



# Affordable Passive House Pilot Project

New Commercial Construction Potential in Nova Scotia:  
The Future of Passive House Designs

October 20, 2015



Opening Possibilities.



# Outline

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- Housing Nova Scotia (HNS)
- HNS Greening Strategy
- Passive House Standard
- HNS Passive House Pilot Project

# Housing Nova Scotia

## Legislated Mandate:

Under the Housing Nova Scotia Act and the Housing Act, HNS to:

- Establish housing projects and construct housing accommodation of all types for sale or rent.
- Plan, design, build, own, maintain, manage, and operate housing projects.
- Construct, acquire, renovate, and maintain housing of all types, and to sell, lease, or otherwise dispose of such housing.
- Promote, construct, and provide more adequate and improved housing for low-income households.
- Improve the quality of housing and the quality of amenities related to housing.

# Housing Nova Scotia

## HNS Background:

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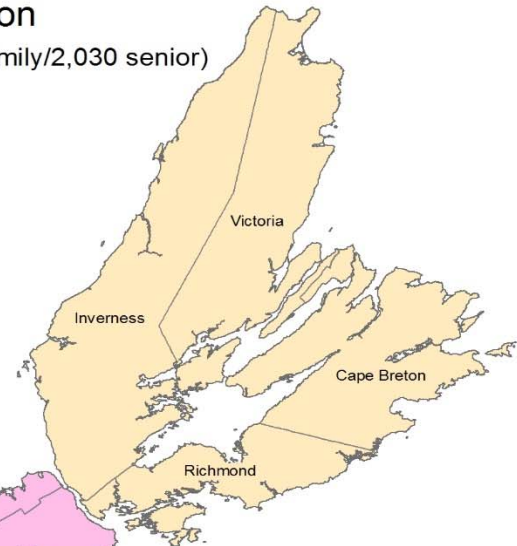
- Largest residential landlord in NS with \$13B in real estate assets.
- Owns and operates 11,560 public housing units for low income families and seniors.
- Portfolio includes single family dwellings (duplex, townhomes, etc.) to low-mid-high rise Multi-Unit Residential Buildings (MURB).
- 75% of units are for seniors over the age of 58.
- Low income family units are typically of 3 to 4 bedrooms
- Units that are managed by 5 regional housing authorities



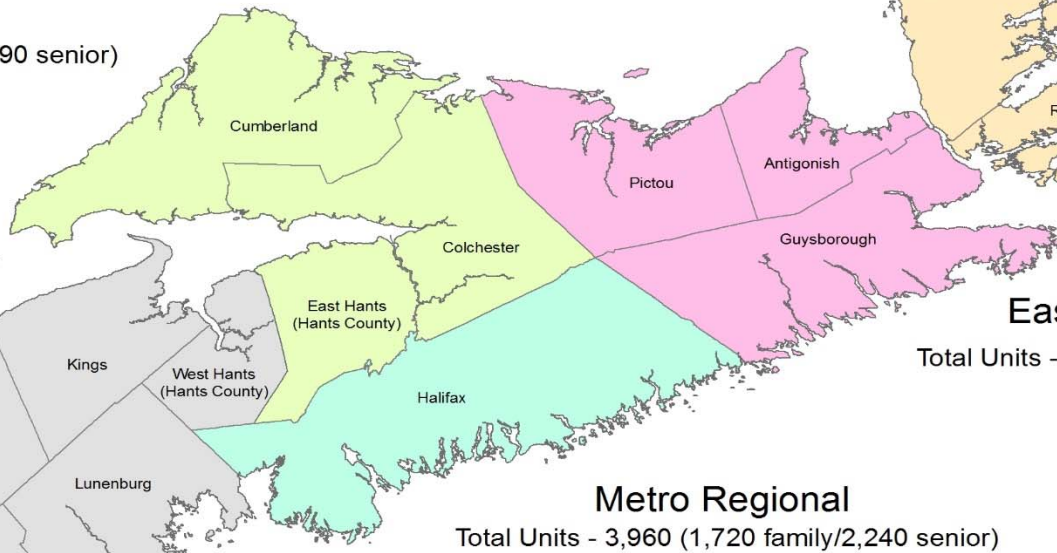
**Cape Breton**  
Total Units - 3,250 (1,220 family/2,030 senior)

