WATERFRONTToronto

FEBRUARY 20, 2019

Green Building Standards

Aaron Barter – Manager, Innovation & Sustainability

TORONTO Ontario Canada

Minimum Green Building Requirements & the Toronto Green Standard

2006

Toronto Green Standard *(Voluntary)*

2009

Minimum Green Building Requirements v1

2010

Toronto Green Standard V1

2012

Minimum Green Building Requirements v2

2014

Toronto Green Standard V2 & Minimum Green Building Requirements v2.1

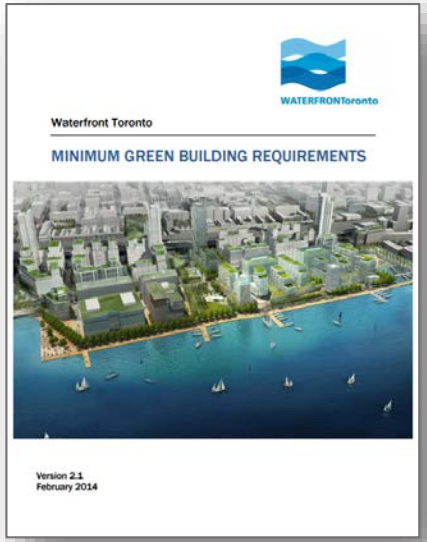
2018

Toronto Green Standard V3

Minimum Green Building Requirements

- Green building standards unique to Toronto's waterfront
- Aiming to raise the bar on low-carbon development
- Contractually binding with $ penalties for noncompliance

- ✓ LEED Gold [energy, water]
- ✓ Smart Building
- ✓ Electric Vehicle Infrastructure
- ✓ Green Roof
- ✓ Engagement and Support
- ✓ Bicycle Parking and Storage
- ✓ Waste Management
- ✓ District Energy
- ✓ High Efficiency Appliances
- ✓ Community Integration
- ✓ Long Term Flexibility
- ✓ Progress Tracking System



Minimum Green Building Requirements

- Green building standards unique to Toronto's waterfront
- Aiming to raise the bar on low-carbon development
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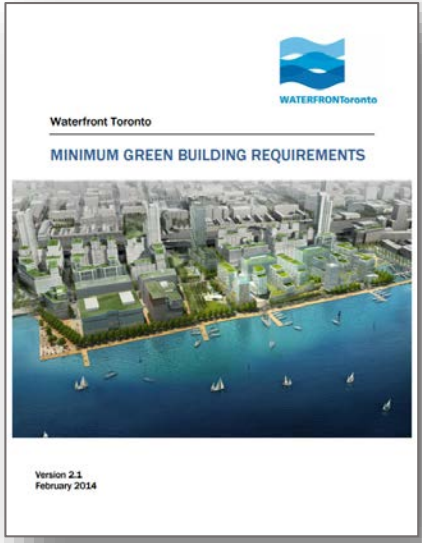
LEED 2009 results in 40% cost savings relative to Canadian Energy Code for Buildings (MNECB) including plug and process loads

3% of a building annual energy cost comes from on-site renewable energy systems

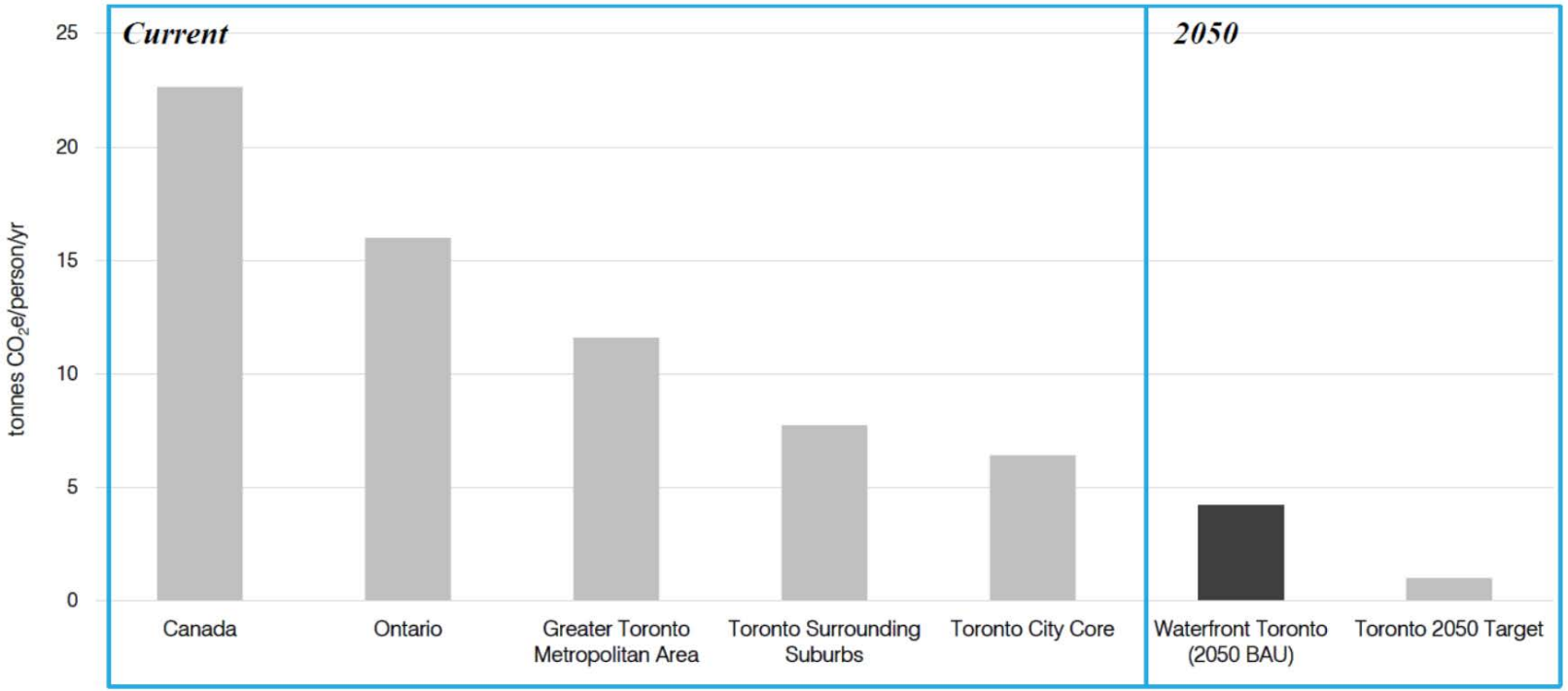


Green Building Outcomes

- Waterfront Toronto has worked with developers to construct 11 LEED Gold buildings along Toronto's Waterfront, representing over 2 million square feet of residential, commercial, retail and community space.
- Seven LEED Gold and three LEED Platinum buildings are currently under construction and expected to be completed in the coming years.
- A net-zero suite was constructed in Aqualina, in the East Bayfront neighborhood. This unit is powered by a rooftop solar installation, along with some of the common areas in the building.

