Reducing Demand

The first priority is to reduce the amount of energy buildings use.

By incorporating various techniques and technologies energy demand can be cut.

1. Electrical load reduction:

By specifying lowenergy appliances, non electric water heating and utilising passive ventilation and high levels of natural daylighting, electrical usage can be reduced by around 25%.

An annual bill of 1000kwh per person drops to 750kwh; a saving of 0.125 Tonnes CO2/pers/Annum or £25/pers/annum.

2. Thermal load reduction:

The following measures reduce space heating loads to near zero (depending on occupants internal gains and target temperatures)

Super Insulation:
300mm of mineral wool insulation reduces Uvalue to 0.1 W/m2`C.

Thermal Mass:
Internally exposed thermally massive construction reduces heating and cooling load by storing thermal energy.

Airtight construction:
(to 3ach @ 50pa) drastically reduces winter heat loss through infiltration.

Passive Heat Recovery Ventilation:
Wind cowl system achieves necessary air changes per hour for fresh clean air without excessive heat loss or any electrical demand.

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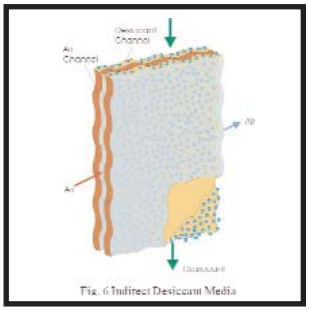
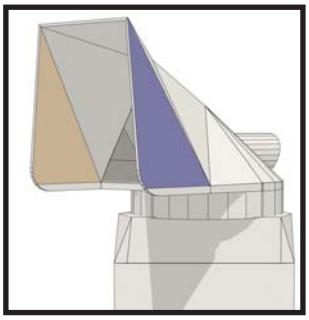
Load Reduction

Index:

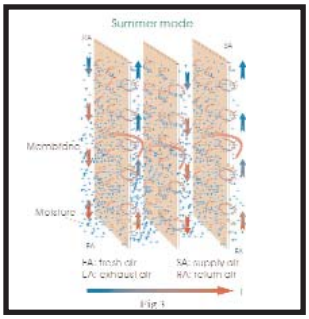
- China
- UK
- both



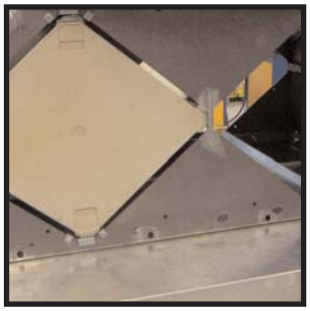
Liquid Dessicant - Dehumidification



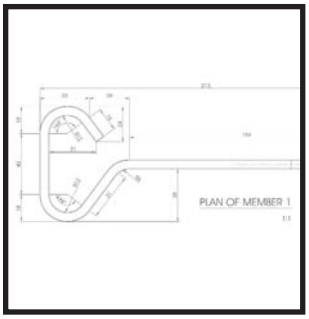
☐ **Wind Cowl**



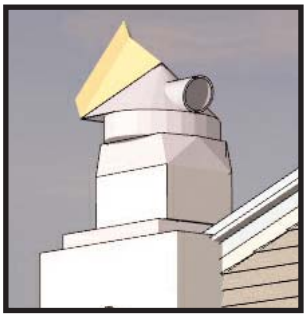
Whole Enthalpy- Heat Recovery



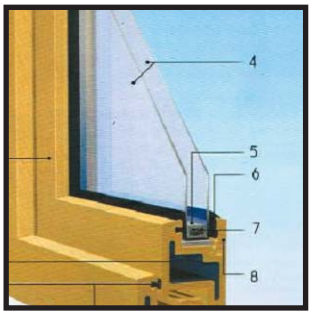
Conventional Heat Exchanger



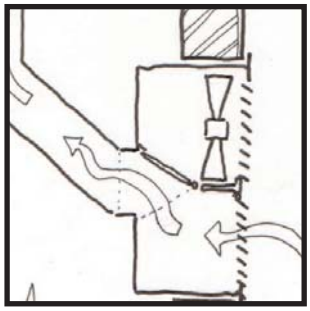
2 Part Cavity Wall Tie



☐ **Micro Wind Cowl**



☐ **Low -E Glass**



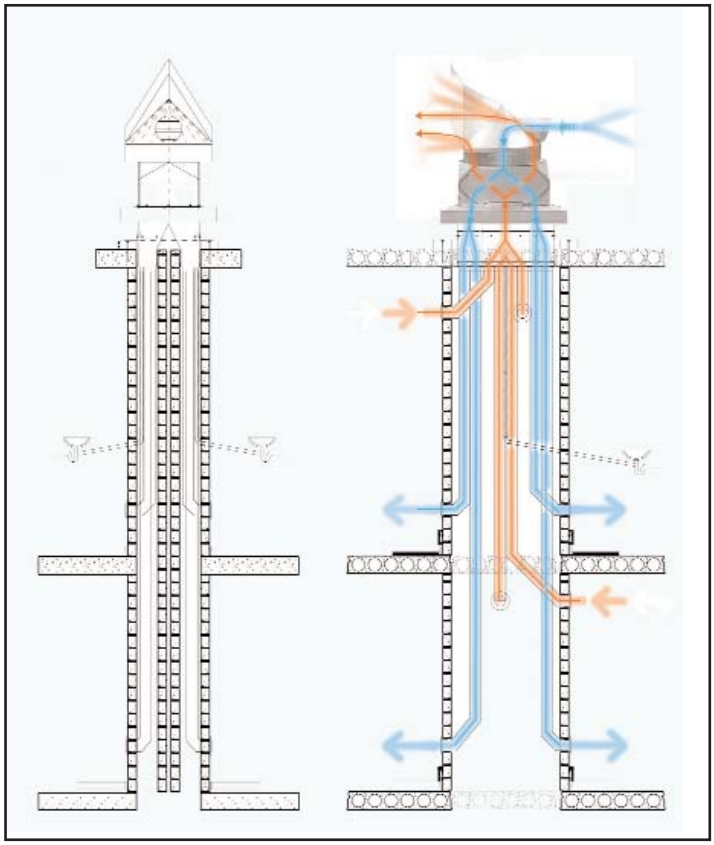
Fan Coil Unit

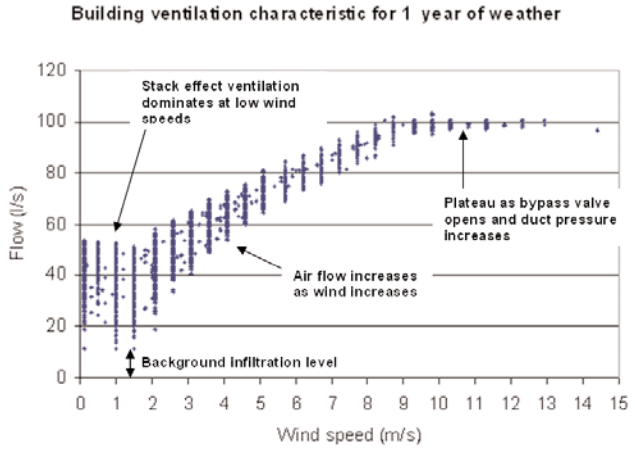
Ground Source Heat Pump

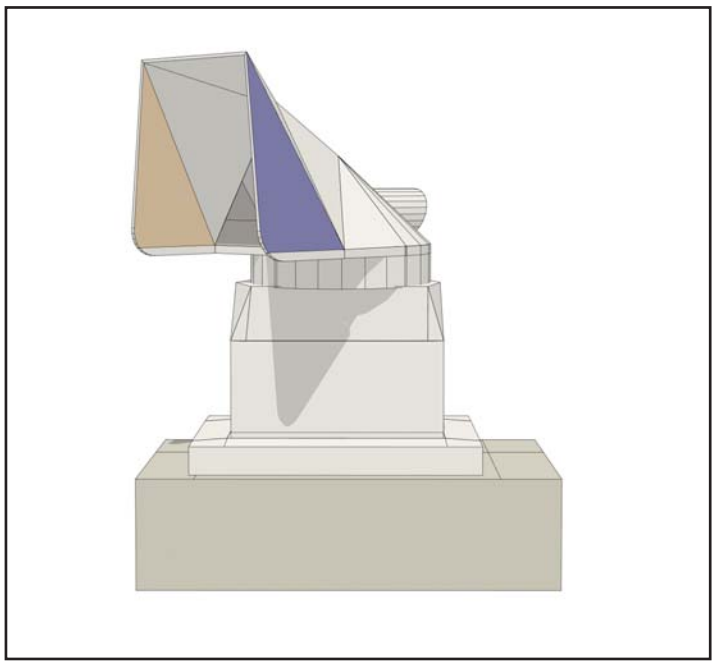
Windcowl & heat exchanger

The ZEDfabric Wind Cowl passive heat recovery ventilation system supplies and extracts air to and from a building to maintain good air quality whilst minimising heat loss. The heat recovery system used is 70% efficient.

At an average windspeed of 4m/s in London, depending on the external temperature, the flowrate of the Wind Cowl is between 50-70 litres per second.







Technical information

The ZEDfabric wind cowl works like an active ventilation system in that it has dedicated inlet and outlet ducts and a heat recovery system, but instead of using electrical fans to drive the air flow it uses the wind to create both positive pressure at the inlet and negative pressure at the outlet ensuring a throughput of air for no electrical input. In low wind conditions it will continue to produce reasonable ventilation levels through stack effect.

Kit components

Wind cowl + PET heat exchanger.

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Micro Wind Cowl

