

# ASHRAE Standard 189.1



Metropolitan Washington Council of Governments

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# About Me





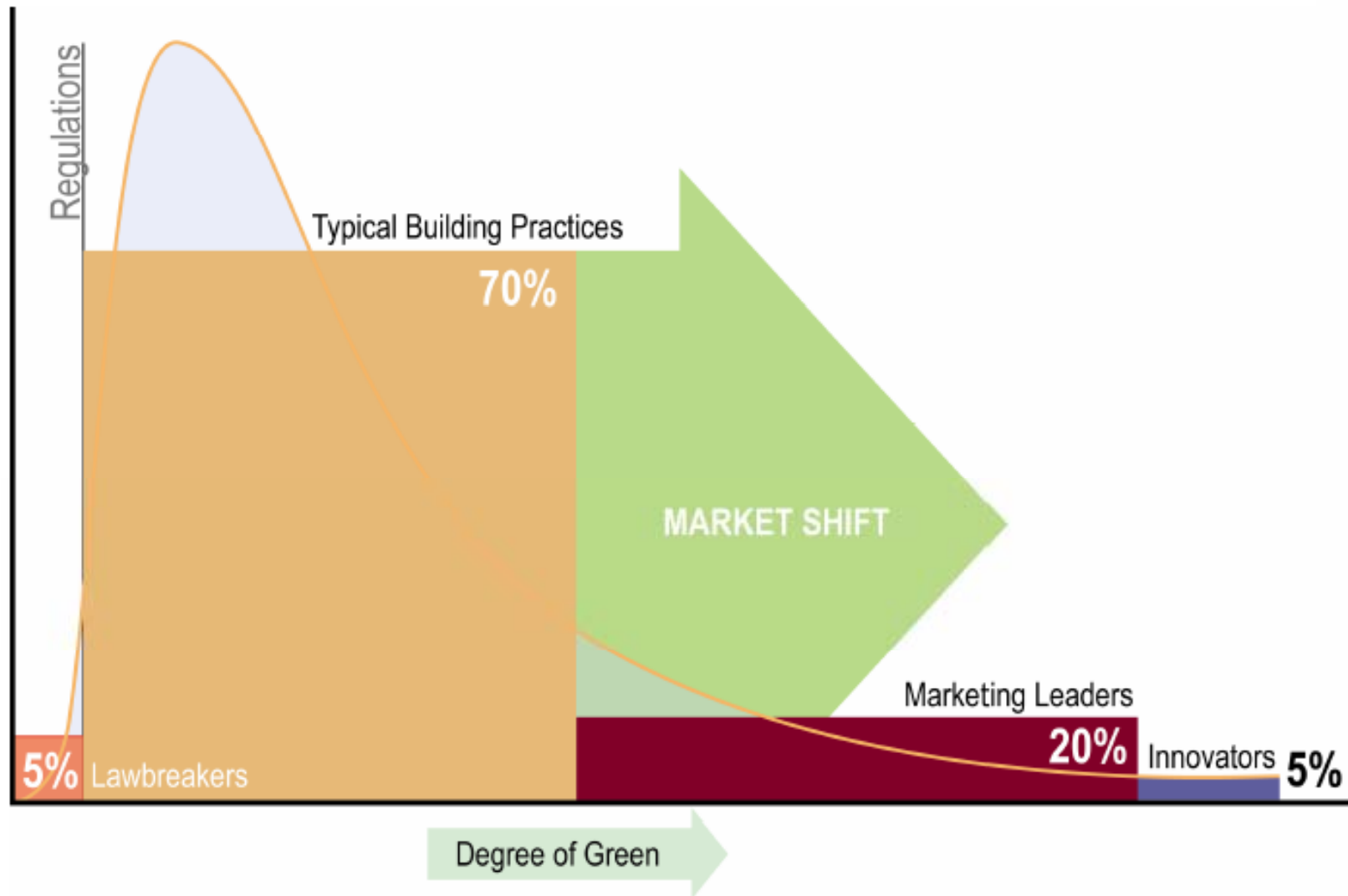
# Outline

- **History of ASHRAE 189.1**
- **Overview of System Components**
- **Comparison to International Green Construction Code and LEED**
- **Resources**

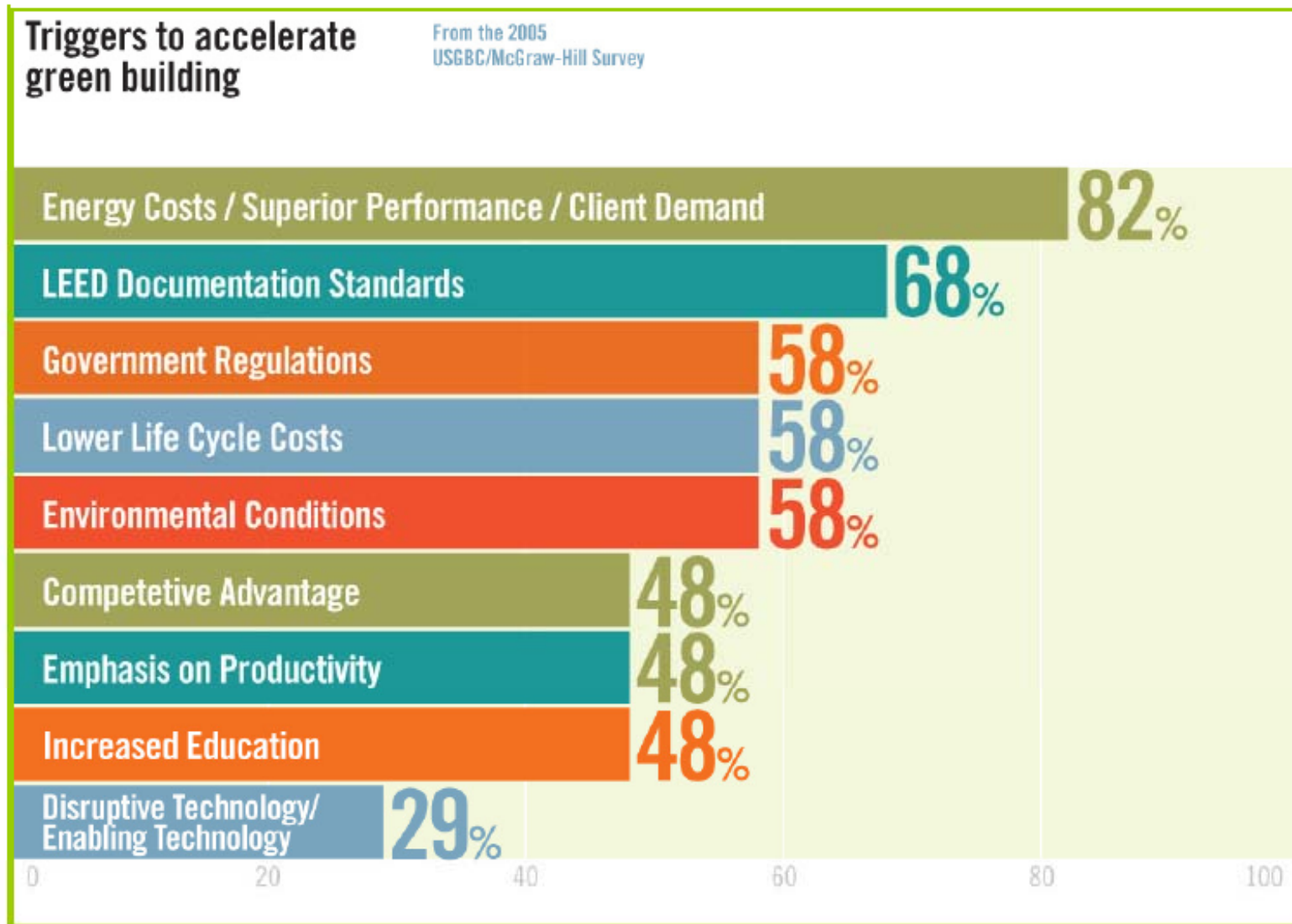
# What is Standard 189.1?

