welcome.
ENGINE 16
223 EAST 25TH STREET
MANHATTAN, NY

MICHAEL INGUI, RA
Certified Passive House Designer

AMY FAILLA, RA
Certified Passive House Designer
BAXT INGUI - COMPLETED PASSIVE PROJECTS

- 8 PASSIVE PROJECTS COMPLETED
- 7 UNDER CONSTRUCTION
- 11 DIFFERENT CONTRACTORS

- 7 BAXT INGUI ARCHITECTS TEAMS
- 3 PASSIVE HOUSE CONSULTANTS

(1) SYSTEMATIC APPROACH

UPPER WEST SIDE, MANHATTAN NYC
BROOKLYN HEIGHTS, BROOKLYN NYC
BROOKLYN HEIGHTS, BROOKLYN NYC
BROOKLYN HEIGHTS, BROOKLYN NYC
A SYSTEMATIC APPROACH

BAXT INGUI’S SYSTEMATIC APPROACH INCLUDES THESE CRITICAL STEPS:

1. Educating the client on passive house in an effective way.
2. Involving the passive house consultant before or during schematic design.
3. Start the certification process with your certification body early and harness their feedback as early as possible.
4. Select and involve a contractor as early as possible, and get them and their team certified/trained.
5. Hold weekly meetings.
6. Use the blower door as a tool.
7. Openly share knowledge & receive feedback with the community.

SCHEMATIC DESIGN PHASE ENERGY MODEL OF SUMMER PERIOD
WINDOW NET ENERGY BALANCE. COURTESY OF BLDGTYP, LLC.
SITE PLAN / CONTEXT

NOTES
1. PLOT PLAN (PROPOSED)
2. SITE PLAN / CONTEXT

LEGEND
- 223 E. 25TH
- SUBWAY STOP
- BUS STOP
- CITIKEE STOP
- RESTAURANT/BAR/ENTERTAINMENT (WITHIN HIGHLIGHTED AREA)
- PARK
- PUBLIC FACILITIES + INSTITUTIONS (INCLUDING NYU, BARUCH COLLEGE, SVA)

1" = 200'
• Decommissioned firehouse building, converted into a church in 1974.
• Ground floor was used for religious facilities while upper floors fell into disrepair.
• New owners purchased in 2018.
• Adaptive reuse project as a 4-family residence with a community facility on the ground floor.
REAR FACADE ELEVATIONS

1. EXISTING REAR FACADE PHOTOS (NORTH FACING)
2. EXISTING REAR FACADE (NORTH FACING)
3. PROPOSED REAR FACADE (NORTH FACING)
SIDE FACADE ELEVATIONS

1. WEST REAR FACADE
2. EAST FACADE AT AIR SHAFT
HISTORIC + RESTORED ELEMENTS

1. HISTORIC FIREHOUSE HOSE HOOKS
2. FRONT ADDITION EMULATES HISTORIC CAST IRON FIREHOUSE SHED
3. HISTORIC WOOD RAILING
4. REPURPOSED WOOD FLOOR JOISTS
5. RESTORED WOOD FLOORING
6. HISTORIC STEEL RAILING
7. HISTORIC WINDOWS
8. HISTORIC FIREHOUSE HOSES
9. RESTORED TIN CEILING
EXISTING CONDITIONS - FACADE DETAILS
EXISTING CONDITIONS - 1ST FLOOR CHURCH
EXISTING CONDITIONS - 2ND FLOOR
EXISTING CONDITIONS - 3RD FLOOR
EXISTING CONDITIONS - FIRE POLE OPENING
CELLAR + 1ST FLOOR PLANS: COMMUNITY SPACE

1. CELLAR PLAN
2. 1ST FLOOR PLAN
3. CELLAR COMMUNITY CENTER AREA = 1113SF
4. 1ST FL. COMMUNITY CENTER AREA = 1400SF
SKETCHES - ENTRY

1. EXISTING STEEL RAILING AT ENTRY
2. PROPOSED ENTRY STAIR W/ RESTORED RAILING
3. RESTORED STEEL RAILING
2ND FLOOR + LOFT PLANS: UNITS 2A + 2B
UNIT 2A

FEATURES
- 625 SF
- 1 BR, 1 BATH
- IN-UNIT WASHER, DRYER, DISHWASHER
- INDIVIDUAL ROOM TEMPERATURE CONTROL
- 13’ TALL CEILINGS
- LARGE WINDOWS/ABUNDANT NATURAL LIGHT
- RECLAIMED WOOD FLOORS
- MOBILE LADDER FOR LOFT ACCESS
FEATURES

