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3M Window Film

Building Report - Solar Load Reduction

Report completed and compiled by:
Joe Miller, 3M Application Engineer
Ph: 046 8603 786 email: jtmiller@mmm.com

The objective of this report is to present a simplified estimate of the amount of energy that can be saved by using 3M Window Film for Depot Brewery.

3M Sun Control Window Films work to reduce the amount of the sun's energy that enters the building, so this tool evaluates the total solar load on the building before and after window films are applied and how this can translate to HVAC energy and carbon emissions savings. Calculations are based on the building information provided by Ben Kooyman.

For more information on how these estimates were calculated and the assumptions that were made, please see below.

Assumptions:

From the four basic window type choices, the closest match to the customer's actual glass was thought to be dual pane, tinted.

The analysis was done using PPG clear 6mm glass, SolarBronze, ½" air gap. VLT of 47% and a SHGC 0.51.

The total glazing area by orientation for this project is estimated to be:

Orientation/Building Face	Approx. Total Window Area (m2)
N	0
NE	0
E	0
SE	0
S	0
SW	0
W	172.44
NW	91.98
Skylights	0

- The Coefficient of Performance (COP) of the HVAC chillers is 3.5
- A "multiplier" of 1.4 to account for the reduced electric loads on the pumps, fans, and parasitic loads on the system.
- The (simple) utility rate is $0.250 /kWh.
- Please Note: The selected films are assumed to be compatible for the glass type chosen in this simulation. In a real world scenario, the film compatibility may depend on a combination of factors including window size, type, thickness, location, shading, etc. 3M and our Select Installers use a Glass Checklist Tool in order to evaluate the risk for thermal stress for each project before initiating work.

Outside Data:

In order to make these calculations, 3M utilizes publicly available information for weather data and fenestration products:

- Window performance data was obtained from LBNL's International Glazing Database (IGDB), and modeled using LBNL's Window 7.8 software.

- National Renewable Energy Laboratory (NREL): 3M utilized the monthly figures for daily average incident solar irradiance (energy) by orientation, and slope for the latitude and longitude: -33.87, 151.22 station (Sydney).
- The data was obtained using the NREL's PV Watts calculator:

  (https://pvwatts.nrel.gov/pvwatts.php)

Calculations:

- The monthly solar load, per building orientation is calculated as follows:

  Solar Load = (glass area) x (SHGC) x (daily average) x (# days)
- The annual tonnes of CO2 emissions equivalent saved is calculated as follows:

  tCO2e Saved = (Cooling Load Reduction) /1000 x (emissions factor for that location)
- Emission factors used were provided by the Clean Energy Regulator:

State/Territory	2021–22 emission factor	2022–23 emission factor
NSW	0.79	0.73
VIC	0.96	0.85
QLD	0.80	0.73
SA	0.35	0.25
WA (South West Interconnected System)	0.68	0.51
TAS	0.16	0.17
NT	0.57	0.54
ACT	0.79	0.73

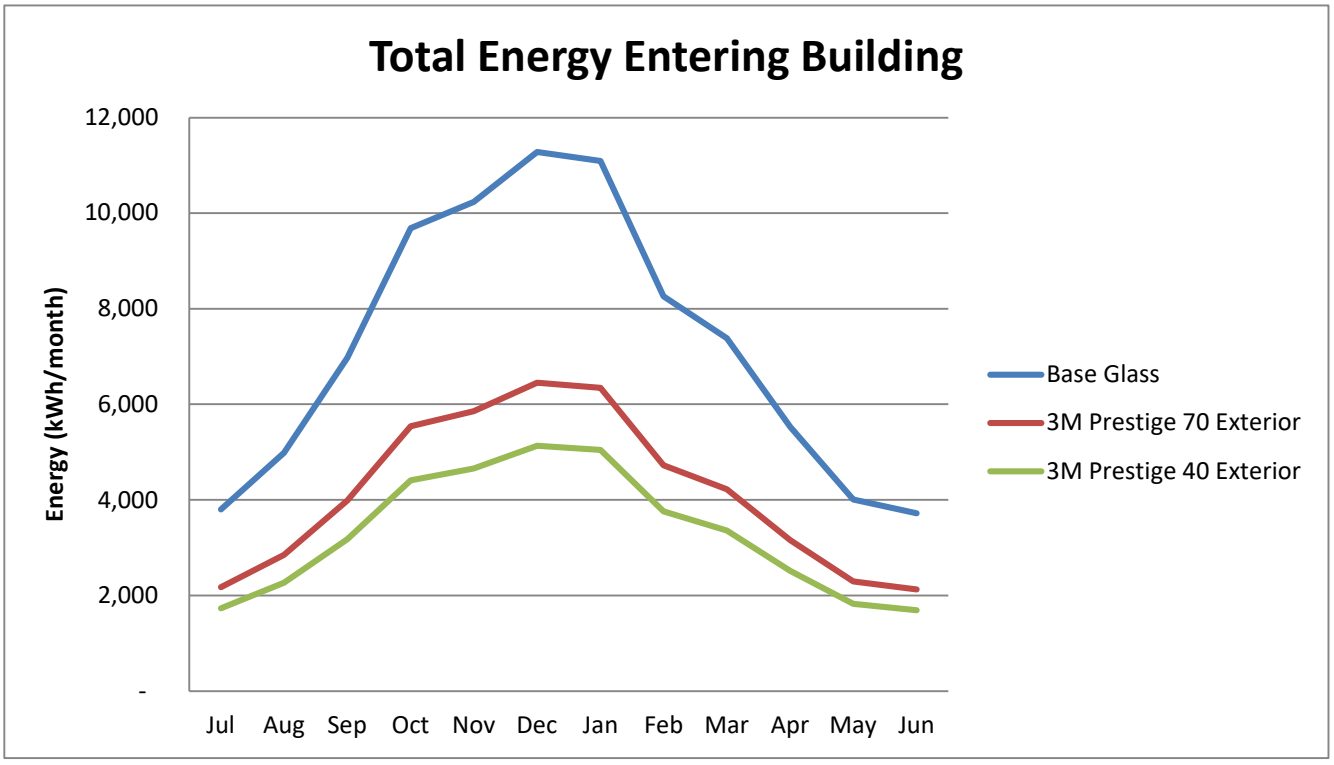
Source: https://www.cleanenergyregulator.gov.au/OSR/EERS/eers-current-release

