

# **ASHRAE/USGBC/IESNA Std 189.1P**

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# What is Standard 189.1P?

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

*189.1 applies to all buildings except low-rise residential buildings (same as ASHRAE/IESNA Std 90.1)*

not a design guide, not a rating system

# Scope of Standard 189.1

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## **2. SCOPE**

**2.1** This standard provides minimum criteria that:

(a) apply to the following elements of building projects:

1. new buildings and their systems.
2. new portions of buildings and their systems.
3. new systems and equipment in existing buildings.

(b) address site sustainability, water use efficiency, energy efficiency, indoor environmental quality (IEQ), and the building's impact on the atmosphere, materials and resources

**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 use none of the following: electricity, fossil fuel, or water.

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

# Triggers to accelerate green buildings

## Triggers to accelerate green building

From the 2005  
USGBC/McGraw-Hill Survey



# Goals for Standard 189.1

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- **Establish mandatory criteria in all topic areas:**
  - one “problem” with existing rating systems is that they contain few mandatory provisions
  - consequently, a designer can achieve “points” & claim that they have a “green building”, but still make **no** improvements in some areas
- **Provide simple compliance options:**
  - another critique of existing rating systems is the need for extensive calculations (e.g. energy)
- **Complement green building rating programs:**
  - Std 189.1 is **not** intended to compete with green building rating programs

# Sponsors and Project Committee 189.1

- Consensus process
- Sponsor and co-sponsors:
  - ASHRAE  
(American Society of Heating, Refrigeration and Air Conditioning Engineers),
  - USGBC (U.S. Green Building Council),
  - IESNA (Illuminating Engineering Society of North America)
- Project committee: 22 voting members



# Challenges

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- Using normative (code) language
- Determining the stringency for a “minimum” standard
- Identifying standards or regulations to cite  
*(could not reference guidelines)*
- Prescribing universal strategies  
*(requirements for all, not a menu to choose from)*
- Coordinating with other U.S. National initiatives  
*U.S. Federal agencies Memo of Understanding,  
American Institute of Architects,  
National Conference of Mayors*
- Creating something that is enforceable by AHJs  
*(authority having jurisdiction)*

# **Indirect Impacts of Establishing Baselines**

- **Provides more certainty for manufacturing:**
  - manufacturers will provide the next-generation of products if there is a large-enough market for them
  - a program with a firm baseline provides this market (either regulatory like California for material emissions or voluntary like EnergyStar for windows)
- **Will have benefits for existing buildings:**
  - stores will stock better products as they become available (water-efficient, energy-efficient, low-emitting)
  - in Seattle, many stores sell paints that meet Calif. stds, all window products sold in large retail stores are EnergyStar (double-glass w/low-emissivity coating)
  - someone buying replacement windows can not buy a bad window even if they do not know about energy

# Development Process for Standard 189.1

- **June 2006:** Preliminary meeting
- **August 2006:** Review of 150 recommendations *including all 7 prerequisites and all 69 optional credits in USGBC's LEED-NC prog.*
- **Oct, Dec 2006, Jan, Mar, Apr 2007:**  
2-day meetings to develop/refine draft
- **May-July 2007:** First public review
- **August, October, December 2007:**  
2-day meetings to assess comments & revise
- **Feb-Apr 2008:** Second public review
- **May, June 2008:** meetings to assess comments
- **4<sup>th</sup> quarter 2008:** Third public review (limited)

# Potential Users for Standard 189.1

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- **Organizations with Green Building Rating Systems (USGBC, GBI):**  
incorporated as the baseline (prerequisite) in a green building rating system
- **Developers:** individual project
- **Corporations:** corporation buildings
- **Universities:** campus buildings
- **States/municipalities:** their own buildings
- **States/municipalities:** basis for incentives, such as zoning bonus for greater height
- **States/municipalities:** all private construction; may need to cite in multiple codes such as zoning, plumbing, energy, building

# Standard 189 Topic Areas

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

# Standard 189 Chapter Structure

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- x.1: Scope
- x.2: Compliance
- x.3: Mandatory  
(required for all projects)
- x.4: Prescriptive **option**  
(simple option, very few calculations)
- x.5: Performance **option**  
(more sophisticated, but more effort)

