

Establishing the Green Building Baseline: ASHRAE/USGBC/IESNA Std 189

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State Building Energy Codes 2007
Pittsburgh, 26 July 2007

What is Standard 189?

A model code that provides standards for high-performance, green buildings

189 applies to all buildings except low-rise residential buildings.

not a design guide, not a rating system

Scope of Standard 189

2. SCOPE

2.1 This standard provides minimum criteria that:

(a) Apply to new buildings and major renovation projects (new portions of buildings and their systems): a building or group of buildings, including on-site energy conversion or electric-generating facilities, which utilize a single submittal for a construction permit or which are within the boundary of a contiguous area under single ownership.

(b) Address sustainable sites, water use efficiency, energy efficiency, the building's impact on the atmosphere, materials and resources, and indoor environmental quality (IEQ).

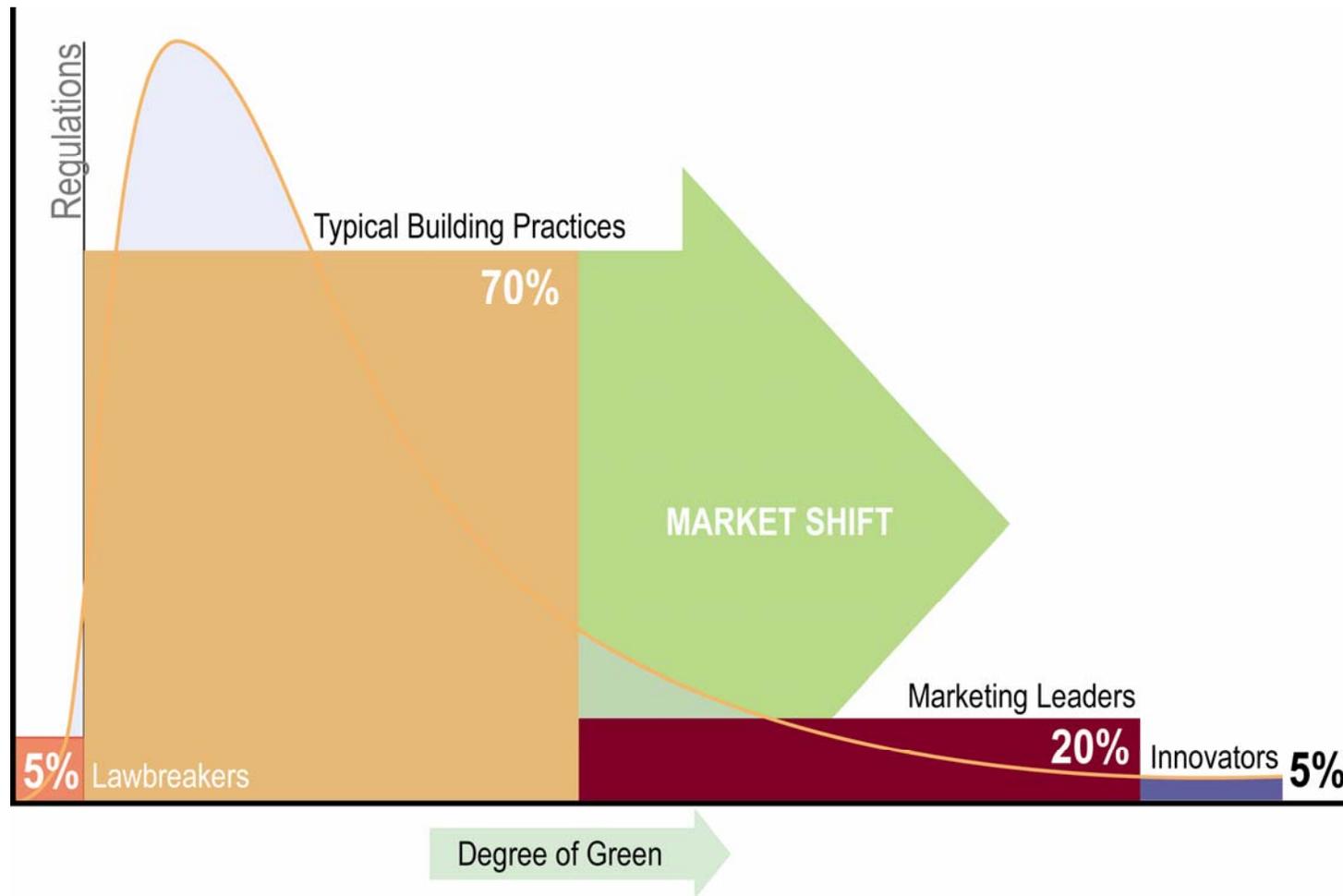
2.2 The provisions of this standard do not apply to:

(a) single-family houses, multi-family structures of three stories or fewer above grade, manufactured houses (mobile homes) and manufactured houses (modular), and

(b) buildings that do not use either electricity or fossil fuel.