## Public Housing Units

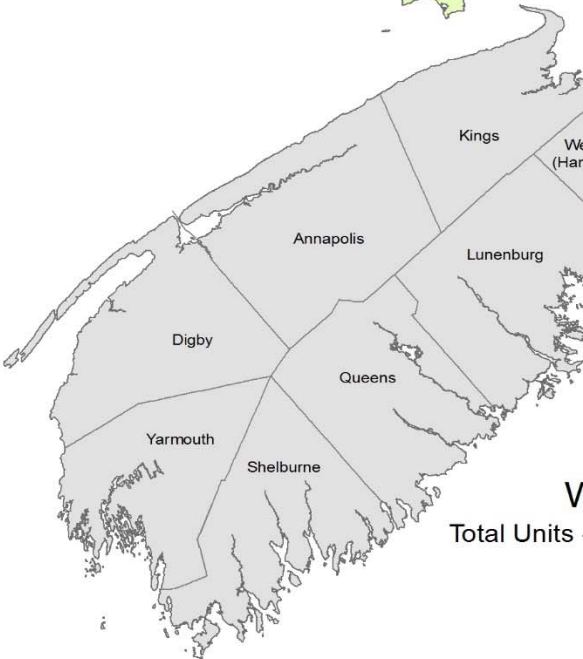
**Cobequid**  
Total Units - 1,050 (160 family/890 senior)



