Best Practices for Building Operations and Maintenance

HUD GREEN ACADEMY
Course 3

Funding for this educational program is provided by the U.S. Department of Housing and Urban Development

Shaun Donovan, Secretary

HUD Green Academy Training

- Course 1 — Intro to Green Building for Affordable Housing
- Course 2 — Executive Decision-Making in Green Building
- Course 3 — Best Practices for Building Operations and Maintenance
- Course 4 — Financing Green Building
- Course 5 — Energy Performance Contracting for Small PHAs

Course Summary

This course covers basic sustainable operations and maintenance (O&M) concepts for affordable housing.

Participants will learn how to assess opportunities for: greening operations, setting goals, and measuring performance for ongoing O&M, including energy and water saving opportunities

Concepts for purchasing and waste management as well as green cleaning and integrated pest management are also discussed.

The importance of engaging occupants and providing resident education will be discussed.

Finally, O&M concepts and practices will be applied through case studies and hands-on exercises.

COURSE OBJECTIVES

- Understand basic sustainable O&M concepts and practices in affordable housing.
- Explain how to measure and verify building performance for on-going O&M.
- Discuss effective purchasing and waste management.
- Learn green strategies for cleaning, landscaping, and integrated pest management.
- Learn how affordable housing managers implement green repair programs.
- Identify tools to assist in resident education.

AGENDA

- Module 1 Introduction to O&M Concepts and Practices
- Module 2 Evaluating Building Performance
- Module 3 Exercise – Green Unit Turn
- Module 4 Maintaining Energy and Water Efficiency
- Module 5 Exterior Maintenance and Landscaping

AGENDA

- Module 6 Preventative Maintenance
- Module 7 and Operating Safe, Healthy, Accessible Housing
- Module 8 Reducing Waste and Materials
- Module 9 The Green O&M Plan & PNA
- Module 10 Exercise – Green O&M Plan
- Module 11 Resident Education and Engagement

Module 1

Introduction to O&M Concepts and Practices

Defining Sustainability

Photo: Studio E Architects Courtesy Design Matters

Defining Sustainability

Review of Course 1:

Introduction to Green Building for Affordable Housing

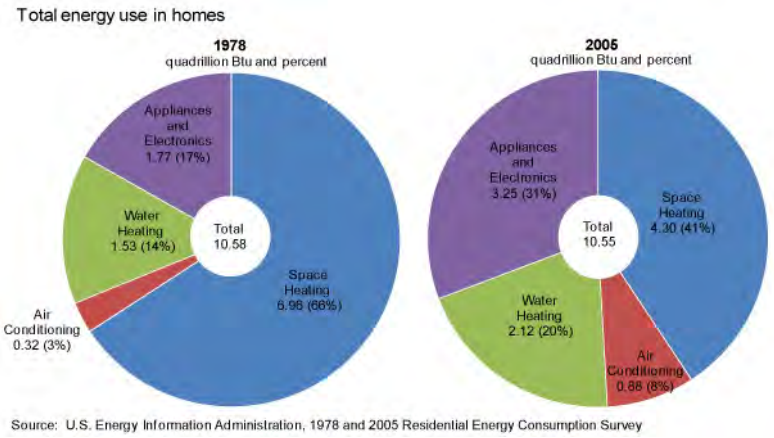
Importance of O&M in Sustainable Buildings

Importance of O&M in Sustainable Buildings

The benefits of sustainable O&M practices can include:

- Reduced utility bills
- Extended service life for equipment and materials
- Lower levels of indoor air pollution
- Reduced material waste
- Faster and cheaper unit turn-around
- Fewer occupant complaints and vacancies

Importance of O&M in Sustainable Buildings



Source: U.S. Energy Information Administration, 1978 and 2005 Residential Energy Consumption Survey

Importance of an O&M Plan

Importance of an O&M Plan

A good O&M Plan includes the following key elements:

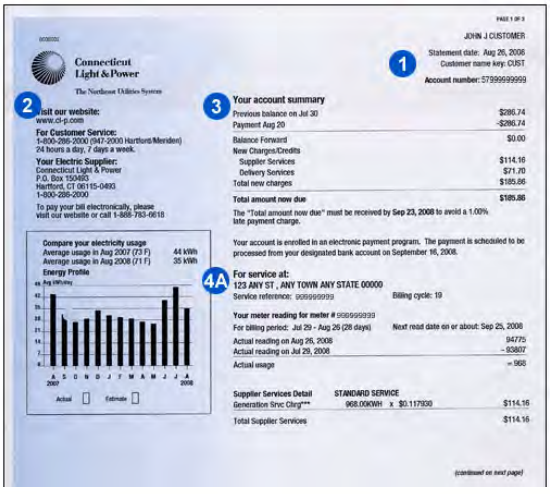
- Equipment Information
- Routine Maintenance
- Record Keeping
- Training
- Plan Accountability

Importance of an O&M Plan

Module 2

Evaluating Building Performance

Evaluating Building Performance



Connecticut Light & Power
The Northeast Utilities System

JOHN J CUSTOMER
1 Statement date: Aug 26, 2008
Customer name key: CUST
Account number: 57999999999

2 Visit our website:
www.cl-p.com
For Customer Service:
1-800-286-2000 (947-2000 Hartford/Meriden)
24 hours a day, 7 days a week.
Your Electric Supplier:
Connecticut Light & Power
P.O. Box 150493
Hartford, CT 06115-0493
1-800-286-2000
To pay your bill electronically, please visit our website or call 1-888-783-6618

3 Your account summary

Previous balance on Jul 30	$286.74
Payment Aug 20	-$286.74
Balance Forward	$0.00
New Charges/Credits	
Supplier Services	$114.16
Delivery Services	$71.70
Total new charges	$185.86
Total amount now due	$185.86

The "Total amount now due" must be received by Sep 23, 2008 to avoid a 1.00% late payment charge.

Your account is enrolled in an electronic payment program. The payment is scheduled to be processed from your designated bank account on September 16, 2008.

Compare your electricity usage
Average usage in Aug 2007 (73 F) 44 kWh
Average usage in Aug 2008 (71 F) 35 kWh
Energy Profile
Actual Estimate

4A For service at:
123 ANY ST , ANY TOWN ANY STATE 00000
Service reference: 999999999 Billing cycle: 19

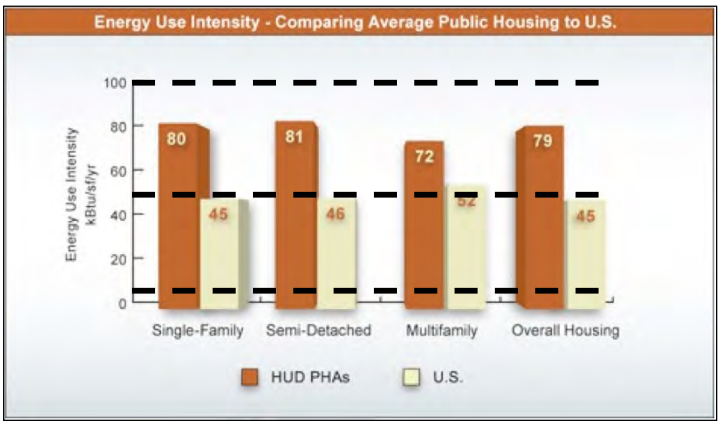
Your meter reading for meter # 999999999
For billing period: Jul 29 - Aug 26 (28 days) Next read date on or about: Sep 25, 2008

Actual reading on Aug 26, 2008	94775
Actual reading on Jul 29, 2008	- 93807
Actual usage	= 968

Supplier Services Detail	STANDARD SERVICE		
Generation Srvc Chrg***	968.00KWH	x $0.117930	$114.16
Total Supplier Services			$114.16

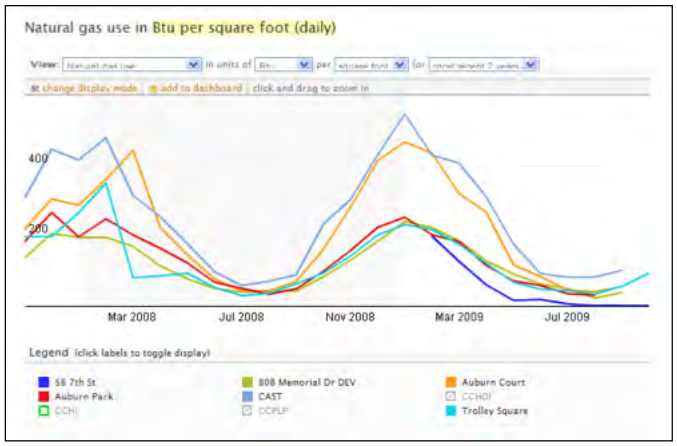
(continued on next page)

Evaluating Building Performance



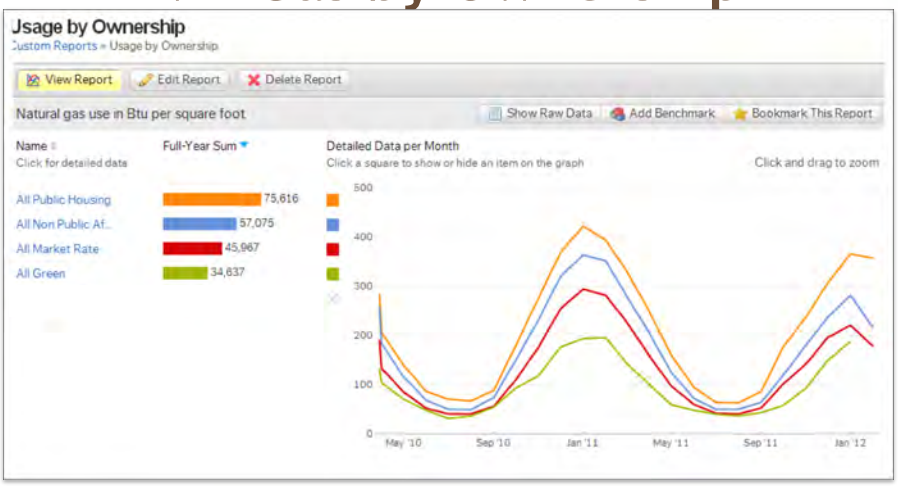
Benchmarking Utility Usage in Public Housing, HUD 2007

Evaluating Building Performance: Portfolio of Buildings in Boston



Benchmarking Properties for Energy Usage, Enterprise Community Partners

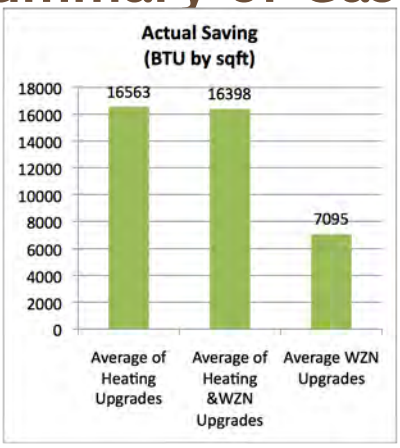
MA Gas by Ownership

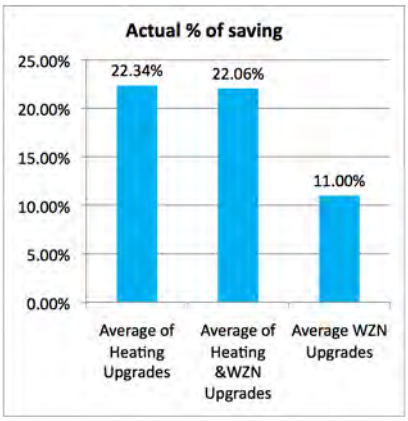


Targeting Heating Energy

Courtesy New Ecology, Inc.