2.3 This standard shall not be used to circumvent any safety, health, or environmental requirements.

Market Shift



Triggers to accelerate green buildings

Triggers to accelerate green building

From the 2005
USGBC/McGraw-Hill Survey



Standard Project Committee 189

- ASHRAE, USGBC, IESNA
- 22 voting members
- Considerable expertise
- Strong sponsorship



Challenges

- Using normative (code) language
- Defining the scope for a “minimum” standard
- Identifying and referencing existing standards or regulations
- Prescribing universal strategies
- Coordinating with other National initiatives
 - *U.S. Federal agencies MOU, AIA, Natl. Conf. of Mayor*
- Completing a draft for public review in 12 months
- Creating something that is enforceable by AHJs

Standard 189 Subjects

- Sustainable Sites
- Water Use Efficiency
- Energy Efficiency
- The Building's Impact on the Atmosphere, Materials and Resources
- Indoor Environmental Quality (IEQ)
- Construction and Operation

Standard 189 Chapter Structure

- x.1: Scope
- x.2: Compliance
- x.3: Mandatory (required for all projects)
- x.4: Prescriptive option
- x.4: Performance option
- x.4: Submittals

Sustainable Sites

Mandatory Provisions

- **Allowable sites**

- brownfields, greyfields
- greenfield sites where < $\frac{1}{2}$ mile to transit or 10 basic services, or residential area with density > 10 units/acre



- **Prohibited sites**

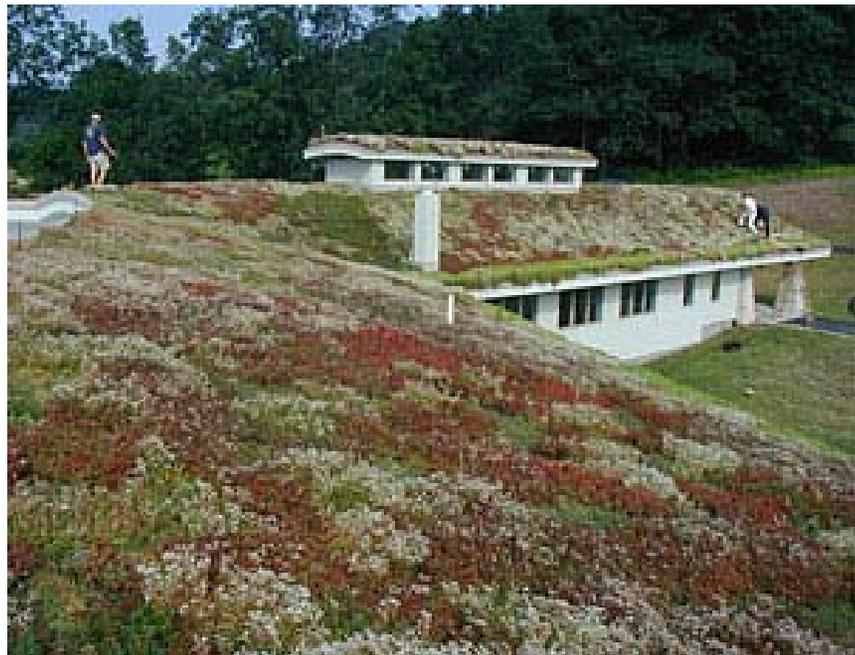
- flood plains, wetlands, fish and wildlife habitat

Sustainable Sites

Mandatory Provisions

- **Site development**

- All sites:
Min. 40% of area
to be effective
pervious surface
(vegetation, green
roof, porous pavers)
- Greenfield sites:
Min. 20% of area to be native or adapted plants



Sustainable Sites

Mandatory Provisions

- **Heat island effect**

- site hardscape:
to be shaded, be SRI 29, or porous pavers
- wall and air conditioner
to be shaded up to
20 feet above grade
- Roofs:
to be SRI 78 (low-slope)/29 (steep-slope)
or cool roof



Sustainable Sites

Mandatory Provisions

- **Reduction of light pollution**
 - luminaire cutoff requirements:
cutoff if > 150 Watts,
full cutoff if > 400 W
 - outdoor lighting trespass:
limits on horizontal and vertical footcandles



