EEFA & GHHI Case Studies

- Examination of both health and energy outcomes of weatherization and energy retrofitting projects performed at affordable multifamily housing properties in EEFA states.
- Produced to provide narrative descriptions that demonstrate how energy retrofitting addresses home health hazards, how families directly benefit from these investments.

<table>
<thead>
<tr>
<th>Number of Units</th>
<th>Number of Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 or Fewer</td>
<td>5</td>
</tr>
<tr>
<td>61-100</td>
<td>5</td>
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<tr>
<td>100 or More</td>
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<table>
<thead>
<tr>
<th>Scope of Work</th>
<th>Number of Studies</th>
<th>Avg. Cost Per Unit</th>
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<tbody>
<tr>
<td>Limited</td>
<td>6</td>
<td>$21,712</td>
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<tr>
<td>Comprehensive</td>
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<td>$124,655</td>
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<table>
<thead>
<tr>
<th>Location</th>
<th>Number of Studies</th>
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</thead>
<tbody>
<tr>
<td>Urban</td>
<td>7</td>
</tr>
<tr>
<td>Suburban</td>
<td>3</td>
</tr>
<tr>
<td>Rural</td>
<td>2</td>
</tr>
</tbody>
</table>

Median Original Year Built: 1958
Case Study: Commons at Imperial
Atlanta, Georgia

Pre-Intervention
- High-rise building constructed in 1911
- 90 Units
- Property comprehensively rehabbed 2014, serves previously homeless individuals
- Energy retrofitting planned with Southface Energy Institute

Outcomes:
- Total annual energy savings: $52,000
- Energy use dropped by 32 percent
- LEED Gold Certification
- 100% occupancy, 500+ on waiting list

Cost of Intervention: $11,469,000 ($127,433 per unit)

Weatherization Interventions
- Energy efficient windows
- R-20 pray foam insulation
- Continuous R-30 roof insulation
- High efficiency HVAC system
- Programmable thermostats and utility monitoring
- Energy Recovery Ventilator (ERV)
- Energy Star appliances and electric water heating
- High efficiency LED and CFL lighting

Healthy Homes Interventions
- Paint stabilization to reduce lead hazards
- Low VOC paints and sealants
- Pest management services
- Mold remediation
- Installation of fire sprinkler systems and alarm system
- Installation of carbon monoxide detectors
- Water Sense Certified low-flow toilets and shower heads installed
- Drought resistant landscaping

www.ghhi.org
Case Study: Commons at Imperial
Atlanta, Georgia

Donna Werkheiser
Pre-Intervention Situation:
• History of homelessness and economic insecurity related to health conditions
• Chronic conditions include asthma, bronchitis, and emphysema

Intervention Services:
• One of the first tenants to move into the renovated building in 2014
• Case manager on-site assisted Werkheiser to apply for disability benefits and healthcare coverage

Outcomes:
Health Costs 12 months pre-intervention: $30,000 | 12 months post-intervention: $676

Othinel Jenkins
Pre-Intervention Situation:
• Sarcoidosis (chronic disease causing shortness of breadth and inflammation)
• Aspergilloma (chronic infection that impacts pulmonary function)
• Lost job in inventory management and housing due to health conditions

Intervention Services:
• Moved into the Imperial in April 2014
• Case manager assisted him to apply for disability coverage and Medicaid
• Medication management to reduce frequency of breathing treatments

Outcomes:
No breathing treatments in past 16 months | enrolled in vocational school
Case Study: Park Terrace Apartments
Rockford, Illinois

Pre-Intervention

- High-rise building constructed in 1984
- 183 Units
- Rockford Housing Authority developed plan in 2013 with goal to reduce energy use by 20% portfolio-wide
- Developed Energy Performance Contract with Johnson Controls for 9 properties

Cost of Intervention: $1,033,290 ($5,646 per unit)

Weatherization Interventions
- High efficiency condensing boiler
- ENERGY STAR appliances
- Efficient faucets
- Air sealing
- Resident Education (Efficient Living Program)

Healthy Homes Interventions
- Heat recovery ventilation system
- Smoke free policy
- Smoking cessation support for tenants
- Healthy homes resident education

Outcomes
- 21.36% savings in electric usage
- 34.39% savings in natural gas usage
- $39,539 annual reduction in utility costs
- Reduced O&M costs
Case Study: Annunciation Inn  
New Orleans, Louisiana