- **ANSI standard developed in model code language**
- **Provides minimum requirements for high-performance, green buildings**
- **Applies to all buildings except low-rise residential (same as ASHRAE Standard 90.1)**
- **Optional compliance path to the International Green Construction Code**
- **Not a design guide or a rating system**

# Why?



# Triggers to green building



# Sponsors and Project Committee

- **Sponsor and co-sponsors:**
  - ASHRAE
  - USGBC (U.S. Green Building Council)
  - IES (Illuminating Engineering Society)
- **Project committee:**  
**35+ voting members; variety of disciplines, industries & organizations**

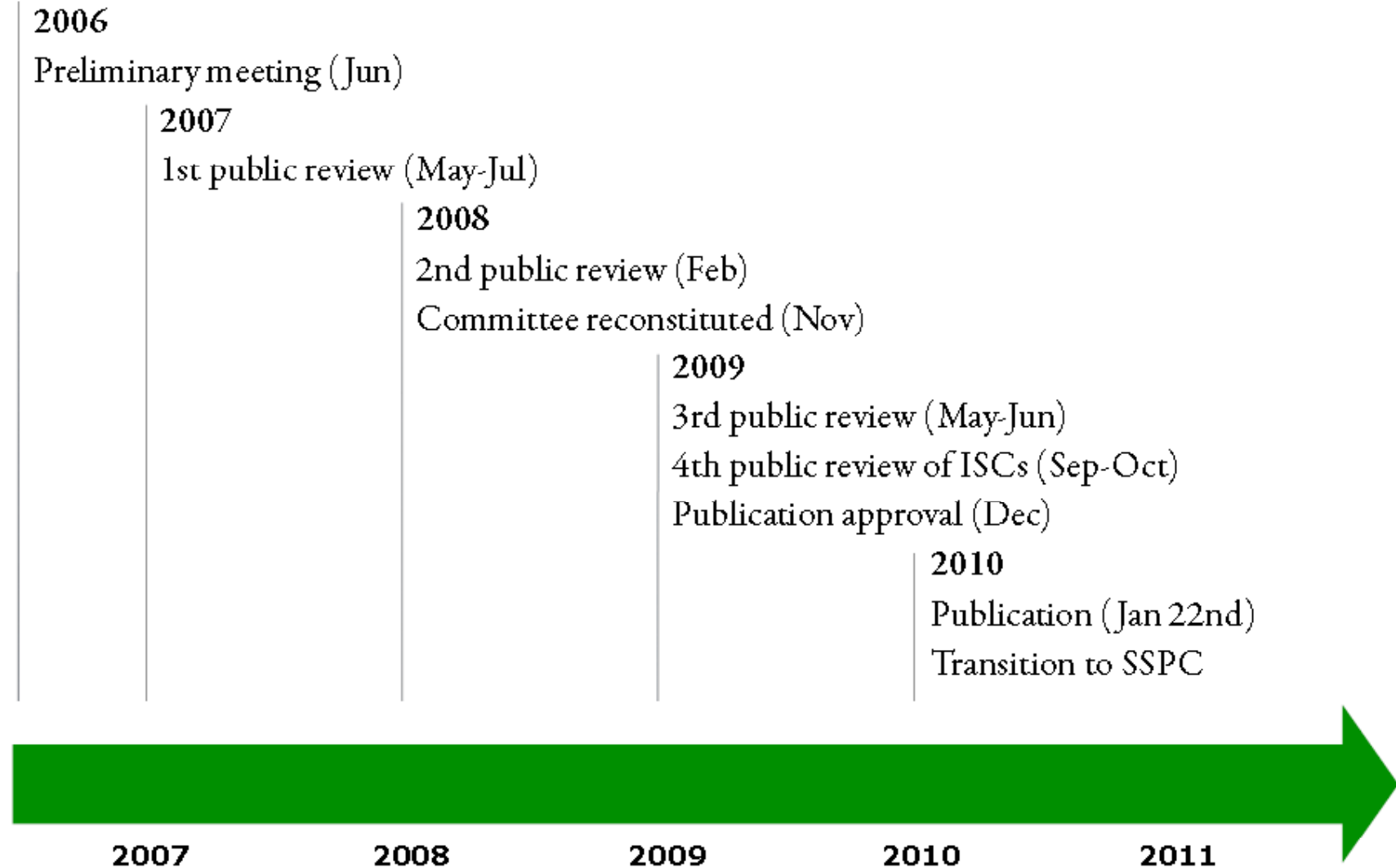
# Challenges with development

- Using code language
- Determining stringency for a minimum standard
- Prescribing universal strategies
- Coordinating with other initiatives
- Creating an enforceable model