• 926 SF
• 2 BR, 1 BATH
• PRIVATE ROOF DECK
• STORAGE LOFT
• LAUNDRY CLOSET
• INDIVIDUAL ROOM TEMPERATURE CONTROL
• 13’ TALL CEILINGS
• LARGE WINDOWS/ABUNDANT NATURAL LIGHT
• DISHWASHER
• RECLAIMED WOOD FLOORS

NOTES

1. AXON
2. SECTION
3. 2ND FLOOR PLAN
4. LOFT FLOOR PLAN
3RD + 4TH FLOOR PLANS: UNITS 3 + 4
UNIT 3 DUPLEX

FEATURES

- 1165 SF DUPLEX
- 1 BR, 2 BATH
- DOUBLE-HEIGHT SPACE
- BONUS MEZZANINE SPACE
- LAUNDRY CLOSET
- INDIVIDUAL ROOM TEMPERATURE CONTROL
- 13' TALL CEILINGS
- LARGE WINDOWS/ABUNDANT NATURAL LIGHT
- DISHWASHER
- RECLAIMED WOOD FLOORS

NOTES

1. AXON
2. SECTION
3. 3RD FLOOR PLAN
4. 4TH FLOOR PLAN
5. RENDERING OF STAIR/LOFT
5TH FLOOR + ROOF PLANS: UNIT 4 & SHARED ROOF
UNIT 4 TRIPLEX

FEATURES
- 3829 SF TRIPLEX
- 4 BR, 4 FULL BATHROOMS, 2 POWDER ROOMS
- MASTER SUITE W/ WALK-IN CLOSET
- BONUS OFFICE OR GUEST ROOM
- LAUNDRY ROOM
- 2 PRIVATE ROOF DECKS
- INTERIOR STAIR TO ROOF W/ PRIVATE BULKHEAD CREATES MULTI-LEVEL SPACE
- INDIVIDUAL ROOM TEMPERATURE CONTROL
- TALL CEILINGS + ABUNDANT NATURAL LIGHT
- DISHWASHER
- RECLAIMED WOOD FLOORS

NOTES
1. AXON
2. SECTION
3. 3RD FLOOR PLAN
4. 4TH FLOOR PLAN
5. 5TH FLOOR PLAN
6. 6TH FLOOR PLAN
+ ROOF
SKETCH + RENDERING

1. ROOF KEY PLAN
2. FRONT ROOF DECK RENDERING
3. UNIT 4 STAIR SKETCH
BULKHEAD ELEVATIONS & PLAN

1. EAST BULKHEAD ELEVATION & SECTION (FACING WEST)
2. NORTH BULKHEAD ELEVATION (FACING NORTH)
3. FRONT ROOF DECK RAILING (FACING SOUTH)
4. SOUTH BULKHEAD ELEVATION (FACING NORTH)
5. SOUTH BULKHEAD ELEVATION (FACING NORTH)
6. BULKHEAD ROOF PLAN
1. CONDENSER UNITS: FUJITSU HEAT PUMPS (SEE MECH. PLANS FOR SPECS)
2. ERV: ZEHNDER COMFOAIR 550 ERV
3. WATER HEATER: SANDEN HEAT PUMP
4. ERV: VENTACITY
5. MOTORIZED ROLLER SHADES
6. AIR HANDLERS: WALL-MOUNTED FUJITSU (SEE MECH. PLANS FOR SPECS)
7. COMMON BIKE STORAGE
8. COMMON RECYCLING
9. COMMON COMPOSTING
10. AIR HANDLERS: CEILING-MOUNTED FUJITSU (SEE MECH. PLANS FOR SPECS)
11. PYRAMID SKYLIGHT: LAMILUX
12. PHOTOVOLTAIC SOLAR ARRAY
MECHANICAL PLANS: CELLAR + 1ST FLOOR
MECHANICAL PLANS: 2ND FLOOR + LOFT

[Diagrams of mechanical plans for 2nd Floor and Lofts with annotations and color-coding for different systems.]
MECHANICAL PLANS: 5TH FLOOR, BULKHEAD & ROOF
1. WALL TYPE #7: NEW STEEL STUD WALL W/ EXTERIOR FOAM
2. WALL TYPE #4: EXISTING MASONRY WALL W/ CELLULOSE INSULATION
3. WALL TYPE #5: EXISTING MASONRY WALL W/ STEEL STUD + MINERAL WOOL
4. ROOF TYPE #9: NEW METAL JOIST W/ CELLULOSE INTERIOR INSULATION + EXTERIOR FOAM
5. ROOF TYPE #8: NEW WOOD JOIST W/ CELLULOSE INTERIOR INSULATION + EXTERIOR FOAM
6. WALL TYPE #6: NEW MASONRY WALL W/ CELLULOSE INTERIOR INSULATION + EXTERIOR FOAM
7. UNIT TO UNIT AIR SEALING DETAIL
8. CELLAR SLAB DETAIL
9. VESTIBULE AIR SEALING + INSULATION DETAIL
WALL DETAILS

