Managing and Supporting the Development of Green Affordable Housing

Understanding and Applying Green Communities Design Criteria

NEW ECOLOGY INC.
Environmental Protection and Economic Development in Urban Communities

Edward F. Connelly
President

Madeline Fraser Cook
Vice President

New Ecology, Inc.
Cambridge, MA

D.C. Government Trainings

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Green Affordable Housing

- Better designed and built
- Not significantly more expensive
- Cheaper to operate
- Healthier
- More environmentally sound
- Less Risky

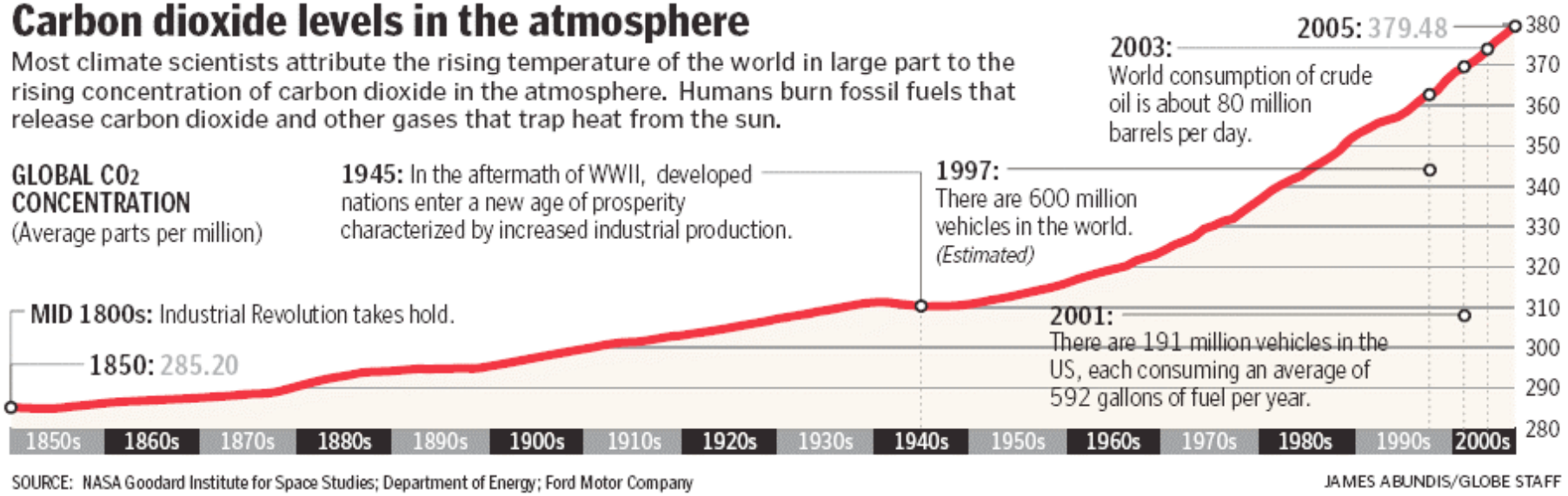
Green? Why Should I Care?

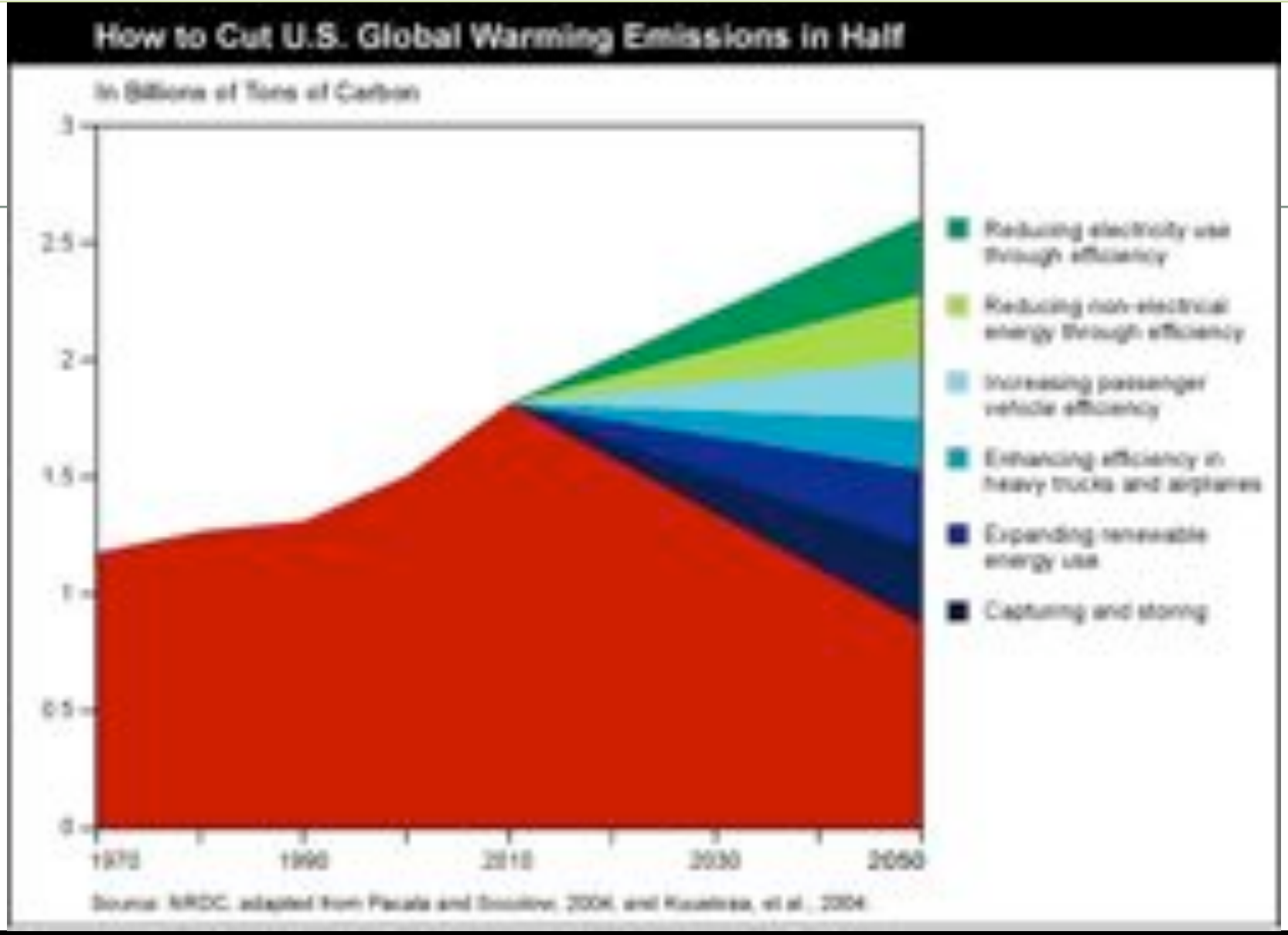
1. Global Warming
2. Operations Costs
3. Risk Mitigation
4. DC as a leader



