Design Guidelines for PVT Collectors

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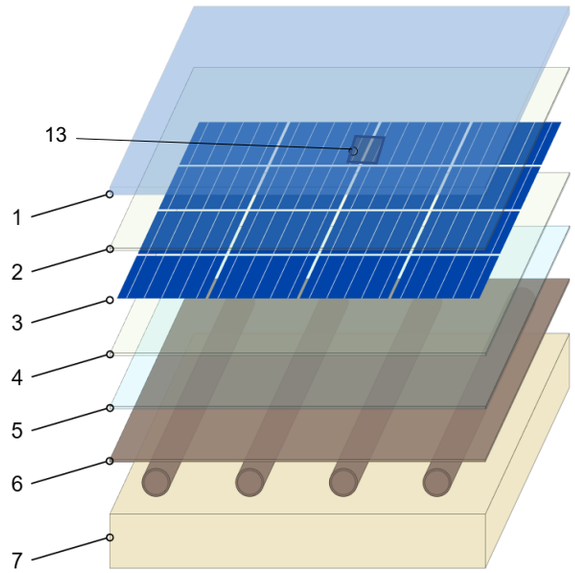
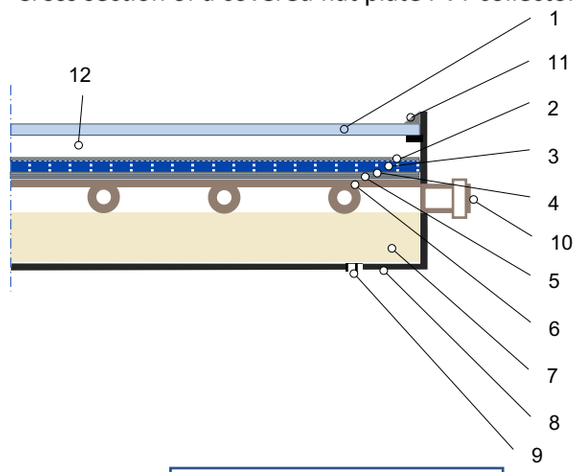
Exploded-view of a typical PVT collector



Cross section of a covered flat plate PVT collector



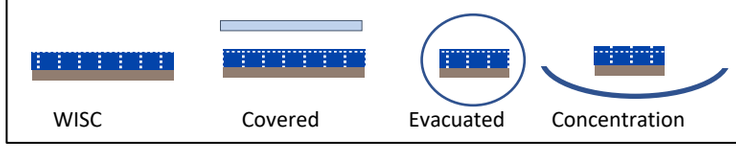
1 Transparent cover - Optional
Blocks IR radiation, protects from wind, snow, hail, acid rain
High transparency, UV resistance, anti-reflective, mechanical stability, durability, protective
Tempered glass, polymer
Not present for WISC design / when operated at low temperature, e.g. as source for heat pump system

2a Front cover of PV module
Protects cells, barrier against moisture
High transparency, UV resistance, long lasting, temperature stable, low dilatation coefficient, low IR emission
Tempered glass, glass, polymer

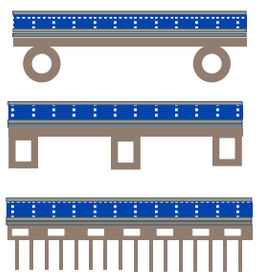
2b Encapsulant
Protects cells, maintains cells
Good thermal conductivity, long lasting, resilient to dilatation and shear effect, easy lamination if not sprayed, low temperature coefficient
EVA, polyolefins, silicone, polymer

3 Solar PV cells connected
DC electricity production, absorbing IR, transmitting heat
High efficiency, high absorptance, low IR emission, low heat resistance, low temperature coefficient, soldering and tabbing adapted, thin , bifacial if absorber design allows
c-Si, a-Si, CIGS, Organic

4 PVT collector types



Examples of 3 WISC designs
- No cover
- No insulation



4 Encapsulant - Optional
Protects cells, maintains cells
Good thermal conductivity, long lasting, resilient to dilatation and shear effect, easy lamination, low temperature coefficient
EVA, polyolefins, silicone, polymer

5a Backsheet / Rear cover of PV module - Optional
Protects cells, maintain cells, barrier against moisture, glue PV and T
Good thermal conductivity, long lasting, resilient to dilatation and shear effect, low temperature coefficient
Tempered glass, polymer
Not necessary in a fully glued PVT but part of PV industrial modules

5b Glue/Encapsulant - Optional
Glues PV and T
Good thermal conductivity, long lasting, resilient to dilatation and shear effect, low temperature coefficient
EVA, polyolefins, silicone, polymer
Not necessary in a PVT mechanically fixed where the backsheet is necessary

6a Absorber
Absorbs solar radiation and heat from the PV, transfers heat to the heat transfer medium
Low IR emission, good contact with upper layer, high heat transfer with ambient for WISC PVT, light-weight, thin, easy to weld or moulded or extruded, high thermal conductivity, thin for lamination, low pressure drop, low inertia, low temperature coefficient, high heat transfer to fluid properties, eventually transparent
Copper, Aluminium, Steel, Polymer
Very high exchange surface with ambient for non-insulated WISC PVT when operated with a heat pump

6b. Heat transfer medium
Extracts thermal energy, cools down collector
Open loop or closed loop, single or multipass, opaque or not

Liquid	Gaseous	*Bi fluids*
Water	*Air*	
Glycol/Water	*Carbon Dioxide*	
Additive	*Other special*	
Hydrocarbon	*gasses*	
Refrigerant		
Nanofluids		

Legend:
Nomenclature
Function
Guidelines
Materials

7 Insulation – Optional
Reduces heat losses, stays hydrophobic
Low thermal conductivity, hydrophobic, insects resistant, no degassing, not flammable
Mineral wool or similar
Optional: with a protective foil on top

8 Casing - Optional
Protects, rigidifies, simplifies fixing, maintains air tightness, supports all elements
Light, stiff, watertight, formable, corrosion free, non sensitive to electrical currents, lets components dilatation occur, gas filling possible
Aluminium, polymer

9 Air vent - Optional
Ventilates at low pace, dehumidifies
Insects protected, accessible to visual inspection, adapted flow rate of air through

10 Fluid Outlets
Connect the absorber with circuit
Easy to clip or connect to next collector, no spiky parts, consider forces on tubing if handled hereby, considers corrosion risks if made in another metal than absorber
Metallic piping materials (Cu, stainless steel, Al, …), polymer, clips

11 Sealing
Water tightness
UV resistant, highly resilient, easy to put in place and to dismount
Silicone, elastomers

12 Gap – Optional (only if 1 is present)
Reduces top heat losses by convection, conduction, protects cells
Air, inert gas, transparent insulation materials

13 Junction box
Connects strings of cells to DC cables outside the module, standard PV connectors
Temperature resistant (incl. sealing), corrosion resistant, absorber material compatible
Polymer and glue

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