Summary of Gas Upgrades Savings

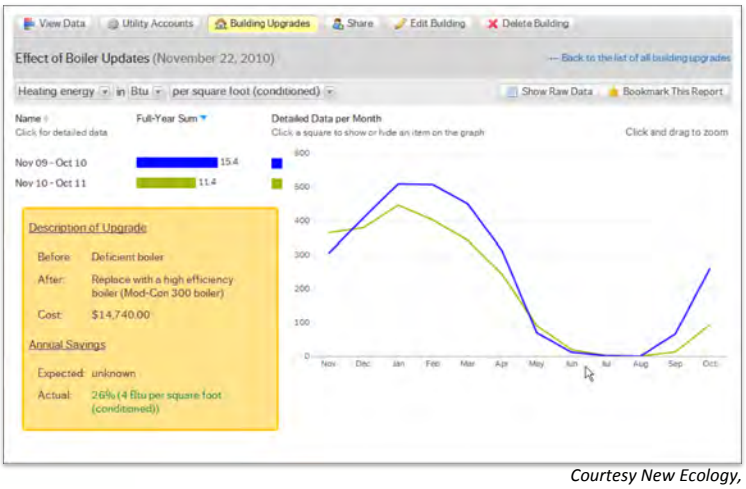




Reductions of ~3 BTU/SF/HDD for heating and 1.3 for WZN

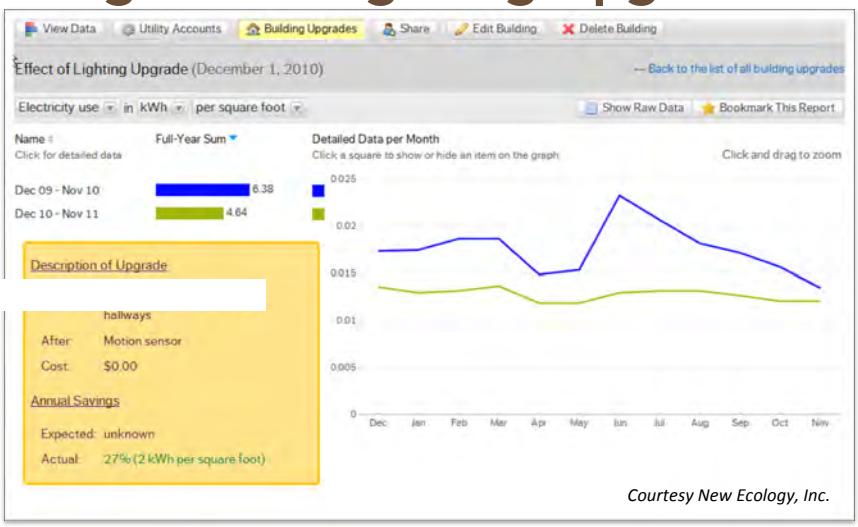
Courtesy New Ecology, Inc.

Boiler Replacement



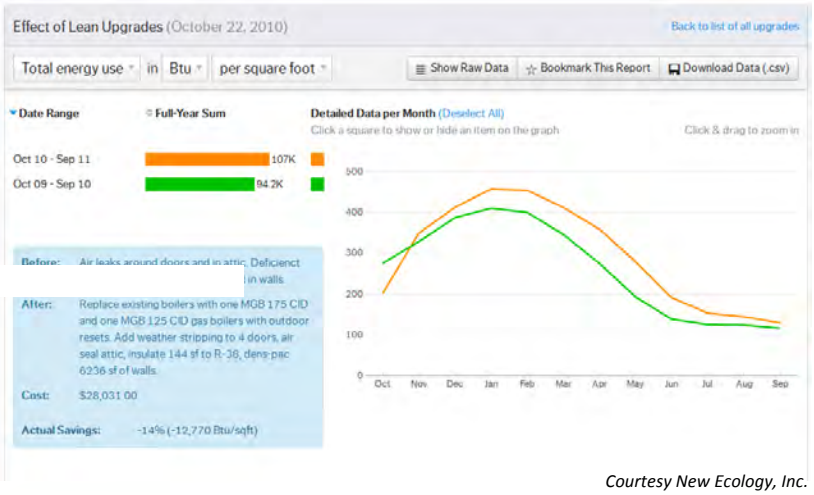
Courtesy New Ecology, Inc.

High Rise Lighting Upgrades



Courtesy New Ecology, Inc.

Unsuccessful Boiler Upgrade

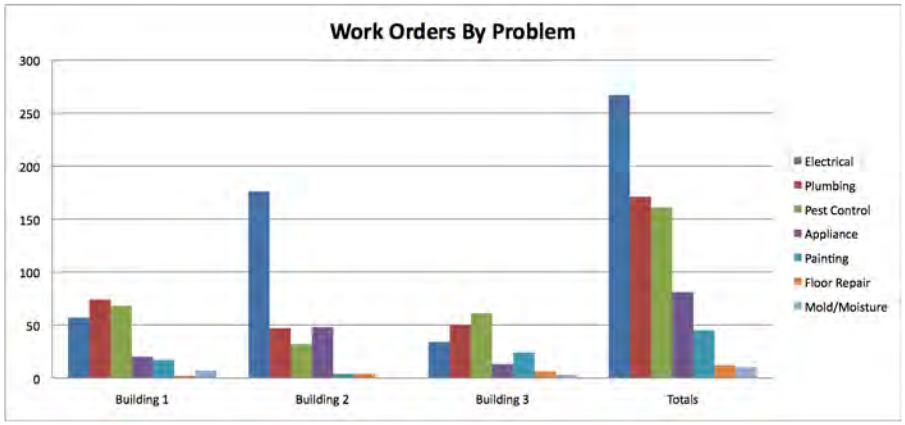


Courtesy New Ecology, Inc.

Controls

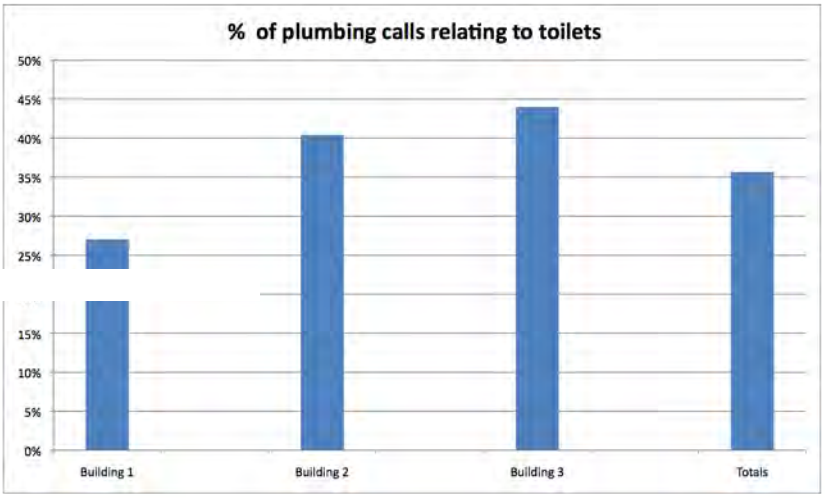
Courtesy New Ecology, Inc.

Maintenance Budget

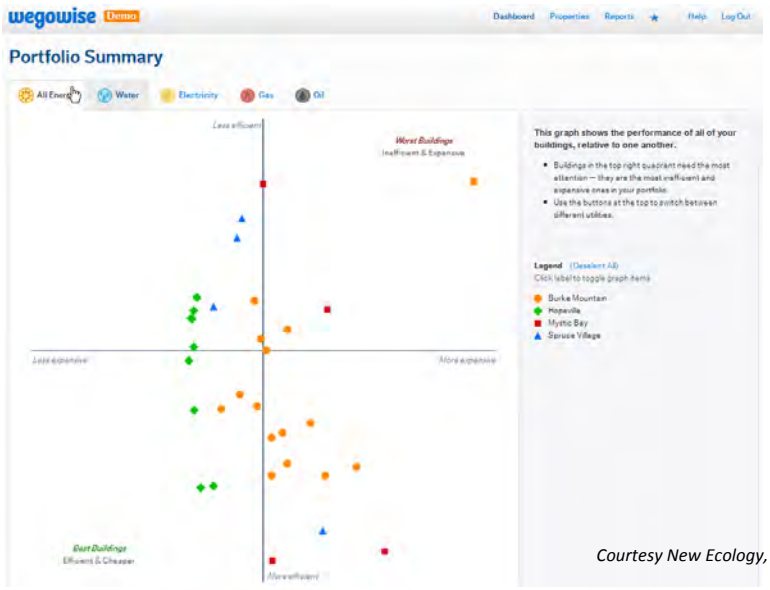


Courtesy New Ecology, Inc.

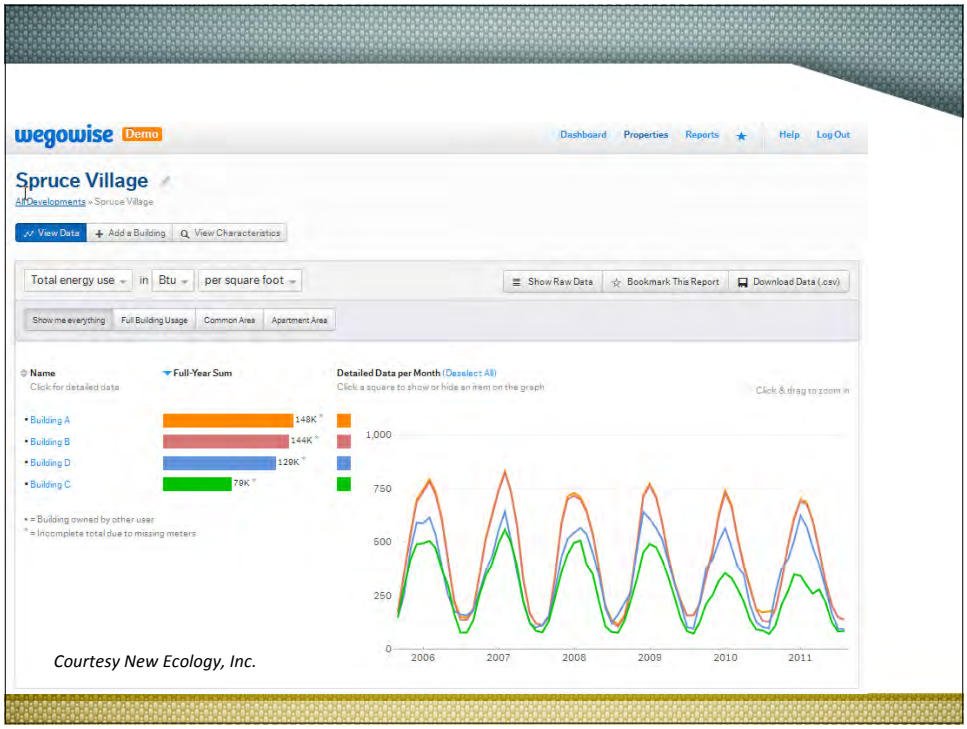
Toilet Repair



Courtesy New Ecology, Inc.

