# International Energy Conservation Code
# Consensus Committee-Commercial

## Meeting Agenda (Draft 3/16)

March 23, 2022
2:00 PM Eastern to 5:00 PM Eastern (3 hours)
Webex Link

**Committee Chair:** Duane Jonlin
**Committee Vice Chair:** Emily Hoffman

1. Call to order.

2. Meeting Conduct. Staff
   a. Identification of Representation/Conflict of Interest
   b. ICC Council Policy 7 Committees: Section 5.1.10 Representation of Interests
   c. ICC Code of Ethics: ICC advocates commitment to a standard of professional behavior that exemplifies the highest ideals and principles of ethical conduct which include integrity, honesty, and fairness. As part of this commitment it is expected that participants shall act with courtesy, competence and respect for others.

3. Roll Call – Hoffman

4. Approval of Agenda

5. Approval of Minutes

6. Administrative issues.
   a. Progress indicators

7. Action Items.
   a. Code Change Proposals

| | |
|---|---|
| CEPI-50-21 (Cool Roofs) | (Envelope deny 12-8-3) |
| CEPI-73-21 (Flexible Facilities) | (HVACR deny 12-2-0) |
| CEPI-86-21 (Fault Detection and Diagnostic) | (HVACR as modified 12-0-1) |
| CEPI-98-21 (Dedicated Outdoor Air Systems) | (HVACR deny 14-0-2) |
| CEPI-109-21 (Demand Control Ventilation) | (HVACR deny 16-0) |
| CEPI-110-21 (HVAC Demand Control Vent) | (HVACR as modified 13-0-3) |
| CEPI-222-21 (Roof Replacement) | (Envelope deny 15-0-1) |
| CEPI-223-21 (Roof Replacement) | (Envelope deny 14-1-2) |
| CEPI-9-21 (Kitchen Exhaust) | (HVACR as modified 14-0-1) |
| CEPI-14-21 (Dedicated Outdoor Air System) | (HVACR as modified 14-0-1) |
| CEPI-76-21 (HVAC Total System Performance) | (HVACR as modified 9-5-1) |

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|---|---|
| CEPI-97-21 (Boiler Controls) | (HVACR as modified 12-1-4) |
| CEPI-101-21 (Occupied Standby Controls) | (HVACR disapprove 15-0-1) |
| CEPI-105-21 (DX Condenser Fan Control) | (HVACR disapprove 14-0-1) |
| CEPI-107-21 (Direct Digital Control Airflow) | (HVACR approve 16-0-0) |
| CEPI-108-21 (Vent. Occupied Standby Cont) | (HVACR approve 15-0-1) |
| CEPI-112-21 (Energy Recovery, Series) | (HVACR approve 13-0-1) |
| CEPI-113-21 (ERV Nontransient Dwelling Units) | (HVACR as modified 13-0-1) |
| CEPI-205-21 (Performance Renewable energy) | (Modeling disapprove 18-3) |
| CEPI-209-21 (Mand. Performance Table) | (Modeling approve 15-2-1) |
| CEPI-212-21 (Performance Stand Ref Table) | (Modeling approve 19-0-0) |
| CECPI-2-21 (Comm Min. Renewables Cap.) | (Elect. Power approve 10-3-3) |
| CEPI-150-21 (Scope of Exterior Lighting) | (Elect. Power approve 10-4-2) |
| CEPI-153-21 (Occupant Sensor) | (Elect. Power disapprove 11-3) |
| CEPI-71-21 (Air Leakage Test Level) | (Envelope as modified 18-0-2) |
| CEPI-62-21 (Climate Zone & Building Size Exc) | (Envelope as modified 19-0-2) |
| CEPI-61-21 (Climate Zone & Building Size Exc) | (Envelope as modified 20-0-2) |
| CECPI-3-21 (Consensus Air Leakage Restructuring) | (Envelope agenda 3/17) |
| CEPI-55-21 (Air Barriers) | (Envelope agenda 3/17) |
| CEPI-56-21 (Air Leakage) | (Envelope agenda 3/17) |
| CEPI-57-21 (Air Leakage) | (Envelope agenda 3/17) |
| CEPI-70-21 (Air Leakage Dwelling Unit Testing) | (Envelope agenda 3/17) |
| CEPI-58-21 (Air Barrier Testing) | (Envelope agenda 3/17) |

