

# Energy Efficiency in Traditionally-built Homes

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# Agenda

- Who We Are and What We Do
- Energy Efficiency Opportunities
- Energy Efficiency Challenges
- Partnership with Heritage Branch
- Practical Solutions
- Thermal Imaging for Saanich Heritage Homes
- Training Opportunities

# Who We Are and What We Do

## **City Green Solutions is an enterprising non-profit:**

*Mission to excite, inspire and lead British Columbians in finding innovative home and building energy efficiency solutions*

## **City Green Solutions provides**

- Energy efficiency assessments for new and existing homes
- Community engagement projects
- Research and data analysis
- Project management for assessment, exchange, and product rebate programs
- Curriculum and training program development



# Energy Efficiency Opportunities in Traditionally-built Homes

- Energy assessments on over 1,000 traditionally-built homes
- City Green clients see 30-70% reduction in energy use, depending on the depth of energy retrofits
- Potential to achieve current building code levels of efficiency (EnerGuide 77) and above
- Additional benefits of energy efficiency retrofits
  - Increased affordability of operations (lower energy bills)
  - Extended building life
  - Reduced risk of building be replaced – saving the embodied energy and heritage value

# Energy Efficiency Challenges in Traditionally-built Homes

- Standard ecoENERGY report and government grants are for conventional upgrade recommendations
  - E.g. Replace existing window with vinyl Energy Star window
- Disconnect between conventional recommendations and need to preserve character defining features
- Building science and house as a system approach needs to be applied to traditionally-built homes during energy efficiency upgrades
- Energy advisor/contractor understanding of historic building techniques and materials inconsistent

# Partnership with Heritage Branch

- Identification of opportunities and challenges led to partnership
- Meeting energy saving potential requires dissemination of information:
  - To educate CEAs, Contractors and EE professionals
  - To combine knowledge of building science with goal of preservation of character defining elements of traditionally-built and heritage homes

# Our Approach

Energy efficiency retrofit options for traditionally-built homes should be balanced with:

- House as a system/building science
- Cost of retrofit
- Technical difficulty
- Suitability for traditionally-built homes
- Impact on character-defining elements
- Environmental considerations (embodied energy, cradle to cradle, life cycle assessment)

# House as a System

The various parts of a house work together as a system to create a comfortable, durable and energy efficient buildings. The house system itself interacts with both its surrounding environment and with its occupants.

**Goal:** Consider the impact of single retrofits on the whole system.

- Added draft proofing may trap in moisture
- Added insulation may allow for a smaller furnace
- More exhaust ventilation may cause back drafting

# Energy Efficiency Priorities

## Space and Water Heating

- Low efficiency, high energy costs, not direct-vented

## Ventilation

- Rely on natural ventilation /air leakage, modern living creates excess moisture

## High Air Leakage

- Drafts, heat loss, higher energy bills

## No, Low or Degraded Insulation

- Attic, walls, basement.

## Single Pane Windows

- High air leakage, low R value

# Practical Solutions

Space and Water Heating: *Low efficiency, high energy costs, not direct-vented*

- Replacement often appropriate for traditionally-built homes
  - Likely not original – replaced during previous retrofits
  - Can be replaced while retaining visible elements with heritage value (e.g. grates, radiators, fixtures)
  - Replacement addresses flue gas/combustion spillage and air leakage concerns
- Source of energy efficiency gains
  - Account for 81% of residential energy use
  - Furnace replacement represents 35% of potential energy savings in pre-WWII homes

# Practical Solutions

Ventilation: *Rely on natural ventilation /air leakage, modern living creates excess moisture*

- Must balance heating system upgrades, air sealing and insulation with ventilation to avoid moisture, mold and air quality issues
  - Direct vented heating systems
  - ENERGY STAR® bathroom and range hood fans are essential
  - Attic ventilation (soffit and ridge/gable vents) are essential
- Over ventilating without direct vented combustion appliances can lead to combustion spillage

# Practical Solutions

*Air Leakage: Drafts, heat loss, higher energy bills*

- Air sealing can be improved through
  - General maintenance and repair
  - Advanced weatherproofing with assistance of blower door and thermal imaging
- Focus on the ceiling: keep inside air and moisture out of the attic (to avoid heat loss, moisture, mold and rot)