# Development Timeline



# Potential users

- Green building rating system organizations (USGBC)
- Developers
- Corporations
- Universities
- States/Municipalities



# Indirect impacts

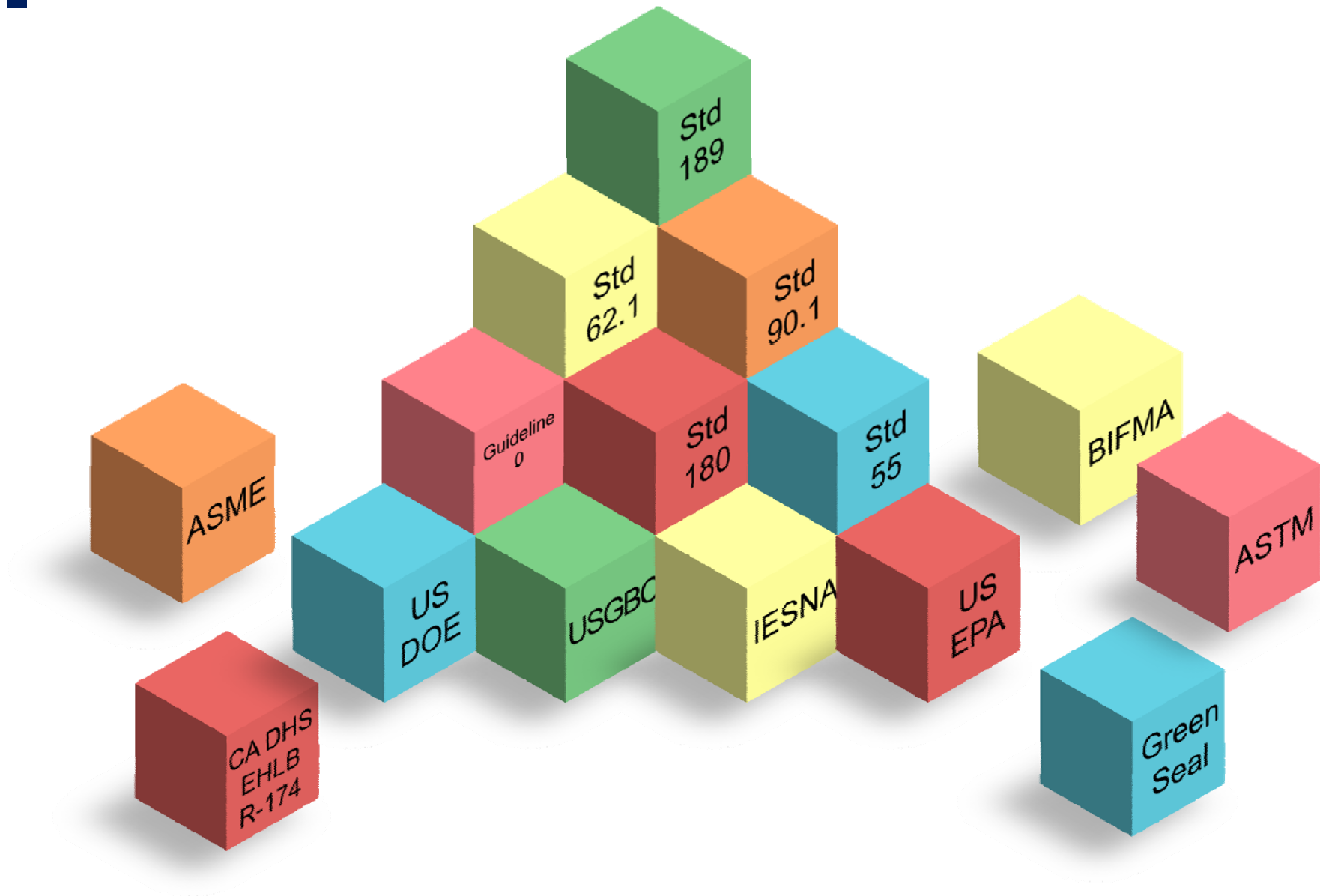
- Drives innovation – create the market
- Creates benefits for existing buildings
  - Easier access to better products



**PHILIPS**  
**LPRIZE®**  
**WINNER**



# Standard 189.1 Building Blocks



# Standard 189.1 Topic Areas

SS

**Sustainable Sites**

WE

**Water Use Efficiency**

EE

**Energy Efficiency**

IEQ

**Indoor Environmental Quality**

MR

**Building's Impact on the Atmosphere, Materials & Resources**

CO

**Construction and Operations Plans**

# Standard 189.1 Basic Structure

**x.1: Scope**

**x.2: Compliance**

**x.3: Mandatory**

**x.4: Prescriptive path**

**x.5: Performance path**

## **7. ENERGY EFFICIENCY**

**7.1 Scope.** This section specifies requirements for energy efficiency for buildings and appliances, for *on-site renewable energy systems*, and for energy measuring.

**7.2 Compliance.** The energy systems shall comply with Section 7.3, “Mandatory Provisions,” and either

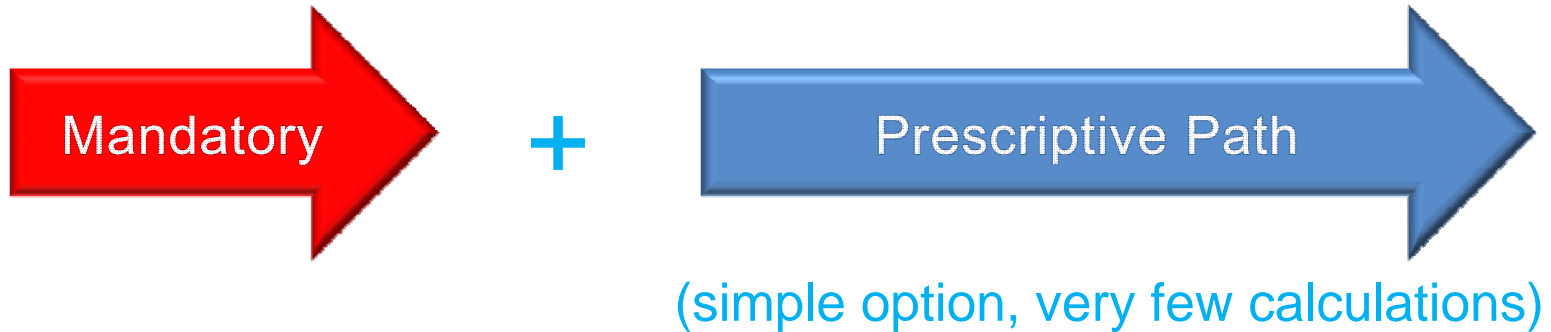
- a. Section 7.4, “Prescriptive Option,” or
- b. Section 7.5, “Performance Option.”

