


Module 1

HUD promotes conservation, including

- energy efficiency,
- renewable energy,
- water conservation,
- reduction of environmental impacts,
- waste minimization and
- the creation of a healthy and comfortable living environment



Introduction to Green Building and Sustainability

HUD's

PRIORITY GOAL 1: FORECLOSURE PREVENTION

PRIORITY GOAL 2: RENTAL ASSISTANCE

PRIORITY GOAL 3: VETERANS HOMELESSNESS

PRIORITY GOAL 4: ENERGY AND GREEN RETROFITS

Introduction to Green Building and Sustainability

What is green building?

Which definition do you prefer?

A.) Green building is the practice of creating structures and using processes that are environmentally responsible and resource efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation and deconstruction. - EPA

B.) (Green buildings are) high performance, healthful, durable, affordable and environmentally sound buildings. - LEED for Homes

C.) A green building is one that uses energy and materials more effectively both in production and operation while polluting and damaging natural systems as little as possible. - buildingscience.com

GREEN STANDARDS INCREASING

Nationwide, **63%** of units financed with LIHTC in 2010 committed to meet a holistic green building standard.

% of units funded in 2010 meeting a holistic green building standard

Standard	% of units
100%	Over 66%
Over 33%	None recognized

of agencies recognizing each standard

Courtesy: Enterprise



Bellingham, WA Green Communities Initiative

CASE STUDY


Bellingham Green Communities

Owner:
Bellingham Housing Authority

Location:
Bellingham, WA

Completed:
2011

Key concepts:
Resource savings,
community building



ENERGY EFFICIENT GREEN IMPROVEMENTS

- Envelope and insulation improvements
- New hot water heating system with solar hot water panels on the roof
- Photovoltaic electrical panels
- Energy efficient lighting and lighting controls
- Improved ventilation
- Green roof retrofits to existing resident courtyard
- Rainwater harvesting for landscape irrigation

Photo credit:

Bellingham Green Communities Overview

- **396 units in three 1970s buildings**
- Envelope and insulation improvements
- New hot water heating system with solar hot water panels on the roof
- Photovoltaic electrical panels
- Energy efficient lighting and lighting controls
- Improved ventilation
- Green roof retrofits to existing resident courtyard
- Rainwater harvesting for landscape irrigation

92% CONSTRUCTION WASTE RECYCLED

- Now performing 17 percent over 2004 building standards

Bellingham Green Communities Lesson

- Resident education and community participation
- Creative recycling of building waste
- Thirty percent energy savings



CASE STUDY Curtis Apartments Cogeneration

Owner:
Worcester Housing
Authority

Location:
Worcester, MA

Completed:
2010

Key concepts:
Energy retrofit with
cogeneration



Photo credit: Mercantile Square Loft

Curtis Apartments Cogeneration Overview and Lessons

- Replaced boiler system and installed cogeneration system simultaneously
- Achieved 50 percent energy savings



CASE STUDY ecoMOD

Owner:
University of Virginia

Location:
Nationwide

Founded:
2004

Key concepts:
Research, education and
sustainable construction



ecoMOD Overview

Uses pre-fabricated components to create efficient and sustainable dwellings and communities

ecoMOD
new units

ecoREMOD
adaptive additions

ecoMOD XS
small or accessory dwellings

Los Angeles Eco-Village Case Study



Eco-Village

Measures	Cost
Insulation	\$9,630
Demand controls for central boiler	\$1,816
Dual pane glass doors	\$20,645
Total Cost	\$32,091
Incentives through DFC	\$32,091
Net Costs	\$0

Cost Savings	
Electric cost savings/year	\$4,700
Gas cost savings/year	\$3,900
Total energy efficiency improvement after rehab	30%

In your opinion which is the greenest project?

- A.) Bellingham Washington
- B.) Curtis Apartments Cogeneration
- C.) ecoMOD
- D.) Eco - Village

Introduction to Green Building and Sustainability

Green Building:

- ✓ Location efficient
- ✓ Conserves
 - energy,
 - water,
 - materials and
 - resources
- ✓ Healthy and accessible
- ✓ Built to last

Introduction to Green Building and Sustainability

What type of project do you anticipate next?

- A.) Weatherization
- B.) Mod Rehab
- C.) Substantial Rehab
- D.) New Construction
- E.) NA

Introduction to Green Building and Sustainability



- Utility costs in public and assisted housing are more than a quarter of operating costs
- Maintenance is more than a third

Introduction to Green Building and Sustainability Integrated Design



Whole Building Design Guild - National Institute of Building Sciences

Introduction to Green Building and Sustainability



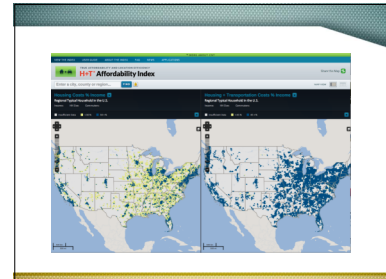
HUD Spends \$7 Billion a Year on Utilities

How would you spend \$1.4 billion in energy savings?

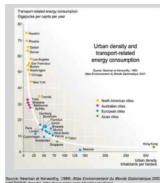
- A.) Tenant services
- B.) Neighborhood renewal
- C.) More housing
- D.) Other

Module 2

Location Efficiency and Site Design



Location Efficiency: Facts and Impact



Location Efficiency: Site Selection



Build here



Not here

What are the most important obstacles to securing affordable housing sites?