Work has been underway to downscale the current wind cowl for upgrade of existing buildings. The idea is for the wind cowl to become a small-sized, lightweight and easily installed micro ‘chimney’ system.

Kit components

Micro Wind cowl + PET heat exchanger.

Why use a Wind Cowl?

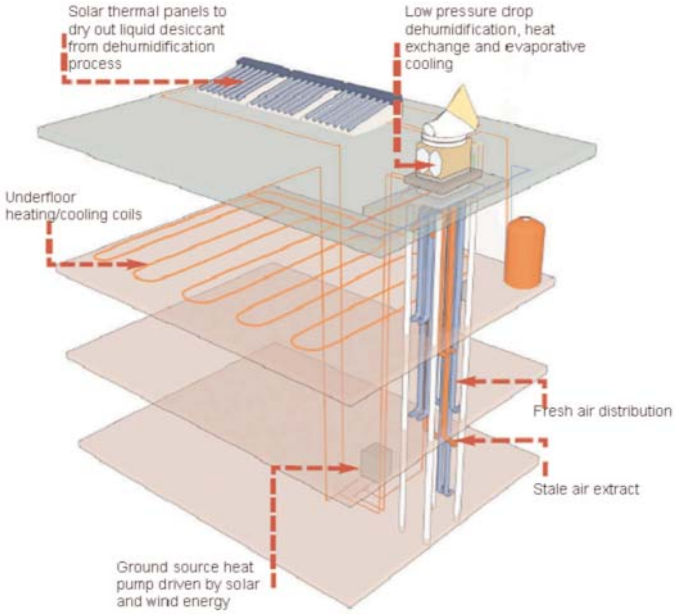
Passive ventilation systems typically rely on trickle ventilator in windows for air inlet and stack effect ducting systems which work like chimneys, relying on the buoyancy of the warm air in the building to rise up a vertical duct to be exhausted through an outlet in the roof. These outlets can be designed so that airflow across them from the wind results in negative pressure and helps draw out the exhaust air.

Active ventilation systems typically are driven by electrical fans and have dedicated inlet ducts as well as outlet ducts. These ducts can be brought together to pass through a heat exchanger where the incoming air gains heat from the outgoing air reducing the amount of heat loss. They can often be over 70% effective, however the energy recovered through the heat exchanger is offset by the energy required to drive the electrical fans.

The ZedFactory wind cowl works like an active ventilation system in that it has dedicated inlet and outlet ducts and a heat recovery system, but instead of using electrical fans to drive the air flow it uses the wind to create both positive pressure at the inlet and negative pressure at the outlet ensuring a throughput of air for no electrical input. In low wind conditions it will continue to produce reasonable ventilation levels through stack effect.