Photo credit: Jose Uribe

Comparison of per capita CO2e emissions



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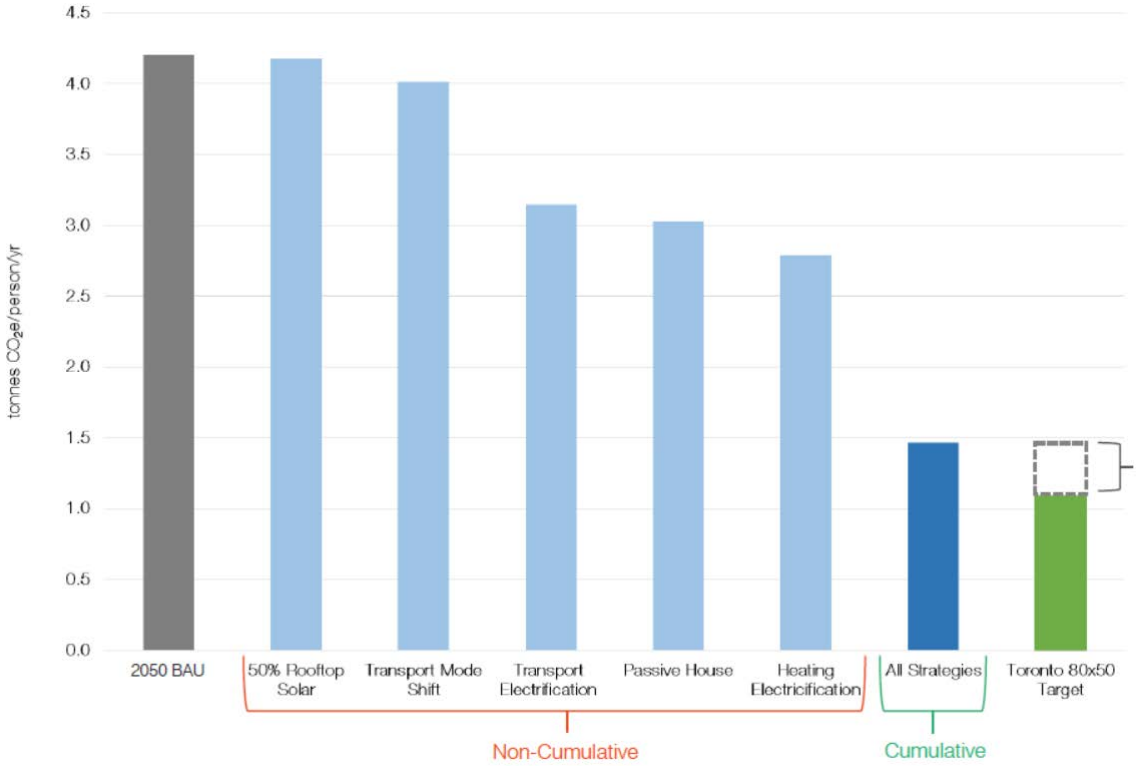
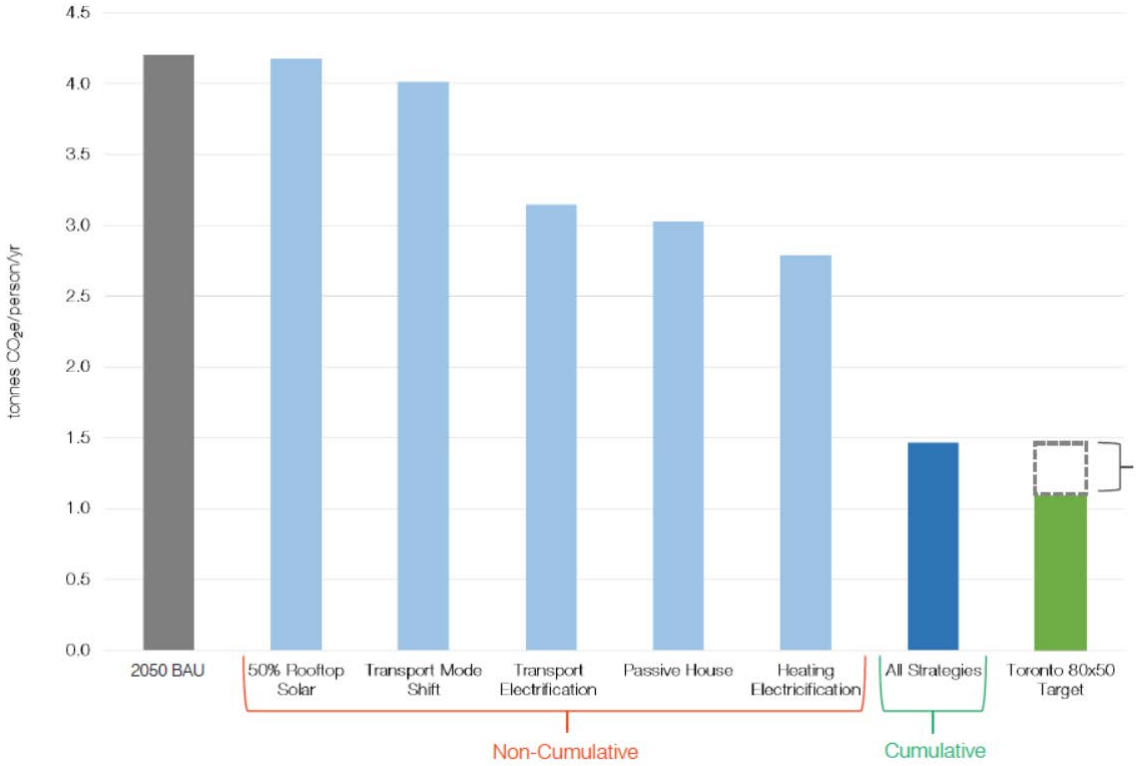


Still 26% higher than Toronto 80x50 target

Comparison of per capita CO2e emissions



Still 26% higher than Toronto 80x50 target

and CLIMATE+ Climate Positive Development Program ?

Looking Ahead: MGBR V3

Our hope is that the waterfront continues to be a leader in green building excellence, and a replicable case study for developments across the city and beyond.

Objectives for the next MGBR:

- Further integrated with the Toronto Green Standard v3
- Supports Waterfront Toronto in achieving our Climate Positive goals for new communities along the waterfront
- Is informed by the green building and low carbon pathways established at Quayside

Role of the Design Review Panel

- Waterfront Toronto staff are responsible for enforcing MGBR compliance through development agreements.
- As part of the MGBR, developers are asked to summarize their sustainability strategies for DRP presentations. We're currently working on refining these reporting requirements.
- We believe it is important for the DRP to be briefed on the sustainability initiatives of developments in the DWA, and that the DRP plays an important role in engaging with developers on their green building design.
- DRP members are uniquely poised to identify design considerations that play a role in the sustainable outcomes of a building, such as thermal bridging, passive solar features and built form optimization.
- The WT sustainability team is hoping to play a stronger collaborative role with developers through the DRP process to move the needle on green building design and innovation. Our team is also here for DRP members to answer any sustainability or MGBR related questions.

Toronto Green Standard v3

Getting to Low Carbon and Resilience
Presentation to the Waterfront Toronto Design Review Panel,
February 20, 2019
Lisa King, City of Toronto Planning Division

1) Background/ context
2) TGS/Zero Emissions buildings framework and targets
3) TGS v3 crash course

Toronto Green Standard

Sustainable performance for new development

- 2006- Voluntary standard
- 2010- TGS V1.0 Two-Tier performance standard & **Development Charges Refund**
- 2014- V2.0 Update & **Aligned with MGBR**
- 2018- V3.0 Update, adopted by Council Dec., 2017 & **Includes Toronto's Zero Emissions Buildings Framework**

Toronto Green Standard

- Air Quality
- GHG Emissions/Energy Efficiency & Resilience
- Water Balance, Quality & Efficiency
- Urban Ecology
- Solid Waste Management





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Raising the Bar

TransformTO

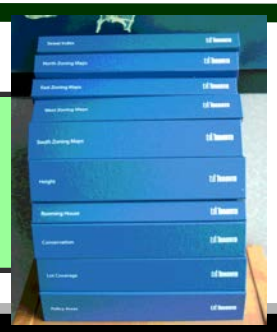
Policies

Municipal Official Plan

Sustainable (GREEN) Development Standards

The Bare Minimum

Zoning Bylaw



Ontario Building Code

Regulations

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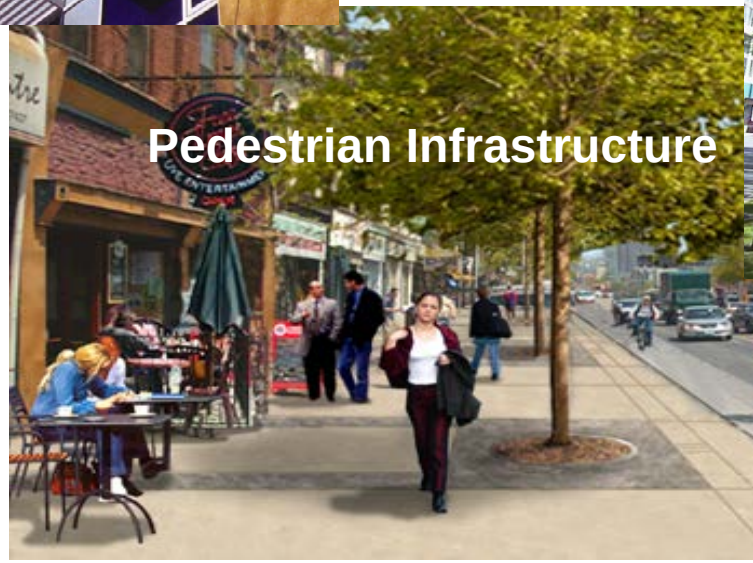
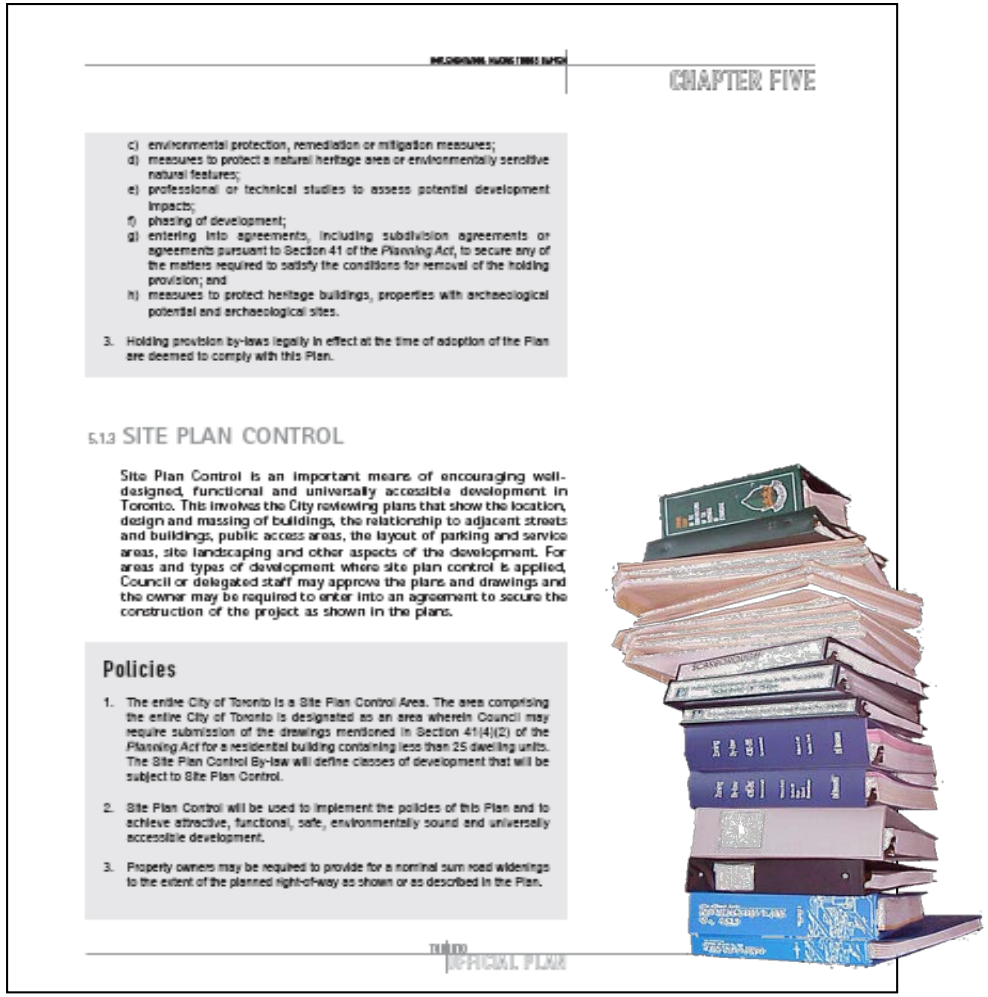
Tier 1: Minimum required standard