**Eastern Mainland**  
Total Units - 1,080 (200 family/880 senior)



**Metro Regional**  
Total Units - 3,960 (1,720 family/2,240 senior)

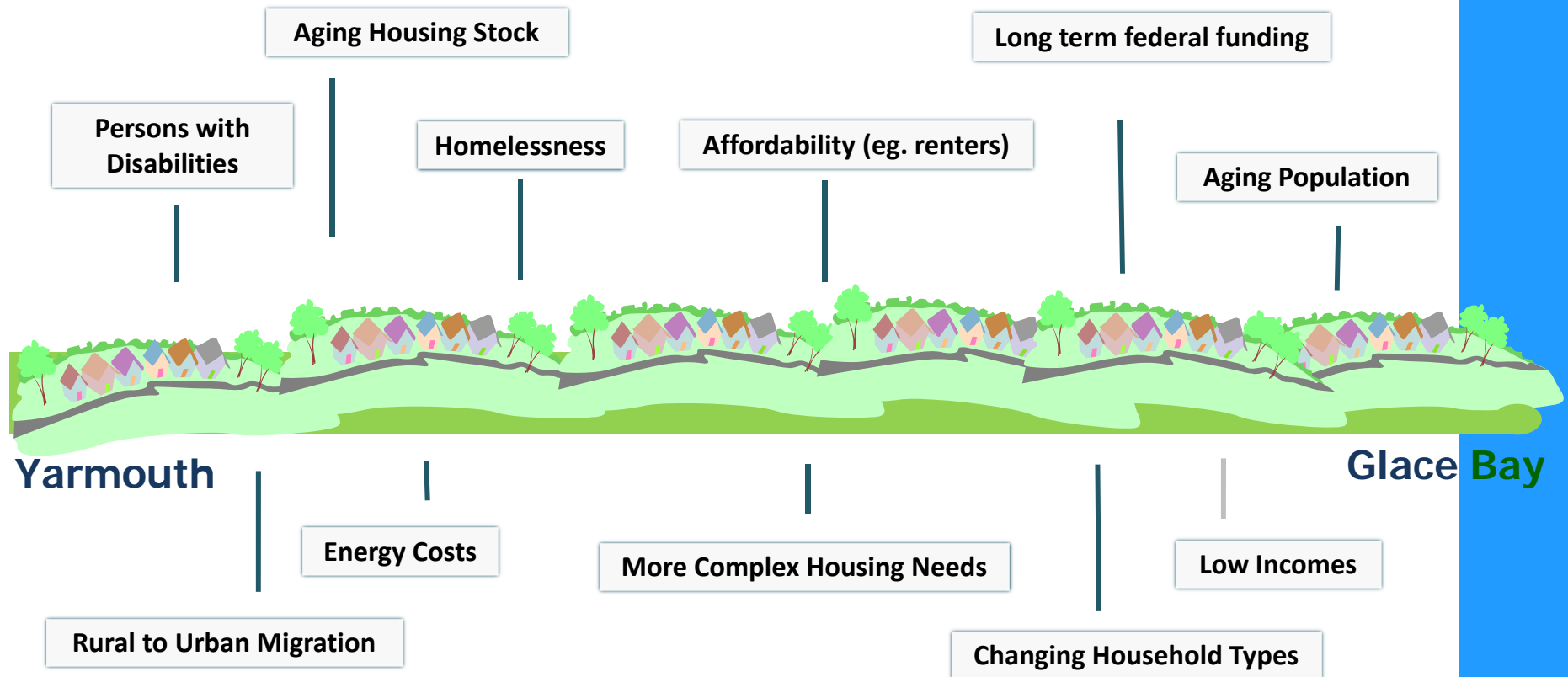


**Western Regional**  
Total Units - 2,220 (520 family/1,700 senior)

**Nova Scotia Total**  
Total Units - 11,560 (3,820 family/7,740 senior)

# Housing Nova Scotia

## Affordable Housing Challenges:



# Housing Nova Scotia

## Affordable Housing Challenges:

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- Aging public housing stock:
  - Majority built between 1954 and 1994.
  - 53% of the stock was built between 1971/1980
  - 25% between 1981/1990
- Building standards of the day cause excessive air infiltration/heat loss.
- Rising operating utility budgets (electricity, oil, propane, natural gas, water) lead to reduced capital budgets:
  - Volatile energy prices.
  - Limited capacity of clientele to absorb utility price increase.
  - Difficult to reduce electrical demand due to high occupancy levels in units.
  - Absence of dedicated funding for energy efficiency projects.

# HNS Greening Strategy

## Commitment to Sustainability:

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- Improving energy efficiencies for over 30 years.
- A 2008 *Greening Strategy* set out 5 key energy usage drivers:
  1. building envelope
  2. mechanical/electrical systems
  3. maintenance and operations
  4. building occupants
  5. products/services & information systems



# HNS Greening Strategy

## HNS Commitment to Sustainability:

Quick snapshot of HNS energy consumption numbers prior to the Greening Strategy compared to recent consumption numbers for

Year	Oil (L)	Electricity (KWH)	Natural Gas (GJ)	Propane (L)	Total GJ Equivalent	Heating Degree Days (HDD)
2007-2008	14,570,937 (535,045 GJ)	60,936,199 (219,370 GJ)	20,253	24,756 (170,816 GJ)	945,484	4779
2014-2015	10,399,198 (381,859 GJ)	60,474,656 (217,709 GJ)	90,654	23,117 (159,507 GJ)	849,729	4697
Change (%)	-29%	-0.8%	348%	-7%	-10%	-2% (Adjusted total savings -8%)

PS: The jump in KW demand consumption may be due to increased use of electricity in facilities with simultaneous use of air handling systems and electrical baseboards. The increase in NG consumption is due to recent gas conversions of our heating system from Oil fired systems.



