The south eastern elevation of an existing industrial shed was over-cladded with 410m$^2$ of metal SolarWall™ system and the heating energy contribution was monitored over 12 months. The SolarWall™ system contributed 70,061kWh of a total heating usage of 365,974kWh over this period. This equates to 19% of the total heating energy used.

# OVER-CLADDING OF INDUSTRIAL SHED USING SOLAR WALL SYSTEM IN COUNTY DURHAM, UK

South East Elevation over cladded with metal SolarWall™ system

The building is the CA Group profiles mill's headquarter (a building systems manufacturer and distributor) and located in the North East of the UK. CA profile is the sole distributor of the metal steel cladding SolarWall™ system in the UK and decided to showcase the system on their profile mill industrial shed to improve internal condition and supplement heating demand.

A typical steel frame steel industrial shed built in 1991. The existing building envelope consists of a light insulated twin-skin wall and roof build up system built off cavity dwarf brick wall. The only source of heating is provided by a single gas heating unit.

Due to the nature of the heater, only workers in close proximity experience acceptable working conditions, whilst those working away from the heating unit experience cooler, less comfortable temperatures. These temperature differences are especially noticeable during prolonged cold periods.

The continuous negative pressure within the building causes personnel doors to slam close when staff enter and exit the building and lead to the influx of uncontrollable cold draughts through open doors.

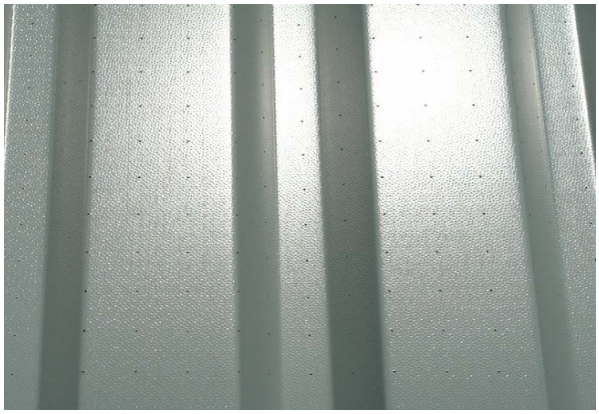
The South East elevation of the building was over-cladded with 410m$^2$ SolarWall™ cladding system (also know as the Transpired Solar Collector) is a perforated, profiled metal cladding panel, which is installed as an additional skin to a buildings elevation. The dark coating on the panel absorbs solar radiation and is subsequently heated. Ambient air is then warmed as it is drawn through the perforations in the panel, to where it is collected within a cavity created between the two building walls. From here the heated air rises up the cavity to a fan unit, which distributes the air through high level fabric ducting.

**Sustainability Benefits:**

- Rapid installation with no disruption of internal operation
- Aesthetically enhances the building appearance
- Improve users' comfort and internal air condition
- Enhances the U-value of the south eastern elevation
- Acts as a 'sun screen' shading the building from direct solar gain especially in summer when the cavity heat can be vented out via summer by-pass damper
- Provides clean and renewable source of heating
- Significantly reduces heating demand and cooling load thereby lowing $CO_2$ emissions

**Project Team:**

| | |
|---|---|
| **Client:** | CA Group, UK |
| **Architects:** | CA Group, UK |
| **Project Manager:** | CA Group, UK |
| **Contractor:** | |



Metal SolarWall™: Perforated cladding

Installation of SolarWall™ and thermocouples

### *Construction Details:*

Top hat cold form steel purlins were attached to the existing envelope of the south east elevation (70m wide x 5.85m high) and over-cladded with metal SolarWall™. The collector panel is coated with a dark grey coating. Three ducts with three mixed flow ventilation fans are installed at the top the wall. Each ducts carries between 08.5 and 0.94m3/s.

The panel absorbs solar radiation and heats the air boundary layer lining its surface. The heated air is drawn through the perforations in the cladding via the fans. This heated air is then collected within the SolarWall™ cavity from where it is delivered into the building via a 60m of fabric ductwork

The building was monitored over 12 months and the result indicated a significant energy savings. The heat collected by SolarWall™ and delivered to the building ventilation system amounts to 19% of the total heating energy requirement, 70,061kWh out of 365,974kWh. The SolarWall™ together with the ventilation system which reduced air stratification in the building, led to a reduction in gas-fired heating requirement of 303,543kWh. This equates to 58.9tonnes of CO2 or 51% of previous year consumption prior to SolarWall™ installation. In addition to the above, negative pressure has been greatly reduced and a more even temperature profile was noted within the building due to the introduction of higher level ventilation, which prevents stratification.

BSRIA (Building Services Research & Information Association) carried out air-tightness test and thermography survey on the building before over-cladding and monitored the performance the SolarWall™ system after installation. The monitoring comprises 32 thermocouples embedded in the wall, two in the delivery duct and one in the building and one outside below the SolarWall™ plus a pyranometer in the plane of the SolarWall™, all connected to one PC.