-2004	3
2005-2009	8
2010-2014	15
2015-2019	22

Data found from news and technical reports online, therefore biased towards visible fires that are likely to be reported

Source: KRESNIK: A top-down, statistical approach to understand the fire performance of building facades using fire test data

Source: New York Post – Fire on skyscraper in Changsha, in China’s central Hunan province

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# THE REASONS?

❑ Systems complexity

- Geometry
- Shape

Source: Parametric House: Architecture, Art & Design © 2023  
Graz Art Museum, Graz, Austria

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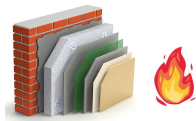


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### ❑ Use of combustible materials



Source: Edilportale – Torre del Moro – Milano – 29<sup>th</sup> of August 2021

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## WHAT ABOUT BIPV ON FAÇADE?

- Electrical Components
- Thermal Effects
- Integration with Building Materials
- Special features to be considered in testing



Source: Solarchitecture  
New Campus Franklin University SWITZERLAND

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## FIRE TESTING AND SUPSI'S ROLE



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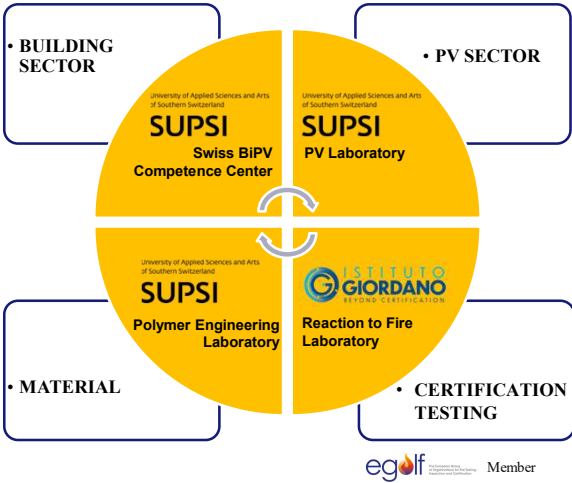
Source: SUPSI/Isaac - Istituto Giordano S.p.A.

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## INTERDISCIPLINARITY NEEDED



- Certification Body and Testing Laboratory
- Notified Body for CPR NB0407
- Accredited by Accredia ISO 17025, LAB N° 0021
- Authorized by the Italian Ministry of the Interior to issue test certificates in the Fire Resistance and Reaction to fire sector
- FBT VKF - Switzerland Official recognition by the Swiss Construction Technology Commission (FBT) and the Association of Public Buildings Insurance Companies (VKF) as a test laboratory for fire resistance of building components.
- Approved by UNITED ARAB EMIRATES MINISTRY OF INTERIOR CIVIL DEFENSE

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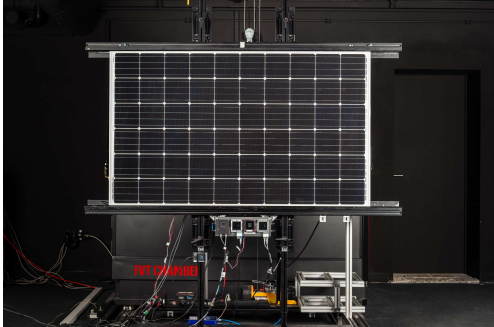
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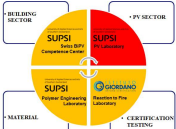
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- PV testing: Innovation between PV Testing and Fire Prevention**





Source: SUPSI PVLab




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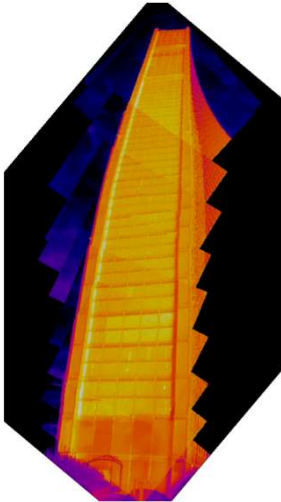
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- Dynamics of Building Envelope Performance for Fire Prevention**





