

# ASA

Architectural Solar Association

## Barriers & Strategies for Integrating Architectural Solar *A US Market Perspective*

Christopher Klinga, PE  
*Technical Director, ASA*

Stan Pipkin  
*Regional Manager, ASA*

September 22, 2022



# Who We Are

**The Architectural Solar Association (ASA)** represents a growing industry with a common goal of transforming building facades and other architectural surfaces into generating assets.

## **ASA**

- Expands Awareness
- Acts as a Supply Chain Resource
- Develops Standards



## **Christopher Klinga P.E.**

*Technical Director, ASA*  
*Principal, SolMotiv Design*

- 2007-2016 - VP of Product Development Lumos
- Actively consulting in architectural solar product & project development
- B.S. Mechanical Engineering University of Colorado
- Colorado & Texas licensed professional engineer



## **Stan Pipkin**

*US Regional Manager, ASA*  
*Owner, Lighthouse Solar & Pipkinc.*

- 2007-Present, Lighthouse Solar Austin - hybrid solar EPC and architectural design firm.
- Principal of Pipkinc. design firm focusing on residential sustainable architecture.
- Masters of Architecture from the University of Texas
- Policy expertise at Solar Austin, TXSES
- IREC Design Award
- Product Design with Lumos Solar

# Overview

---

- Definition of Architectural Solar
- Architectural Integration Opportunities
- Market Barriers
- Path to Widespread Adoption

Image courtesy of Lumos Solar

# Definitions of BIPV and BAPV

per EN 50583 / IEC 63092 / IEC 61730

## 3.3.1 Building Attached PV (BAPV)

Photovoltaic modules are considered to be building attached if the PV modules are mounted on a building envelope and do not fulfil the criteria for building integrated PV

## 3.3.2 Building Integrated PV (BIPV)

Photovoltaic modules are considered to be building integrated if the PV modules form a building component providing additional functions as defined in 4.5 b

### **Building Functions: (in addition to power generation)**

Mechanical rigidity or structural integrity, Primary weather impact protection: rain, snow, wind, hail, Energy economy, such as shading, daylighting, thermal insulation, Fire protection, Noise protection, Separation between indoor and outdoor environments, Security, shelter or safety

*Thus, the BIPV module is a prerequisite for the integrity of the building's functionality. If the integrated PV module is dismantled, the PV module would have to be replaced by an appropriate building component.*



# BIPV Solar Technology with Architectural Significance

Image courtesy of Lumos Solar

**ASA**  
Architectural Solar Association

# Architectural Solar

Image courtesy of Lumos Solar

**ASA**  
Architectural Solar Association

# Architectural Solar

Solar energy generating technologies that are coordinated with the architectural design process.