Pre-Intervention

- 6 story building constructed in 1982
- 106 Units
- Occupied by people ages 62+
- Comprehensively rehabbed in 2008 post Hurricane Katrina
- Green Coast Enterprises contracted for energy audit & green retrofit in 2014

Cost of Intervention: $74,200 ($700 per unit)

Weatherization Interventions
- Packaged Thermal Air Conditioning (PTAC) heat pumps
- HVAC service and replacement schedule
- Upgraded interior and exterior lighting

Healthy Homes Interventions
- Noise machines for control of car traffic noise (residents were running water to cancel out ambient noise)
- Identified unreported maintenance needs (leak repairs)

Outcomes

- 13% decrease in water usage
- 13% decrease in power usage
- $10,535 annual reduction in utility costs
- Reduced O&M costs
- Improved thermal comfort
Case Study: Harwill/Cole/Harrington Apts. Detroit, Michigan

Pre-Intervention

• 3 Multifamily Buildings constructed 1920s
• 60 Total Units
• Owned and managed by Southwest Housing Solutions
• Units rehabbed in 2012 to improve efficiency and reduce operating costs

Cost of Intervention: $315,250 ($5,254 per unit)

Weatherization Interventions

• Roofing retrofit (reflective shingles)
• ENERGY Star kitchen appliances and hot water tanks
• Exterior repairs and tuck-pointing to reduce leakage
• Insulation replacement
• Weather-stripping at doors and windows

Outcomes

• 15% decrease in monthly energy costs
• Increased life cycle of appliances and other property features
• Reduced O&M costs
• Improved thermal comfort
Case Study: Viking Terrace
Worthington, Minnesota

<table>
<thead>
<tr>
<th>Pre-Intervention</th>
<th>Weatherization/Efficiency Interventions</th>
<th>Healthy Homes Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Multi-family development constructed in 1974</td>
<td>• Geothermal heating and cooling system</td>
<td>• Low VOC paints and sealants</td>
</tr>
<tr>
<td>• 60 Units</td>
<td>• ENERGY Star windows and appliances</td>
<td>• Pest management services</td>
</tr>
<tr>
<td>• Damaged exterior siding</td>
<td>• Dual flush toilets</td>
<td>• Mold remediation</td>
</tr>
<tr>
<td>• Outdated furnaces, electrical system, appliances</td>
<td>• Pitched roofs</td>
<td>• Radon remediation</td>
</tr>
<tr>
<td>• Leaking roofs, damaged foundations</td>
<td>• Environmentally-friendly siding</td>
<td>• Sealing to reduce moisture intrusion and air leakage</td>
</tr>
<tr>
<td>• Pest infestations, mold and radon</td>
<td>• Improved landscaping</td>
<td>• Smoke free policy adoption (2013)</td>
</tr>
<tr>
<td>• Property comprehensively rehabbed 2006-2007</td>
<td>• High quality ventilation system</td>
<td></td>
</tr>
</tbody>
</table>

Cost of Intervention: $4.7 million ($78,333 per unit)

Outcomes:
• 46% reduction in energy use
• 39% reduction CO2 emissions
• Reduced O&M costs
• Improved indoor air quality/VOC reduction

Pre-Intervention:
• Multi-family development constructed in 1974
• 60 Units
• Damaged exterior siding
• Outdated furnaces, electrical system, appliances
• Leaking roofs, damaged foundations
• Pest infestations, mold and radon
• Property comprehensively rehabbed 2006-2007

Weatherization/Efficiency Interventions:
• Geothermal heating and cooling system
• ENERGY Star windows and appliances
• Dual flush toilets
• Pitched roofs
• Environmentally-friendly siding
• Improved landscaping
• High quality ventilation system

Healthy Homes Interventions:
• Low VOC paints and sealants
• Pest management services
• Mold remediation
• Radon remediation
• Sealing to reduce moisture intrusion and air leakage
• Smoke free policy adoption (2013)
**Case Study: Viking Terrace**  
**Worthington, Minnesota (Tesfazghi Family)**

**Mulugheta Tesfazghi**

**Pre-Intervention Situation:**
- Mulugheta and his wife have resided at Viking Terrace for 14 years
- Trouble controlling temperature in winter and summer
- Holes in floor around heating furnace
- Pest infestations
- Stress from living conditions

**Intervention Services:**
- HVAC system upgrade
- New windows, appliances, flooring repairs
- Integrated Pest Management

