



CALCULATING ENERGY TARGETS FOR NEW CONSTRUCTION UNDER THE SUSTAINABLE MUNICIPAL BUILDINGS OFFER

Tips on calculating EUI and TEDI targets for new buildings based on building typology

This document describes the energy use intensity (EUI) and thermal energy demand intensity (TEDI) eligibility requirements in the Green Municipal Fund (GMF) Sustainable Municipal Buildings (SMB) funding offer for new buildings. Note that this document does not discuss other eligibility requirements not related to energy. Consult the [Sustainable Municipal Buildings](#) page for details.

Read this tip sheet for more information on how to:

- Determine targets for both energy use intensity (EUI) and thermal energy demand intensity (TEDI) in application submissions based on building typology.
- Ensure targets accurately account for buildings with more than one building typology.

Who should read this document:

- Energy modelling consultants working on applications to the SMB funding offer, specifically for new buildings.
- Energy managers, modellers and building managers within local governments who are responsible for developing applications under the SMB new building offer.

DEFINING ENERGY USE TARGETS IN EACH BUILDING TYPOLOGY

GMF's Sustainable Municipal Buildings requirements for both studies and capital projects state that new buildings must meet two separate targets: one for energy use intensity (EUI) and one for thermal energy demand intensity (TEDI).

Energy targets vary depending on the building area's primary function and typology. When determining energy targets for buildings with multiple typologies, all relevant functions and typologies are combined in a blended target, using a weighted average calculation.

KEY DEFINITIONS

EUI (energy use intensity)

EUI is a building's total energy use per square metre per year. To calculate it, add up all the building's energy use—including heating, cooling, ventilation, lighting, plug loads, hot water heating and other sources—and divide by total conditioned floor area. Do not subtract any renewable energy production from total building energy use.

If the building has a conditioned parkade, include the parkade's energy use but exclude the parkade floor area from the EUI calculation.

TEDI (thermal energy demand intensity)

TEDI is a building's thermal energy demand per square metre per year. It encompasses thermal energy demand for both space heating and ventilation and takes into account any thermal energy recovery, such as from a heat recovery ventilator (HRV).

To calculate TEDI, use energy modelling software to determine the amount of heating energy delivered to the building from all types of space-heating equipment (for some buildings, this is a measure of the sensible heating load energy at the heating coils) and divide by total conditioned floor area. If the building has a conditioned parkade, include the parkade energy use but exclude the parkade floor area from the TEDI calculation.

Note that heating system efficiency is irrelevant for TEDI. For example, a building with a 400% efficient heating system has the same TEDI as a building with an 80% efficient heating system, assuming all other building elements are identical.

A building with a good (low) TEDI typically has a well-insulated envelope (walls, roof, windows, doors, foundation), is relatively airtight, includes an efficient ventilation heat recovery system, minimizes thermal bridges and is careful with window design, placement and orientation.

Typology One

Office or office-like buildings, including libraries and town halls.



Typology Two

Non-office buildings such as ice arenas, pools, fitness centres, indoor soccer fields and public works buildings.



Typology Three

A building containing a mix of Typologies One and Two. Note: if 75% or more of a building's floor area is Typology One, treat it as Typology One, not Three. Likewise, if 75% or more of a building's floor area is Typology Two, treat it as Typology Two, not Three.





Example 1: Assessing energy targets for a building with a typology of “office or office-like building” (Typology One)

The energy use targets for the building type in this example are defined based on the EUI and TEDI targets for each climate zone as seen in Tables 1 and 2 below. For example, an office or office-like building in climate zone 5 would have an EUI target of 100 kWh/m² and a TEDI target of 32 kWh/m². Climate zones are defined within NECB 2020.

TABLE 1: EUI (kWh/m²/year) for offices and office-like buildings

Climate zone	EUI target
4	100
5	100
6	100
7 & 8	0.0078 x HDD18 + 78 see footnote 1

TABLE 2: TEDI (kWh/m²/year) for offices and office-like buildings

Climate zone	TEDI target
4	30
5	32
6	34
7	36
8	40

Important! See General Requirements list at the end of this document for other requirements which apply to all building typologies.



Example 2: Energy targets for non-office building typologies such as ice arenas, pools, fitness centres, indoor soccer fields and public works buildings (Typology Two)

- EUI Target: NECB 2020 proposed building EUI must be 25% better than the NECB 2020 baseline (reference) building EUI, and
- TEDI Target: NECB 2020 proposed building TEDI must be equal to (or better than) the NECB 2020 baseline building TEDI.

The NECB 2020 proposed building EUI and TEDI are based on your actual building design and the NECB 2020 baseline building EUI and TEDI are based on your building, but modelled to NECB 2020 prescriptive requirements. Both the NECB 2020 proposed building EUI and TEDI values, and NECB

2020 baseline EUI and TEDI targets, will be unique to your building, and must be calculated by your building energy modelling consultant. No two buildings will have the same EUI and TEDI values or targets.