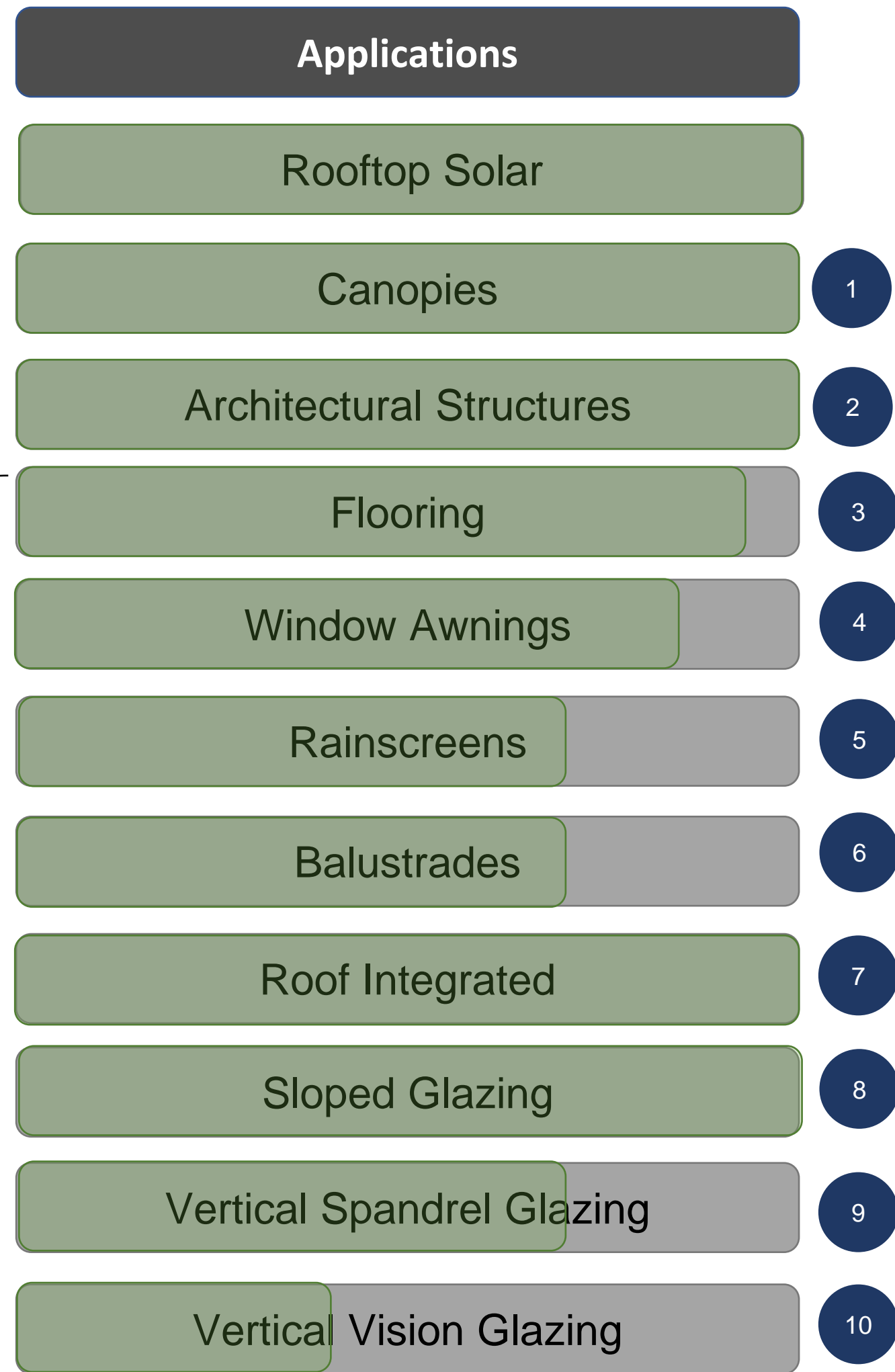


Least Integrated

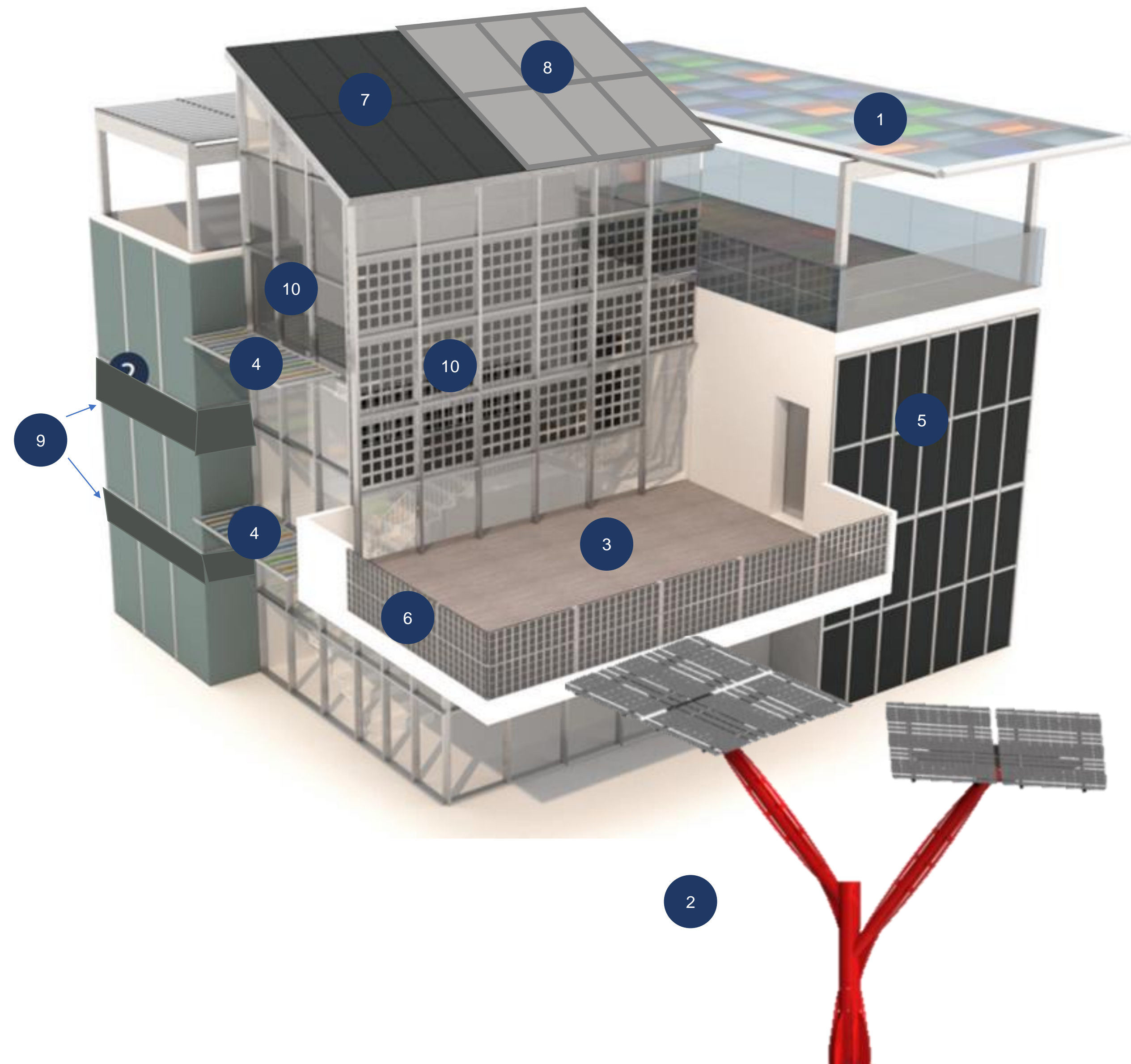
Architectural Solar

BIPV

Most Integrated



0 South Facing Energy Score 10

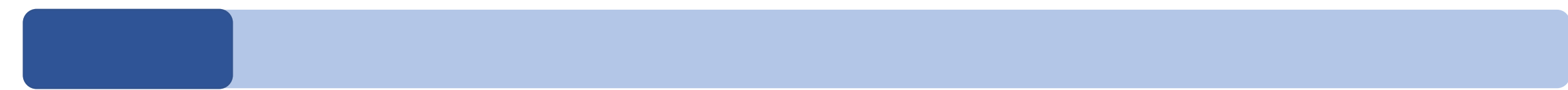


Graphic courtesy of SUPSI

# Architectural Solar Continuum



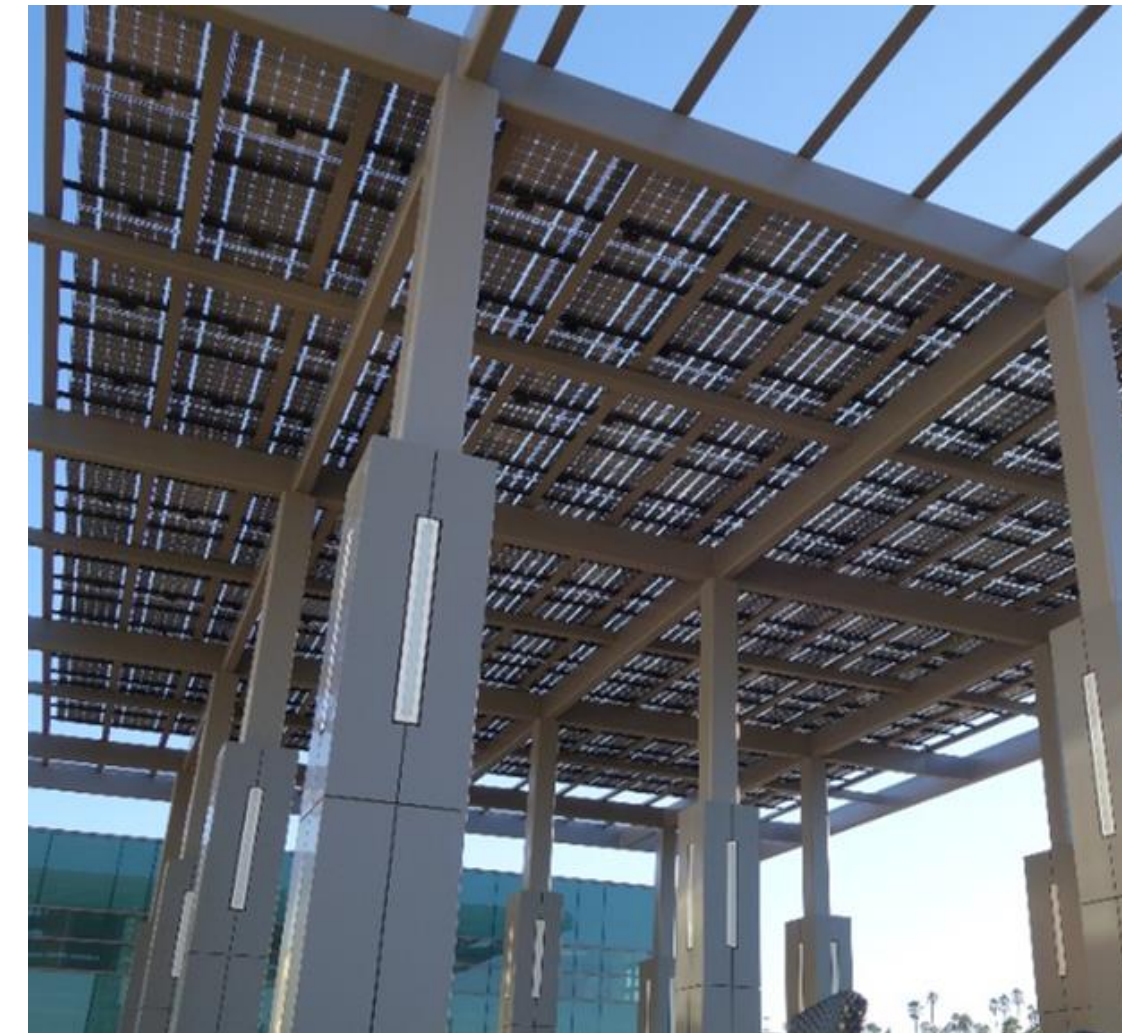