**Outcomes:**
- Electricity bills reduced by $20-50 per month
- Improved indoor air quality, reduced noise
- Reduced stress, improved satisfaction with property
- Healthy pregnancy, daughter now 7 years old
Case Study: Mill Pond Apts. (Coffman Family) O’Fallon, Missouri

Pre-Intervention

- Multi-family building constructed in 2008
- 52 Units
- Efficient HVAC, windows and ENERGY Star appliances
- High levels of dust observed in some units
- Additional efficiency upgrades and health interventions completed in 2013

Weatherization Interventions

- HVAC system tune-up and cleaning
- High quality air filter installation
- Installation of efficient thermostats

Healthy Homes Intervention

- Ionic air purifiers and oxidizers used to remove particulate matter

Outcomes

- Improved air quality (reduced particulate matter)
- Reduced O&M costs
- Improved thermal comfort

Cost of Intervention: $74,200 ($700 per unit)

Tina Coffman

Pre-Intervention

- COPD diagnosis
- Polyps blocking air flow in sinuses

Post-Intervention

- Cleared from specialty medical care
- No emergency department visits
- Increased ability to exercise (lost 30 pounds)
Case Study: Lincoln Mills (Martinez Family)  
Manville, Rhode Island

Pre-Intervention

- Multi-family building constructed in 1906
- 98 Units
- Inefficient conditions at Lincoln Mills (air leakage from doors and dryer vent)
- History of injury and child with elevated lead levels at previous place of residence

Weatherization Interventions

- Single unit weatherization
- Insulation door kits
- Dryer vent kits
- Window seals
- Efficient light bulbs

Healthy Homes Intervention

- Smoke Alarms installed

Cost of Intervention: $767

Outcomes:
No injuries, lead free kids, reduced utility costs
Avoided medical costs of $610 in first six months
Resident reports gas bills are $50-100 lower per month
Case Study: Liberty Village Apartments
Richmond, California

- Asthma prevalence double national average (17% to 8%)
- Long-term residents more likely to have asthma vs short term residents
- Hospitalization rate of children due to asthma is double the California average
- Residents concerned about air quality with presence of petrochemical plants

Interventions
- High efficiency showerheads and faucets
- ENERGY STAR water heaters and refrigerators
- Increased roof insulation
- New light fixtures
- New furnace wall units
- Efficient, double pane windows

Cost of interventions: $22,000 per unit or $2.19 million total

Pre-Intervention
- 99 units built in 1942
- Needed upgrades to
  - energy efficiency
  - water conservancy
  - reduce air leakage

Outcomes:
- Greater level of comfort
- Improved indoor air quality

<table>
<thead>
<tr>
<th>Utility</th>
<th>Annual Reduction</th>
<th>Annual Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas</td>
<td>8,051 Thms</td>
<td>$8,856</td>
</tr>
<tr>
<td>Electricity</td>
<td>29,278 kWh</td>
<td>$4,392</td>
</tr>
<tr>
<td>Water</td>
<td>880,563 Gal</td>
<td>$1,761</td>
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</table>
Case Study: Cottages and Gardens at Chesapeake in Elkton, Maryland

Pre-Intervention
• Originally built in the 1980's
• Single-site (90 units)
• Two buildings managed separately
• Energy inefficient
• Outdated building systems

Energy Efficiency Interventions
• Central HVAC and heating systems
• Energy efficient appliances and lighting
• Improved piping and plumbing features
• Energy efficient windows
• Blow-in insulation

Healthy Housing Interventions
• Pest Management
• Americans with Disabilities Act compliant
• Sealing to reduce moisture and air leakage
• Installation of smoke alarms

Project Cost:
$12,220,463 or $124,698 per unit
Case Study: Cottages and Gardens at Chesapeake in Elkton, Maryland

Marian Creswell:
• Homeless for 30 days before moving into the Chesapeake, where she's lived for 22 years
• Prior to the rehab:
  ➢ Experienced a draft from her bedroom windows
  ➢ Moisture from pipe leakage damaged ceilings
  ➢ Noisy wall AC/heating unit generated poor quality air
• After the rehab:
  • She enjoys a quieter AC/heating system with improved air quality
  • Less stressed because appliances and HVAC stay in good, working condition

"I am never moving out because the combination of income-adjusted rent, lower utility bills, and comfortable living is ideal for a 72-year old"
Case Study: 1351 Greene Ave.
Brooklyn, New York

- Brooklyn has undergone massive change in the past few decades
- Rising rents have forced many low-income renters out of the area
- The Ridgewood-Bushwick Senior Citizens Council manages over 1800 units of affordable housing in Brooklyn