8. Subcommittee & Temporary Work Group reports
    a. Envelope and Embodied Energy- Culp
    b. Electrical Power, Lighting, and Renewables-Jouaneh
    c. HVACR & Water Heating-Shelide
    d. Modeling, Whole-Building Metrics, Zero Energy-Eades
    e. Construction Cost & LCC Update- Tillou

9. Other business.
    a. Public comment on any matters discussed at the meeting (Please limit comments to 2 minutes. Further comments can be directed to the Secretariat following the meeting to be considered at a future meeting.)

10. “3 Minutes of Fame.” Speakers TBD

11. Upcoming meetings. April 13

12. Adjourn.

FOR FURTHER INFORMATION BE SURE TO VISIT THE ICC WEBSITE:
IECC Commercial Consensus Committee Webpage
https://www.iccsafe.org/products-and-services/i-codes/code-development/cs/iecc-commercial-consensus-committee/
ICC Energy webpage
https://www.iccsafe.org/products-and-services/codes-standards/energy/
Code Change Proposal Submittals

https://energy.cdpaccess.com/login/
Energy Complete Monograph
Monograph

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:

Kristopher Stenger, AIA, Director of Energy Programs
International Code Council
kstenger@iccsafe.org

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

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|---|---|
| Proposal # | CEPI-050-21 Cool Roofs |
| CDP ID # | 189 |
| Code | IECC CE |
| Code Section(s) | C402.3, TABLE C402.3 New Section n |
| Location | base |
| Proponent | Kim Cheslak kim@newbuildings.org |
| Proposal Status | SC rev |
| Subcommittee | CE Envelope |
| Subcommittee Notes | **Reason statement:** There is concern about negative impact to energy savings in CZ 4&5, as well as concerns about cost effectiveness. There is also a concern about durability and maintenance in colder climates. |
| Recommendation | **Disapprove**. |
| Vote | Disapprove 12-8-3 |
| Recommendation Date | 2/17/22 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee_____X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# International Energy Conservation Code

# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-073-21 Flexible Facilities |
| CDP ID # | 169 |
| Code | IECC CE |
| Code Section(s) | C403 New Section Y |
| Location | base |
| Proponent | Megan Hayes Megan.Hayes@nema.org |
| Proposal Status | SC rev |
| Subcommittee | CE HVACR & WH |
| Subcommittee Notes | The committee understood the good intent of the proposal, but discussed that it belongs in the IMC. In addition, it does not provide enforceable requirements. For example, there is a requirement for the building systems to react when indoor contaminants exceed an undefined value, but neither the pollutants nor the threshold values are defined. |
| Recommendation | Disapprove<br><br>Reason: This proposal should be presented to the IMC with enforceable requirements |
| Vote | 12-2-0 |
| Recommendation Date | 2/24/2022 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee __X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