# Sustainable Sites

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## Mandatory Provisions

- **Allowable sites**

- Brownfields, greyfields
- Greenfield sites where < 800 m (½ mi) to transit or 10 basic services, or residential area with density > 4 units/ha (10 units/acre)

- **Prohibited development activity**

- Flood plains, wetlands, fish and wildlife habitat



# Sustainable Sites

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## Mandatory Provisions

- **Heat island effect**

- Site hardscape:  
to be shaded, be SRI 29, or porous pavers
- Wall:  
to be shaded up to 20 feet above grade
- Roofs:  
to be SRI 78 (low-slope)/29 (steep-slope)  
or cool roof



# Sustainable Sites

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## Mandatory Provisions

- **Reduction of light pollution**
  - Outdoor lighting trespass:  
limits on horizontal and vertical lux (footcandles)



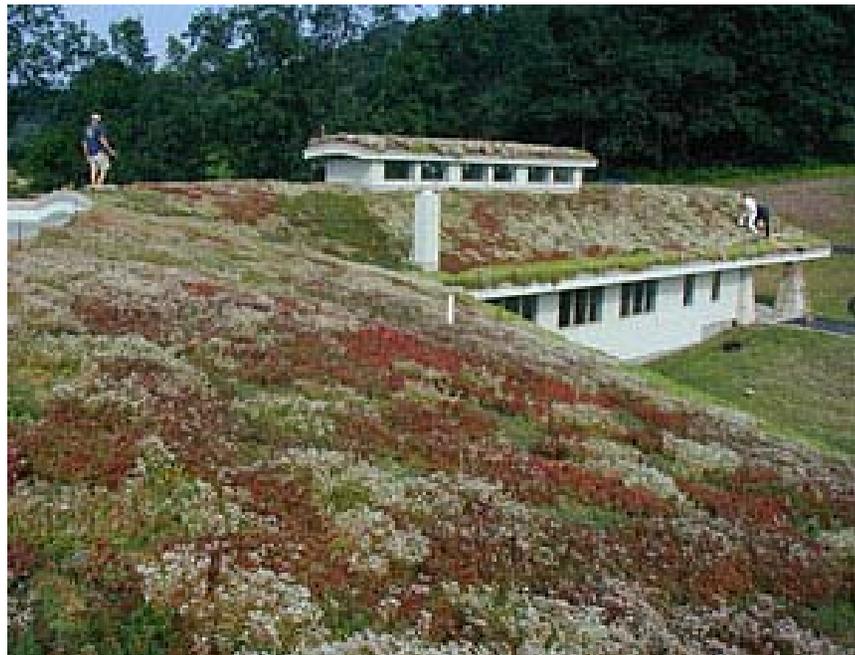
# Sustainable Sites

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## Prescriptive/Performance Options

- **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



# Water Use Efficiency

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## Mandatory Provisions

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



# Water Use Efficiency

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## Mandatory Provisions

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



# Water Use Efficiency

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## Prescriptive Option

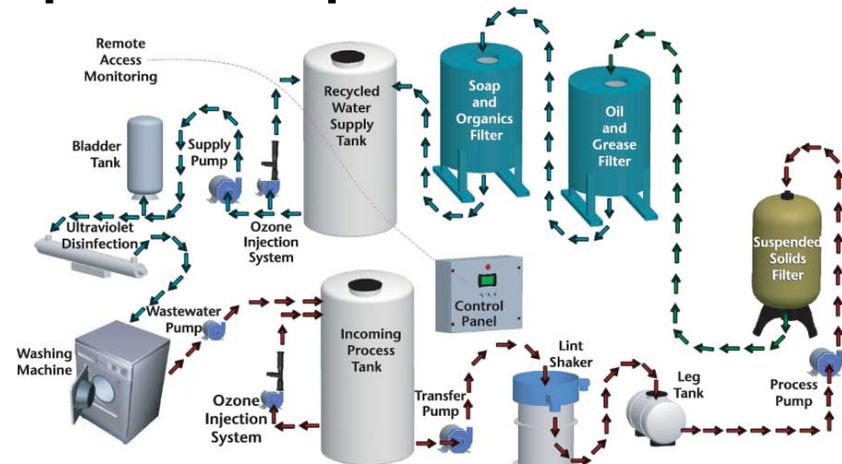
- **Site water use:**  
1/3 max. of improved landscape irrigated with potable water
- **Building water use reduction:** efficient comm. food service and laboratories
- **Special water features:** fountain water to be from alternate source or reclaimed