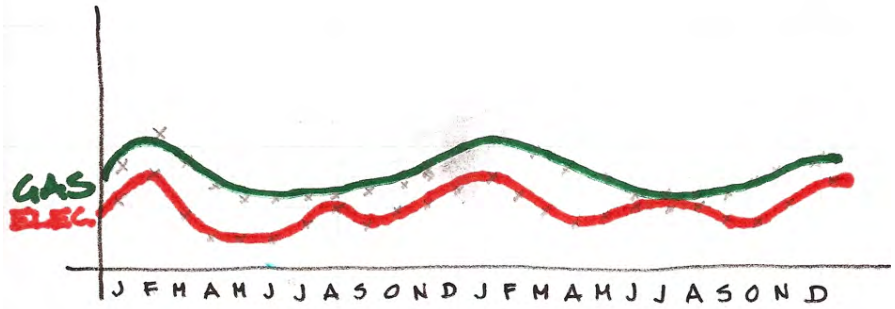


Courtesy New Ecology, Inc.

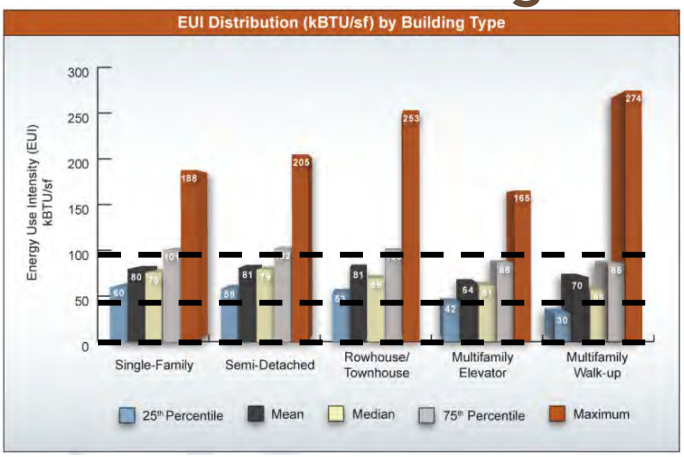


Courtesy New Ecology, Inc.

Evaluating Building Performance: Benchmarking

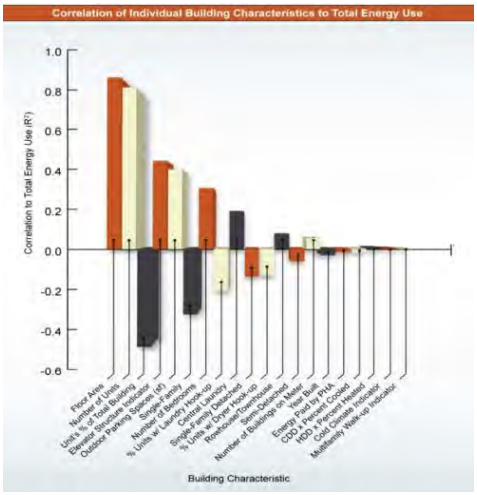


Evaluating Building Performance: Benchmarking



Benchmarking Utility Usage in Public Housing, HUD 2007

Evaluating Building Performance



Benchmarking Utility Usage in Public Housing, HUD 2007

Benchmarks Used by New Ecology for Mass Housing

Heating:	10 BTU/SF/HDD
Water Use:	60 G/BR/D
DHW:	25000 BTU/BR/D
Total Building Electric:	5-6 kWh/SF*
Common Area Electric:	5.6 kWh/SF

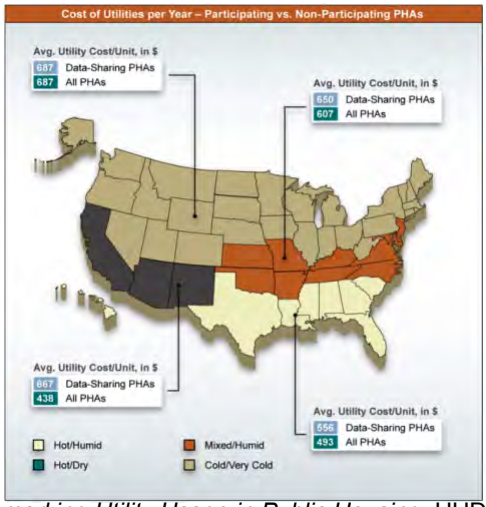
*Depending upon building type

Evaluating Building Performance

- Where are you now?
- What's your goal?
- How will you get there?

Provided courtesy US DOE

Evaluating Building Performance



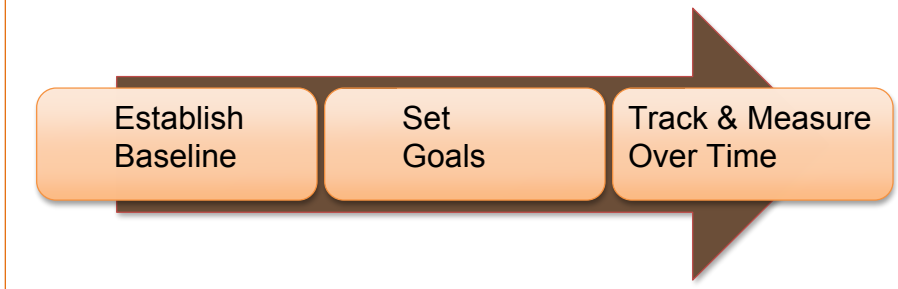
Benchmarking Utility Usage in Public Housing, HUD 2007

Evaluating Building Performance

Benchmarking Portfolio Manager

www.energystar.gov

Evaluating Building Performance



Evaluating Building Performance

Benchmarking
Collection & Analysis
Heating Performance

- Climate Zone 5 Target: <10 BTU/SF/HDD
- Range: 2 to 45! BTU/SF/HDD

Evaluating Building Performance

10 Unit Affordable Apt, Boston, MA

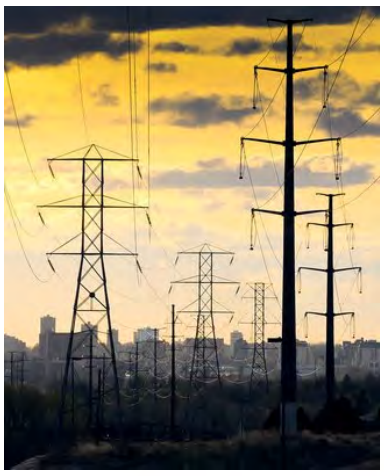
Used Gas History to Calculate New Boiler Size:

- Need output capacity of 380,000 Btu/h
- Existing: 916,500 Btu/h - 240% oversized
- Higher efficiency and lower standby loss to decrease consumption by 20%
- $3275/year

Evaluating Building Performance

Electric Usage

A kilowatt-hour (kWh) is the energy needed to light 10 100-watt light bulbs for one hour.



Evaluating Building Performance

Electric Usage

The average U.S. home uses 938 kilowatt-hours (kWh) per month

Evaluating Building Performance

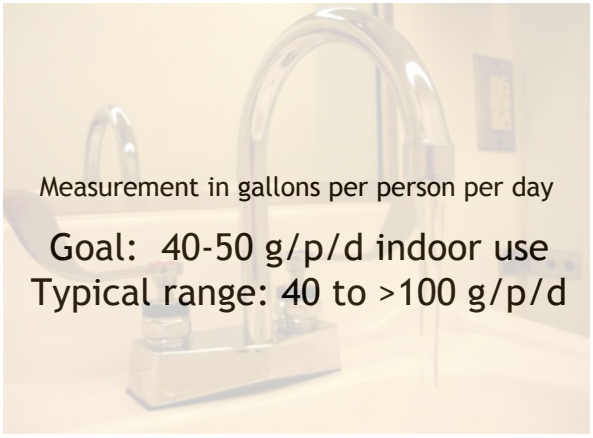
Benchmarking Collection & Analysis
Electrical Usage

Address if over 6 kWh/SF/YR

Massachusetts Whole Building Electricity Usage by Quartile *(kWh/bldg ft²)*
< 4.90
4.91 - 6.42
6.43 - 7.85
> 7.86

Evaluating Building Performance

Benchmarking Water Usage



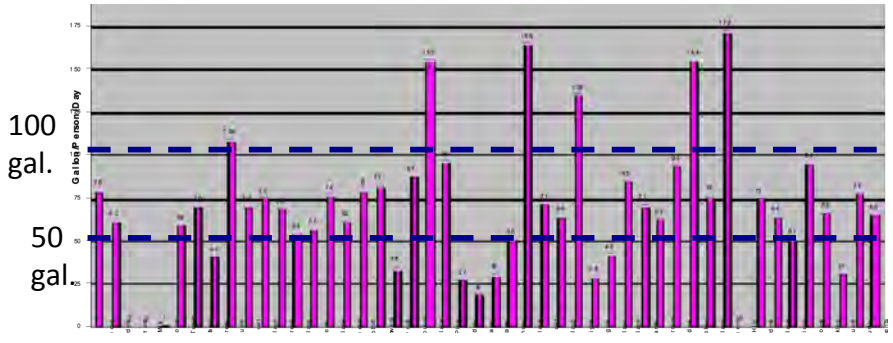
Measurement in gallons per person per day

Goal: 40-50 g/p/d indoor use

Typical range: 40 to >100 g/p/d

Evaluating Building Performance

Benchmarking Water Usage



Water use in gallons per person per day by property for a portfolio

Evaluating Building Performance

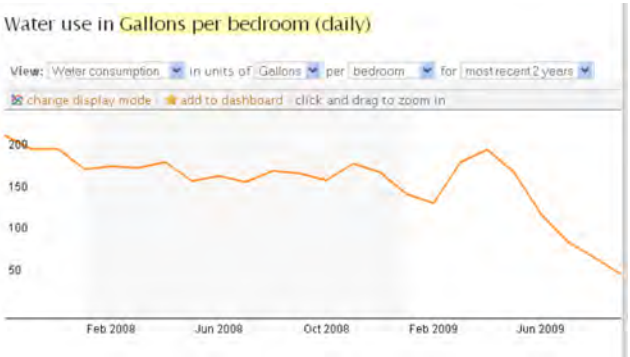
Benchmarking Water Usage
6 Unit Building in Boston

Fixture	# for Replacement/ Fix	Estimated Cost	Estimated Water Savings	Payback
Kitchen Aerators	5	$19.75	$36.68	~ 7 months
Shower Heads	5	$15.00	$401.06	~ 14 days
Bathroom Aerators	8	$6.00	$48.90	~2 months
TOTAL =	**18**	**$40.75**	**$486.64**	**~ 1 month**

Courtesy New Ecology Inc.

