

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

**SUPSI**

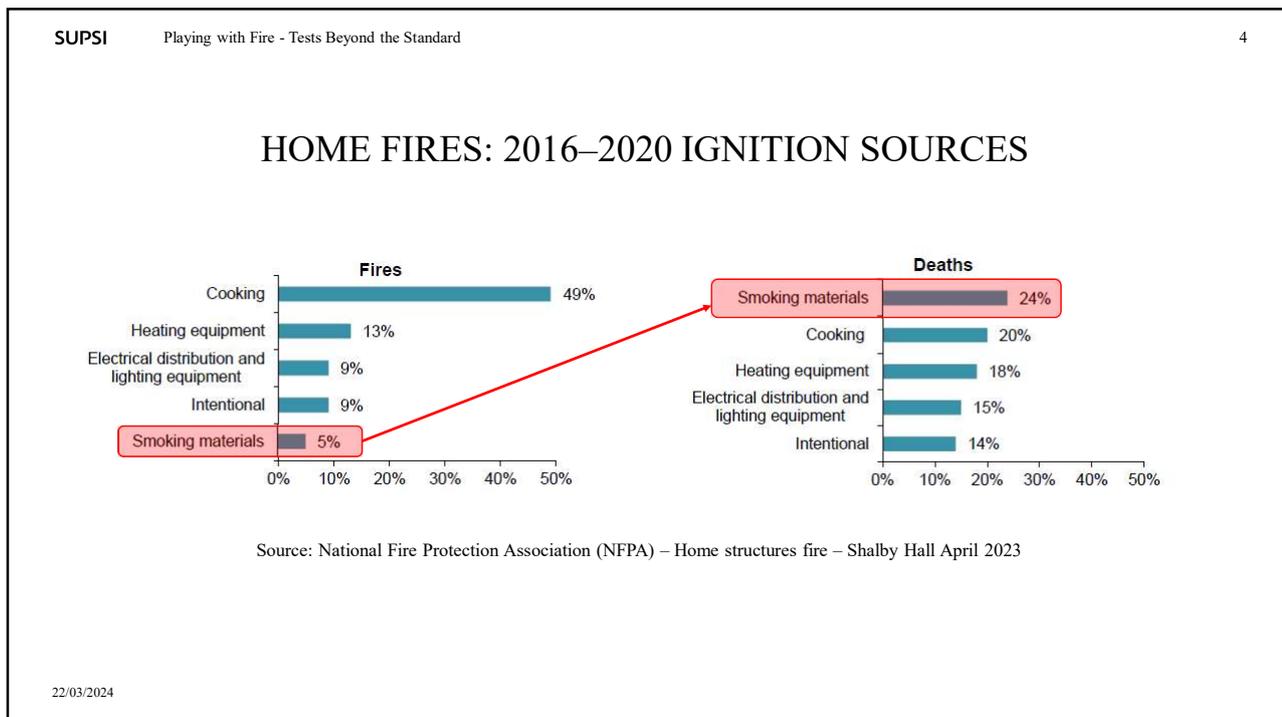
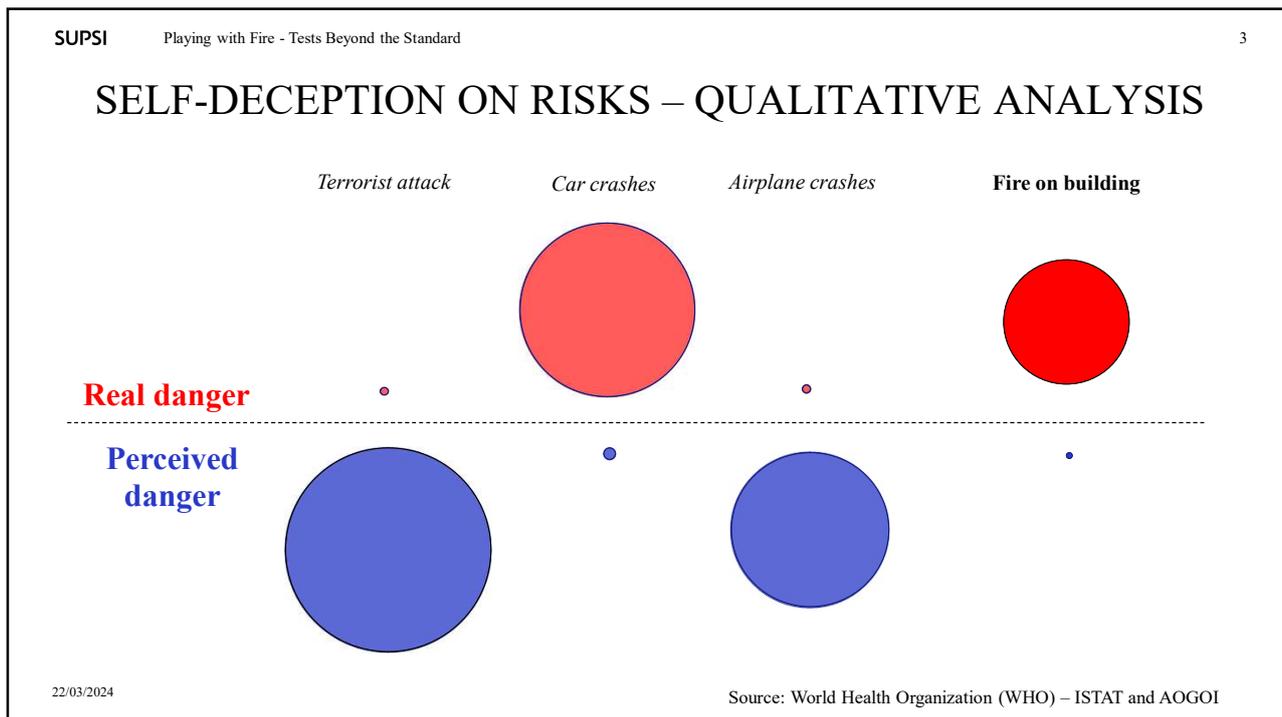
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## WHY ARE FIRE TESTING SO IMPORTANT?

