

2021 IECC for Existing Commercial Buildings

5/21/2024



SEDAC

SMART ENERGY DESIGN ASSISTANCE CENTER

Providing effective energy strategies for buildings and communities



SEDAC

SMART ENERGY DESIGN ASSISTANCE CENTER

Presenters:

Shawn Maurer



Ryan Siegel



Learning Objectives

By the end of the presentation, participants will be able to:

1. Define the scope and applicability of the energy code as it applies to existing commercial buildings.
2. Explain the differences in code requirements for Additions, Alterations, Repairs, and Historic commercial buildings.
3. Apply real world examples to better understand the requirements of Chapter 5 for existing commercial projects.
4. Identify how improving existing building stock is key to improving sustainability and resiliency.

Who We Are



SEDAC

SMART ENERGY DESIGN ASSISTANCE CENTER

Our mission: Reduce the energy footprint of Illinois and beyond



What We Do

We are an applied research program at the University of Illinois.

We assist buildings and communities in achieving energy efficiency, saving money, and becoming more sustainable.

We help facilities become more energy efficient.

We educate.

We research.

We advocate for a greener future.



SEDAC is the Illinois Energy Conservation Code Training Provider



This training program is sponsored by **Illinois EPA Office of Energy**

SEDAC is a Preferred Education Provider with the International Code Council (ICC). Credits earned on completion of this program will be reported to ICC for ICC members. Certificates of Completion will be issued to all participants.



This workshop is approved for 1 LU/HSW CES credits from the American Institute of Architects (AIA). Credits earned on completion will be reported for AIA members.



Energy Code Assistance

Technical support

- energycode@illinois.edu
- 800.214.7954

Online resources at

smartenergy.illinois.edu/energy-code

- Workshops
- Webinars
- Online on-demand training modules



SEDAC Energy Code Training Series

Energy Code Webinar Schedule

08.22.23 – ARCHIVED – Energy Code Basics

09.26.23 – ARCHIVED – Existing Residential Buildings

11.14.23 – ARCHIVED – Residential Stretch Code

12.12.23 – ARCHIVED – Q&A Review – How We Answer Energy Code Questions

02.20.24 – ARCHIVED – Commercial Stretch Code

03.19.24 – ARCHIVED – 2021 IECC Updates (Residential)

03.20.24 – ARCHIVED – 2021 IECC Updates (Commercial)

04.09.24 – ARCHIVED – Simplified Code Compliance

05.21.24 – TODAY! – Existing Commercial Buildings

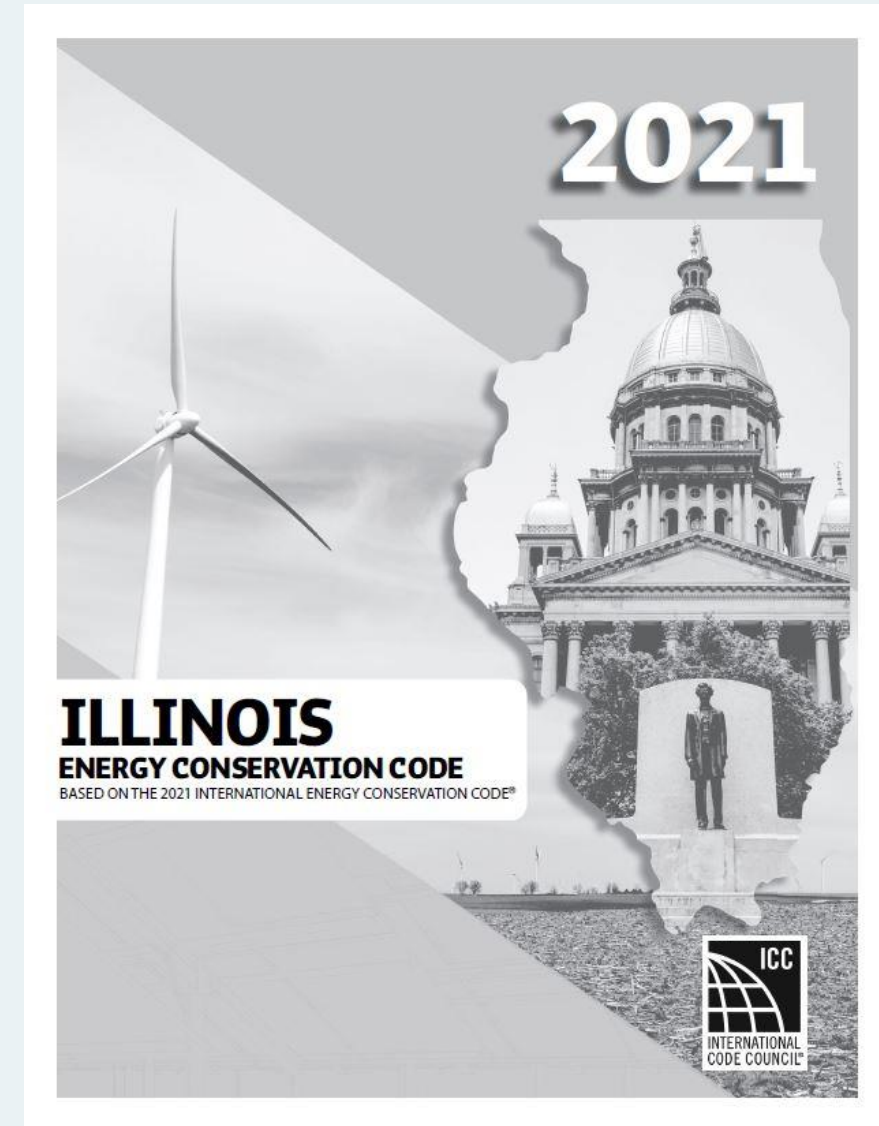
Registration: <https://smartenergy.illinois.edu/events>

Illinois Energy Conservation Code

Updated Illinois Energy Conservation Code (2021 IECC with IL Amendments) went into effect January 1st 2024.