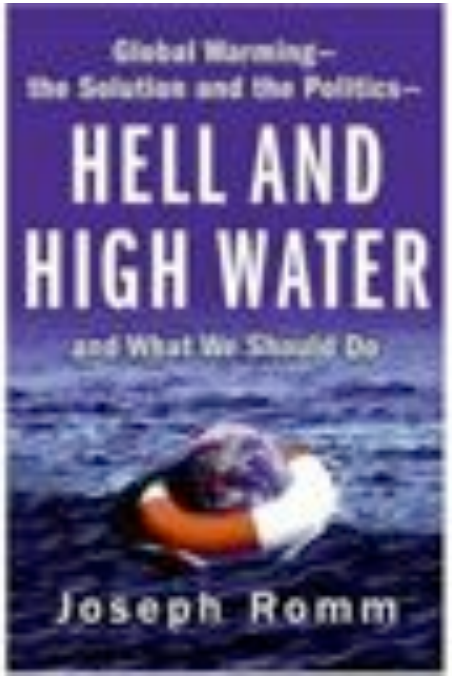

Green? Why Should I Care?

Buildings Use 36% Total US Energy;
Make 30% of Greenhouse Gases




How to Cut U.S. Global Warming Emissions in Half
In Billions of Tons of Carbon
3
2.5
2
1.5
1
0.5
0
1970
1990
2010
2030
2050
Reducing electricity use through efficiency
Reducing non-electrical energy through efficiency
Increasing passenger vehicle efficiency
Enhancing efficiency in heavy trucks and airplanes
Expanding renewable energy use
Capturing and storing
Source: NRDC, adapted from Pacala and Socolow, 2004, and Kousksa, et al., 2004

Green? Why Should I Care?



Green? Why Should I Care?

Costs less to operate!!

- ***Use 30-50% less energy than code buildings to heat and cool***
- ***Use 20% less electricity***

Green? Why Should I Care?

Costs less to operate!!

Linden Street Apartments and Linwood Court Building Energy Use (heating) Comparison

Linwood Court – Conventional building

- **6 units, 5,988 sq. ft.**
- **13.17 BTU/SF/HDD (Total of 439,863,000 BTU/YR)**

Linden Street – Green Building

- **6 units, 6,570 sq. ft.**
- **4.30 BTU/SF/HDD (Total of 158,070,000 BTU/YR)**

The Green Building is using 33% of Energy for Heating!

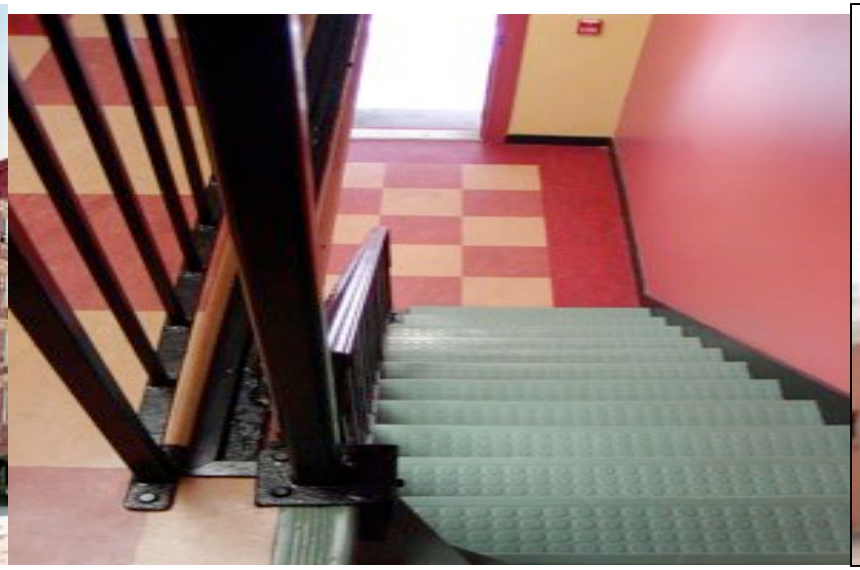
Green? Why Should I Care?

Healthier

- **Asthma mitigated with better IAQ and IPM**
- **Compare commercial -- cannot quantify productivity, employee retention, sick days usage**

Green? Why Should I Care?

Choice of Materials & Construction Techniques makes projects more durable & cheaper to maintain


Green? Why Should I Care?

Attention to Landscaping and Siting results in:

- landscapes that are easier to maintain and provide more amenities to occupants
- Infiltrate stormwater – often reducing costs

Mitigating Risk

Major Risk Factors Addressed by Green Strategies

- Poor design and construction
- Cost overruns
- Higher Than Projected Operating Costs

Mitigating Risk

Higher Than Projected Operating Costs

- **Energy Budgets: 25% of operating costs and climbing**
  w/ annual 10% increases: >30% in 5 years
  20% increases > 40% in 5 years

- **Similar for high rate sewer districts**

Mitigating Risk

Major Risk Factors Addressed by Green Strategies

- Poor design and construction
- Cost overruns
- Higher Than Projected Operating Costs
- **The Next Lead Paint-type issue?**

Analyzing Risk

The Next Lead Paint-type issue?

- Asthma: increasing evidence that IAQ has a significant effect on attacks: Potential liability for not reducing triggers?
- Mold
- Pesticide exposure

Green? Why Should I Care?

- DC in the lead
- The people we serve deserve this type of quality
- Leaving the less well off behind

Can We Afford It?

$20.00 on line @
www.newecology.org

Cost of Greening
(as % of *total construction costs w/o PV*)

Mean: 4.95%

Median: 3.83%

Range: -25% to 38.94%

(11 of 16 cases under 5%)

Where are the leaders going?

1. Green with no cost Premium

228 and 299 Third Street
New York, NY

Two Apartment Buildings:
22 and 38 Units

Cost: $121 per square ft.

Green Premium: $0

Linden Street Apartments
Somerville, MA

Net cost of Greening: $20,150
.18% TDC; .30% Const.
$479/unit

Green Features:
- Site Remediation, Open space, Xeriscaping, Community integration and access, Rainwater recharge, Low flow toilets, Low-e windows, Icynene and cellulose insulation, No VOC adhesives, Bathroom fans for increased air quality, Bike racks, Tall windows for daylighting and safety

NPV: Residents: +$2,514,162; $59,861/unit; developer $286,920/337,320

Where are the leaders going?

1. Green with no cost Premium
2. **Zero Energy Homes**
3. **Green Renovations**
4. **Alternative Funding**
5. **Green Management**

Habitat For Humanity of Metro Denver

Cold Climate

1100 square foot

Energy Bills Avg $18.25/mo. (80% fixed charges)

Where are the leaders going?