Municipal Authorities

- *City of Toronto Act (COTA), 2006*
- Site Plan Approval s. 114(5)2. iv) *also section 41 of Planning Act*
- OPA 66 defines matters exterior sustainable design
- Site Plan Bylaw amended August, 2010
- COTA Section 108 authority to require and govern construction of green roofs



CHAPTER FIVE

c) environmental protection, remediation or mitigation measures;
d) measures to protect a natural heritage area or environmentally sensitive natural features;
e) professional or technical studies to assess potential development impacts;
f) phasing of development;
g) entering into agreements, including subdivision agreements or agreements pursuant to Section 41 of the *Planning Act*, to secure any of the matters required to satisfy the conditions for removal of the holding provision; and
h) measures to protect heritage buildings, properties with archaeological potential and archaeological sites.

3. Holding provision by-laws legally in effect at the time of adoption of the Plan are deemed to comply with this Plan.

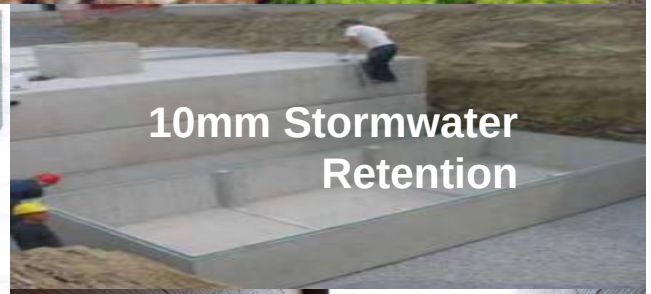
5.13 SITE PLAN CONTROL

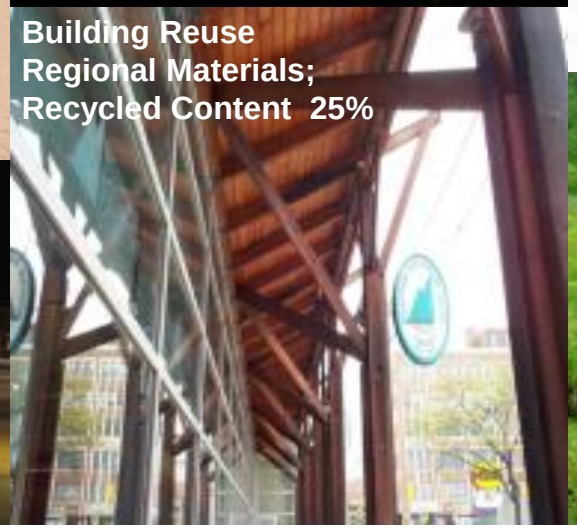
Site Plan Control is an important means of encouraging well-designed, functional and universally accessible development in Toronto. This involves the City reviewing plans that show the location, design and massing of buildings, the relationship to adjacent streets and buildings, public access areas, the layout of parking and service areas, site landscaping and other aspects of the development. For areas and types of development where site plan control is applied, Council or delegated staff may approve the plans and drawings and the owner may be required to enter into an agreement to secure the construction of the project as shown in the plans.

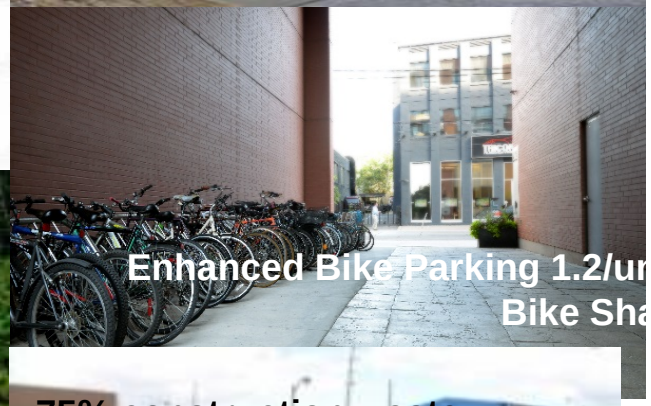
Policies

1. The entire City of Toronto is a Site Plan Control Area. The area comprising the entire City of Toronto is designated as an area wherein Council may require submission of the drawings mentioned in Section 41(4)(2) of the *Planning Act* for a residential building containing less than 25 dwelling units. The Site Plan Control By-law will define classes of development that will be subject to Site Plan Control.
2. Site Plan Control will be used to implement the policies of this Plan and to achieve attractive, functional, safe, environmentally sound and universally accessible development.
3. Property owners may be required to provide for a nominal sum road widenings to the extent of the planned right-of-way as shown or as described in the Plan.

Tier 2 - 4: Voluntary performance standard







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Toronto Green Standard Overview

Since 2010:

- 1500+ developments
- 30 certified Tier 2 through DC refund program
- Tiered/stepped performance measures
- Market transformation tool - raised bar for energy efficiency targets in OBC
- Partners: Environment/Energy; Water; Parks/Forestry; Transportation; Solid Waste
- V3 External Partners: CaGBC, Building Industry and Associations

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Our achievements are increasing…

- 420,000 m^2 of green roof or 500 building permits built & under construction
- TTC has 100,00m^2 to date, the largest green roof owner
- Green Roofs saving >700,000 m^3/yr Storm Water retention by 2017
- >800,000 tonnes of CO2 saved by 2017
- 30.6 MT saved by 2050

