

## National Green Home Rating Programs and Standards

Energy Out West 2008 Conference

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## Overview



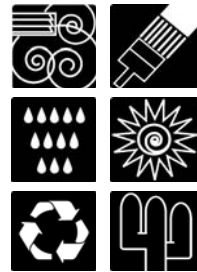
1. Background
2. Government and Industry Trends
3. Green Home Rating Programs
4. Summary and Conclusions

## Green/Environmentally Responsible Buildings

- Integrated, whole-systems approach
- Creating synergy between climate, building use, and place
- Considers larger ramifications of design, material selection and building practices

## Green Building Rating by Environmental Impacts

- Site Use
- Energy
- Building Materials
- Indoor Air Quality
- Water
- Solid Waste



## Green Building Rating by Construction Categories

- |  |                                     |
|--|-------------------------------------|
| 1. Site Use                                | 7. Roofing                          |
| 2. Structural Elements                     | 8. Exterior Finishes                |
| 3. Building Envelope                       | 9. Interior Finishes                |
| 4. HVAC & Indoor Air Quality               | 10. Interior Doors, Cabinetry, Trim |
| 5. Electrical Power, Lighting & Appliances | 11. Finish Floor                    |
| 6. Plumbing System                         | 12. Solid Waste                     |
|  | 13. Innovative Design               |

## Sustainability: The triple Bottom Line

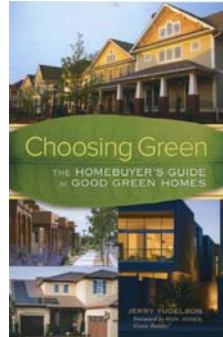




## Shades of Green

- All buildings provide some level of environmental attributes
  - Passive and active systems
- Baseline measures
  - Local code and ordinance requirements

## Choosing Green



- Guide to Good Green Homes
  - Green Systems and Technologies
  - Green Home Rating Programs
  - Evaluating Home Builder Offerings
  - Finding Green Home Developments

Jerry Yudelson, 2008

## Government and Industry Trends

## Architecture 2030

- This fossil fuel reduction standard for the operation of all new buildings must be increased to:
  - 60% in 2010
  - 70% in 2015
  - 80% in 2020
  - 90% in 2025
  - carbon-neutral by 2030 (meaning they will use no fossil fuel energy to operate).

[www.architecture2030.org](http://www.architecture2030.org)

## Energy Independence and Security Act of 2007

Signed by President Bush on 12/19/07

1. Corporate Average Fuel Economy (CAFE)
  - 35 MPG by 2020
2. Appliance and Equipment Efficiency
  - heating/cooling equipment, electric motors, standby power use, refrigerators, clothes washers, dishwashers
3. Lamp Efficiency Standards
  - 25-30% less energy by 2012-2014
  - 60% less energy by 2020

## Energy Independence and Security Act of 2007

4. Regional Standards for Heating/Cooling
  - accommodate range of climatic conditions
5. Commercial Building Initiative
  - combines development and deployment activities towards net zero energy buildings by 2030
    - meaning that a building produces as much energy as it uses

## Energy Independence and Security Act of 2007

### 6. Federal Buildings

- Designed so that fossil fuel-generated energy consumption in buildings is reduced by:
  - 55% by 2010
  - 65% by 2015
  - 80% by 2020
  - 90% by 2025
  - 100% by 2030
- Energy Savings Performance Contracts
  - financing tool for upgrading energy efficiency

## National Industry Trends

- Environmental Protection Agency (EPA) guidelines, standards and programs
  - Energy Star Buildings
    - certifies new homes, buildings and more than 40 types of products that are energy efficient
  - Energy Star - Indoor Air Package
    - certifies homes that protect against moisture and mold, pests, combustion gases, and other airborne pollutants
  - WaterSense
    - identifies products and services that meet water-efficiency performance criteria for plumbing fixtures and landscape irrigation



## Industry Trends & Benchmarks

### • Green Labeling Programs

- Green Seal, GreenGuard, Cradle to Cradle, SCS
- FloorScore (Resilient Flooring Covering Institute), Green Label Plus (Carpet and Rug Institute)
- Forest Stewardship Council (FSC) and Sustainable Forest Initiative (SFI)