### **7.3 Mandatory Provisions**

**7.3.1 General.** *Building projects* shall be designed to comply with Sections 5.4, 6.4, 7.4, 8.4, 9.4, and 10.4 of ANSI/ASHRAE/IES Standard 90.1.

**7.3.2 On-Site Renewable Energy Systems.** *Building project* design shall show allocated space and pathways for future installation of *on-site renewable energy systems* and associated infrastructure that provide the annual energy production equivalent of not less than 6.0 kBtu/ft<sup>2</sup> (20 kWh/m<sup>2</sup>) for single-story buildings and not less than 10.0 kBtu/ft<sup>2</sup> (32 kWh/m<sup>2</sup>) multiplied by the total *roof* area in ft<sup>2</sup> (m<sup>2</sup>) for all other buildings.

# Compliance Paths





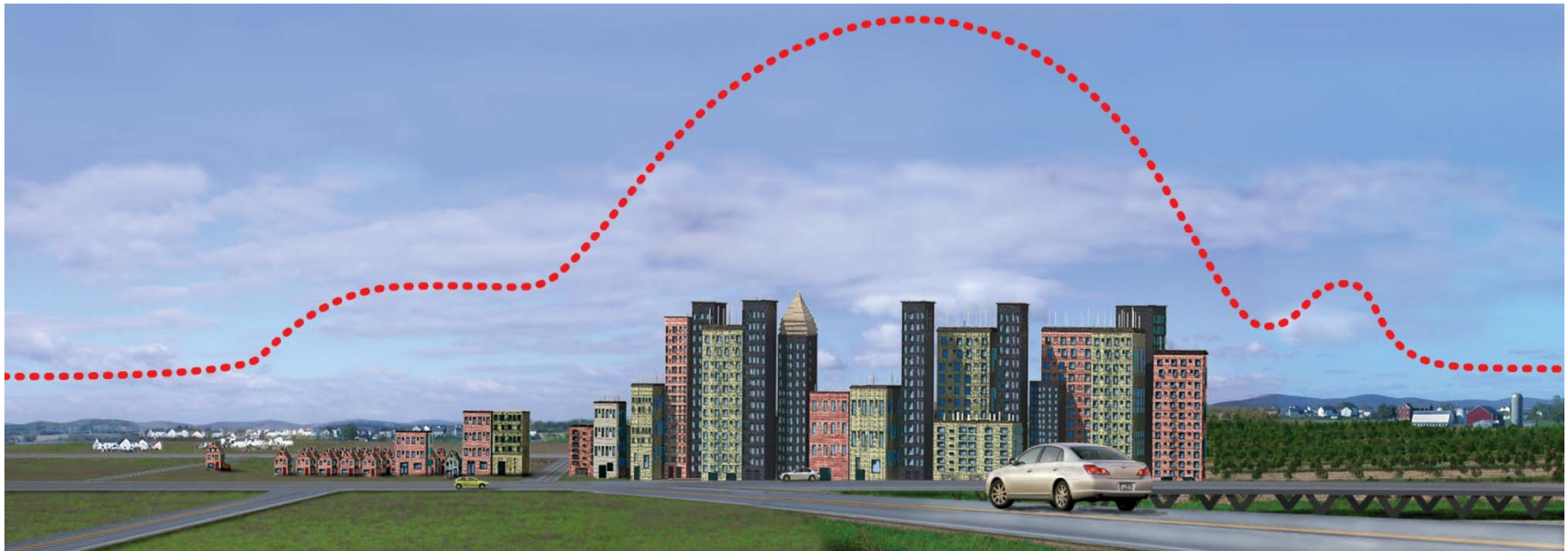
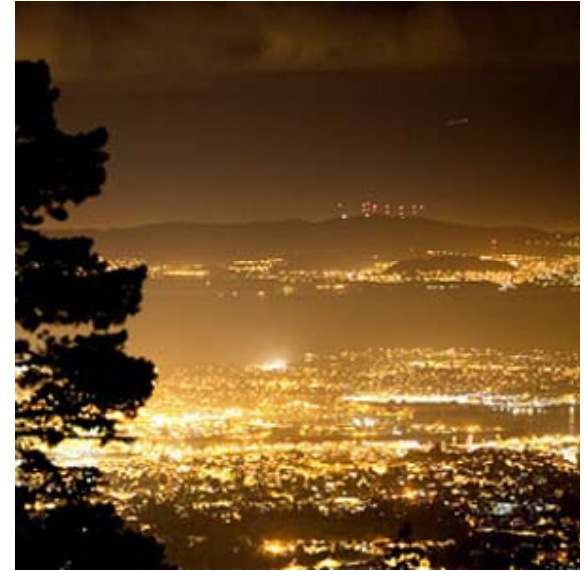
# Scope

- **New buildings and their systems**
- **New portions of buildings and their systems**
- **New systems and equipment in existing buildings**
- **Does not apply to:**
  - Single-family houses
  - Multi-family structures of 3 stories or less
  - Mobile homes
  - Buildings that use no electricity, fossil fuel or water



# Sustainable Sites

- **Mandatory Provisions**
  - Site Selection
  - Reduce heat island effect
  - Reduce light pollution