- A.) Zoning
- B.) Lag in securing funding
- C.) Neighborhood response (NIMBY)

Location Efficiency: Site Design & Management



CASE STUDY Mercantile Square Lofts

Owner:
Morey Mercantile LLC

Location:
Denver, CO

Completed:
1996

Type:
Mixed-use
renovation



Photo credit: Mercantile Square Lofts

Mercantile Square Lofts Goals

- Honor goal of LoDo District to preserve historic character
- Preserve a beloved landmark
- Provide affordable housing amid rising demand
- Add housing units convenient to urban center and transit



Mercantile Square Lofts Overview

- Multi-unit residential above retail
- Historic rehab in urban setting
- 94 residential units, including 77 affordable
- 133,00 square feet, including 52,000 retail and 18,000 office
- LEED Gold certification



Photo credit: Mercantile Square Lofts

Mercantile Square Lofts Financing

- Equity: LIHTC
- Grant: public agency (state historic grant)
- Loans: Public institution (TIF), traditional mortgage
- Bonds: Tax Increment Financing
- Total project cost (land excluded): \$20.7 million

Mercantile Square Lofts Design

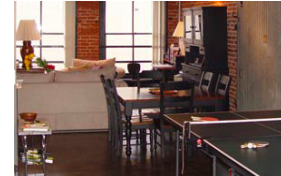
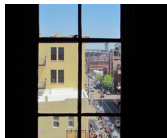


Photo credit: Mercantile Square Lofts

Mercantile Square Lofts Lessons

- Local partnerships can:
- Create and preserve affordable housing
 - Reuse industrial buildings
 - Preserve landmarks
 - Revitalize whole districts
 - Create walkable, transit-oriented neighborhoods



CASE STUDY South Lincoln Redevelopment Project (SoLi)

Owner:
Denver Housing
Authority

Location:
Denver, CO

Completed:
1996

Key concept:
Sustainable,
integrated
redevelopment



Photo credit: Mercantile Square Lofts

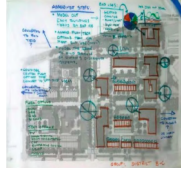
South Lincoln Redevelopment Project (SoLi) Overview

- In Denver's La Alma/Lincoln Park neighborhood
- 270 public housing units on 17.5 acres
- Integrated design and construction process




The map shows the project site in the center, bounded by 17th Ave S, 18th Ave S, and 19th Ave S. The site is surrounded by existing residential areas and commercial streets like Broadway and 17th St. A large green area labeled 'PARK' is visible to the west. The map also shows the 'SOUTH LINCOLN' area and the 'LA ALMA' area. A legend in the bottom right corner identifies the project site, surrounding streets, and landmarks.

- In Denver's La Alma/Lincoln Park neighborhood
- 270 public housing units on 17.5 acres
- Integrated design and construction process



South Lincoln Redevelopment Project (SoLi) Charrettes

- Energy
- Transportation
- Stormwater
- Green Infrastructure

A photograph showing a group of people, including men and women of various ages, standing in a room and looking at large informational displays or maps mounted on a wall. The room has a drop ceiling with recessed lights. The people are dressed in casual to business-casual attire. The displays appear to be maps or diagrams related to urban planning or infrastructure.

- Energy
- Transportation
- Stormwater
- Green Infrastructure



South Lincoln Redevelopment Project (SoLi) Lessons

- Build on existing plans
- Get resident and stakeholder buy-in
- Think beyond the property line
- Create a convening body that promotes interagency communication and collaboration

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- Build on existing plans
- Get resident and stakeholder buy-in
- Think beyond the property line
- Create a convening body that promotes interagency communication and collaboration

Green Site Selection

- Location efficiency
- Solar access
- Environmental preservation

- Location efficiency
- Solar access
- Environmental preservation

Green Site Design

- Solar orientation
- Prevailing winds
- Pedestrian and bicycle access
- Groundwater recharging
- Existing features
- Sustainable planting
- Usable spaces

- Solar orientation
- Prevailing winds
- Pedestrian and bicycle access
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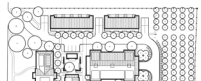
Orchard Gardens

Missoula MT

Developer:
homeWORLD

Architect:
MacArthur, Means
& Wells Architects,
PC

36 units – 30-50%
AMI
7.5 units per acre

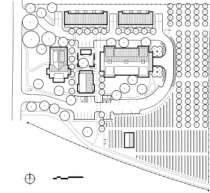


Missoula MT

Developer:
homeWORLD

Architect:
MacArthur, Means
& Wells Architects,
PC

36 units – 30-50% AMI
7.5 units per acre



Orchard Gardens

Photos: Mark Fritch courtesy the Design Advisor



Photos: Mark Fritch courtesy the Design Advisor


Pine Ridge Townhomes

Ketchum, ID

Developer: Thunder Springs LLC

Architect: Living Architecture

32 units- mixed inc.
16.6 units per acre



The site plan illustrates the layout of the Pine Ridge Townhomes development. It features a central cluster of townhome units arranged around a common area with trees and a small pond. A parking lot is located to the left of the main building cluster. A road, labeled 'Pine Ridge Road', runs along the right side of the site. The plan also shows various landscaping elements like trees and shrubs. A legend on the right side of the plan identifies symbols for 'Pond', 'Trees', 'Shrubs', and 'Grass'. A scale bar at the bottom right indicates distances in feet (0, 20, 40, 60, 80, 100).