Evaluating Building Performance

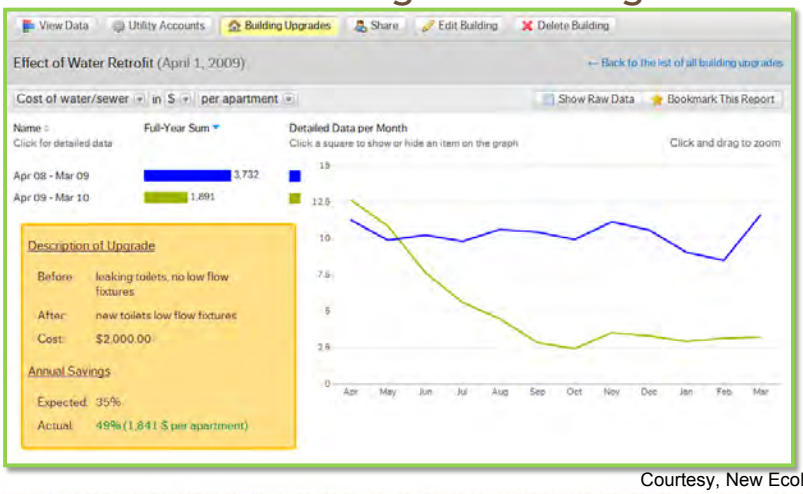
Benchmarking Water Usage
6 Unit Building in Boston



Courtesy New Ecology Inc.

Evaluating Building Performance

Benchmarking Water Usage



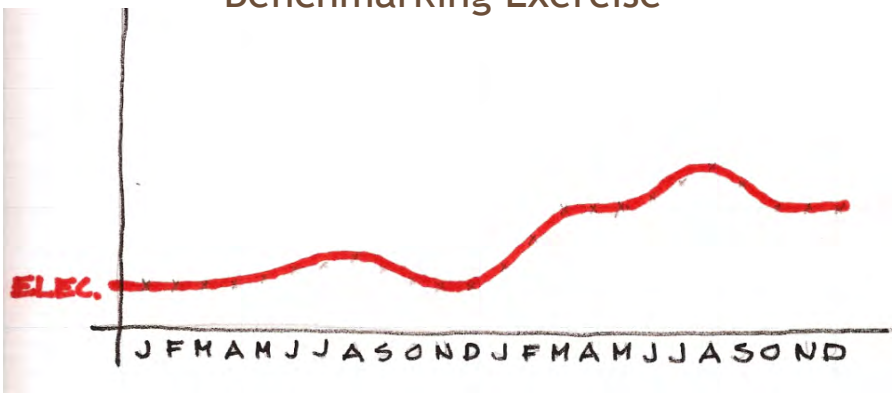
Courtesy, New Ecology Inc.

Evaluating Building Performance

Benchmarking Natural Gas Use

Evaluating Building Performance

Benchmarking Exercise



Property with electric for plugs, lighting, AC, & solar HW back up

Evaluating Building Performance

Fund Watch Customize

Net values as of 07/06/2012	Value	Change	%
CREF Variable Annuity Accounts			
Stock	246.26	(-2.64)	(-1.06%)
Global Equities	94.98	(-1.03)	(-1.07%)
Growth	79.84	(-0.95)	(-1.18%)
Equity Index	101.63	(-0.99)	(-0.96%)
Social Choice	146.86	(-0.86)	(-0.58%)
Bond Market	107.80	+0.21	+0.20%
Inflation-Linked Bond	69.55	+0.13	+0.19%
Money Market	25.53	0.00	0.00%
TIAA Variable Annuity Accounts			
Real Estate	262.44	+0.04	+0.02%

For performance information, visit the funds' individual profile pages.

Benchmarking TIAA CREF Example

One of the largest real estate investors reduced community area utility consumption

Energy Audit

Energy Audit Tools

Fog Generator

Courtesy Home Energy Pros

Energy Audit Steps

1. Interview
2. Exterior Inspection
3. Interior Inspection
4. Combustion safety testing
5. Infiltration and duct testing
6. Recommendations

Blower Door Test

Courtesy Holtkamp Heating & A/C. Inc. & Energy.gov

Combustion Safety Testing

Home Energy Pros

Infrared Camera

Courtesy Energy.gov

Energy Audit Video

Energy Audit Recommendations

1. Service water heater and furnace
2. Mitigate mold
3. Replace light bulbs
4. Air sealing
5. Insulation
6. Duct sealing

Case Study: Los Angeles Eco-Village

Evaluating Building Performance Review

Use information for:

- Planning
- Funding Applications
- Measuring progress

Module 3

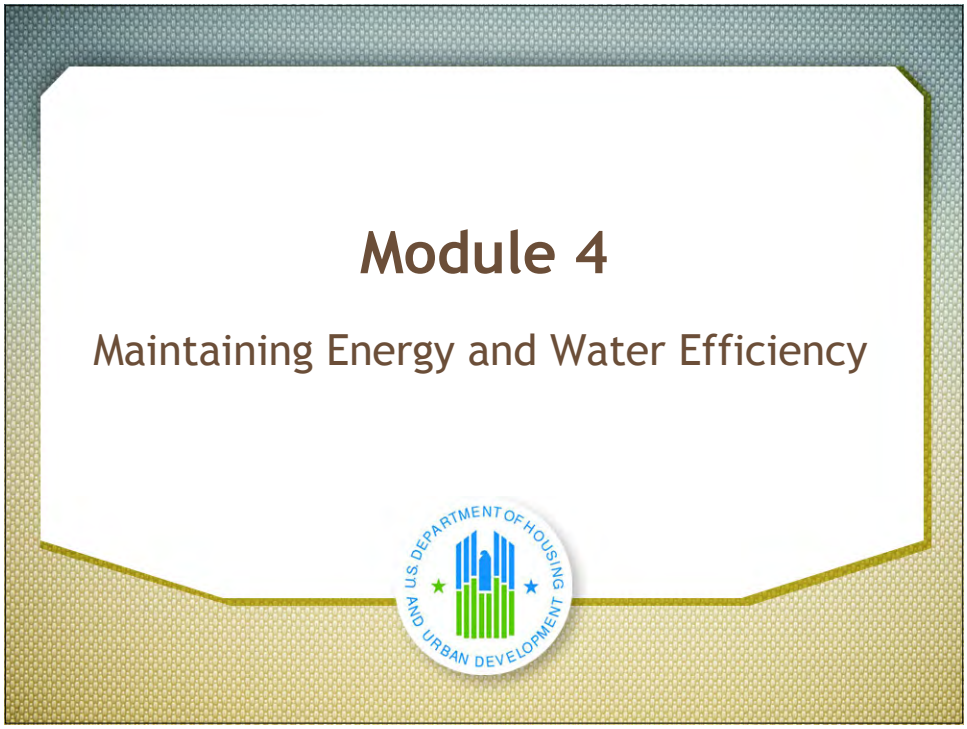
Exercise – Green Unit Turn Over

Exercise - Green Unit Turnover

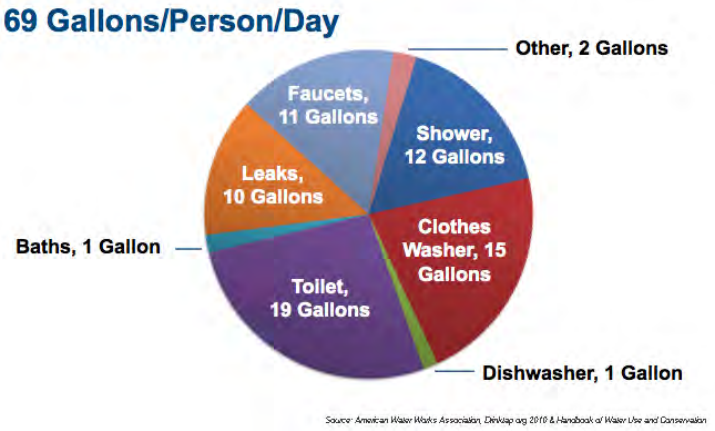
seattle.gov office of housing

Module 4

Maintaining Energy and Water Efficiency



Maintaining Energy and Water Efficiency

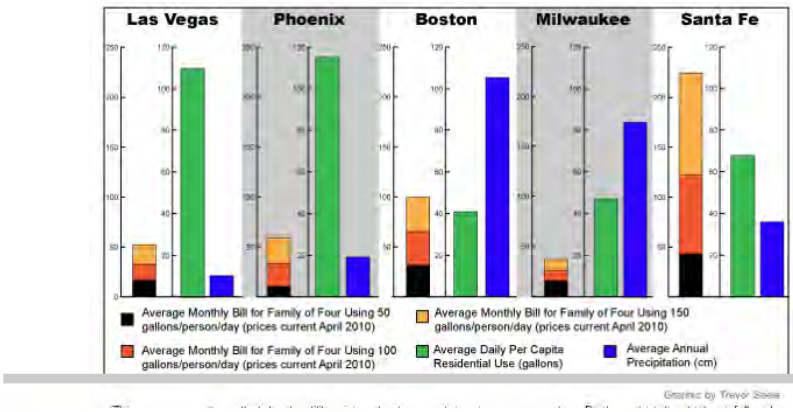


Leaks

- Leaking toilet can waste up to 200 gallons/day
- Faucet leak 1 drip/second wastes 5 gallons/day
- Hot water leaks waste water and energy
- Leaks account for 14% of household water use

Maintaining Energy and Water Efficiency

Infographic: Water Use Comparison of 5 U.S. Cities

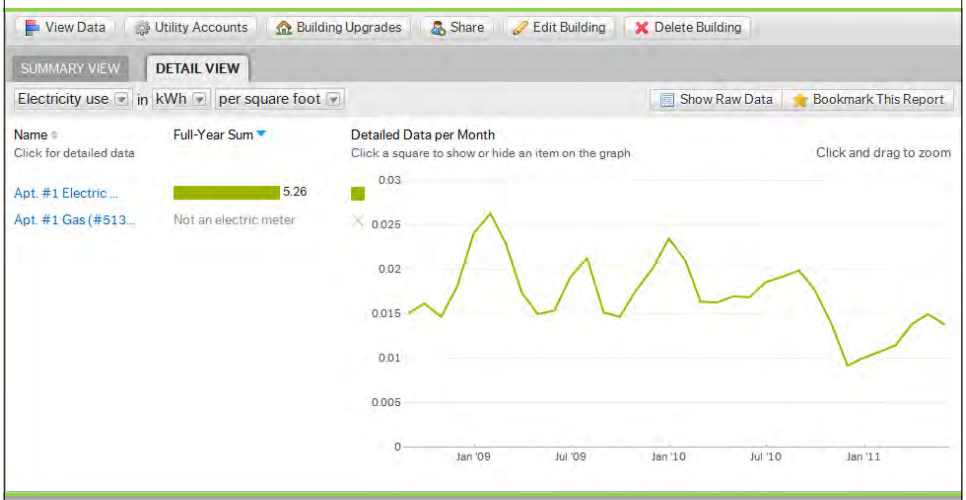


Maintaining Energy and Water Efficiency

Together, We Can Make a Difference!