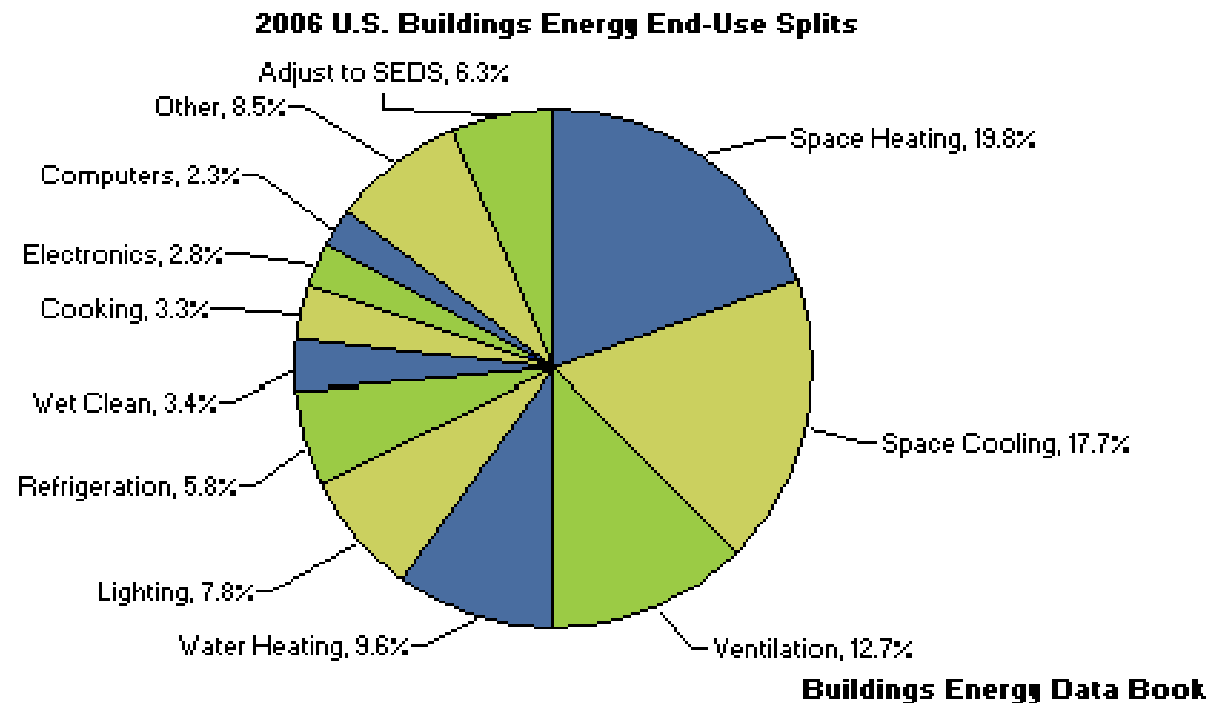
# Water Use Efficiency

- **Mandatory Provisions**
  - Site water use
  - Building water use
  - HVAC systems
  - Water consumption management

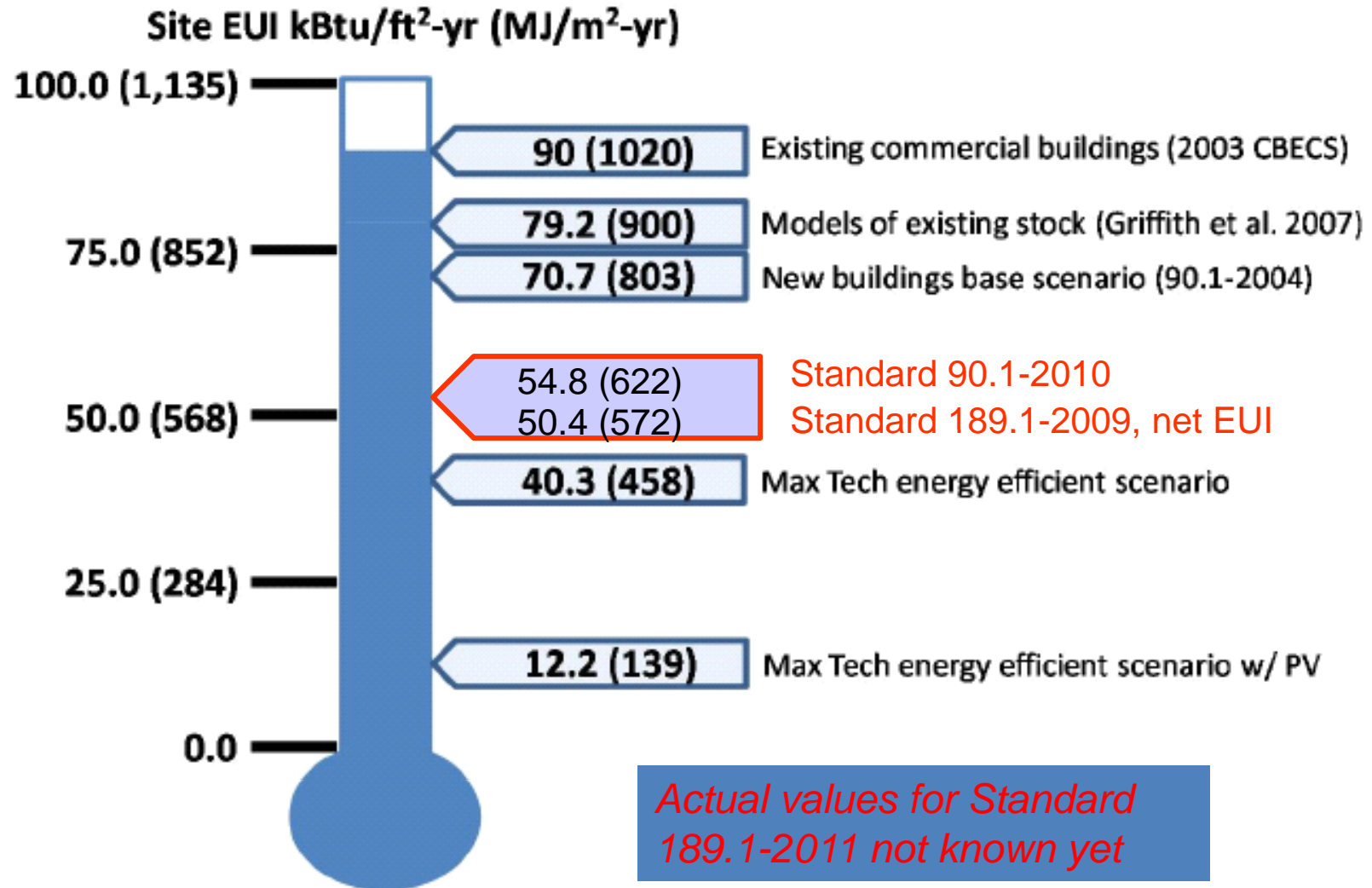


# Energy Efficiency

- Original Standard 189.1-2009 goal
  - 30% lower than Standard 90.1-2007 (LEED 2009 Reference)
- Standard 189.1-2011 goal
  - 5-15% lower than Standard 189.1-2009