# 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

- Metering: meters, meter data collection, and data storage and retrieval
- On-site renewable energy power systems with a peak electrical generating capacity of not less than 1.0% of the electrical service load



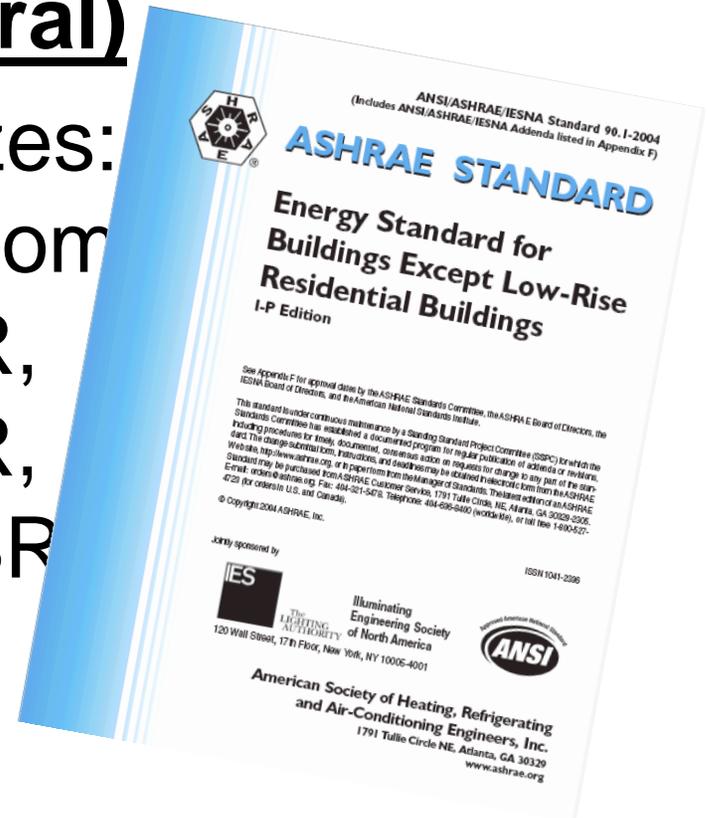
# Energy Efficiency

## Prescriptive Option (General)

- Maximum dwelling unit sizes:  
90 m<sup>2</sup> (900 ft<sup>2</sup>) for 1-bedroom  
125 m<sup>2</sup> (1,250 ft<sup>2</sup>) for 2 BR,  
170 m<sup>2</sup> (1,700 ft<sup>2</sup>) for 3 BR,  
210 m<sup>2</sup> (2,100 ft<sup>2</sup>) for 4+ BR