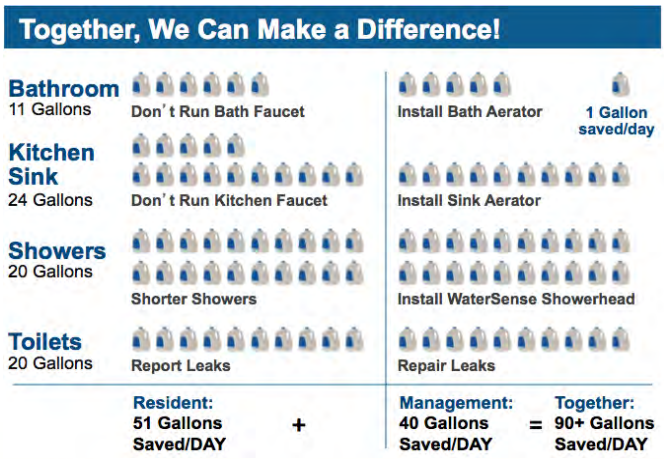
Bathroom 11 Gallons	Don't Run Bath Faucet	Install Bath Aerator	1 Gallon saved/day
Kitchen Sink 24 Gallons	Don't Run Kitchen Faucet	Install Sink Aerator	
Showers 20 Gallons	Shorter Showers	Install WaterSense Showerhead	
Toilets 20 Gallons	Report Leaks	Repair Leaks	
	Resident: 51 Gallons Saved/DAY +	**Management:** 40 Gallons Saved/DAY =	**Together:** 90+ Gallons Saved/DAY

Use Patterns to Detect Problems



Courtesy wegowise

Maintaining Energy and Water Efficiency



Plumbing Fixtures - WaterSense

WaterSense is a label that indicates whether a product meets EPA water efficiency standards

WaterSense Standards

- Showerheads < 2 gallons per minute
- Faucets <1.5 gallons per minute
- Toilets use < 1.28 gallons per flush & flush 350 grams of solid matter (they work!)

www.epa.gov/watersense website lists EPA WaterSense products

Water Saving Repairs or Replacements

	Retrofit Option	Replacement Option
Toilet	Fix leaking flapper	EPA WaterSense toilet
Kitchen & Bath Faucet	Install WaterSense aerator	WaterSense faucet
Showerhead	N/A	WaterSense showerhead
ClothesWasher	N/A	Energy clothes washer
Dishwasher	N/A	EnergyStar dishwasher





Domestic Hot Water

VS

Sealed combustion

Draft hood

Energy Star

EPA program that sets energy and water efficiency standards for products, evaluates products, lists approved products.

You may recognize the logo, it's on appliances like refrigerators, televisions, etc.

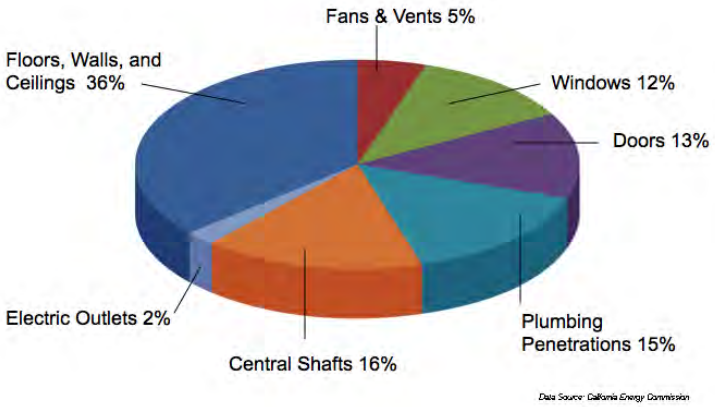
ENERGY STAR also evaluates clothes washers for energy and water use.

www.epa.gov/energystar

ENERGY STAR

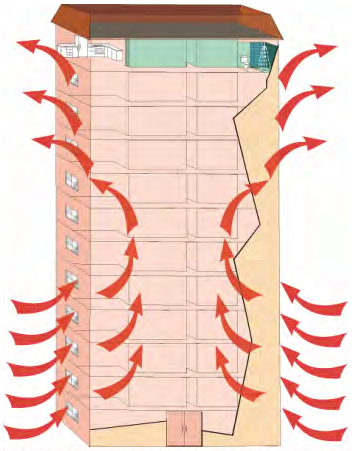
Maintaining Energy and Water Efficiency

Building air leakage in residential properties



Maintaining Energy and Water Efficiency

The Stack Effect



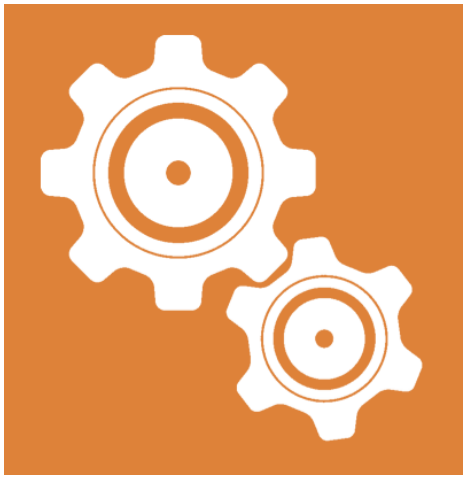
HVAC Maintenance

- Filters
- AC coils
- AC coil fins
- Condensate drains

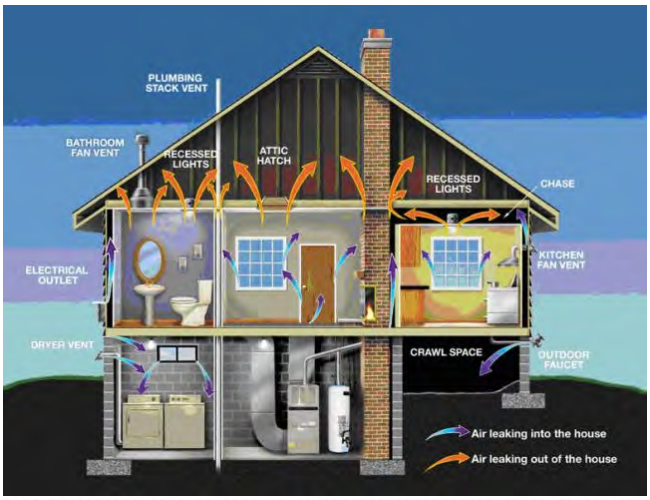
Lighting

- Can be the highest electricity usage and cost
  - For some buildings it's 40% of the cost.
- Fluorescents use 1/3 of the energy used by incandescent lighting and last 10 times longer
- Retrofitting apartment and common area lights could save 10–20%
- **Before you retrofit, beware of:**
  - Code minimums
  - Retrofit vs. Replace
  - Rewiring

Motors



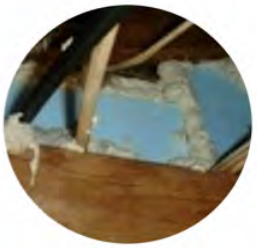
Thermal Envelope



Thermal Envelope

Gaps ≤ 1/4"
Caulk

Gaps 1/4" – 3"
Spray foam



Other
Foam board, fiberglass in plastic bags, etc.

Windows

	"Typical" % of total envelope area for a 5-story building	Recommended (R-Value: the measure of thermal resistance)	Typical (R-Value: the measure of thermal resistance)
Walls	60%	R-21	R-11
Roof	20%	R-49	R-30
Windows*	**15%**	**R-3****	**R-1.5**
Basement	3%	R-13	R-9
Doors	2%	R-3**	R-1.5

***Windows are a small % of the envelope & have limited potential R value improvement**
**This is dependant on your climate, but only varies from 1.5-3.5

Equipment Replacement

Table 1. Annual Estimated Savings for Every $100 of Fuel Costs by Increasing Your Heating Equipment Efficiency*

Existing System AFUE	New/Upgraded System AFUE								
	55%	60%	65%	70%	75%	80%	85%	90%	95%
50%	$9.09	$16.76	$23.07	$28.57	$33.33	$37.50	$41.24	$44.24	$47.36
55%	—	$8.33	$15.38	$21.42	$26.66	$31.20	$35.29	$38.88	$42.10
60%	—	—	$7.69	$14.28	$20.00	$25.00	$29.41	$33.33	$37.80
65%	—	—	—	$7.14	$13.33	$18.75	$23.52	$27.77	$31.57
70%	—	—	—	—	$6.66	$12.50	$17.64	$22.22	$26.32
75%	—	—	—	—	—	$6.50	$11.76	$16.66	$21.10
80%	—	—	—	—	—	—	$5.88	$11.11	$15.80
85%	—	—	—	—	—	—	—	$5.55	$10.50
90%	—	—	—	—	—	—	—	—	$5.30

*Assuming the same heat output

Case Study - Water Use

Yorktown Bachelor Enlisted Quarters (Yorktown BEQ)

- Location - Yorktown, VA
- Scope - Multi-unit residential
  - New construction
  - 48,700 ft2 (4,530 m2)
  - 3-story building
  - Suburban setting
  - Completed January 2005
- Budget
  - $11,500,000 + land
- Water usage reduction
  - Fixtures reduce indoor use 36%
  - No potable water used for irrigation

