

## Sustainability:

“Design and construction that conserves resources, recycles materials, and promotes the health and longevity of people and their natural and man-made environments”.

-A. Vernon Woodworth

“A delightfully diverse, healthy, and just world, with clean air, water, soil, and power—economically, equitably, ecologically, and elegantly enjoyed.”

-William McDonough



# Definitions

- ***Sustainability:***

- The concept of meeting present needs without compromising the ability of future generations to meet their own needs.

- ***Sustainable design:***

- Design that seeks to avoid depletion of energy, water, and raw material resources; prevents environmental degradation caused by facility and infrastructure development over their life cycle; and creates environments that are livable, comfortable, and safe and that promote productivity.

- Joseph Demkin AIA (Architect's Handbook of Professional Practice)





## Recommendations of the Union of Concerned Scientists for addressing climate change:

- Accelerate the transition from fossil fuels to renewable energy.
- Purchase energy efficient appliances, systems, and vehicles.
- Use state and municipal zoning laws, and building codes, and incentives to encourage energy-efficient buildings, discourage urban sprawl, provide low-emissions transportation alternatives, and avoid development in vulnerable coastal areas and floodplains





# BUILDING CODES: Where did they come from, where are they going?

- Formation of Mutual Insurance Companies at the turn of the 20<sup>th</sup> century established first minimum standards for life-safety and structural performance.
- Different standards developed in different parts of the country eventually coalesced into three competing model code groups: BOCA, SBC, and UBC.
- Common code format developed and used by all three model code groups.





# BUILDING CODES: Timeline

- **1970's**

- Arab oil embargo results in first energy conservation requirements introduced into model building codes.
- Insulation requirements generate need for moisture barrier requirements to prevent condensation and deterioration of building envelope.

- **1993**

- UGBC founded to develop green building standards for new construction. LEED rating system gains attention of owners, developers and architects.





## BUILDING CODES: Timeline (cont.)

- **2000**

- ICC publishes new integrated family of codes including IBC, IRC and IEBC, replacing all three previous model code groups.

- **Circa 2005**

- Increasing concerns over the consequences of global warming leads to the adoption of local requirements, outside the building code process.

- LEED and other rating systems, developed as voluntary standards, are made mandatory as a condition of building permits or zoning approvals.

- Local jurisdictions adopt “green building guidelines” without clear inspection and enforcement protocols.



# BUILDING CODES: Timeline (cont.)

- **Present**

- New standards for green buildings under development, including:

- ASHRAE 189P, Standard for the Design of High Performance Green Buildings.
- NAHB/ICC ANSI standard for residential green buildings.
- Development of Energy Modeling and plan check software open doors to the future of code compliance for energy conservation.





# Building Codes and Sustainability

- Can and should sustainability be incorporated into building codes?
- Or is there a better way?
- Is it appropriate to take a system like LEED, developed as a voluntary rating system, and convert it to code-like requirements?



# Building Codes and Sustainability

**Pro: ICC codes are coordinated and comprehensive, providing an established context in which to introduce requirements for sustainability:**

**Example:**

- Smart Growth Principles can be incorporated into the International Zoning Code
- Water conservation requirements can be incorporated into the International Plumbing Code
- Energy efficiency requirements can be incorporated into the International Mechanical Code, the International Building Code, and the International Residential Code.
- Building Envelope requirements can be incorporated into the International Energy Conservation Code.





# Building Codes and Sustainability

**CON: ICC codes are developed through committee process with significant industry involvement, often resulting in resistance to innovation and new technologies:**

## Example: Air Barrier

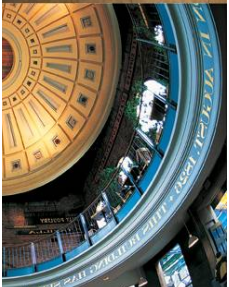
- By providing an airtight, structurally supported air barrier for the entire building envelope the principle source of energy loss in buildings, infiltration and exfiltration through pressure differentials, is reduced significantly.
- Air barriers have been required in Canada and Massachusetts for over a decade
- Attempts to introduce an air barrier requirement into the national model codes have not been successful, largely due to resistance from owners, but also from architects and others concerned about the additional cost and potential for unforeseen consequences (moisture and mold, for instance)



# Building Codes and Sustainability

## Biggest PRO:

- Existing infrastructure for quality control in terms of plan review and building inspections by AHJ, authority having jurisdiction (local building officials)
- But can Building Departments develop the expertise to enforce these requirements effectively (given that their main focus is on zoning and life-safety issues, and the backgrounds of most building officials do not provide them with expertise in energy conservation issues)?



# Building Codes and Sustainability

One alternative to the Building Code process is to allow individual jurisdictions to adopt standards and requirements, like the NAHB or ANSI standards, and enforce these locally.

## Biggest CON:

- Uncertainty About Requirements
- Possibly Redundant Enforcement
- Additional Costs



# Building Codes and Sustainability

## Example:

- The Boston Redevelopment Authority (BRA) has adopted a provision that projects requiring their approval must achieve LEED “certifiability”.
- Validation of compliance is submitted to a panel of City Department representatives (Building, Water & Sewer, Public Works, etc.)



# Building Codes and Sustainability

Can achieving the goals of energy conservation in buildings, required to address the threats of global warming, be left to a process of, essentially, self-certification?



# Building Codes and Sustainability

- **Alternative approach, currently proposed for inclusion in the energy conservation requirements of the Massachusetts State Building Code, would be to provide incentives for energy conservation above code minimum.**
- **Local jurisdictions would determine the incentives and provide enforcement through the local building departments, but the nature of enhanced compliance would be defined by the State Building Code.**



# So what is the role of building codes in sustainable design?

## Performance-based Design

- The performance approach to codes is a primary tool that can be used to address issues of sustainable design because it allows the standard to be created for the specific design. This approach to code-compliance has yet to realize its potential, but could hold the keys to the future, especially with the use of computer modeling.



# So what is the role of building codes in sustainable design?

## Centralized Promulgation

- Finally, a critical aspect of coordinated codes is their ability to address issues of sustainability and construction regulation in one forum where there can be focused debate on the issues and input from all affected interests. If the codes are not coordinated the issues of sustainable design which are adversely controlled by the codes will be more difficult, perhaps even impossible, to rectify.

- Dave Collins (Cincinnati)



# So what is the role of building codes in sustainable design?

## Existing Buildings

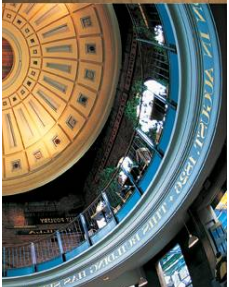
- Excessive requirements for existing buildings, whether they be seismic, accessibility, or energy conservation, carry the potential for being self-defeating by discouraging the reuse and rehabilitation of existing structures. To promote the redevelopment of downtowns, limit sprawl, and maximize the use of resources, all effort should be made to maintain and reuse existing buildings. This requires the promotion of reasonable and coordinated building code and accessibility requirements for existing buildings.

- **Vernon Woodworth (Boston)**



## Conclusions

- Building Codes will play an important part in the advancement of sustainability in buildings.
- This will take place through the incorporation of performance-based design and at the insistence of insurance companies
- The AIA has a significant role to play in advancing the goals of sustainability at the national model code hearings



## Contact Information

□ A. Vernon Woodworth, AIA, LEED AP

E-mail: [avw@rwsullivan.com](mailto:avw@rwsullivan.com)

Direct: (617) 337-9345

R.W. Sullivan Engineering

The Schrafft Center

529 Main Street, Suite 203

Boston, MA 02129-1107