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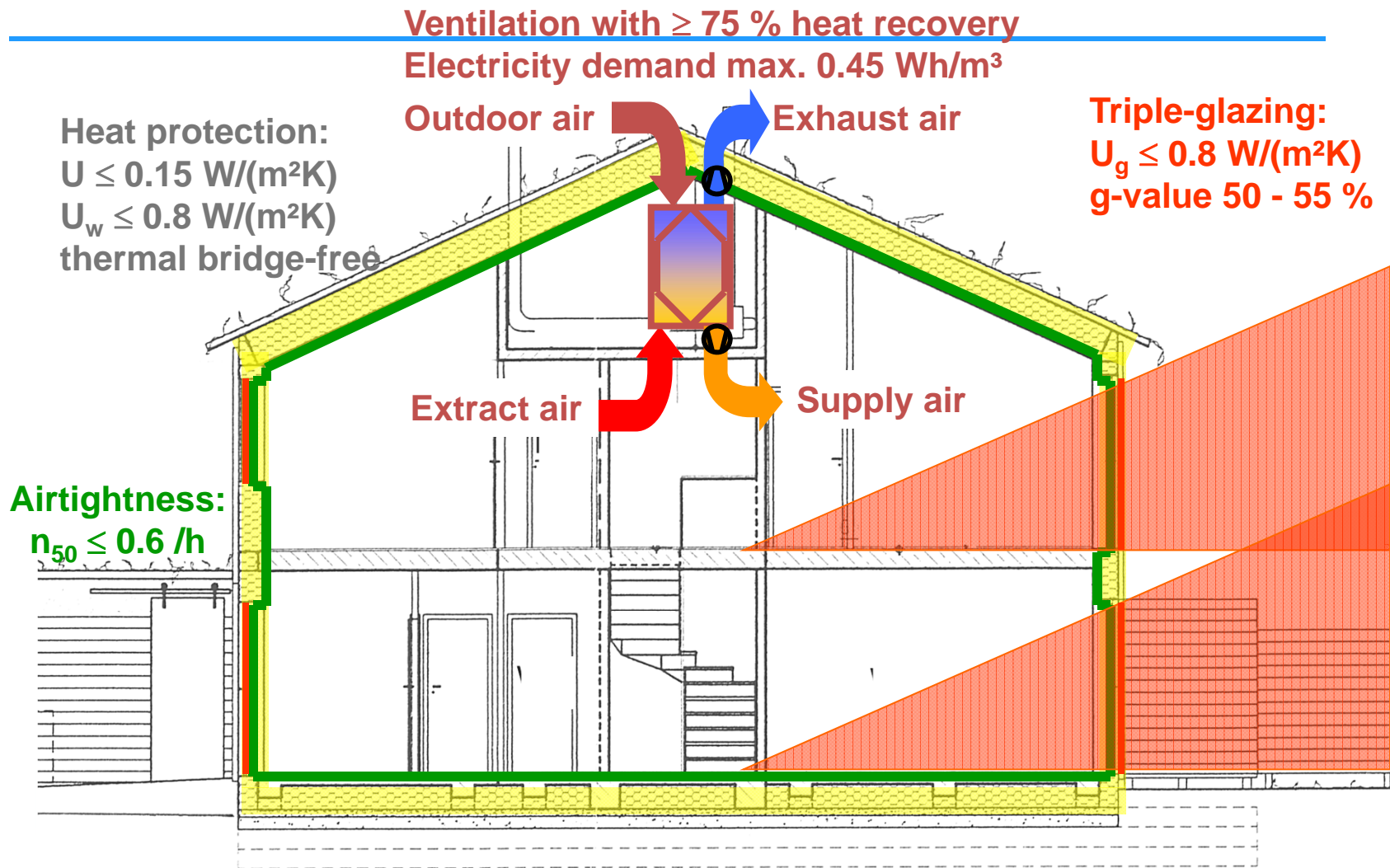
# Passive House Standard

## Elements of Passive House Design:

The key principles of Passive House are:

- Superinsulation: Installing a continuous layer of thick insulation below the foundation, on the walls and in the attic.
- Airtightness: The 0.6 ACH requirement at least two times tighter than the R2000 standard.
- Minimize thermal bridging: Avoiding “cold spots” by designing thermal breaks in the building assemblies.
- High Performance Windows and Doors: Triple glazed, argon filled, custom Low e coatings, airtight. This insures more solar heat and reduce transmission losses.
- Use Very High Efficiency HRV: Installed with best practices, the HRV will provide adequate fresh air while reducing heat losses.