Wind cowl with Cooling and Dehumidification

Work has been carried out by ISAW, Nottingham University, BDA Zedfactory and Arup to design a low energy heating,
ventilation, and air conditioning (HVAC) system that can be integrated into the ZED passive wind cowl based heat recovery ventilation system.



Low Energy Air Con

The low energy nature of the system is achieved through the combined use of desiccant dehumidification system, total enthalpy heat exchangers and a solar thermal driven evaporative cooling system.

Combined Systems

The system will rely on a combination of different renewables, assembled in such a way to absolutely minimise the electrical load. In some cases this will involve the use of ground source heat pumps for summer cooling and winter heating, but only when absolutely necessary.

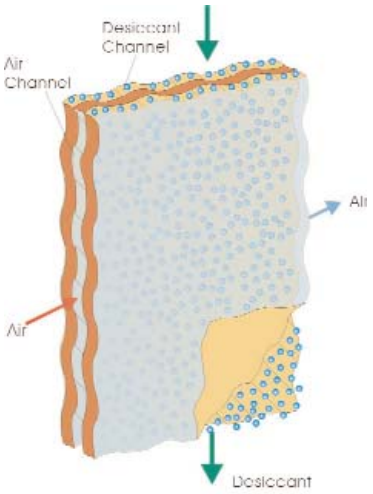


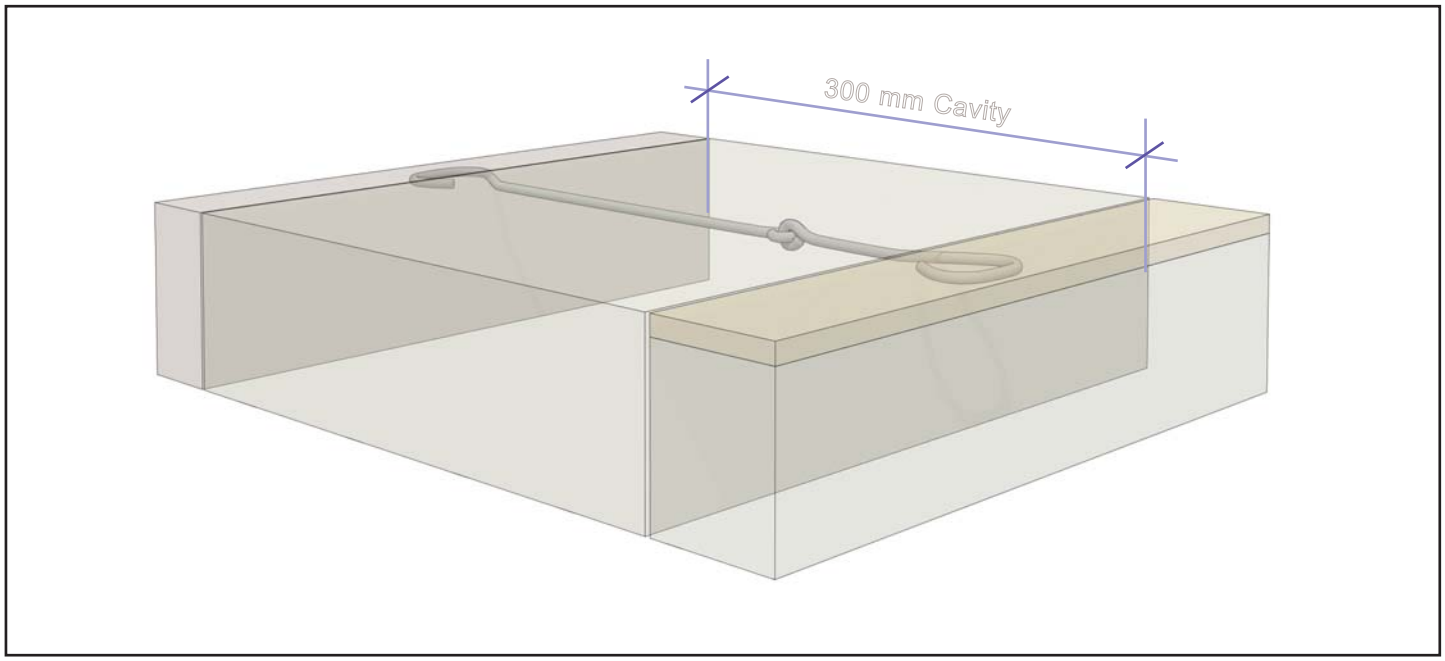
Fig. 6 Indirect Desiccant Media

Two-part cavity wall ties

The structure of the ZED houses is characterised by high thermal mass, tight sealing from air infiltration, and super insulation.