1. WALL TYPE #2: 2X4 STEEL STUD W/ MINERAL WOOL BATT
2. WALL TYPE #4: EXISTING MASONRY WALL W/ CELLULOSE INSULATION
3. WALL TYPE #5: EXISTING MASONRY WALL W/ STEEL STUD + MINERAL WOOL

Boundary Condition: $q_{BLU} [W/m^2]$ vs $T [^\circ F]$ vs $[BLU]_{h-t'} [F]$ vs $E$

Material:
- Air layer, unventilated, upwards, thickness: 40 mm
  - 0.000
- Diffusion (Damp-proof) [0.2-0.7 m]
  - 0.000
- Damp-proof (polyethylene) [0.12-0.25 m]
  - 0.000
- Polyurethane foam [0.05-0.15 m]
  - 0.000
- Wood, Coniferous (Seamless) [0.120 m]
  - 0.000
WALL + ROOF DETAILS

1. WALL TYPE #6: NEW CMU WALL W/ EXTERIOR FOAM INSULATION
2. WALL TYPE #7: NEW STEEL STUD WALL W/ EXTERIOR FOAM
3. NEW ROOF: WOOD JOIST W/ EXTERIOR FOAM INSULATION
ENTRY RETROFIT AIR SEALING DETAILS

1. VESTIBULE AIR-TIGHTNESS DIAGRAM
2. FRONT + REAR WALL SECTION DETAIL - AIR SEALING AROUND FIRST FLOOR JOIST
3. ENTRY DOOR + VESTIBULE DETAIL
4. AIR-SEALING DETAIL BETWEEN FLOORS THAT SEPARATE APARTMENTS
MASONRY RETROFIT DETAILS

1. BELOW GRADE FOUNDATION WALL PLAN DETAIL
2. BELOW GRADE FOUNDATION WALL SECTION
3. BELOW GRADE SLAB/ WALL SECTION DETAIL
4. PARTY WALL / ROOF + PARAPET SECTION DETAIL
5. PIPE PENETRATION @ ROOF DETAIL
6. PARTY WALL / ROOF CONNECTION DETAIL
NEXT STEPS & VALUE ENGINEERING
THANK YOU!
Site
197 North Miller Street

Business Case

1) **Scarcity** of readily available **affordable housing** gives confidence in demand

2) **Negligible property costs** to drive down capital requirements

3) Existing building stock of **structurally sound** buildings in need of renovation

4) Owner-paid utility model to **turn utility cost savings into income**.

This combination of factors is **common in Newburgh, NY** and other financially distressed areas, this project can serve as an example to be **replicated by other developers and lenders**.
North Miller Passive
Newburgh, NY

11,234 kWh/yr On-Site Solar generation

Project meets all Energy Star requirements for reduced energy consumption

High Performance Tri-paned windows and doors

Airtight building envelope

Super-insulated assemblies and thermal bridge-free construction

Project meets all Energy Star requirements for reduced energy consumption

High efficiency mini split heat pump cooling and heating at each unit

Balanced Heat Recovery Ventilation provides filtered fresh air at high efficiencies

Project meets all EPA airPLUS requirements for vapor control, air quality and radon mitigation

Heat pump hot water heater with 'on command' recirculation at each unit

Plumbing system conforms with all EPA Watersense criteria

0 kWh/person.yr + Renewables

North Miller Passive
Newburgh, NY

PHIUS+ SOURCE ZERO
Project As Designed (PHIUS+ 2018)

<table>
<thead>
<tr>
<th>Component</th>
<th>As Designed</th>
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<tbody>
<tr>
<td>Heating demand</td>
<td>5.59 kBtu/ft²·yr</td>
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<tr>
<td>Cooling demand</td>
<td>4.78 kBtu/ft²·yr</td>
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<tr>
<td>Heating load</td>
<td>5.49 Btu/hr ft²</td>
</tr>
<tr>
<td>Cooling load</td>
<td>3.37 Btu/hr ft²</td>
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<tr>
<td>Source energy</td>
<td>3,710 kWh/Person yr</td>
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<tr>
<td>Site energy</td>
<td>15.41 kBtu/ft²·yr</td>
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</tbody>
</table>

As Designed:
- PHIUS+ 2018 certification
- Offsite Photovoltaics to satisfy source energy requirement
- Heat recovery ventilation system
- No post-occupancy monitoring

