

3M *Innovation* Window Films



3M Proof of Technology Experiment Cover Letter

This Proof of Technology experiment was conducted at a large office facility in the Los Angeles, California area. This large office had over 10 stories. The experiment was conducted in adjacent offices all facing the south with climate control in the rooms turned off. The offices had 78 square feet of single pane clear $\frac{1}{4}$ " glass.

This experiment can be used as a case study, and will be most representative of a large office building in a hot climate with single pane clear glass.

3M Window Films



Energy Savings Report

Proof of Technology Test Procedure A
Temperature logger formula analysis

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CLEARLY SUPERIOR >>

3M introduces the new Prestige Series, a unique collection of films with superior heat rejection, no-metal technology, low reflectivity, and a warranty backed by one of the world's most respected companies.

*prestige
window films*

Executive Summary:

3M Window Film Prestige 70 was applied to a south facing room. Temperature loggers were placed in the room to record temperature data at one minute intervals in order to determine both energy savings and temperature comfort levels and to compare with a second identical room without film. The experiment was conducted using 3M’s Proof of Technology Test Procedure A. A four day average showed maximum temperature reductions of 8° F with PR 70. The average heat flux through the window shows a 31% improvement with PR 70.

Table 1

	No Film	Prestige 70
Average Peak Room Temperature (°F)	91.78	83.68
BTU % Improvement	N/A	31%

The conclusions and data reported in this case study are in 3M's opinion a fair and accurate representation of the benefits of window films in the particular application. Temperature and energy improvements shown are only valid for the areas and rooms that were tested on the particular days that were tested. Variations in weather patterns as well as changing room dimensions and room orientation and configuration, among other variables, will significantly affect these results. While 3M believes that window films will have an overall benefit in reducing solar transmission, individual heat load and energy savings results will always 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. 3M also does not recommend using the percentage Improvement numbers reported in this study to estimate annual energy savings for the entire building.

Observations:

The graphs displaying the results from the temperature loggers are shown in Figures 1-5. Figures 1-5 show data from 3/12-3/15, which is the data utilized in the analysis in Table 1 shown in the analysis section. Notice that in Figures 1-4 not only did the non-filmed room reach a higher maximum temperature, but the room also heated up at a faster rate. Figures 1-4 show the actual data obtained by the temperature loggers, which is represented by the curved pink, and blue, as well as two straight lines which connect the initial temperature of the rooms at 8am, to the maximum temperature of the rooms during the day. The slope of the straight lines can be used to compare the amount of BTU’s entering each room, for example, in Figure 1, the room with no film has the steepest slope while the room with PR70 has the shallowest slope; therefore, the room with PR70 heats up at a slower rate and has less BTU’s entering through the window.