Water Use Efficiency

Mandatory Provisions

- **Site water use:** bio-diverse plantings, hydrozoning, & smart irrigation controllers



Water Use Efficiency

Mandatory Provisions

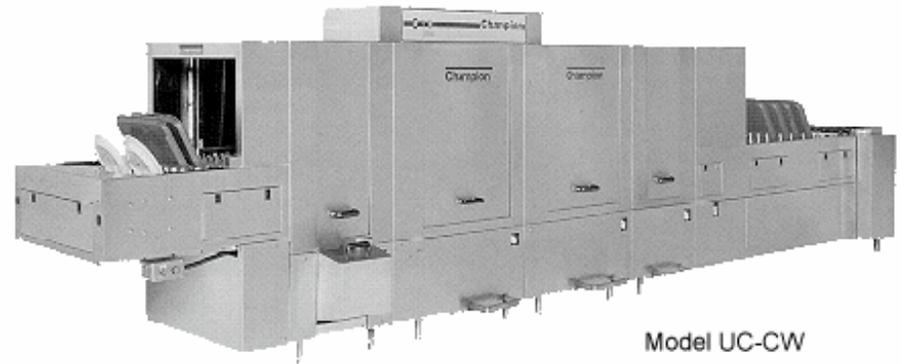
- **Building water use:** plumbing fixtures & fittings, appliances, HVAC systems & equipment, generally 20% lower than EPA Act
- **Metering:** meters, meter data collection, data storage & retrieval



Water Use Efficiency

Prescriptive Option

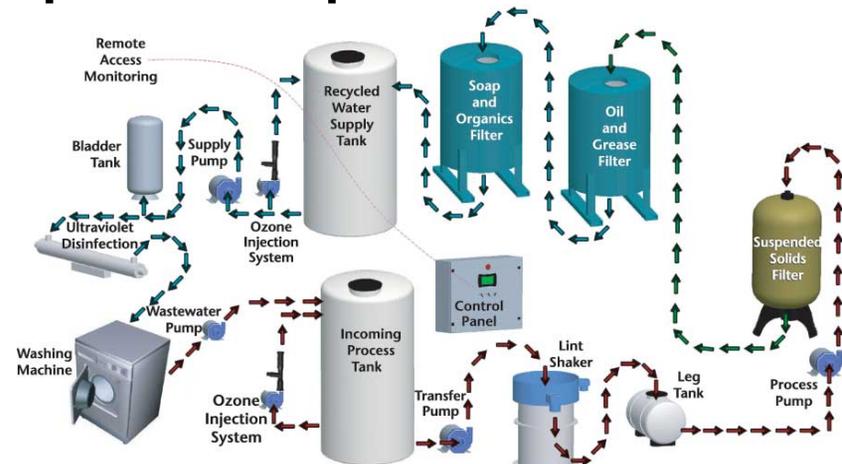
- **Site water use:**
1/3 max. of improved landscape irrigated with potable water
- **Building water use reduction:** efficient comm. food service and laboratories
- **Special water features:** fountain water to be from alternate source or reclaimed



Water Use Efficiency

Performance Option

- **Site water use reduction:**
proposed potable water for irrigation
< 35% of baseline evapotranspiration
- **Building water use:**
proposed water use
< mandatory
plus prescriptive



Energy Efficiency

Mandatory Provisions

- Energy Star equipment and appliances
- Metering: meters, meter data collection, and data storage and retrieval