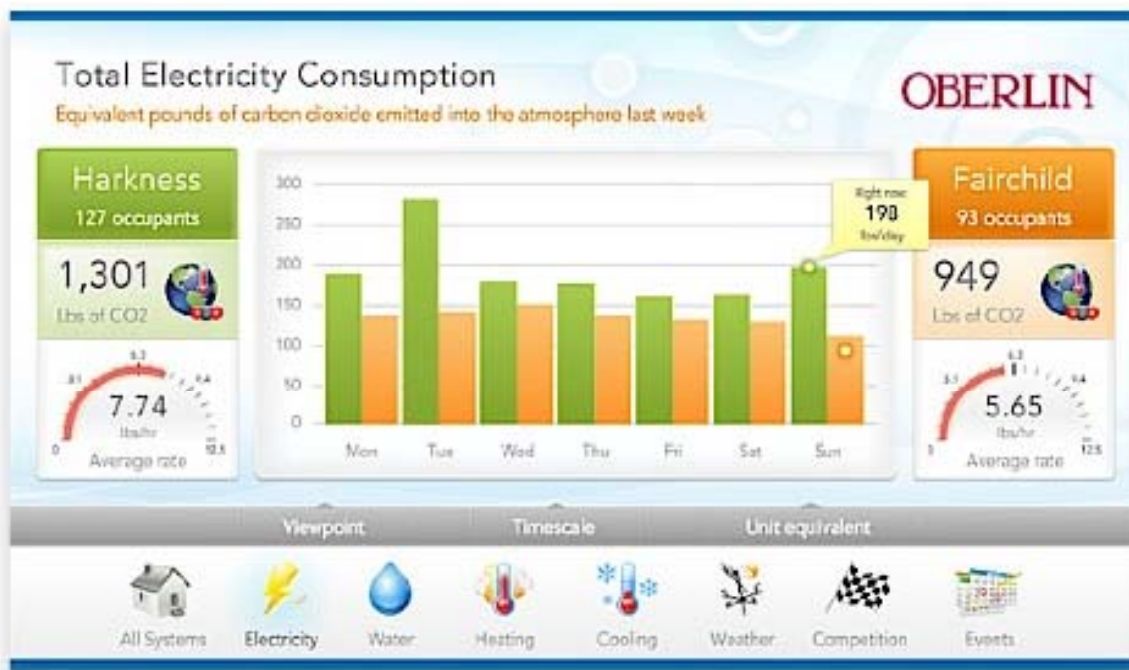
# ASHRAE Standards





# Energy Efficiency

- **Mandatory requirements**
  - Renewable energy provisions
  - Remote or automatic reading meters *criteria based on size*
  - Meters communicate to central recording system
  - Data storage for minimum 36 months



# Energy Efficiency

- **Prescriptive highlights**

- Annual renewable energy –  $6 \text{ kBTU/sf}_{\text{roof}}$  ( $1.75 \text{ kwh/sf}_{\text{roof}}$ )
- Building envelope – approximately 10% more stringent than ASHRAE 90.1-2010
- HVAC – heat recovery, insulation, equipment performance
- Lighting – controls, power density, daylighting
- Appliances



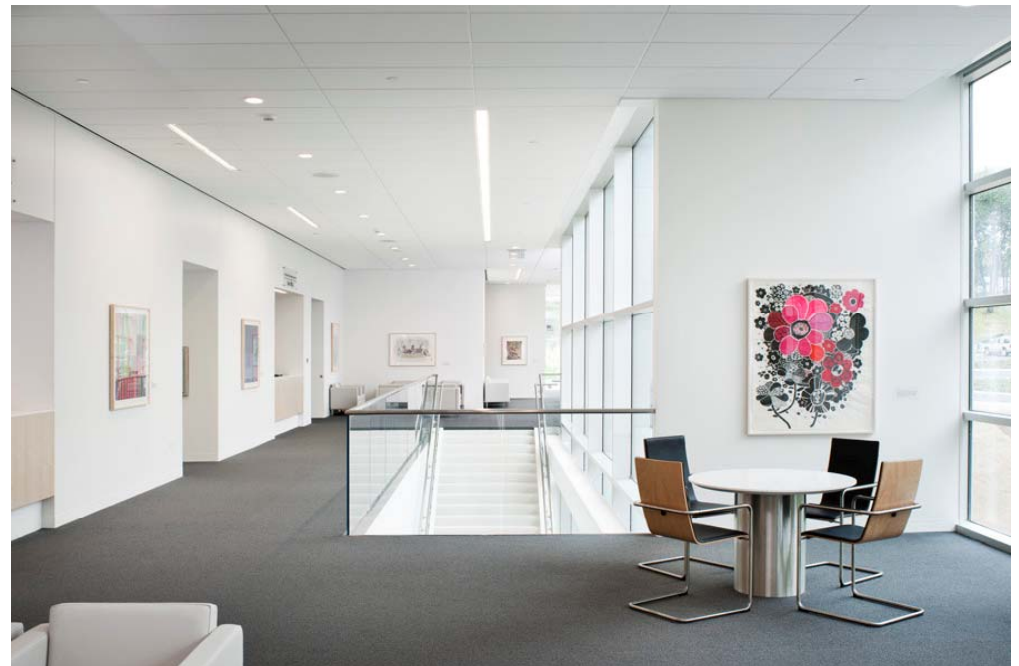
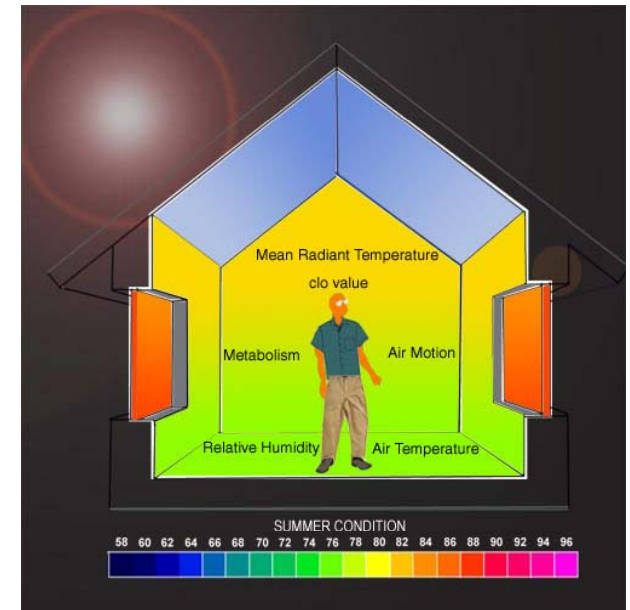
# Energy Efficiency