Source: Fabio Parolini – Altra sede Regione Lombardia - Milano

IR Image

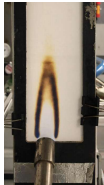


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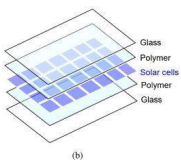
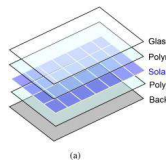


- Innovations in Product Development for Fire
- Small-scale test development (mini-SBI)

Features Flame Retardancy of Polymeric Materials  
Flame Retardancy Nanocoatings



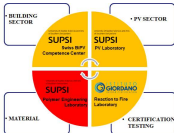
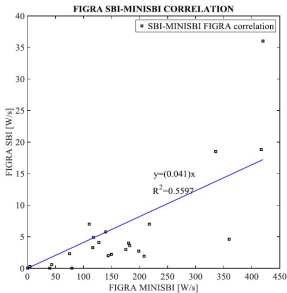
Source: SUPSI



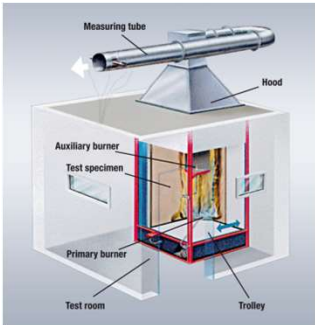
Source: Modelling and experimental investigations of microcracks in crystalline silicon photovoltaics: A review - DOI: [10.1016/j.renene.2019.07.138](https://doi.org/10.1016/j.renene.2019.07.138)  
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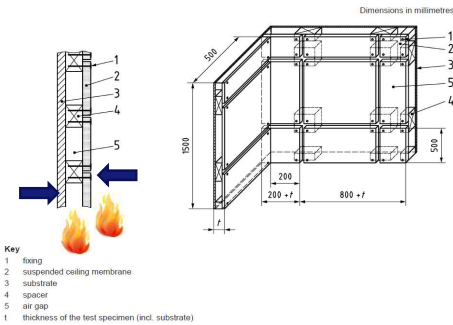
Source: SUPSI



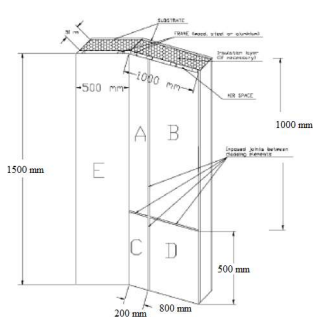
- Fire testing in collaboration with
- 



Source: tradekorea.com – SBI test machine

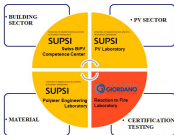


Source: EAD 090019-00-0404  
Example of SBI test Installation



CEN EN 13501-1:2019 – “Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests”  
CEN EN 13823:2020+A1:2022 – «Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item”

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RESEARCH & DEVELOPMENT THROUGH.....

NATIONAL PROJECTS




Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra


EUROPEAN PROJECTS




INTERNATIONAL WORKING GROUPS




Innosuisse – Swiss Innovation Agency




PVNB  
Photovoltaic Noise Barriers



BIPV  
Building Integrated Photovoltaics



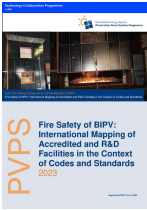
VIPV  
Vehicles Integrated Photovoltaics



AGRI PV  
Agricultural Photovoltaics

Task 15

Enabling framework for the development of BIPV



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STANDARDIZING SBI TEST FOR BIPV PRODUCTS

Challenges....



Source: SUPSI - Istituto Giordano S.p.A.

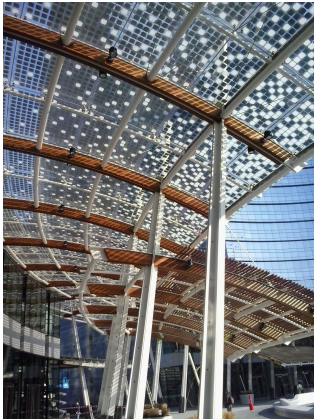
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### BIPV FEATURES: IMPACT ON SBI TEST

- Vertical and Horizontal string connection
- Solar cells density
- Samples dimension



