

GREENING HUD HOUSING and GREEN JOBS

Building Green: State of the Art Green and Energy Retrofits in Affordable Housing



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Sustainable Building is:

- Healthy
- Energy Efficient
- Durable
- Resource Efficient
- Low-Impact



- **Environmental responsibility**

Resource use of U.S. buildings

- 40% of overall energy
- 60% of electricity
- 5 billion gallons of potable water to flush toilets.



- **Reduce operating costs**

(increase affordability).

- **Improve occupant health** through better indoor environmental quality.

Green Retrofits



Intended to Dramatically Improve the Energy Efficiency, Indoor Environmental Quality, Resource Efficiency, and Durability of Occupied Dwellings.

Major Systems Affecting Building Performance

- **Building Envelope**
 - Air-tightness, Insulation levels
 - Water-management
- **Windows and Glazing Systems**
 - Glazing SHGC
 - Overall “U” Value
- **Heating, Ventilation, and Air Conditioning**
 - Equipment sizing, efficiency and location
 - Duct tightness, distribution effectiveness, and location

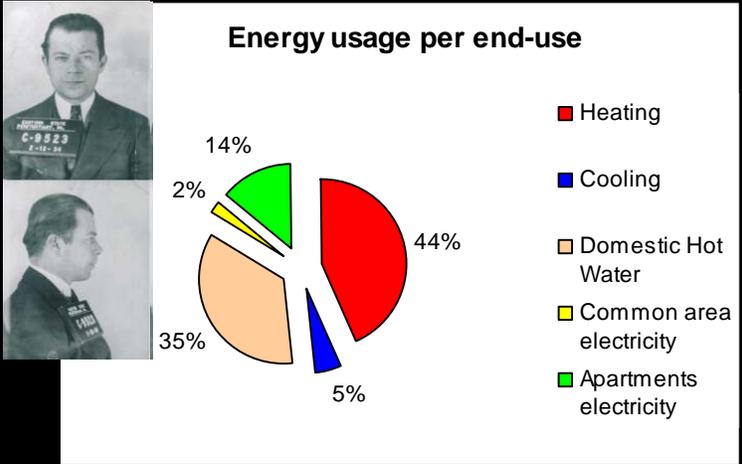


Major Systems Affecting Building Energy Performance

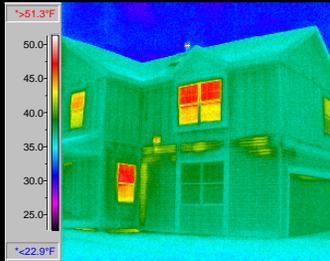
- **Domestic Hot Water**
 - Generation
 - Distribution
 - Stand-by-losses
- **Appliances**
 - Refrigerator,
 - dishwasher,
 - clothes washer/dryer
- **Lighting and miscellaneous**



Think Like Willie Sutton



Benchmarking and Diagnostics



REM/Rate v 12.1 - HighEfficiency.Mlg

File Building Extras Libraries Reports Tools Options Help

Mechanical Equipment Properties Summary

#	Type	Htg Eff	Cool Eff	Dhw Eff
1	139k 30tube 85el NG	0.90	0.80	0.65
2	148EER A/C 3 ton		14.0 SEER	

Mechanical Equipment Properties

Type: Integrated space/water heating Number of Units: 1

Equipment: 139k 30tube 85el NG

Location: Conditioned area Heating Cooling DHW

Performance Adj. (%): 100.0 Load Served (%): 100.0 80.0 100.0

System-Wide Properties

Setpoint Temperature (F): Heating 68.0 Cooling 78.0 DHW

Programmable Thermostat:

Capacity Weight % of Load Served:

Total Load Served (must total 100%): 100 100 100

Detailed Denver, CO

Low-Rise vs. Mid-Rise Housing



Different building types will have different energy, comfort, and improvement needs,



But...sample diagnostics along with utility bill analysis can provide a roadmap for the entire complex

Typical Retrofit Solutions



- **Start with the Building Envelope**
 - Air-sealing, Air-sealing, and Air-sealing
 - Accessible insulation (attic and basement / crawlspace)
 - Windows and other envelope weak-links