# Practical Solutions

## No, Low, or Degraded Insulation: *Attic, Walls, and Basement*

- Requires careful application
  - Compatible materials must be used
  - Blown in/spray insulation may be possible
  - Special care needed around masonry, balloon cavity walls, character defining elements and moisture sources
- Opportunities for insulation where siding and/or interior finishes have been removed

# Practical Solutions

Single Pane Windows: *High air leakage, low R value - but typically high heritage value.*

- Replacement of doors and windows typically accounts for 11% of potential energy savings
- Typically character defining features
- Air leakage can be improved with
  - Repair/maintenance rather than replacement
  - Air sealing/weather proofing
  - Restoring or adding historically appropriate features (storm window, awnings, shade plantings)

# Summary: Before Getting Started

1. Make sure all combustion appliances have make up air and are vented correctly (heating system replacement)
2. Ensure controlled mechanical ventilation
3. Make the ceiling as air tight as possible & add sufficient attic ventilation
- 4. Then insulate and air seal as much as you can!**

# Thermal Imaging - Saanich Heritage Homes

Eight District of Saanich heritage properties received City Green energy and thermal imaging assessments

Results will inform repair and maintenance as well as retrofit plans

- Maintenance and Repair
- Window Improvements
- Air Sealing
- Insulation
- Retrofit Prioritization