As Improved:
- PHIUS+ 2018 + Source Zero
- Offsite Photovoltaics + Maximum Onsite Photovoltaic roof array
- Upgrade to ERV
- Post-occupancy monitoring protocol
  - Site Sage electricity use
  - Temperature / RH sensors
- Information Broadcasting protocol
The Path to Zero

Conventional Retrofit (2015 IECC)

Project As Designed (PHIUS+ 2018)

1. Insulation + Air-tightness

2. Renewables

-38%

-100%

6,009 kWh/person

3,710 kWh/person

0 kWh/person

North Miller Passive
Newburgh, NY
Step 1: Insulation & Air-tightness

Annual Heating Demand

**Insulation Levels**
- R49 Ceiling
- R17 Walls
- R30 Floor

**Airtightness**
- .4 cfm/ft²

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**Conventional Retrofit (2015 IECC)**

- Annual Heating Demand: 51,122 kBTU/yr

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**Project As Designed (PHIUS+ 2018)**

- Annual Heating Demand: 21.72 kBTU/ft²·yr
- Insulation Levels:
  - R64 Ceiling
  - R35 Typ Wall
  - R33 Floor
- Airtightness:
  - .06 cfm/ft²

- Reduction: 75%
Step 2: Add Renewables
kWh/yr

11,485 kWh

+ 2,900 kWh Offsite
Step 2: Add Renewables
kWh/yr

Conventional Retrofit (2015 IECC)

- Space heating: 13,086.5 kWh/yr
- Space cooling: 7,438.2 kWh/yr
- Hot water: 2,901.3 kWh/yr
- Auxiliary energy/fans: 28,786.3 kWh/yr

- Space heating: 3,364.3 kWh/yr
- Space cooling: 7,714 kWh/yr
- Hot water: 2,743.2 kWh/yr
- Auxiliary energy/fans: 28,992.6 kWh/yr

- Renewable electricity: 36,063.0 kWh/yr
- Miscellaneous loads: 11,555.0 kWh/yr

Legend:
- Space heating
- Space cooling
- Hot water
- Auxiliary energy/fans
- Appliances
- Lighting
- Miscellaneous loads
- Renewable electricity
Field Conditions

North Miller Passive
Newburgh, NY
Retrofit Assemblies

**South Wall**
- Cementitious stucco over wire drainage plane and wire lathe
- 6" Unfaced polyisocyanurate insulation
- Existing brick wall, clean and repair as required
- 1/2" painted type X GWB

**Typical Wall**
- Painted face of existing historic brick facade
- Existing brick wall, clean and repair as required
- Intello smart air-barrier
- 1-1/2" Furred chase wall - uninsulated
- 1/2" painted type X GWB

**Thin Wall**
- Continuous mineral wool as fire blocking between floors
- Existing brick wall, clean and repair as required
- Intello smart air-barrier
- 1-1/2" Furred chase wall - uninsulated
- 1/2" painted type X GWB

**R70**
- R-70 TOTAL

**R35**
- R-35.5 TOTAL

**R28**
- R-28 TOTAL

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North Miller Passive
Newburgh, NY
North Miller Passive
Newburgh, NY

Patches of existing plaster were left

New lime plaster coat
Spray applied Visconn is seemingly the magic solution.

Spray-applied air barrier covers inconsistent surfaces and inside corners easily.

Visconn sprays on blue and dries black.
Adhesion on type O plaster - Visconn chips right off
Sistering of two different types of dimensional lumber

Tape origami around pocket beams
Dissimilar framing members and air-sealing come into conflict.
3/8" Hole drilled between beams and filled with expanding foam.
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Blower Door 01:
310 cfm total
.056 cfm/ft²

2x4 strapping installed before first blower door test

Air leaking around 2x4 strapping
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Newburgh, NY

Blower Door 02:
227 cfm total
.041 cfm/ft²
Blower Door 03:
195 cfm total
.035 cfm/ft²
North Miller Passive
Newburgh, NY

- Project meets all performance standards for PHIUS+ 2018 Passive House Certification
- Project achieves a Source Zero designation (Primary Energy of 0 kWh/person.yr)
- 11,234 kWh/yr On-Site Solar generation
- Project meets all Energy Star requirements for reduced energy consumption
- High Performance Tri-paned windows and doors
- Airtight building envelope
- Super-insulated assemblies and thermal bridge-free construction
- High efficiency mini split heat pump cooling and heating at each unit
- Balanced Heat Recovery Ventilation provides filtered fresh air at high efficiencies
- Project meets all EPA airPLUS requirements for vapor control, air quality and radon mitigation
- Heat pump hot water heater with ‘on command’ recirculation at each unit
- Plumbing system conforms with all EPA Watersense criteria

0 kWh/person.yr + Renewables
discussion.