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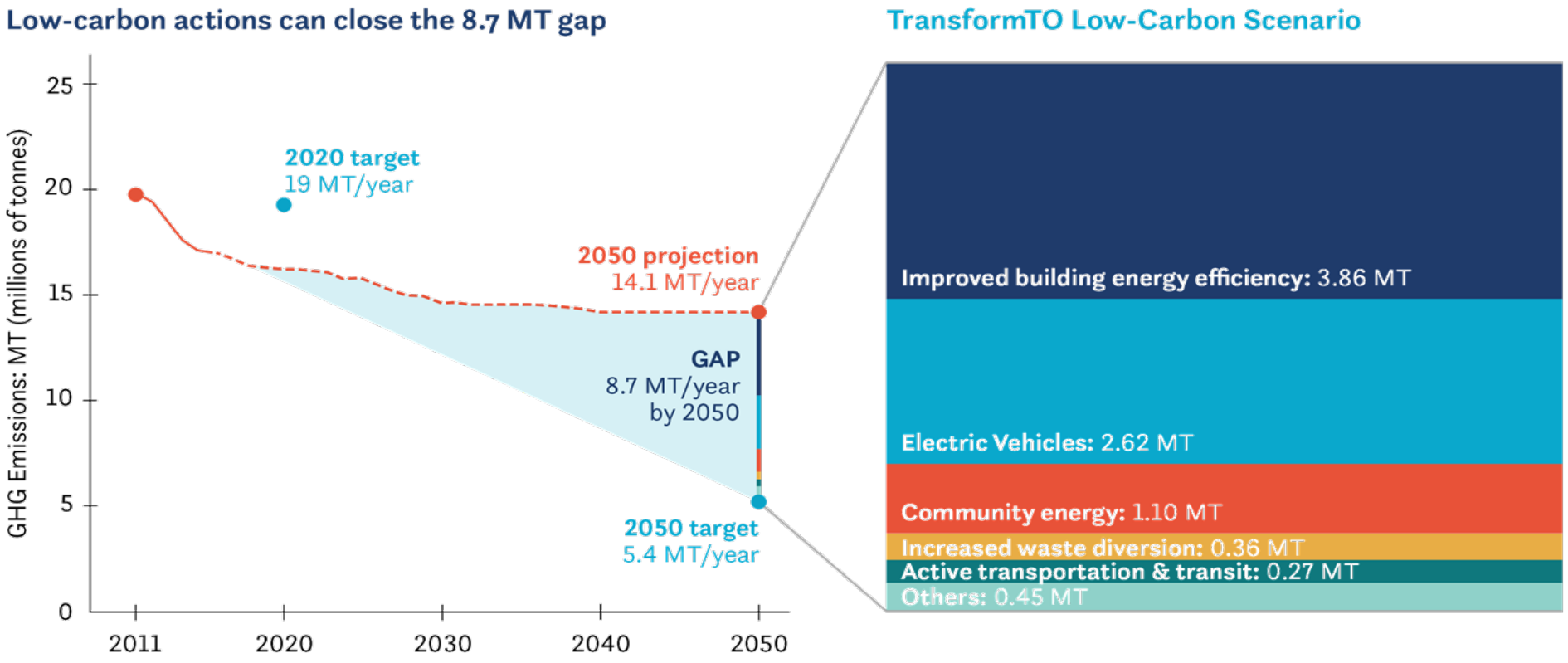
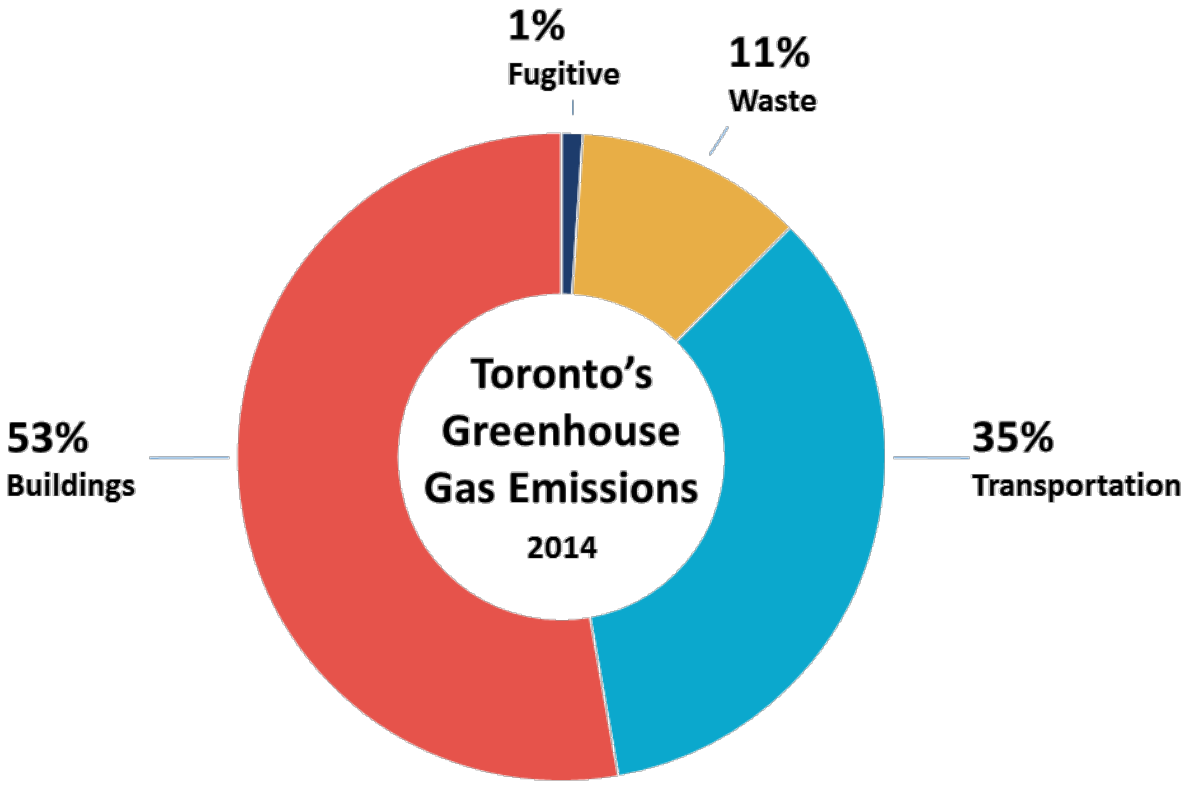
We want to be a sustainable, low carbon & resilient City…

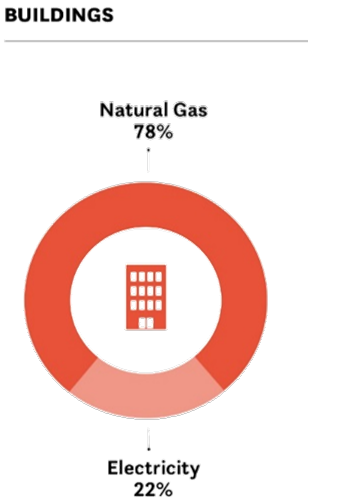
TORONTO

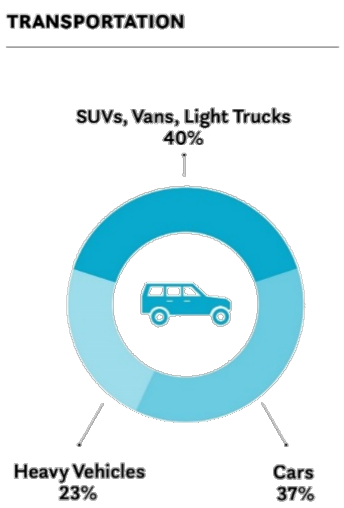
Transform TO: Closing the emissions gap



Toronto’s Emissions by sector







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TransformTO

Transform TO city-wide goals

65%
reduction in **GHG emissions** by 2030 as an interim target

100%
of existing **buildings are retrofitted** by 2050

30%
of total floor space uses **low-carbon thermal energy** by 2050

75%
of **trips** under 5km are **walked or biked** by 2050

100%
of **new buildings** are near **zero GHG emissions** by 2030

75%
of energy use from **renewable or low-carbon sources** by 2050

100%
of **transportation uses low or zero carbon energy** by 2050

95%
of **waste is diverted** in all sectors by 2050

TORONTO

Toronto flooding gives city a double whammy: Hume

Aging infrastructure keeps us always on the brink, and experts suggest Monday's record storm is a sign of things to come.

GLOBE EDITORIAL

A ditch in time will save cities from floods

The Globe and Mail

Published Tuesday, Jul. 09 2013, 6:39 PM EDT

Last updated Tuesday, Jul. 09 2013, 6:53 PM EDT

'Catastrophic ice storm' slams into Toronto, strands travellers across the province

Southern Ontario, Quebec and the Maritimes are now fully in the grip of a massive weather system that's coating the landscape in ice.

Peter Thompson/National Post

Opinion / Commentary

How to get ahead of the storm with green infrastructure

As Toronto mops up from its stormy wake-up call, it's time to have a discussion about how to respond to the dark, costly clouds on the horizon.

Building trends

- Denser city, taller buildings
- No significant correlation between % improvement over OBC and actual energy performance
- High rates of thermal energy losses through the building envelope

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Global Best Practice Comparison

STANDARD	COMMERCIAL	MULTI-UNIT RESIDENTIAL
Denmark **Building Regulation 10 (BR10)**	Non-Residential, Offices, School, Institutions, other 71.3 kWh/yr/m2	Residential, Student Accommodation, Hotels 52.5 kWh/yr/m²
Norway **Tek10**	Office building 150 kWh/yr/m² heated floor area	Blocks of Flats 115 kWh/yr/m²
France **Regulation Thermique RT2012**	40-65 kWh/m²/yr (as per climate zone/altitude)	57.5 kWh/yr/m²
England/Wales **The Building Regulations 2010** **Conservation of fuel and power**	Meet or exceed reference building kgCO2/m2/yr with pre-defined envelope and building systems standards.	Meet or exceed reference building kgCO2/m2/yr with pre-defined envelope and building systems standards. Multi Family Housing 39 kWh/m2/yr (2016)
Germany **Energy Savings Ordinance (EnEV)**	Meet or exceed reference building kWh/m2/yr with pre-defined standards.	Meet or exceed reference building kWh/m2/yr with pre-defined standards.
California **Title 24, Part 6**	97.7 kWh/m2/yr (Example Office Building)	88.2 kWh/m2/yr (Example Residential Tower)
Seattle **SEC2012 Target Performance Path**	40 kBTU/sf/yr (aprox: 125 kWh/yr/m²)	40 kBTU/sf/yr (aprox: 125 kWh/yr/m²)
Passivhaus	Maximum cooling demand Maximum space heating demand Maximum total primary energy demand	15 kWh/m²/yr 15 kWh/m²/yr 120 kWh/m²/yr
Minergie	Public/Office Buildings 40 kWh/m²/yr	Multi Family Housing 60 kWh/m²/yr

Which pathway?

Approaches to Building Energy Performance

PRESCRIPTIVE	PERFORMANCE	
Lists design requirements for mechanical, electrical and envelope systems	Focuses on the overall building performance	
Prescriptive Approach	**Reference Building Approach**	**Absolute Performance Target Approach**
OBC SB-10, ASHRAE 90.1 and NECB	OBC performance path, TGS v2.0	TGS v3.0, Passive House, Minergie

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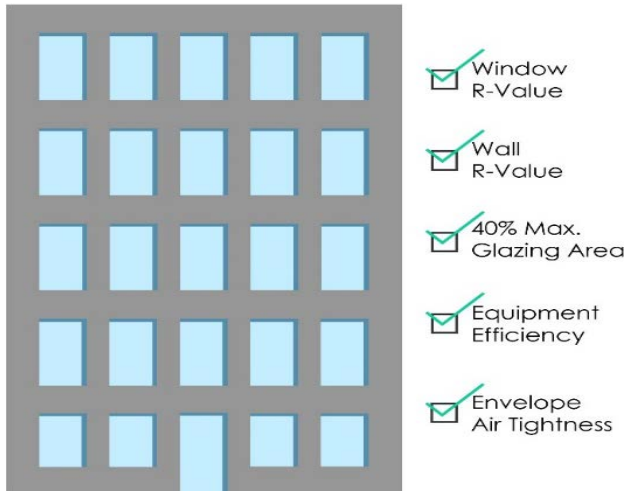
Measure, manage it

Approaches to Building Energy Performance

PRESCRIPTIVE

PERFORMANCE

Prescriptive Approach



Reference Building Approach

- x Limited success in reducing building energy performance over time
- x Shifting baseline can create confusion