Permit applications before 1/1/24 comply with the 2018 IECC

Permit applications on or after 1/1/24 comply with the 2021 IECC



Access to 2021 IECC & IL Amendments

Menu Search all of Digital Codes

All Codes <

Legend Information

CODE SECTIONS MY NOTES

2021 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)

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PREFACE

▶ ARRANGEMENT AND FORMAT OF THE 2021 IECC

ABBREVIATIONS AND NOTATIONS

IECC—COMMERCIAL PROVISIONS

▶ CHAPTER 1 [CE] SCOPE AND ADMINISTRATION

▶ CHAPTER 2 [CE] DEFINITIONS

▶ CHAPTER 3 [CE] GENERAL REQUIREMENTS

▶ CHAPTER 4 [CE] COMMERCIAL ENERGY EFFICIENCY

2021 International (IECC) Add to Favorites

The 2021 IECC® addresses energy efficiency on several resources and the impact of energy usage on the environment.

Related Titles

2021 Complete Revision History to the 2021 I-Codes - IECC: Successful Changes and Public Comments >

2021 Significant Changes to the International Energy Conservation Code >

<https://cdb.illinois.gov/business/codes/illinois-energy-codes/illinois-energy-conservation-code.html>

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Illinois Energy Codes

Illinois Energy Conservation Code

Illinois Stretch Energy Code

Advisory Council Meetings

Illinois Energy Conservation Code (20 ILCS 3125/15)

State Funded Facilities must comply with the IECC per 20 ILCS 3125. See Subpart B of the [Illinois Energy Conservation Code](#) for more information. The 2021 edition of the IECC as amended went into effect on 1/1/24.

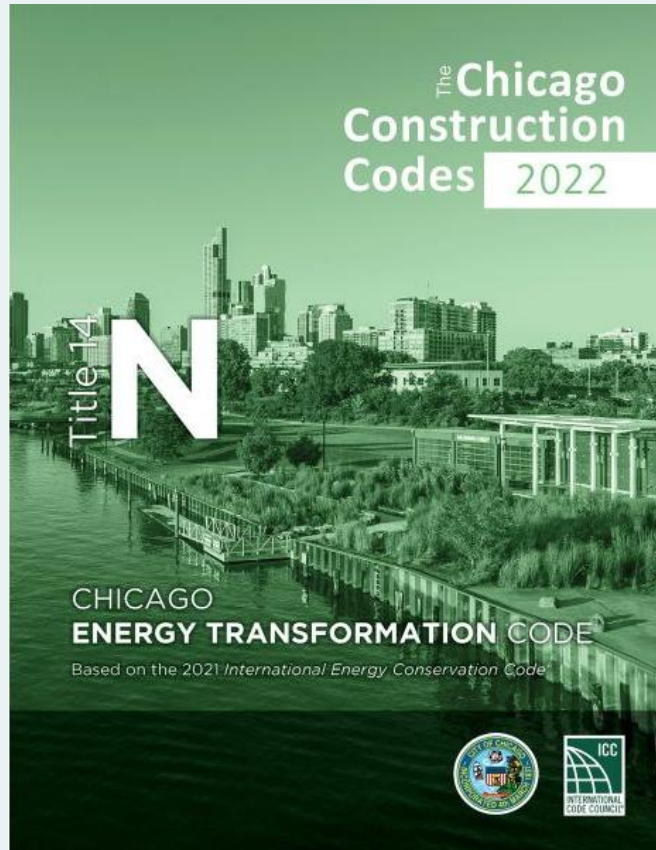
Privately Funded Commercial Facilities must comply with IECC per 20 ILCS 3125. See Subpart C of the [Illinois Energy Conservation Code](#) for more information. The 2021 edition of the IECC as amended went into effect on 1/1/24.

Residential Buildings must comply with IECC per 20 ILCS 3125. See Subpart D of the [Illinois Energy Conservation Code](#) for more information. The 2021 edition of the IECC as amended went into effect on 1/1/24.

- 2021
 - [Illinois Specific Amendments](#)
 - [Illinois Specific Amendments with Modifications Shown](#)

<https://codes.iccsafe.org/content/IECC2021P2>

Access to Chicago Energy Transformation Code



<https://codes.iccsafe.org/codes/illinois/Chicago>

ARTICLE XIII. **CHICAGO ENERGY CONSERVATION CODE**

SECTION 1. The Municipal Code of Chicago is hereby amended by inserting a new Title 14N, as follows:

TITLE 14N ENERGY CONSERVATION CODE

PART I – COMMERCIAL PROVISIONS

CHAPTER 14N-C1 SCOPE AND PURPOSE

14N-C1-C001 Adoption of the commercial provisions of the International Energy Conservation Code by reference.