Energy Efficiency



Mandatory Provisions

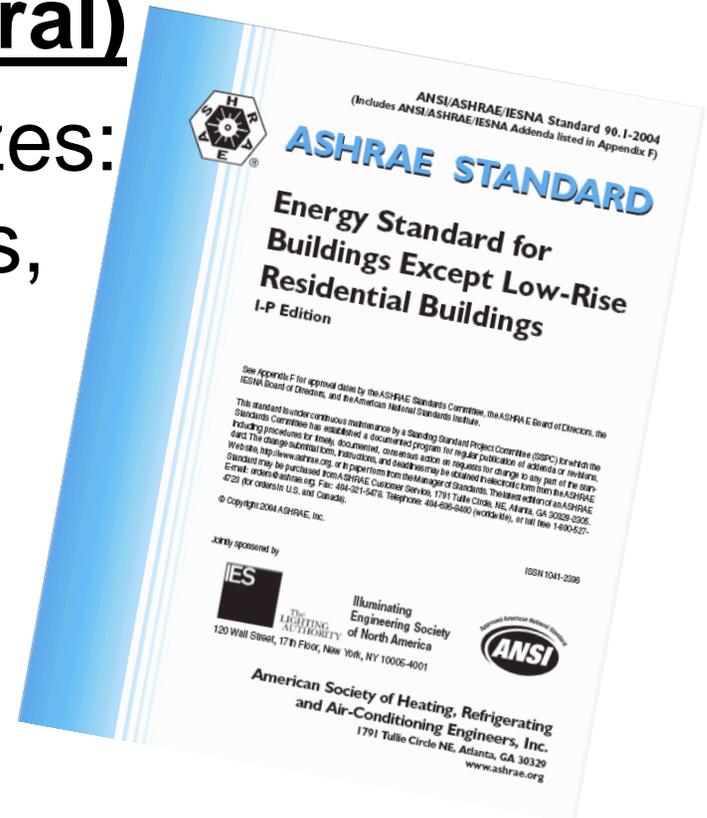
- On-site renewable energy power systems with a peak electrical generating capacity of not less than 1.0% of the electrical service load



Energy Efficiency

Prescriptive Option (General)

- Maximum dwelling unit sizes:
900 ft² for 1-bedroom units,
1,250 ft² for 2,
1,700 ft² for 3 and
2,100 ft² for 4 or more
- Comply with
ASHRAE/IESNA
Standard 90.1-2007 plus...30% savings



Energy Efficiency

Prescriptive Option (Building Envelope)

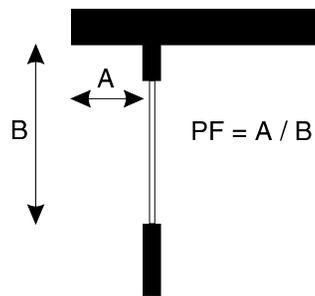
- Roof insul.: R-25 continuous, R-49 attic
- Wall insulation: R-13 cavity + R-10 cont.
- Fenestration assembly:
U-0.35 metal curtainwall,
U-0.25 wood/vinyl/
fiberglass frame,
SHGC-0.35



Energy Efficiency

Prescriptive Option (Building Envelope)

- Overhang: $PF > 0.5$



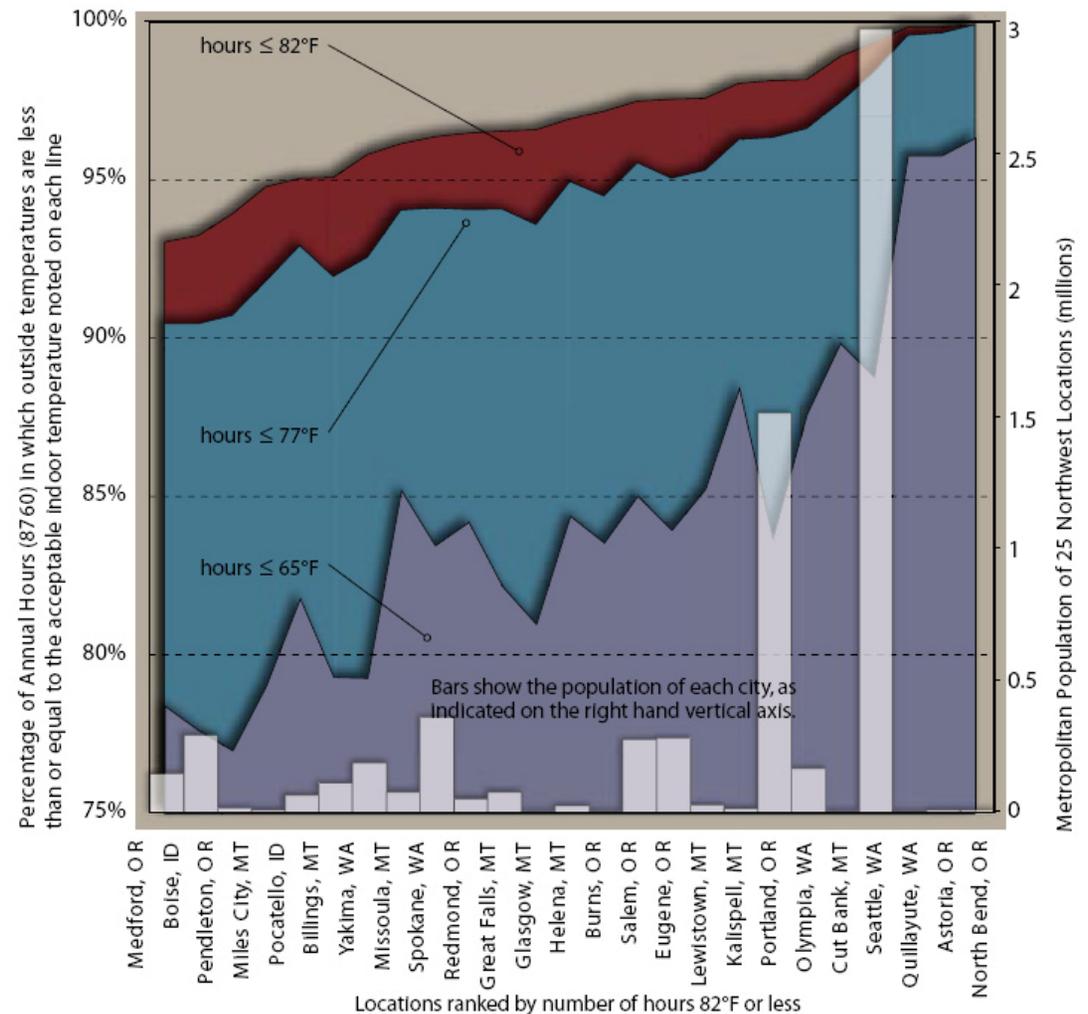
- Orientation:
solar gain through
east/west < north/south
- Continuous air barrier