1. Green with no cost Premium
2. Zero Energy Homes
3. **Green Renovations**
4. **Alternative Funding**
5. **Green Management**

How To Make Every Project Greener

What to Demand:

- Density/TOD
- High levels of Energy and Water efficiency
- Stormwater control
- Low maintenance/high value landscaping
- Improved IAQ/Health
- Durability
- Materials
- Recycling

These Are The Green Communities Criteria!

Green Communities Criteria

- Integrated Design
- Location and Community Fabric
- Site Improvements
- Water Conservation
- Energy Efficiency
- Materials Beneficial to the Environment
- Healthy Living Environment
- Operations and Maintenance

Section 1: Integrated Design

Green Communities Minimum Standards

Integrated Design Process

Y	N	?	Item #	Item Title	Possible Points
			1.1	Green Development Plan	Mandatory

Section 1: Integrated Design

- Green Development Plan
  - **Green or sustainable features should be incorporated into the design from the onset of the project**
  - **A development plan must be submitted, detailing all greening processes and outlining the responsibilities of each of the design & development team members**
  - **Integrating the greening process from the beginning can lower cost and increase effectiveness**

Why Integrated Design is Better

- Works to set and meet comprehensive project goals from the beginning
- Takes into consideration multiple solutions to design problems
- Reduces chances of costly change orders
- Can smooth permitting process
- Can reduce costs

The Keys to Successful Integrated Design

1. **Desire/Require**
2. **Starting Early**
3. **Assembling a Qualified Team**
4. **Setting Goals vs. Benchmarks**
5. **Modeling Siting/Density/Program**
6. **Designing in a Collaborative Way**
7. **Testing Assumptions/Modeling**

The Keys to Successful Integrated Design

8. **Completing Design Collaboratively**
9. **Detailed Construction Drawings**
10. **Teamwork with contractors and subs**
11. **Follow Through in the Field**
12. **Commissioning**
13. **Operations Training**

Setting Project Goals

Beverly Housing Coalition-SRO

Pre-Charrette:
Rehab, with goals of :

- **Adding units**
- **Deepening affordability**
- **Improving appearance**
- **Better client services**

Setting Project Goals

Post-Charrette: Rebuild

- **Be a good neighbor with unique character that emphasizes green, responsible development;**
- **Be walkable and bicycle friendly with easy access tc public transportation;**

Setting Project Goals

Post-Charrette:

- **Reduce the cost of occupancy through energy efficiency/ lower utility bills (meet Energy Star Homes standards), and reduced maintenance through quality construction with durable materials**

Setting Project Goals

Post-Charrette:

- **Health IAQ**
- **Safety through design**
- **Reduce off site impacts**
- **LID techniques**
- **Maintenance plan**

Interactive Exercise

As part of the response to the RFP, you receive charrette notes that describe two meetings with architect, owner and financial consultant.

The Green Communities Appendix B was completed with passing score.

What questions should be asked of team?

Section 2:
Location and Neighborhood Fabric

Green Communities Minimum Standards

Location and Neighborhood Fabric

Y	N	?	Item #	Item Title	Possible Points
			2.1a	Smart Site Location — Proximity to Existing Development	Mandatory
			2.1b	Smart Site Location — Protecting Environmental Resources	Mandatory
			2.1c	Smart Site Location — Proximity to Services	Mandatory
			2.2	Compact Development	Mandatory
			2.3	Walkable Neighborhoods	Mandatory
			2.4a	Smart Site Location — Make Use of Passive Solar Heating/Cooling	5
			2.4b	Smart Site Location — Grayfield, Brownfield or Adaptive Reuse Site	10
			2.5	Compact Development	5
			2.6	Walkable Neighborhoods	5
			2.7	Transportation Choices	12

Section 2:
Location and Neighborhood Fabric

Specific Green Communities Standards

Mandatory Items 2.1a – 2.1c

Smart Site Location

a. **Proximity to Existing Development**
b. **Protecting Environmental Resources**
c. **Proximity to Services**

Section 2:
Location and Neighborhood Fabric

Specific Green Communities Standards

Mandatory Items 2.2 and 2.3

- **Compact Development**
- **Walkable Neighborhoods**

Courtesy of rosecompanies.c

The Value of Location

If we combine the energy used by a home and the energy used in the transportation getting to and from the home, we see that a green urban multifamily home consumes one quarter of the energy (62 million BTUs) used by a typical suburban home (250 million BTUs). So location and energy consumption are deeply causally related.

Jonathan Rose, *Developing Times* Spring 2007

Section 2:
Location and Neighborhood Fabric

Specific Green Communities Standards

Optional Items 2.4a and 2.4b

Smart Site Location

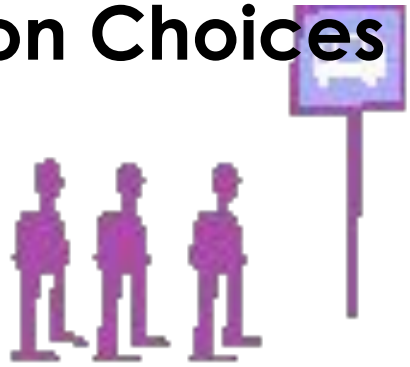
- **Make Use of Passive Solar Heating/Cooling (5 points)**
- **Grayfield, Brownfield or Adaptive Reuse (10 points)**

Section 2:
Location and Neighborhood Fabric

Specific Green Communities Standards

Optional Items 2.5, 2.6 and 2.7

- **Compact Development (5 points)**
- **Walkable Neighborhoods (5 points)**
- **Transportation Choices (12 points)**



Section 2:
Location and Neighborhood Fabric

Why It's Important: The Big Picture

- *Protect watersheds*
- *Infrastructure Savings*
- *Community Health/Recreation*
- *Wildlife Habitat*
- *Conserve Land/Farms*

Section 2:
Location and Neighborhood Fabric

Why It's Important: Project Issues

- *Infrastructure Savings:*
  Roadways, Water, Sewer, Utilities
- *Civic Amenities*
- *Car Ownership/Costs*
- *Community*

Section 2:
Location and Neighborhood Fabric

Design Process: Decision Making

- In D.C., most developments meet siting criteria
- Advanced thinking needed for pedestrian access
- If not in proximity to Metro, explore alternative transportation choices/zip car
- Parking/Bike Storage

Section 2:
Location and Neighborhood Fabric

Cost Implications

- Due to the relative density of neighborhoods in the District, there should be few cost implications for achieving this requirement;

  savings from reduced parking or increased density

- May be issues if developer is pushing the density beyond what the community is used to

- Walkability improvements could cost

Section 2:
Location and Neighborhood Fabric

City Review Process: What To Look For

Site map, density calculations, and location map

Section 2:
Location and Neighborhood Fabric

Likely Excuses, Issues & Complaints

- Neighbors will not support density/marketability
- Marketability of housing on former brownfield
- People prefer their cars/inadequate parking/market rate parking issues
- Desire for green space/open space

Section 2:
Location and Neighborhood Fabric

- **Plenty of good examples of developments that have met criteria in attractive, non-controversial ways**
- **Walking/biking = healthier communities**
- **Savings due to existing infrastructure should be starting point of discussion**

Interactive Exercise

As part of the Green Plan, a developer proposes a parking ratio of one parking space per four units in an area zoned for a 1:3 ratio.