The commercial provisions of the *International Energy Conservation Code*, 2018 edition, second printing, and all erratum thereto identified by the publisher (hereinafter referred to as "IECC-CE"), except Appendix CA, are adopted by reference and shall be considered part of the requirements of this title except as modified by the specific provisions of this title.

If a conflict exists between a provision modified by this title and a provision adopted without modification, the modified provision shall control.

14N-C1-C002 Citations.

Provisions of IECC-CE which are incorporated into this title by reference may be cited as follows:

14N-C[IECC-CE chapter number]-[IECC-CE section number]

14N-C1-C003 Global modifications.

The following modifications shall apply to each provision of IECC-CE incorporated into this title:

1. Replace each occurrence of "*International Codes*" with "*Chicago Construction Codes*."
2. Replace each occurrence of "*International Building Code*" with "*Chicago Building Code*."
3. Replace each occurrence of "ASME A17.1" or "ASME A17.1/CSA B44" with "the *Chicago Conveyance Device Code*."
4. Replace each occurrence of "NFPA 70" with "the *Chicago Electrical Code*."

2021 IECC Arrangement

| Chapters | Subjects |
|----------|--|
| 1-2 | Administration and definitions |
| 3 | Climate zones and general materials requirements |
| 4 | Energy efficiency requirements |
| 5 | Existing buildings requirements |
| 6 | Referenced standards |



2021 IECC C501

General

2021 IECC Section C501 General

- **C501.1** Scope
- **C501.2** Compliance with IECC
- **C501.3** Maintenance
- **C501.4** New & Replacement Materials
- **C501.5** Historic Buildings

C501.1 Scope

The provisions of this chapter shall control the *alteration, repair, addition,* and *change of occupancy* of the existing buildings and structures.



Addition



Alteration



Repair



Change of Occupancy

Each of these types of existing building work have specific compliance requirements covered by Chapter 5.

C501.2 Compliance

C501.2 details when existing buildings must comply with Chapter 5 of the code.

- Each type of existing building work has specific levels of compliance that must be met

| | |
|--------------------------------|---------------------------------------|
| R502 – Additions | Strict Compliance |
| R503 – Alterations | Moderate Compliance |
| R504 - Repairs | Limited Compliance |
| R505 – Change of use/occupancy | Strict Compliance (includes existing) |

- Relocation is mentioned but does not have a specific compliance section
 - Applies addition and alteration together to account for relocation.

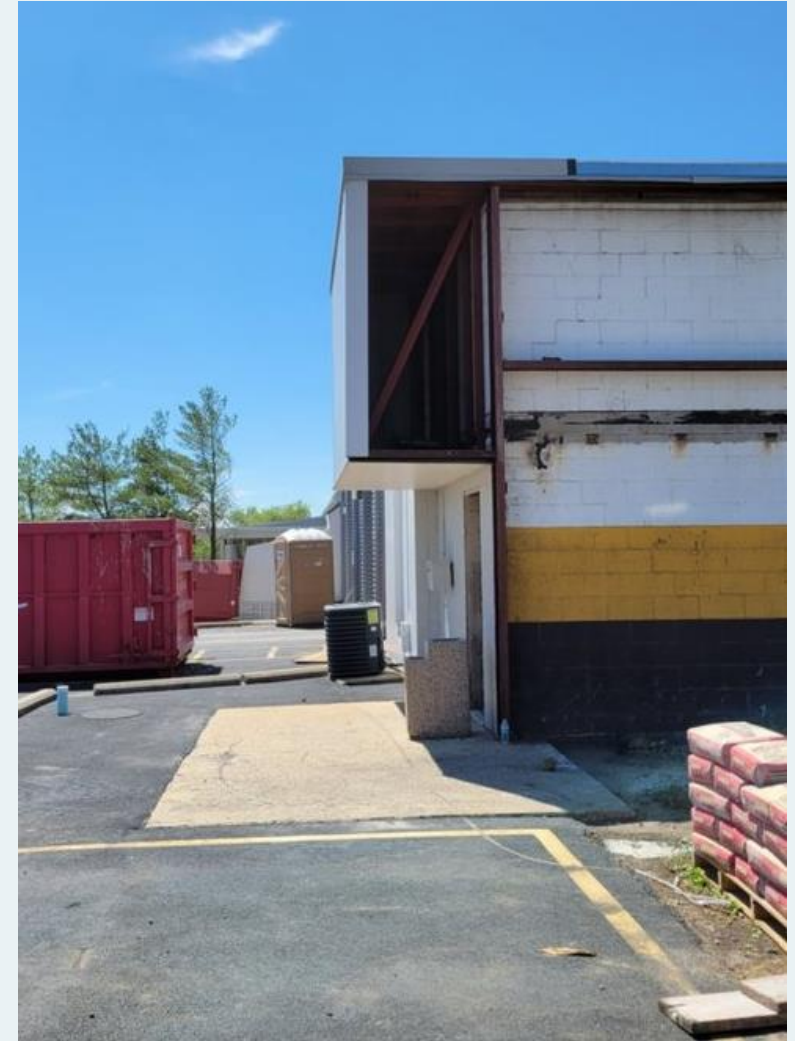


Image source: SEDAC

C501.3 Maintenance

- Buildings should be maintained in a safe and sanitary condition
- Building components required by the IECC shall be maintained at IECC edition under which they were installed, **i.e. performance can't be reduced.**
- Requirements in Chapter 5 shall not provide a basis for removal or abrogation of existing energy conservation or life-safety systems
- Maintenance does not require maintained system to be brought up to current code
 - Patching, painting, or resurfacing
 - Component replacements in equipment
 - Lighting repairs
 - Closely aligned with C504-Repairs section