- Comply with  
ASHRAE/IESNA

Standard 90.1-2007 plus...30% savings

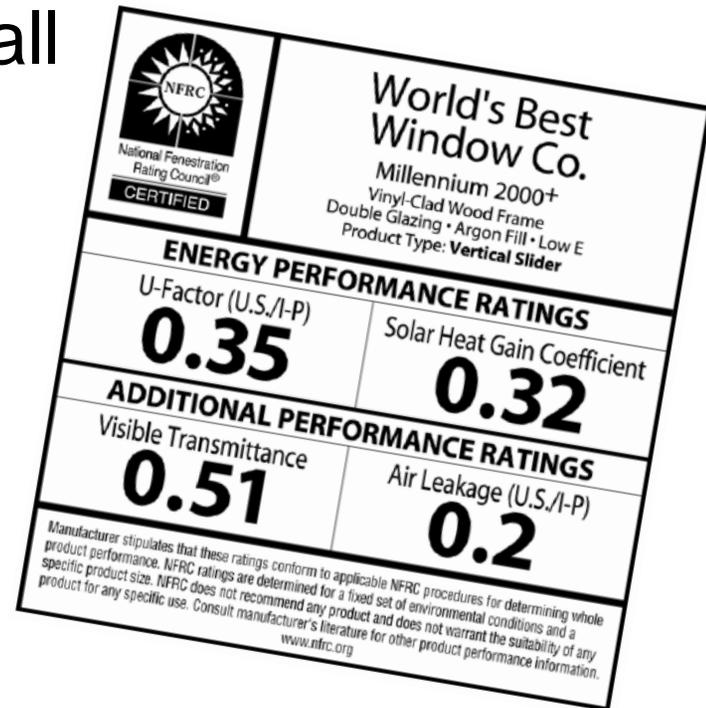


# Energy Efficiency

## Prescriptive Option (Building Envelope)

### CZ-6 St. Paul

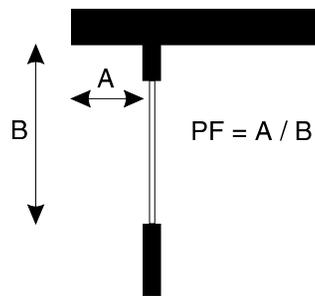
- **Roof insulation:** R-5.3 (R-30) continuous, R-8.6 (R-49) attic
- **Wall:** R-2.3 (R-13) cavity + R-1.8 (R-10) cont. R-2.7 (R-15.2) mass wall
- **Fenestration assembly:**  
U-1.4 (U-0.25) wood, vinyl, fiberglass frame  
U-2.0 (U-0.35) curtainwall  
U-2.6 (U-0.45) other metal  
SHGC-0.40



# Energy Efficiency

## Prescriptive Option (Building Envelope)

- Overhang:  $PF > 0.5$



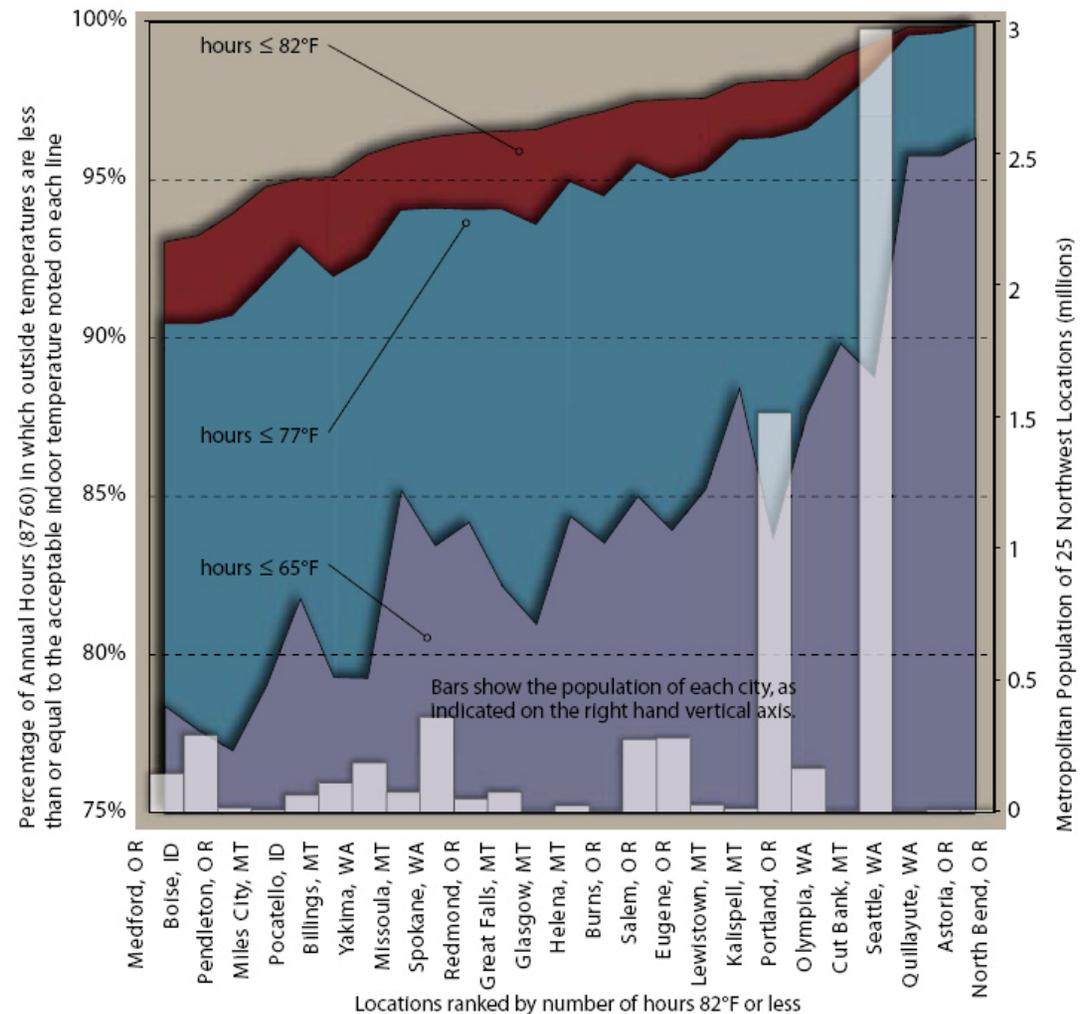
- Orientation:  
solar gain through  
east/west < north/south
- Continuous air barrier