Reduced parking contributed to more open space on the site that was used for a community garden.

How would the city evaluate this proposal?

Section 3: Site Improvements

Green Communities Minimum Standards

Site Improvements

Y	N	?	Item #	Item Title	Possible Points
			3.1	Environmental Remediation	Mandatory
			3.2	Erosion and Sedimentation Control	Mandatory
			3.3	Landscaping	Mandatory
			3.4	Surface Water Management	5
			3.5	Storm Drain Labels	2

Section 3: Site Improvements

Specific Green Communities Standards

Mandatory Items 3.1, 3.2, and 3.3

- **Environmental Remediation**
- **Erosion/Sedimentation Control**
- **Landscaping**

Section 3: Site Improvements

Specific Green Communities Standards

Optional Items 3.4 and 3.5

- **Surface Water Management (5 points)**
- **Storm Drain Labels (2 points)**

www.detroitriver.org/.../Storm_Drain_w_Label.JPG

Section 3: Site Improvements

Why It's Important: The Big Picture

- *Improve underutilized blighted land*
- *Conserve and improve water quality*
- *Avoid introduction of invasive plant species*

Section 3: Site Improvements

Why It's Important: Project Issues

- *Environmental liabilities*
- *Reduced landscaping maintenance costs*
- *Avoids stormwater problems*
- *Nicer spaces*

Section 3: Site Improvements

Design Process: Decision Making

- Clarity on environmental conditions simply part of due diligence
- Important to plan early for erosion & sedimentation control as well as stormwater management
- Native species can at times be more difficult to source

Section 3: Site Improvements

Cost Implications

- Erosion & sedimentation control can be more expensive depending on experience of design team

- Stormwater management can be approached in a variety of ways, most having higher up front costs

Section 3: Site Improvements

City Review Process: What To Look For

Expertise of design team

(Civil engineer, Landscape Architect, Licensed Site Professional)

http://www.usgbc.org/DisplayPage.aspx?CMSPageID=1584

Section 3: Site Improvements

Likely Excuses, Issues & Complaints

- **Too expensive**
- **Have used traditional approaches – they worked**
- **Calculations too demanding**
- **No space on the site**

Section 3: Site Improvements

- There are effective strategies that if planned early can have little cost impact
- This is more than calculating amounts of water, quality counts
- Resources and expertise are out there, teams should demonstrate that they are aware of them
- Expertise is key

Interactive Exercise

The site is a brownfield and the project has gone through a Phase I assessment revealing oil contaminated soil.

What would you require in terms of further testing and budgeting for remediation?

Interactive Exercise

The Green Plan demonstrates that 60% of the plantings on the site are native or non-invasive species.

How would you evaluate the plans and specs to make sure the criteria were met?

How would you conduct a field inspection to verify?

Section 4: Water Conservation

Green Communities Minimum Standards

Water Conservation

Y	N	?	Item #	Item Title	Possible Points
			4.1a	Water-Conserving Appliances and Fixtures	Mandatory
			4.1b	Water-Conserving Appliances and Fixtures	Mandatory
			4.2	Efficient Irrigation	Mandatory

Section 4: Water Conservation

Specific Green Communities Standards

Mandatory Items 4.1a – New Construction

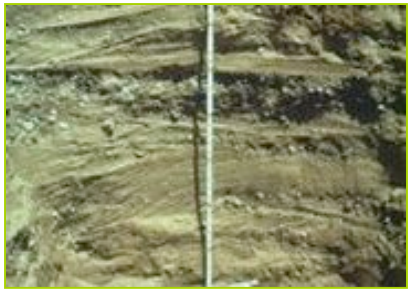
Mandatory Items 4.1b – Rehab

	GC STANDARD	ACHIEVABLE
Toilets:	1.6 gpf	1.1 gpf/waterless
Kitchen Aerator:	2 gpm	1.5 gpm
Bathroom Aerator:	2 gpm	0.5 gpm
Showerhead:	2 gpm	1.5 gpm

Section 4: Water Conservation

Why It's Important: The Big Picture

- *Reliable Sources*
- *Drought*
- *Infrastructure Costs*



Section 4: Water Conservation

Why It's Important: Project Issues

Operating Costs

- *Water*
- *Sewer*
- *DHW*

DC Combined Water & Sewer Rates:
$.007 per gallon- 5% increase

Section 4: Water Conservation

Design Process: Decision Making

- **Early not critical unless integrating irrigation systems into development**

- **With more sophisticated approaches, code issues could arise**

Section 4: Water Conservation

Cost Implications

First Cost: $0 to $100 per unit

Operating Costs

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

Section 4: Water Conservation

City Review Process: What To Look For

Specifications and Plan Schedules

Section 4: Water Conservation

Likely Excuses, Issues & Complaints

- **Cost**
- **Product Availability**
- **Performance**
- **Removal/Vandalism**
- **Maintenance**

mygreenhomeblog.com/.../2007/10/showerhead.jpg

Section 4: Water Conservation

- **MaP Test: Maximum Performance of Toilets**
- **Available Free Online**
  http://www.cuwcc.org/MapTesting.lasso
  Third Party, independent, *realistic* testing of toilet performance and efficiency
- **Do not spec a toilet without checking it first!**

Section 4: Water Conservation

Other Water Issues - Appliances

- **Washing Machines**
  - Front Loading
  - High Modified Energy Factor (MEF): min. 1.72
  - Low water factor: max 8
  - Be sure to Spec a dryer with a humidity sensor to go with it!
  - Think about design as well! Common vs. individual.
- **Dishwashers**
  - Size Appropriately
  - High Energy Factor (EF): min

The average non-conserving household uses 69.3 gallons/ capita/ day

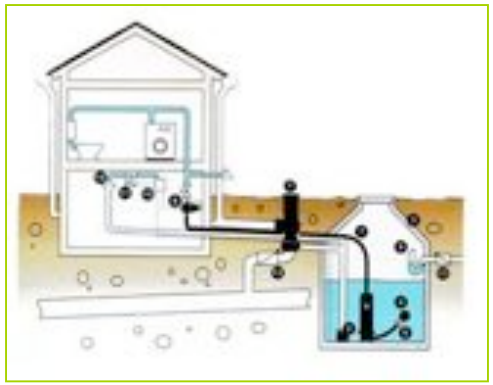
Section 4: Water Conservation

- **Efficient Irrigation**
  - **Efficient water transfer (i.e. drip irrigation)**
  - **Reduced potable water needed (stormwater catchment system)**
- **No Potable Water for Irrigation**
  - **All non-potable sources**
  - **No need for irrigation**
    - **Native landscaping, reduced turf**