- **Performance highlights**
  - Annual energy cost
  - Annual carbon dioxide equivalent
  - Annual peak electrical demand
  - Significant demand on energy modeling practitioners



# Indoor Environmental Quality

- **Coverage areas**
  - Tobacco smoke control
  - Outdoor air monitoring
  - Filtration and air cleaning
  - Low-emitting materials
  - Daylighting
  - Thermal comfort
  - Acoustics
- **Performance**
  - Daylight simulation





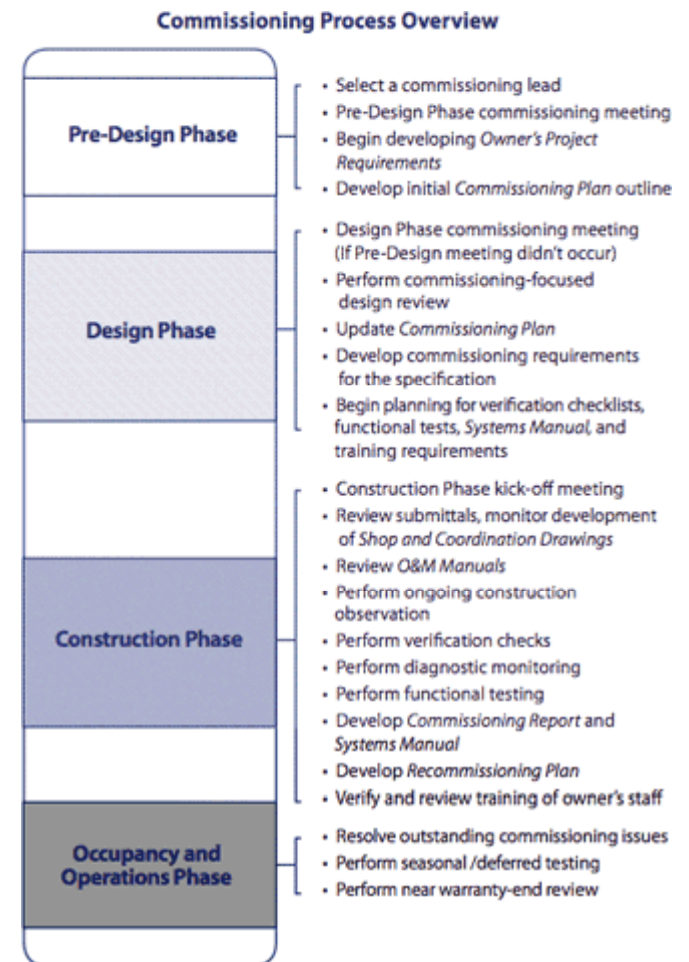
# Building's Impact on Atmosphere, Materials and Resources

- **Mandatory provisions**
  - Construction waste management
  - No CFC based refrigerants
  - Recyclables storage areas
- **Performance**
  - Life cycle analysis



# Construction and Operation Highlights

- Building acceptance testing/commissioning
- IAQ construction management plan
- Plans for operation
  - High performance building operation
    - Ventilation/filtration
    - Green cleaning
  - Maintenance
    - MEP/FP
  - Service Life
    - Assemblies
    - Materials
    - Access
  - Transportation Management
    - Preferred parking
    - Bicycle transit



# IGCC and LEED

- **International Green Construction Code**
  - Latest Version Released April 2012
  - ASHRAE 189.1 can be selected as compliance path
  - Similar coverage of green building issues
  - Key differences
    - ASHRAE 189.1 must be used in its entirety
    - IGCC can be customized by jurisdiction
    - IGCC uses zEPI rating for energy
- **LEED**
  - Silver-Gold equivalency
  - 189.1 has very stringent energy, IEQ, and operations requirements

# Comparison – Envelope

Component	IECC 2012	IGCC 2012	90.1-2010	189.1-2011
<b>Roof - U-value</b>				
Insulation Entirely Above Deck	0.039	<b>0.035</b>	0.048	0.039
Metal Buildings	0.035	<b>0.032</b>	0.055	0.035
Attic and Other	0.027	0.024	0.027	<b>0.021</b>
<b>Walls, Above Grade - U-value</b>				
Mass	0.104	0.094	0.104	<b>0.09</b>
Metal Building	0.052	<b>0.047</b>	0.084	0.052
Metal Framed	0.064	0.058	0.064	<b>0.055</b>
Wood Framed and Other	0.064	<b>0.058</b>	0.089	0.064
<b>Walls, Below Grade - C-value</b>				
Below-Grade Wall	0.119	<b>0.107</b>	1.14	0.119
<b>Floors - U-value</b>				
Mass	0.076	<b>0.068</b>	0.087	0.074
Joist/Framing	0.033	0.030	0.033	<b>0.026</b>
<b>Slab-on-Grade Floors - F-value</b>				
Unheated	0.54	<b>0.486</b>	0.73	0.54
Heated	0.65	0.585	0.86	<b>0.55</b>
<b>Vertical Fenestration - U-value</b>				
Fixed	0.38	<b>0.342</b>	0.50 (metal)	0.40 (metal)
Operable	0.45	<b>0.405</b>	0.55	0.45
<b>Vertical Fenestration - SHGC</b>				
SHGC	0.4	0.36	0.4	<b>0.35</b>
<b>Skylights</b>				
U-value	0.5	<b>0.45</b>	0.69	<b>0.45</b>
SHGC	0.4	0.36	0.39	<b>0.32</b>

