



Adapting to Climate Change

Climate Change and the  
Effects on Building  
Operations and Maintenance



**SNC-LAVALIN**  
**O&M**

## **SNC Lavalin O&M – Who Are We**



SNC-Lavalin O&M provides effective management of resources – from buildings to bridges and highways, and from plants to remote camps and ships.

We are recognized as Canada's leading outsourced operations and maintenance solutions expert.

Founded in 1993 to provide efficient, reliable facilities management for a single client, SNC-Lavalin O&M has grown into a fully diversified organization providing operations and maintenance solutions across other lines of business.





## Tunney's Pasture Case Study



The Tunney's Pasture Campus is a 46-hectare federal government office colony in the western sector of the City of Ottawa and adjacent to the Ottawa River. The campus contains buildings serving several federal departments and agencies. The federal government owns roads and servicing infrastructure within the campus, which is connected to off-site city owned services.

The case study reviewed three buildings – the Main Statistics Canada Building, the Jean Talon Building and the Brooke Claxton Building – each at varying lifecycle stages. Each site is well documented in building condition reports and asset management plans. Public Works and Government Services Canada owns the buildings and SNC Lavalin O&M operates them under contract.



## Immediate Effects of Climate Change



- Increase in temperatures throughout the year;
- More precipitation in spring, winter and fall in the form of rain and snow;
- Less precipitation (rain) in June, July and August;
- Increase in rain on snow events;
- Increase in freeze-thaw events;
- Significantly shorter frost season where temperatures are below 0°C;
- Significantly less Heating Degree Days below 18°C; and
- Significantly more Cooling Degree Days above 18°C.



## Effects of Climate Change on O&M



The highest priority considerations due to climate change are:

- the walkways, parking areas, stairs and ramps because of potential risk to human health, safety, injury, falling etc.
- the building envelop because of accelerated deterioration will affect the structural integrity of the building.
- the adequacy of the cooling system because it poses significant costs to PWGSC and directly affects occupant comfort and productivity.
- the reliability of power (electricity) to the building because it is critical to the daily work and productivity of occupants and the operation of the computer/LAN room.



## Effects of Climate Change on O&M



The study recommended that current building management processes be maintained to help ensure that many building components (e.g. stairs, walkways, ramps, windows, doors) adversely affected by climate change (i.e. premature deterioration) will be identified and subsequent remedial action taken to reduce or eliminate any specific impacts.

The study found that the rigorous process under which Federal buildings are managed is based on sound financial and building science best practices and overall ensures that the building asset is kept in the best condition, practically speaking.



## Effects of Climate Change on O&M



Current emphasis in Engineering Vulnerability Assessment of the Tunney's Pasture facilities to the Impacts of Climate Change condition reporting and operations is focused on a "component by component" basis.

A "building as a system" approach could prove beneficial in terms of planning and responding to changes in climate that affect numerous building components/systems simultaneously.



## Walkways & Stairs



Effects Observed:

- Shifting of concrete pavers
- Heaving of interlock and concrete slab sidewalks
- Cracking of concrete and precast elements
- Deterioration of infrastructure
- Deterioration of sealants



## Walkways & Stairs Measures Taken



- Podium studies (all elements)
- Seasonal and ongoing maintenance of concrete
  - Incorporating more resilient materials
- Replacement of sealants and glazing
  - Incorporating more resilient materials
- Concrete foundation repairs
  - Scope of repairs addresses broader issues, climate change



## Cracking of Walkways



## Movement of Podium Stones



## Movement of Concrete Slab Walkways



## Cracking on Edges of Steps



## Building Envelope



### Factors Affecting:

- Temperature
- Ice
- More powerful storms (wind)
- Ice

### Effects Observed:

- Windows leaking
- Heat Loss
- Cold Penetration



## Building Envelope Measures Taken



- Roof studies
- Flashing repairs
- More regular maintenance
- Recaulking
- Energy efficient glazing / window coverings



## Foundation Leaks



## Foundation Leaks



## Roof Membrane - Blistering



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## Detached Flashing



## Cooling System Capacity



Effects of Higher Average Temperatures:

- Occupancy comfort
- Ability of current HVAC units to maintain required temperatures
- Cooling requirements and redundancy for Computer Centres
- Tenant Service call in particular during seasonal (heating/cooling) switchover
- Less redundancy in the cooling systems for computer centres.



## Cooling System Capacity Measures Taken



- Augmentation of BAS and HVAC systems
- Cooling systems for battery rooms
- Upgrading of thermo glazing and single pane glass panels
- Upgrading of exit doors
- Study of entrance way vestibules
- I&R of HVAC systems/components



## Upgrading Doors & Thermo Glazing



## Over Cooling



## Rooftop / Computer Centre Cooling



## Availability of Electrical Power



- By as much as possible reduce our use of electrical power to do our part to conserve energy to help maintain regular available power
- the electrical power for the buildings is fed through a main plant for the complex.
- The electrical power supply is relatively stable.



## Availability of Electrical Power Measures Taken



- Upgrading of base building generators
- Augmentation of base building emergency systems
- Stand alone supplementary computer centre generator systems
- Energy efficient electrical and plumbing systems



## Generator Systems



## Upgraded Generator



## Moving Forward



- We need to know what can be done about potential climate change on your building.
- We need to change our way of thinking with respect to management practices regarding climate change.
- Climate change must be incorporated into all decisions affecting operations and maintenance in particular studies and condition reports.
  - Choosing material at end of life replacement
  - Mitigation measures for moisture issues
  - Load capacity of storm drains
  - Cooling redundancy



## Moving Forward



The study was done in 2008 and we have lived with this for the past 4 years – it has taught us to look at the BCR, budgets and planning through a different lens:

- Need to be more strategic
- Business as usual will not cut it
- Increase resiliency of a building
- We can plan more strategically and spend money wisely
- Past practices may not be sufficient for the future



**Thank you**