Testing Integrated Building Technologies

Outdoor Research Lab for Building Integration

SUPSI brenet collaboration

Forschungslunch #5

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Franklin University Building in Sorengo (source: Franklin University Switzerland and Leo Torri)

Integration turns component performance into building performance

PERFORMANCE

Does it deliver under real boundary conditions?

RELIABILITY

Do materials and interfaces remain stable over time?

SAFETY

Are fire, mechanical and electrical risks addressed?

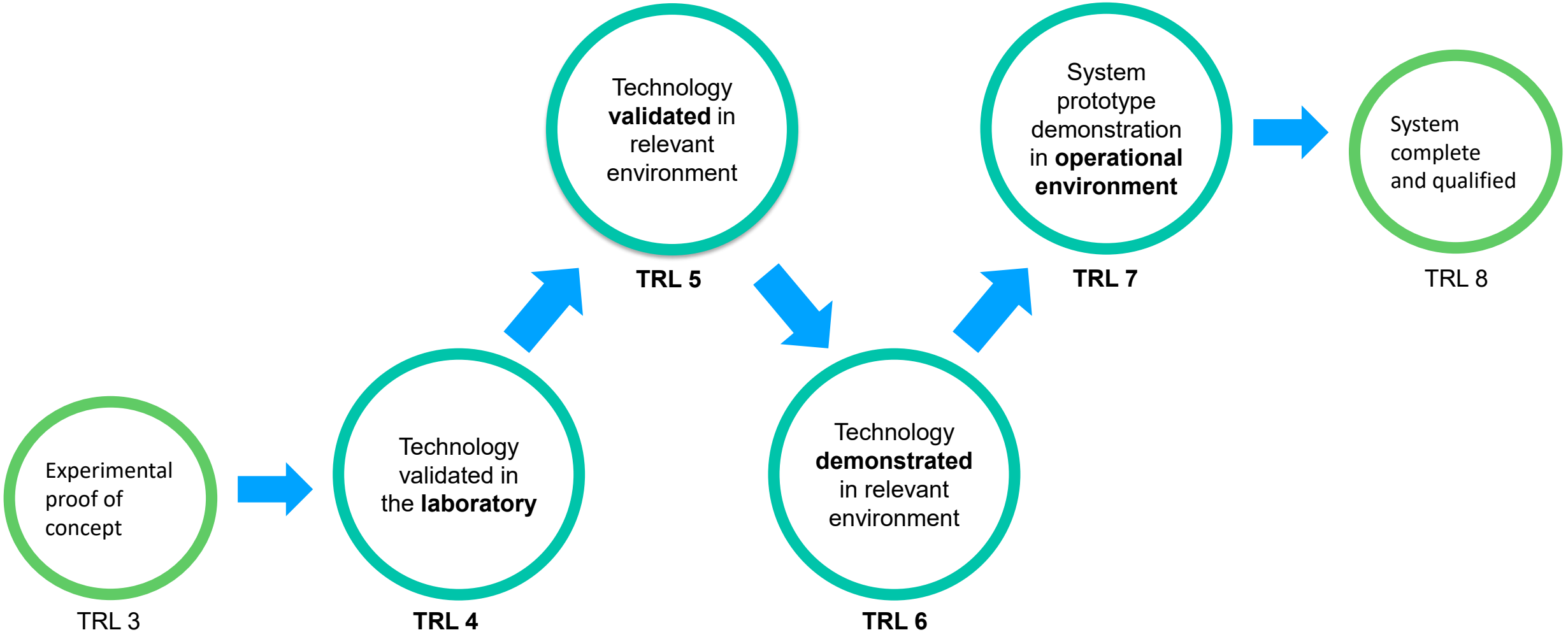
BUILDING INTERACTION

How do envelope, systems and comfort influence each other?

ReHouse project – Multi purpose façade mockup in Trepuzzi, Le - (source: RI group S.p.A.)