# Passive House Standard



# HNS Passive House Pilot Project

## Project Context:

- Is part of HNS's Alice Street Neighborhood Revitalization Program located near the Town of Truro's eastern boundary.
- Existing 2 story single family dwelling was structurally unsafe; to be replaced by a new 2 unit building.
- Existing street has specific building patterns.
- Building orientation facing street is north – south.



# HNS Passive House Pilot Project

## Project Challenges:

- South solar access blocked by dense trees uphill in adjacent schoolyard. (south glazing ineffective as a heat source).
- Proposed plan area close to maximum buildable area



# HNS Passive House Pilot Project

## Project Design:

- HNS Building Design Team (BDT) had designed 3-bedroom duplex obtained a development agreement from Truro.
- The new building will provide 2 additional affordable housing units of 2030 SF each for residents of Truro and surrounding area.
- Design phase was tendered through the Cobequid Housing Authority
- Passive House E-Design was awarded the design contract to work with the BDT to transform the existing plans to:
  - Incorporate the passive house principles
  - Use PHIUS climate adjusted standards to reach certification
  - Specify assemblies and mechanical systems that have been successfully installed in projects built in Nova Scotia in the construction tender documents
- Construction tender was awarded to Global Construction with a construction cost was close to \$125/SF.

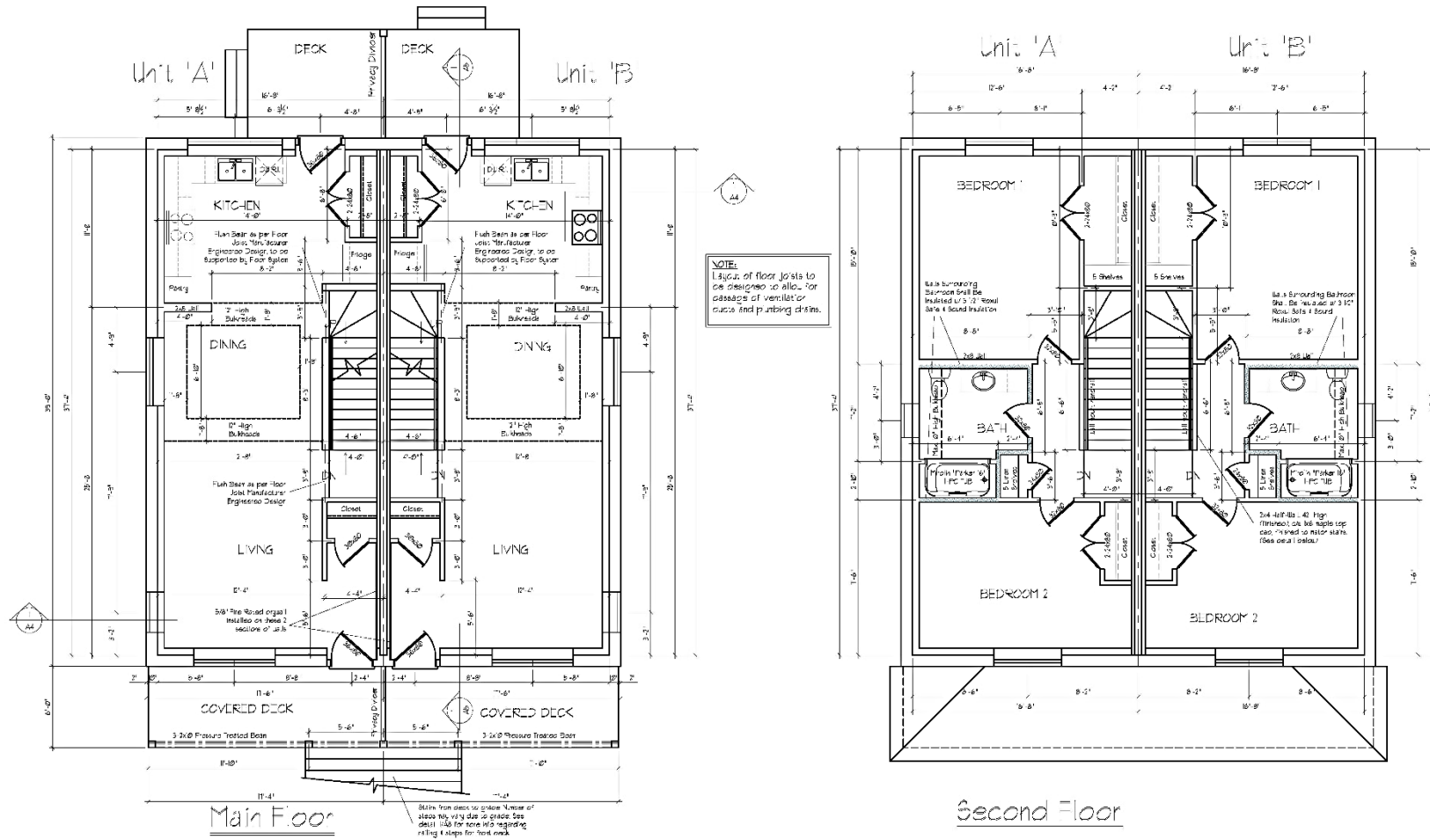
# HNS Passive House Pilot Project

## Passive House Design Phase:



# HNS Passive House Pilot Project

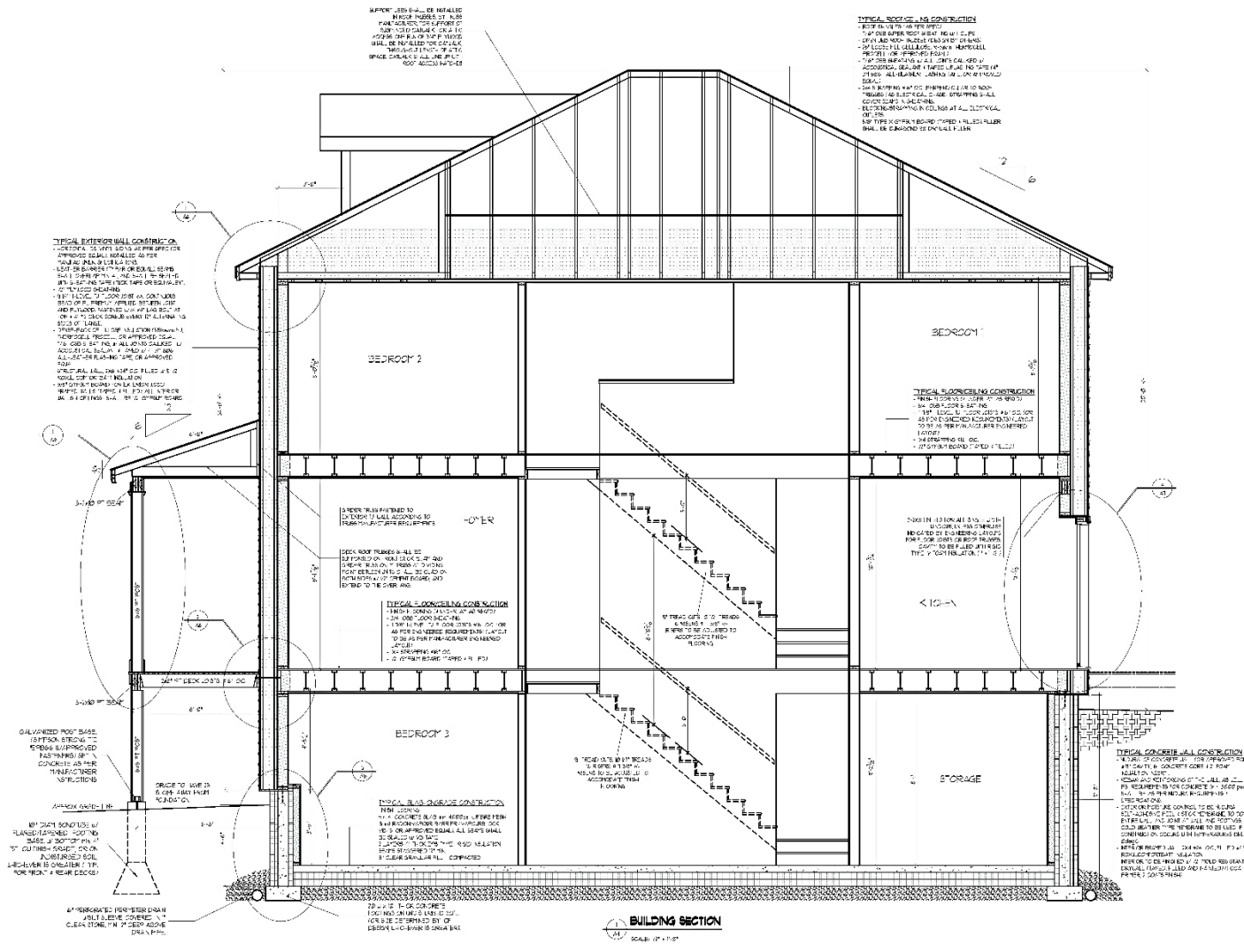
## Passive House Design Phase:





# HNS Passive House Pilot Project

## Passive House Design Phase:





# HNS Passive House Pilot Project

## Passive House Contractor Training and Video:

The ENS supported instructional video captures the 6 key milestone steps in the PH construction process during which PH E-Design provides training to the contractor:

1. Laying sub slab insulation and vapour barrier installation.
2. Installation of exterior walls and air sealing exterior walls and penetrations.
3. Installation and air sealing of windows and doors.
4. Electrical rough in, Plumbing rough in, Heat pump rough in, Ventilation rough in.
5. Blower door pre-drywall, final blower door, and ventilation commissioning.
6. Summary of completed home – review of costs and savings.

# HNS Passive House Pilot Project

Passive House Construction Phase: Photos August 8, 2015



# HNS Passive House Pilot Project

## Passive House Construction Phase: Photos August 26, 2015



# HNS Passive House Pilot Project

Passive House Construction Phase: Photos September 11, 2015



# HNS Passive House Pilot Project

Passive House Construction Phase: Photos September 25, 2015



# HNS Passive House Pilot Project

Passive House Construction Phase: Photos October 9, 2015





# HNS Passive House Pilot Project

Passive House Construction Phase: Photos October 16, 2015



**housing**  
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# Passive House Standard

## Affordability and Passive House Design:

- The focus of the Passive House standard is conserving energy by reducing heat loss through the building envelope and maximizing solar heat gains.
- HNS is constructing the first passive house built by government, as part of its continuing effort to reduce utility and energy costs (over \$30 per year) which HNS pays on behalf of tenants.
- PH should save up to 85% in heating costs over conventional building standards.
- Expected heating costs on this project are \$350/year per unit.
- This project is a good learning experience for the building design team at HNS and the contractor.

# HNS Passive House Pilot Project

## Conclusions:

- Passive House is economically viable because it uses simple conservation techniques that are not complicated or expensive.
- Using PH standards, HNS can adapt conventional construction materials and techniques in its tenders to reduce energy needs.
- PH is a viable approach for housing in NS given the wealth of expertise which could be leveraged to create a new standard of construction.
- Our role is about promoting innovation in housing, not just in social housing, but for the entire population. Making Passive Housing more common for any market at any income level will have a significant impact on sustainability.