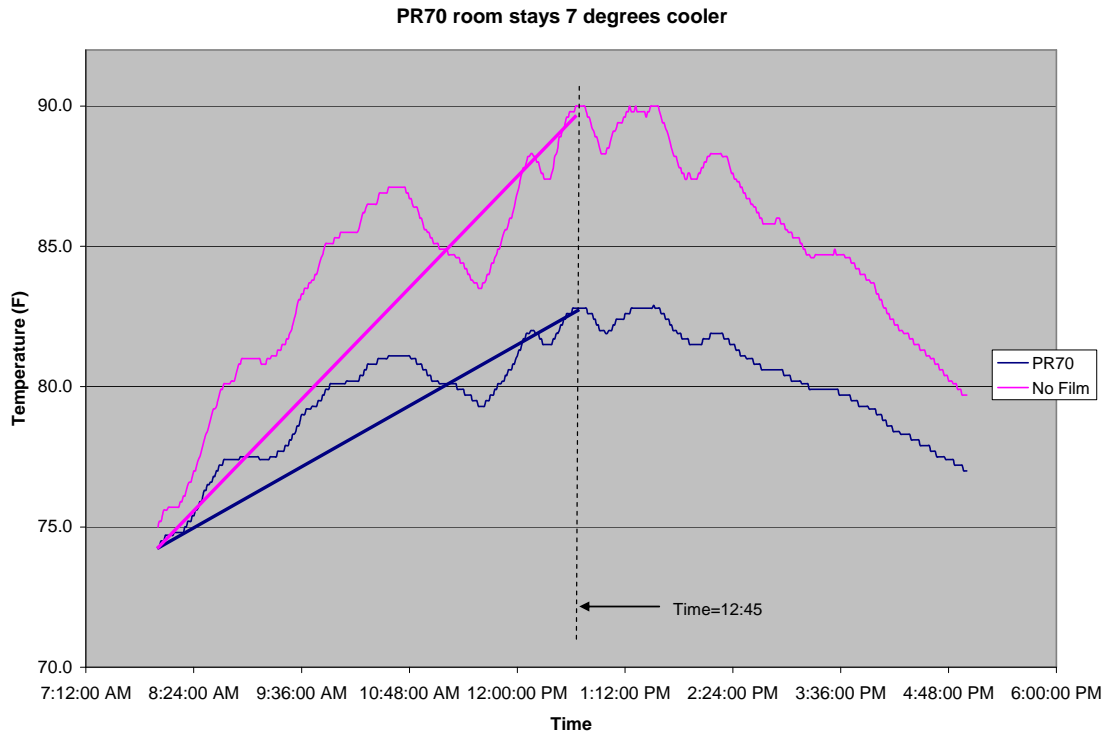


Figure 1 Temperature Data from 3-12-08

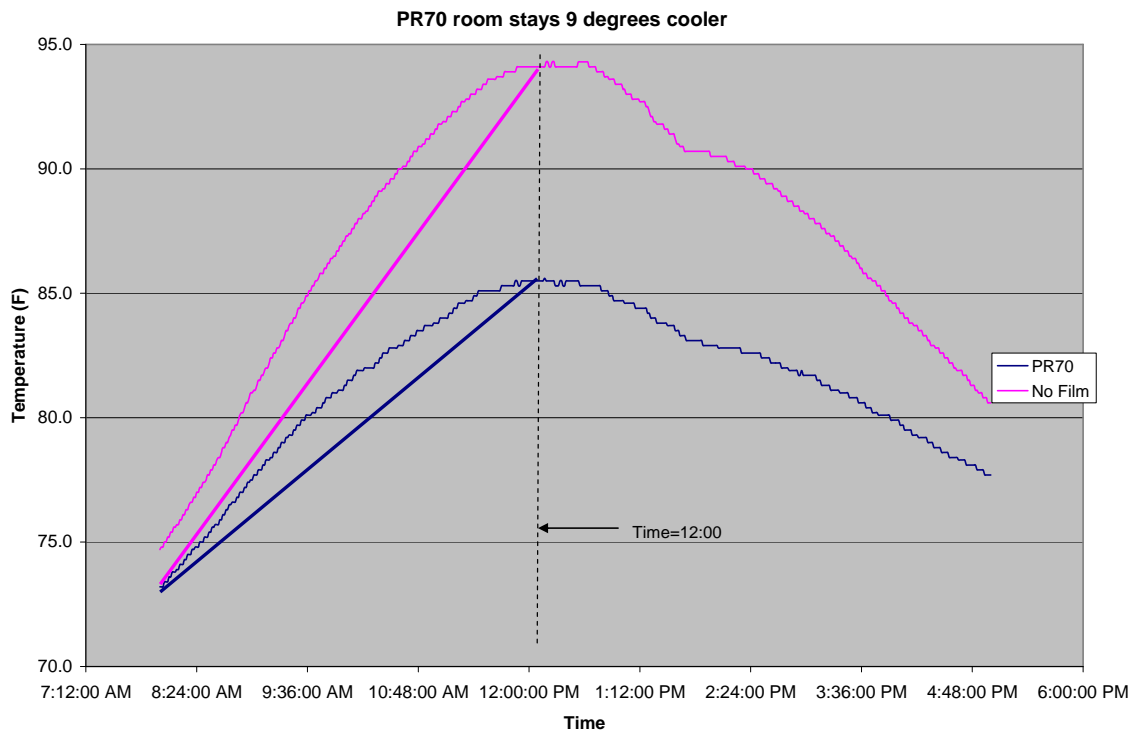


Figure 2 Temperature Data from 3-13-08

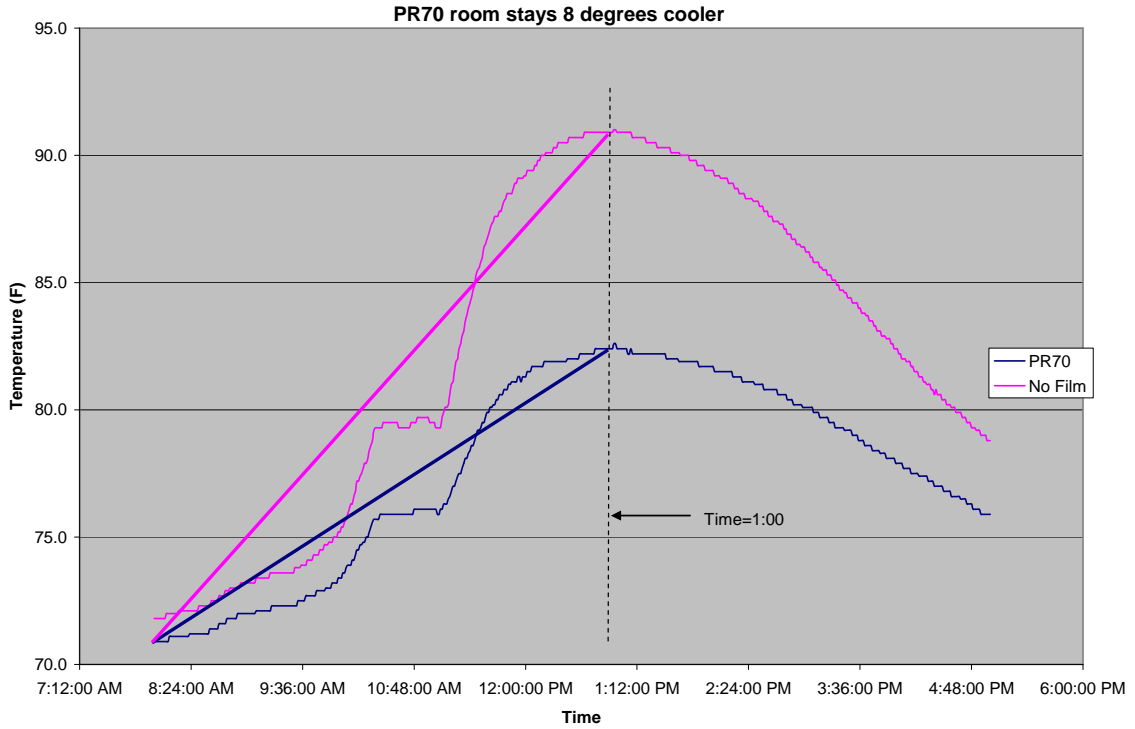