Energy Efficiency

Prescriptive Option (Mechanical)

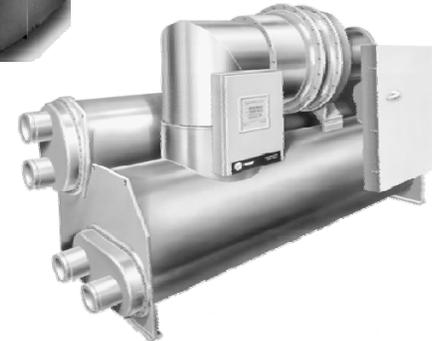
- Economizer cycle for units > 33,000 Btuh



Energy Efficiency

Prescriptive Option (Mechanical)

- Higher equipment efficiencies (CEE Tier II)
- More pipe/duct insulation
- Fan power to be 10% less
- Unoccupied hotel/motel rooms to have auto-shutoff



Energy Efficiency

Prescriptive Option (Lighting)

- Interior lighting power to be 10% less
- Occupancy sensor controls
- Auto-controls for lighting in daylight zones



Energy Efficiency

Performance Option

Two criteria:

- Annual energy cost:
proposed <
mandatory plus prescriptive
- Annual carbon dioxide equivalent (CO₂e):
proposed < mandatory plus prescriptive



The Buildings Impact on the Atmosphere

Mandatory Provisions

- Construction Waste Management
- Wood Products
- Refrigerants
- Storage and Collection of Recyclables and Discarded Goods

The Buildings Impact on the Atmosphere

Prescriptive Provisions

- Reduced Impact Materials
 - Recycled Content
 - Regionally Extracted, Processed, and Manufactured Materials
 - Biobased Products



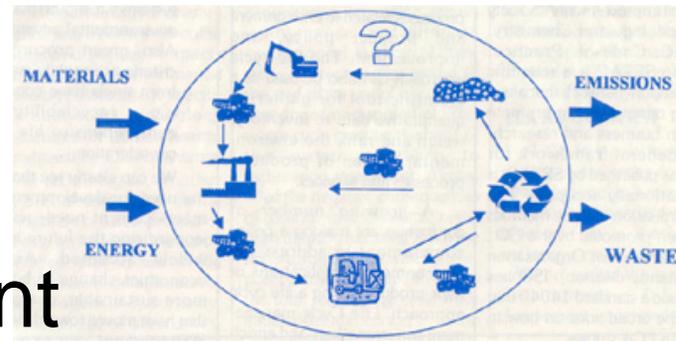
The Buildings Impact on the Atmosphere

Prescriptive Provisions

- Reduced Impact Materials
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Performance Option

