Transformational Change: Adopting the EnerPHit Approach for Social Housing Tower Retrofits

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CityHousing Hamilton is a municipally owned social housing provider embarking on an ambitious revitalization of its $1B portfolio.
CityHousing Hamilton is using Passive House to accelerate social housing transformation by improving financial and social sustainability.

Passive House
- 1x high-rise retrofit
- 2x neighbourhood revitalization
- 4x new builds

Social
- Air quality
- Wellness
- Aging in Place
- Resiliency

Financial
- Energy
- Maintenance
- Grants
What if...

we reimagined what social housing could be and shifted the conversation from affordable housing as liability to affordable housing as a cutting-edge landmark?
WHAT WE HEARD
Shaping Canada’s National Housing Strategy

76% of Canada’s rental buildings were built more than 36 years ago

letstalkhousing.ca • #LetsTalkHousing
Progressive Planning

progress continues...
TOWER RENEWAL

Targeted green renewal and community reinvestment that will enable existing high-density tower neighbourhoods to emerge as self-sufficient, economically vibrant, socially diverse, culturally integrated and ‘low carbon’ communities throughout the city and region.
PUBLIC PARTNERSHIPS

Working Together Toward Stronger Tower Neighbourhoods
New Zoning, New Opportunities for Complete Communities:

Residential Apartment Commercial (RAC) Zone

Developed with

- Children’s Play Areas
- Gathering
- Convenience (Food, Shops & Daycare)
- Gardens
- Community Program
- Connections

<table>
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<tr>
<th>Activity</th>
<th>New Condo</th>
<th>Older Apartment</th>
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<tr>
<td>Dwelling</td>
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<td>YES</td>
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<td>Clothing store</td>
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<tr>
<td>Bank</td>
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<td>YES</td>
</tr>
<tr>
<td>Coffee Shop</td>
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<td>YES</td>
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<tr>
<td>Accountant</td>
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<td>Drug Store</td>
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<tr>
<td>Patio</td>
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<td>YES</td>
</tr>
<tr>
<td>Art Gallery</td>
<td>YES</td>
<td>YES</td>
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<tr>
<td>A Place of Worship</td>
<td>YES</td>
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</table>
DEFINING BUILDING RETROFITS

LEVEL 00 – BUSINESS AS USUAL BASELINE (0-10% GHG reductions)

LEVEL 00+ – MODEST GHG REDUCTIONS (30%)

LEVEL 01 – MAXIMIZE GHG REDUCTIONS (70%) - RECOMMENDED THRESHOLD FOR ENTRY

LEVEL 02 – MAXIMIZE GHG REDUCTIONS (90%) USING BEST IN CLASS TECHNOLOGY, AND PERFORM IN-SUITE UPGRADES
RETROFITS TODAY
ISOLATED REHABILITATION MEASURES
LINKING HOUSING QUALITY OUTCOMES TO RETROFITS

Tenant comfort
Thermal controls
Adequate ventilation
Life safety measures
Community connectivity
Climate resilience
INTERNATIONAL RETROFITS TODAY
Financing
Funding building retrofit with loan levels, interest rates and grants tied to achieving specific performance standards

Long-term Stewardship

Standards
Housing quality standards for retrofit implemented through building codes. Guidebooks to lead stakeholders through process with clear evidence base for investments

Retrofit Industry
Research and development, skills training, new products, means and methods for a made-in-Canada approach

HOUSING REHABILITATION
# Linking Housing Quality to Retrofits

## Standards*

### Healthy Space
- **Condensation / Mould**
  - Mitigated through rain, interior surface temperature (12.6°C)
- **Healthy Ventilation Systems**
  - Mechanical and natural means
- **Controlled Infiltration**
  - By operable windows or trickle vents

### Thermal Comfort
- **Internal Temperatures**
  - Based on dynamic metrics
  - (i.e., operative temperature and adaptive comfort modelling)
- **Thermostat Control**
  - Individual control of thermostats/thermostats in each room
- **Eliminating Thermal Bridging**
  - By implementing continuous insulation and other strategies
- **Air Tightness**
  - In-situ testing required
- **Triple-pane Windows / Doors**
  - Max U-value 0.89 W/m²K (insulated)
  - (current PHI standard for comfort reasons)
- **Shading Control**
  - For summer cooling

### Fire Safety
- **Overcladding**
  - Avoiding flammable insulation materials at all building heights
- **Sprinklers**

### Energy Performance
- **Energy Requirements**
  - Low energy performance standards

### Tracking and Monitoring
- **Commissioning**
- **Sub-Metering / Energy Tracking / Energy Modelling**

## Legend
- **Enforced**
- **Proposed Change**
- **Not Enforced**
- **Under Consultation**

* Deep energy currently considered for non-extensive retrofits.
  ** Non-flammable insulation required for six storeys and above in Ontario.
Social Housing Repairs and Retrofits