Absolute Performance Target Approach

- ✓ Correlate with better building performance
- ✓ Support straightforward comparison and review
- ✓ Allow creativity in design

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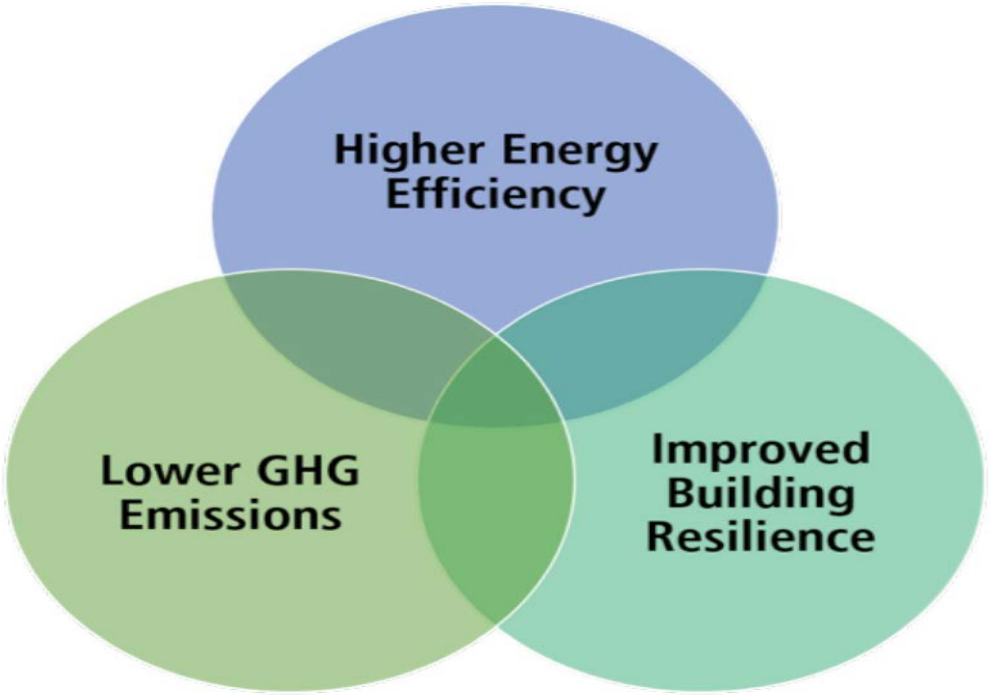
Zero Emissions Buildings Framework



- An increase in building **energy efficiency** to reduce overall energy demand from the built environment
- A decrease in **GHG emissions** via a shift towards the use of renewable and/or district energy as a primary source of energy in buildings
- An increase in the **resilience** of the buildings sector to changing conditions and extreme events

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Targets for Toronto

5 Large Building Types

- High Rise MURB
  (i.e. concrete tower)
- Low Rise MURB
  (i.e. 4-6 storey wood frame)
- Commercial Office
- Commercial Retail
- Residential Mixed Use

Toronto Projected New Construction Market

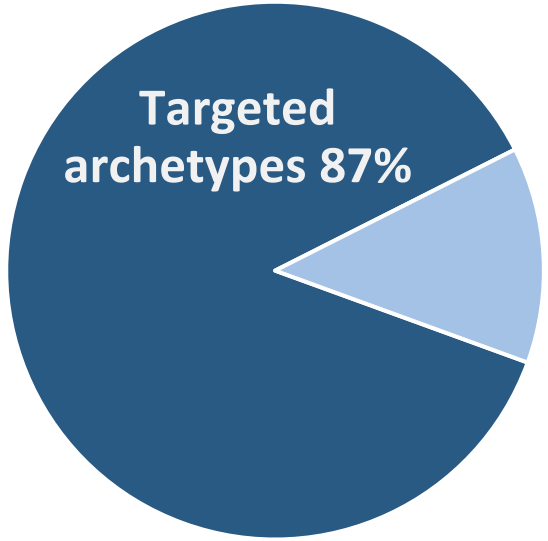


Photo: Minto 775


Photo: Passive House Canada

Photo: Peo.on.ca

Photo: Ledcor

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New performance metrics

Thermal Energy Demand Intensity (TEDI)
to encourage higher quality building envelopes and improve building resilience to climate change impacts

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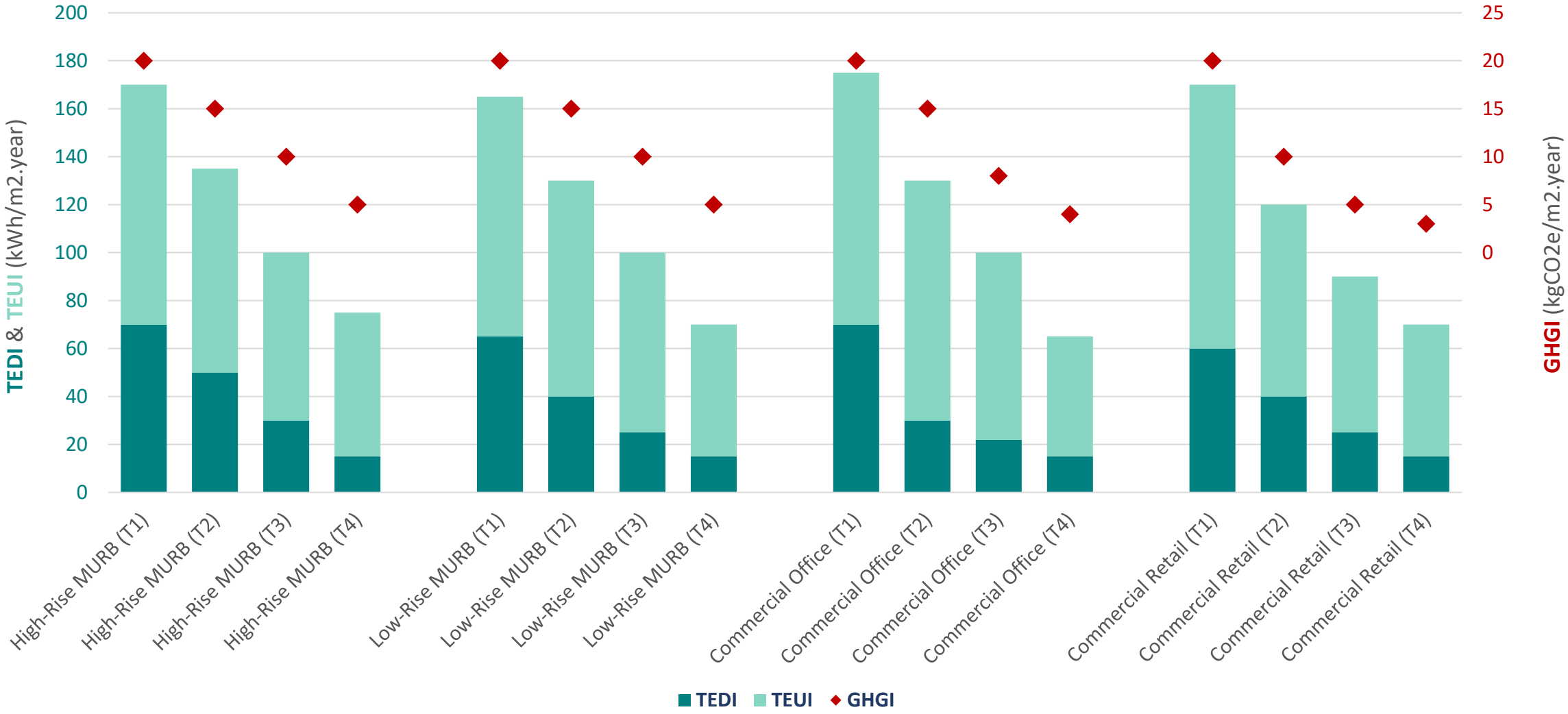
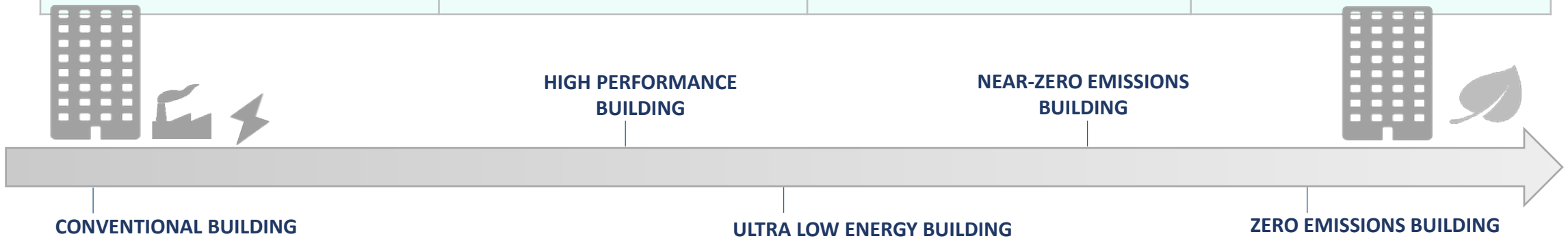
TGS V3.0 TARGETS



Pathway forward

2018	2022	2026	2030
V3 Tier 1	--	--	--
V3 Tier 2	V4 Tier 1	--	--
V3 Tier 3	V4 Tier 2	V5 Tier 1	--
V3 Tier 4	V4 Tier 3	V5 Tier 2	V6 Tier 1