Ketchum, ID

Developer: Thunder
Springs LLC

Architect: Living
Architecture

32 units- mixed inc.
16.6 units per acre



Pine Ridge Townhomes

Photos: Living Architecture courtesy the Design Advisor



Photos: Living Architecture courtesy the Design Advisors

Site Design: Eastampton Township, NJ




Original Site Plan

- Automobile intensive
- Wide Road Ways
- No relationship of buildings to each other
- Uses more land
- Buildings closer to wetlands
- Building orientation doesn't take advantage of passive solar gain
- Community building and other services not accessible

Courtesy Pennrose Properties/Kitchen & Associates

Site Design: Eastampton Township, NJ




Modified Site Plan

- Compact site plan allowed for nature trail and playing field
- Oriented for passive solar gain
- Community building centrally located
- Narrower road widths
- Rain Gardens
- Housing connected by paths and common spaces - creating sense of community

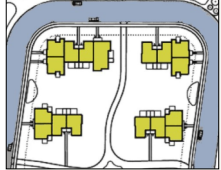
Courtesy Pennrose Properties/Kitchen & Associates

Site Design: Eastampton Township, NJ



Courtesy Pennrose Properties/Kitchen & Associates


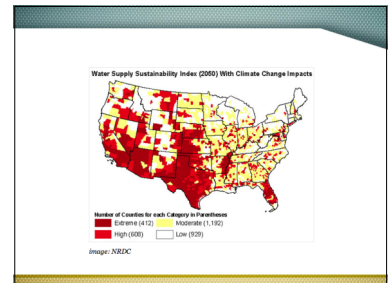
Site Design: Eastampton Township, NJ



Courtesy Pennrose Properties/Kitchen & Associates

Module 3

Water Conservation: Facts and Impact

Water Conservation: Indoor Water Use




Leaking Pump

Enterprise Community Partners

According to the U.S. EPA, if all U.S. households installed water-efficient fixtures and appliances, the country would save more than 3 trillion gallons of water and more than \$18 billion dollars per year.

Water Conservation: Indoor Water Use



Calculate Your Water Savings

1. Enter the number of households:
2. Enter how many people live in each household?
3. What WaterSense labeled products are you interested in?
☐ Faucets ☐ Showerheads ☐ Toilets ☐ Water-saving devices
☐ Low-flow toilets ☐ Low-flow showerheads ☐ Low-flow faucets ☐ Water-saving appliances
4. Select the length of time for estimated savings:

Calculate how much I'll save

WaterSense Meets EPA Criteria

Water Conservation: Stormwater Management



Water Conservation: Irrigation

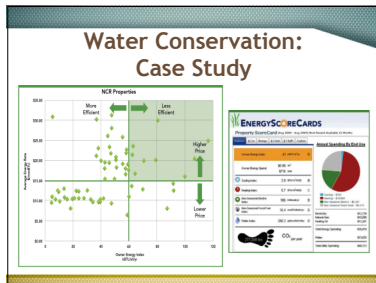
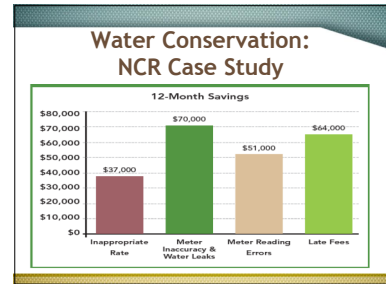
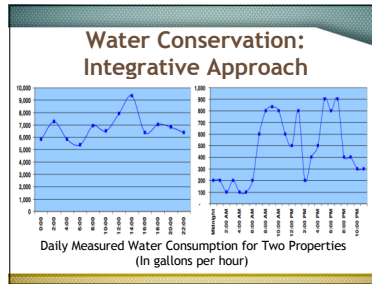
EPA United States Environmental Protection Agency
LEARN THE ISSUES | SCIENCE & TECHNOLOGY | LAWS & REGULATION

About Us Products Outdoor New Homes

WaterSense An EPA Partnership Program

WaterSense / Meet Our Partners

Meet Our Partners



Water Conservation: Case Study

	Cost	Annual Savings	Average Payback Period
Lighting retrofit initiative	\$1.1M	\$300,000	3.6 years
Water conservation initiative	\$183,000 per property	\$213,000 per property	10 months

CASE STUDY CMHA Green Roof Installation

Owner: Cuyahoga Metropolitan Housing Authority

Location: Cleveland, OH

Completed: 2007

Project type: Energy retrofit

Photo credit: Cuyahoga Metropolitan Housing Authority

CASE STUDY Goals

- Reduce storm water runoff
- Reduce roof top temperatures and the "heat island" effect surrounding it
- Reduce heating requirements for the building
- Add visible value

Photo credit: Cuyahoga Metropolitan Housing Authority

CASE STUDY Overview

- Installed in 2007, matured in approximately two years
- Now covering 8,750 square feet on seven buildings at Lakeview Terrace
- Modification of traditional, existing roof system

Photo credit: Cuyahoga Metropolitan Housing Authority

CASE STUDY Financing

Financed through HUD Energy Performance Contracting (EPC) Program

Photo credit: Cuyahoga Metropolitan Housing Authority

CASE STUDY Lessons

- Green roof construction can be part of an overall energy reduction strategy
- Pilot installation can help test a strategy for future implementation
- Energy and Green upgrades can provide job training and opportunity to build resident skills
- Green roofs have community benefits beyond savings




Photo credit: Cuyahoga Metropolitan Housing Authority

Water Conservation: Synthesis

- Indoor
- Outdoor





Photo Kathleen Dugan

Module 4


Resident Health, Safety, and Accessibility: Facts and Impact



Sources of air pollution are in homes, schools, and offices. Some pollutants cause health problems such as sore eyes, burning in the nose and throat, headaches, or fatigue.

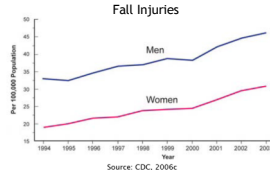
Other pollutants cause or worsen allergies, respiratory illnesses (such as asthma), heart disease, cancer, and other serious long-term conditions.

Sometimes individual pollutants at high concentrations, such as carbon monoxide, cause death.