Module 5

Exterior Maintenance and Landscaping

Exterior Maintenance and Landscaping

Exterior Maintenance and Landscaping

2025 irrigation partners

Exterior Maintenance and Landscaping

Landscape/ Plantings

Photos Courtesy City of Seattle

Photo KA Dorgan

Exterior Maintenance and Landscaping

Shade

Exterior Maintenance and Landscaping

Waste and Integrated Pest Management

Exterior Maintenance and Landscaping

Photos: Seattle Housing Authority courtesy Design Advisor

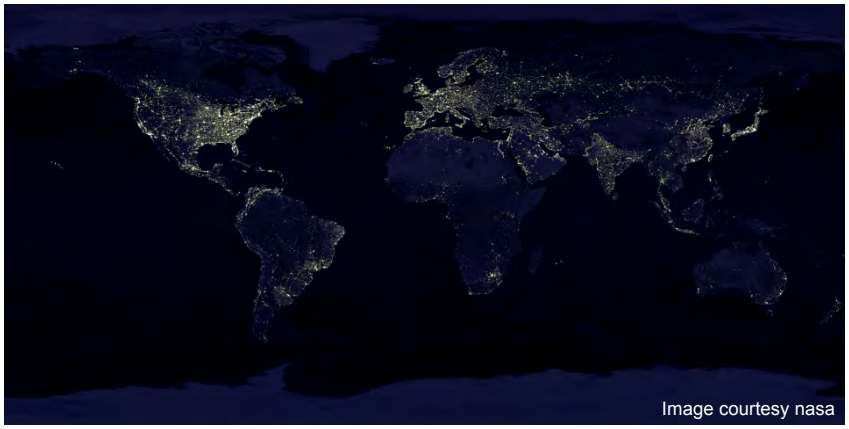
Exterior Maintenance and Landscaping

Roofing

Photo: Kathy Dorgan

Exterior Maintenance and Landscaping

Exterior Lighting



Exterior Maintenance and Landscaping

Equipment

Exterior Maintenance and Landscaping

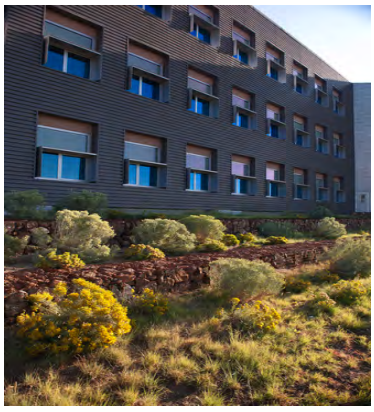
Climate Specific

Exterior Maintenance and Landscaping

Review

First steps:

- –Native plantings & limit irrigation
- –Energy Star or LED Lighting wio. Light spill
- –Green cleaning and equipment
- –Integrated pest management



Module 6

Preventative Maintenance

Preventative Maintenance Tenant Performed

- Changing air filters
- Unplugging
- Turning off appliances
- Thermostat control
- Reporting leaks and repair needs
- Changing light bulbs

Preventative Maintenance Staff/Contractor Performed

- Clean air ducts
- Install efficient fixtures/ appliances
- Use non-toxic cleaning products
- Spec non-formaldehyde cabinets
- Purchase no/low VOC adhesives, paints, and caulk
- Install garbage disposals
- Communicate with Tenant

Preventative Maintenance Staff/Contractor Performed

- Repair/replacement records
- Regularly scheduled maintenance
- O & M manual
- Accountability

Work Order Checklist

Staff members should look for the following issues while in the unit:

1. Evidence of pest problems. If pest problems are present, report to IPM contractor.

2. Evidence of moisture issues. Look and smell for moisture problems; check that exhaust fans are working.

3. Evidence of leaks. Check the toilet flapper, faucet aerators, showerhead and shower diverter valve for visible leaks. If a toilet leak is suspected but running water cannot be heard, a drop color dye tablet in tank and check bowl for coloring before leaving the unit

Maintenance of New Technologies

Solar Checklist Items:

- Shading
- Soiling
- Glazing & seals
- Connections
- Insulation
- Roof penetrations
- Support structures
- Pressure relief valve or dampers
- Pumps or blowers
- Heat transfer fluids
- Storage systems

iStockphoto.com courtesy Energy.gov

Staff Training

Staff Training

Professional Certifications / Accreditations

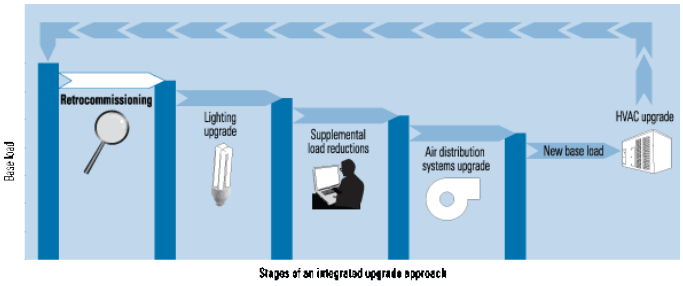
- LEED AP O&M
- Certified Sustainable Property Management
- Affordable Green Academy
- Building Performance Institute (BPI)
- Neighborworks

Commissioning and Retrocommissioning

- When
- Who
- Benefits

Commissioning and Retrocommissioning

- When
- Who
- Benefits



Stages of an integrated upgrade approach

Courtesy: E source

Module 7

Operating Safe, Healthy, and Accessible Housing

Indoor Air Quality

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

Indoor Air Quality

Inadequate ventilation can cause or exacerbate problems with indoor air quality.

- Often ventilation fans can break or malfunction and not trigger a complaint from affected residents.
- Residents occasionally will place furniture in front of vents, reducing the effectiveness of ventilation.
- Ventilation may be achieved by gaps under doors, which residents may actually impede on purpose.
- Ventilation fans must not be noisy or resident may disconnect or not use them.

Indoor Air Quality

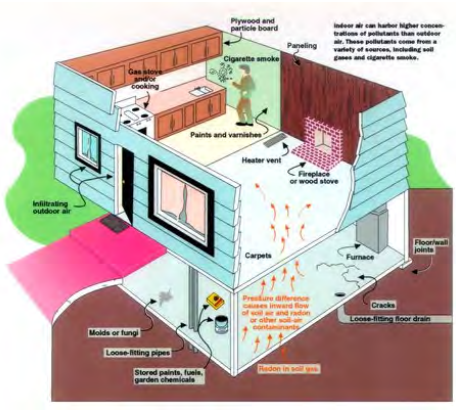
Indoor air pollution can come from many sources, including:

- Off-gassing from building materials and finishes
- Cleaning products and solvents
- Cigarette smoke
- Combustion from fuel-fired appliances and equipment
- Water leaks and moisture intrusion or accumulation
- Pesticides
- even some types of “air fresheners”

Indoor Air Quality

Primary pollutants :

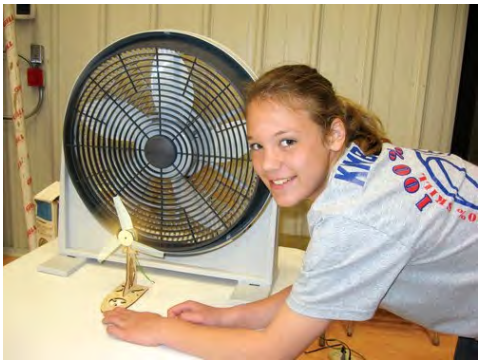
- Radon
- Second-hand smoke
- Carbon monoxide
- Nitrogen dioxide
- Volatile Organic Compounds (VOCs)
- Mold



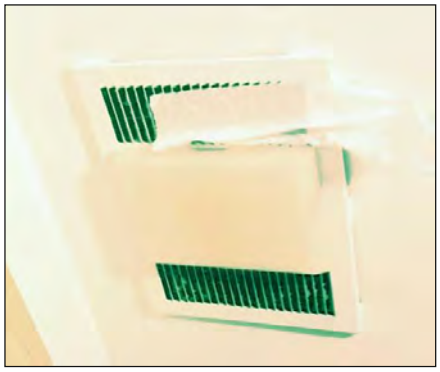
Indoor Air Quality

Improvements:

- Eliminate sources of pollution
- Properly ventilate
- Change filters regularly
- Adjust humidity



Does Bath Fan Work & Exhaust Outside?



Low tech toilet paper method

Use flow hood

Courtesy New Ecology Inc.

Green Cleaning

If you're selecting conventional cleaning products, look for products that are labeled "nontoxic," "low VOC" or "zero VOC," and/or "biodegradable."

Also, look for unscented products (some people are allergic to certain fragrances) and products with recyclable packaging/containers.

Green Cleaning

- Avoid the use of chlorine bleach unless it's absolutely necessary.
- Hydrogen peroxide is a good alternative to chlorine bleach.
- Never use undiluted chlorine bleach or ammonia. Both of these substances can cause major respiratory irritation.

Green Cleaning

Green Cleaning Standards and Labels

- Green Seal
- Environmental Choice – EcoLogo Program
- EPA Comprehensive Procurement Guidelines
- Carpet and Rug Institute
- California Air Resources Board

Green Seal

- Green Seal is an independent non-profit organization
- Green Seal Certification ensures that a product meets rigorous, science-based leadership standards
- Products or service are evaluated using a life cycle assessment, considering environmental impacts from raw material extraction to final disposal
- Green Seal standards meet ISO, EPA, and Global Eco-labeling Network (GEN) standards for Eco-labeling

Green Cleaning

- Cleaning Products
  - Green Seal GS-37
  - Environmental Choice CCD-110, 146, 148
- Disinfectants, metal polish, floor finishes, strippers or other products
  - Green Seal GS-40
  - Environmental Choice CCD-112 , 113, 115, 147
  - California Code of Regulations maximum allowable VOC levels for specific product category

Green Cleaning

- Disposable janitorial paper products and trash bags:
  - Environmental Protection Agency (EPA) Comprehensive Procurement Guidelines for Janitorial Paper and Plastic Trash Can Liners
  - Green Seal GS-09, 01
  - Environmental Choice CCD-082, 086
- Janitorial products:
  - Hand Soaps
  - No antimicrobial agents (other than as a preservative) except where required by health codes and other regulations
  - Green Seal GS-41
  - Environmental Choice CCD-104

Green Cleaning

LEED references the following Green Seal standards for the purchase of sustainable cleaning products and materials:

- GS-37 for general-purpose, bathroom, glass and carpet cleaners
- GS-40 for industrial and institutional floor care products
- GS-09 for paper towels and napkins
- GS-01 for tissue paper
- GS-41 for industrial and institutional hand cleaners

Green Cleaning

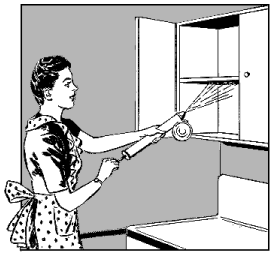
Green Cleaning Equipment

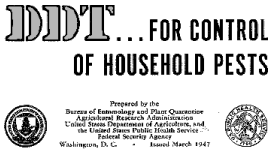
- Carpet and Rug Institute “Green Label” vacuums a sound level of <70 dBA
- Carpet and Rug Institute "Seal of Approval" Testing Program certified carpet extraction equipment
- Powered floor maintenance equipment equipped for capturing fine particulate and operates at <70 dBA
- Propane-powered floor equipment meets California Air Resources Board/EPA standards and operates at <90 dBA
- Scrubbing machines optimize cleaning fluids or no added chemicals
- Equipment minimizes vibrations, noise, and user fatigue

Housing-Related Health Problems

Mold and Pests…

… can cause or exacerbate asthma, allergies and other respiratory illnesses.





