



 **Re-tech PV**®

PV FAILURES CATALOG

PV FAILURES

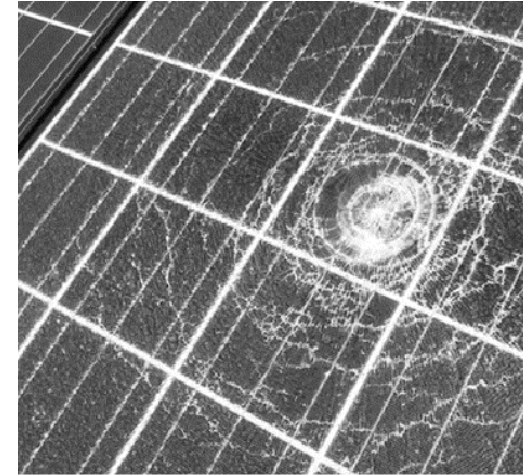
BROKEN GLASS	ISOLATION ERROR	DELAMINATION	BACKSHEET CRACKS	SNAIL TRAILS
DUST BUILD-UP	CRACKED CELLS	POOR STRING CONNECTION	PID	CHALKING
HOT SPOTS	JUNCTION BOX	MICRO CRACKS	HOLES	SCRATCHES



BROKEN GLASS

No value at all, panel is recycled.

Moisture enters and affects PV cells, expanding the damaged glass surface. Only option is to recycle the panels.

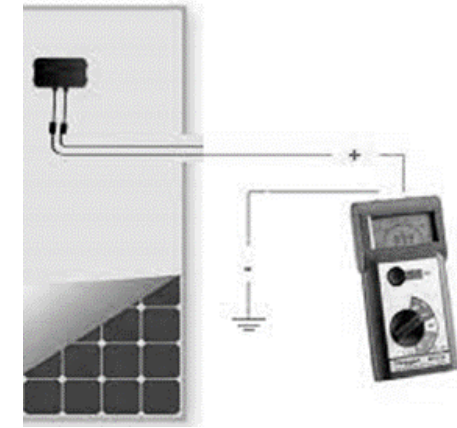


ISOLATION ERROR

Depends on the level of the isolation error.

A PV isolation fault is usually an earth fault on the DC side (the PV panels side) of the system which is usually caused by moisture ingress or damage to the system or the panel.

1. Low
2. Medium
3. High



DELAMINATION

Delamination of a PV panel is the detachment, even if partially, of the encapsulant from the glass or the backsheet.



Different types and levels:

1. Bubbles inside modules.
2. Low isolation resistance.
3. Ribbon / busbar corrosion.
4. Forming a continuous path between any part of the electrical circuit and the edge of the PV panel.

BACKSHEET CRACKS

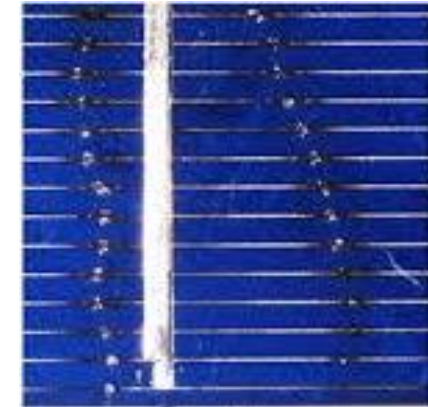
Backsheet cracks is the degradation of the outermost “layer” of a PV panel and occurs on different stages.

1. Not visible yet, backsheet gets porous.
2. Beginning of cracks — light impact.
3. Full cracks around the cells.
4. Backsheet desintegrates.



SNAIL TRAILS

Snail trails are discoloration of the PV panel, which builds up over years of power production on the field. Moisture can enter through the backsheet and diffuse to the cell surface.



Different levels

1. 1-3 cells affected.
2. 4-6 cells affected.
3. More than 6 cells with snail trails.

DUST BUILD-UP

Accumulation of dust on
the surface of PV panel.