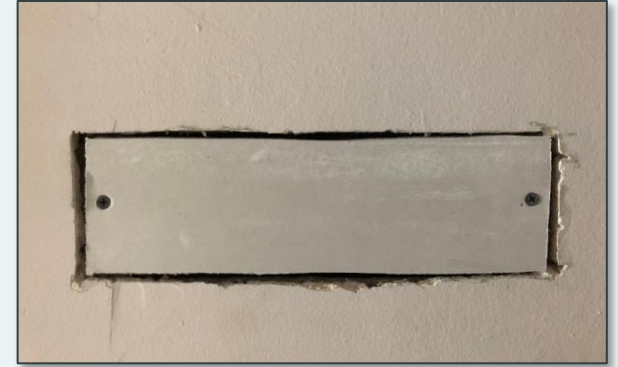


Image source:
<https://www.energyvanguard.com/blog/in-praise-of-those-who-do-the-dirty-work/>

C503 Alteration vs C504 Repair

When is new work considered an alteration vs. a repair?
Is there a % of area/equipment requirement?

- 2021 IECC Definition of “repair”: The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage.
- Specific items that may require permit identified in Section C504-Repairs
- Generally, work not requiring a permit considered maintenance or repair.
- Alterations often change characteristics of existing building systems; e.g. new wall materials, change in insulation levels, or changing the type of HVAC system.



Drywall patching (above) is a repair that does not trigger energy code compliance, where adding roof insulation (below) usually will.



C501.4 New and Replacement Materials

- Materials permitted by the applicable code for new construction should be used.
- Like materials shall be permitted for repairs, provided hazards to life, health, or property are not created.
- Hazardous materials shall not be used where the code for new construction would not allow their use.



Lead Paint



Asbestos pipe insulation

Asbestos abatement resources: <https://dph.illinois.gov/topics-services/environmental-health-protection/asbestos.html>

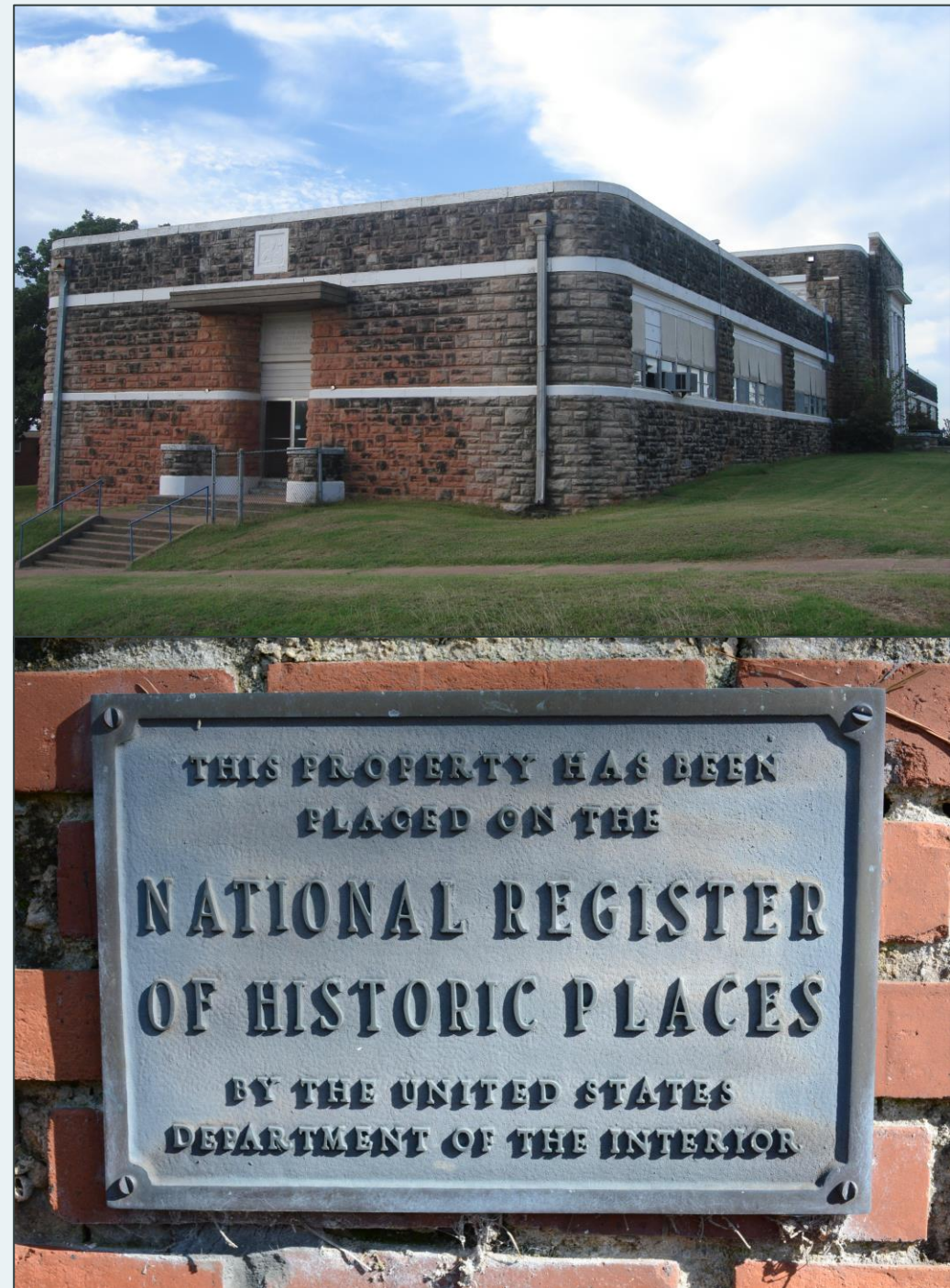
Lead abatement resources:

<https://dph.illinois.gov/content/dam/soi/en/web/idph/files/publications/get-theleadout-homeowner-lead-based-paint-abatement-guide-042016.pdf>

Historic Buildings

Historic Building: Any building or structure that is one or more of the following:

1. Listed or certified as eligible for listing by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places, in the National Register of Historic Places.
2. Designated as historic under an applicable state or local law.
3. Certified as a contributing resource within a National Register-listed, state-designated or locally designated historic district.



C501.5 Historic Buildings

Buildings or portions of buildings that are designated as historically significant are exempt from the provisions of the energy code if it modifies the form, fabric, or function of the building or building component.

One of the following must submit report to code official:

- Owner
- Registered Design Professional
- Representative of State Historic Preservation Office
- Representative of Historic Preservation AHJ



Image Source:

<https://www.flickr.com/photos/cmhpictures/12866361994>

Addition to historic building

- An addition must be built to existing code.

Additions do not receive historic building exemptions!

- Historic portion of building can be preserved in existing condition.



Image Source: <https://wedc.org/blog/building-additions-in-historic-commercial-districts/>

2021 IECC R502 Additions

Requirements for Additions

- **Addition** is “an extension or increase in the **conditioned space** floor area, number of stories or height of a building or structure.”
- Additions to an existing building, building system or portion thereof shall conform to the code as it relates to new construction **without** requiring the **unaltered portion** of the existing building or building system to comply.
- Additions should not create an unsafe condition or overload existing building systems.
- Additions can comply with the code alone or include the existing building’s performance.
- Additions converting unconditioned to conditioned space need to comply with C502.2, other additions typically comply with C502.3

C502.2 - Change in Space Conditioning

- Any nonconditioned space that is altered to become conditioned space shall be required to be brought into full compliance with the code and is also covered by the “Additions” section of Chapter 5.

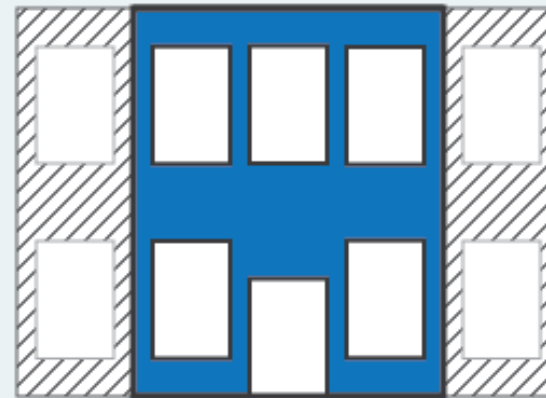
Example:

- Converting an unconditioned warehouse space to conditioned offices
- Addition or Change in Space Conditioning requires starting in Chapter 4 and complying with the code.
- Unaltered portions of building connecting to addition do not need to be updated.
- Altered portions would comply per Section C503 - Alterations

C502.2 - Full Compliance Exception #1

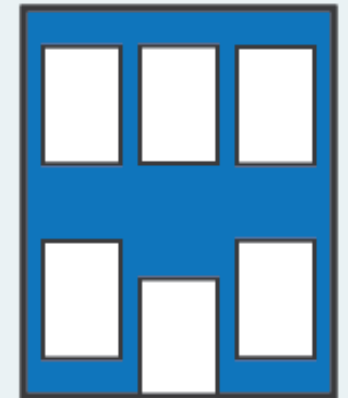
A change in space conditioning complying with C402.1.5 for envelope performance using UA trade-off complies if the UA is within 110% of the target UA.

Note: Only applies to changes in space conditioning, **NOT** additions.