Source: SUPSI - Gae Aulenti square -Milano



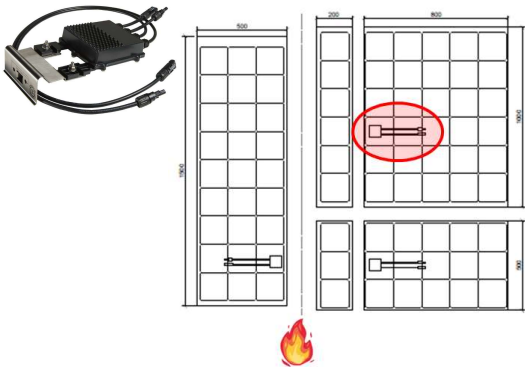
Source: SUPSI - Istituto Giordano S.p.A.

### CABLES AND ELECTRICAL AND ELECTRONICS COMPONENTS



EN 50575 Power, control and communication cables - Cables for general applications in construction works subject to reaction to fire requirements

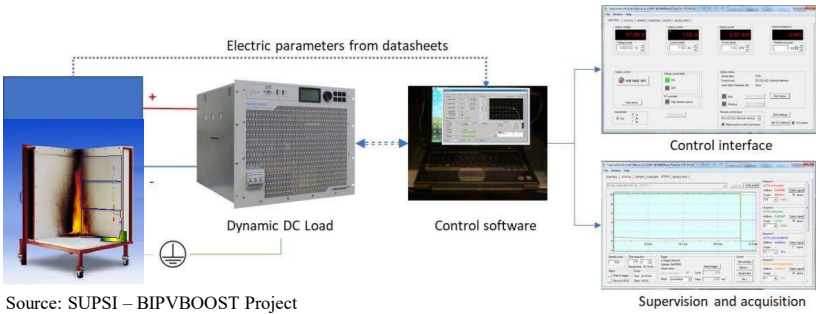
EN 13501-6 (B2ca-s1, d0, a1)



Source: SUPSI - Istituto Giordano S.p.A.



IMPACT OF A ELECTRICAL LOAD



D5.2 Report on the project developments of specific performance-based laboratory testing procedures for BIPV products

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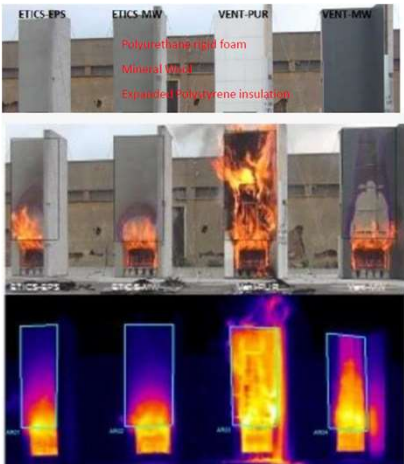
LARGE SCALE TESTING



Source: SKYLINE Total testing Solution



Source: Kingspan  
<https://www.kingspan.com/fr/fr/articles-de-connaissance/essai-lepir-2-kingspan-ite/>



Source: Compartment and façade large scale tests: Behavior comparison of different insulating materials in case of Fire  
<http://dx.doi.org/10.14311/asfe.2015.069>

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Source: Erhan Elaldi – Polat Tower in Istanbul



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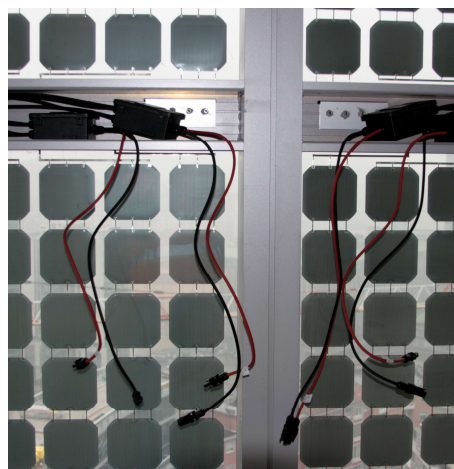
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## CONCLUSION AND OUTLOOKS

- **DESIGNERS**  
Awareness of risk and minimizing it
- **INDUSTRY**  
Product development considering the fire challenge
- **POLICY MAKER**  
Defining new standards suitable for products and BIPV
- **EDUCATION**  
Training and professional skills
- **R&D**  
Supporting the market and manufacturers



Source: Fabio Parolini

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