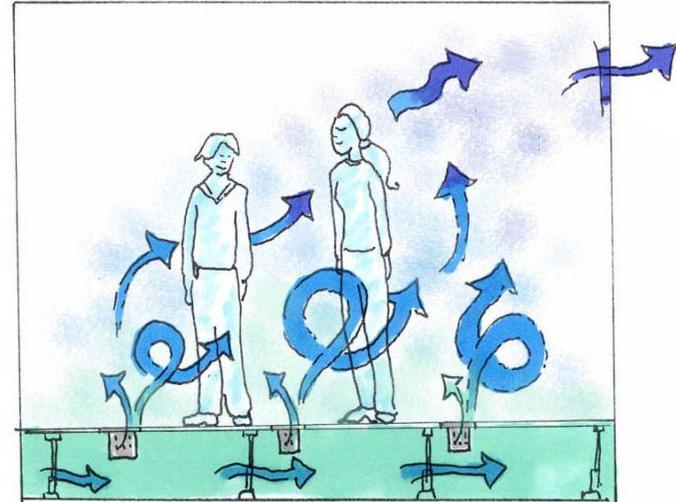
- Life Cycle Assessment



Indoor Environmental Quality

Mandatory Provisions

- Ventilation rates
 - per ASHRAE 62.1
 - 1.3 X ASHRAE 62.1 for offices and classrooms
- No smoking inside building



Indoor Environmental Quality

Mandatory Provisions

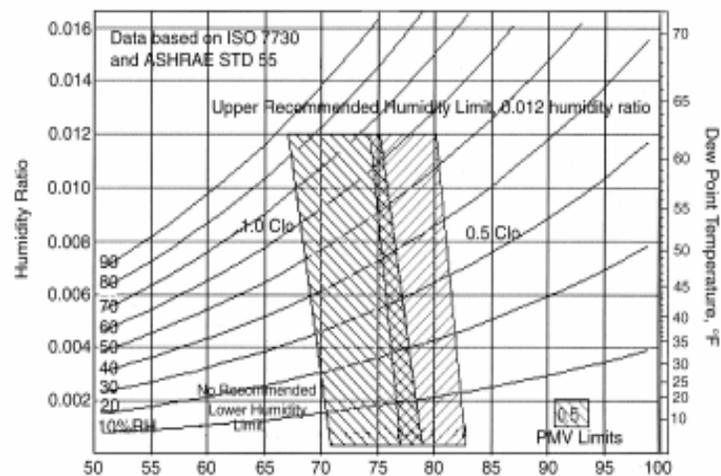
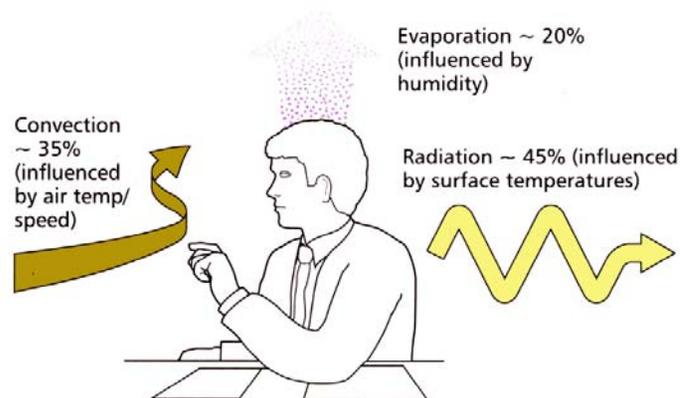
- Outdoor air monitoring
 - CO2 monitoring in densely occupied mechanically ventilated spaces, and naturally ventilated spaces
 - Outdoor air flow rate monitoring in non-densely occupied, mechanically ventilated spaces



Indoor Environmental Quality

Mandatory Provisions

- Thermal Comfort
 - Comply with ASHRAE Std 55
- Mat Systems at Building Entrances



Indoor Environmental Quality

Mandatory Provisions

- Acoustical Control
 - Defined STC values for exterior and interior assemblies
- Daylighting by toplighting (skylights)
 - Targeted for big box retail applications



Indoor Environmental Quality

Prescriptive Option

- Daylighting by sidelighting (office/class)
 - Minimum effective apertures
 - Minimum interior surface visible light reflectances
 - Minimum shading projection factors