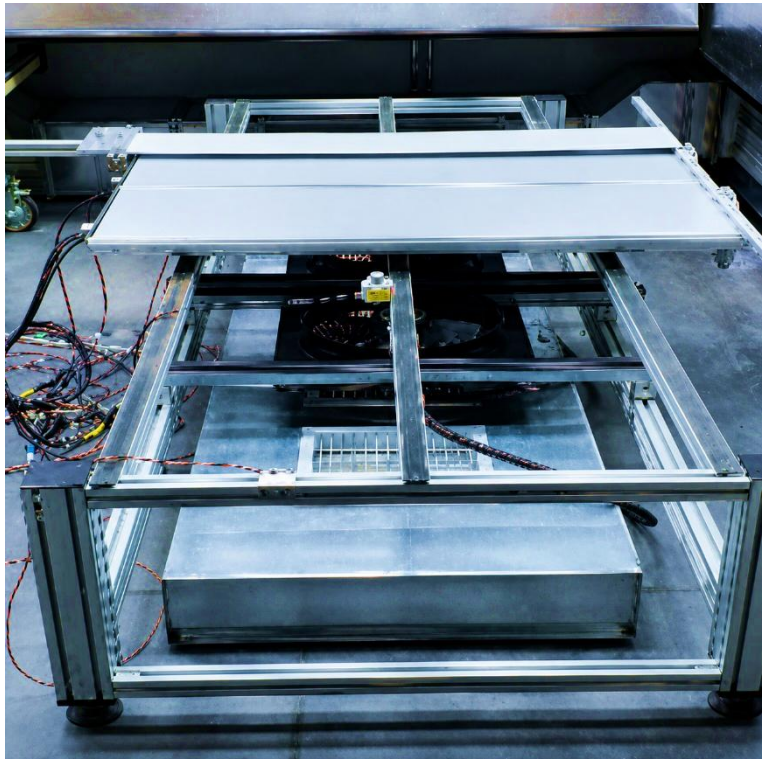
Building performance emerges at the interfaces

Bridging the gap from lab to real operation



One research question, three scales of evidence

Electrical test at SUPSI PVLab in the solar simulator (source: SUPSI/ISAAC - PVLab



01 - CONTROLLED LAB TESTING

Franklin mockup at SUPSI outdoor facilities (source: SUPSI/ISAAC – Innovative Envelope Team)

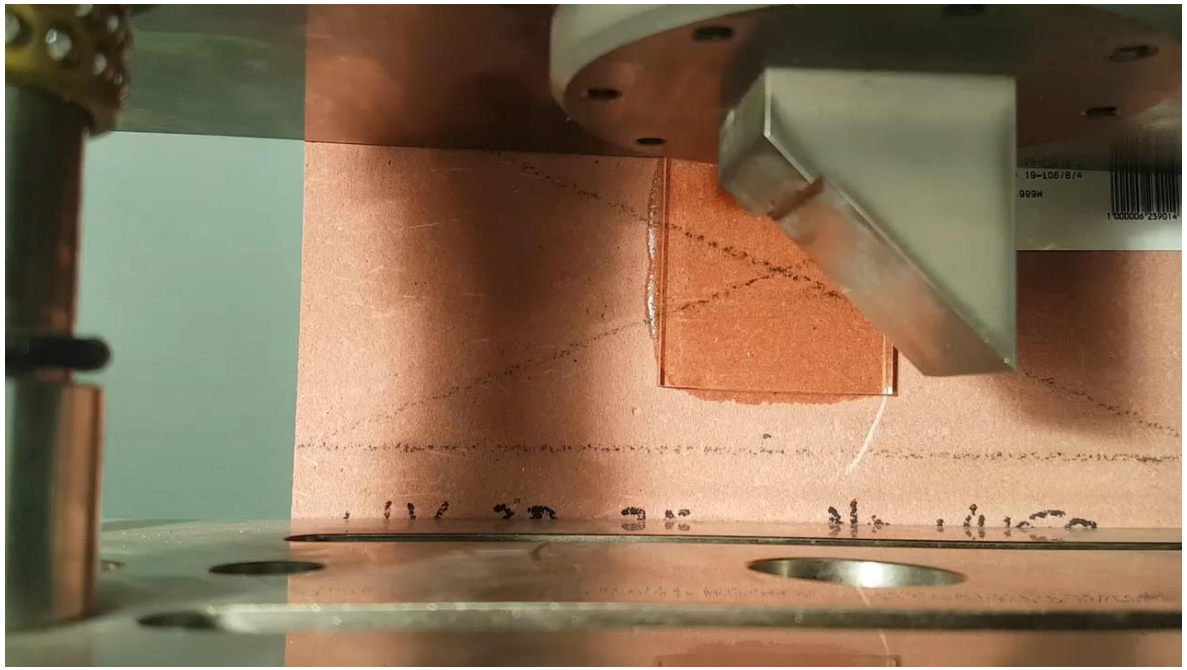
02 - OUTDOOR EXPOSURE

Franklin University Building in Sorengo (source: Franklin University Switzerland and Leo Torri)