Resident Health and Safety: Facts and Impact

Fall Injuries



Source: CDC, 2006c

Resident Health and Safety: Facts and Impact

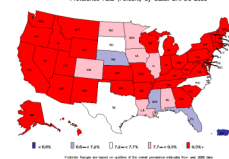


Fall injuries: curb cut summer (left) and winter (center and right)

Source: Toronto Rehabilitation Institute

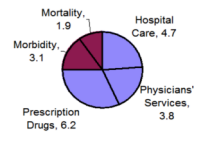
Asthma National Perspective

Map C1
Adult (18+)-Reported Current Asthma Prevalence Rate (Percent) by State, BRFSS 2008




Source: Behavioral Risk Factor Surveillance System, CDC

Resident Health and Safety: Facts and Impact



\$19.7 Billion Asthma Cost in US 2007, NIH, 2007

Housing-based Asthma Triggers



Courtesy New Ecology, INC

Resident Health and Safety: Facts and Impact





The EPA ranks indoor air pollution among the top five environmental risks to public health.

MERV Filtration

MERV Rating	Efficiency Range (%)	Particle Size Range (microns)	Typical Applications
1-4	1-10	10-100	Residential HVAC systems
5-8	10-20	10-100	Commercial HVAC systems
9-12	20-40	10-100	Commercial HVAC systems
13-16	40-90	10-100	Commercial HVAC systems
17-20	90-99.9	10-100	Commercial HVAC systems

HEPA – 99.97% plus

Resident Health and Safety: Healthy Building Materials




Resident Health and Safety: Indoor Air Quality

Water Vapor	Bulk Moisture	Condensation
<ul style="list-style-type: none"> Shower Cooking Humidifiers Evaporated Bulk Moisture 	<ul style="list-style-type: none"> Standing water Roof Leaks Plumbing Leaks Ice Dams 	<ul style="list-style-type: none"> Exposed Ductwork Windows Condensed Water Vapor

Moisture is the #1 cause of structural failure

Resident Health and Safety: Indoor Air Quality

Proper ventilation is vital for:

- Moisture control
- Indoor Air Quality
- Combustion Appliances
- Comfort



Resident Health and Safety: Integrated Pest Management



QualityPro Green GreenShield EcoWise

Resident Health and Safety: Integrated Pest Management

- Property Managers should use IPM methods
- Reduce food, water that attracts them.
- Use baits & gel, NOT sprays
 - Won't work if contaminated by strong-smelling cleaners or other chemicals, pesticide sprays or foggers or nicotine from cigarette smoke.
 - Use in every room.
- Tenants are key partners.

Enterprise Community Partners

Resident Health and Safety: Integrated Pest Management

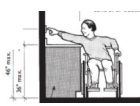


Resident Health and Safety: Accessibility




Common Compliance Oversight: Curb Ramp Creates Excessive Cross Slope

Accessibility



ADA – All public spaces
Section 504 - Apartments

Resident Health and Safety: Accessibility - Visitability

- At least one zero-step entrance approached by an accessible route on a firm surface no steeper than 1:12, proceeding from a driveway or public sidewalk
- Wide passage doors
- At least a half bath/powder room on the main floor



Visitability

Resident Health and Safety: Accessibility - Visitability



On flat lots...
on steep lots...
On high-end houses...
Detached houses...
and town houses...
and inexpensive houses

Photo Credit: concrete change.org

Resident Health and Safety: Integrative Approach

Increased collaboration has decreased:

- Second hand smoke
- Unintentional Injuries
- National Disasters
- Lead Hazards
- Radon Risk

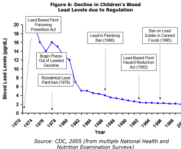
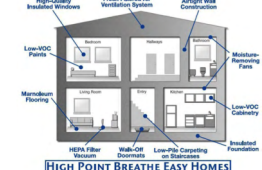


Figure 4: Decline in Children's Blood Lead Levels due to Regulation

Source: CDC, 2005 (from multiple National Health and Nutrition Examination Surveys)

Resident Health and Safety: Case Study




HIGH POINT BREATHE EASY HOMES

Resident Health, Safety, and Accessibility: Synthesis



Module 5

Materials and Resources



CASE STUDY Wheeler Terrace

Owner: Community Preservation and Development Corp
Location: Washington, DC
Completed: April 2012
Type: Deep Renovation



Photo credit: Enterprise

Wheeler Terrace Goals

- Saving affordable apartments that are near transit along with recreational, cultural and medical resources, while reusing older buildings
- Saving energy, resources and money over the long term through Green retrofit
- Improving health measurably by improving indoor air quality
- Revitalizing the site and connecting it with the larger urban area



Photo credit: DCMAI Blog

Wheeler Terrace Strategies

- Formed tenant association and purchased property
- Assigned rights to CPDC
- Re-secured Section 8 status



Photo credit: National Center for Healthy Housing

Wheeler Terrace Overview

- 116 total units
- 133,000 SF
- Urban setting
- LEED Gold

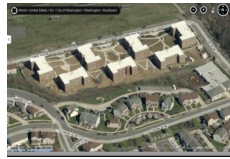


Photo credit: Bing Maps

Wheeler Terrace Financing

Equity: LIHTC

Grant: Private (foundation), public agency (ARRA)

Loans: Public institution

Total project cost (land excluded): \$32,000,000, (\$131,000 per unit)

Wheeler Terrace Design Elements

- Walls insulated and windows replaced
- New roof coating and one green roof
- Low-volatile finishes, sealants, adhesives and carpets
- Geothermal heat pump
- Energy STAR appliances and lighting
- Stormwater sand filter system



Photo credit: Enterprise

Wheeler Terrace Indoor Environment



Photo credit: DCMed Blog

Wheeler Terrace Lessons

- Derelict properties can be turned around with strategic partnerships and green design strategies
- Indoor air quality, a tenant priority, can become a measurable goal
- Making tenants a partner in the development helps them take ownership of the changes

Materials and Resources: Reuse & Waste Reduction

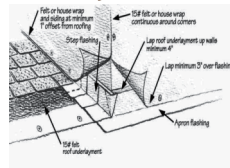


Photo: Kathleen Duggan

Materials and Resources: Durability

Standing against



Moisture
Sunlight (UV radiation)
Temperature
Chemicals
Insects
Fungi
Natural Hazards
Wear and Tear



Materials and Resources: General Cond. & Certifications



Energy Efficiency: HUD New Construction

FEMP

FEDERAL ENERGY MANAGEMENT PROGRAM

ENERGY STAR Buildings

ENERGY STAR Buildings Feature...