# Rooftop Solar



Least Integrated

Most Integrated

**ASA**  
Architectural Solar Association



# Canopies

Least Integrated

Most Integrated

**ASA**  
Architectural Solar Association

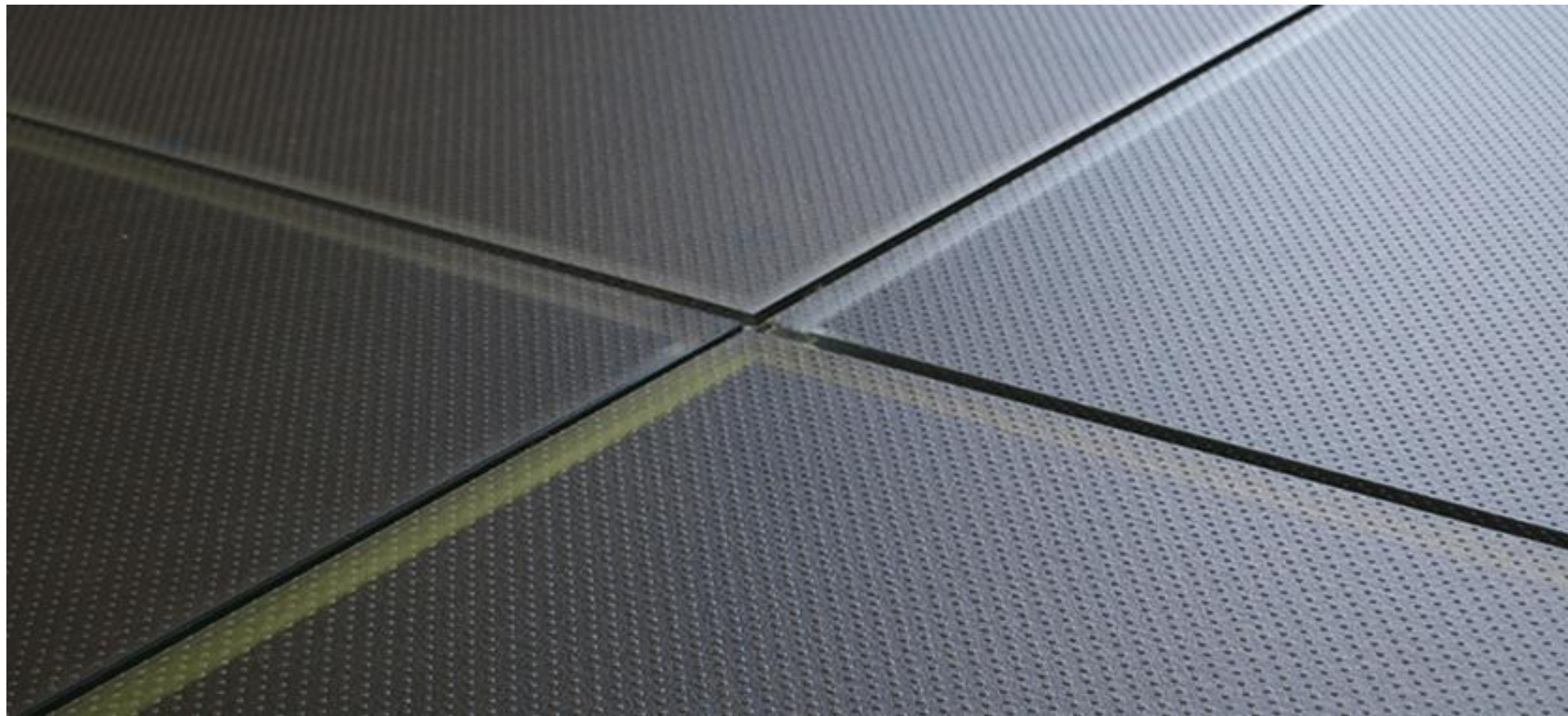
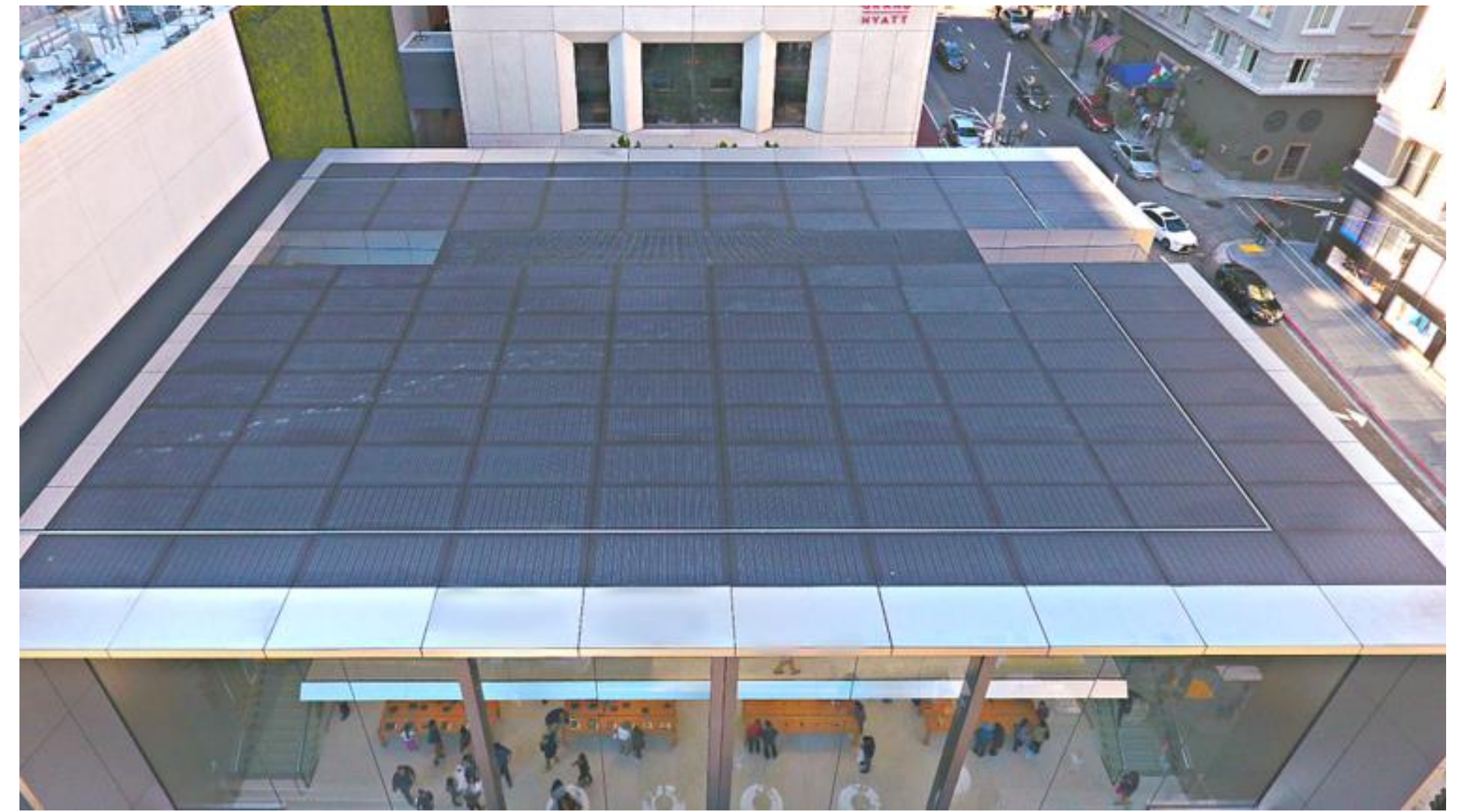