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Meeting the Targets

TIER 2	TIER 3	TIER 4
• > R-10 walls • Triple glazing • 40% WWR • 75% efficient heat recovery	• > R-10 walls • Triple glazing • 40% WWR • 80% efficient heat recovery • Improved air tightness • Shift to heat pumps for portion of loads	• > R-20 walls • Passive House level windows • 40% WWR • 85% efficient heat recovery • Significant reductions in electrical loads • Removal or thermal breaking of balconies

*High-rise MURB case

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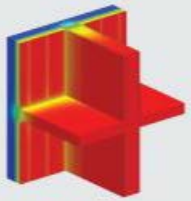
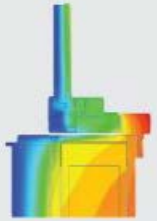
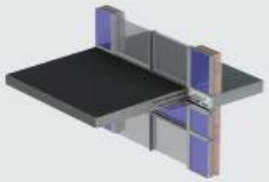






Building Envelope Thermal Bridging Guide

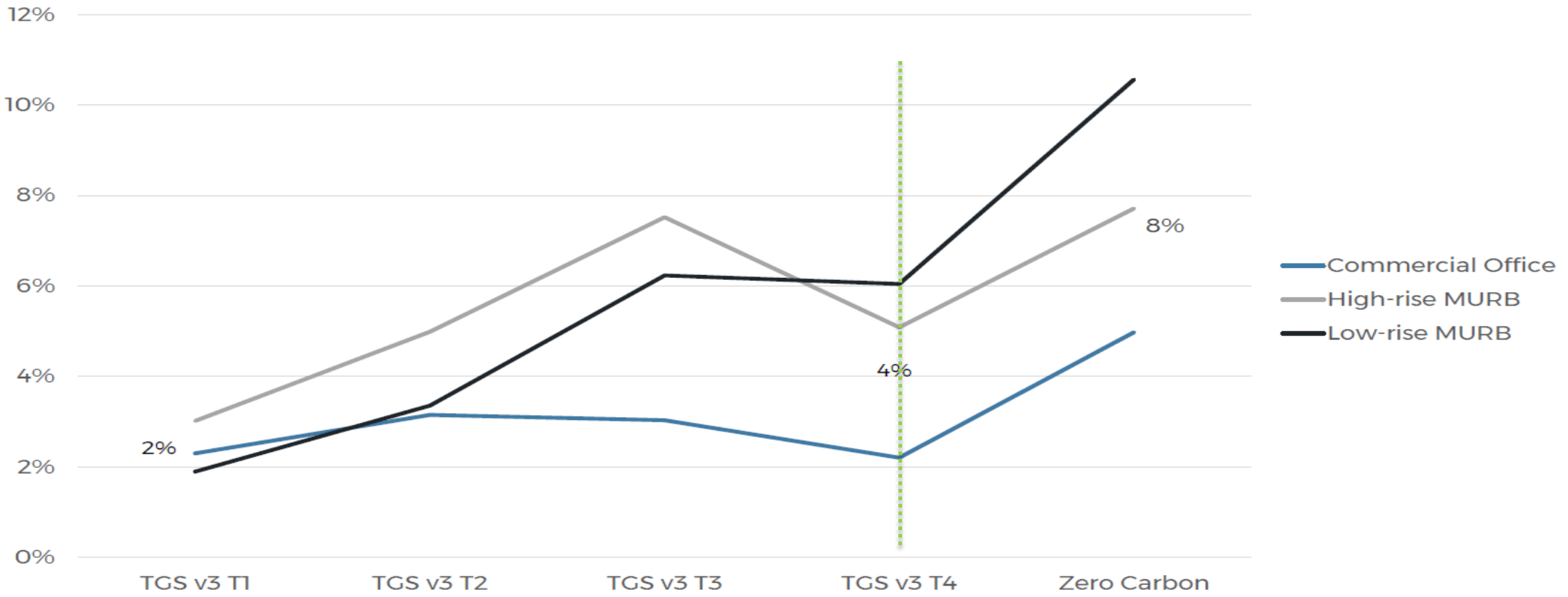
VERSION 1.1

2016

Courtesy of Quadrangle

Courtesy of Quadrangle

Capital Cost



% vs. OBC-2017, References:
City of Toronto/TAF "Zero Emissions Building Framework (2017)"
+ some reconfigured data from up-coming WSP/CaGBC zero carbon study

Courtesy of WSP Canada Inc.

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Resilient buildings

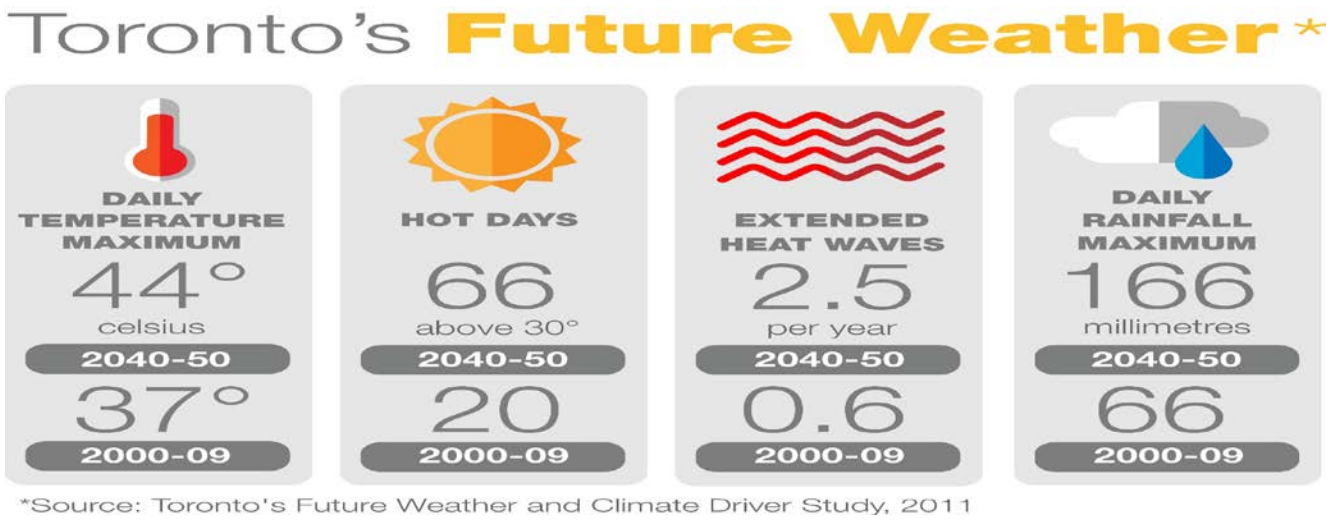
- **Passive survivability:** maintain critical life-support functions and conditions for occupants during extended power outages
- **Thermal resilience:** maintain liveable indoor temperatures during extended power outages

- *Toronto's Future Weather and Climate Driver Study (2011)*

Flooding events

Extreme heat events

Power outages



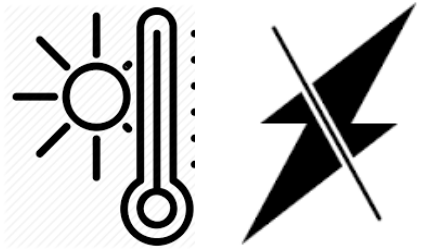
Building resilience co-benefits

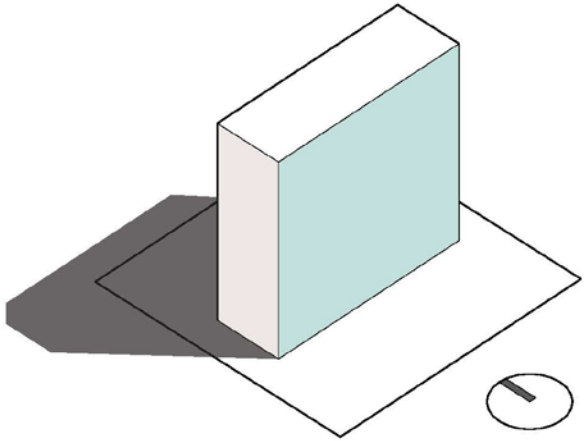
HR MURB

TIER	72h Power Off Temperature Low (˚C)	2-week Power Off Temperature Low (˚C)	Emergency Fuel Factor (x baseline TGS v2 T1)
Tier 1	13.5	5.8	1.3
Tier 2	14.6	7.6	1.4
Tier 3	17.0	14.0	1.5
Tier 4	19.7	18.3	1.8

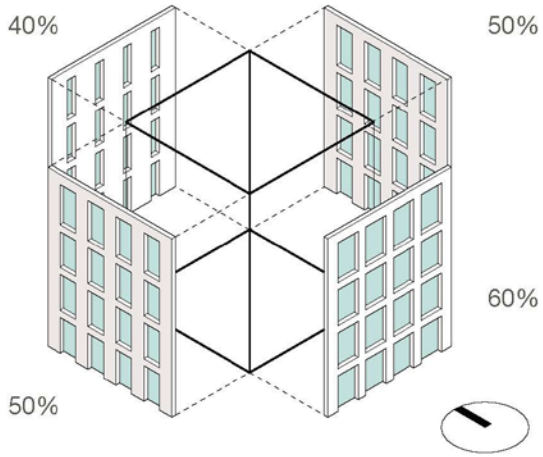
LR MURB

TIER	72h Power Off Temperature Low (˚C)	2-week Power Off Temperature Low (˚C)	Emergency Fuel Factor (x baseline TGS v2 T1)
Tier 1	6.5	-1.5	1.1
Tier 2	9.6	1.2	1.3
Tier 3	13.1	5.1	1.3
Tier 4	14.5	7.1	1.6