- To calculate an estimated electricity savings, we used a utility rate of $0.25 to give an indication of savings. However, electricity prices are variable from building to building, and to get a more accurate estimate for your building we recommend finding out your electricity rate and multiplying it by the "total estimated electricity reduction" savings in the table from the next page.

Results:

Savings and payback estimates		3M Prestige 70 Exterior	3M Prestige 40 Exterior	
Total Solar Load Reduction:	(kWh/yr)	37,206	47,375	
Cooling Load Reduction:	(kWh/yr)	31,854	40,560	
*Assumes 9 months of cooling				
HVAC System COP		3.5	3.5	
Multiplier		1.4	1.4	
Total Est. Electricity Reduction	(kWh/yr)	12,741	16,224	
Utility Rate	($/kWh)	$ 0.250	$ 0.250	
Annual Cooling Cost Savings	**($/yr)**	**$ 3,185.37**	**$ 4,056.04**	
Annual Tonnes of CO2 emissions equivalent saved	**(tCO_2e)**	**9.30**	**11.84**	

Reduction in Solar Load:



Analysis and Conclusions:

The results of this Solar Load Estimate show that installing 3M film should substantially reduce the solar load in the filmed areas of the building, resulting in a more comfortable environment and saving money on their utility bills. In addition to the obvious savings, owners often find the reduced solar load can also allow for a higher thermostat setting, which would save additional money. Finally, the reduced solar load should result in a reduction in the demand on the HVAC system which could extend the life of the existing system. Neither of these savings has been considered in the simple payback provided by this report.

The conclusions and data reported in this analysis are, in 3M's opinion a fair and accurate representation of the benefits of window films in the particular application. Variations in weather patterns, as well as different actual parameters compared to the assumptions stated above, among other variables, can significantly affect the results. While 3M believes that window films will have an overall benefit in reducing solar transmission, individual heat load and energy savings results depend on the unique circumstances of the application.

3M, therefore, does not warrant or promise any particular level of solar heat reduction or energy savings. Any technical information and statements contained in this report or otherwise provided by 3M are based on the information that was provided to 3M via the Information Input Form, including the total area of filmed windows and their orientations, by Ben Kooyman.

The accuracy, completeness, and representative nature of such information is not guaranteed, and 3M does not accept responsibility for any matters arising or consequences from the further use of the information and/or statement contained in this report.

This workbook estimates the reduction in solar loading based on the center of glass value for Solar Heat Gain Coefficient (SHGC) as modeled by Lawrence Berkeley National Laboratory's (LBNL) Window software, and the inputs provided in the Information Sheet. The savings estimates assume that all solar energy entering the building during the cooling months must be cooled. This is not an hourly model (8760 hours), nor does it consider any building parameters other than the center of glass values.

Additional Information:

To get in touch with the 3M Sales Team, please call: 136 136

General 3M Window Film Information and Resources:
https://www.3m.com.au/3M/en_AU/building-window-solutions-au/

3M Building Report - Solar Load Reduction Estimator

Building Information Input Form

Instructions: Please fill out the required fields below in yellow. See examples on the right for guidance.

			Example:
Customer/Contact:	Person providing information	Ben Kooyman.	*John Smith*
Project Name:	Project/Building/Address/etc.	Depot Brewery.	*Joe's Hotel*
Building Information:	Location (City, State):	Sydney	*Sydney, NSW*
Window Information:	A) Choose the closest match from the drop-down list:	Double Pane Tinted	*Example: Single Pane Clear*
	B) If completing the form by hand, please circle which of the four window types is the closest match on the right:		
3M Film Selections:	Choose up to 3 Films	3M Prestige 70 Exterior 3M Prestige 40 Exterior	*Prestige 70* *Night Vision 35*

Façade Information:	**Orientation/Building Face**	**Approx. Total Window Area (m^2)**
Only for windows being considered for window film	N (45° skylights)	0
	NE	0
	E (45° skylights)	0
	SE	0
	S (45° skylights)	0
	SW	0
	W (45° skylights)	172.44
	NW	91.98
	Skylights	0

HVAC Information (optional):

Coefficient of Performance (COP)*	3.5	*3.5*

*If not known, we will assume an average COP of 3.5