# Architectural Structures



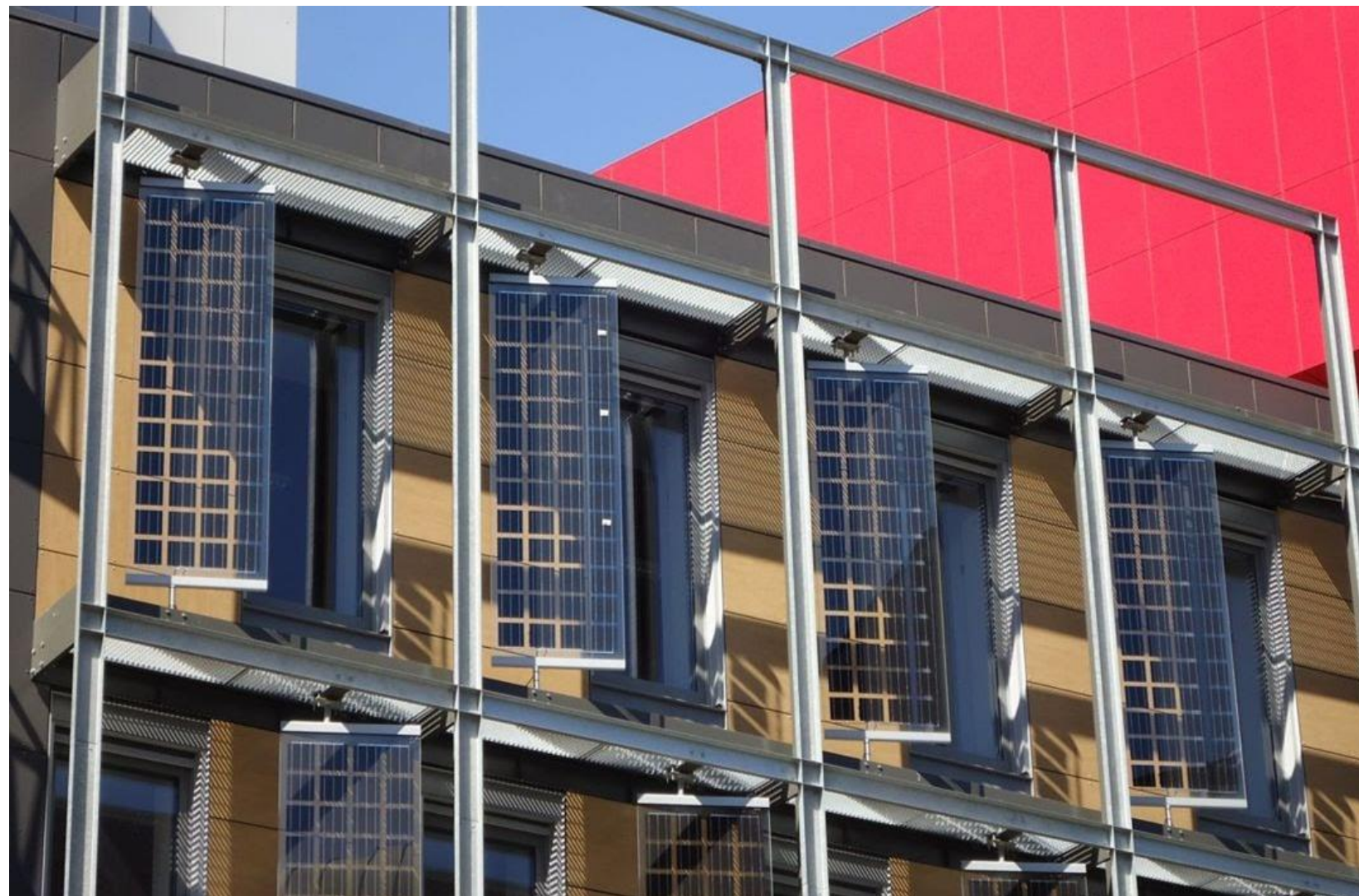
Least Integrated

Most Integrated



# Flooring





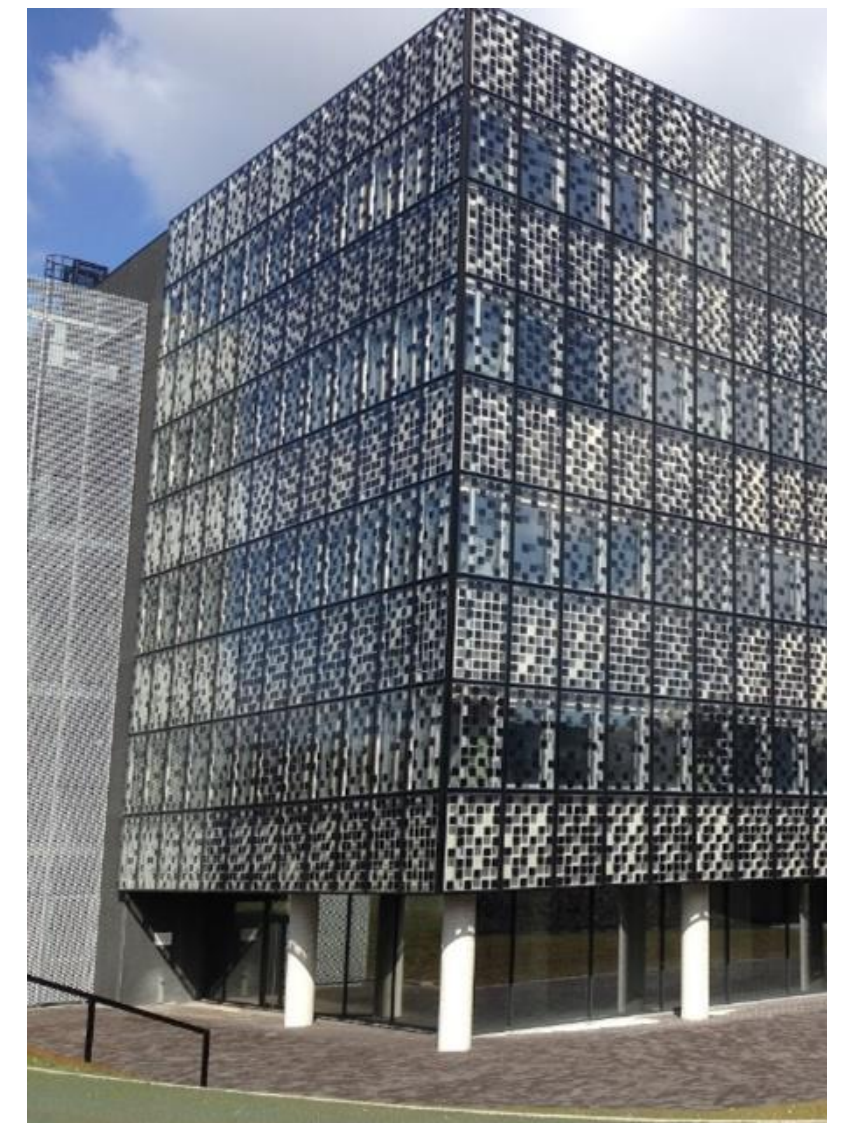
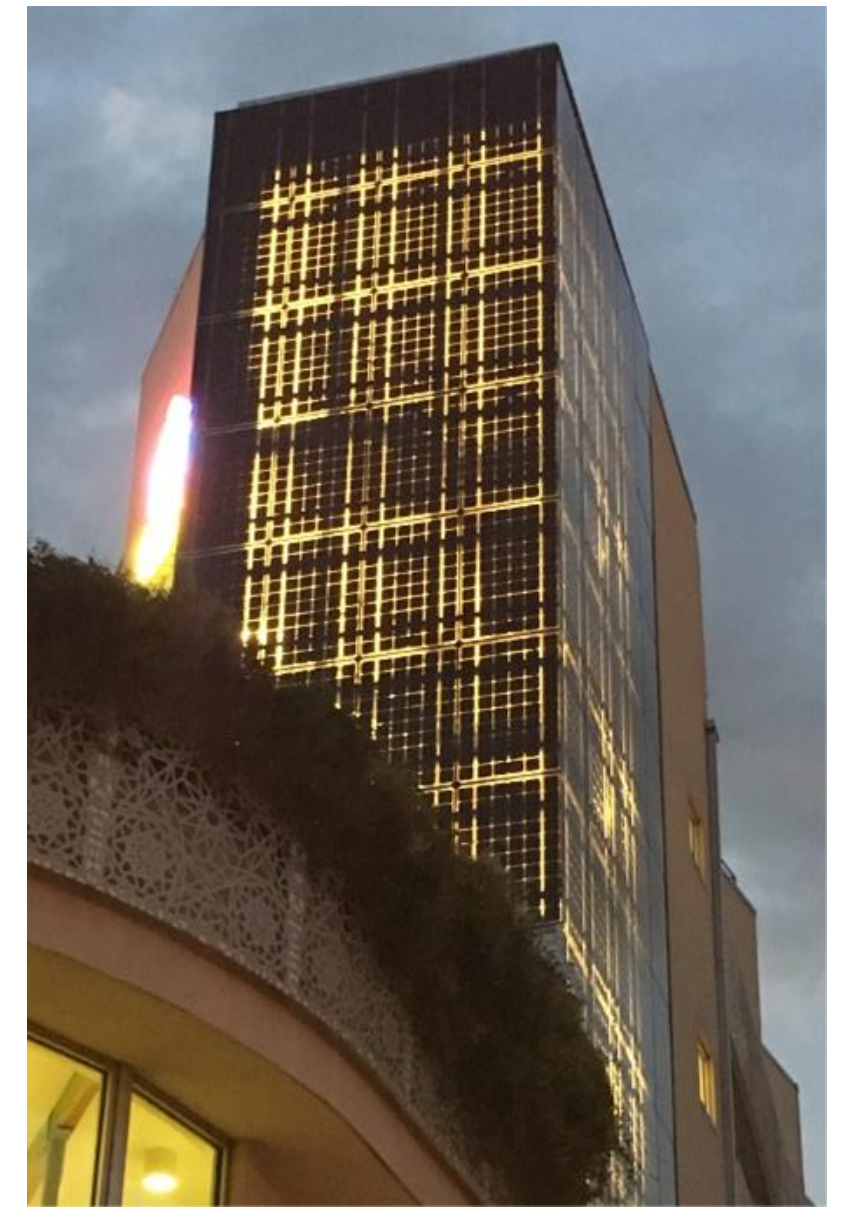
# Awnings & Louvers