©EPA

Materials and Resources: Integrative Approach

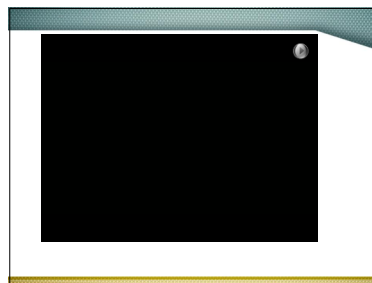


KACorpus

Materials and Resources: Case Study



SEEDocs: One'neh Bupingeh Preservation Plan and Rehabilitation Project



CASE STUDY Housing Nantucket

Owner:
Housing Nantucket

Location:
Nantucket, MA

Started:
1994

Program:
Recycling structures




Photo credit: Housing Nantucket

Housing Nantucket Goals and Achievements

- Founded in 1994 to retain residents who would otherwise have to leave.
- Moved unwanted homes to new sites and created 26 rental units.
- Available to those earning 50-100 percent of median



Photo credit: Housing Nantucket

Housing Nantucket Organization and Financing

- Two paid staff and an annual budget of \$600,000
- Projects funded from fees and from private and public granting sources




Photo credit: Housing Nantucket

Housing Nantucket Operations




Photo credit: Housing Nantucket

Housing Nantucket acquires vacant sites from the Nantucket Housing Authority and the Town of Nantucket

Housing Nantucket Operations



Photo credit: Housing Nantucket

A rehabbed house awaits its new tenant.

Housing Nantucket Lessons

- Unwanted but sound houses can be reused on vacant lots, preserving community character and fabric
- Historic housing can be made into a vital part of the affordable housing supply and the future of the community

Synthesis

Green Building Issues covered this morning:

- Location
- Site Planning
- Water Conservation and control
- Health and Safety
- Accessibility
- Materials and Resources




Lunch ☺

Module 6

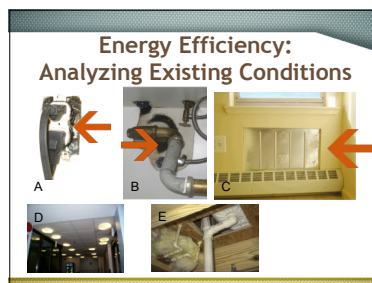
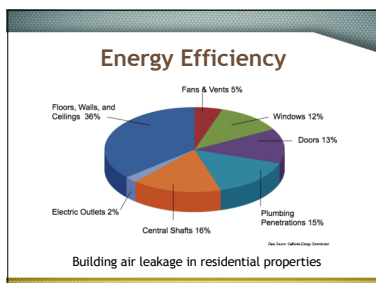
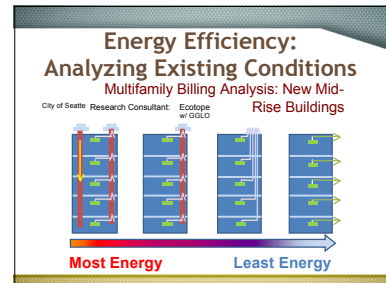
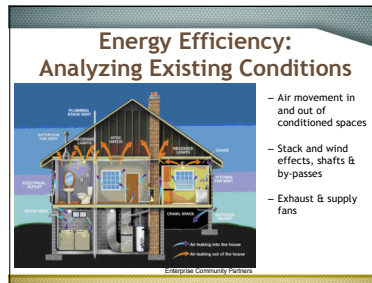
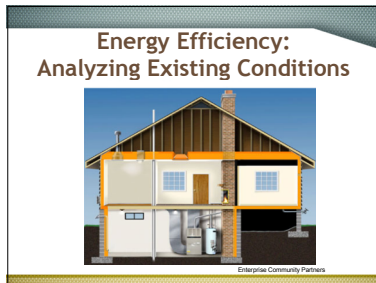
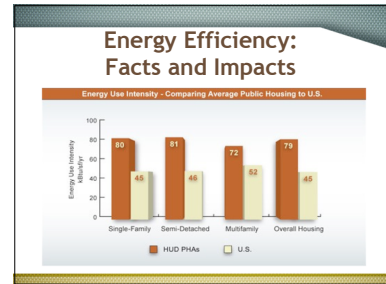
Energy Efficiency



Energy Efficiency





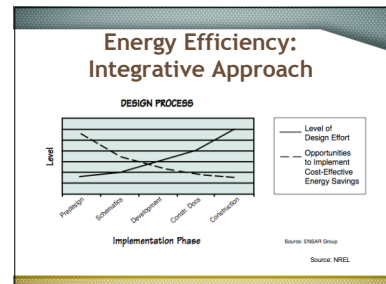
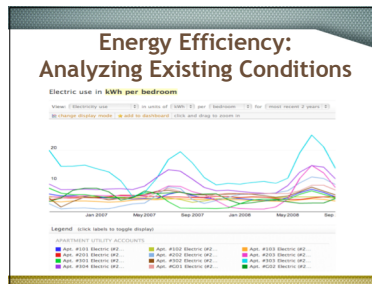
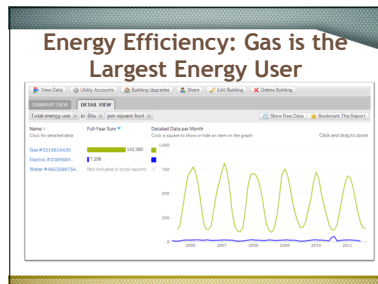
- Continuous Drainage Plane, Air Barrier and Insulation
- Properly-sized HVAC System
- Properly-installed HVAC System