03 - DEMONSTRATION BUILDING

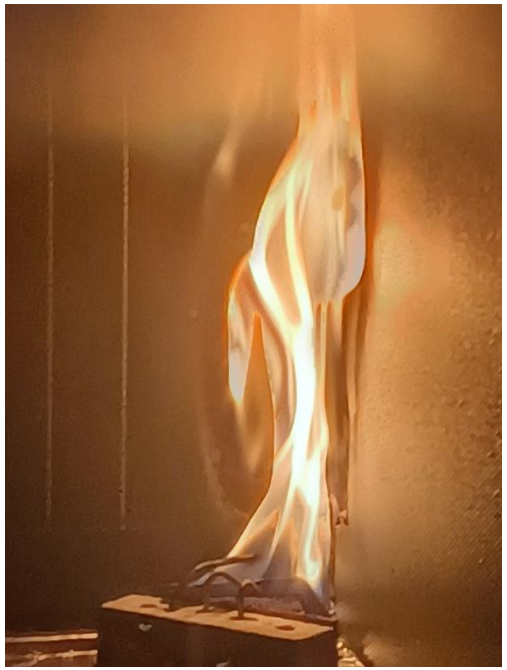
From adhesion to fire behavior

Mechanical test at SUPSI PVLab (source: SUPSI/ISAAC - PVLab



MECHANICAL RELIABILITY

Reaction to fire test at SUPSI DTI (source: SUPSI/ISAAC – Innovative Envelope Team)



REACTION TO FIRE

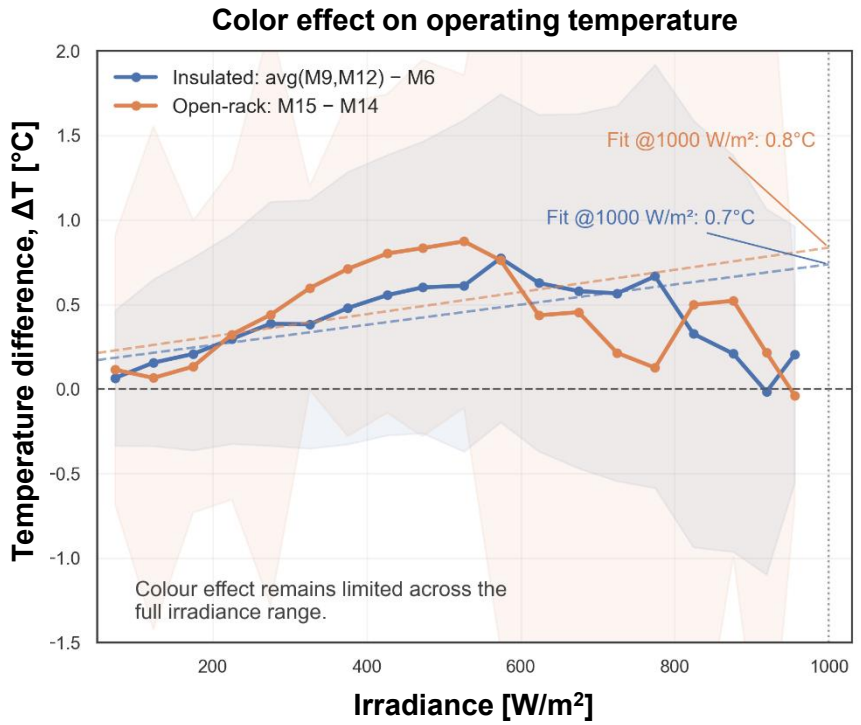
Controlled tests verify safety and durability before full-scale integration.

Outdoor testing quantifies real performance

CASE STUDY · COLORED BIPV

Pairwise module temperature differences were evaluated across irradiance bins. At 1000 W/m², the fitted color effect was 0.7°C for the insulated configuration and 0.8°C for the open-rack configuration.

Seamless-PV Project – PIZ mockup at SUPSI outdoor facilities (source: SUPSI/ISAAC – Innovative Envelope Team)



A new research lab bridges control and reality

Research Lab – at SUPSI outdoor facilities (source: SUPSI/ISAAC – Innovative Envelope Team)

Full-scale testing and monitoring of integrated building technologies in realistic operating conditions

From boundary conditions to building-level KPIs

Research Lab – at SUPSI outdoor facilities (source: SUPSI/ISAAC – Innovative Envelope Team)