Least Integrated



Most Integrated



# Ventilated Solar Facades/ Rainscreens



Least Integrated



Most Integrated



# Balustrades





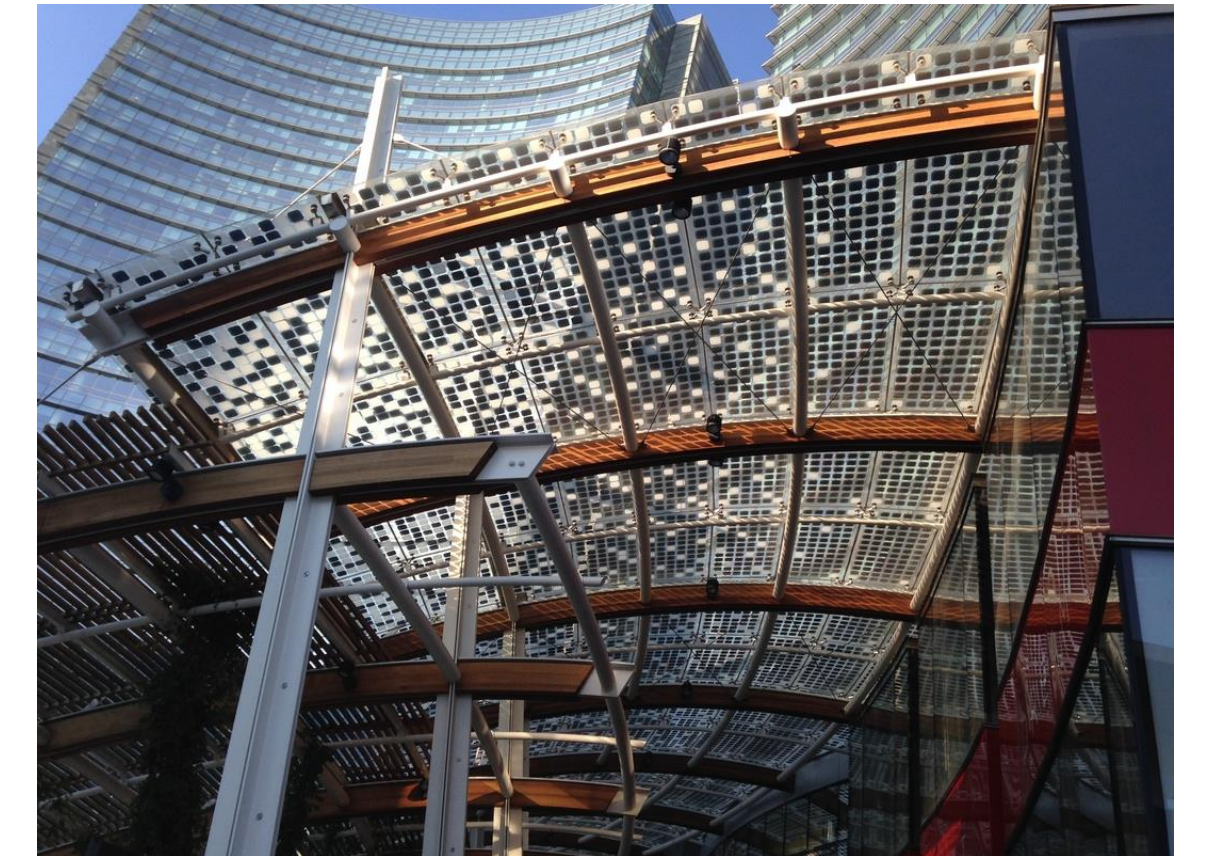
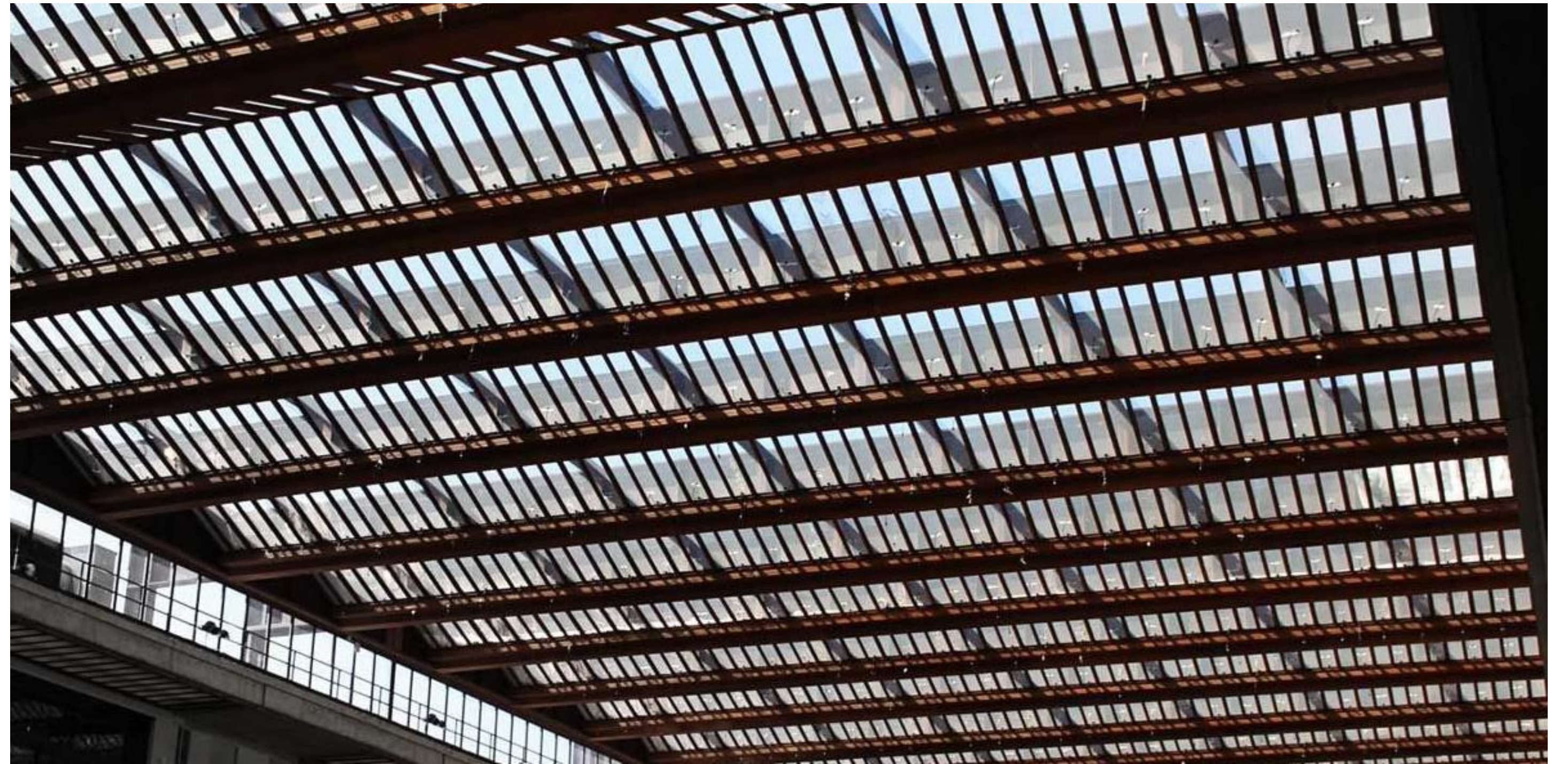