Energy Efficiency Interventions
- Energy efficient Windows
- Upgraded Lighting
- Efficient boiler and furnace
- Improved building insulation
- Replaced ventilation system
- Roof and masonry repairs

Healthy Homes Interventions
- Mold Remediation
- Electrical and plumbing repairs
- Asbestos abatement
- Pest management
- Sealing to reduce moisture intrusion and air leakage
- Fire safety measures

Project Cost: $1,085,000 ($180.833 per unit)
Case Study: 1351 Greene Ave.
Brooklyn, New York

Teresa Yanes and Derian De La Torre:
• Lived in this apartment since 1992
• Temporarily relocated during renovation
• **Outcomes**
  - Increased protection from extreme temperatures
  - Derian, a college student, enjoys increased productivity with better, efficient lighting
  - Reduced stress levels
  - Increased disposable income

<table>
<thead>
<tr>
<th>Average Monthly Pre-Rehab Utility Costs</th>
<th>Average monthly Post-Rehab Utility Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>$250</td>
<td>$78</td>
</tr>
</tbody>
</table>

Property-wide outcomes
• Reduction in mold and mildew
• Noticeable reduction in pests
• Improved air quality
• No raise in rents
• Lower utility bills

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Case Study: Temple I Apartments
Philadelphia, Pennsylvania

- Originally built in the mid-1860s and redeveloped in 1994
- Temple I went through rapid deterioration after years of mismanagement

Energy Interventions:
- Low E Energy Star windows and doors
- New plumbing features
- Individual high-efficiency split systems for heat/AC
- Closed-cell spray foam and additional insulation
- Energy Star light fixtures
- 85% of construction waste diverted from landfills to recycling facilities

Healthy Housing Interventions:
- Mold and radon remediation
- Integrated pest management
- No-VOC and non-toxic finishes
- Hydrochlorofluorocarbon (HCFC)-free mechanical systems
- Sealing to reduce air leakage and moisture

First domestic offset program supporting carbon reducing efforts through green affordable housing

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<table>
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<tr>
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<tbody>
<tr>
<td>Total Construction Cost</td>
<td>$9.5 million</td>
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<tr>
<td>Construction cost per unit</td>
<td>$158,333</td>
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<tr>
<td>Total Soft Cost</td>
<td>$8.5 million</td>
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<tr>
<td>Total Development Cost</td>
<td>$18 million</td>
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Case Study: Temple I Apartments
Philadelphia, Pennsylvania

Ms. Franklin
- Suffers from Arthritis, Type-1 diabetes, COPD, and numerous respiratory diseases, including asthma
- After the rehab, she has had to go the doctors 3 times less than she used to

Property Outcomes
- Improved air quality
- Elimination of mold
- Lower utility bills
- Neighborhood crime reduction

<table>
<thead>
<tr>
<th>Average Monthly Pre-Rehab Utility Costs</th>
<th>Average Monthly Post-Rehab Utility Costs</th>
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<tbody>
<tr>
<td>$400</td>
<td>$80</td>
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<table>
<thead>
<tr>
<th>Total Medical Costs 3-Year Pre-Rehab</th>
<th>Total Medical Costs 3-Year Post Rehab</th>
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</thead>
<tbody>
<tr>
<td>$2,175</td>
<td>$1713.97</td>
</tr>
</tbody>
</table>
Case Study: Warwick SRO Apartments
Newport News, Virginia

Pre-Intervention Conditions
• Originally built in 1928 (88 units)
• Occupied by previously homeless individuals
• Inefficient appliances
• Aged gas boilers and standard electric water heaters
• Lacked fresh air system for common areas and individual units
• Air and water leakage from windows and walls

Energy Interventions
• Variable Refrigerant Flow (VRF) heating and cooling systems
• High efficiency water heaters
• ENERGY STAR light fixtures, dishwashers, and refrigerators
• High efficiency windows
• Upgraded plumbing

Healthy Housing Interventions
• Roof replacement
• Corridors and units air sealed
• New HVAC systems paired with Energy Recovery Ventilators (ERV)

Outcomes
• EarthCraft multifamily certification
• 50% reduction in energy usage
• Fewer respiratory issues and other negative health impacts

One-Time Benefits to Local Economy:
Local business income = $527,838
Local wages and salaries = $2,248,663
Total local income from construction = $2,776,502
Taxes and fees from construction = $328,920
Local jobs in construction and other industries = 34

Project Cost: $4,292,300
($48,776 per unit)