50 SolarWall® Systems on 27 Military Buildings

The world's largest collection of solar air heated buildings is located at Fort Drum, New York

Background

One of the largest and most extensive solar air heating projects in the world has now been completed for the United States Military base at Fort Drum, in upstate New York.

The project is extremely significant in terms of the sheer magnitude of energy and CO_2 savings, and it shows the tremendous potential for solar thermal when it is deployed on a large scale.

In the fall of 2005, the Army Corp of Engineers at the base commissioned a multi-million dollar retrofit program to upgrade 27 of their vehicle maintenance buildings. Conserval Engineering and Conserval Systems worked closely with the military base over the two year duration of the contract in the design and installation of the SolarWall transpired collector systems. SolarWall systems had previously been installed at six other U.S. military bases.

This project was one of the reasons why the U.S. Corp of Engineers, in 2006, identified the transpired collector as one of two cost-effective technologies ideally suited for military buildings, such as vehicle maintenance garages.

Project Summary

- **50 SolarWall® heating systems installed on 27 buildings**
- **110,000 square feet (10,220 m^2) of solar panels**
- **300,000 cfm (510,000 m^3/h) of air heated with 99 fans**
- **Projected fuels savings of 44,000 million BTU/h (46,000 GJ) per year**
- **4 MW of thermal energy capacity**
- **2,000 tons of CO_2 displacement per year**

Types of Buildings Selected for SolarWall® Systems

Typical military buildings, such as vehicle maintenance garages, hangars, and warehouses are ideal for solar air heating. They have a high ventilation load which represents an enormous energy expenditure given the tremendous volume of air that has to be continuously brought in and then heated over the entire heating season. As well, these buildings have large wall surfaces available, which makes it easy to integrate a SolarWall system into the exterior façade.

Vehicle Maintenance Buildings

Building 10670 before (left) and after (right) the installation of rocky grey colored SolarWall system.

Hangars

Rocky Grey SolarWall panels were chosen for the hangar buildings to match an existing color.

Warehouses

Blue-grey solar cladding installed on the south-east and southwest walls of Building 60.

Recycling & Special Purpose Buildings

Design & Installation

Above, the SolarWall framing

A variety of colors were selected for the 50 SolarWall systems; including: black, brown and blue-grey. The objective was to compliment the existing color schemes of the buildings.

Above, the SolarWall panels being installed on the framing

The SolarWall panels were mounted 6 to 10 inches from the exterior wall to create an air cavity. The heated boundary layer is drawn off the panels and through the perforations into the air cavity behind. From there, it is either directed into the HVAC units or into the building through a fan and ducting system.

Conserval Engineering customized the interior heat distribution for optimal performance in each building. In total, 99 fans are being used to deliver 300,000 cfm of air. As well, new air makeup fans and distribution ducting were installed to improve the ventilation air in some of the older facilities. In some cases the air was brought in through wall fans, in other cases through roof mounted fans or HVAC units. The issue of destratification was present in many of the buildings; the temperature at the ceiling of tall hangars was as much as 20 F (12 C) hotter than floor temperature prior to the installations. The SolarWall ducting systems were designed to minimize the stratified ceiling heat, resulting in additional energy savings.

In buildings with heat stratification at the ceiling, the SolarWall system was connected to wall mounted fans and perforated distribution ducting to disperse the hot air at the ceiling around the building.

Above, the heat from the SolarWall panels is ducted across the roof to the building's rooftop air intake and HVAC system.

The $3 million that was allocated to the turnkey SolarWall project will allow the base to generate a minimum of 4MW of thermal energy. It will displace 2,000 tons of CO_2 annually by reducing 44,000 million BTU/h (46,000 GJ) of natural gas each year. From a cost and energy production perspective, these values illustrate the financial attractiveness of the SolarWall solar air heating system.

The SolarWall project at Fort Drum also created ten man years' worth of work, which highlights the local job creation benefits of solar.

Monitoring

Brown SolarWall panels on the south façade of Building 91.

One of the SolarWall systems (4,100 ft^2) on Building 91 is currently being monitored by NREL (National Renewable Energy Laboratory). The preliminary results from one month of monitoring were calculated as follows:

- Building 91 @ $0.90 /therm,
- Boiler efficiency 70%
- Solar energy gain - $36/day
- Natural gas savings for the one SolarWall system for one month were approximately $1000

U.S.A.
Conserval Systems Inc.
4242 Ridge Lea Road, Suite 28, Buffalo, NY 14226
P: 716-835-4903 F: 716-835-4904
E: info@solarwall.com
www.solarwall.com

Canada
Conserval Engineering Inc.
200 Wildcat Road, Toronto, ON M3J 2N5
P: 416-661-7057 F: 416-661-7146
E: info@solarwall.com
www.solarwall.com