# Roof Integrated



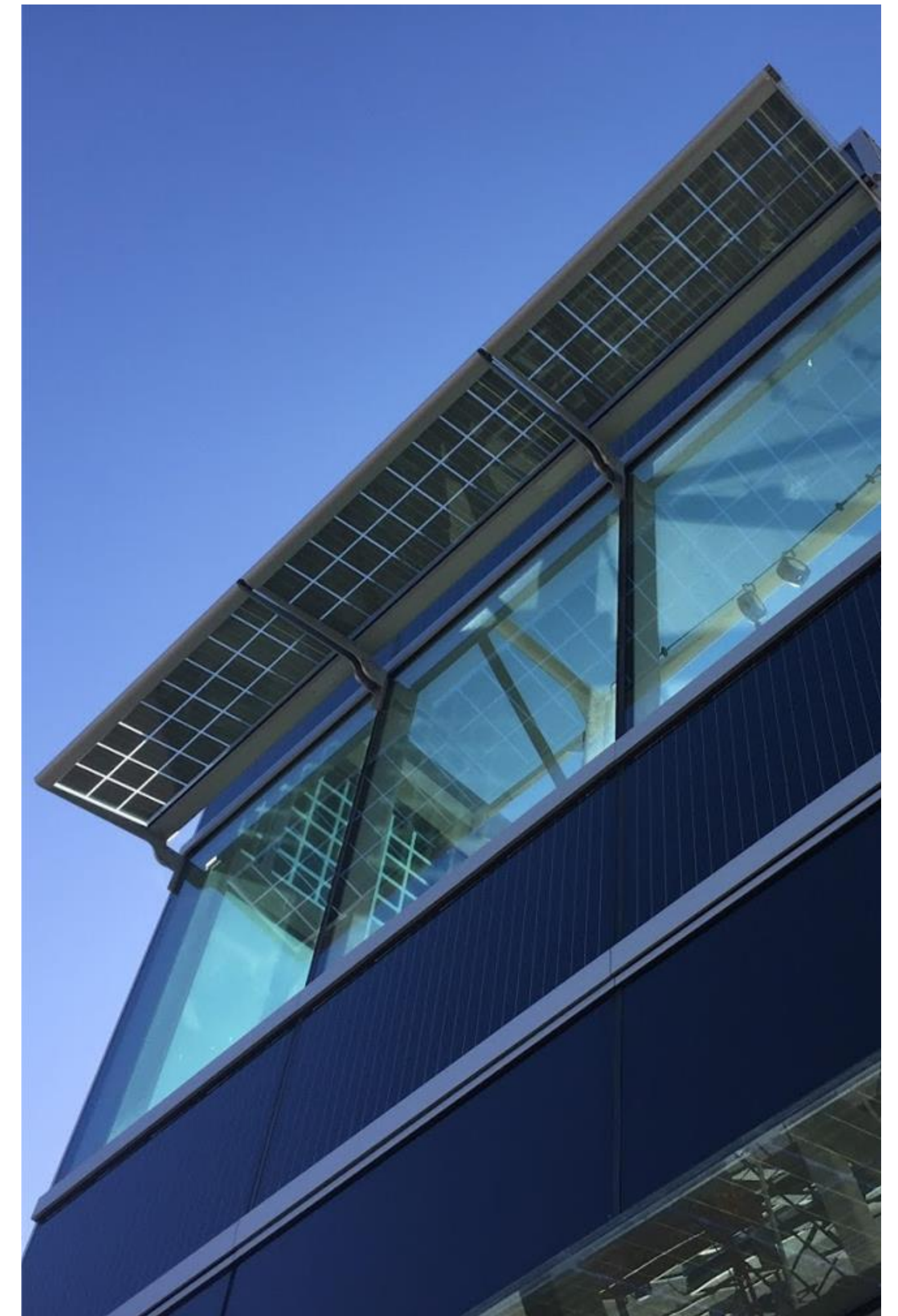
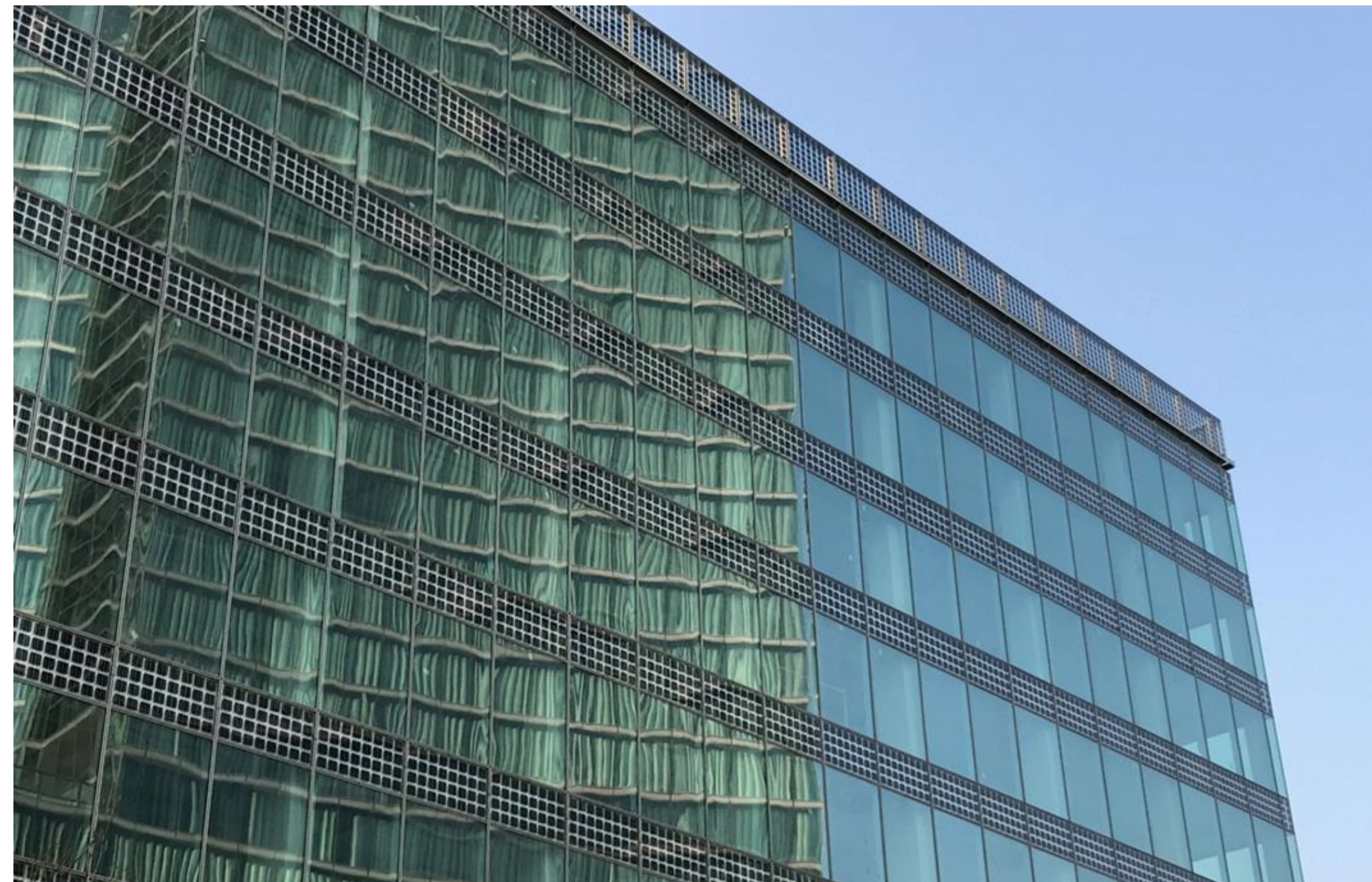
Least Integrated

