University of Applied Sciences and Arts of Southern Switzerland
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BEYOND STANDARDS: Fire Safety and BIPV Facades

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Fire safety is still too underestimated a discipline.

Fire risk is perceived as " remote " but there are still too many victims worldwide and economic damages are large and increasing.

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

The frequency of fires involving flame spread along the facade has been increasing due to:

1. Complexity of the geometry
2. Combustible material used
3. Standard tests require further refinement

The Challenge of Fire safety for BIPV Products

The increase in façade fires is a general problem given the increasing complexity of building geometric shapes and combustible materials used. Geometry can significantly contribute to harsh effects such as chimney effects. In addition, it has been preferred in building materials to meet requirements for thermal insulation and lightness to reduce structure, as well as aesthetic factors without fully considering fire behavior. For example, ventilated facades made of lightweight materials such as combustible polymer materials can significantly participate in the spread of a fire if hit by a large heat source. In architecture, the increasing trend of integrating photovoltaic products into building facades significantly helps to reduce buildings' energy consumption. While this integration offers undoubted benefits contributing also to sustainability aims, ensuring fire safety is a crucial facet. The multifunctional nature of Building Integrated Photovoltaic (BIPV) modules presents challenges in meeting fire safety requirements. Existing test methods require refinement to effectively evaluate these products, and it is essential to establish testing procedures that accurately reflect the fire risks associated with integrating multifunctional building and electrotechnical components into building facades. BIPV doesn't exacerbate fire behavior. However, like any building material, it's crucial to comprehend its behavior, limitations, and potential applications.

Supported by:
Seamless-PV

Project funded by
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs, Education and Research EAER
State Secretariat for Education, Research and Innovation SERI

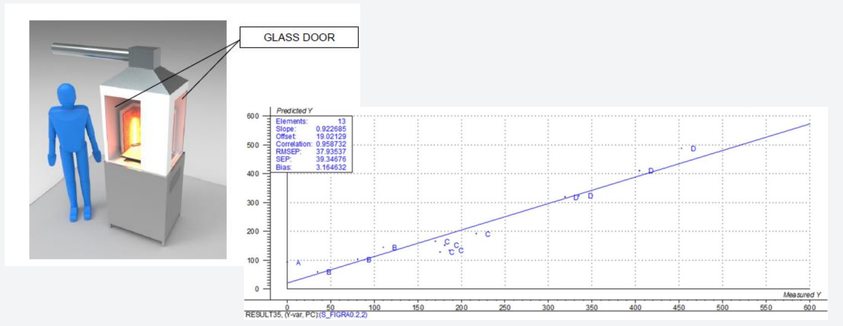
In collaboration with
ISTITUTO GIORDANO BEYOND CERTIFICATION
IEA PVPS

Fire Testing for Building Integrated Photovoltaics (BIPV)

1 SMALL SCALE TEST: MINI-SBI

A scaled-down version of the standard SBI for product development

- Efficiently test numerous on-the-spot samples
- Significant cost savings
- Specimen preservation.

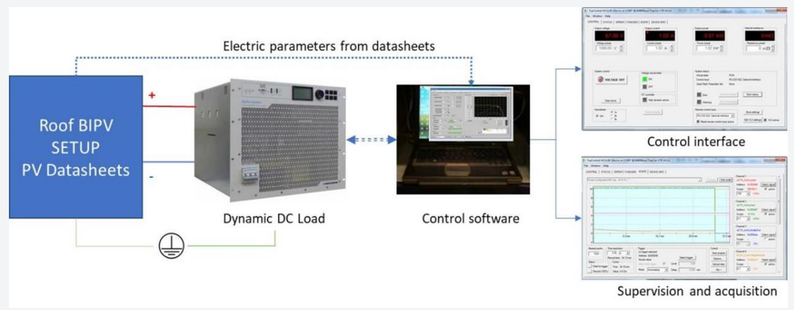


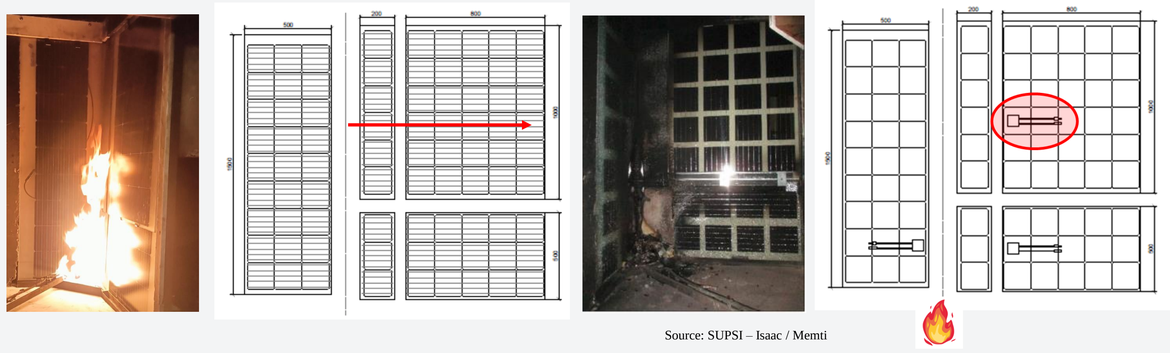
A statistical analysis has been used to establish an empirical correlation between the MINI-SBI and the standard SBI results

Research program:
- Statistical analysis between the MINI-SBI and the SBI results
- Flame retardancy
- Material chemistry and combustion behavior

2 SBI TEST AND CHALLENGES

- Connection , dimension, and solar cell density
- Junction boxes and cables
- Electrical load





Source: SUPSI – Isaac / Memti

Research program:
- Electrical load during the SBI test
- Unification of SBI test setup for BIPV products
- New testing procedures harmonized at the EU level for SBI test for BIPV

3 LARGE SCALE TESTS

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

Research program:
- Comparative Analysis of Fire Dynamics in BIPV Systems versus Conventional Building Products
- Possible Harmonization of Diverse European Testing Methods