# Energy Efficiency

## Prescriptive Option (Mechanical)

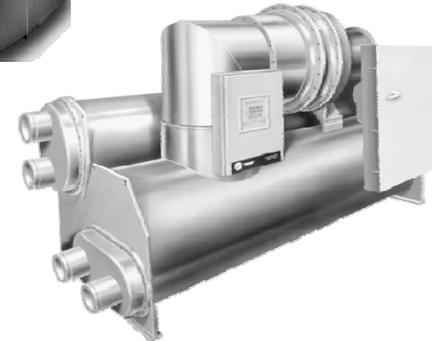
- Economizer cycle for units  $> 9.7$  kW (33,000 Btuh)



# 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

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## Prescriptive Option (Lighting)

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



# Energy Efficiency

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## **Prescriptive Option (Other Equipment)**

- Energy Star equipment and appliances



# Energy Efficiency

## Performance Option

Two criteria:

- Annual energy cost:  
proposed <  
mandatory plus prescriptive
- Annual carbon dioxide equivalent (CO<sub>2</sub>e):  
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



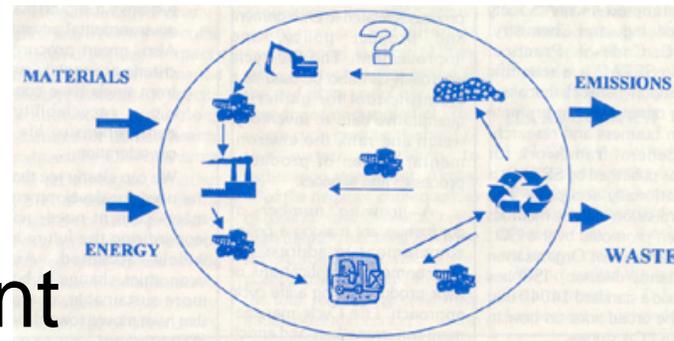
# The Buildings Impact on the Atmosphere

## Prescriptive Provisions

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

## Performance Option

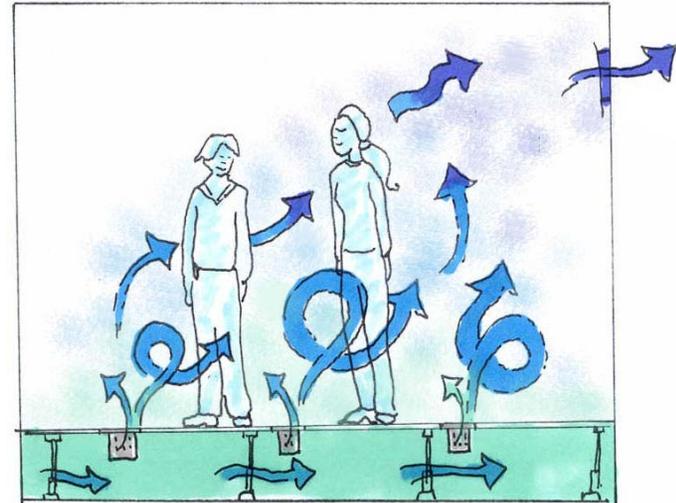
- Life Cycle Assessment



# Indoor Environmental Quality

## Mandatory Provisions

- Ventilation rates
  - Per ASHRAE Std. 62.1
  - 1.3 X ASHRAE 62.1 for offices and classrooms
- No smoking inside building