Most Integrated



# Sloped Glazing





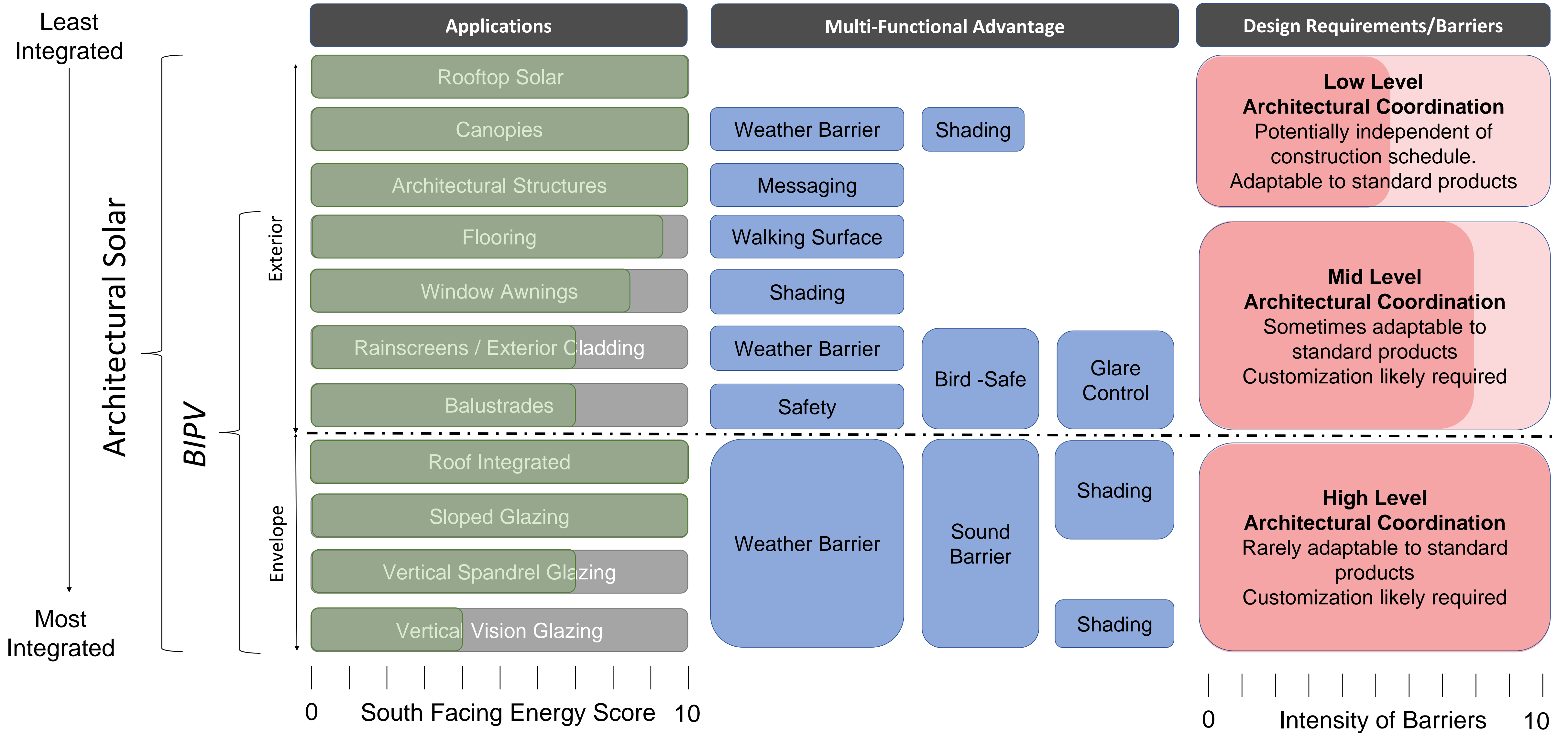
# Spandrel Glazing





# Vision Glazing

Least Integrated  Most Integrated



# Architectural Solar - Advantages

# Market Barriers

---

Architectural Solar

Rooftop Solar

- Lack of Continuing Education
- High soft costs
- Incompatibilities with Arch. Workflows
- Lack of Awareness
- Building Industry Adoption
- Standards Development
- Limited Supply Chain



# BIPV Specific Constraints

- 100+ glass sizes per project
- System design complexity
- Variable shading / orientations
- 3+ year construction schedule
- Concealed conductors
- BOS equipment locations
- UL Field listing due to lack of certified product suites.

# The Pull

## New Construction Requirements

- Progressive Municipalities
- State Mandates

## Net Zero Ambitions

- Maximizing energy potential

## Cost Reductions

- Modules -  $\$0.40/\text{watt} = \$7.60/\text{sqft}^*$
- Installed Systems -  $\$3.00/\text{watt} = \$57/\text{sqft}^*$

\*Assumes 19 watts/sqft technology

## ESG

- Corporate Initiatives
- Climate Action Plans

## Demand

- Market Growth
- IRA

Image courtesy of SolMotiv Design



# The Path to Widespread Adoption

- Embrace broad approach to integration
- An educated AEC community
- Business model innovation in design workflow
- Simplified design processes and integration methodologies
- Supply chain integration
- Non-export interconnection protocols

# Architectural Solar Education for Design and Construction Professionals



## Objective

ASA & NREL will educate design and construction professionals on key principles of Architectural Solar; solar energy generating technology that has architectural significance or is coordinated with the architectural design process.