UA

≤

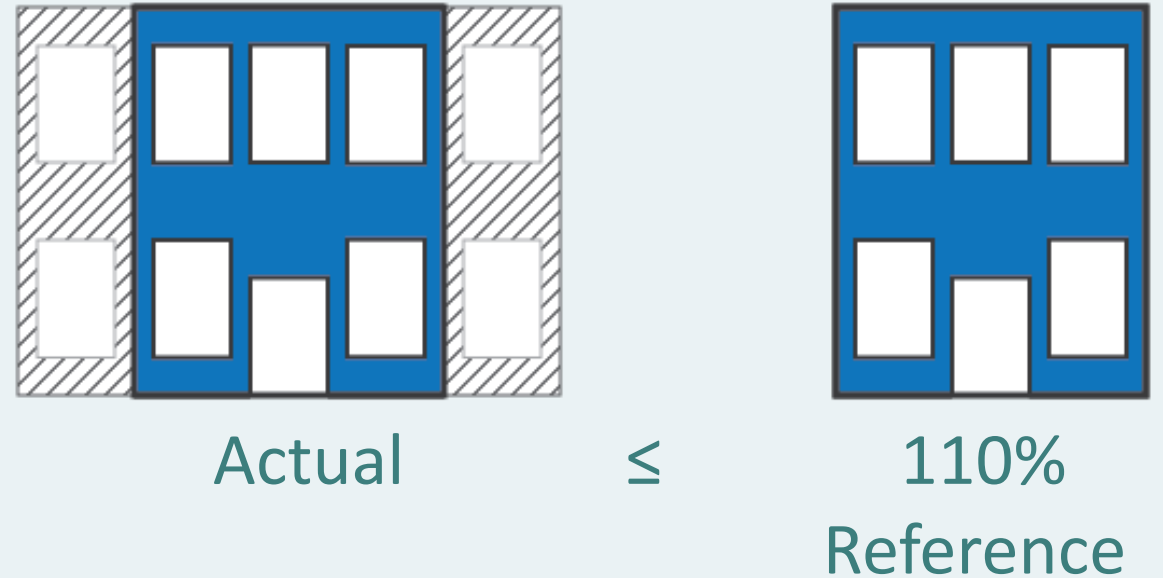


110% UA
Target

C502.2 - Full Compliance Exception #2

Changes in space conditioning complying using the total building performance path comply with C407 if total energy cost is no more than 110% of the reference design.

Note: Only applies to changes in space conditioning, **NOT** additions.



C502 Additions Building Envelope

New building envelope assemblies that are part of the addition shall comply with the following sections per C502.1

- **C402.1** – Thermal envelope requirements & exceptions for low-energy buildings (<1W/sf space conditioning), unconditioned spaces, and log homes.
- **C402.2** – Prescriptive requirements for specific assemblies (walls, foundations, roofs, floors, etc..)
- **C402.4** – Fenestration requirements
 - Specific requirements for additions in C502.3.
- **C402.5** – Air sealing requirements

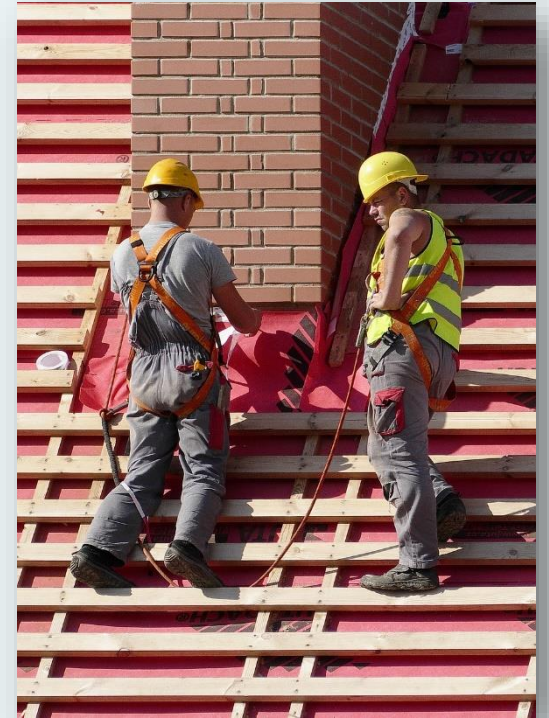


Image source:
<https://www.pixabay.com/>

C502.3 Requirements for Fenestration

| Window/Wall Ratio | Applicable Compliance |
|---|--|
| Less than 30% for whole building | C402.1.5 – UA Trade-off C402.4.3 – Max U-Factor & SHGC C407 – Performance modeling |
| Between 30% and 40% for addition only or whole building | C402.1.1 – Increased Fenestration with daylighting for addition only |
| Over 40% for addition only | C402.1.5 – UA Trade-off C407 – Performance modeling |

| Skylight/Roof Ratio | Applicable Compliance |
|---|---|
| Less than 3% for whole building | C402.1.5 – UA Trade-off C407 – Performance modeling |
| Between 3% and 6% for addition only or whole building | C402.1.2 – Increased Skylight Area with daylighting for addition only |
| Over 6% for addition only | C402.1.5 – UA Trade-off C407 – Performance modeling |



Image source:
<https://www.pixabay.com/>

Chapter 4 Skylight Exemptions Apply

- Skylights not required if general lighting LPD <math><0.5\text{W/sf}</math> (feasible with LEDs)
- Where structures or natural objects block daylight for 50%+ of the roof over the enclosed area more than 1,500 daytime hours between 8:00-16:00 (likely for shorter additions on north side of building)