Section 4: Water Conservation

Innovative Wastewater Systems

- **Greywater/Rainwater Sewage System**



Section 5: Energy Efficiency

Green Communities Minimum Standards

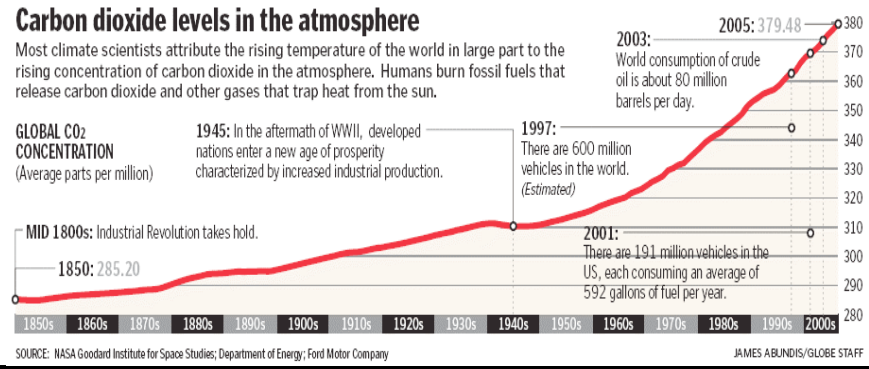
Energy Efficiency

Y	N	?	Item #	Item Title	Possible Points
			5.1a	Efficient Energy Use	Mandatory
			5.1b	Efficient Energy Use	Mandatory
			5.2	Energy Star Appliances	Mandatory
			5.3a	Efficient Lighting – Interior	Mandatory
			5.3b	Efficient Lighting – Exterior	Mandatory
			5.4	Electricity Meter	Mandatory
			5.5a	Additional Reductions in Energy Use for New Construction	10
			5.5b	Additional Reductions in Energy Use for Moderate Rehab	10
			5.6a	Photovoltaic (PV) Panels	10
			5.6b	Photovoltaic (PV) Ready	2

Section 5: Energy Efficiency

Why It's Important: The Big Picture

- *Impact on disposable income*
- *Climate change*
- *Oil dependence*



Section 5: Energy Efficiency

Why It's Important: Project Issues

Operating Costs

- *Financial sustainability of project*
- *Serving low-income people*
- *Enables feasibility of renewables*

Section 5: Energy Efficiency

Specific Green Communities Standards

Mandatory Items 5.1a & b and 5.2

- **Efficient Energy Use**

  (new construction: Energy Star or ASHRAE -30%. Rehab 10 year payback)

- **Energy Star Appliances**

Section 5: Energy Efficiency

Specific Green Communities Standards

Mandatory Items 5.3a & b and 5.4

- **Efficient Lighting (interior and exterior)**
- **Electricity Meter**

Section 5: Energy Efficiency

Specific Green Communities Standards

Optional Items 5.5a & b and 5.6a & b

- **Additional Reductions in Energy Use (New Construction: Above Energy Star or ASHRAE -30%. Rehab: 14 year payback) (10 points)**
- **Photovoltaic Panels (10 points)**
- **Photovoltaic Ready (2 points)**

Section 5: Energy Efficiency

Specific Green Communities Standards

What is Energy Star Homes?

How does it work?

http://i.treehugger.com/energy-star-at-home.jpg

Section 5: Energy Efficiency

Specific Green Communities Standards

- **What is the HERS rating system?**
- **How does it interface with Energy Star Homes?**

Section 5: Energy Efficiency

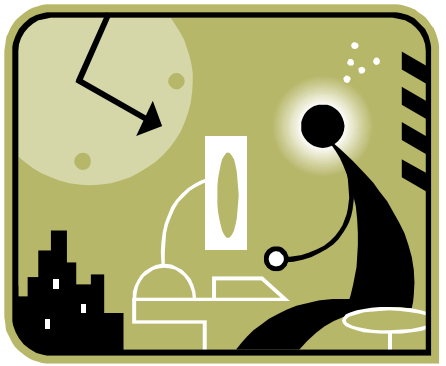
Specific Green Communities Standards

- **What is ASHRAE 90.1?**
- **What does it mean to beat ASHRAE 90.1 by 30%?**
- **What are the cost implications?**
- **New legislation/conservation charges**

Section 5: Energy Efficiency

Design Process: Decision Making

- **Perhaps the most time consuming and complex of the design issues**
- **Starting early and being diligent about integrated design is crucial**
- **Savings can be quantified**
- **Reasonable opportunities for funding**



What Makes for Energy Efficient Building?

- **Energy Performance:**
  - **Building Envelope**
  - **Air Sealing**
  - **HVAC Systems**
  - **Modeling**
  - **Lighting and Plug Load**
  - **Renewable Energy**
  - **Commissioning**
- **Other Energy Issues:**
  - **Refrigerants**
  - **Green Power**

HVAC/ Envelope: Cost/Benefit

- **Things to Consider**
  - **First Cost (are there rebates to offset first cost?)**
  - **Durability/Life Span**
  - **Ancillary Benefits (pest control-borate; comfort)**
  - **Operational Cost**
    - **Energy Modeling – compare life cycle costs of different efficiency systems/building envelope components**
      - » **Account for inflation of energy and cost of money**

Building Envelope

Things to Carefully Consider

- **Insulation R-Values and Material**
- **Windows**
- **Air Sealing**
- **Moisture Migration**

Insulation

Recommended R-Values

- **Basement/Slab: R-11 to R-19**
- **Wood frame Walls: R-11 to R-22**
- **Roof: R-38**

Material

- **Fiberglass (R-3 per inch)**
- **Cotton Batt (R-3.5 per inch)**
- **Mineral Wool (R-3.2 per inch)**
- **Cellulose (R-3.5 per inch)**
- **Spray Foam**
  - **Polyurethane (R-6 per inch)**
  - **Icynene (R-4 per inch)**
- **Rigid Skin (R 4-6 per inch)**

Windows

Energy Star Certified

- **Frame Material – Good thermal properties; fiberglass the best**
- **Low E Glass – reflects heat into the building in winter and out in the summer**
- **Gas Filled – Argon/krypton between panes have good insulating properties**
- **U Value – Thermal value (max .35)**
- **Solar Heat Gain Coefficient – lower the #, the less solar heat it lets in (important for passive solar)**

Air Sealing and Moisture Migration

- **Air infiltration:**
  - **Reduce by carefully specifying air sealing requirements (Thermal Bypass Inspection Checklist from Energy Star Homes)**
  - **Air Tight Drywall Approach**
  - **Rigid Skin**
  - **Inspection/Blower door testing before drywall is up.**