# Comparison – Lighting

Building Type (W/sf)	IECC 2012	IGCC 2012	90.1-2010	189.1-2011
Courthouse	1.2	1.2	1.05	0.95
Dining - Cafeteria/ Fast Food	1.4	1.4	0.9	0.95
Dining - Family	1.6	1.6	0.89	0.95
Dormitory	1	1	0.61	0.95
Exercise Center	1	1	0.88	0.95
Fire Station	0.8	0.8	0.71	1
Gymnasium	1.1	1.1	1	1
Health-Care Clinic	1	1	0.87	0.95
Hospital	1.2	1.2	1.21	0.95
Hotel	1	1	1	1
Library	1.3	1.3	1.18	0.95
Manufacturing Facility	1.3	1.3	1.11	1
Motel	1	1	0.88	1
Motion Picture Theater	1.2	1.2	0.83	1
Multifamily	0.7	0.7	0.6	0.95
Museum	1.1	1.1	1.06	1
Office	0.9	0.9	0.9	0.95
Parking Garage	0.3	0.3	0.25	1
Penetentiary	1	1	0.97	0.95
Performing Arts Theater	1.6	1.6	1.39	1
Police Station	1	1	0.96	0.95
Post Office	1.1	1.1	0.87	1
Religious Building	1.3	1.3	1.05	0.95
Retail	1.4	1.4	1.4	1
School/University	1.2	1.2	0.99	0.9
Sports Arena	1.1	1.1	0.78	1
Town Hall	1.1	1.1	0.92	0.95

# Compliance checklist

## Construction and Plans for Operation Compliance Documentation – Mandatory

Project Name	
Project Address:	Date:
Designer of Record:	Telephone:
Contact Person:	Telephone:
City:	

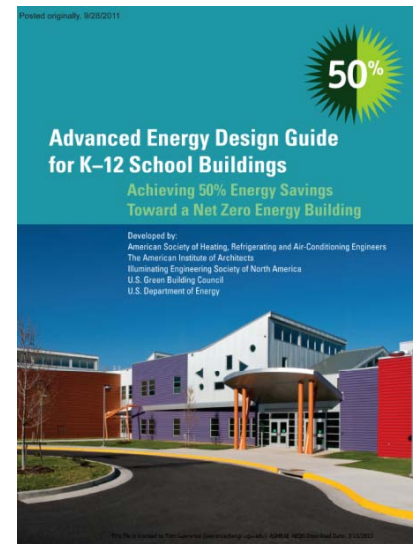
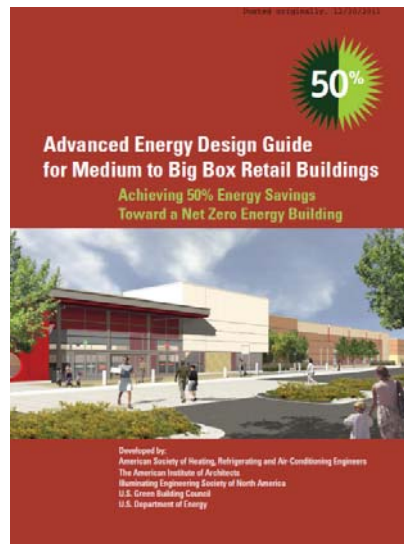
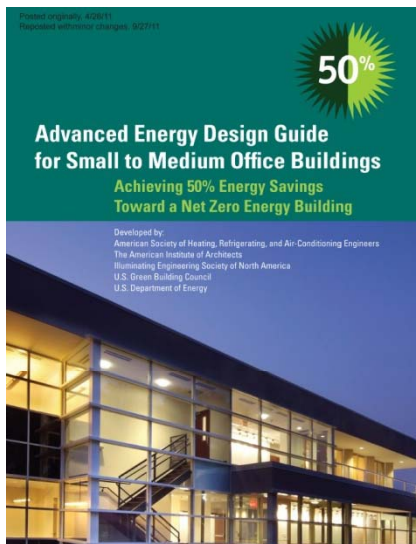
### Mandatory Provisions

Complies	Not applicable	Requirement	Document Reference
<b>§10.3.1: Construction</b>			
<input type="checkbox"/>	<input type="checkbox"/>	§10.3.1.1: Acceptance testing has been performed on all buildings using generally accepted engineering standards and handbooks acceptable to the AHJ.	
<input type="checkbox"/>	<input type="checkbox"/>	§10.3.1.1: An acceptance testing process has been incorporated into the design and construction of the building project that verifies systems perform in accordance with construction documents.	
<input type="checkbox"/>	<input type="checkbox"/>	§10.3.1.1.1a: Prior to building permit, the project has designated an acceptance representative to lead, review, and oversee completion of acceptance testing activities.	
<input type="checkbox"/>	<input type="checkbox"/>	§10.3.1.1.1b: Prior to building permit, construction documents indicated who is to perform acceptance tests and the details of the tests to be performed.	
<input type="checkbox"/>	<input type="checkbox"/>	§10.3.1.1.1c: Prior to building permit, the acceptance representative reviewed construction documents to verify that relevant sensor locations, devices, and control sequences are properly accounted for.	
<input type="checkbox"/>	<input type="checkbox"/>	§10.3.1.1.2a: Prior to building occupancy, the acceptance representative has verified that systems are properly installed and started up.	
<input type="checkbox"/>	<input type="checkbox"/>	§10.3.1.1.2b: Prior to building occupancy, acceptance tests have been performed. For each acceptance test, there is a complete test form and the signature and license number, as appropriate, of the party who performed the test.	



# Advanced Energy Design Guides

- Guidance for achieving 50% energy efficiency over Standard 90.1-2004
- Provide tools and recommendations for achieving goal
- More emphasis on integrated design process, design practices, process loads
- *50% Advanced Energy Design Guides:*
  - AEDG for Small to Medium Office Buildings
  - AEDG for K-12 School Buildings
  - AEDG for Medium to Big Box Retail





## Further Information

- **Standard 189.1:** [www.ashrae.org/greenstandard](http://www.ashrae.org/greenstandard)
- **International Green Construction Code:**  
[www.iccsafe.org/cs/IGCC](http://www.iccsafe.org/cs/IGCC)
- **User Manual available to assist in understanding in how to apply the standard**





## Discussion?

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