# Indoor Environmental Quality

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## Mandatory Provisions

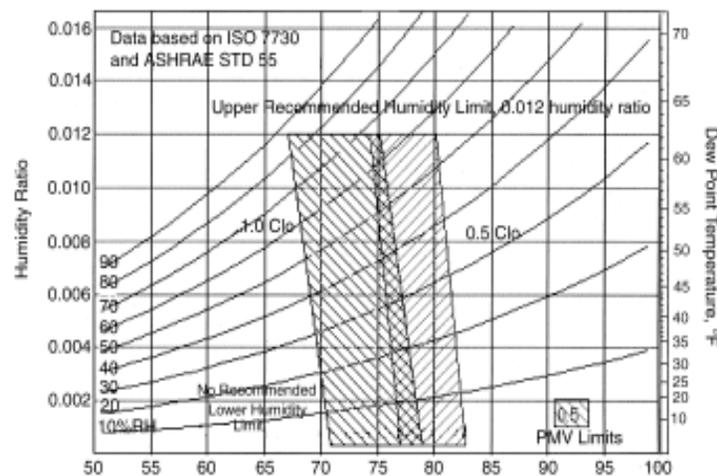
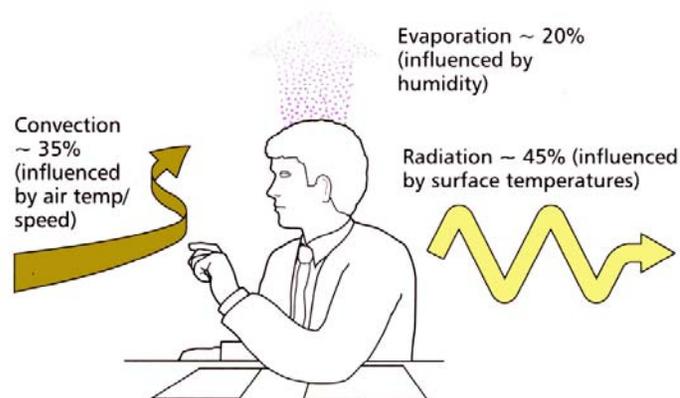
- Outdoor air monitoring
  - CO<sub>2</sub> monitoring in densely occupied mechanically ventilated spaces, and naturally ventilated spaces
  - Outdoor air flow rate monitoring in non-densely occupied, mechanically ventilated spaces



# Indoor Environmental Quality

## Mandatory Provisions

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



# Indoor Environmental Quality

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## 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

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## Prescriptive Option

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



# Indoor Environmental Quality

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## Prescriptive Option

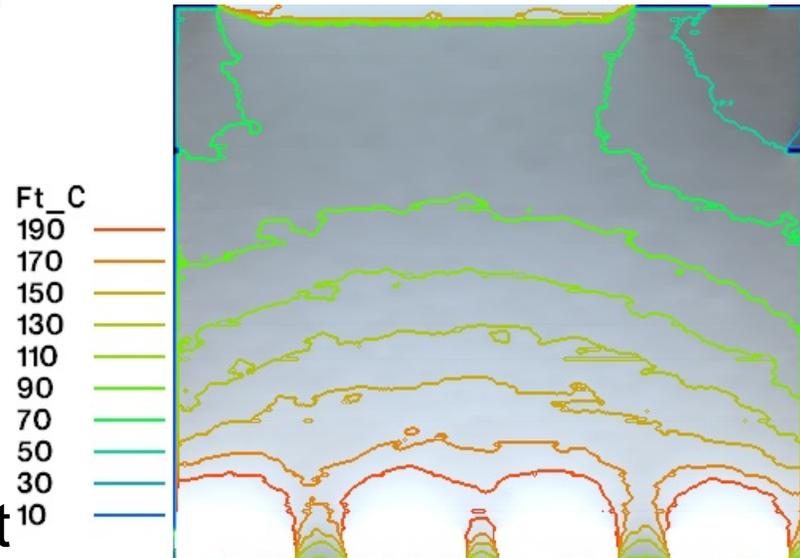
- Low emitting materials
  - Adhesives and sealants
  - Paints and coatings
  - Floor covering materials
  - Composite wood and agrifiber products



