Building integrated Photovoltaics

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Summary

In terms of rising energy costs and limited fossil fuels the solar energy becomes more and more important. In the last years a change of applications was visible: From energy plants on fields and grasslands only for producing energy to the so called BIPV (building integrated Photovoltaic). Here the PV acts not only for producing energy: Other purposes are e.g. acting as building envelope and/or acting as architectural element. In this paper the basics of PV are shortly presented. Other important points are the aspects of safety e.g. for overhead glazing and large façade systems with PV and aspects of static analysis. Finally some examples of BIPV are presented.

Keywords: solar, glass structure, linear fixing, point fixture, solar clamp, BIPV, Façade, Overhead glazing, railing

1. Introduction

Until now most applications with photovoltaic are standard applications with framed panels on roofs or installations on fields. More and more attractive applications from the architectural point of view are built or are under construction. The possible glass sizes are increasing, so there are many new ways of application. The electric demands of the electric engineers and the safety aspects of the structural engineers are worlds apart. To design a BIPV application knowledge and background is required about many points like the electric part, possible position of cells on the panes, properties of glass, finite element analysis, remaining load carrying capacity, influence of temperatures, approval of the building authorities and many others things. Focus in this paper will be mainly the part of the structural engineer.

2. Basics of Photovoltaic

Photovoltaic panels and solar cells respectively can be classified in many ways like e.g. thickness, material or production process. A common feature of most solar panels is the fact that the cells are placed on a surface of one glass to which a second layer (plastic, foils, etc.) is laminated or the cells are placed between two layers of glass.

Three principle techniques are the thin-film technology (see Fig. 1) - a special coating on the glass, monocrystalline cells with the standard dimensions of 156mm x 156mm which are laminated between two glass panes (Fig. 2) or polycrystalline cells (Fig. 3). The size of the cells is founded in the size of the silicium blocks, where the cells are cut off. The efficiency of monocrystalline cells is a little bit higher than the efficiency of polycrystalline cells. It is possible to produce the thin-film panels translucent for applications like windows or overhead glazings.

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