Figure 3 Temperature Data from 3-14-08

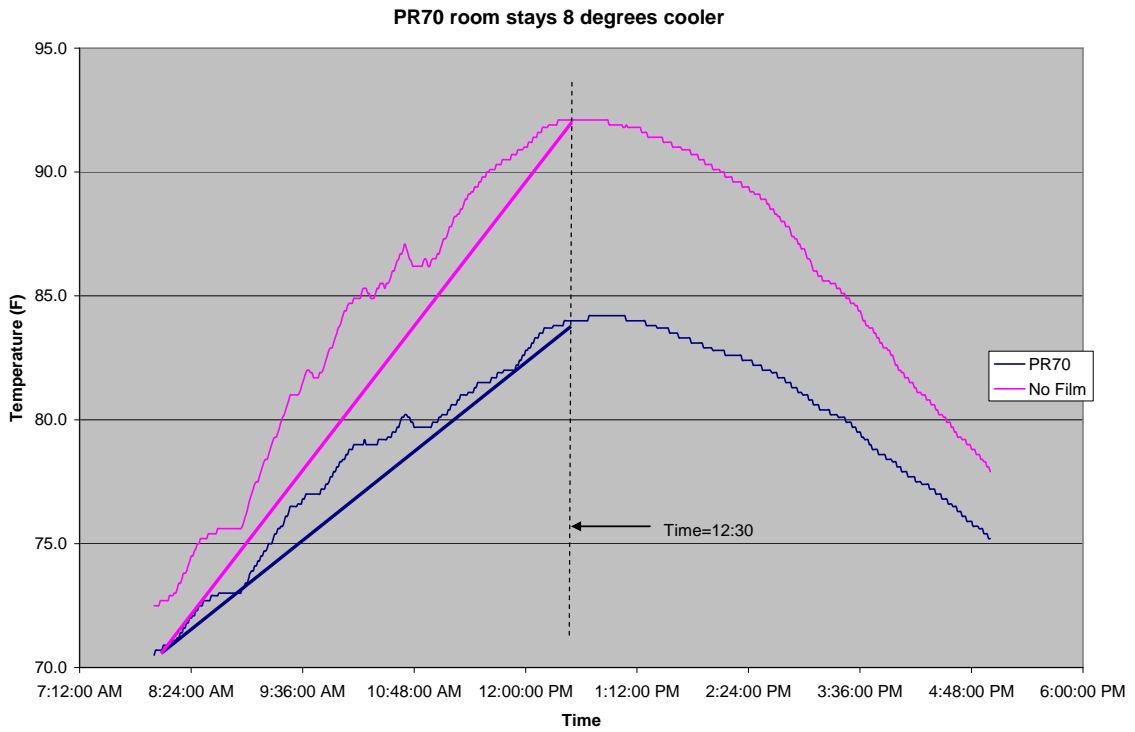


Figure 4 Temperature Data from 3-15-08

Figure 5 is a graph showing a comprehensive look at all of the data collected over all of the days.