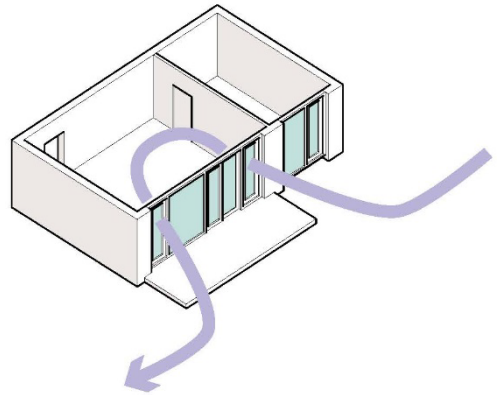




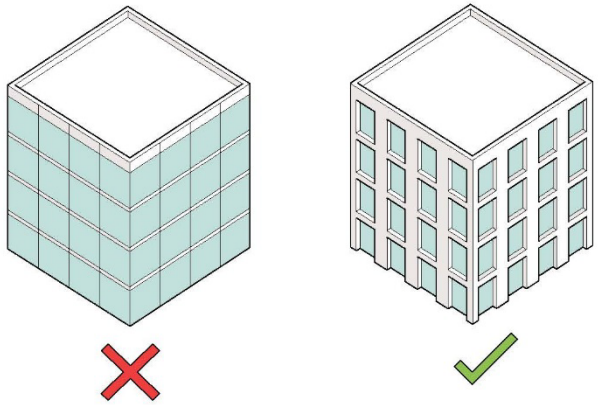
Orient building with long axis facing south



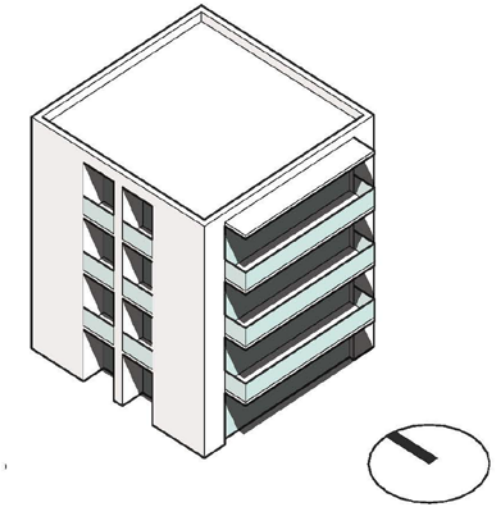
Keep the window to wall ratio to 40-50%



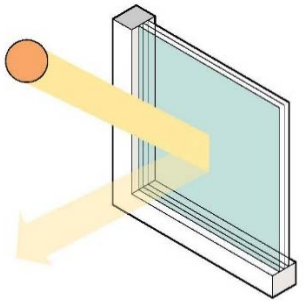
Provide operable windows



Use walls, not window walls.



Projected balconies on South, Inset on East and West



Use the best windows.

Courtesy of Quadrangle

TGS v3 Update Summary and what can you do…

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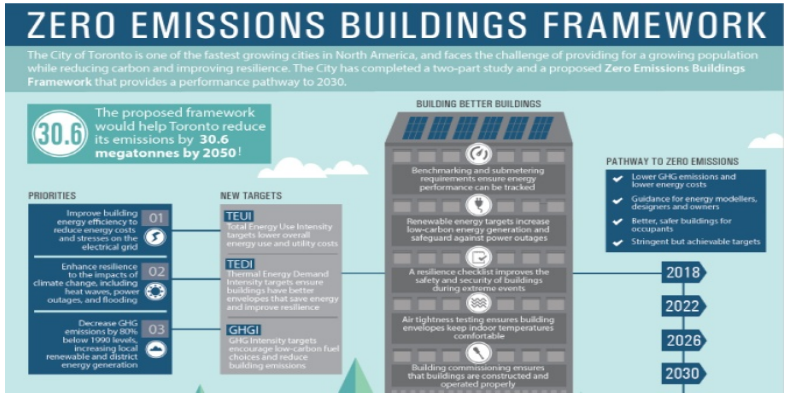
TGS V3: What's driving the update?

TransformTO



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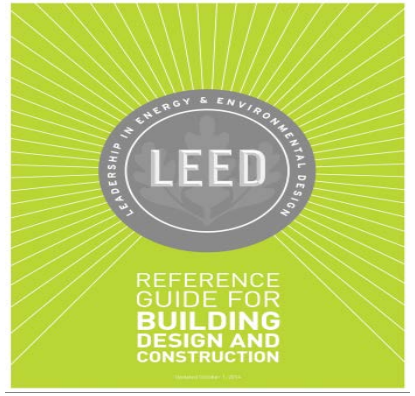

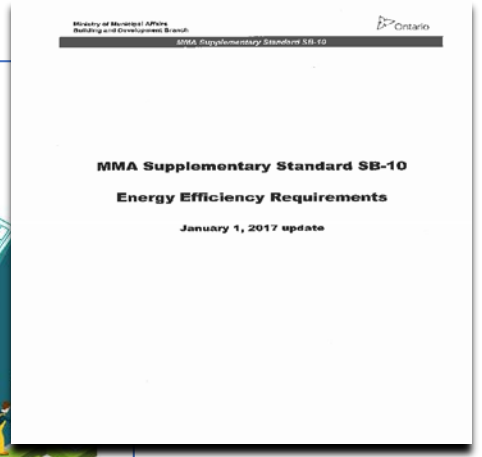

Toronto Green Standard v3

Effective May 1, 2018

- **Tier 1** required through planning process
- **Tier 2** voluntary higher performance incented through DC refund.
- **New Tier 3:** energy, water, waste
- **New Tier 4** energy& GHG targets
- Zero Carbon Building Standard or Passive House certification

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Toronto Green Standard Version 3
City Leadership

- Separate consolidated standard for ACDs (non-residential)
- TCH applies Tier 2 in applicable residential standards
- Tier 2 policy for City ACD approved March 2017
- Target net zero energy and emissions by 2026
- Zero Carbon Building Standard or Passive House certification

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Mt. Dennis Daycare, City's first Net Zero Facility

- 20,40SF
- Targeting Tier 3 TGS and CaGBC Zero Carbon Building Standard

Building Envelope

- Roof R61
- Walls R35+
- Geothermal heat pump system
- PV on roof
- Water to air heat pumps

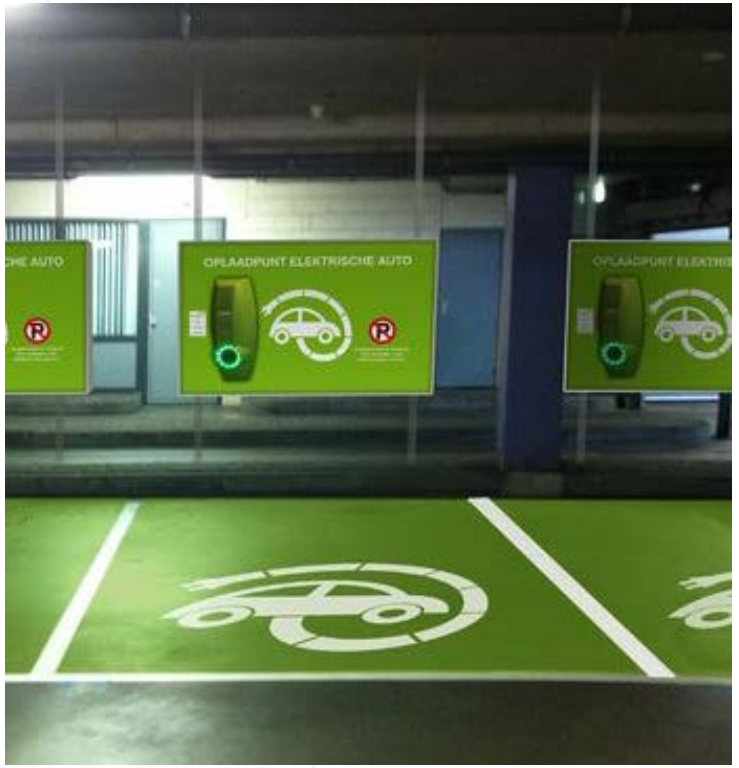
AIR QUALITY

Low Emissions Transportation

Tier 1

- Single Occupancy Vehicle Trips:
  Reduce single occupancy vehicle trips by 15% through TDM and multimodal infrastructure.