## Project Impact

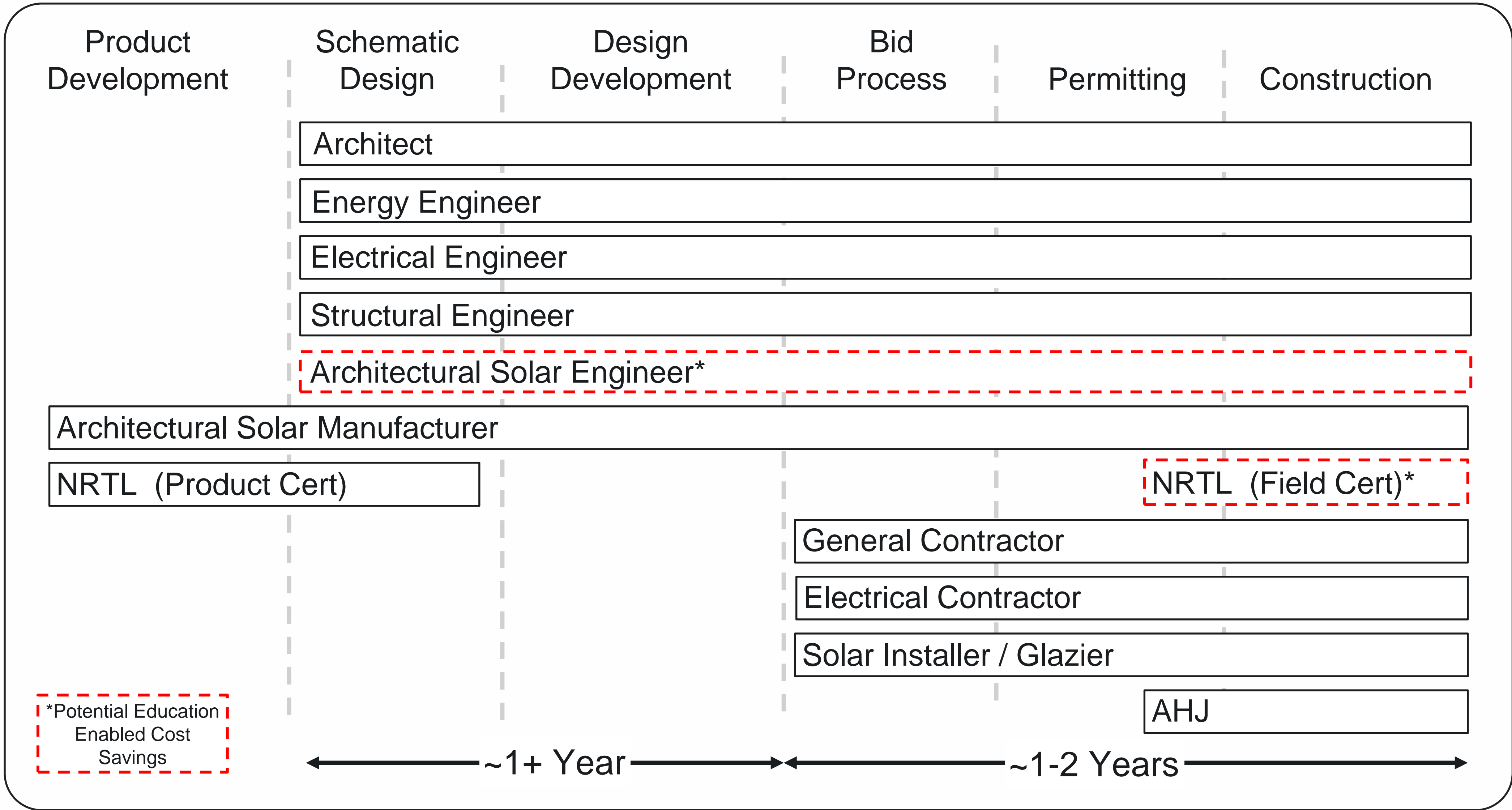
The project will equip solar and building industry professionals with the skills to work at the intersection of solar energy and the building industry. It will break down key barriers inhibiting the widespread adoption of architectural solar, increasing the penetration of on-site renewable energy and enabling grid-efficient buildings (GEB). The program will promote architectural solar innovation and deployment.

**Duration:** 2-3 Years

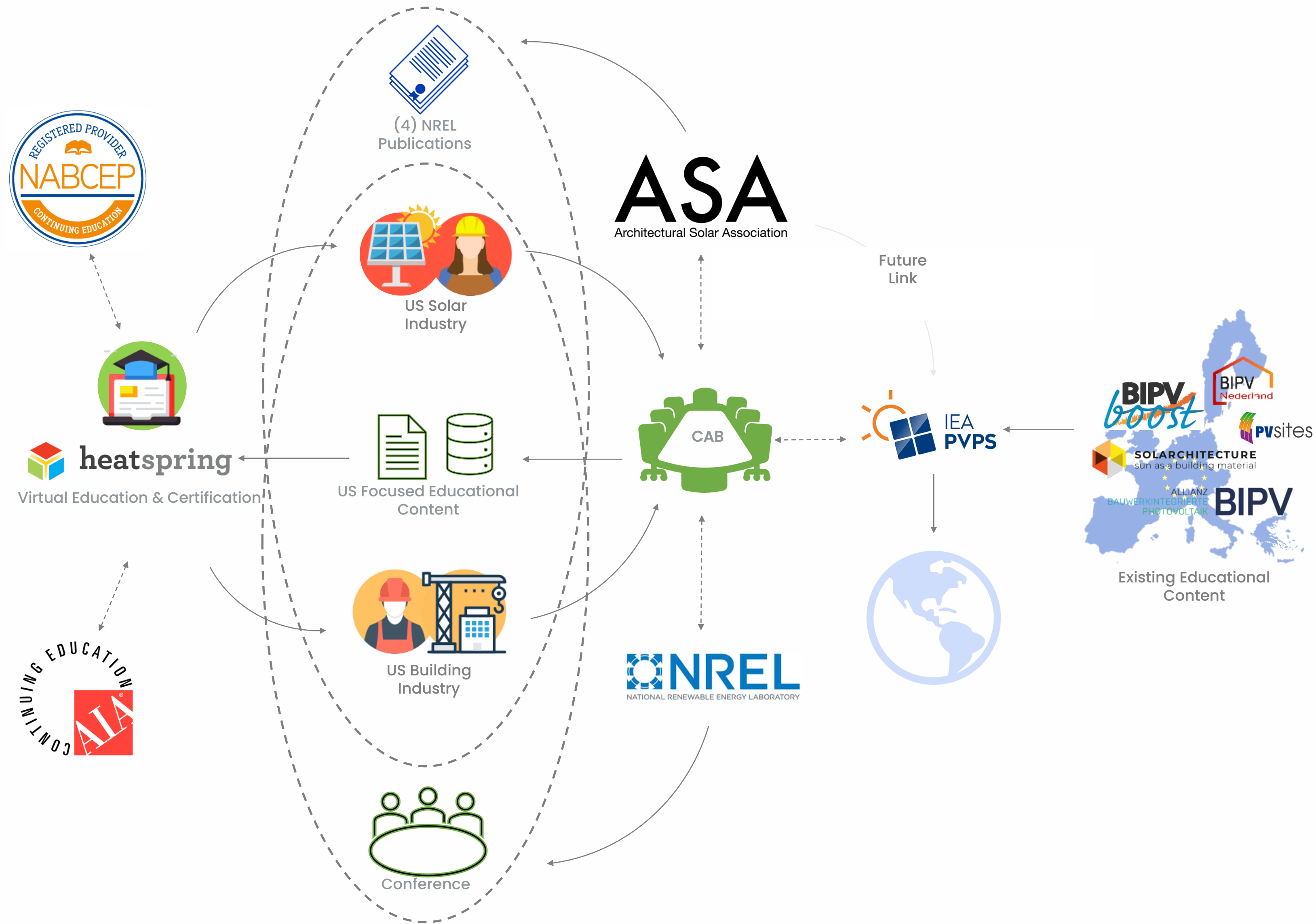
**Budget:** \$750,000

All thanks to the help from the following supporting organizations;





# Architectural Solar Process



# ASA Educational Framework

# Thank you!

Christopher Klinga P.E.  
Technical Director, ASA  
[chris@archsolar.org](mailto:chris@archsolar.org)

Stan Pipkin  
US Regional Manager  
[stan@archsolar.org](mailto:stan@archsolar.org)

Architectural Solar Association  
1035 Pearl St.  
Suite 325  
Boulder, CO 80302

Images courtesy of BIPV Boost, Energy Glass, IEA, Issol, Lumos Solar, Lighthouse Solar, Morgan Creek Ventures, NRG, Onyx Solar, SolMotiv Design, Solaria, Spotlight Solar, SUPSI, Tres Birds, Walters & Wolf