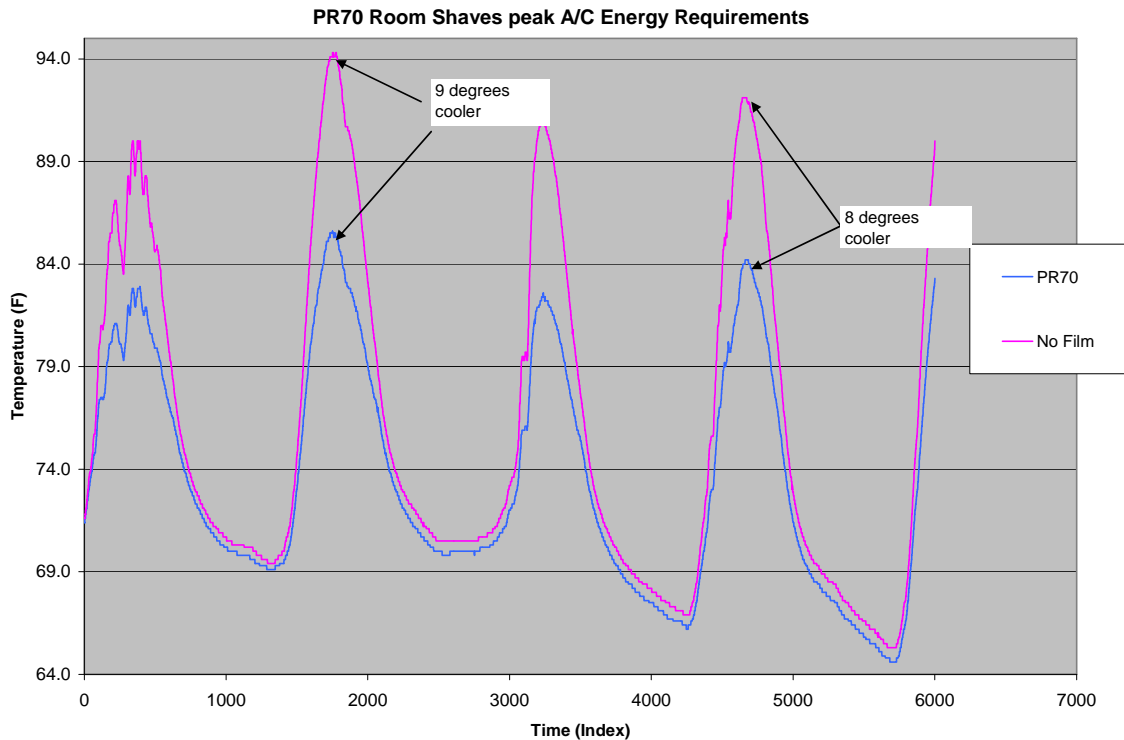


Figure 5 Temperature Data for 3/12/08-3/15/08

Analysis and Conclusions:

Figures 1-5 not only show that the maximum heat level in the room is reduced, but that the rate of heat transfer into the room has also been reduced which is noted by the slope of the line from 8:00 am to the maximum temperature of the room. The slope of the line is directly related to the amount of energy coming into the room, with the steeper line (the room with no film) having more energy per time entering the room causing the room to heat up at a greater rate. Table 2 shows the average improvement, over the four days shown in Figures 1-4, in reduced solar energy entering through the window. Over the four days these three rooms experienced a reduction in heat flux by an average 31% and an average maximum temperature reduction of 8°F with PR70. The results of this Proof of Technology experiment show that installing 3M Window Film reduces the energy flux through the window and reduces the maximum temperature reached in the room during the experimental period, both of which lead to energy savings.

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Table 2

Average Data						
Average Data	Temperatures (F)					
Average Hours of Analysis	4.5625					
	No Film	W/ PR 70	Madico			
Initial Temperature (F)	73.50	72.23	73.28			
Final Temperature (F)	91.78	83.68	86.45			
	Temperatures (C)					
	No Film	W/ PR 70	Madico			
Initial Temperature (C)	23.06	22.35	22.93			
Final Temperature (C)	33.21	28.71	30.25			
Q net [kJ/hr]	135.13	61.77	71.08	W/ PR 70		
kW-hr	0.03754	0.01716	0.01974	Normalized		
BTU	128.08	58.55	67.37	No Film	W/ PR 70	% Improvement
kw-hr/ft^2	0.00048	0.00033	0.00038	0.00000	0.00015	31.43%
BTU/ft^2	1.65	1.13	1.30	0.00	0.52	31.43%

Notes:

- A logging BTU meter was not used for this experiment. BTU's were calculated using an ASHRAE approved formula.

Appendix



Figure 6 Film applied south facing 8th floor



Figure 7 Prestige room temp loggers and unfiled room temp loggers