Indoor Environmental Quality

Prescriptive Option

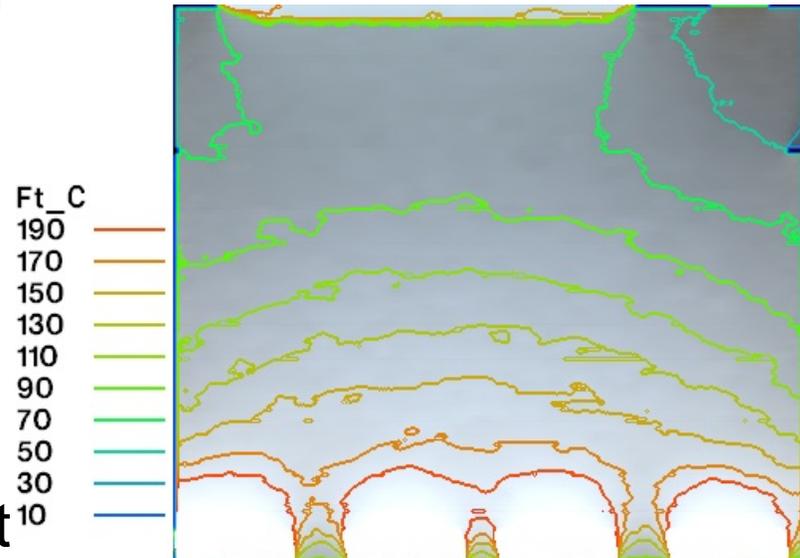
- Low emitting materials
 - Adhesives and sealants
 - Paints and coatings
 - Floor covering materials
 - Composite wood and agrifiber products



Indoor Environmental Quality

Performance Option

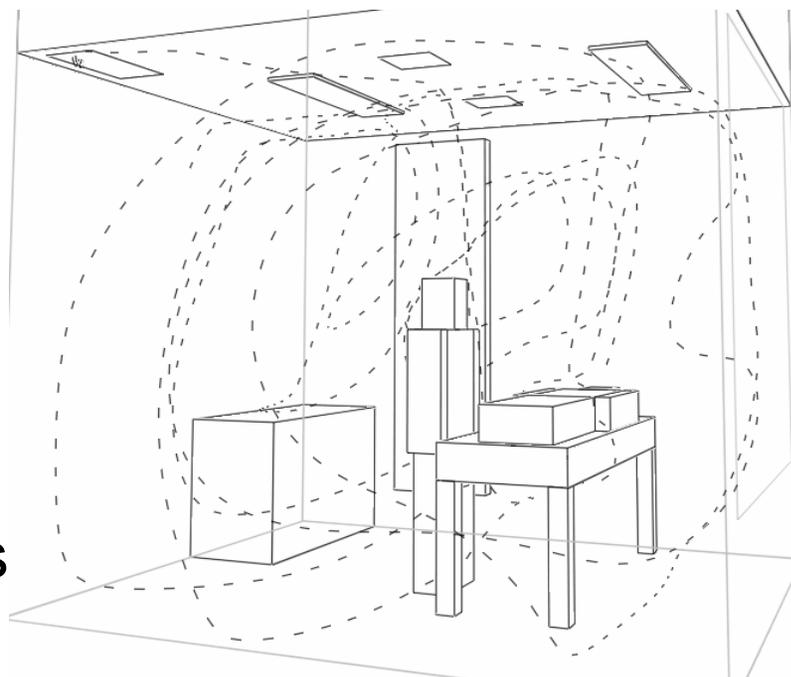
- Daylighting
 - Physical or computer model
 - All regularly occupied spaces
 - Minimum illuminance target 30 foot-candles on work surfaces, 15 ft from façade, noon equinox
 - Direct sunlight on workplane < 20% of occupied hours on equinox day



Indoor Environmental Quality

Performance Option

- Low emitting materials
 - IAQ concentration model of all spaces
 - Materials testing in small scale environmental chambers
 - CDHS California Section 01350



Construction and Operation

Mandatory Provisions

- Building Commissioning
 - Fundamental building commissioning (> 5000 ft²), or
 - Acceptance testing of HVAC and lighting, similar to CEC Nonresidential Compliance Manual
- Measurement and Verification Plan
 - Completed prior to 100% DD
 - Owner responsible for implementation



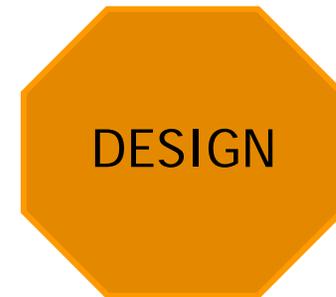
Construction and Operation

Mandatory Provisions

- M&V plan covers:
 - Tree and vegetation shading – within 5 years
 - Water consumption, using installed meters
 - Energy consumption, using installed meters
 - Applies to buildings above defined ft² thresholds
 - Either benchmark to CBECS data (top 8%) or
 - Calibrated energy simulation