The inside face of the walls is most important to the thermal performance. A typical detail through a ZED masonry wall construction shows 140mm dense concrete block inner leaf, 300mm insulation and an outer clading of reclaimed or local bricks. A typical lightweight house built to building regulations standard has no dense thermal mass exposed to the room, and the moderately dense brick outer skin is effectively shielded from the room by the 90mm of insulation. It will lose almost 3 times as much heat through the walls as the ZED house.

ZEDfabric's new patent-pending 300mm annealed 316 grade stainless steel cavity wall ties have an effective interlocking system and require only a third of the materials of our competitors

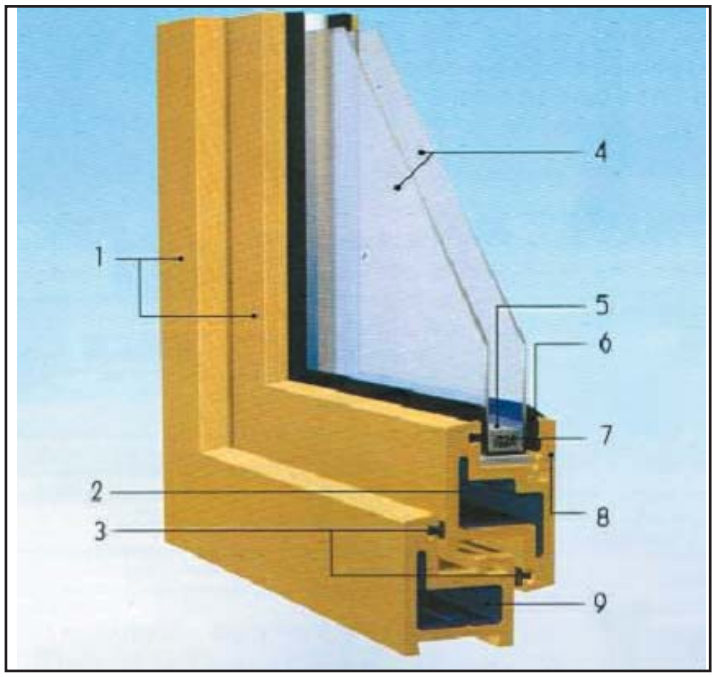


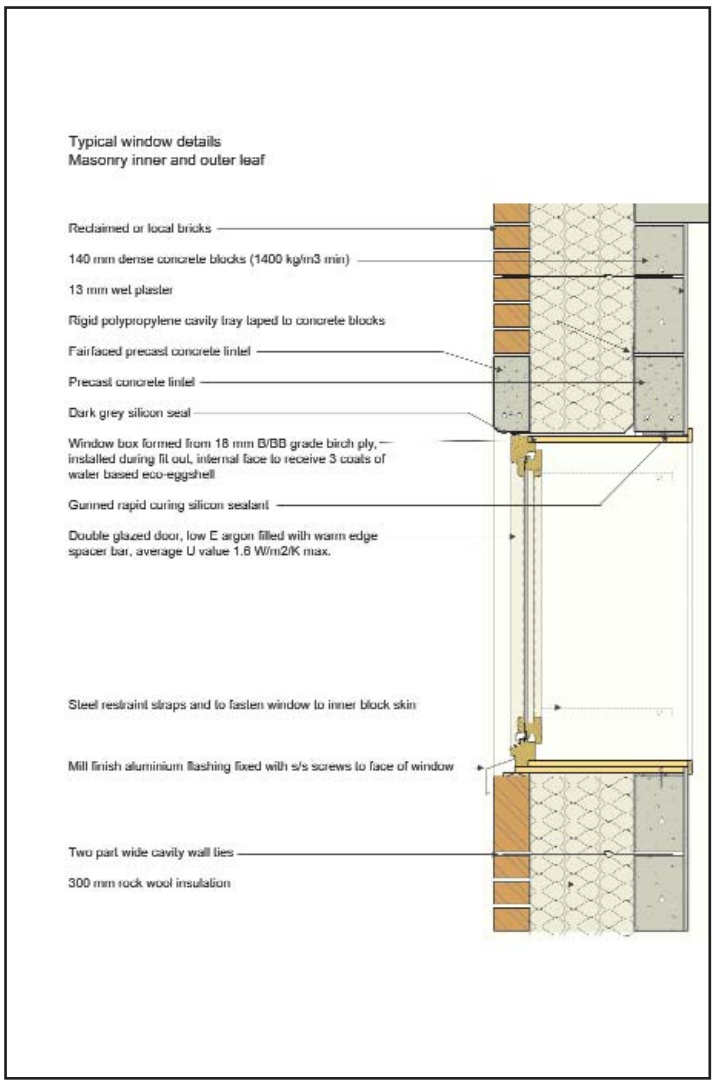
Technical information

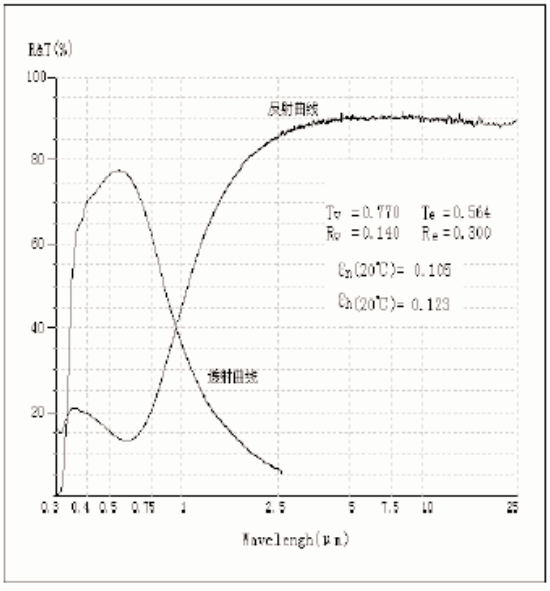
Two-part cavity wall ties are available for blockwork, timber and precast concrete panel building construction.