## Arizona Energy Incentives

- State Tax Credits - Renewable Energy
  - Personal Income Tax Credit, Sales Tax Exemption, Solar Energy Property Tax Exemption
- Utility Company Incentives
  - Solar electric (PV)
    - rebate is \$3,000 for each kilowatt of rated solar electric power installed in a grid-tied application
  - Solar water heating systems
    - payment is based on system's yearly kW hour rating of 0.50 cents per kW hour


## Arizona Energy Incentives

- Demand Side Management (DSM) Program
  - Funding for energy efficiency improvements
- Home Owner Associations
  - HOA's can't prohibit the installation of solar panels, but can have reasonable rules regarding placement provided the rules do not:
    - Impair its function due to imposed location
    - Restrict its use
    - Adversely affect the cost or efficiency of the system

## Growing Green Building Programs

Local Leaders in Sustainability

2007 Study of Green Building Programs



A Study of Green Building Programs in Our Applicants' Communities

The American Institute of Architects

**AIA**

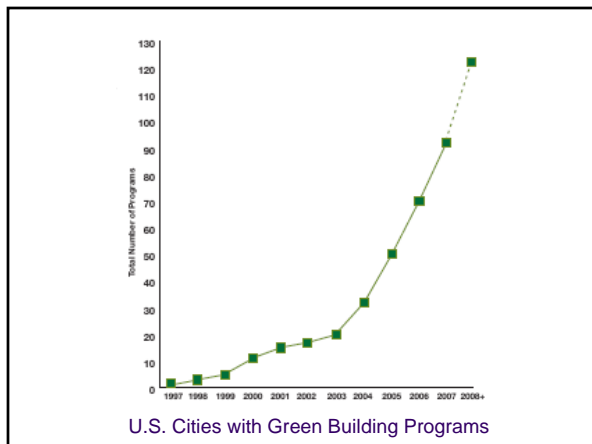
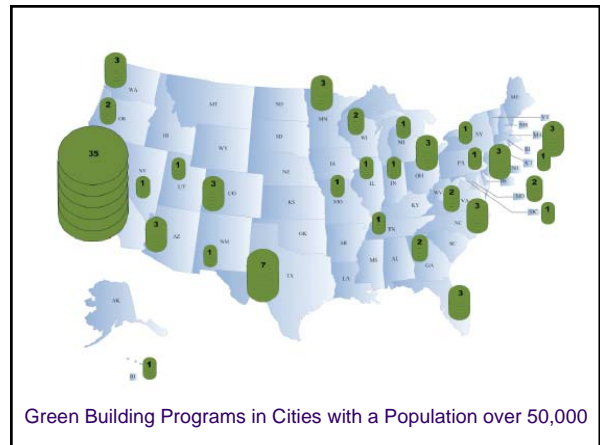
- Examines growth and effectiveness of Green Building Policies in cities

### Local and State Governmental Programs


- Arkansas
- Arizona
- California
- Colorado
- Florida
- Georgia
- Hawaii
- Illinois
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Missouri
- Nevada
- New Jersey
- New Mexico
- New York
- North Carolina
- Ohio
- Oregon
- Pennsylvania
- Tennessee
- Texas
- Utah
- Vermont
- Virginia
- Washington, DC
- Wisconsin

**AIA** 2007 Study of Green Building Programs

- Ninety-two cities have green building programs, or 14 percent of all cities with a population greater than 50,000
- Thirty-nine percent or about 42 million Americans live in cities with green building programs



### Strategies for Transforming Building Practices in the Private Sector



- Policies that establish green building requirements
- Policies that provide expedited plan review
- Policies that provide direct financial incentives
  - Grants
  - Fee Waivers
  - Tax Breaks and Bonus Development

Environmental Law Institute

## National Green Home Rating Systems and Standards

### Market Based Programs

- LEED
- Green Globes
- National Association of Home Builders (NAHB)
- Energy Star
- Environments for Living
- Utilities
- Local HBA's



### Energy Star Label

- ENERGY STAR is the government-backed voluntary program for energy efficiency
  - Homes
    - HERS Index
    - Target Finder
  - Commercial buildings
    - Target Finder
  - More than 50 product types
    - appliances, lighting, office equipment, consumer electronics, and heating/cooling equipment



### Green Building Rating Systems

#### Currently in Operation

- LEED (commercial and residential)
- Green Globes for New Construction (commercial)
- Green Globes for Continual Improvement (existing commercial)
- BOMA – Go Green Plus (existing commercial)
- CHPS – Collaborative for High Performance Schools
- NAHB Model Green Home Building Guidelines (residential)

#### Currently under Development (as standards)

- Green Globes/ANSI Version for New Construction (commercial)
- ASHRAE 189.1P, Standard for the Design of High-Performance Green Buildings (commercial)
- ICC/NAHB – National Green Building Standard (residential)

### National Association of Home Builders



### NAHB Model Green Home Building Guidelines

- Established in 2005
- Aimed at Mainstream Home Builder
  - Designed to highlight ways in which a mainstream home builder can effectively weave environmental concerns holistically into a new home
  - Serve as a tool that local builder associations can use to create a green home building program.

