



Figure 7.19 Cross-section of a standard module

7.8.4 Postlamination Steps

These include (1) trimming the edges of the laminate to remove spread-out encapsulant, (2) sealing them with silicone rubber to close this potential path of moisture penetration in the module, (3) sticking the plastic junction box at the back of the laminate and performing the connections and (4) when required, installing the anodized aluminum frame (Figure 7.19). The frame must be electrically insulated from the active cell circuit so that high-voltage differences can be sustained between the electrical terminals and the frame without current flow.

Besides, among other final tests, the $I-V$ curve of all modules under standard conditions is measured in a solar simulator to check if they fulfill specifications. Flash simulators are commonly utilized to save energy, with the electronic equipment able to record a complete $I-V$ curve in a fraction of a second. They must have a spectral content matched to the AM1.5 standard, or else, they must be calibrated with a calibrated cell of the same technology.

7.8.5 Special Modules

7.8.5.1 BIPV products

Building integration of PV modules (BIPV) has emerged as one of the most important – by volume – applications of Photovoltaics. Modules perform two tasks: as constructive materials as well as power generators. Modules can be incorporated to a building in a number of ways and special products are being developed so that the typical framed module is no longer the only PV product. Very large modules with special fixing for roof or façade integration, roof tiles with cells and semitransparent modules allowing light through are available. Visual appearance is enhanced by module shape, encapsulation and cell color [130]. Besides, these products must comply with building normative such as fire resistance.

7.8.5.2 Bifacial modules

Several cell structures have been presented that can operate with bifacial illumination. By encapsulation between two glass panes, bifacial modules offering increased power output per unit cell area can be produced without technology changes. In spite of their potential, their presence in the market is very small at the moment.