Resilience Planning New Construction

Why do we need a resilience checklist?

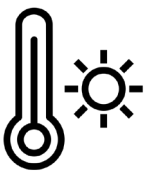
Improving the ability of the buildings to withstand the impacts of climate change and extreme weather is an important step towards creating a more resilient city and to protecting the health, safety and economic well-being of the city's residents and businesses. The aim of this checklist is to summarize the level of resilience planning undertaken for your development project.

What responses will help improve building resilience?

The overall impact of changes in Toronto's climate on the development sector includes: higher risk of flooding events, extreme heat and cold events, and power outages. To reduce the impact of these expected changes, new developments must be constructed in such a way as to mitigate flood events, improve thermal resilience, and extend the duration of back-up power generation.

Flooding Events An increase in the overall volume of precipitation and larger individual storm events create a higher risk of flooding in certain areas of Toronto. The Toronto and Region Conservation Authority (TRCA) provides flood plain mapping resources that help identify flood-prone areas of the city. Toronto Water conducts regular servicing studies, develops and maintains the City's Wet Weather Flow Management policy and guidelines for storm water management, and institutes the City's Basement Flooding Program to ensure residents and businesses are protected from back flow and sewage disruptions.

Extreme Heat & Cold Events The risks associated with the impact of extreme heat and cold events on vulnerable populations is an increasing concern in the City of Toronto. Measures to protect at-risk residents (e.g. the elderly, socially isolated, those with pre-existing illness, and young children) and those without access to air conditioning from excessive heat will therefore be important to include into the design and operation of Toronto's buildings. Higher levels of building energy performance improve passive survivability. Buildings designed with well insulated and sealed building envelopes, lower window-to-wall ratios or other passive building design strategies help to maintain liveable indoor temperatures with less energy and for longer periods of time under power outages during winter or summer.



Power Outages The impact of a warmer climate and more extreme weather events can have an effect on the reliability of our power supply. As temperatures rise, our use of air conditioning also increases, putting stress on the ability of the power grid to deliver electricity. Periods of extreme heat are increasingly leading to brownouts and blackouts, as are events in the fall/winter such as the December 2013 ice storm. Research from past events of this nature has shown that extended back-up power, community energy systems help to reduce both the likelihood and the impact of possible power outages and help communities to recover more quickly from a disruption.

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A. Modelling Assumptions

For expected changes in climate across the Greater Toronto Area, consult Toronto's Future Weather and Climate Driver Study

Has any enhanced modelling using future climate data been conducted for the building site?

☐ Yes ☐ No If yes, what time period was considered?

What temperature minimums/maximums were considered in building design?

Temperature Low (°C): Temperature High (°C):

What variables were assumed for extreme heat events, if any?

Temperature Max (°C): Duration of events (days):

Frequency (events/year):

What variables were assumed for extreme flooding events, if any?

Daily Rainfall Max (mm): Duration of extreme rainfall events (days):

Frequency (events/year):

Risk Assessment/modelling undertaken (Y/N), method used:

B. Thermal Resilience & Safety

For expected changes in climate across the Greater Toronto Area, consult Toronto's Future Weather and Climate Driver Study

What measures have been taken to reduce the impacts of heat waves?

Building - passive

- ☐ Higher roof R values
- ☐ Higher envelope R values
- ☐ Operable Windows
- ☐ Window films
- ☐ Cool/green roof
- ☐ High albedo envelope materials
- ☐ External window shading devices
- ☐ Triple glazed windows
- ☐ Tenant emergency preparedness guides
- ☐ Other passive ventilation strategies

Building - active

- ☐ Indoor refuge area with cooling
- ☐ Centralized air conditioning
- ☐ Ceiling fans

Building - site

- ☐ High albedo landscaping materials
- ☐ Soft landscaping
- ☐ External pools (eg. splash pads)
- ☐ Reduced hardscapes
- ☐ Other building shade structures
- ☐ Use of solar PV as shades
- ☐ Shade trees/shrubs
- ☐ Outdoor shaded amentiy space with seating
- ☐ High albedo hardscapes, including parking lots
- ☐ Other

Has a refuge area with cooling been provided in the building?

☐ Yes ☐ No If so, what is the total area? (m^2)

Refuge areas should be a minimum of 93 m^2 (1000 square feet), and/or 0.5m^2/occupant

What critical services are provided?

If not, what is the location of the closest emergency warming or cooling centres during an emergency?

C. Back-up Generation

Consult the City of Toronto's Minimum Backup Power Guidelines for MURBs for additional information on critical services in residential buildings.

Measures have been used to reduce the building's energy demand on the grid?

- ☐ On-site solar PV
- ☐ CHP system
- ☐ On-site solar thermal
- ☐ Ground source heat pump
- ☐ On-site battery storage
- ☐ Microgrid connected
- ☐ District energy ready
- ☐ Smart grid ready
- ☐ Building-integrated windd turbines
- ☐ Other

Describe the Back-up power/emergency generator system selected?

Is storage adequate to provide 72 hours of back-up generation? ☐ Yes ☐ No

Total storage capacity (kW): Total back-up generation fuel (units):

Critical services have been included into back-up power generation calculations?

- ☐ Passenger elevator(s)
- ☐ Unit space heating
- ☐ Refuge area cooling
- ☐ Refuge area electricity
- ☐ Sump Pumps
- ☐ Domestic water booster pumps
- ☐ Other
- ☐ Security systems
- ☐ Unit space cooling
- ☐ Refuge area lighting
- ☐ Refuge area heating
- ☐ Hot water boilers/pumps

D. On-site Flood Mitigation

Is the building in a known flood plain? ☐ Yes ☐ No

List any flood prevention measures used to mitigate the impact of heavy rainfall events and associated risk of flooding within the building:

- ☐ Flood proofed Electrical and HVAC Systems (located above grade or 1st floor)
- ☐ Back-up generator/fuel located above grade or 1st floor
- ☐ Ground floor electrical circuits located in ceiling
- ☐ Waste water back flow prevention
- ☐ Water tight utility conduits
- ☐ Storm water back flow prevention.

List the strategies used to accommodate heavy rainfall events under the Stormwater Retention (Water Balance) section of the TGS:

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E. Manager & Tenant Preparedness

Will building management have access to a vulnerable person's list?	☐ Yes	☐ No
If so, has building management been made aware of the location of the preparedness kit?	☐ Yes	☐ No

What additional resources for emergency preparedness have been made available to building managers, operators, and/or tenants?

Completed By:

Name (First,Last):

Position Title:

Date (yyyy-mm-dd):