Guide for Preparation of Energy Savings Evaluation Report

Energy efficiency program – Efficient construction and renovation

Energy efficient renovation

Key Components of Evaluation Report

This guide is intended for the engineer responsible for producing an energy evaluation related to work on a building's envelope.[1] The evaluation is needed in order to confirm that a building is eligible for financial assistance under the Energy Efficient Renovation.

For Énergir to consider the report valid, the report must contain the following basic information, as well as specific details on the type of renovation work:

- Contact information for the customer
- Énergir account number
- Contact information for the professional who calculated the energy savings.

For work on the windows

- ☐ Technical specifications of current windows (description of frame, glass, U value of glass with frame, etc.).
- ☐ Technical specifications of new windows (description of frame, glass, U value of glass with frame, etc.).
- ☐ Total surface area of windows replaced.
- ☐ Calculations of expected energy savings, including underlying hypotheses.
- ☐ Results of annual energy savings expected in cubic metres of natural gas (taking into consideration the efficiency of the heating system).
- ☐ Photographs taken before and after the renovation work.

For work to insulate the roof or walls

- ☐ Composition of current building structure and nominal value of thermal resistance (R-value).
- ☐ Composition of renovated building structure and nominal value of thermal resistance (R-value).
- ☐ Total surface area of building.
- ☐ Photographs taken **during** the insulation work.
- ☐ Calculations of expected energy savings, including underlying hypotheses.
- ☐ Results of annual energy savings expected in cubic metres of natural gas (taking into consideration the efficiency of the heating system).

For work to install thermal screens for greenhouses

- ☐ Dimensions and architectural description of the greenhouses.
- ☐ Type of cultivation.
- ☐ Periods of cultivation.
- ☐ Ambient conditions of cultivation (temperature, air exchange).
- ☐ Technical specifications of thermal screens (provide technical brochure).
- ☐ Total surface area of screens.
- ☐ Calculation of estimate of annual reference consumption (before installation of thermal screens) for the greenhouses.
- ☐ Calculations of expected energy savings, including underlying hypotheses.
- ☐ Results of annual energy savings expected in cubic metres of natural gas (taking into consideration the efficiency of the heating system).

For work to seal the building

To calculate the savings generated by work to seal the building to eliminate air leaks, you must **use one of the following two methods:**

- Method for calculating savings from sealing with an infiltrometer test;
- Method for calculating savings from sealing with estimate of surface area of openings.

Note: If you are using the second method and estimating the surface area of openings, you must describe the openings to be sealed (length, width) by category (e.g. doors, windows, space between windows and walls, etc.)

[1] To be eligible, the work must be done on the whole building.

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Method for calculating savings with infiltrometer test

$$Savings\,[m^3] = \frac{(Q_{reference_{before}} - Q_{reference_{after}}) \times (\Delta P_{reference})^{-0.65} \times DJC15 \times (0.0261 \times v^2)^{0.65}}{356.4 \times E}$$

$Q_{reference_{before}} - Q_{reference_{after}}$	Infiltration rate before and after the work (L/s)
$\Delta P_{reference}$	Pressure differential under which the infiltration tests were carried out (Pa)
v	Average annual wind speed during heating months (km/h)
$DJC15$	Degree-days of heating below 15 (°C)
E	Efficiency of appliance (%)

Variable I

Infiltration rate differential

$Q_{reference_{before}} - Q_{reference_{after}}$ [L/s]

The infiltration rates before and after the work, used in calculating the building's infiltration rate differential must have been measured by an infiltrometer test, using the same reference differential pressure. The rates must be in litres per second (L/s).

The following table shows how to convert all air flows into litres per second.

The total length that has been sealed has to be known when the infiltration rates are measured by unit of length per opening.

	Multiplier for obtaining measurements in L/s
m^3/h	0.2777778
ft^3/min	0.4719474

Variable II

Reference differential pressure

$\Delta P_{reference}$ [Pa]

The reference pressure differential that accompanies the results of the infiltration test must be the same before and after the sealing work. It is usually 4, 10, 50 or 75 Pa.

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Variable III

Degree-days of heating

DJC15 [°C]

The number of degree-days of heating in degrees Celsius, base of 15, must have been determined by consulting the meteorological station nearest the building. Consult Environment Canada[2] to find the climate normals.

For example, for the MONTREAL/PIERRE ELLIOTT TRUDEAU INTL A station, choose Degree days below 15°C, then find the annual total,i.e., 3700.1°C.

Thus, *DJC15* = 3700.1°C

Degree Days

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
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	626.3	368.8	156.7	42.8	7.9	21.1	117.2	308	492.2	753.5	4518.7	A

Variable IV

Annual average wind speed

v [km/h]

Annual average wind speed v must be extracted from the same Environment Canada[3] table of climate normals for the months of September to May inclusive.

For example, for the MONTREAL/PIERRE ELLIOTT TRUDEAU INTL A station, take the average for the nine months of heating.

Thus, v = 15.0 km/h

Wind

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year	Code
Speed (km/h)	16.6	15.4	15.9	15.6	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		
Maximum Gust Speed (km/h)	117	138	161	106	103	111	126	105	97	117	113	103		
Date (yyyy/dd)	1959/22	1958/25	1964/05	1975/19	1956/14	1957/29	1975/02	1966/09	1956/06	1979/06	1969/16	1971/11		
Direction of Maximum Gust	SW	SW	S	SW	SW	S	W	S	SW	SW	S	SW		
Days with Winds >= 52 km/h	2.5	1.2	1.6	1.0	0.8	0.5	0.7	0.4	0.3	0.9	1.7	2.0	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	0.1	0.6	0.4	3.3	C

[2] www.climate.weatheroffice.gc.ca/climate_normals/index_e.html?

[3] ibid.

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Method for calculating savings with estimate of surface area of openings

$$Savings\ [m^3] = \frac{100 \times A \times DJC15 \times (0.0135 \times v^2)^{0.65}}{356.4 \times E}$$

A	Surface area of openings (m^2)
$DJC15$	Degree-days of heating below 15 (°C)
v	Average annual wind speed during heating months (km/h)
E	Efficiency of appliance (%)

Variable I

Surface area of openings
A [m^2]

The surface area of the openings must be evaluated by a contractor or a specialized firm. A detailed description must be provided on the type, length and width of the openings that are to be 100% sealed.

Variable II

Degree-days of heating
$DJC15$ [°C]

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For example, for the MONTREAL/PIERRE ELLIOTT TRUDEAU INTL A station, choose Degree days below 15°C, then find the annual total, i.e., 3700.1°C.

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Degree Days

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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	117.6	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	436.9	250.9	88.3	13.3	3238.2	A
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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
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[4] www.climate.weatheroffice.gc.ca/climate_normals/index_e.html?

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Variable III

Average annual wind speed

v [km/h]

Average annual wind speed v must be extracted from the same Environment Canada[5] table of climate normals for the months of September to May inclusive.

For example, for the MONTREAL/PIERRE ELLIOTT TRUDEAU INTL A station, take the average for the nine months of heating.

Thus, v = 15.0 km/h

Wind

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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		
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		
Days with Winds >= 52 km/h	2.5	1.2	1.6	1.0	0.8	0.5	0.7	0.4	0.3	0.9	1.7	2.0	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	0.1	0.6	0.4	3.3	C

[5] See (4) above.

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