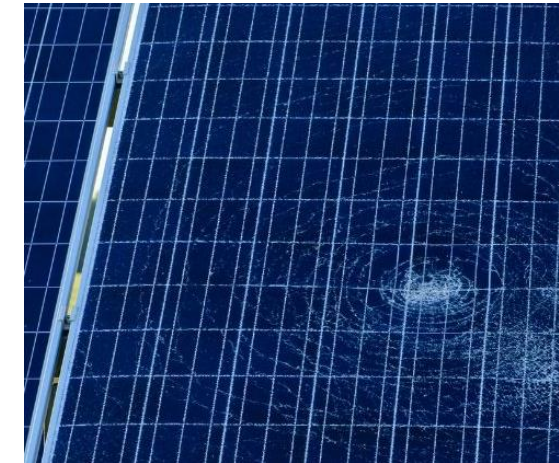
Reduces the glass cover transmittance
and hence decreases the amount of
solar irradiation reaching the cells.



CRACKED CELLS

They are triggered by mechanical and chemical environmental factors causing stress to the panel during operation

Further stress factors are geared to the thermal cycles of the cells involving contracting, expanding and flexing metal contacts, solder and wire interconnects.



POOR STRING CONNECTION

Failures due to improper installation and operating stress are both avoidable.

Inadequate wire terminations, undersized conductors, environmental conditions that are outside of the equipment rating, inadequate protection from surge voltage and inadequate protection from physical damage.



POTENTIAL INDUCED DEGRADATION

Potential induced degradation (PID) is a performance degradation in crystalline PV panels.

Caused by so called stray currents. This effect may cause power loss of up to 30 percent.



CHALKING

Polymer degradation in paints and coatings affecting reliability and performance.

Backsheet chalking is a failure mode of field exposed PV panels and is observable as a white powder on the outer backsheet layer.



HOT SPOTS

Hot spot heating occurs in a PV panel when its operating current exceeds the reduced short circuit current (I_{sc}) of a shadowed or faulty cell or group of cells.

When such a condition occurs, the affected group of cells is forced into reverse bias and dissipates power, which can cause local overheating with different levels.

1. 1-3 cells affected.
2. 4-6 cells affected.
3. More than 6 cells with hot spots.



JUNCTION BOX

The junction box of PV panels fails in the field mainly because of fault current passing through the Junction box.

The main failures of Junction boxes are:

1. Burnt bypass diode.
2. Burnt off junction box.
3. Lost connection.
4. Malfunction.
5. Connection cable cut / broken.



MICRO CRACKS

Micro fractures, also known as micro cracks.

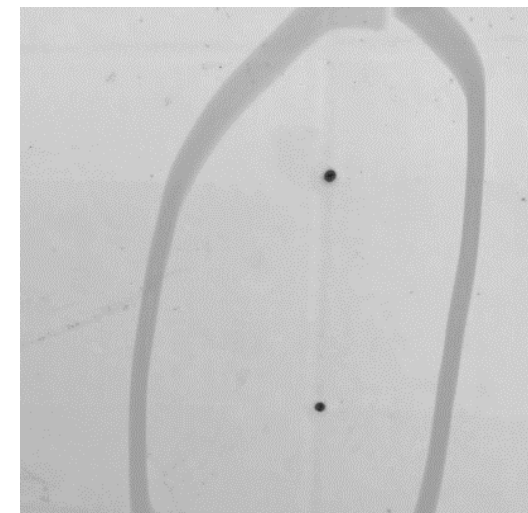
The silicon used in the PV cells is very thin and expands and contracts due to thermal cycling. During the day, the solar panels expand because of higher temperatures.



HOLES

Different types of holes.

Moisture enters and affects PV cells.
Holes tend to expand and get bigger.



SCRATCHES

Damage or scratches will result in a reduction of efficiency.

The wrong cleaning tools and improper cleaning methods can scratch PV panels or make the glass cloudy.



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