DDT is no longer allowed

Integrated Pest Management (IPM)

Overall steps for Maintenance:

- Prevent pests from entering the building through holes or cracks.
- Address moisture issues that can attract pests.
- Use the least toxic possible approach to pest eradication.

- Where pesticides are necessary, treat only verifiable problem areas rather than entire buildings.
- Keep accurate and detailed records of pest control activities and problem areas.

Integrated Pest Management

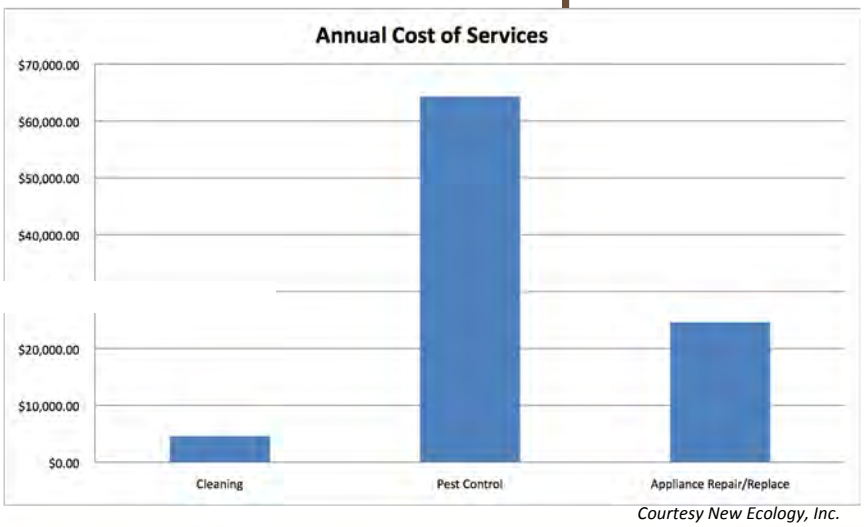
Management and tenants should work together on housekeeping standards such as:

- Do not leave food unsealed.
- Clean and rinse bottles and other containers before putting them in the recycling.
- Take out the trash regularly.
- Sweep, mop and vacuum frequently.
- Minimize clutter.

Integrated Pest Management

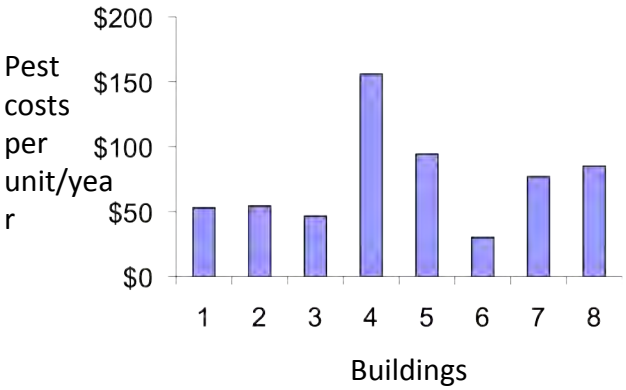
- Implement a written IPM policy, preferably as part of an overall Green O&M Plan.
- Schedule inspection and monitoring of buildings and grounds.
- Designate an individual to be responsible for the implementation.
- Utilizes trained and certified IPM contractors or staff.

Maintenance Expenses



Courtesy New Ecology, Inc.

Pests Cost Money



Annual pest control costs for Boston , MA multi family housing. Some properties spend over $150/unit/year .

Courtesy New Ecology, Inc.

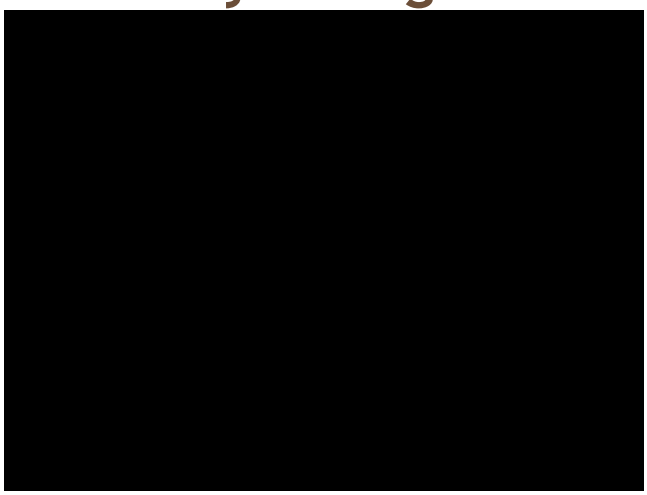
Housing-Related Health Problems

Toxic building materials and products can cause:
•hyperactivity,
•impaired growth,
•reading and learning disabilities,
•and a range of other health and behavioral problems

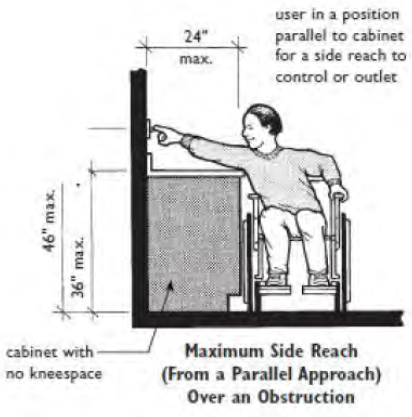
Housing-Related Health Problems

Poisonous gases can cause harm at low levels over time, and often are odorless and the effects can go undiagnosed.

Healthy Living Video



Accessibility



Prepare a plan for reaching compliance with:

•ADA for public spaces

•Section 504 for apartments

SUMMARY

Operating Safe, Healthy, and Accessible Housing

Module 8

Reducing Waste and Materials

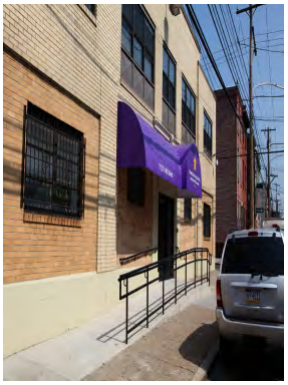
Reducing Waste and Materials

Waste and Materials

- Residents and maintenance staff must be made aware that hazardous materials may not be thrown in the garbage, but rather disposed of at an appropriate facility or recycling center.
- Examples of hazardous waste materials:
  - Chemical cleaning supplies
  - Pesticides and fertilizers
  - Paint, paint thinners, primers, stains and other finishes
  - Motor oil
  - Fluorescent lamps/light bulbs
  - Batteries
  - Computers, TVs and other electronic equipment

Building Waste Recycling

- Administrative Offices
- Appliances
- Deconstruction
- Revenue Generating Opportunities



PHA Administrative Offices

Purchasing

- Volume and delivery efficiencies
- Sustainable sources
- Certifications
- Buying local and with partners
- Benefits

FSC Controlled Wood

CASE STUDY
Sherwood Village Apartments

Owner:

Community Housing Improvement Systems and Planning Association (CHISPA) of Salinas

Location:

Salinas, CA

Completed:

2008

Photo credit: HUD

CASE STUDY
Sherwood Village

- Senior housing, Multi-unit residential
- Renovation, conversion
- 124 total units
- 3 acres, 2-story
- Suburban setting
- Priorities: Energy efficiency, rainwater collection, waste reduction, transit-oriented

CASE STUDY
Sherwood Village

- Financing Mechanisms
  - Equity: Low-income housing tax credits
  - Grant: CDBG, HOME
  - Loans: traditional
- Total project cost (land excluded): $22,000,000
- Property cost: $2,500,000

CASE STUDY
Sherwood Village

Photo credit: HUD

- Rehabilitating the three motel structures cost approximately 25 percent less than new construction because of savings from infrastructure and construction costs.

CASE STUDY
Sherwood Village

Photo credit: HUD

- Onsite rain garden protects water resources by filtering the rainwater collected from the roof before it is released into the local watershed.
- Vegetable and flower gardens provide a chance for resident to stay active outdoors.

CASE STUDY
Sherwood Village

Photo credit: CHISPA

CASE STUDY
Sherwood Village

Photo credit: HUD

- The developer installed innovative heating and air conditioning systems, dual flush toilets, solar tubes that bring natural light into the units, and ENERGY STAR® appliances.

CASE STUDY
Sherwood Village

Photo credit: CHISPA

- An innovative composting and recycling program — that included YouTube instructional videos explaining how to recycle and compost —approximately 9 tons of material is recycled annually.

CASE STUDY
Sherwood Village

Key takeaways:

- Reuse of an existing building to reduce construction costs
- Tenant education on recycling and composting can greatly reduce garbage fees
- Swales and biorentention that reduce water runoff and sewer expense

Edan Housing Recycling

Courtesy Enterprise and Eden Housing

- Manages 80 affordable properties
- Developed toolkits
- Shared benefits with Boys and Girls Club
- Trash expenses reduced by up to 25%

Module 9

The Green O&M Plan

And

The Green PNA

Elements of a Green O&M Plan

- Indoor Air Quality Management
- Indoor Pest Prevention and Control
- Waste Reduction and Recycling
- Energy and Water Conservation
- Green Grounds keeping
- Continual Training

Elements of a Green O&M Plan

Strategies for Indoor Air Quality Management

- Selection of less-toxic materials and products
- Entryway cleaning
- Moisture control
- Mold control
- Carpet cleaning
- HVAC/duct maintenance
- Ventilation system

Elements of a Green O&M Plan

Indoor Pest Prevention and Control

- Integrated pest management
- Pest management protocols
- Getting rid of bed bugs

Elements of a Green O&M Plan

Waste Reduction and Recycling

- Waste prevention
- Recycling program
- Construction waste management
- Hazardous waste disposal

Elements of a Green O&M Plan

Energy Conservation

- Mechanical equipment operations and maintenance
- Duct and filter maintenance
- Heating system maintenance
- Photovoltaics and other renewables
- Lighting

Elements of a Green O&M Plan

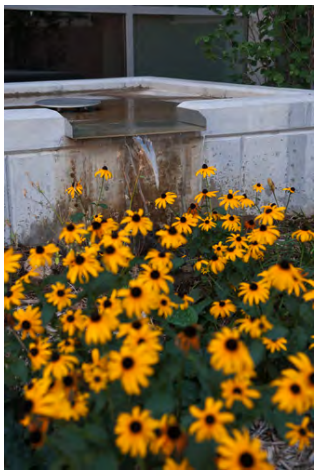
Water Conservation

- Read water meters monthly
- Check for leaks
- Install aerators
- Review landscaping and irrigation policies