- **Moisture Migration:**
  - **Carefully consider how moisture will move through your wall / how the wall will dry. IAQ issue!**

Saving Energy Through Air Sealing

Cost Benefit Analysis From Lazarus House

Air Sealing – Lazarus House

	Leaky	Model	Tested	What If	vs Tested	
Natural Air Changes Per Hour	0.65	0.35	0.34	0.25		
Eff Leakage Area: si/100 sf shell	5.89	3.17	2.8	2.04		
HERS Score	84	73	69	63	6	8.70%
Annual Usage-Heating Therms	5673	3723	3188	2696	492	15.43%

Value of Air Sealing – Lazarus House

Lazarus House:

492 Therms Per Year Saved

@ 1.65 per therm = $811.80

NPV 10 Years = $8431

HVAC Systems

- **Key Questions to Ask**
  - **Who Pays for the Utilities?**
  - **Are you providing A/C?**

- **Right Size & Efficiency of Systems**
  - **Heat Load Calculations – demand them!**

- **System Type**
  - **Thermal comfort**
  - **Efficiency (furnaces vs. boilers)**
  - **Interaction with Envelope (ie a/c sleeves)**

- **Renewable Energy Interaction?**

Section 5: Energy Efficiency

Cost Implications

Gut Rehab of 6 Unit Fire Damaged Rental Property

Project Examples - 7th Street Cambridge

HEATING SEASON (MMBtu/yr)	base ce infiltration to .25	.25 + 1.5" R6 Rigid	.25+ triple glaze	all 3
Above Grade Walls 24.5	24.5	24.6	21.5	24.7	21.6
Windows/Skylights 19.7	19.7	20.1	20.2	13.5	13.6
Infiltration 24.1	24.1	14.4	14.4	14.4	14.4
Mechanical Ventilation 21.0	21	21	21	21	21
Internal Gains -39.5	-39.9	-39.1	-38.9	-38.6	-38.5
Total 80.9	80.9	72.3	69.3	66	63

Project Examples - 7th Street Cambridge

	CODE	BASE	REDUCED INFILTRATION TO 0.25
ANNUAL HEATING FUEL USE (therms)	2035	745	662
COST @ $ 1.65	$ 3,358	$ 1,229	$ 1,092
$ SAVINGS		$ 2,129	$ 137
% SAVINGS		63%	11%
NPV			
5 YEARS		$ 10,632	$ 684
10 YEARS		$ 22,592	$ 1,454
15 YEARS		$ 36,046	$ 2,320
30 YEARS		$ 87,349	$ 5,621

Project Examples - 7th Street Cambridge

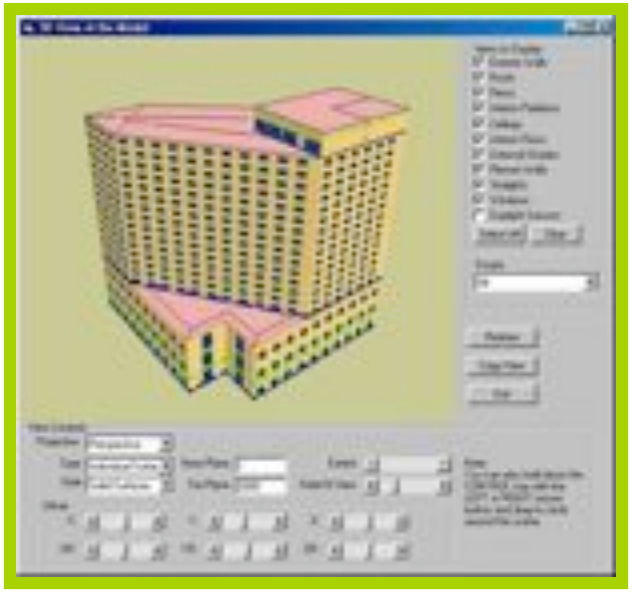
Next Steps:

- **Calculate savings from boiler size**
- **Concentrate on electrical load reduction**
- **8834 kWh--$1695**
- **Investigate solar PV and thermal**
- **Water heating 598 therms ~ heating load**

Section 5: Energy Efficiency

City Review Process: What To Look For

Specifications and Energy Modeling, HERS Score, Payback Analysis



Section 5: Energy Efficiency

Likely Excuses, Issues & Complaints

- **Don't need energy modeling/cost of modeling**
- **Higher first cost**
- **Complexity of systems**
- **Design and O&M**
- **Commissioning recommended**

Section 5: Energy Efficiency

Other Energy Issues - Renewables

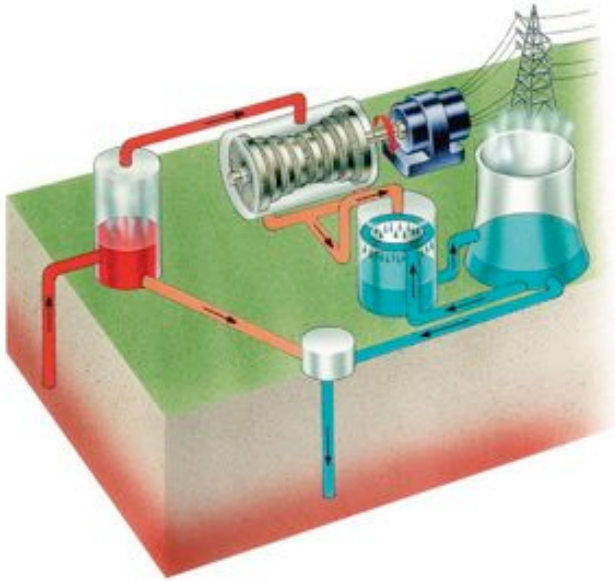
- **Solar energy is currently the most feasible in urban environments**
- **Requires subsidy for reasonable payback periods**

- **<u>Feasibility Considerations</u>**
  - **Roof space**
  - **Shading and orientation**
  - **Electrical load**

Section 5: Energy Efficiency

Innovative Approaches

- **Geothermal – cost/benefits**
- **Biomass**
- **Combined heat and power**
- **Distributed generation**



Interactive Exercise

A project application has just gone through value engineering, and the developer is suggesting downgrading the efficiency of the air conditioning system.

What must they do in order to prove that they are still meeting the Green Communities standard?

Are there any other issues that should be addressed?