## NAHB Model Green Home Building Guidelines

	Bronze	Silver	Gold
Lot Design, Preparation, and Development	8	10	12
Resource Efficiency	44	60	77
Energy Efficiency	37	62	100
Water Efficiency	6	13	19
Indoor Environmental Quality	32	54	72
Operation, Maintenance, and Homeowner Education	7	7	9
Global Impact	3	5	6
Additional Points From Sections of Your Choice	100	100	100

## NAHB/ICC Green Building Standard

- Chapter 1 - Scope and Administration
- Chapter 2 - Definitions
- Chapter 3 - Compliance Method
- Chapter 4 - Site Design and Development
- Chapter 5 - Lot design, Preparation and Development
- Chapter 6 - Resource Efficiency
- Chapter 7 - Energy Efficiency
- Chapter 8 - Water Efficiency
- Chapter 9 - Indoor Environmental Quality
- Chapter 10 - Operation, Maintenance and Building Owner Education

## NAHB/ICC Green Building Standard

### Site Development Rating for Subdivisions

Threshold Point Ratings for Site Design and Development		Performance Level Points			
Green Subdivision Category		One Star	Two Stars	Three Stars	Four Stars
Chapter 4	Site Design and Development	79	104	134	175

## NAHB/ICC Green Building Standard

Threshold Point Ratings for Green Buildings			Performance Level Points <sup>1,2</sup>			
Green Building Categories			BRONZE	SILVER	GOLD	EMERALD
1.	Chapter 5	Lot Design, Preparation, and Development	39	66	93	119
2.	Chapter 6	Resource Efficiency	45	79	113	146
3.	Chapter 7	Energy Efficiency	50	60	100	120
4.	Chapter 8	Water Efficiency	14	26	41	60
5.	Chapter 9	Indoor Environmental Quality	36	65	100	140
6.	Chapter 10	Operation, Maintenance and Building Owner Education	8	10	11	12
7.	Additional Points from any category		50	100	100	100
Total Points:			222	406	558	697

1. In addition to the threshold number of points in each category, all mandatory provisions of each category shall be implemented.
2. For dwelling units greater than 4,000 square feet, the number of points in Category 7 (Additional Points from any category) shall be increased in accordance with Section 601.1. Total Points shall be increased by the same number of points.

## NAHB/ICC Green Building Standard

- All categories have mandatory provisions
  - usually building code related items
- Energy efficiency category options
  - Performance Path requires 15% above IECC and minimum of two energy efficiency practices
  - or -
  - Prescriptive Path requires at least 30 points and minimum of two energy efficiency practices

## NAHB/ICC Green Building Standard

Designed to be adopted by an Adopting Entity

- Adopting Entity is defined as
  - the governmental jurisdiction, green building program, or any other third party compliance assurance body that adopts the Standard, and is responsible for implementation and administration of the practices
- Adopting entity
  - can require additional points from any category to increase threshold requirements
  - can not reduce the threshold requirements in any of the rating categories

## U.S. Green Building Council

### LEED Green Building Rating System



## USGBC and LEED

- Developer and administrator of the LEED Green Building Rating System
  - Tool used to certify the design, construction and operation of buildings
  - Consensus-driven
  - Committee-based product development

