

## 7-Year Payback Annual Energy Savings for Syracuse, NY

### SPECIFICATIONS

$A_{\text{coll}}$	=	collector area	20,000	ft <sup>2</sup>
$t_{\text{hours}}$	=	time that there is airflow through the collector (length of collector operating day)	16	hours/day
$t_{\text{days}}$	=	time that there is airflow through the collector (length of collector operating week)	5	days/week
$t_{\text{weeks}}$	=	time that there is airflow through the collector (length of collector operating season)	36	weeks/year
$q_{\text{solar}}$	=	useful energy from the collector	180	kBtu/ft <sup>2</sup> -year
$q_{\text{fan}}$	=	fan energy for airflow through the collector (typically about 1 W/ft <sup>2</sup> )	1	W/ft <sup>2</sup>
$U_{\text{wall}}$	=	heat loss coefficient for the building wall	0.1	Btu/EF-ft <sup>2</sup> -hour
HDD	=	annual heating degree-days	6760	EF-days/year
$E_{\text{htg}}$	=	efficiency of the conventional heating system	0.75	fraction
$C_{\text{fuel}}$	=	cost of fuel for conventional heating system	6.75	\$/MBtu
$Q_{\text{fan}}$	=	fan energy use (kWh/year, offset)	57,600	kWh/year
$Q_{\text{solar}}$	=	solar energy collected (MBtu/year)		
$Q_{\text{wall}}$	=	wall heat recapture (MBtu/year)		
$Q_{\text{saved}}$	=	thermal energy savings (Mbtu/year)		

### THERMAL ENERGY SAVINGS

$$Q_{\text{solar}} = \frac{20,000}{A_{\text{coll}}} \times \frac{180}{q_{\text{solar}}} \times \left( \frac{5}{t_{\text{days}}} \div 7 \right) \div 10^3 = \mathbf{2571} \quad \text{MBtu/year}$$

$$Q_{\text{wall}} = \frac{20,000}{A_{\text{coll}}} \times \frac{0.1}{U_{\text{wall}}} \times \frac{16}{t_{\text{hours}}} \times \left( \frac{5}{t_{\text{days}}} \div 7 \right) \times \frac{6760}{\text{HDD}} \div 10^6 = \mathbf{155} \quad \text{MBtu/year}$$

$$Q_{\text{saved}}^* = \left( \frac{2571}{Q_{\text{solar}}} + \frac{155}{Q_{\text{wall}}} \right) \div \frac{0.75}{E_{\text{htg}}} = \mathbf{3635} \quad \text{MBtu/year}$$

$$\text{Savings}^1 = \frac{3635}{Q_{\text{saved}}} \times \frac{6.75}{C_{\text{fuel}}} = \mathbf{\$24,536 / year}$$

\*These figures are based on a 20,000 square foot SOLARWALL<sup>®</sup> system in Syracuse, NY.

<sup>1</sup>The savings are based on a projected \$6.75/MBtu/year rate for the 2000-2001 winter. The cost of installing a SOLARWALL<sup>®</sup> system is approximately \$10 per square foot of paneling.