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Window Tests at National Defence Medical Centre

At the request of Mr. Jeff Clarke of In'Flector Control Systems, Scanada Consultants was contracted to evaluate the In'Flector control panels in terms of its impact on the air leakage characteristics in the installed condition. In'Flector Control Systems is currently retrofitting a number of windows at the National Defence Medical Centre in Ottawa. Two windows were randomly selected and tested in this facility on November 17, 1995.

Procedure

Field tests were conducted in order to quantify the reduction of air leakage through the existing windows with the installation of an In'Flector panel. The window tests were conducted according to the ASTM Standard E783-84: *Standard Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.* The window tests were done with and without In'Flector panel installed.

The window air leakage tests were done using the CAN-BEST window test rig. The air leakage through each window, with and without In'Flector panel, was determined in the infiltration mode.

At the National Defence Medical Centre, the majority of windows being retrofitted with In'Flector panels have similar dimension and type of construction. Out of the 200 plus window retrofits already completed, two windows were selected for the test purpose.

Description of In'Flector Control Panel

The In'Flector control panel is an interior mounted solar screen. The In'Flector solar screen consists a metallized polyethylene sheet laminated to a very thin sheet of carbon graphite P.V.C. which is then perforated and laminated to a sheet of clear polyester The solar screen is reversible, so one may have the reflective surface face the interior during the heating season and reversed during the summer season. The screen is held in place by Velcro. The Velcro strip together with a foam gasket is secured to the window trim by a self adhesive backing and staples. The Velcro fasteners coupled with closed-cell foam gaskets seal the In'Flector panel to the window.

Description of Existing Windows

The windows tested are typical of the majority of windows in the building. They are double-hung sashes within a casement frame that swing inward to allow cleaning. The operable perimeter of the double-hung sashes is 5.95 m and the operable perimeter of the casement sash is 5.52 m. The total crack length, as determined according to ASTM E783-84 and CSA A440 is 11.47 m. Visual observations showed that all test windows were very air leaky.

Test Results

The field tests were conducted using the standard procedure and set up. In both cases, the intent was to record air flow rates at 75 Pa and then at 5 Pa intervals down to 10 Pa. However, due to the severe leakiness of the existing windows, the test equipment could not establish the required 75 Pa depressurization in both window tests without the In'Flector panel. In those cases, at least four reading were taken to calculate a linear regression. Using the following flow equation, the air flow rate at 75 Pa was determined.

$$q = C (\Delta P)^n$$

where, q = flow rate, m^3/s

ΔP = pressure difference, Pa

C = flow coefficient, $m^3/(s.Pa^n)$

n = dimensionless coefficient

For each window, the depressurization test was conducted with In'Flector panel in place and then without the In'Flector panel.

Table 1 summarizes the air leakage tests. The existing windows are very leaky. The use of In'Flector panels substantially reduces the air leakage through these windows from 64.8% to 71%. The perimeter fasteners of the In'Flector panels seem to be holding well and provide a good air-seal.

The pressure difference across the building envelope (indoor and outdoor) was 5 to 24 Pa (indoor is lower) on the day of the test. The average operating condition in the building should be about 10 Pa across windows during the winter months. Table 1 shows the air leakage through the specimen windows when subjected to the 10 Pa pressure difference during the normal operation in winter months. The table also shows the comparison of the air leakage rate with the CSA A440 classification for airtightness of window assemblies. Figure 1 shows the measured improvement in the air leakage rate at the normal operating conditions for existing windows with the use of In'Flector panels in the building.

Table 1: Air leakage characteristics of a sample of existing windows at the National Defence Medical Centre in Ottawa.

Test		Normalized Leakage @ 75 Pa m3/hr/m	Flow through a Window at 10 Pa L/s	Percent Improvement in Leakage Rate	CSA A-440 Leakage Classification
Window 1 Room 105	Without In'Fiector	7.30	5.68	Base	(*)
	With In'Fiector	2.57	2.00	64.8%	A1
Window 2 Room 540	Without In'Fiector	5.63	4.38	Base	(*)
	With In'Fiector	1.63	1.27	71.0%	A2

* Window leakage rate is high and exceeds CSA A440 limits

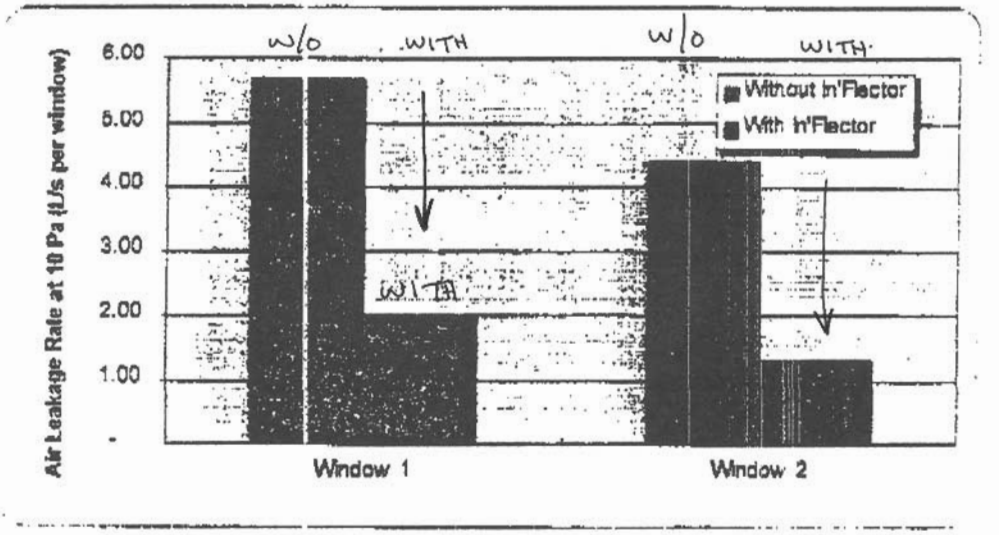

Figure 1: Improvements in the air leakage behavior of windows with the use of In'Fiector panels at the normal operating conditions in the building.

Please call Ken Ruest or Anil Parekh for further information regarding the field tests of these windows.

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