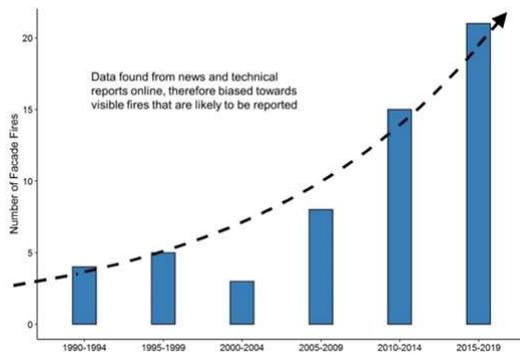


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## RISING FREQUENCY OF FACADE FLAME SPREAD FIRES

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



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

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

## THE REASONS?

### ❑ Systems complexity

- Geometry
- Shape



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

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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

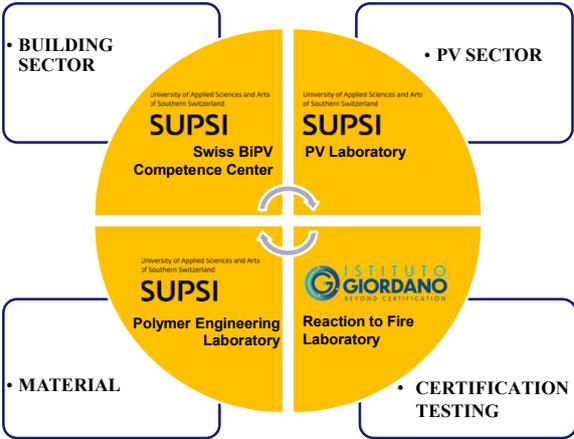


Source: SUPSI/Isaac - Istituto Giordano S.p.A.