- EV Infrastructure:
  20% chargeable/80% rough-in parking spaces for all uses



Tier 2

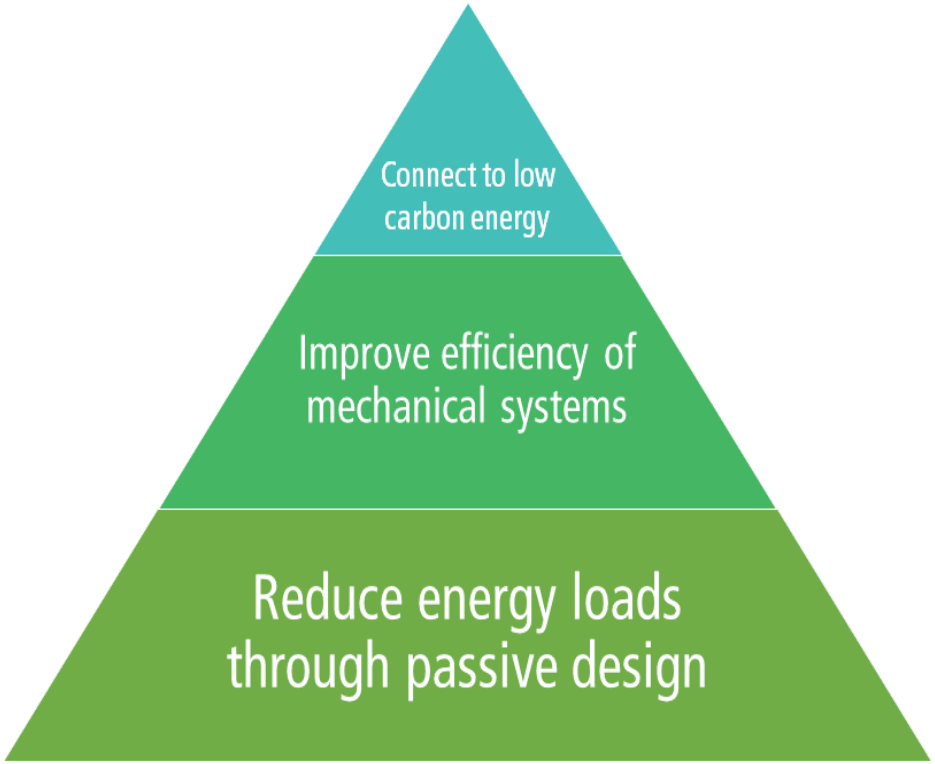
- TDM: 30% reduction in SO vehicle trips
- EV Infrastructure: 25% charged residential spaces

Building Energy Performance (Pt. 3)

Tier 1
15% improvement over SB-10, Div. 3 OR
TEUI, TEDI & GHGI capped targets

Tier 2
TEUI, TEDI & GHGI capped targets
Other buildings: >25% SB-10

Tier 3, 4
TEUI, TEDI, GHGI capped targets
OR
CaGBC Zero Carbon Building Standard or Passive House



Low Carbon Energy & Operational Systems

Tier 2

Solar Readiness: Rough-in for solar PV or solar thermal

Renewable Energy: 5% or 20% for geo-exchange

DE-Ready & connection where feasible

Submetering
Best Practice Commissioning
Air Tightness Testing
Benchmarking & Reporting

Building Resilience

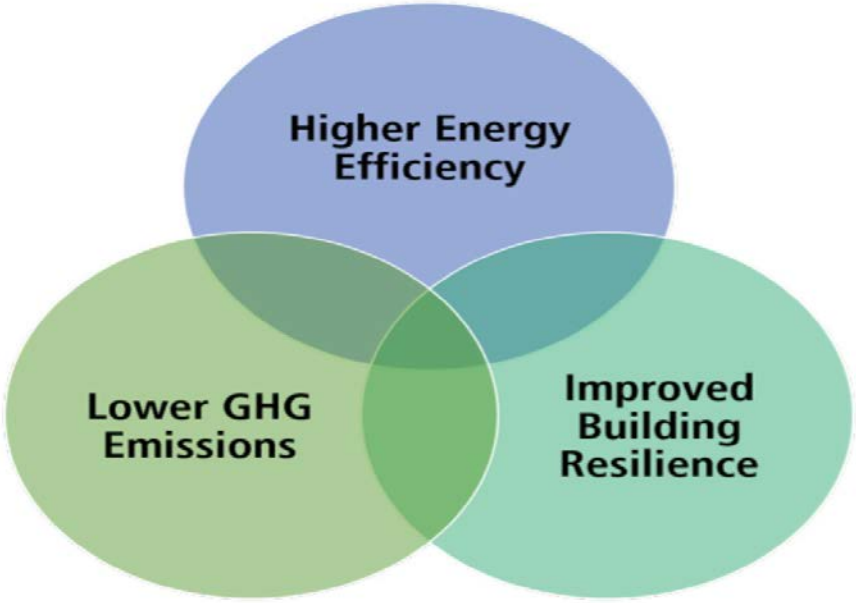
Tier 2

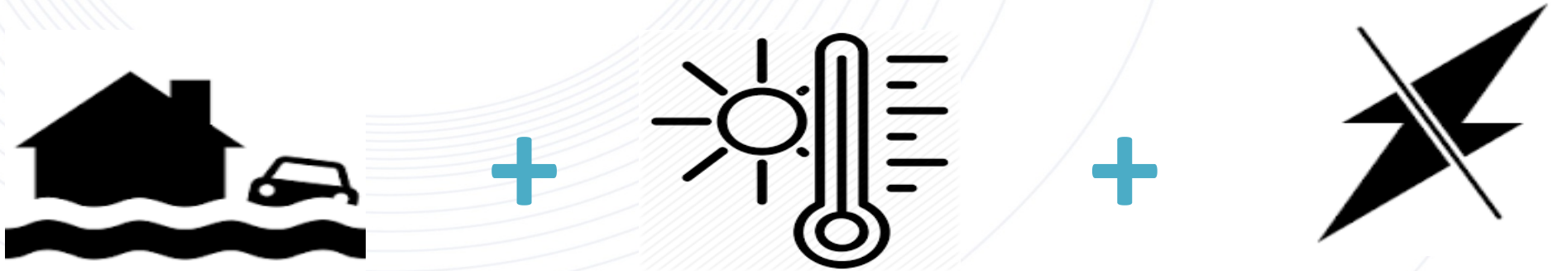
Resilience Planning Checklist

Refuge area:

heating cooling, lighting, power, water

Back-Up generation: 72 hours





Water Balance/Water Efficiency

Tier 1

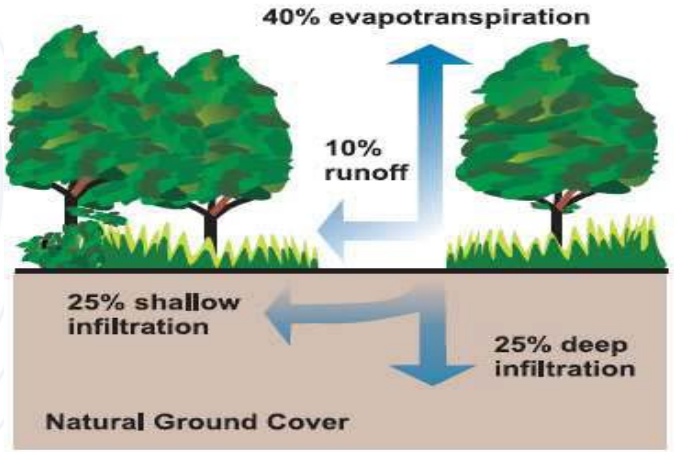
No major change
Drought tolerant planting when irrigation from potable water used

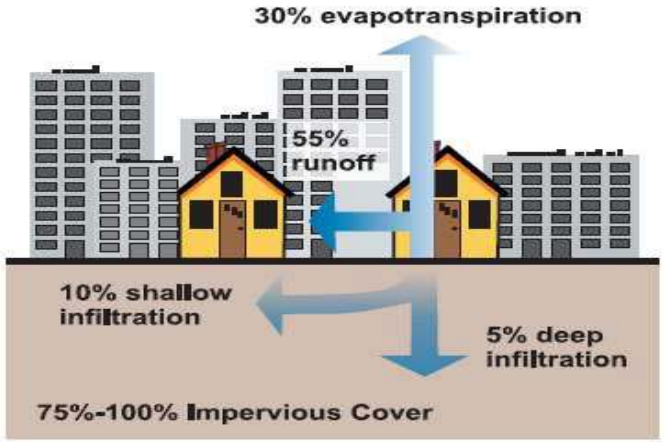
Tier 2

New Core: 10 mm stormwater retention and reuse
Water Use: 40% potable water reduction

Tier 3

Stormwater: 25 mm retention and reuse
Water Use: 50% potable reduction





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ECOLOGY

Tree Canopy/Biodiversity

Tier 1

Tree Planting: tree planting across the site or and/on deck total soil volume calculation & 30m^3 per 'Planting Area'

Natural heritage:100% native Species
Light Pollution: Dark Sky fixtures

Tier 2

New option: Restoration of 30% of the site including Pollinator habitat

New option: Biodiverse Green Roofs, bird-friendly glass

Urban Forest: Increase Tree Canopy

Tier 1

EC 1.1 Tree Planting Areas and Soil Volume

Create tree planting areas within the site and in the adjacent public boulevard that meet the soil volume and other requirements necessary to provide tree canopy. Determine the total amount of soil required by the following formula:

40 per cent of the site area ÷ 66 m² x 30 m³ = total soil volume required

Ensure that each separate tree planting area has a minimum space of 30m³ soil. [1,2]

EC 1.2 Trees Along Street Frontages

Plant large growing shade trees along street frontages that are spaced appropriately having regard to site conditions and have access to a minimum of 30 m³ of soil per tree.[3,4,5]

Waste storage/diversion

Tier 1

Compaction: compactor required for large buildings

Tier 2

New core: Household Hazardous Waste Space

New core: 75% construction & Demolition waste diversion

New optional: 25% of raw materials sustainably sourced.

Tier 3

Divert 95% construction & demolition waste from landfill

What can you do?

1. Encourage the prioritization of passive design principles that reduce thermal demand, mitigate flood and anticipate power outages;

2. Understand and explain local climate change risks and adaptability strategies in building and on site e.g. cool paving, green infrastructure;

3. Push the use of climate future scenarios during the design process;

4.

5.

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TORONTO GREEN STANDARD

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