

Improving Code Compliance – Change of Occupancy A Project of the Consortium for Building Energy Innovation

Pennsylvania Energy Code Collaborative
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Consortium for Building Energy Innovation

Goals

A

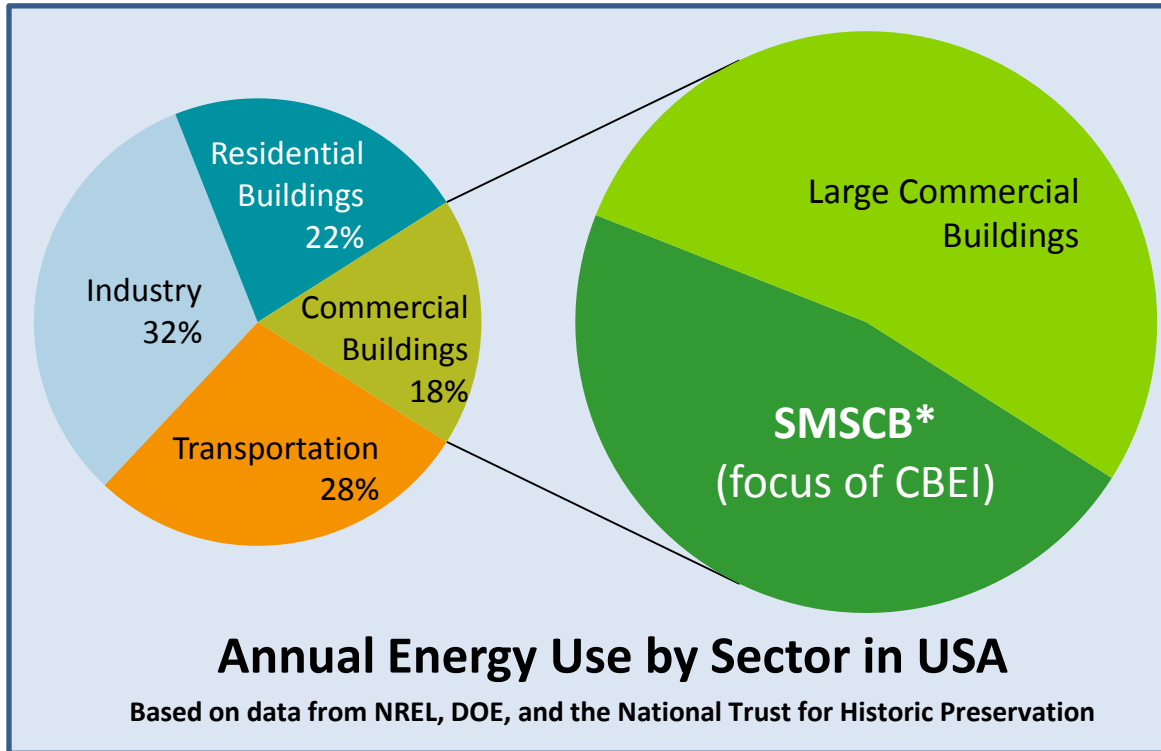
Develop market-tested pathways to 50% energy reduction in existing buildings

B

Identify and overcome market barriers in implementing energy efficiency in existing buildings

C

Accelerate adoption of energy efficient retrofit solutions at local and national scales



- Reducing building energy use is a national priority (EPA Act 2005)
- Despite ~50% improvement in equipment efficiency (since 1970s), building energy use has only declined by 15%
- **Challenge:** SMSCB* are diffuse (>95% of comm. bldgs.), ~half (>47%) of commercial building energy consumption, and has received little attention

*Small and Medium Sized Commercial Buildings
(less than 250k square feet)

This Project Objective:

Develop guidance for regulators for improved code compliance with change-of-occupancy provisions in International Energy Conservation Code (IECC) through proof-of-concept testing

Why:

- Policy objective of the IECC is energy conservation
- Principal use is main determinant of energy consumption
- Change-of-occupancy provision is hard to enforce in its current form
- Project designed to help overcome issues/confusion related to existing change-of-occupancy provisions and help improve opportunities to optimize energy efficiency in existing buildings through code compliance

How:

- Develop data on PA municipalities/commercial building inventory/rate of reuse
- Work with target PA municipalities to gather information that informs the development of compliance guidance
- Field test compliance guidance and disseminate to stakeholders
- Propose IECC code change (in 2016); scale up nationally

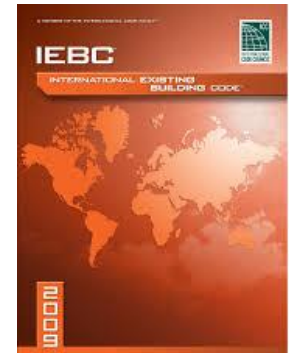


Building codes and the impact of “smart codes” on rehabilitation - historical precedents:

- International Existing Building Code (IEBC)
- Nationally Applicable Recommended Rehabilitation Provisions (NARRP)
- NJ Rehabilitation Code
- Massachusetts Article 22



IEBC Change of Occupancy



HAZARD CATEGORIES AND CLASSIFICATIONS: LIFE SAFETY AND EXITS

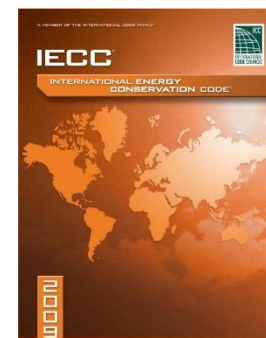
RELATIVE HAZARD	USE CLASSIFICATION
1 (Highest Hazard)	H
2	I-2, I-3
3	A, E, I-1, M, R-1, R-2
4	B, F-1, R-3, R-4, S-1
5 (Lowest Hazard)	F-2, S-2, U

IECC 2009 101.4.4 (identical for IECC 2015 C505)

Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code.

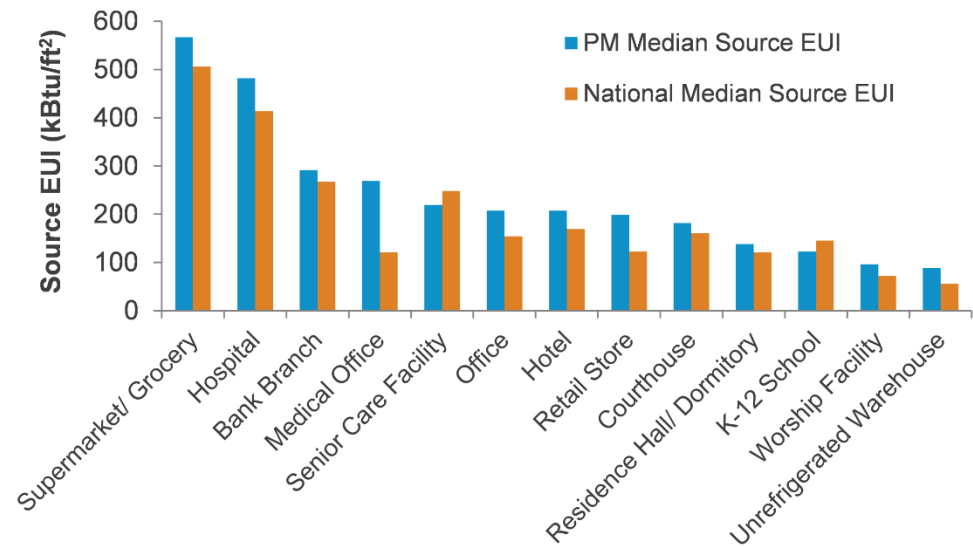
A change from one building type to another that increases end use energy intensity based on CBECS data, or other data to be defined, requires compliance with IECC requirements that address that end use.

A change from one building type to another that does not increase end use energy intensity based on CBECS data, or other data to be defined, or that decreases it, does not trigger any specific IECC requirements.



End Use Energy Intensities:

- Space conditioning
- Lighting
- Water heating



Some building types excluded due to inadequate data and/or EUI values beyond this range

Source: www.energystar.gov

Change of Occupancy Scale— Space Heating, Cooling, and Ventilation

	CBECS Building Type	IBC Occupancy Classification
1.	Health Care (Inpatient)	I-2
2.	Food Service, Public Assembly	A-1, A-2, A-3, A-4, A-5, B-Broadcasting Studios
3.	Education, Health Care (outpatient), Public Order and Safety, Office, Service, Food Sales, Retail (other than mall), Religious Worship	A-3-Courthouse or Religious Worship, B, E, I-3, M
4.	Lodging	I-1, R-1, R-2-Dormitory, R-4
5.	Warehouse and Storage	S-1, S-2

Table 1. Change of Occupancy Scale for Space Conditioning

Suggested Compliance Guidance:

A change of occupancy from one classification to another in a higher energy intensity classification (i.e., moving up on the scale of Table 1) the building or portion of the building changing occupancy shall comply with all applicable HVAC and envelope requirements of the IECC.