The building must be modelled to NECB 2020, both for the baseline and proposed models. Modelling to other years of NECB (2015, 2017, etc.) is not acceptable.

Consider a hypothetical aquatic centre with a floor area of 600 m². The relevant NECB 2020 baseline building energy use is 200,000 kWh. Therefore its NECB 2020 baseline EUI is:

$$200,000 \text{ kWh} / 600 \text{ m}^2 = 333 \text{ kWh/m}^2$$

1 For buildings in climate zones 7 and 8, calculate the EUI based on the formula 0.0078 x HDD18 + 78. For example, Edmonton is in climate zone 7 and has 5,120 heating degree days below 18°C. Its EUI target for an office building is therefore 0.0078 x 5,120 + 78 = 118 kWh/m².

As the EUI target must be 25% better than the NECB 2020 baseline building, the relevant NECB 2020 proposed EUI target is therefore:

$$333 \text{ kWh/m}^2 \times 0.75 = 250 \text{ kWh/m}^2$$

If the NECB 2020 baseline thermal energy demand is 36,000 kWh, this equates to a TEDI of:

$$36,000 \text{ kWh} / 600 \text{ m}^2 = 60 \text{ kWh/m}^2$$

The NECB 2020 proposed TEDI target is therefore 60 kWh/m² or less.

Note that this EUI target of 250 kWh/m² and TEDI target of 60 kWh/m² are for this example in particular. Your actual EUI and TEDI targets must be calculated by your building energy modelling consultant using data relevant to your specific building; each project will have its own unique EUI and TEDI targets.

Important! See General Requirements list at the end of this document for other requirements which apply to all building typologies.



Example 3: Energy-use targets for buildings with a blend of typologies (Typology Three): whole-building weighted average

Buildings often contain both Typology One and Typology Two spaces. Consider a recreation centre with a substantial office space taking up at least 25% of the total building floor area. The EUI and TEDI targets must be calculated based on a weighted average that takes into account both typologies. Note that if an office or office-like area makes up less than 25% of the total area, the NECB 2020 targets (Example 2) apply for the entire building, in which case this Example 3 does not apply.

For EUI and TEDI targets in blended buildings, a weighted average calculation based on floor area is used, determined using the EUI and TEDI target-setting methods presented in Examples 1 and 2.

An example of this weighted-average calculation is shown below.

Example calculation for determining energy-use targets for blended buildings

Consider a 1,000 m² building consisting of 400 m² of office space (40% of total area) and 600 m² of pool space (60% of total floor area) that is located in climate zone 5.

1. Calculate the EUI and TEDI targets for the office (or similar) areas as shown in Example 1 above.
2. Calculate the EUI and TEDI for the pool area as shown in Example 2 above.
3. Calculate the EUI and TEDI targets for the whole building using a weighted average, as shown below.

Whole-building weighted average EUI target:

$$(100 \text{ kWh/m}^2 \times 40\%) + (250 \text{ kWh/m}^2 \times 60\%) = 190 \text{ kWh/m}^2$$

Whole-building weighted average TEDI target:

$$(32 \text{ kWh/m}^2 \times 40\%) + (60 \text{ kWh/m}^2 \times 60\%) = 48.8 \text{ kWh/m}^2$$



The EUI and TEDI for the office area can be above 100 kWh/m² (EUI) and above 32 kWh/m² (TEDI), as long as the building as a whole meets the whole-building weighted-average EUI (190 kWh/m²) and TEDI (48.8 kWh/m²).

The same applies for the pool area: the EUI and TEDI for the pool can be above 250 kWh/m² (EUI) and above 60 kWh/m² (TEDI), so long as the building as a whole meets the whole-building

weighted-average EUI (190 kWh/m²) and TEDI (48.8 kWh/m²) targets.

For instance, in this example, the proposed building office area EUI could be 120 kWh/m², so long as the pool area EUI is 236 kWh/m² or lower, which equates to a whole-building weighted-average EUI of (120 kWh/m² x 40%) + (236 kWh/m² x 60%) = 190 kWh/m².

GENERAL REQUIREMENTS FOR ALL BUILDING TYPOLOGIES:

- 1.** Renewable energy, such as solar panels, does not count towards the energy targets. When calculating EUI, do not deduce renewable energy production from the building energy use.
- 2.** Thermal bridging must be taken into account.
- 3.** If your building contains a parkade, the parkade energy use must be included in the EUI and TEDI, however the parkade floor area must be excluded from the EUI and TEDI calculations.
- 4.** The reference (baseline) and proposed energy models must be modeled in accordance with NECB 2020. Other versions of NECB (such as NECB 2015, NECB 2017) are not acceptable.
- 5.** The building must achieve zero operational GHGs (no natural gas or other fossil fuel combustion), with the exception of emergency back-up (grid electricity emissions are excluded).
- 6.** Building conversions may be considered new builds, contact GMF.