# Thermal Imaging - Saanich Heritage Homes

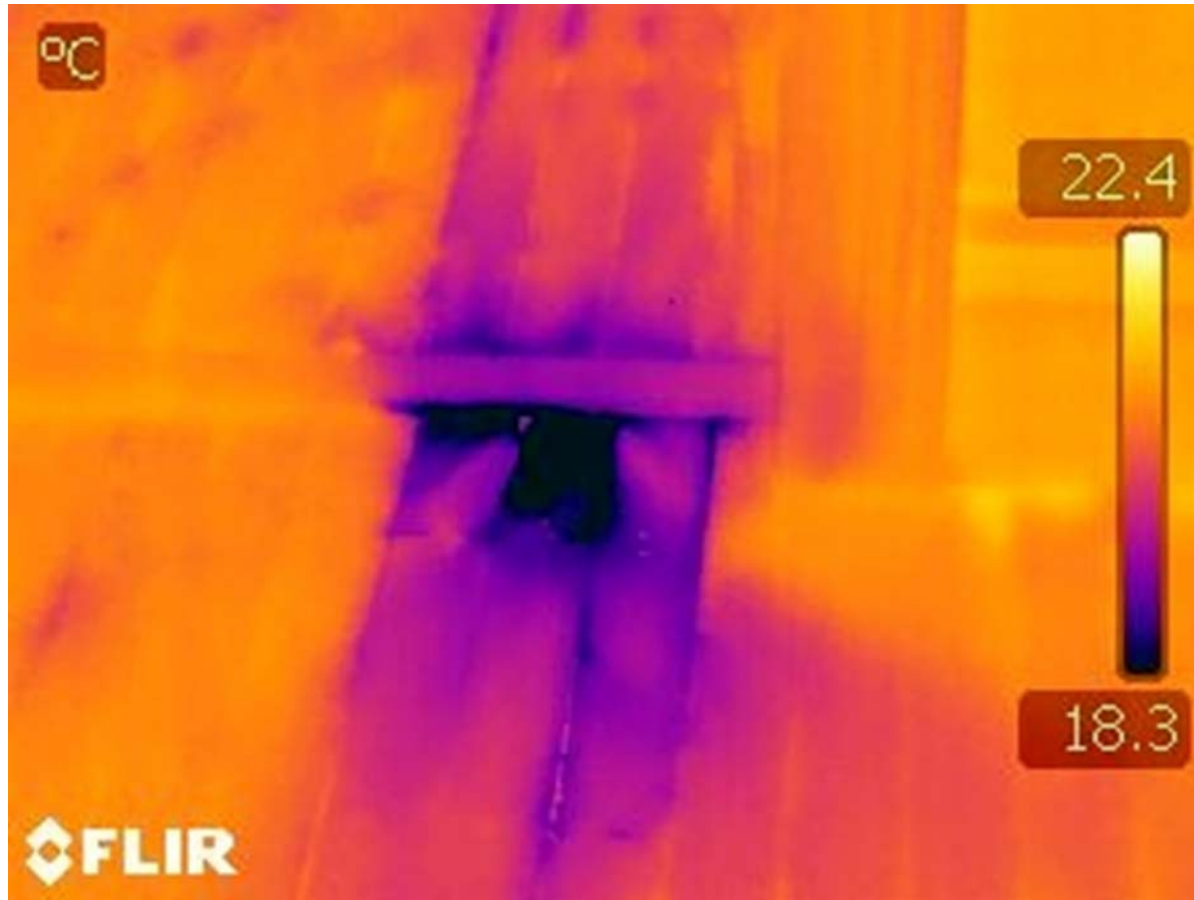


# Thermal Imaging - Saanich Heritage Homes Maintenance and Repair



# Thermal Imaging - Saanich Heritage Homes

## Maintenance and Repair



# Thermal Imaging - Saanich Heritage Homes Windows Improvements



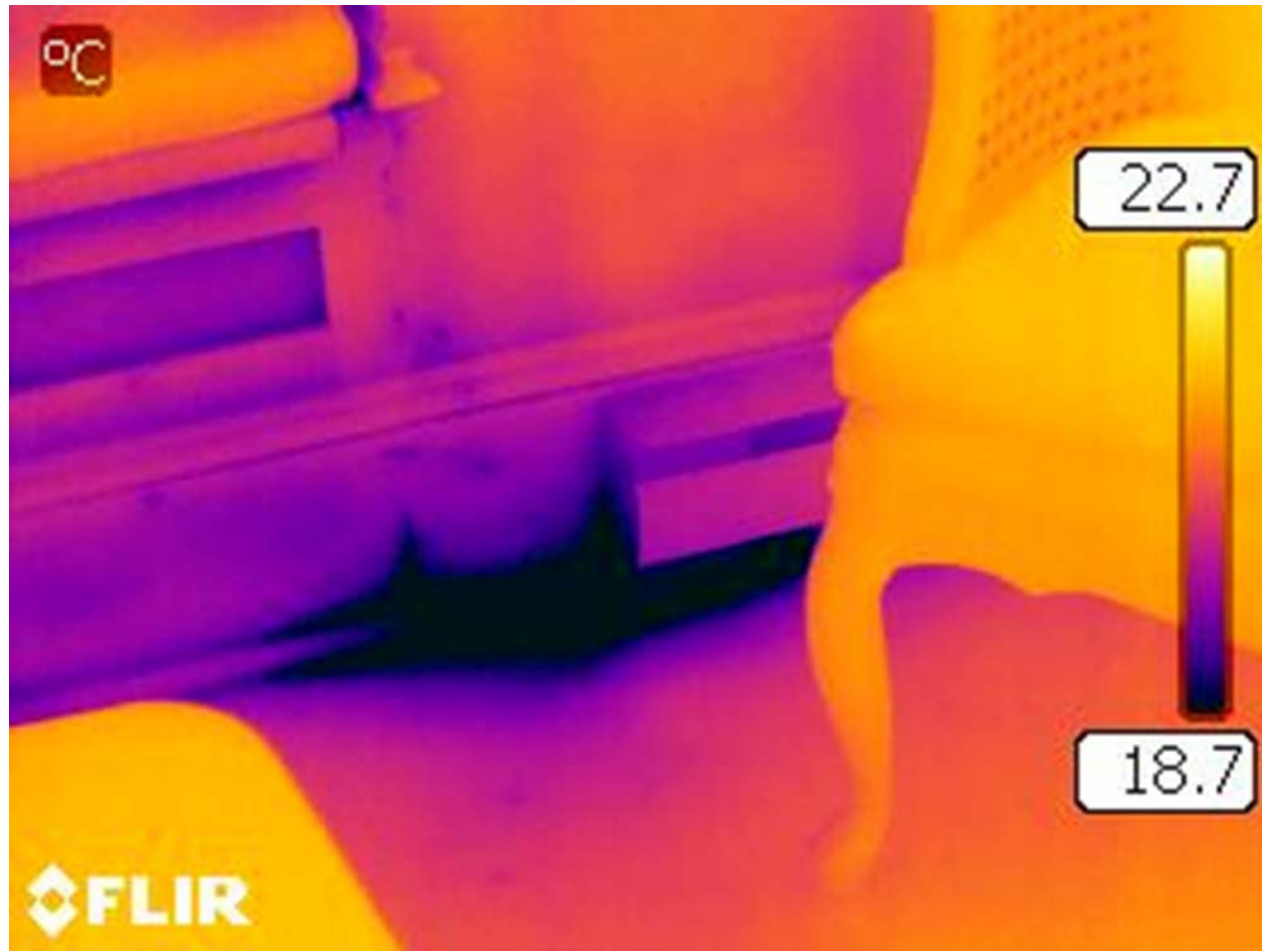
# Thermal Imaging - Saanich Heritage Homes Windows Improvements