# Indoor Environmental Quality

## Performance Option

- Daylighting
  - Physical or computer model
  - All regularly occupied spaces
  - Minimum illuminance target 300 lux (30 fc) on work surfaces, 4.5 m (15 ft) from façade, noon equinox
  - Direct sunlight on workplane < 20% of occupied hours on equinox day

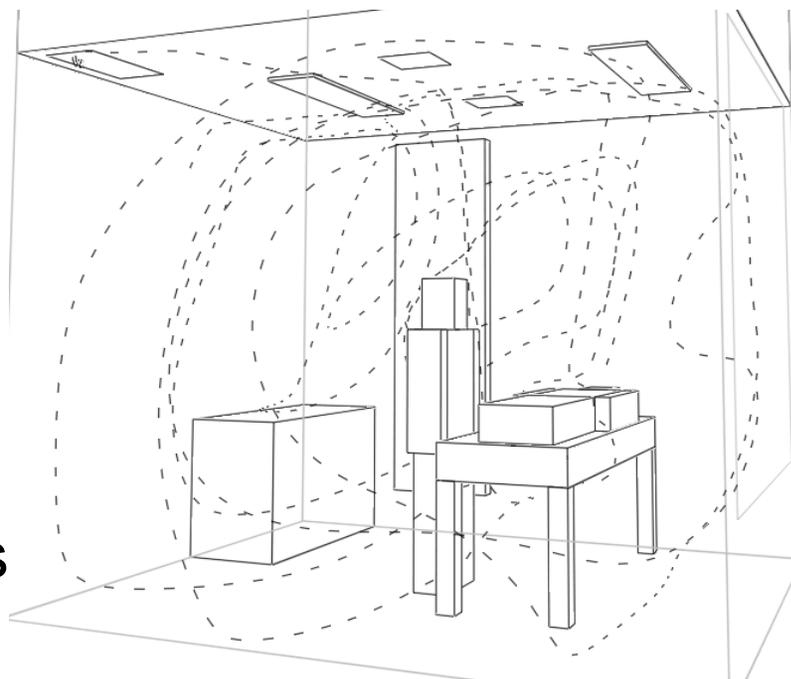


# Indoor Environmental Quality

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## 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 > 500 m<sup>2</sup> (5000 ft<sup>2</sup>), 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

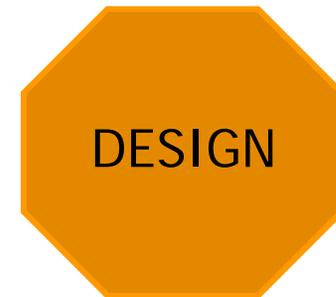
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## Mandatory Provisions

- 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 area thresholds
    - Either benchmark to CBECS data (top 8%) or
    - Calibrated energy simulation



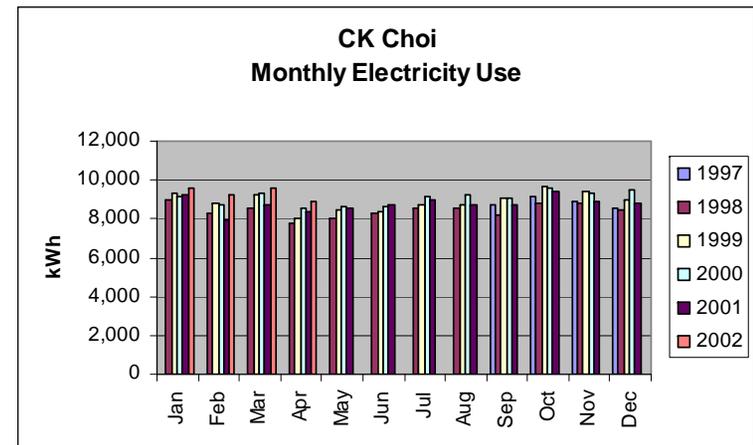
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# Construction and Operation