Section 6:
Materials Beneficial to the Environment

Green Communities Minimum Standards

Materials Beneficial to the Environment

Y	N	?	Item #	Item Title	Possible Points
			6.1	Construction Waste Management	5
			6.2	Recycled Content Material	14
			6.3	Certified, Salvaged and Engineered Wood	10
			6.4a	Water-Permeable Walkways	5
			6.4b	Water-Permeable Parking Areas	5
			6.5a	Reduce Heat-Island Effect – Roofing	5
			6.5b	Reduce Heat-Island Effect – Paving	5

Section 6:
Materials Beneficial to the Environment

Specific Green Communities Standards

All Optional Items 6.1 – 6.5 a &b

- **Construction Waste Management (5 points)**
- **Recycled Content Material (14 points)**
- **Certified, Salvaged and Engineered Wood (10 points)**
- **Water-Permeable Walkways (5 points)**
- **Water-Permeable Parking Areas (5 points)**
- **Reduced Heat-Island Effect – Roofing (5 points)**
- **Reduced Heat-Island Effect – Paving (5 points)**

Section 6:
Materials Beneficial to the Environment

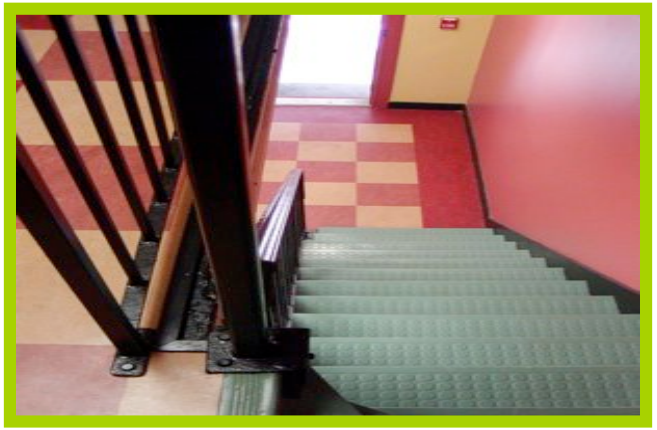
Why It's Important: The Big Picture

- *Resource protection*
- *Aquifer recharge*
- *Climate change*

Section 6:
Materials Beneficial to the Environment

Why It's Important: Project Issues

- *Reduction in tipping fees*
- *Stormwater management*
- *Thermal comfort translates to energy use*
- *Aesthetics*



Section 6:
Materials Beneficial to the Environment

Design Process: Decision Making

- **Sourcing of materials can be time consuming**
- **Transportation costs and environmental impact should be considered**
- **Are the GC and subs familiar with the products? INTEGRATED DESIGN!**

Section 6:
Materials Beneficial to the Environment

Cost Implications

- Lower cost items include fly ash concrete, recycled content drywall and steel studs
- First costs of some materials can be more than traditional
- Consider durability and ease of maintenance
- Controlling for heat island effect makes sense in D.C. with hot, humid summers – operating efficiencies on utility side; resident comfort

Section 6:
Materials Beneficial to the Environment

City Review Process: What To Look For

Specifications and Plan Schedules

Section 6:
Materials Beneficial to the Environment

Likely Excuses, Issues & Complaints

- **Too expensive**
- **Too difficult to implement waste management**
- **Can't find distributor**
- **ADA and winter maintenance issues with paving**
- **Ran out of time to research options (nearly universal to all sections)**

Section 6:
Materials Beneficial to the Environment

Comparison between a black EPDM roof and white EPDM roof

	Geographic Location			
	Washington	**Phoenix**	**Washington**	**Phoenix**
Annual Heating Energy Use (therms)	**870**	**46**	**930**	**60**
Annual Cooling Energy Use (kWh)	**20,700**	**40,400**	**19,300**	**37,300**
Annual Energy Cost	**$1,590**	**$2,440**	**$1,530**	**$2,260**
Lifetime Energy Cost	**$17,100**	**$25,600**	**$16,500**	**$23,800**
Lifetime Energy Cost Savings	-	-	$600	$1,800

Source: Federal Energy Management Program (FEMP) of the U.S. Department of Energy

Section 6:
Materials Beneficial to the Environment

But did you know?

- **Suburban/urban areas with large amounts of dark, energy-absorbing surfaces can be 2-10 degrees F hotter than comparable rural areas. (US EPA)**

- **Using light colored roofing – with a high solar reflectance index – can make solar panels more efficient!**

Prime example of thinking holistically **about the project.**

Interactive Exercise

A project has proposed using permeable pavers for its walkways in an elderly project.

What issues should you require them to address?

Section 7: Healthy Living Environment

Green Communities Minimum Standards

The Importance of Indoor Air Quality

Healthy Living Environment

Y	N	?	Item #	Item Title	Possible Points
			7.1	Low / No VOC Paints and Primers	Mandatory
			7.2	Low / No VOC Adhesives and Sealants	Mandatory
			7.3	Formaldehyde-free Composite Wood	Mandatory
			7.4	Green Label Certified Floor Covering	Mandatory
			7.5a ★	Exhaust Fans – Bathroom	Mandatory
			7.5b ★	Exhaust Fans – Kitchen	Mandatory
			7.6 ★	Ventilation	Mandatory
			7.7	HVAC Sizing	Mandatory
			7.8a	Water Heaters – Mold Prevention	Mandatory
			7.8b	Water Heaters – Minimizing CO	2
			7.9	Cold Water Pipe Insulation	Mandatory
			7.10a	Materials in Wet Areas – Surfaces	Mandatory
			7.10b	Materials in Wet Areas – Tub and Shower Enclosure	Mandatory
			7.11a	Basements and Concrete Slabs – Vapor Barrier	Mandatory
			7.11b ★	Basements and Concrete Slabs – Radon	Mandatory
			7.12	Water Drainage	Mandatory
			7.13	Garage Isolation	Mandatory
			7.14	Clothes-Dryer Exhaust	Mandatory
			7.15	Integrated Pest Management	Mandatory
			7.16	Lead-Safe Work Practices	Mandatory
			7.17a	Healthy Flooring Materials – Alternative Sources	5
			7.17b	Healthy Flooring Materials – Reducing Dust	2

Section 7: Healthy Living Environment

Specific Green Communities Standards

All but 3 of the 22 items in this section are MANDATORY!

The 3 that ARE NOT, **are:**

- **Water Heaters – Minimizing CO (2 points)**
- **Healthy Flooring Materials – Alternative Sources (5 points)**
- **Healthy Flooring Materials – Reducing Dust (2 points)**

Section 7: Healthy Living Environment

Why It's Important: The Big Picture

- *Public Health Costs*
- *Energy Efficiency*
- *Climate Change*
- *Liability Issues*

Section 7: Healthy Living Environment

Why It's Important: Project Issues

- *Occupant health*
- *Reduced operating cost – utilities and pest management*
- *Reduced replacement costs*

Section 7: Healthy Living Environment

Image: Aspen Testing

RISKS

- **Mold**
- **VOCs**
- **Pesticides**
- **Air Particulates**

FACTS

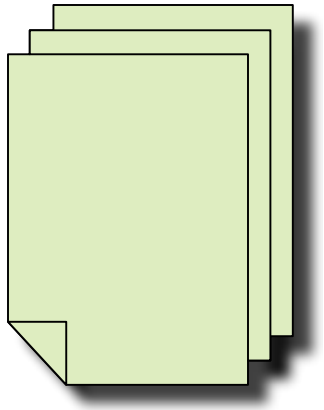
- **90% of a person's time is spent indoors**
- **Airborne pollutants are estimated to be 2-5 times greater indoors**
- **1 in every 5 adults in New England reported illness or symptoms they thought were due to poor indoor air quality.**
- **DOE estimates that indoor air improvements have the potential to reduce respiratory disease, allergy and asthma symptoms 10-30%.**