Energy Efficiency: Analyzing Existing Conditions

- ENERGY AUDIT
- Research
- Energy and Water Data
- Review of operations
- Physical Inspection
- Analysis
- Recommendations



Module 7

Operations & Maintenance: Facts and Impact

Several studies over the past few years have indicated that existing U.S. commercial office buildings hold tremendous opportunities for increasing energy efficiency through low-cost O&M improvements. These improvements can yield savings of five to twenty percent of a building's annual utility bill. Simple paybacks are generally less than 2 years, which equals a 98% IRR (based on a 7 year measure life.)

Operations & Maintenance: Training

The slide features logos for the Building Performance Institute, Inc. and the LEED for Homes Green Rater Candidate Handbook. The BPI logo is on the left, and the LEED logo is on the right.

CASE STUDY

Paisano Senior Housing

Owner: HACEP
Location: El Paso, TX
Completed: 2012
Program: Net Zero Energy

Photo credit: Workshop

Paisano Senior Housing Goals

- Site reuse
- Net zero energy
- High quality living environment
- Visitable
- Highest design quality

Paisano Senior Housing Overview

- Reuse of existing site
- 14 structures united by common wall and garden
- 1 and 2 bedrooms plus SROs
- All wheelchair adaptable

Paisano Senior Housing Financing

- Total project cost: \$10 million
- Financing:
 - \$8.25 million from ARRA initiative
 - \$1.6 million from Housing Authority of El Paso
 - \$.5 million El Paso city loan
 - Donations: Local residents and building owners

Paisano Senior Housing Features

- Tall canopy wall shelters west side
- Wind turbines
- Rooftop solar panels
- Solar chimneys
- Rooftop gardens



Paisano Senior Housing Lessons

- Overall design excellence goes hand in hand with the highest goals of energy conservation
- With strong partnerships at the local and national levels, it is possible to reach net zero energy use
- In accommodating disabilities, 'visitability' is an important value

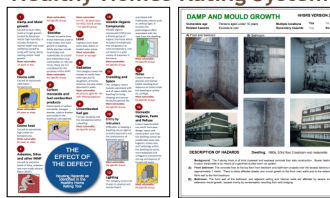
Operations & Maintenance: Recycling



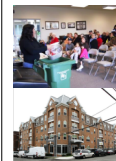
PHA Administrative Offices

- Administrative Offices
- Appliances
- Deconstruction
- Revenue Generating Opportunities

Operations & Maintenance: Healthy Homes Rating System



CASE STUDIES Green Cleaning Policy



There are several examples of organizations integrating green cleaning policies into their housing communities.

CASE STUDY Sherwood Village Senior Apts.



Photo credit: CHSRA

- Salinas, CA
- An innovative composting and recycling program
- Includes YouTube instructional videos on recycling and composting
- Approximately 9 tons of material is recycled annually

CASE STUDY HELP USA



Photo credit: HELP USA

- Housing for veterans and formerly homeless
- Program of "green lifestyles" for residents

Enterprise Community - Training In A box (TIAB)

- Four workshops, 30 min each
- Healthy Living module focuses on cleaning




Enterprise Community - Training In A box (TIAB)

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Green Physical Needs Assessment (GPNA)


A projection of future needs and costs based on a condition and operations assessment that includes an Energy Audit




Green Physical Needs Assessment (GPNA)

Includes:

- Assessment of property conditions and identification of necessary repairs and replacements
- Operating cost analysis and projections
- Energy Audit findings including potential savings through energy and water efficiency measures
- Integrated Pest Management Plan



Synthesis



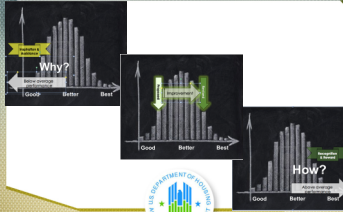

4 Asbestos, Silica and other MMF
Caused by excessive levels of silica, asbestos and man-made mineral fibers (MMF).

What are the challenges of integrating:


- IPM, recycling, and composting?
- Energy efficiency and indoor air quality?

Module 8

Green Building Standards & Codes: Facts and Impact

Energy Efficiency Codes




2012 IECC:

- 15% more Energy Efficient than 2009
- 30% more Energy Efficient than 2006

Adopted locally with State variations.

Some States and localities use Other codes






"Above Code" Programs






ENERGY STAR

Complete Thermal Enclosure System	High-quality insulation & fenestration Proper installation & air sealing Reduced thermal bridging
Complete Heating & Cooling System	Fully-engineered design Best practice installation Fresh air & exhaust
Complete Water Management System*	Water-managed site, foundation, walls, and roof *Not required for MHR

ENERGY STAR

ENERGY STAR QUALIFIED HOMES
THERMAL ENCLOSURE SYSTEM RATER
CHECKLIST

SECTION 3. FULLY ALLIGNED AIR BARRIERS *

3.1 Walls¹⁾
3.1.9 All other exterior walls

Electrical box not air sealed.

Wiring penetrations properly air sealed.