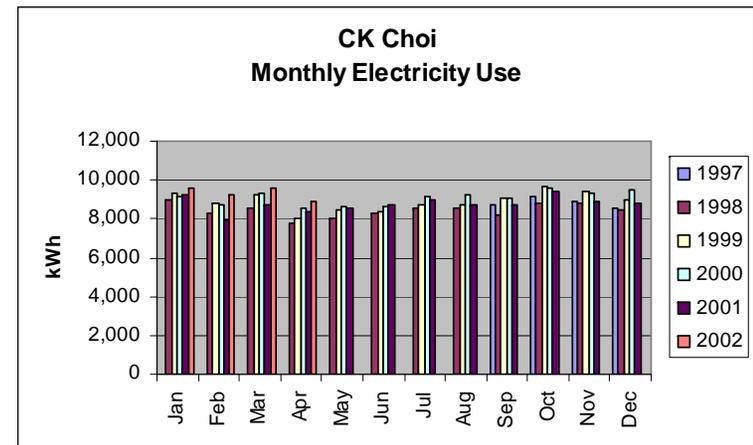
VS



Construction and Operation

Mandatory Provisions

- M&V plan also covers:
 - Certification of lamp and ballast recycling
 - Verification/testing of air monitoring strategies
- EPA Energy Star Portfolio Manager:
 - Required reporting of energy consumption



Construction and Operation

Mandatory Provisions

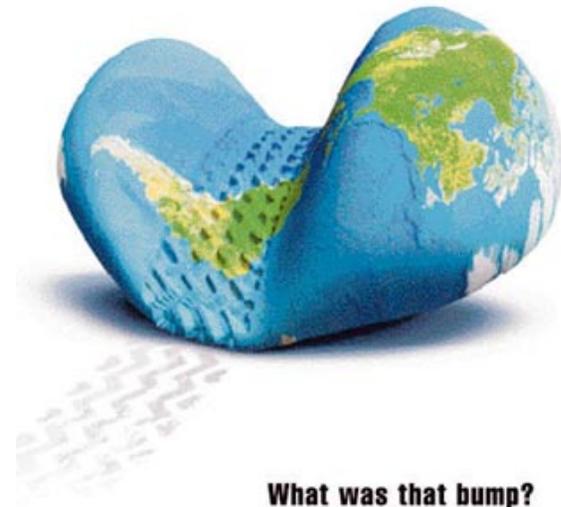
- Durability Plan
 - Service life estimates for structural, building envelope, and hardscape materials that need to be replaced during the life of the building



Construction and Operation

Mandatory Provisions

- Transportation Management Plan
 - Target: 15% reduction in vehicle trips in 5 yrs
- Erosion and sediment control plan
 - Baseline: USEPA NPDES General Permit for Stormwater Discharges From Construction Activities



Construction and Operation

Mandatory Provisions

- IAQ Management Plan
 - Cleanliness of HVAC air systems during construction
 - Post-construction “flush-out” or IAQ testing



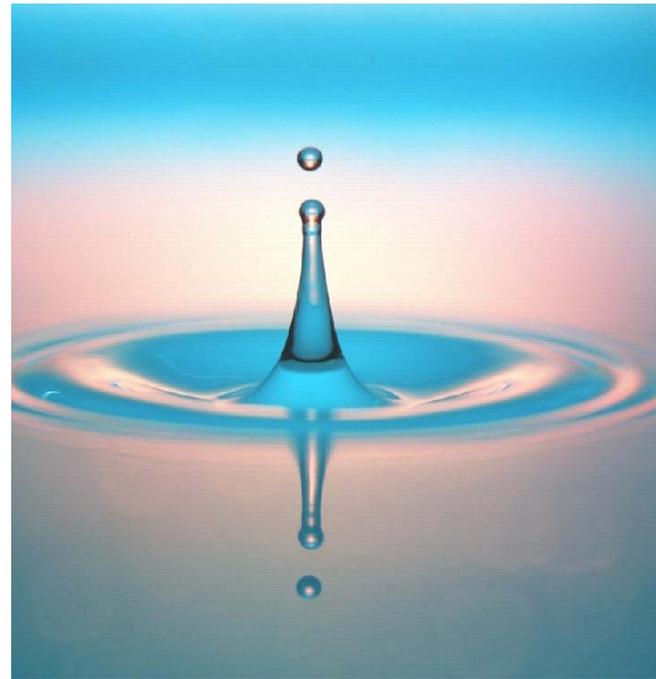
Construction and Operation

Mandatory Provisions

- Construction
 - Minimize idling of construction vehicles
 - Moisture control measures during construction

Prescriptive Option - NONE

Performance Option - NONE



SCHEDULE

- Public review ended *July 9, 2007*
- Review of comments to follow
- Further information on ASHRAE standards:
www.ashrae.org,
then follow “Standards”