Change of Occupancy Scale—Lighting

	CBECS Building Type	IBC Occupancy Classification
1.	Health Care (Inpatient)	I-2
2.	Food Sales, Food Service, Retail (other than mall), Lodging, Office, Health Care (outpatient)	A-2, B, I-1, M, R-1, R-2-Dormitory, R-4
3.	Public Order and Safety, Service, Education, Warehouse and Storage	A-3-Courthouse, B-Service Transactions, E, I-3, S-1, S-2
4.	Public Assembly	A-1, A-3, A-4, A-5, B-Broadcasting Studios
5.	Religious Worship	A-3-Religious Worship

Table 2. Change of Occupancy Scale for Lighting

Suggested Compliance Guidance:

A change of occupancy from one classification to another in a higher energy intensity classification (i.e., moving up on the scale of Table 2) the building or portion of the building changing occupancy shall comply with all applicable lighting requirements of the IECC.

Change of Occupancy Scale—Water Heating

	CBECS Building Type	IBC Occupancy Classification
1.	Food Service, Health Care (Inpatient)	A-2, I-2
2.	Lodging	I-1, R-1, R-2-Dormitory, R-4
3.	Public Order and Safety	A-3-Courthouse, I-3
4.	Education, Retail (other than mall)	E, M
5.	All rest	A-1, A-3, A-4, A-5 , B,, S-1, S-2

Table 3. Change of Occupancy Scale for Water Heating

Suggested Compliance Guidance:

A change of occupancy from one classification to another in a higher energy intensity classification (i.e., moving up on the scale of Table 3) the building or portion of the building changing occupancy shall comply with all applicable water heating requirements of the IECC.

Project Example 1:

- I1 to A2: Change of use from office/shelter to private club
- Proposed work: Interior alterations
- Estimated cost: \$80,000
- Permit date: 7/14/11
- Exterior walls: Stone and plaster, not altered
- Climate Zone: 4A

Compliance Guidance:

Envelope, HVAC, Water Heating



Project Example 2:

- S2 to R3: Nonconforming use change to less intense use/residential. Assume change is to R-4. The Building Code requires R4 to comply with R3 requirements.
- Proposed work: Frame interior walls – remove existing gable ends and replace with CMU walls to meet Fire Code. Install new windows and fire stopping.
- Estimated cost: \$30,000
- Permit date: 9/5/12
- Climate Zone: 4A



Compliance Guidance:

Envelope, HVAC, Lighting, Water Heating

Project Example 3:

- B to R2: Change of use from county offices to five apartments on 2nd and 3rd floors. **This was the most frequent change of occupancy in this jurisdiction.**
- Proposed work: Not reported
- Estimated cost: \$65,000
- Permit date: 7/12/12
- Climate Zone: 4A

Compliance Guidance:

Water Heating



Project Example 4:

- B or M to A2: Partial change from office or store to restaurant on first floor of a building with residential above.
- Proposed work: To be determined for specific project
- Estimated cost: Not provided
- Permit date: 5/22/14
- Climate Zone: 4A

Compliance Guidance:

Envelope, HVAC, Water Heating



Policy Consideration: should smaller buildings be exempt?

Cohorts targeted	(% of Total Energy Use)	(% of Total Buildings)
All buildings >25k ft ²	67%	11%
All buildings >25k ft ² & Offices, Labs, Food Sales, Food Service, Inpatient Healthcare, Nursing, Strip Mall, Enclosed Mall >10k ft ²	74%	15%
All buildings >25k ft ² & Offices, Labs, Food Sales, Inpatient Healthcare, Nursing, Strip Mall, Enclosed Mall >10k ft ² & All Food Service > 5k ft ²	75%	17%
All buildings >25k ft ² & Offices, Labs, Food Sales, Inpatient Healthcare, Nursing, Strip Mall, Enclosed Mall >10k ft ² & All Food Service	78%	21%
All buildings >10k ft ²	81%	27%
All buildings >10k ft ² except Education, Public Assembly, Religious Worship, Nonrefrigerated warehouse <25k ft ²	77%	20%
All buildings >10k ft ² and all Food Service	86%	33%
All buildings >5k ft ²	89%	47%
All buildings >1k ft ² *	100.00%	100.00%

Table of Illustrative Policy Scenarios

Note: *CBECS microdata do not include buildings with floor areas of 1,000 ft² or less. CoStar data for DVRPC-PA region suggests that 3% of the commercial building stock has floor areas of 1,000 ft² or less.

Additional Consideration: Partial Change of Occupancy as Alterations?

IECC 2009 101.4.3 (some modifications in IECC 2015 C503)

...alterations...to an existing building, building system or portion thereof shall conform to the provisions of this code...without requiring the unaltered portion(s)...to comply with this code...

Exceptions:...

1. Storm windows installed over existing fenestration.
2. Glass only replacement in an existing sash and frame.
3. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation.

Questions?

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