- Improved insulation
- Energy-efficient boilers
- Energy-efficient windows

#ONclimate
A $40 Billion Once-in-a-Generation Joint Investment

- Housing Rights Are Human Rights
- National Housing Co-Investment Fund and Federal Lands

- Federal Community Housing Initiative
- Federal-Provincial/Territorial Housing Partnership

- Canada Community Housing Initiative
- Distinctions-Based Indigenous Strategies with funding in addition to the $40 billion National Housing Strategy funding

- Homelessness Programming
- A New Canada Housing Benefit

- Improving Homeownership Options for Canadians
- Evidence-Based Housing: Research, Data and Demonstrations

$40 billion
Federal Government:
National Housing Strategy Launched with Direction to Retrofit 200,000+ units of Public and Private Sector Housing through $15.8 Billion Co-Investment Fund

A place to call home
ACCELERATING RETROFIT INDUSTRY
NATIONAL IMPACT

IN CANADA THERE ARE 777,100 HOUSEHOLDS LIVING IN AGING POSTWAR HIGHRISES. EACH HOUSEHOLD EMITS 4.11 TONNES GHG/YR*.

FOLLOWING RETROFIT GHG REDUCTION OF 90%
EACH HOUSEHOLD*

* The average based on typical building condition per city of Toronto 2016
Adapting Existing Buildings
Retrofitting Postwar Apartment Towers
Key Challenges

- Deteriorating envelopes
- Lack of insulation
- Inadequate ventilation
- Mould and hazardous materials
- Lack of thermal control
- End of life systems
- Occupied buildings
Project Team
Ken Soile Tower Transformation
Project Overview

ENVELOPE
R38 Overcladding
Passive House Windows
Juliette Balconies

SYSTEMS
Centralized HVAC with Cooling
Riser Replacements for Most Systems
Full Building Sprinklering

MODERNIZATION
Accessibility Upgrades
New Community Room
and Solarium
Interior Upgrades
Challenge 01: Balconies
Thermal Envelope Continuity

At ambient temperature: -20 °C

Heat Flux Colour Gradients

Temperature Colour Gradients

Minimum Inside Surface Temperature

- 1.2 °C
- 3 °C
- 13.2 °C
- 13.1 °C
- 13.4 °C
Challenge 02: Improving Indoor Air Quality
Modernized Ventilation Systems

- New Ventilation Systems
- Direct Ducting into Suites
- Sealing Corridor Doors
- Modernized Risers

Winter
Summer
Challenge 03: Preventing Overheating
Thermal Comfort and Control
Other Key Considerations

Regulating heat loss through vertical shafts (garbage chutes, elevators)
Distribution system replacements prior to insulation
Stabilizing envelope prior to overcladding
Improving internal acoustic separation
Certifying equipment to expand the local market
Social Sustainability, City Sustainability

Image: West Harbour Masterplan
How do we make this happen?
Our Approach

Cost: $15.65M
Debt: $9.75M
Equity: $5.90M
Debt/Equity: 62:38
Cost/Unit: $107,200
DCR: 1.1

Rent Subsidy/Supplement
Resident Relocation

Image: Markus Säynevirta
Political Persistence - Board and City willing to invest in poverty alleviation

Hamilton City Hall Restoration
mcCallumSather in association with Invizij Architects predecessor firm Garwood-Jones & Hanham (GJH)
Policy Alignment - Focus on affordable housing in the community and all levels of government
Community Engagement - Harness the passion of residents and neighbours
Social Equity - Education and health institutional investments

Mississauga Campus North Building, University of Toronto
Perkins+Will

David Braley Health Sciences Centre, McMaster Health Campus, Hamilton
NORR
Is this replicable?
Option cost comparison

### Traditional Rebuild Scenario
- **COST / UNIT:** $245K
- **TOTAL COST:** $5.3M

### Passive House Retrofit Scenario
- **COST / UNIT:** $130K
- **TOTAL COST:** $11.5M
- **GRANT VALUE:** $11.2M

### State of Good Repair Scenario
- **COST / UNIT:** $77K
- **TOTAL COST:** $6.3M
- **LOAN VALUE:** $6.2M
Idea and Plan

Equity and Execution
Decision Framework

Informed by data:
Values driven choices.

Demonstration:
Quantify benefits and costs to de-risk choices and drive down costs for next projects.

Informed by better facts:
Fact driven choices.
welcome to unstoppable

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