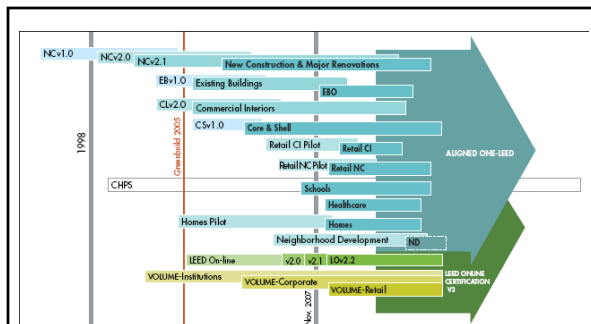
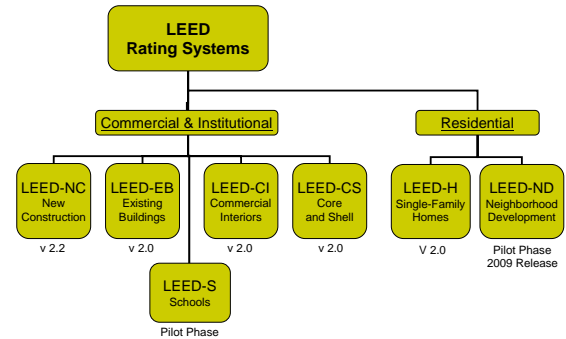


## LEED Rating System

- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials & Resources
- Indoor Environmental Quality
- Innovation & Design Process

[www.usgbc.org](http://www.usgbc.org)

## LEED Rating Systems



USGBC is working to align the rating systems so they can be managed as separate implementations of a common set of credits (upper arrow). Similarly, the certification processes will be integrated in the next iteration of LEED Online (lower arrow).

## LEED for Homes

### LEED® for Homes Rating System



January 2008

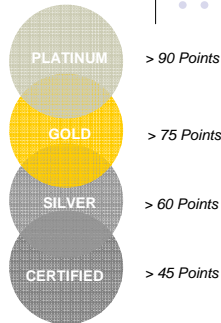
- Single family and multi-family
- Certification Levels
  - Certified
  - Silver
  - Gold
  - Platinum



## LEED for Homes

### Rating Categories

- Innovation & Design Process
- Location & Linkages
- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality
- Awareness and Education



## LEED for Homes

### Mandatory Measures

- Energy efficiency
- Durability plan
- Waste management
- Site protections
- Health & safety measures
  - Combustion venting
  - Controlled ventilation
- Owner's manual



## LEED for Homes

### Prerequisites & Minimum Point Requirements

Exhibit 3: Prerequisites and Minimum Point Requirements

Credit category	Prerequisites (mandatory) measures	Minimum point requirements	Maximum points available
Innovation & Design Process (ID)	3	0	11
Location & Linkages (LL)	0	5	10
Sustainable Sites (SS)	2	5	22
Water Efficiency (WE)	0	3	15
Energy & Atmosphere (EA)	2	0	38
Materials & Resources (MR)	3	2	16
Indoor Environmental Quality (EQ)	7	6	21
Awareness & Education (AE)	1	0	3
<b>Total</b>	<b>18</b>	<b>16</b>	<b>136</b>

## LEED for Homes

### Performance Testing

Exhibit 2: Performance Tests

Category	Performance Tests	Responsible Party	Type of Measure	
			Prerequisite	Credit
EA	Envelope Leakage	Rater	X	
	Duct Leakage	Rater	X	
	HVAC Refrigerant Charge	HVAC	X	
EQ	Outdoor Air Flow	Rater		X
	Local Exhaust	Rater		X
	Supply Air Flow	Rater		X

## House Size Adjustment

Exhibit 4: Threshold Adjustment (point range: -10 to +10)

Maximum home size (sq ft) by number of bedrooms					Adjustment to award thresholds*
1 Bedroom	2 Bedrooms	3 Bedrooms	4 Bedrooms	5 Bedrooms	
610	950	1290	1770	1940	-10
640	990	1340	1840	2010	-9
660	1030	1400	1910	2090	-8
680	1070	1450	1990	2180	-7
710	1110	1500	2060	2260	-6
740	1160	1570	2140	2350	-5
770	1200	1630	2230	2440	-4
800	1250	1690	2320	2540	-3
830	1300	1760	2400	2640	-2
860	1350	1830	2500	2740	-1
<b>900</b>	<b>1400</b>	<b>1900</b>	<b>2600</b>	<b>2850</b>	<b>0 ("neutral")</b>
940	1450	1970	2700	2960	+1
970	1510	2050	2810	3080	+2
1010	1570	2130	2920	3200	+3
1050	1630	2220	3030	3320	+4
1090	1700	2300	3150	3460	+5
1130	1760	2390	3280	3590	+6
1180	1830	2490	3400	3730	+7
1220	1910	2590	3540	3880	+8
1270	1980	2690	3680	4030	+9
1320	2060	2790	3820	4190	+10

For larger homes, or homes with more bedrooms, see below.