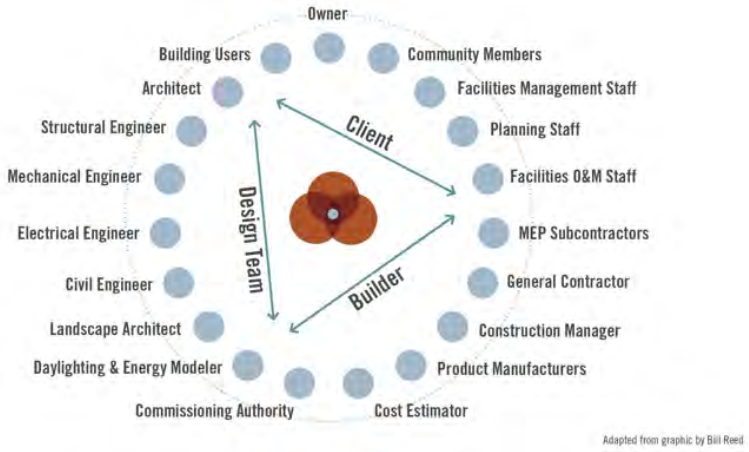
Elements of a Green O&M Plan

Green Groundskeeping

- Irrigation
- Plantings
- Stormwater filtration
- Exterior lighting



Integrated Design

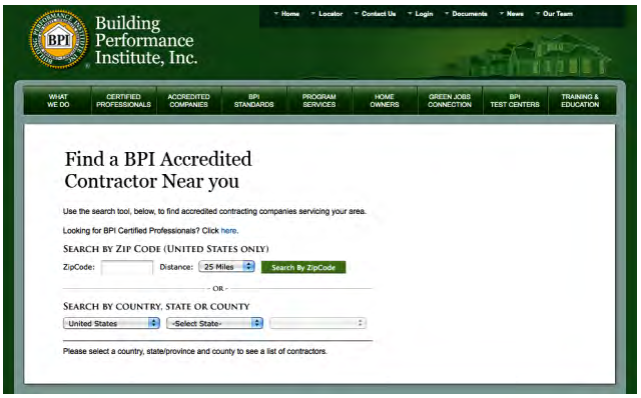


Contractor Qualifications and Certifications

www.hhcontractors.org

Contractor Qualifications and Certifications

www.bpi.org



Green Property Management Certifications

Credential for Green Property Management (CGPM)

- Offered by the National Apartment Association (NAA) and the National Affordable Housing Management Association (NAHMA)
- Aimed at on-site managers, maintenance staff and supervisors of front-line staff
- Meets the training requirements of the HUD M2M Green Initiative.

Green Product Labeling

Products and Services

- Green Seal
- EcoLogo
- GREENGUARD
- Local and statewide directories

CASE STUDY
Denny Park Apartments

Owner:
Low Income Housing Institute

Location:
Seattle, WA

Completed:
2005

Photo credit: Michael Seidl / DOE

CASE STUDY
Denny Park Apartments

- Multi-unit residential
- New construction
- 50 total units
- 39,700 ft2
- Urban setting
- Priorities: Energy efficiency, indoor air quality, rainwater collection, waste reduction, transit-oriented

CASE STUDY
Denny Park Apartments

- Financing Mechanisms
  - Equity: Low-income housing tax credits
  - Grant: Private (foundation), public agency
  - Loans: Public institution
- Total project cost (land excluded): $9,411,797
- Property cost: $1,413,242

Photo credit: Michael Seidl / DOE

CASE STUDY
Denny Park Apartments

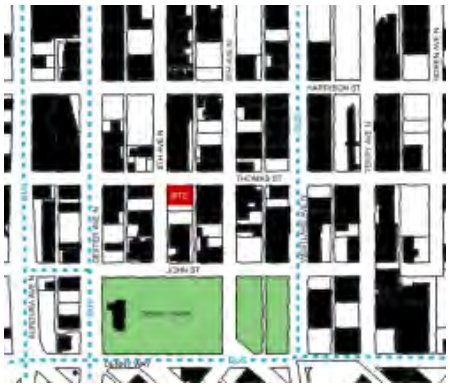


Photo credit: HUD

- The infill site allows residents to be within walking distance of multiple transit lines reducing the need for parking spaces.

CASE STUDY
Denny Park Apartments

Photo credit: Michael Seidl / DOE

- Project team focused on maximizing natural daylight and minimizing western solar gain during the summer months.
- The corridor receives natural light and fresh air through recessed windows at the end of the building.

CASE STUDY
Denny Park Apartments

Photo credit: Michael Seidl / DOE

- Durable materials were used to reduce maintenance and last 50 years.
- Use of sealants was minimized.
- Rain screen minimizes water penetration.

CASE STUDY
Denny Park Apartments

Photo credit: CHISPA

- Continuously operating whole-house fans ensure that fresh air is drawn into the building.
- Energy efficient lighting and occupancy sensors reduce energy use.

CASE STUDY
Denny Park Apartments

Key takeaways:

- Construction team focused on product durability to maximize life of building components
- Windows promote cross ventilation and whole-house fans bring in air to increase indoor air quality
- Windows also maximize natural daylighting reducing energy use

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

Green Physical Needs Assessment (GPNA)

GPNA are used in the following programs:

- Multifamily Green Retrofit Program
- Mark to Market Green Initiative
- Fannie Mae's Green Refinance Plus
- Public and Indian Housing (PIH) Green PNA Pilot

Green Physical Needs Assessment (GPNA)

New PNA Rule for PIH (in final rule making)

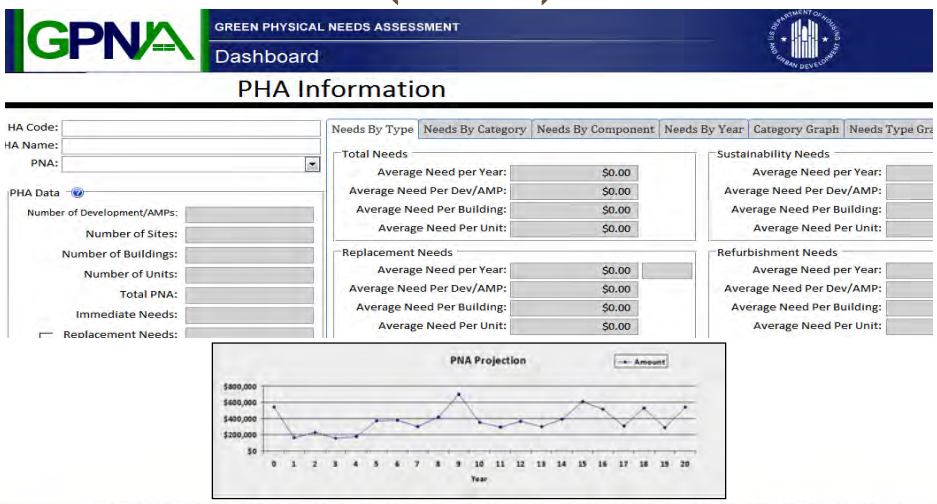
- Perform a PNA every 5 years
- 20-year planning horizon
- Coordinated with an energy audit

Green Physical Needs Assessment (GPNA)

Minimum qualifications for a PNA provider:

- Experience (5 years) performing physical property inspections and cost estimating
- Demonstrated knowledge of applicable building standards and codes
- Demonstrated knowledge of energy efficiency practices
- Working knowledge of commonly used computer technology (MS Excel, Office, etc.)

Green Physical Needs Assessment (GPNA)



PNA Draft Tool:
http://portal.hud.gov/hudportal/HUD?src=/program_offices/public_indian_housing/programs/ph/capfund/physicalassessment

SUMMARY

The Green O&M Plan

- Indoor Air Quality Management
- Integrated Pest Management
- Waste Reduction and Recycling
- Energy and Water Conservation
- Green Grounds keeping
- Continual Training

SUMMARY

The Green PNA

- Assessment of property conditions
- Operating cost analysis and projections
- Energy Audit findings
- Integrated Pest Management Plan

Module 10

Prepare a Section of the Green O&M Plan

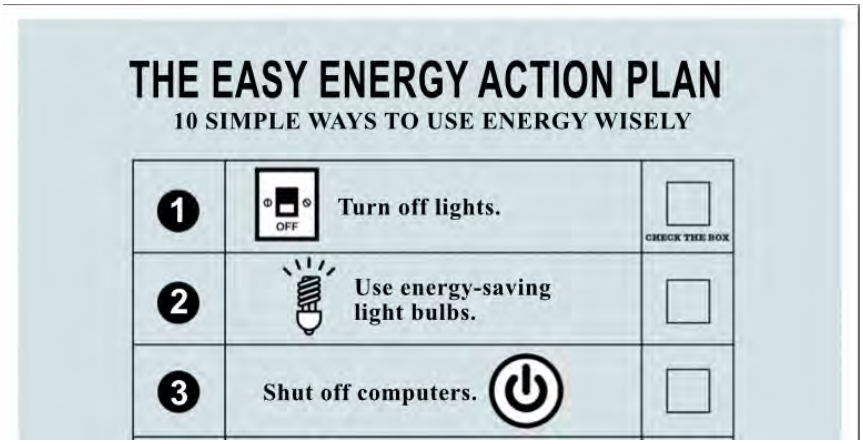
Module 11

Resident Education and Engagement

Resident Orientation

- New Residents
- Current Residents
- Monitoring
- Modeling Behavior
- Benefits

DCHA Resident Leaders



DOE, LoseYourExcuse.gov, AdCouncil

Resident Recycling

- Site Collection Strategies
- Recycling Program Kick-Off
- Recycling at Resident Events
- Behavior Modeling

PHA's Norris Apartments, LEED certified

Green Incentives

- Recyclebank
- Property Reward Program
- Local Grower Partnerships
- Local Health Department
- Spring Cleaning

DCHA Garfield Gardens

Resident Leader Initiatives

- Smoke-Free Housing
- Urban Farming
- With Every Heartbeat is Life
- Parks, Walking/Biking
- Intergenerational Activities

Resident Leader Initiatives

Resources

Product

- Set of electronic "Cards" in a Power Point format
- Potential end uses:
  - Power Point presentation…
  - Printed signs…
  - Flashcards…
  - Bound as a resident handbook…

ACTION ITEMS AND NEXT STEPS

- ✓ Get an energy audit – or (re)read the existing
- ✓ Prepare or update your O& M plan
- ✓ Buy WaterSense Fixtures
- ✓ Buy Energy Star Equipment and Lighting
- ✓ Fill exterior gaps
- ✓ Use native drought-resistant plants
- ✓ Use green certified cleaning products
- ✓ Investigate, Implement or evaluate your IPM plan
- ✓ Become a national leader in Green O&M
- ✓ And ……..

Thank You!