



## Assessment and Demonstration 5.1

### What are the legal requirements for BIPV?

**Building-integrated photovoltaic (BIPV) modules/systems have to be compliant with both electro technical standards and existing building codes and practices, since they are both generators of electricity and part of the building envelope.**

Standardization of Building-integrated photovoltaic (BIPV) systems is under discussion and progressing at the international level in ongoing research activities and working groups. The BIPV sector, within the legal framework set by the CPR 305/2011, can rely on a solid normative building framework and, for specific requirements, next researches and standardization works are going to contribute in covering gaps and supporting the BIPV market with testing and performance assessments.

Keywords: BIPV quality; Standards; Normative compliance; Testing procedures; Safety.

Target audience: Regulation makers; Owners & other decision makers; Architects & engineers; Suppliers & companies.

According to EN 50583, Parts 1 and 2, "Photovoltaics in buildings" [1], "Photovoltaic modules are considered to be building-integrated, if the photovoltaic modules form a construction product providing a function as defined in the European Construction Product Regulation CPR 305/2011 [2]."

Thus, the Building-integrated photovoltaic (BIPV) module is a prerequisite for the integrity of the building's functionality. If the integrated photovoltaic module is dismantled (in the case of structurally bonded modules, dis-mounting includes the adjacent construction product), the photovoltaic module would have to be replaced by an appropriate construction product".

But beyond definitions, what does this mean? What is the reality for the market?

In most EU countries, as well as in Switzerland, there is a lack of harmonized BIPV standards for building skin technologies (e.g. curtain walls, cold facades, etc..) or official regulations defining special technical requirements and testing/qualification procedures for building envelopes integrating PV. From the electro/technical side, the design qualification and type approval of PV modules is done according to the standard EN 61215 or EN 61646, but these cannot provide a reliable performance assessment for most building requirements. On the other side, from the building perspective, in the current framework a BIPV system is often considered as the conventional equivalent system it is replacing, such as a curtain wall facade or a pitched roof.

Thus, depending on the main mounting categories (roof, facade and external devices) and the main composing material (e.g. glass, membrane, metal, plastic, etc.), the essential BIPV requirements are defined, and the main reference performance are taken from existing standards for construction products.

For example, if, according to the type of installation, PV components can be treated as glazing systems for the building skin, the construction rules of glass building skin must be met. Accordingly, and thanks to the combination of extensive glass know-how with photovoltaic technology, some manufacturers of BIPV glass mark their products according to CE-marking for laminated safety glasses - not developed for PV building integration.

Once the requirements for the BIPV's final intended use in the building skin are identified, the related building performances have to be verified, to assess if the element can be used or not in building envelope (e.g. mechanical safety, fire safety, glass safety, etc. See the basic requirements for construction works are set out in Annex I of CPR 305/2011). Formally, if EN 50583:2016 is applied, it is also necessary to obtain the correct qualification procedure for applying a CE-mark as a construction product according to CPR 305/2011.



## Electrical

### PV Module

- [IEC 61646](#): *Thin-film terrestrial photovoltaic (PV) modules, Design qualification and type approval*
- [IEC 61215](#): *Crystalline silicon terrestrial photovoltaic (PV) modules, Design qualification and type approval*
- [IEC 61730](#): *Photovoltaic module safety qualification*
- [Low Voltage Directive \(LVD\) 2006/95/CE \(CE-marking of electrical devices\)](#)
- [Electromagnetic Compatibility Directive \(EMCD\)](#)

## Building



### Building product

- [Construction Products Regulation \(CPR\)](#)
  - Basic requirements for building products (Annex I)
  - General principles for CE-mark ([DoP](#), [hENs](#), [ETA](#), ...)
  - Harmonized Standards ([hENs](#)) and European technical Assessment ([ETA](#))



**CE –Mark for Building products**

Fig. 1 Overview of electrical and building technical standards (@SUPSI-ISAAC).

In conclusion, we can summarize that:

- BIPV elements, as part of the building construction, are affected by both European directives for construction products and electro-technical standards for PV products;
- Construction products must comply with harmonized standards where available, or the corresponding alternatives allowed by Construction Products Regulation;
- Further requirements for construction products are given by national building codes; and
- In the case of composite material-based construction products such as BIPV, most current standards seem to be not directly applicable/valid for testing some technical requirements (e.g. mechanical, fire safety, etc.).

Performance-based methodology should be applied to each BIPV project, because the required performances can vary depending on the BIPV project location, the building's geometry and typology, the use as well as the envelope system and the specific conventional PV module.

Once the final intended use of the PV element in the building skin is determined, the standards in force (e.g. building codes) can be applied to BIPV elements to verify an adequate performance level for the building use (e.g. this is already adopted in many BIPV glasses for a performance assessment like the safety glass, mechanical resistance, g-value, U-value, etc.). However, in most cases, some missing gaps call for further research, since BIPV requirements cannot be considered the simple sum of building and PV prescriptions in force. The development of new testing procedures for a performance-based approach is still a relevant question for BIPV sector [2-4].

The next challenge in BIPV field will be to identify the missing gaps within the current standardization work and existing normative framework in relation to the most relevant BIPV requirements, performance risks, reliability and potential failure mechanisms to define the main routes for the development of new qualification procedures to support the market.

### References

- [1] Regulation (EU) No 305/2011. European Construction Product Regulation.
- [2] EN 50583:2016 Photovoltaics in Buildings (part 1: BIPV modules and part 2: BIPV system).
- [3] P. Bonomo, F. Frontini, E. Saretta, M. Caccivio, G. Bellenda, G. Manzini, P. G. Cappellano. Fire Safety of PV Modules and Buildings: Overviews, Bottlenecks and Hints, EU PVSEC 2017", 2017.
- [4] E. Saretta et al. Laminated BIPV glass: approaches for the integration in the building skin. In J.Schneider and B. Weller (Eds.), Engineered Transparency 2016: Glass in Architecture and Structural Engineering (363-372). Ernst&Sohn, 2016.

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