## House Size and LEED Points

- Based on published data a 100% increase in home size yields an increase in
  - annual energy usage of 15% to 50%, depending in the design, location, and occupants of the home
  - materials usage of 40% to 90%, depending in the design and location of the home



## LEED for Homes

- **Innovation and Design Process: 9 Possible Pts.**

- Integrated Project Planning
- Quality Management for Durability
- Innovative/Regional Design



## LEED for Homes

- **Location and Linkages: 10 Possible Pts.**

- LEED-ND Neighborhood
- Site Selection
- Preferred Locations
- Infrastructure
- Community Resources and Public Transit
- Access to Open Space



## LEED for Homes

- **Sustainable Sites: 21 Possible Pts.**

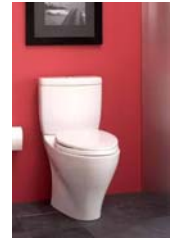
- Site Stewardship
- Landscaping
- Shading of Hardscapes
- Surface Water Management
- Non-Toxic Pest Control
- Compact Development



## LEED for Homes

- **Water Efficiency: 15 Possible Pts.**

- Water Reuse
- Irrigation System
- Indoor Water Use



## LEED for Homes

- **Energy and Atmosphere: 38 Possible Pts.**

- Performance Approach
  - Energy Star Home
  - Water Heating
  - Refrigerant Management
- Prescriptive Approach
  - Insulation
  - Air Infiltration
  - Windows
  - Duct Tightness
  - Space Heating & Cooling
  - Water Heating
  - Lighting
  - Appliances
  - Renewable Energy
  - Refrigerant Management



## LEED for Homes

- **Materials and Resources: 14 Possible Pts.**

- Material Efficient Framing
- Environmentally Preferable Products
- Waste Management



## LEED for Homes



### • Indoor Environmental Quality: 20 Possible Pts.

- Energy Star Indoor Air Package
- Combustion Venting
- Moisture Control
- Outdoor Air Venting
- Local Exhaust
- Supply Air Distribution
- Supply Air Filtering
- Contaminant Control
- Radon Protection
- Garage Pollutant Protection



## LEED for Homes



### • Awareness and Education: 3 Possible Pts.

- Education for Homeowner and/or Tenants
- Education for Building Managers



## LEED for Homes

### Roles

Raters  
Providers  
USGBC



## Provider

- Responsibilities:
  - Marketing to Builders
  - Preliminary Review
  - Project Registration/Setup
  - Submitting documents for certification



## Rater

- Responsibilities: Verification
  - Energy testing
  - Project inspection
  - Compilation/Completion of:
    - Project Checklist
    - Durability forms
    - Accountability forms

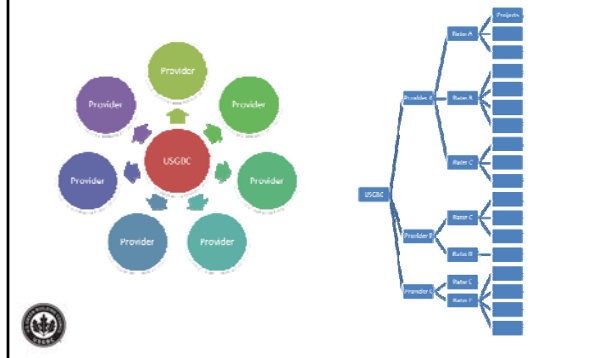


## USGBC

- Responsibilities: Processing & Certification
  - Registration processing
  - Review of certification materials
  - Issuing of Certification
  - Certification processing
  - Project Tracking & Reporting



## Delivery Model



## Project Timeline



## New Fee Structure

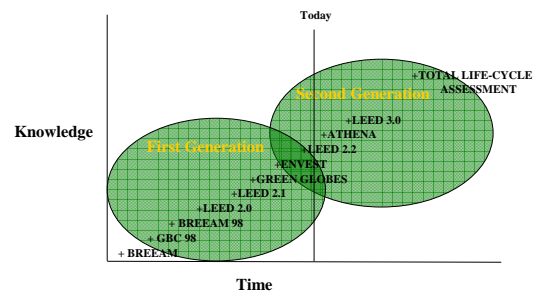
Project Type	Single Family	Multi Family	Volume Pilot
Registration	\$150 Members \$250 Non-Members	\$150 Members \$600 Non-Members	Proposed Flat Fee \$10,000
Certification	\$250 (M) \$350 (NM)	\$0.035/Ft <sup>2</sup> (M) \$0.045/Ft <sup>2</sup> (NM)	