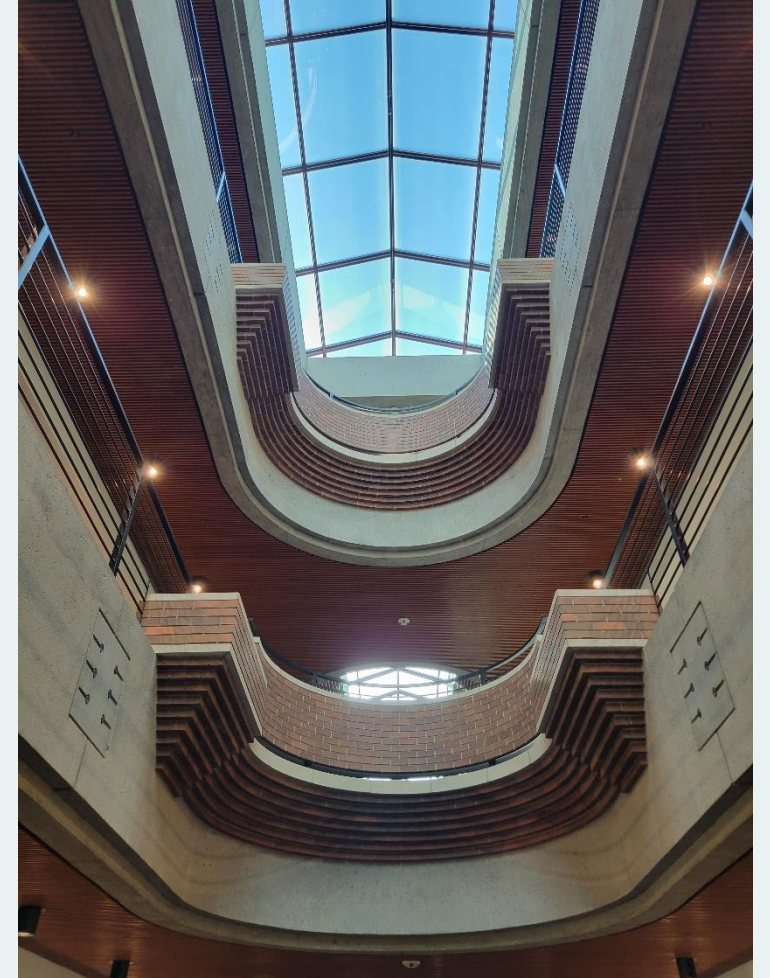
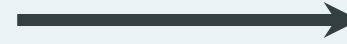


Image source: SEDAC site assessment

Chapter 4 Skylight Exemptions Apply (cont.)

- Where daylight zone under roof monitors is >50% of enclosure area (unlikely/situational)
- Where total area minus side-lit area is <2,500sf and lighting controlled per C405.2.3 (light reduction controls) (possible for smaller footprint additions)
- Spaces designated as storm shelters (situational)



Section C402 compliance

Section C402.4:

- Envelope must be air sealed per this section
 - Testing is required for C502 additions and change of space conditioning projects!
 - Must meet 0.30 CFM/sf target for new envelope area
- Can isolate addition from existing building to pressure test only the new envelope.
 - Pressurize existing building to same level as addition so only addition leakage registers as leakage.

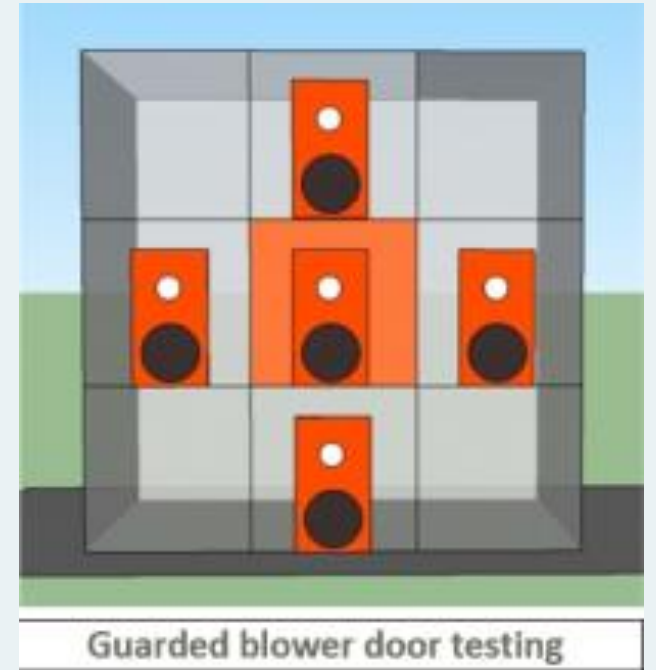


Image source:
<https://www.greenbuildingadvisor.com/article/testing-air-leakage-in-multifamily-buildings>

Addition Building Systems

HVAC, Lighting, and Service Hot Water must all fully comply with Chapter 4

- Chapter 5 has no allowances for new systems in additions.

Lighting requirements can apply to the addition alone, or the addition and existing building in combination.



