ENERGY EFFICIENCY FUND

for Gaz Métro Customers

Preparation guide for the airtightness savings evaluation report

FONDS EN EFFICACITÉ ÉNERGÉTIQUE de Gaz Métro

PREPARATION GUIDE FOR THE AIRTIGHTNESS SAVINGS EVALUATION REPORT

This guide is intended for the person responsible to produce an energy evaluation in relation to airtightness work done on a building. *

To be considered valid, **the report must be identified with its author's name and at the very least contain the following information:**

- ☐ General building description
- ☐ Gaz Métro account number of building affected by the project
- ☐ Address, city, postal code
- ☐ Building type and occupancy use (e.g. office building)
- ☐ For multi-unit buildings, specify number of units
- ☐ Total floor surface area
- ☐ Year of construction
- ☐ Number of floors
- ☐ Description of heating system (type, brand, year, efficiency, etc…)
- ☐ Indicate if there are heating sources other than natural gas used in the building. If so, specify the source as well as the percentage of its load on the total heating load
- ☐ Photo of building facade

- ☐ Expected date of start of work
- ☐ Expected date of end of work

To calculate the airtightness savings of the building **you must use one of the two following methods :**

N.B. : If you use the method of estimated crack surface area you must describe the cracks listed (length, width) by category of opening (doors, windows, frame/wall joint etc...)

* To be admissible, this work must be done on the entire building

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METHOD FOR THE AIRTIGHTNESS SAVINGS CALCULATION WITH BLOWER DOOR TEST

$$Savings\ [m^3] = \frac{\left(Q_{reference_{before}} - Q_{reference_{after}}\right) \times \left(\Delta_{p_{reference}}\right)^{-0.65} \times HDD18 \times \left(0.0261 \times v^2\right)^{0.65}}{356.4 \times E}$$

$Q_{reference_{before}}$ *and* $Q_{reference_{after}}$: infiltration rate before and after work (L/s)

$\Delta_{p_{reference}}$: pressure differential at which the infiltration tests were done (Pa)

v : average yearly wind velocity during heating months (km/h)

$HDD18$: heating degree days with base temperature of 18 (°C)

E : equipment efficiency (%)

Variable 1 : infiltration rate differential $\Delta Q_{reference}$ [Pa]

The difference of the infiltration rate before and after work $\Delta Q_{reference}$ is defined as follows **:**

$$\Delta Q_{reference} = Q_{reference_{before}} - Q_{reference_{after}}$$

$Q_{reference_{before}}$ *and* $Q_{reference_{after}}$ must have been measured with the same pressure differential.

They must be in L/s. The following table will convert the usual flows to L/s.

	Multiplier to find L/s
m³/h	0.2777778
ft³/min	0.4719474

When the infiltration rates are given by crack length unit, the total length that has been leak-proofed must be known.

Variable 2 : pressure differential $\Delta_{p_{reference}}$ [Pa]

The pressure differential used in obtaining the results of the infiltration test must be the same before and after the airtightness work. In general, it is 4, 10, 50, or 75 Pa.

Variable 3 : heating degree days HDD18 [°C]

Heating degree days in Celsius with a base temperature of 18 must be determined by locating the weather station closest to the building in question. Refer to the Environment Canada website for climate normals :

http://climate.weatheroffice.gc.ca/climate_normals/index_e.html

For example, for the station « MONTREAL/PIERRE ELLIOTT TRUDEAU INTL A », you must choose Degree Days «Below 18°C » and extract the year total of 4518.7°C.