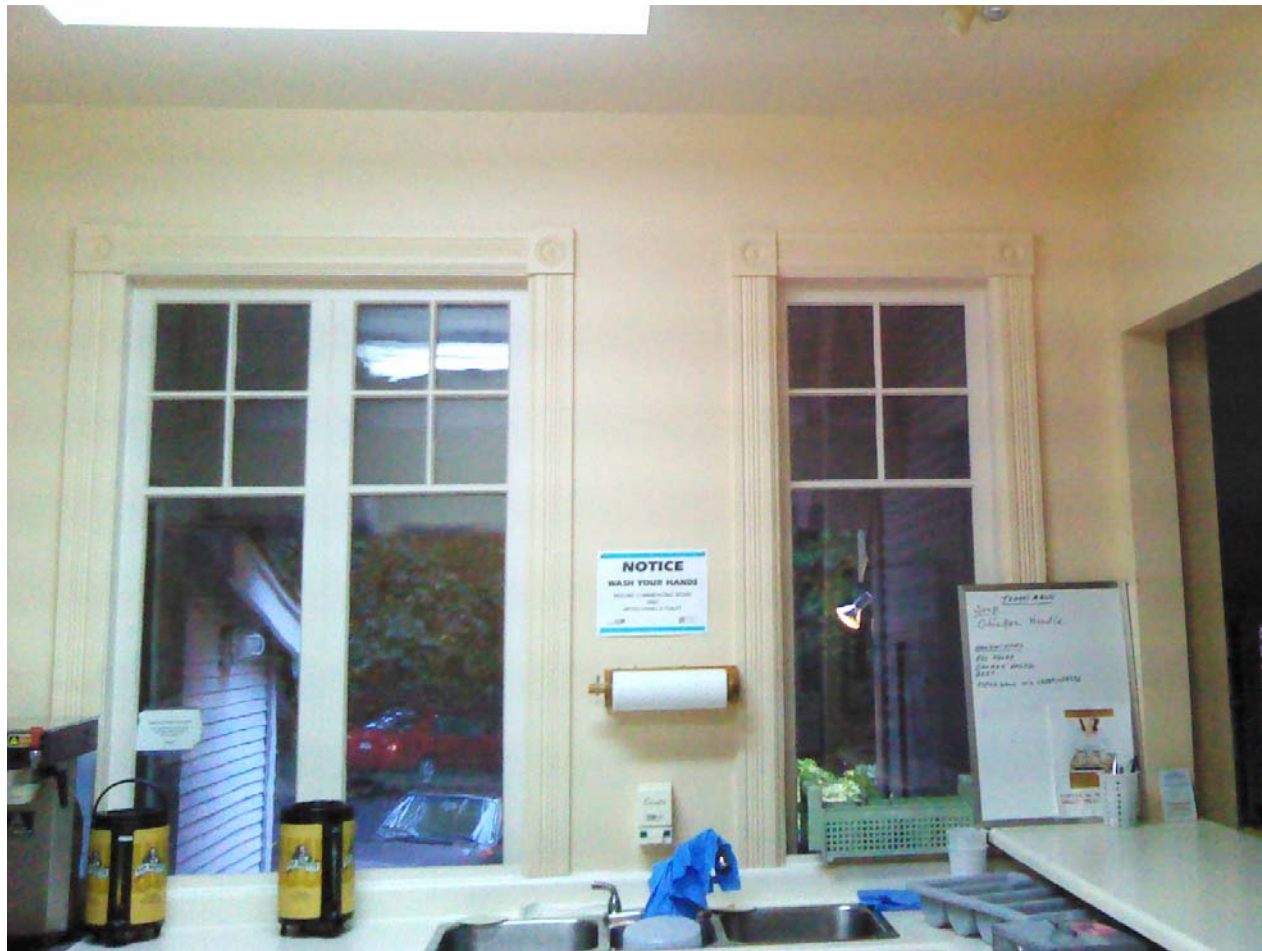
# Thermal Imaging - Saanich Heritage Homes Air Sealing