Typical Retrofit Solutions



Ventilation improvements in tandem with envelope upgrades

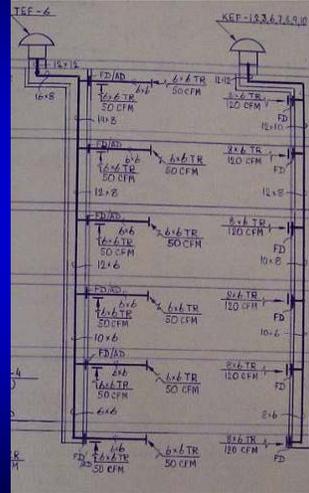
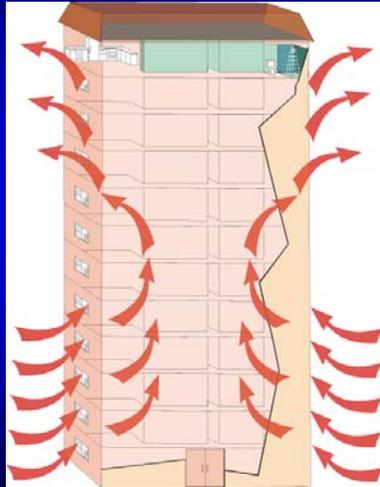
- Exhaust ventilation cheap and effective in many climates.
- Humid climates may need more sophisticated solution



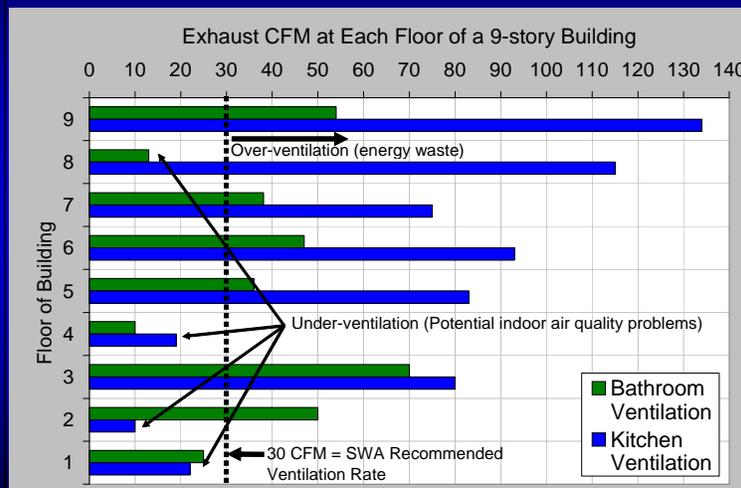
Inadequate air-sealing & a lack of ventilation in a high-occupancy dwelling can lead to big problems!



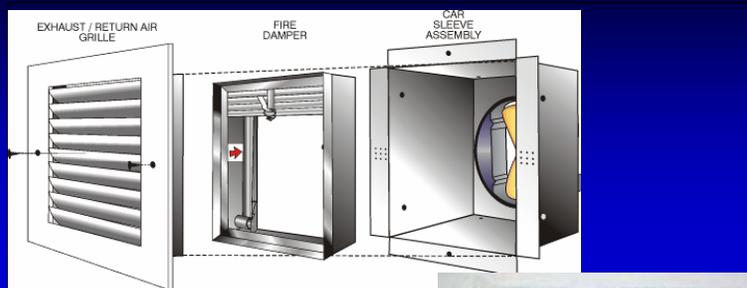
Stack Effect in Tall Buildings



What Really Happens



AERO-Seal Ventilation Duct Retro-fit



CAR (constant air regulating) dampers control amount of apartment ventilation



Echo Apartments, NYC

- 99 unit HUD 202 building
- Energy scope coord. w./ 2.5M rehab
- Energy usage cut by 30%
- Low flow fixtures
- High efficiency boilers
- Air sealing
- SWA Ventilation Package
- Bi-level Lighting, and.....

Making sure the A/C doesn't run in the winter...



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QUESTIONS?



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