Section 7: Healthy Living Environment

Design Process: Decision Making

- **Must coordinate these items with the architect, engineers, contractors EARLY in the process**

- **Documentation is a MUST…**
  too many cases where there is a verbal understanding of the criteria but no follow-through



Section 7: Healthy Living Environment

Cost Implications

- Strategies can cost more up-front, but the downstream cost-saving justify the expense
- Often short payback
- Lack of attention to detail up-front can mean costly change orders

Section 7: Healthy Living Environment

City Review Process: What To Look For

Specifications and Plan Schedules
Manual J and S Calculations

Section 7: Healthy Living Environment

Likely Excuses, Issues & Complaints

- **Didn't know the VOC limits**
- **Thought it was formaldehyde FREE**
- **Construction schedules have to take into account specific requirements for installation of new materials**
- **IPM too costly and involved**
- **Reluctance to down size equipment**

Interactive Exercise

A project meets all the HVAC efficiency requirements. Energy Star is modeled and met, catch pans are put under water heaters, however, water is not drained to the outside. This causes the project to fail a mandatory requirement.

Where in the process should this have been caught…by the developer and/or the city?

What could have been done to prevent missing this crucial detail?

Interactive Exercise

Green Communities requires that carpeting, paint, caulks, and sheet goods meet low or no off-gassing criteria.

Why is this important and how do you ensure it gets done?

Section 8: Operations & Maintenance

Green Communities Minimum Standards

Operations and Maintenance

Y	N	?	Item #	Item Title	Possible Points
			8.1	Building Maintenance Manual	Mandatory
			8.2	Occupant's Manual	Mandatory
			8.3	Homeowner and New Resident Orientation	Mandatory

Section 8: Operations & Maintenance

Specific Green Communities Standards

All items, 8.1-8.3, in this section are mandatory.

- Building Maintenance Manual
- Occupant Manual
- Homeowner and New Resident Orientation

Section 8: Operations & Maintenance

Why It's Important: The Big Picture

- *Impact on IAQ and water quality*
- *Sustainability education*
- *Community involvement*

Section 8: Operations & Maintenance

Why It's Important: Project Issues

- ***Reduction in call-backs***
- ***Occupant health***
- ***Long-term sustainability***
- ***Utility savings***

Section 8: Operations & Maintenance

Design Process: Decision Making

- **Early not critical, but helpful**
- **Take into account occupant ethnic and linguistic backgrounds**
- **Involve maintenance staff early**

Section 8: Operations & Maintenance

Cost Implications

- **Little to no cost implications**
- **Training of staff to use new techniques and products**
- **Involve maintenance staff early**

Section 8: Operations & Maintenance

City Review Process: What To Look For

What is the plan to adhere to these requirements?

Who on the project team is in charge?

Point to examples on Green Communities website

Section 8: Operations & Maintenance

Likely Excuses, Issues & Complaints

- **Green is too complicated to explain**
- **People will not pay attention anyways**
- **Green cleaners are not as effective**
- **Maintenance staff turn over**

Lessons From Green CDCs Initiative

If Greening is So Great,

Why Isn't it Ubiquitous?

Why Doesn't This Happen on Every Project?

- **Failure to "Think Green" Early**
- **Poor Team Selection**
- **Key Decisions Made *Before* Goals Set**
- **Lack of Integrated Design Approach**

How To Make Every Project Greener

Opportunity: "Think Green" Early

Action:

- Develop a vision of the project that combines *programmatic* purpose, building *design* and building *performance.*
- Expect and demand a green project that meets other goals

How To Make Every Project Greener

Opportunity: Careful Team Selection

Action:

- Assemble a team that can form programmatic, design and performance visions into reality.
- Hire architect that is experienced in *Integrated Design* & eager to explore alternatives to the conventional
- Address payment issues early
- Participate in selection of architect's subs
- Get help… hire a green consultant

How To Make Every Project Greener

Opportunity: Don't Make Key Decisions *Before* Goals Set

Action:

- Hold a design charrette before even a schematic sketch is produced – D.C. and Enterprise already making this happen

- Set Design/Program/Performance goals early

How To Make Every Project Greener

Opportunity: Integrated Design

Action:

- Green Communities Planning and D.C. Regulations

- Responsible project team member

Beware of Greenwashing

"the act of trying to pass off unsustainable products as eco-friendly through branding, packaging or mislabeling"

"Can't we just dye the smoke green?"

Source: The New Yorker

Greenwashing

Green Communities is a good guard against greenwashing

Remember the importance of process? A holistic approach to developing green also protects a project from greenwashing

Tom Sawyer Whitewashing the Fence, detail ©1936 Heritage Press and Eaton Press, Norwalk, CT

Managing the Greening Process: Roles and Responsibilities

So now you have a sense of what to look for, how do you manage your part of the process from here?

Don't want to be seen as the mean, green project manager!

Managing the Greening Process: Roles and Responsibilities

- **Be sure to know what questions are appropriate to ask at each stage**
  - **Questions about choosing the design team are probably past their usefulness; questions about managing integrated design ARE appropriate**

- **Understand greening as a *process***
  - **Do not approach greening in terms of achieving individual points – red flag when you see projects that do**

Managing the Greening Process: Roles and Responsibilities

- Know where to get the information you need
  - **There are many resources out there at your disposal**

- Understand which criteria have a cost premium and which don't
  - **Be prepared for push back and "value engineering" on some of the items**

- Use green plan as the project guide
  - **Don't let it get lost in the shuffle!**

Permitting / Project Closing

- **Check on final design and Value Engineering's effect on the Green Communities Criteria**
- **What will you do if these criteria are not met? Require re-submittal of Green Plan?**

Inspection

- **What will you do if these criteria are not met when you do field inspections?**

- **The carrot was the funding, but once the funding is granted and construction is in progress, what is the stick to ensure the greening details are met?**

At the end of the day…

- **Is the Green Communities standard met?**
- **How can you determine what are realistic goals?**
- **What can you do if you see that the Green Development Plan is unrealistic?**
- **How will you develop the expertise and knowledge to be a green resource and advocate?**

Managing and Supporting the Development of Green Affordable Housing

Connelly@newecology.org

Fraser@newecology.org

617-354-4099

NEW ECOLOGY INC.
Environmental Protection and Economic Development in Urban Communities

Edward F. Connelly
President,

Madeline Fraser Cook,
Vice President

New Ecology, Inc.
Cambridge, MA