

# Be an Energy Hero How?

#### With Green Construction, Healthy Homes, Net Zero,

#### Building Performance, Weatherization and More!

Developed by Paul Francisco and his team at the Indoor Climate Research & Training program of the University of Illinois at Urbana-Champaign Illinois Green Economy Network (IGEN) Curated Materials," through funding from the Illinois Environmental Protection Agency, is licensed under CC BY NC 4.0

# **Weatherization/Home Performance**







### **Energy Use in the U.S.**

#### Buildings use about 40% of all energy in the United States





### **Residential Buildings**

Over 120 million residences in the U.S.

About 90% of homes we'll have in 2030 are already built!



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# **Weatherization/Home Performance**

# What is it?

- Improve existing buildings for efficiency, comfort, and health
- Generally achieves about 20% savings
  - Deep energy retrofits would target 50% or more savings





## **Weatherization/Home Performance**

- Major measures
  - Air sealing
  - Insulation
  - Efficient heating and cooling
  - Duct leakage can also be major







## **Other common measures?**

- Water heater replacement
- Faucet aerators
- Replace old refrigerators
- New windows and doors (often not cost-effective)
- Efficient lighting (LEDs)

No cost behavior changes (do not leave the refrigerator door open and dust the coils)





### **Customer Benefits of Building Performance**

Reduced utility bills

Improved comfort

Less pollution & safety problems

Good investment - Many measures pay for themselves multiple times over their lifetime





### **Career Pathways**

- Building/Home Performance Contractor
- HVAC Contractor with heat pump design experience
- Energy Efficiency Program Director
- Residential Building Code Official (with green building experience)
- Multifamily Quality Control Inspector
- Quality Control Inspector
- Multifamily Energy Auditor
- Healthy Home Evaluator
- Building Performance Crew Leader
- Residential Energy Auditor
- Energy Efficiency Sales Representative
- Energy Efficiency Technician (residential)
- Energy Efficiency Program Assistant
- Building Performance Installer



# **COOL TOOLS™ used in building performance**

- Blower Door
- Infrared Camera
- Smoke Pens
- Borescope
- Combustion Analyzer
- Gas Leak Detector
- IAQ Monitors







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# **Green** Construction

### **Green** Construction

- Also known as green, sustainable, or high-performance building
- Creating better structures
- Less polluting, healthier and more efficient



## Standards

LEED (1993)

WELL (2013)





### Green Construction Fundamental Principles

- Use less materials
- Choose materials with less health and pollution impacts
- Design buildings run efficiently
- Build resilient structures that can adapt and will survive

Single header leaving room for insulation.

A CONT

Insulated 3-stud corner or 2-stud corner with blocking

Typical elements

Inline or stacked framing when single top plates are used.

Single top plate when studs and joists are aligned.

2x6 wood studs spaced 24" on center (versus 2x4 studs at 16" o.c.)

Walls continuously sheathed with plywood or OSB.

Jack studs and cripples at openings only where needed.

# **Green Construction Careers**

- Sales
- Consultants
- Developers
- Design
  - Architects
  - Engineers
  - Urban Planners
- Construction
  - Construction Management
  - Tradespeople

**Healthy Homes** 

### **Reduce Healthcare Costs and Housing Hazards**

- \$1.4 billion cost for preventable hospitalizations for asthma in 2004.
- Injuries occurring at home result in 4 million ER visits and 70,000 hospital admissions.
- Preventing lead poisoning among children saves \$110 to \$319 billion dollars annually.

One study found that the per visit cost for patients with asthma who were admitted to the hospital was nearly **\$6,000**.





### **Outgassing/chemicals**

Many building materials and furnishings have chemicals that can outgas unhealthy chemicals









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## **Outgassing/chemicals**

Some manufacturers have tried to reduce use of these chemicals

There are several labels and certification programs





PRODUCT CERTIFIED FOR LOW CHEMICAL EMISSIONS ULCOM/GG UL 2818





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### **IAQ Monitors**

Small monitors for personal home measurements PM<sub>2 5</sub>, VOCs, CO<sub>2</sub>, temperature, radon, moisture





### **Net Zero Homes**



# Department of Energy: What is a Zero Energy Building?

• A 2:03 minute video



### **Careers for those interested in Zero Energy Buildings**

Energy Raters / Building Science\*

- Energy and Sustainability Analyst HERS Rater (PHIUS+ Rater)
- HERS Rater ation Specialist
- Construction nd Green Building Specialist\*
- Building Scientist
- Building Decarbonization specialist

#### Construction\*

- Construction Project Manager
- Project Manager, new construction
- General Contractor
- Project Developer

#### HVAC\*

- Residential HVAC Design / Energy Modeling Specialist
- HVAC Installer / Technician
- HVAC Company owner



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### **Careers for those Interested in Zero Energy Buildings**

#### Energy Raters / Building Science

- Engineering
- Engineer
- Architectural Engineer
- Project Manager/ Senior Mechanical/ HVAC Engineer
- Senior Consultant/Engineer
- Energy Engineer

#### Project Management

- Assistant Project Manager
- Project Manager
- Senior Project Manager
- Project Developer

#### Architecture

- Project Architect
- Architect
- Intermediate Architectural Designer
- Design Program Manager

#### **Energy Programs**

- Energy Program Managers
- Building Energy Manager
- Commissioning / Energy Engineer

#### Higher Education

- Post Doc with advanced education
- Assistant Professor of Architecture





### Positions with Green Building Leaders and Certifying Organizations

#### $\hfill\square$ Passive House and Jobs at Phius

• PH Intern, Phius Certification Team Member, Phius Quality Assurance Associate, PH Coordinator, PH Consultant

#### U.S. Green Building Council Jobs:

- Internships
- Arc Client Solutions Director
- Associate, Market Transformation & Development (Mountain Region)
- Business Systems Analysts
- Compliance & Benefits Manager
- Contracts Manager
- Energy Programs Manager
- GBCI Certification Reviewer
- Global Market Development Associate
- Green Building Coordinator / Green Building Specialist
- LEED Certification Reviewers
- LEED Specialist, Energy Engineer / LEED Specialist, Water
- Manager, Business Intelligence
- Quality Director, LEED Certification
- Regional Coordinator, Market Transformation & Development (Mid-Atlantic and New England Region)



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# Further Reading









Net Zero ENERGY BUILDINGS Case Studies and Lessons Learned

Linda Reeder





Ernst & Sohn WIL

Edited by Andreas Athienitis and William O'Brien

Modeling, Design, and Optimization of Net-Zero Energy Buildings







TOM HOOTMAN





### Types of Passive Buildings

- Single Family Homes
- Traditional and Modern architecture to fit a range of community visual aesthetics.
- Both new construction and retrofit of existing buildings.



#### Traditional Design Passive House image



Modern Design Passive House



### Types of Passive Build in gs

- Multi-family Buildings
- Office Complexes
- Skyscrapers

#### Passive House Principles



Use these ideas in your life plus consider these careers too







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#### and High Performance Buildings!

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