ENERGY STAR

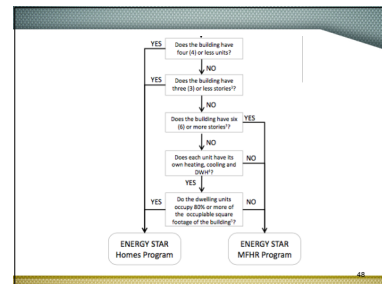
Residential Programs apply to:

- Single Family Homes (detached and attached)
- Factory Built Homes (manufactured and modular)
- Low Rise Residential Buildings
- Mid and High Rise Residential Buildings*

Certified Homes

MFHR

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ENERGY STAR Certified Home

Each ENERGY STAR certified home is independently verified to be at least 15% more energy efficient than a home built to the 2009 International Energy Conservation Code (IECC), and includes additional measures that deliver a total energy efficiency improvement of up to 30% compared to a typical new home.

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ENERGY STAR Certified Homes

Raters

- Builders must work with a Home Energy Rater to gain the ENERGY STAR certification.
- Raters provide:
 - Third party verification
 - Quality assurance
- Raters are trained to:
 - Evaluate construction techniques
 - Take key measurements
 - Perform inspections

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ENERGY STAR Certified Homes

1. Check eligibility.
2. Check Benchmark Home Size.
3. Select Version 3 energy efficiency measures.

Prescriptive Path

1. Build the home using the ENERGY STAR Reference Design.
2. Complete the inspection checklists.

Performance Path

1. Model the home and find the ENERGY STAR HERS Index Target.
2. Select upgrades that achieve a HERS Index \leq ENERGY STAR HERS Index Target and meet other program requirements.
3. Complete the inspection checklists.

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ENERGY STAR Contractor Certification

Energy Star v3

Builders - ENERGY STAR Orientation

HVAC Contractor - ACCA's Quality Assured Contractor Program or Advanced Energy's Quality-Assured Professional Program

ENERGY STAR Multi Family High Rise

Each ENERGY STAR certified mid and high rise project is verified to be at least 15% more energy efficient than a building built to the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 90.1-2007.


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ENERGY STAR MFHR Verifiers

- Developers must work with a Licensed Professional to gain the ENERGY STAR certification.
- Licensed Professionals are Registered Architects or Professional Engineers who:
 - Oversee a team of verification providers (e.g. Rater, HVAC Contractor, Test and Balance Engineer)
 - Quality assurance
 - Fulfill program reporting requirements (Stamped and Signed)

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ENERGY STAR MFHR



1. Check eligibility.
2. Select ES MFHR energy efficiency measures.

Prescriptive Path

1. Design the building using the ENERGY STAR MFHR Prescriptive Path.
2. Submit Proposed Design Submittal
3. Complete the T&V protocols and checklists through construction
4. Submit As-Built Submittal

Performance Path

1. Model the building per ASHRAE 90.1 Appendix G and ES Simulation Guidelines
2. Select upgrades that achieve a Performance Target of $\geq 15\%$ and meet other program Prerequisites.
3. Submit Proposed Design Submittal
4. Complete the T&V protocols and checklists through construction
5. Submit As-Built Submittal


ENERGY STAR MFHR



ENERGY STAR Multifamily High Rise Project Application, Version 1.0

- Partnership Agreement w/ Energy Star
- Application
- Calculation
- Verification
- Benchmarking - 2 years


EPA Indoor airPLUS



HERS Raters Review of:

- Moisture Control
- Radon Control
- Pest Barriers
- HVAC System
- Combustion Pollutant Control
- Low Emission Materials
- Home Commissioning

"Above Code" Programs



Leadership in Energy and Environmental Design (LEED). Guidelines set by US Green Building Council (USGBC) to attain and independently verify improved performance in areas of sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality.

Courtesy P3L Integrated Solutions

Enterprise Green Communities



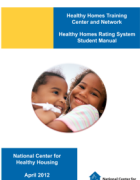
2011 Enterprise Green Communities Criteria

LEED

- LEED for Homes
- Multi-family mid-rise
- REGREEN Residential
- LEED-EB:O&M
- LEED-ND




Healthy Homes Rating System




National Center for Healthy Housing
April 2012

Scores hazards:

- Physiological
- Psychological
- Infection
- Safety

Passive House

Includes:



- Airtight shell
 $\leq 0.6 \text{ ACH} @ 50 \text{ pascal pressure}$
- Low heating requirement
 $\leq 15 \text{ kWh/m}^2/\text{year} (4.75 \text{ kBtu/sf/yr})$

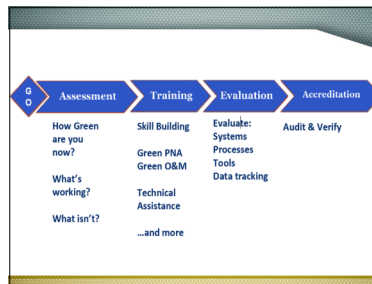
Green Building Standards & Codes



Diagram showing three overlapping circles: Energy, Environment, and Society. Below them is a bar chart with four bars labeled: SOCIAL, ECONOMIC, ENVIRONMENTAL, and DESIGN.

Module 9

Organizational Sustainability: Internal Assessment and HUD Accreditation



Organizational Sustainability Sustainability Policy

- Energy and Water Efficiency
- Employee Health, Training and Productivity
- Recycling and Purchasing
- Resident Training
- Connection to Local Sustainability Plan

Resource: Enterprise Resident Engagement Training in a Box

CASE STUDY Eden Housing

Founded:
1968

Location:
Alameda County,
CA

Example:
Sustainable
Organization

Photo credit: Eden Housing

Overview Eden Housing

- 230 staff members
- \$10.2 million budget
- 6,400 affordable housing units in 88 properties

Eden Housing Goals

- Embarked on three-year program to make the organization sustainable
- New construction exceeds stringent state standards by 15 percent

Photo credit: Eden Housing

Eden Housing Sustainable Leadership

- Digital Connectors
- Think Green program
- Podcast and resident training

Photo credit: Eden Housing

Eden Housing Lessons

- It is possible to make a commitment to green in all parts of an affordable housing organization.
- Build success and commitment beginning with small steps and education.
- Incorporate over time for entire portfolio, and measure results.
- Involve young residents in leadership through media training and technology.