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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

egolf Member

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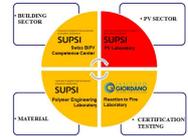
• PV testing: Innovation between PV Testing and Fire Prevention



Source: SUPSI PVLab



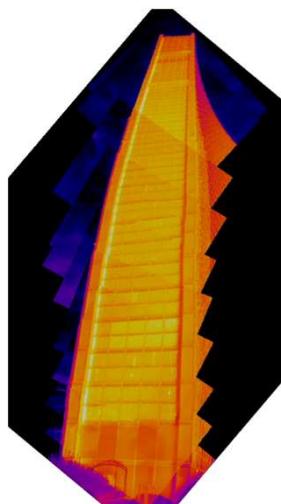
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• Dynamics of Building Envelope Performance for Fire Prevention

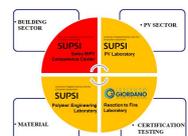


Source: Fabio Parolini – Altra sede Regione Lombardia - Milano



IR Image

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• Innovations in Product Development for Fire

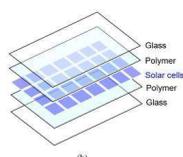
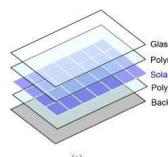
• Small-scale test development (mini-SBI)

Features Flame Retardancy of Polymeric Materials

Flame Retardancy Nanocoatings



Source: SUPSI

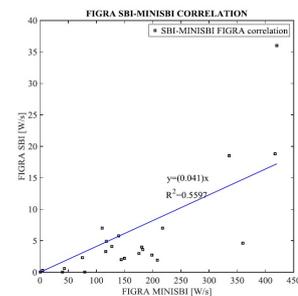


Source: Modelling and experimental investigations of microcracks in crystalline silicon photovoltaics: A review - DOI: [10.1016/j.renene.2019.07.138](https://doi.org/10.1016/j.renene.2019.07.138)

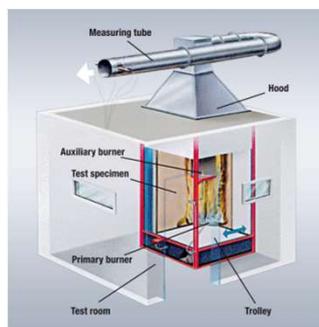
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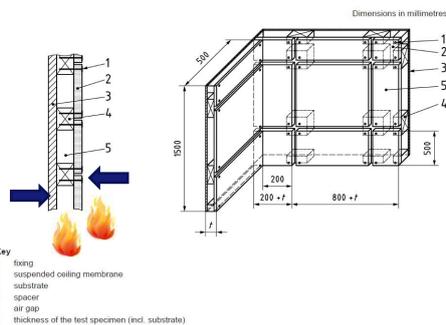
Source: SUPSI



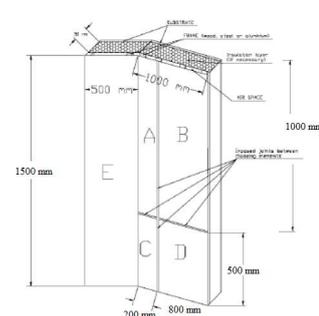
• Fire testing in collaboration with



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

**Innosuisse – Swiss Innovation Agency**

EUROPEAN PROJECTS



**Seamless-PV**

  
**PVNB**  
Photovoltaic Noise Barriers

  
**BIPV**  
Building Integrated Photovoltaics

  
**VIPV**  
Vehicle-Integrated Photovoltaics

  
**AGRI PV**  
Agricultural Photovoltaics

**Task 15**  
**Enabling framework for the development of BIPV**



**PVPS**  
 Fire Safety of BIPV: International Mapping of Accredited and R&D Facilities in the Context of Codes and Standards 2023

INTERNATIONAL WORKING GROUPS



**IEA PVPS**

**Task 15**  
**Enabling framework for the development of BIPV**

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## STANDARDIZING SBI TEST FOR BIPV PRODUCTS