Image sources: SEDAC site assessment



R503 Alterations

Definition of Alteration

- **Alteration** is “any construction, retrofit or renovation to an existing structure other than repair or addition. Also, a change in a building, electrical, gas, mechanical or plumbing system that involves an extension, addition or change to the arrangement, type or purpose of the original installation.”
- Alterations shall be such that only manipulated parts of the building need be brought into compliance with the code, provided existing unaltered structures and systems maintain their existing level of conformance with the code (cannot be made worse)

Building Envelope

Envelope alterations need to comply with Section C503

Alterations cannot result in a component or system that is less conforming with the code than the existing.

Alterations to portions of buildings will not mandate the update of unaltered portions to the code.

Alterations shall not create hazardous conditions or overload existing systems



Image source: <https://www.rockwool.com/north-america/products-and-applications/exterior-wall-insulation/cavitywall-rainscreen-insulation/>

C503 Alterations Compliance Exceptions

Exceptions

1. Storm windows installed over existing fenestration
2. Window films
3. Construction where the existing roof, wall or floor cavity is not exposed
4. Construction where a cavity is not exposed (common for masonry walls)
5. Roof Recover
6. For roof recover or replacement projects, air barriers connecting roof to wall are not required unless wall is altered too.



Envelope Compliance Requirements

C503.2 Building Envelope

- New building envelope assemblies that are part of the alteration shall comply with Sections C402.1 (insulation) through C402.5 (air leakage).
- **Exception:** Where the existing building exceeds the fenestration area limitations of Section C402.4.1 prior to alteration, the building is exempt from Section C402.4.1 provided there is not an increase in fenestration area.

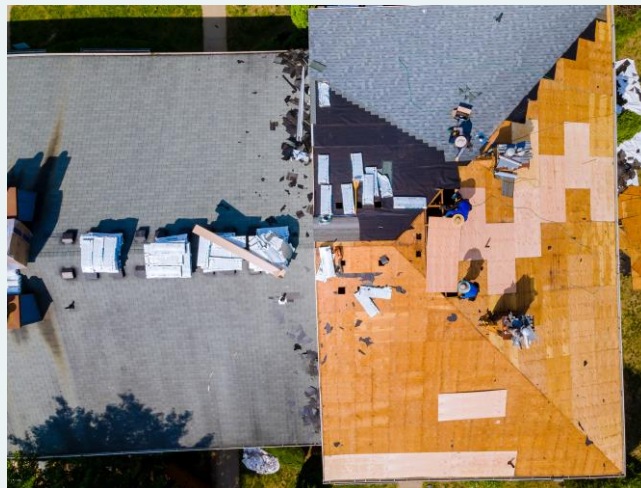


Image source: SEDAC

Envelope Compliance Requirements

C503.1 Roof Replacement

- Roof replacements shall comply with Section C402.1.3, C402.1.4, C402.1.5 or C407 where the existing roof assembly is part of the building thermal envelope and contains insulation entirely above the roof deck.
- In no case shall the R-value of the roof insulation be reduced or the U-factor of the roof assembly be increased as part of the roof replacement.



Envelope Compliance Requirements

C503.2.2-C503.2.3 Skylight and Fenestration Requirements

- As with Additions, window and skylight requirements are the same.
- Refer back to the Additions Fenestration slide for full details
- C503.2.2.1 – Where existing fenestration is replaced with a new product, the new product must meet the Table C402.4 value or better.
 - Area-weighted averages allowed for U-factors, SHGC is not listed, so individual units must meet SHGC without averaging.



Image source: SEDAC site assessment

HVAC and Service Water Systems

- New HVAC systems part of an alteration must comply with C403 and C408 requirements.
 - No Commercial exceptions, new systems must fully comply with Chapter 4 requirements.
- New Service Hot Water systems part of alteration must comply with Section C404 and C408.
 - Again, no Chapter 5 exceptions; full compliance with Chapter 4 is required



Image source: SEDAC site assessment

Lighting Systems

Alterations to lighting systems shall comply with section C405

- Permanent lighting must be high-efficacy
- Exception: Alterations that replace <10% of the luminaires in a space, provided the alterations do not increase the installed interior lighting power



Image source:

<https://betterbuildingsolutioncenter.energy.gov/sites/default/files/attachments/LED-Troffer-Retrofit-Best-Practices.pdf>

R504 Repairs

Definition of Repair

Repair is “The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage.”

The following are defined as repairs that may be confused with alterations, so code calls them out:

- Glass-only replacements in an existing sash and frame
- Roof repairs
- Air barriers not required if repair project for roof does not include repairs to remainder of envelope.
- Replacing existing exterior doors does not trigger requirement to install vestibule, but existing vestibule cannot be removed.
- Lighting repairs that replace only lamp, ballast, or both do not trigger compliance.



R505
**Change of
Occupancy or Use**

Definition of Change of Occupancy or Use

Any space undergoing a change in occupancy **that would increase the demand for electricity or fossil fuels** must fully comply with the code.

Exceptions:

- If using C402.1.5 UA Trade-offs, can be 110% of target UA for compliance.
- If using C407 Performance Path, can be 110% of reference design energy cost.



Image sources:
<https://architizer.com/projects/lampwork-lofts/>

Questions?

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