01 - BOUNDARY CONDITIONS

Solar irradiance · air temperature · humidity · wind

02 - SYSTEM PERFORMANCE

Electrical yield · surface temperature · heat flux · control response

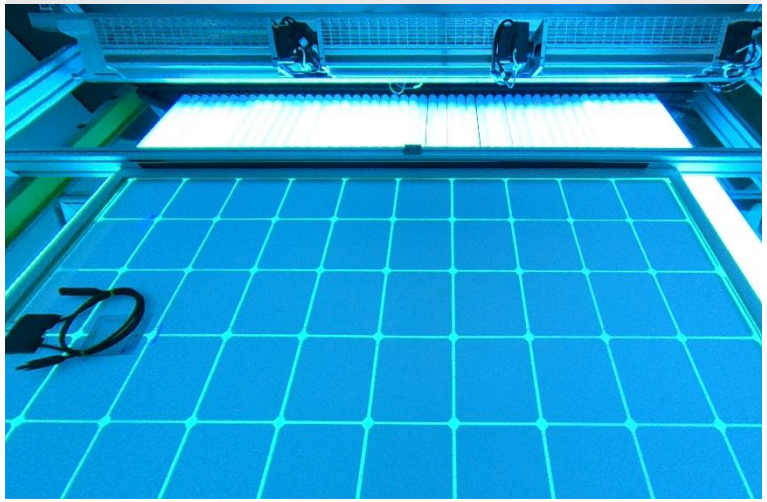
03 – BUILDING IMPACT

Indoor climate · illuminance · thermal and visual comfort · energy demand

Synchronized data · reference comparison · uncertainty analysis · long-term trends

Safety performance is quantified at system scale

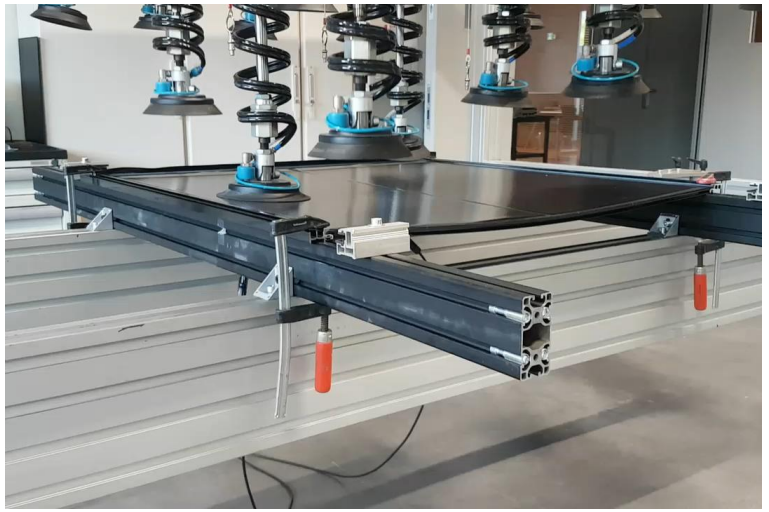
Electrical test at SUPSI PVLab in the solar simulator (source: SUPSI/ISAAC - PVLab



01 - ELECTRICAL

IV curve · Insulation resistance · continuity · power loss

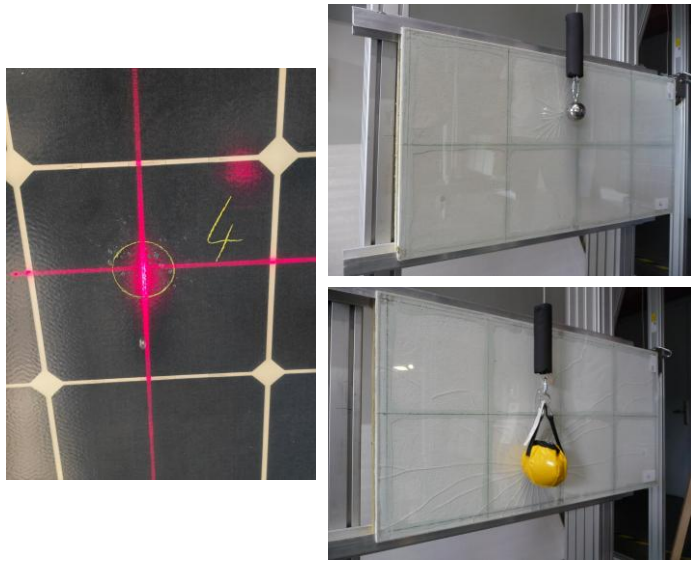
Mechanical test at SUPSI PVLab (source: SUPSI/ISAAC - PVLab



02 - MECHANICAL

Applied load · displacement · deflection · failure mode

Hail and impact test at SUPSI PVLab (source: SUPSI/ISAAC - PVLab



03 – Hail / IMPACT

Impact energy · residual performance · damage mode

Performance is assessed before, during and after loading

Real operation completes the evidence chain

WEATHER

Dynamic solar and thermal boundary conditions

OPERATION

Controls, energy flows and system interactions

USE

Occupants, comfort and real constraints

TIME

Degradation, drift and seasonal behavior

Seamless-PV Project – Demonstration building in Cosio Valtellino, SO (source: PIZ S.r.l.)

Bring us your integration question

Materials · envelope systems · performance · reliability · safety

SUPSI

Engage early, while evidence
can still change the design

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