Thus, $HDD18$ = 4518.7°C

Degree Days:														
Above 24 °C	0	0	0	0	0.1	2	6.1	3.2	0.5	0	0	0	11.9	A
Above 18 °C	0	0	0	0.4	10.6	46.3	97.1	70.6	16.1	0.4	0	0	241.6	A
Above 15 °C	0	0	0	2.2	32.7	106.1	182.9	146.1	45.5	3.4	0	0	518.7	A
Above 10 °C	0	0	0.5	15.7	117.8	244	337.2	297.5	146.5	30.9	2.8	0	1192.9	A
Above 5 °C	0.2	0.8	7	68.3	257.7	393.5	492.2	452.5	289.1	113.3	22.7	1.1	2098.4	A
Above 0 °C	5.6	8.3	43.6	179.4	411.8	543.5	647.2	607.5	438.9	250.9	88.3	13.3	3238.2	A
Below 0 °C	322.4	246.8	113.8	7.7	0	0	0	0	0	0.5	40.4	208.9	940.5	A
Below 5 °C	472	380.7	232.3	46.7	0.9	0	0	0	0.1	17.9	124.9	351.7	1627.1	A
Below 10 °C	626.8	521.2	380.8	144	16	0.5	0	0.1	7.6	90.5	255	505.5	2547.9	A
Below 15 °C	781.8	662.5	535.3	280.6	85.9	12.6	0.7	3.6	56.5	218	402.2	660.5	3700.1	A
Below 18 °C	874.8	747.3	628.3	368.8	156.7	42.8	7.9	21.1	117.2	308	492.2	753.5	4518.7	A

Variable 4 : average yearly wind velocity v [km/h]

The average yearly wind velocity v must be extracted from the same Environment Canada table of climate normals for the months of September to May inclusively.

For example, for the station « MONTREAL/PIERRE ELLIOTT TRUDEAU INTL A », you must calculate the average for 9 months of heating.

Thus, $v = 15.0$ km/h

Wind:														
Speed (km/h)	16.6	15.4	15.9	15.8	14.2	13.2	12.2	11.3	12.2	13.8	15.3	15.4	14.3	A
Most Frequent Direction	W	SW	N	N	SW	SW	SW	SW	SW	SW	SW	SW	SW	A
Maximum Hourly Speed (km/h)	**90**	80	74	70	72	66	58	55	65	72	76	72		
Date (yyyy/dd)	**1959/22**	1961/26	1971/04	1977/03	1964/09	1972/22	1956/11	1965/06	2005/29	1979/06	1975/10	2000/18		
Direction of Maximum Hourly Speed	SW	N	NE	W	SW	NE	SW	NW	NE	SW	SW	W	SW	
Maximum Gust Speed (km/h)	117	138	**161**	106	103	111	126	105	97	117	113	103		
Date (yyyy/dd)	1959/22	1956/25	**1964/05**	1975/19	1956/14	1957/29	1975/02	1966/09	1956/06	1979/06	1989/16	1971/11		
Direction of Maximum Gust	SW	SW	S	SW	SW	S	W	S	SW	SW	S	SW	CALM	
Days with Winds >= 52 km/h	2.5	1.2	1.6	1	0.8	0.5	0.7	0.4	0.3	0.9	1.7	2	13.5	C
Days with Winds >= 63 km/h	0.6	0.2	0.3	0.3	0.2	0.2	0.2	0.1	0	0.1	0.6	0.4	3.3	C

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METHOD FOR AIRTIGHTNESS SAVINGS CALCULATION WITH ESTIMATED CRACK SURFACE AREA

$$\boldsymbol{Savings}\ [\boldsymbol{m^3}] = \frac{\mathbf{100} \times \boldsymbol{A} \times \boldsymbol{HDD18°C} \times \left(\mathbf{0.0135} \times \boldsymbol{v^2}\right)^{\mathbf{0.65}}}{\mathbf{356.4} \times \boldsymbol{E}}$$

$\boldsymbol{A}$:	surface area of cracks (m²)
$\boldsymbol{HDD18}$:	heating degree days with base temperature of 18 (°C)
$\boldsymbol{v}$:	average yearly wind velocity during heating months (km/h)
$\boldsymbol{E}$:	equipment efficiency (%)

Variable 1 : surface area of cracks

The surface area of cracks must be evaluated by a contractor or specialized firm.

A detailed description must include the type, length, width of the cracks which will be completely leak-proofed at 100%.

Variable 2 : Heating degree days $\mathbf{DJC18}$ [°C]

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