## Next LEED-H Steps

- New Providers
- Green Rater training
- Interim LEED AP credit
- LEED for Homes AP
- Advocates
- Mid-Rise Working Group

Green Home Rating Programs	City of Scottsdale Green Building Program <a href="http://scottsdaleaz.gov/greenbuilding">scottsdaleaz.gov/greenbuilding</a>	LEED for HOMES <a href="http://www.usgbc.org/leed/homes">www.usgbc.org/leed/homes</a>	NAHB Green Standard <a href="http://www.nahb.org">www.nahb.org</a>	Energy Star for Homes <a href="http://www.energystar.gov/">www.energystar.gov/</a>
Geographical Area	City of Scottsdale	National	National	National
Focus / Approach	Regionally / Climate Specific to Sonoran Desert	Not Climate Specific More General as it applies across the nation	Not Climate Specific More General as it applies across the nation	Significant in Both Scottsdale & LEED for Homes Programs
Requirements (Some Examples)	<b>Shade:</b> Requires entrance shading to address heat island effect <b>Energy:</b> Requires either EnergyStar or 15% above 2006 Energy Code <b>Water:</b> 40% WaterSaving High Efficiency or Dual Flush toilets Demand Controlled Hot-water Recirculation Pumps <b>Verification:</b> City inspections of field verifiable items Performance testing is optional with associated rating points	<b>Shade:</b> Optional Energy Requires Energy Star for Homes with 3 <sup>rd</sup> party testing <b>Water:</b> Minimum requirement of 3 points from list of options <b>Verification:</b> Certified by both an energy and green rater	<b>Shade:</b> Optional Energy Requires at least 15% above Energy Code <b>Water:</b> Minimum number of points from list of options <b>Verification:</b> Determined by local adopting entity	<b>Shade:</b> Not addressed <b>Energy:</b> Prescriptive or performance path <b>Water:</b> Not addressed <b>Verification:</b> Duct Leakage Thermal Envelope Leakage Thermal By-Pass Inspection (visual check of insulation, airtight seals, and possible air leakage)
Options (Some examples)	<b>Levels Of Certification:</b> Entry Level (50-99) Advanced Level (100-200) LEED for Homes may be used in lieu of Scottsdale's Green Building Rating Checklist	<b>Levels Of Certification:</b> Points LEED Certified (45-59) Silver (60-74) Gold (75-89) Platinum (90-130)	Pending Final Public Review and Committee Approval	Rebates and other tax credits often apply when Energy Star products are used.

## Trends in Building Environmental Assessment



### ASHRAE 189 Standard for High-Performance Green Buildings except Low-Rise Residential



### ASHRAE 189 Standard for the Design of High-Performance Green Buildings

- 189 is a minimum Green Building Standard and not a rating system (can be the platform for either LEED or Green Globes).
- The International Code Council plans to codify it.
- Will use CO<sub>2</sub> as one if its performance metrics.
- Dual prescriptive/performance paths reduces the need for extensive calculations.
- Sets a high level of performance – 30% better than ASHRAE 90.1-2007 (~50% better than 90.1-1999).
- Present level of environmental performance equals LEED NC 2.2 at high silver.
- Has gone out for second public review in spring 2008, completion scheduled for winter 2008/2009.

### ASHRAE 189.1 Standard

- **Sustainable Sites**  
4 mandatory, 1 prescriptive/performance
- **Water Use Efficiency**  
3 mandatory, 2 prescriptive/performance
- **Energy Efficiency**  
4 mandatory, 1 prescriptive/performance
- **The Building's Impact on the Atmosphere, Materials and Resources**  
4 mandatory, 1 prescriptive/performance
- **Indoor Environmental Quality (IEQ)**  
7 mandatory, 2 prescriptive/performance
- **Construction and Operation Plans**  
9 mandatory, 0 prescriptive/performance

### Summary and Conclusions

- National Standardization
  - Energy Codes
  - LEED, NAHB
  - Green Building Standards
  - Certification for Inspectors and Raters
- Regional Programs
- Incentives
  - Tax credits
  - Feebates & rebates