WINPIN glass

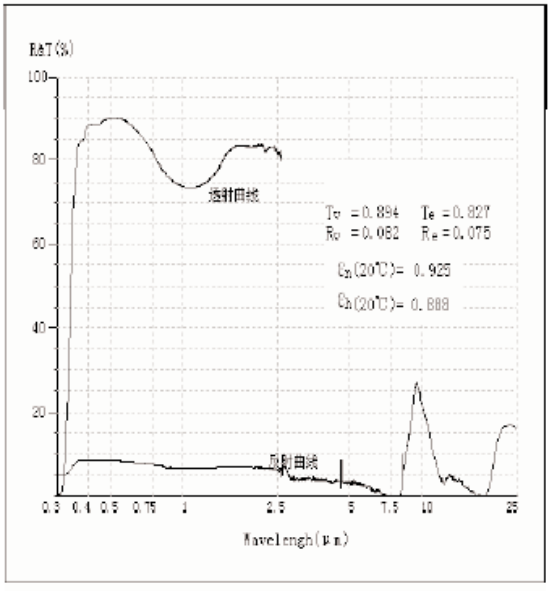
Winpin glass represents the next stage in the development of high performance double glazing. A thin film applied to the inside of the inner pane acts to minimise the radiative heat loss and avoids excessive solar gain whilst retaining high levels of daylighting.







Wenpin Glass



Common Glass

Ground source heat pump

Ground source heat pump (GSHP) systems are commonly used to provide heating and cooling for developments in China, where the biomass technology is yet to be developed. It is an efficient electrical heating and cooling system that can be powered with fossil fuel electricity or renewables.

Ground source heat pump will only be specifically used in our combined system in China.

IVT Greenline with Compact collector and exhaust air recovery

IVT 495 TWIN with Compact collector

The sections are easily connected together at the top.

The trench is refilled.

After a while there are no visible signs of the work.