### Challenges....

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

## BIPV FEATURES: IMPACT ON SBI TEST

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

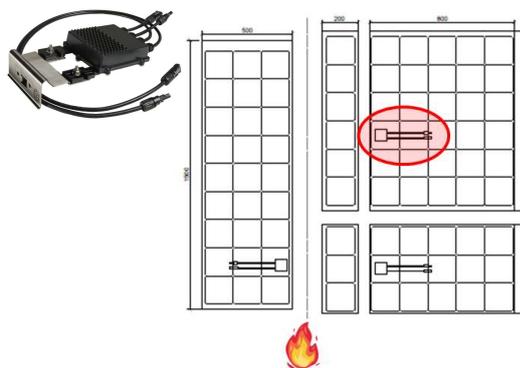


Source: SUPSI - Gae Aulenti square -Milano



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

## CABLES AND ELECTRICAL AND ELECTRONICS COMPONENTS

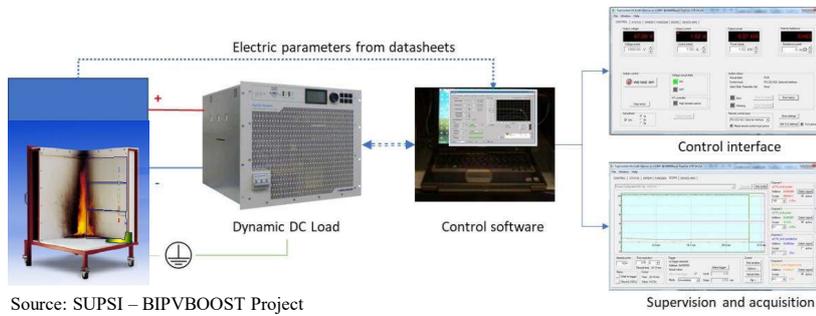


**EN 50575** Power, control and communication cables - Cables for general applications in construction works subject to reaction to fire requirements

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

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

## IMPACT OF A ELECTRICAL LOAD



Source: SUPSI – BIPVBOOST Project



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

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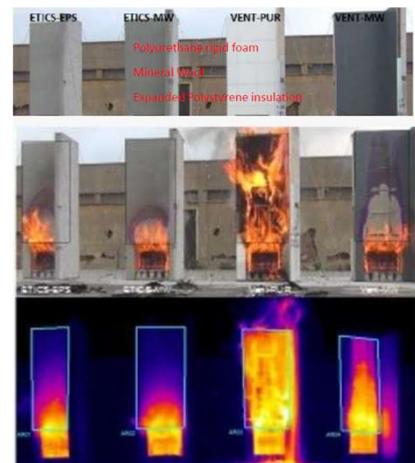
## LARGE SCALE TESTING



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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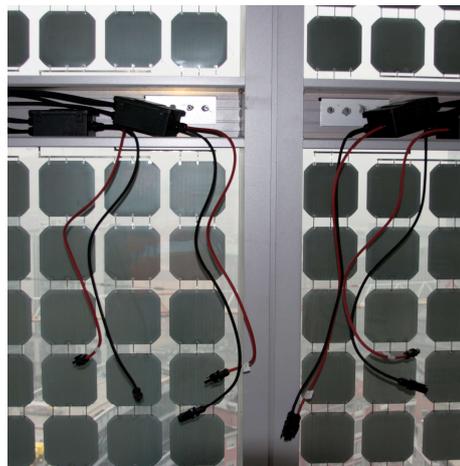
Source: Erhan ElaldI – Polat Tower in Istanbul



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## 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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“A spark neglected makes a mighty fire.”

Robert Herrick

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### ACKNOWLEDGEMENT

 Schweizerische Eidgenossenschaft  
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Education and Research EKAER  
State Secretariat for Education,  
Research and Innovation SERI

 Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

 European  
Commission

 IEA  
PVPS

 Seamless-PV

 BIPV  
boost

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Source: SUPSI

Source: SUPSI