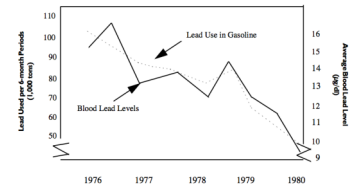
Organizational Sustainability Review



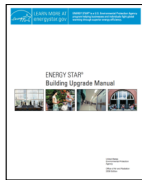
Module 10

HUD Requirements and Green Building Standards

Facts and Impacts



Green Building Standards and Codes



ENERGY STAR appliances



WaterSense Fixtures



Green Building Standards and Codes

- New Construction with Federal Grants
 - ENERGY STAR Certified Home or Multifamily Mid and High Rise (MFHR)
 - IECC or more advanced energy code

Green Building Standards and Codes

High Rise

- Latest Standard
 - 90.1 - 2010



- HUD Default Standard
 - 90.1 - 2004

American Society of Heating, Refrigerating & Air Conditioning Engineers

2012 IECC

America's primary residential energy code is the International Energy Conservation Code or IECC.

2012 IECC-regulated features will use 30% less energy compared to those that comply with the 2006 IECC.

- Regulated features:
 - Insulation & Fenestration
 - Infiltration limits
 - Duct insulation, sealing and testing
 - HVAC controls
 - Equipment sizing
 - Dampers
 - Lighting



Courtesy PSL Integrated Solutions

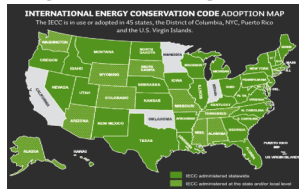
Green Building Standards and Codes

- HUD Standard
 - IECC 2006

- Latest Standard
 - IECC 2012



Green Building Standards and Codes



Insulation and Fenestration Requirements

Minimum R-values

- Roofs
- Walls
- Foundations

R-value indicates resistance to heat flow; higher in cold climates

Maximum U-values

- Windows
- Skylights

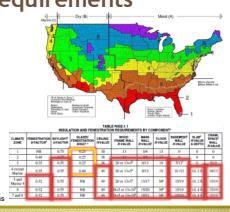
U-value = 1/R-value; lower in cold climates

Maximum SHGC

- Windows
- Skylights

Solar Heat Gain Coefficient; lower in warm climates

Courtesy PSL Integrated Solutions



Insulation Requirements

IECC vs. "Above Code" Programs

(Climate Zone 5 used for all values)

	IECC 2009	IECC 2012	ENERGY STAR v3	LEED FOR HOMES*
Ceiling insulation	R38	R49	R38	Credit
2x6 ext. studs or 1" rigid insulation (R13 + 5)	x	x	x	Credit
Foundation wall insulation R-value (continuous or cavity)	10/13	15/19	10/13	Credit
Windows U-value	< 0.35	< 0.32	< 0.30	< 0.35

Courtesy PSL Integrated Solutions

Green Building Standards and Codes

ENERGY STAR for New Homes

Includes ENERGY STAR for new construction Low-Rise Residential Units

ENERGY STAR Qualified Multifamily High Rise Buildings

for new or substantially rehabilitated



Green Building Standards and Codes

1. New Construction with federal grants
2. Other new construction with federal resources (such as loans) - current IECC and/or ASHRAE
3. Substantial rehabilitation - measures recommended in Green Capital Needs Assessment
4. Moderate/other rehabilitation - at minimum, Energy Star and WaterSense products and appliances
5. Energy Retrofits - cost-effective measures determined by energy audit

Green Building Standards and Codes

New Construction requirement	Already reflect the requirement	Changes required to reflect the alignment
ENERGY STAR for: •Homes •Multifamily •Builders Challenge	HUD •Choice Neighborhoods •Housing Trust Fund •Neighborhood Stabilization Program-3 •Section 202/Section 811 •Self-Help Ownership Opportunity Program (SHOP)	Proposed HUD •HOME Investment Partnerships Program •HOPE VI

*****CDBG not included*****

Green Building Standards and Codes

New Construction requirement	Already reflect the requirement	Changes required to reflect the alignment
Minimum	<ul style="list-style-type: none"> • IECC- International Energy Code Council • ASHRAE- America Society of Heating, Refrigeration and Air-Conditioning Engineers 	<ul style="list-style-type: none"> HUD •Public Housing Capital Fund •Operating Grants •Multifamily Insurance Programs USDA •Section 515 New Const. •Section 514/16 Farm & Labor Housing •Multifamily Preservation & Revitalization •Section 538 Guaranteed Rural Rental Housing

No Changes

HUD Requirements

HUD Reporting PHAs

- Energy Performance Information Center (EPIC) - Capital Funds - ECMS
- CDBG/HOME**
- IDIS - EnergyStar units, energy efficiency

Green Building Standards and Codes



ENERGY STAR Benchmarking Starter Kit

Streamlining your building's energy performance is a key first step in understanding and reducing energy consumption and your carbon footprint. All buildings can access their energy performance, water efficiency, and carbon emissions using Portfolio Manager.

You can [Sign up for Portfolio Manager](#) to:

- Track energy and water consumption
- Identify under-performing buildings
- Benchmark
- Monitor progress
- Verify improvements
- Receive EPA recognition

Module 11

Reflection and Review

Synthesis