## 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

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## Mandatory Provisions

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

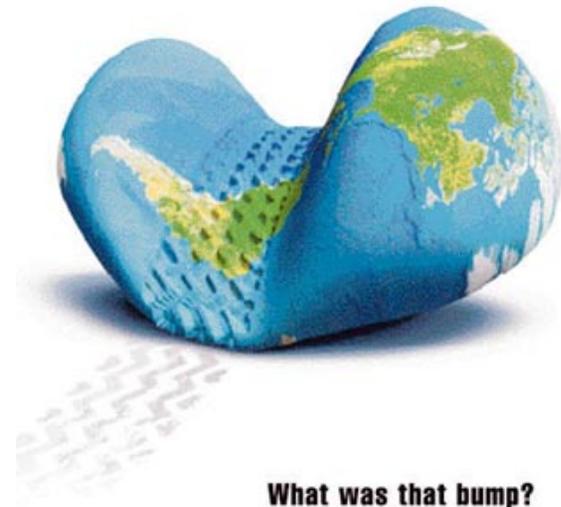


# Construction and Operation

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## Mandatory Provisions

- Transportation Management Plan
  - Target: 14% reduction in vehicle trips in 18 months
- Erosion and sediment control plan
  - Baseline: USEPA NPDES General Permit for Stormwater Discharges From Construction Activities



# Construction and Operation

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## Mandatory Provisions

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



# Construction and Operation

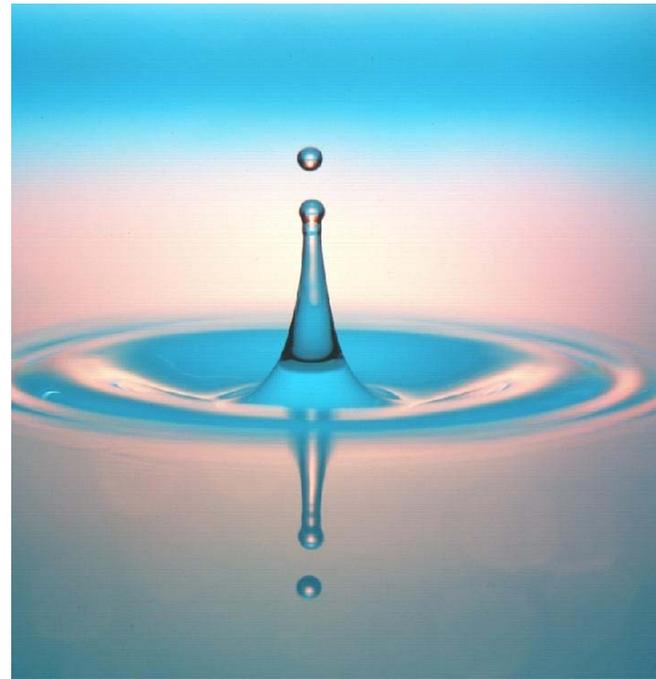
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## Mandatory Provisions

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

Prescriptive Option - NONE

Performance Option - NONE



# Energy Code Adoption Options

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## **Pick up Energy criteria in Standard 189.1P**

- Streamlined option:
  - Building envelope tables in Appendix A
  - Mechanical equipment tables in Appendix C
  - Lighting criteria in Section 7.4.6(a)
- Comprehensive option:
  - Chapter 7, Energy Efficiency
  - Appendix A, Prescriptive Building Envelope Tables
  - Appendix B, Continuous Air Barrier
  - Appendix C, Prescriptive Equipment Efficiency Tables
  - Appendix D, Performance Option for Energy Efficiency
  - and associated definitions in Ch.3 & references in Ch.11

## FURTHER INFORMATION

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- Information on ASHRAE standards:  
[www.ashrae.org](http://www.ashrae.org),  
*then follow “Standards”,*  
*includes listserv for Std 189.1*
- Information on USGBC programs:  
[www.usgbc.org](http://www.usgbc.org)
- Information on IESNA programs:  
[www.iesna.org](http://www.iesna.org)