# Thermal Imaging - Saanich Heritage Homes Windows Improvements



# Thermal Imaging - Saanich Heritage Homes Insulation



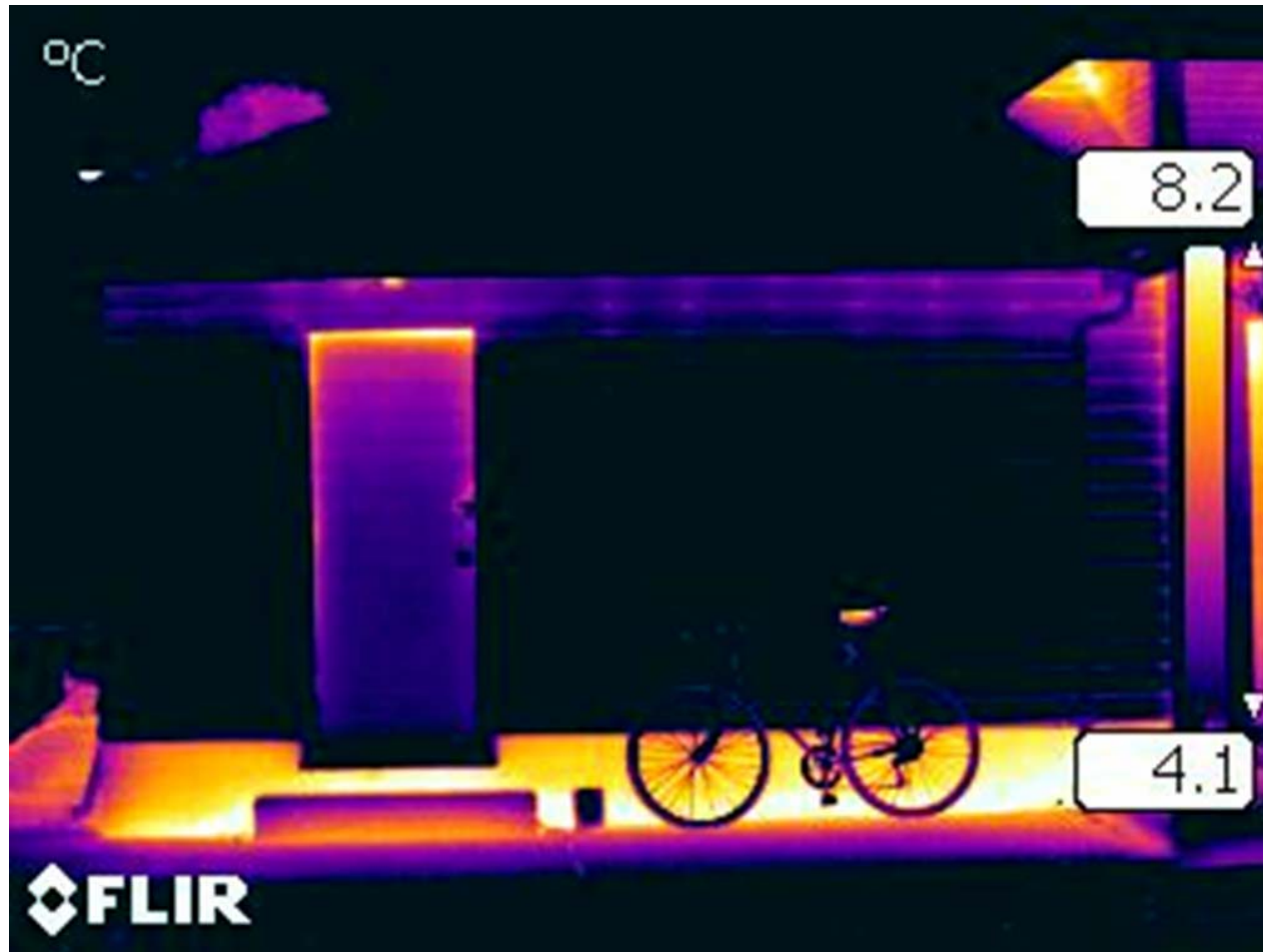
# Thermal Imaging - Saanich Heritage Homes Air Sealing



# Thermal Imaging - Saanich Heritage Homes Retrofit Priorities



# Thermal Imaging - Saanich Heritage Homes Retrofit Priorities



# Training Opportunities

- Curriculum is being adapted into a training package
- Different models will be available for different audiences
  - Energy Efficiency Professionals
  - Heritage Community
  - Municipalities
- Dates and locations to be announced in the new year
- Sign up to receive notification of training opportunities

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# Thank You

Questions?

