

## WINAICO Recommended Handling Guide

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Modern Solar modules are known for their brittle wafer-thin cells. These cells can be as thin as 170 micrometres which is between 2 to 3 times the thickness of standard A4 paper. To maximise the power potential of your solar system we suggest avoiding the following bad habits and practises.

### Moving Modules onto the Roof

Getting solar modules onto the roof will be one of the most strenuous tasks of installation. As modules are moving to higher power classes, we are seeing an increased size and weight of modules making the issue more prevalent.

When moving modules onto a roof, we suggest using a mechanical lift but recognise that it is not always possible nor convenient. Many of our partners move modules with ladders and we recommend trying to distribute the force against the modules. The optimal scenarios for installations with ladders is to allow the module to rest against the arm, shoulder, back and head as much as possible to distribute the load away from a localised place.

Incorrect module carrying as shown below is expected to reduce the power output instantaneously by almost 1%.

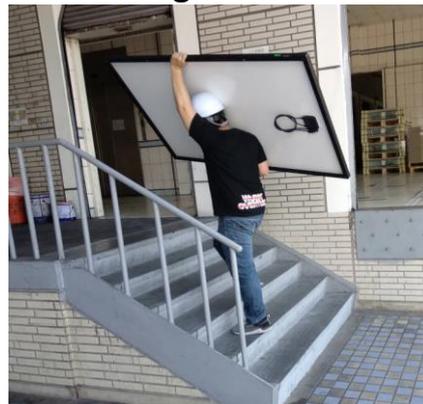
#### Shoulder against Glass



Power Before = 323.6 W  
Power After = 320.5 W

Power Loss = 3.2 W or 0.97%

#### Shoulder against Backsheet



Power Before = 324.3 W  
Power After = 321.5 W

Power Loss = 2.8 W or 0.86%

## Moving Modules to site

While many current installations require less than a full pallet of modules, we strongly recommend taking care when transporting materials on top of exposed modules. A common example is an inverter strapped onto the top of multiple panels. We have aimed to simulate the conditions of a drive with an inverter and a forklift



### Loose Inverter on Top of Module

Power Before = 323.9 W

Power After = 316.0 W

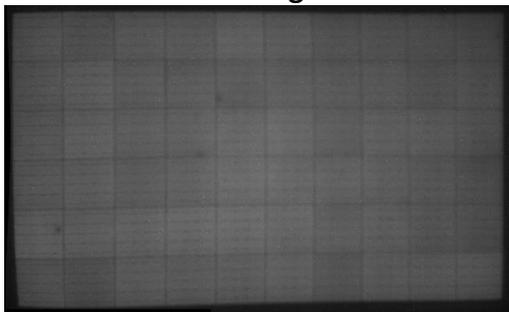
Power Loss = 7.9W or 2.44%

Please avoid applying any force to the top of an open-air module during transport. Strapping on the top of a pallet is suitable however pressure on the glass front or back sheet will cause irreparable damage during the transportation periods.

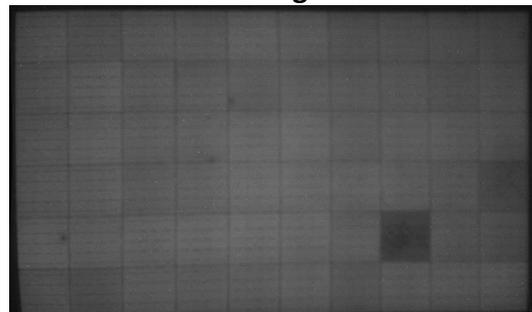
## After Installation Care

It is also common knowledge that standing on a module is habit that must be avoided. We have used an electroluminescence image to demonstrate the impact of one person standing on different points of the panel.

**Before Standing on Panel**



**After Standing on Panel**



Two cells in the bottom right demonstrate distinct darkening. The colour change suggests development of microcracks and a loss of total module performance. The power loss is around 7 watts or 2.2% of the power on a fully functional module. This would propagate further under the influence of humidity, thermal expansion and contraction and usual wear and tear. Please avoid any unnecessary force to the surface of the modules.