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|---|---|
| Proposal # | CEPI-086-21 Fault Detection and Diagnostic |
| CDP ID # | 328 |
| Code | IECC CE |
| Code Section(s) | C403.2.3, C406.11 New Section n |
| Location | base |
| Proponent | William Fay bill@energyefficientcodes.org |
| Proposal Status | SC rev |
| Subcommittee | CE HVACR & WH |
| Subcommittee Notes | The subcommittee discussed that this proposal will improve clarity and enforceability of this code section. |
| Recommendation | Approve<br><br>Reason statement: Good clarifications that will improve enforcement. |
| Vote | 12-0-1 |
| Recommendation Date | 2/24/2022 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee __X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-098-21 Dedicated Out Air Systems |
| CDP ID # | 387 |
| Code | IECC CE |
| Code Section(s) | C403.3.5 (New), C403.3.5.1 (New), C403.3.5.2 (New), C403.7.4, C403.7.4.3 (New), C406.1 New Section y |
| Location | base |
| Proponent | Mark Lyles markl@newbuildings.org |
| Proposal Status | SC rev |
| Subcommittee | CE HVACR & WH |
| Subcommittee Notes | The subcommittee discussed concerns about the “one size fits all” nature of this proposal and also expressed concerns that the proposal is too limiting. |
| Recommendation | Disapprove<br><br>Reason: the proposal is too encompassing for too many climate zones and is limiting of system types. |
| Vote | 14-0-4 |
| Recommendation Date | 2/24/2022 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee __X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-109-21 Demand Control Ventilation |
| CDP ID # | 435 |
| Code | IECC CE |
| Code Section(s) | C403.7.1 New Section n |
| Location | base |
| Proponent | Jeremy Williams jeremy.williams@ee.doe.gov |
| Proposal Status | SC rev |
| Subcommittee | CE HVACR & WH |
| Subcommittee Notes | CEPI-109 and CEPI-110 were similar and were combined by proponents into a common proposal (in CEPI-110) for subcommittee consideration. CEPI-110 was approved as modified, so CEPI-109 is no longer needed since it has been incorporated into CEPI-110. |
| Recommendation | Disapprove<br><br>Reason statement: CEPI-109 has been incorporated into CEPI-110. |
| Vote | Unanimous |
| Recommendation Date | 2/24/2022 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee ___X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-110-21 HVAC Demand control ventilation |
| CDP ID # | 202 |
| Code | IECC CE |
| Code Section(s) | C403.7.1 New Section n |
| Location | base |
| Proponent | Mike Kennedy mikekennedy@energysims.com |
| Proposal Status | SC rev |
| Subcommittee | CE HVACR & WH |
| Subcommittee Notes | CEPI-109 and CEPI-110 were similar and were combined by proponents into a common proposal (in CEPI-110) for subcommittee consideration |
| Recommendation | Approve as Modified. Please refer to attached modification.<br><br>Reason: This proposal clarifies where demand-controlled ventilation (DCV) is required. It also improves the exceptions related to energy recovery. |
| Vote | 13-0-3 |
| Recommendation Date | 2/24/2022 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee _X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |


# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

# CEPI-110-21 AS MODIFIED

## IECC®: C403.7.1

### 2021 International Energy Conservation Code

**Revise as follows:**

**C403.7.1 Demand control ventilation.** Demand control ventilation (DCV) shall be provided for each of the following:

1. Spaces with ventilation provided by ~~all~~ single-zone systems where an air-side economizer is provided ~~required~~ ~~to comply~~ in accordance with Section~~s~~ C403.5. ~~through C403.5.3 and~~
2. Spaces larger than ~~500~~250 square feet (~~46.5~~23.2 $m^2$) in climate zones 5A, 6, 7 and 8 and spaces larger than 500 square feet (46.5 m2) in other climate zones ~~and~~ which have ~~with an average~~ a design occupant load of 15 people or greater per 1,000 square feet (93 $m^2$) of floor area, as established in Table 403.3.1.1 of the International Mechanical Code, and are served by systems with one or more of the following:
   - ~~1~~2.1. An air-side economizer.
   - ~~2~~2.2. Automatic modulating control of the outdoor air damper.
   - ~~3~~2.3. A design outdoor airflow greater than 3,000 cfm (1416 Lis).

**Exceptions:**

1. Spaces served by systems ~~Systems~~ with energy recovery ~~complying~~ in accordance with Section C403.7.4.2 and that have floor area less than:
   - 1.1 6000 square feet (2600 m2) in climate zone 3C .
   - 1.2 2000 square feet (190 m2) in climate zones 1A, 3B, and 4B.
   - 1.3 1000 square feet (90 m2) in climate zones 2A, 2B, 3A, 4A, 4C, 5 and 6.
   - 1.4 400 square feet (40 m2) in climate zones 7 and 8.
2. Multiple-zone systems without direct digital control of individual zones communicating with a central control panel.
3. Spaces served by multiple- ~~Multiple-~~zone systems with a system design outdoor airflow less than 750 cfm (354 Lis).
4. Spaces where more than 75 percent of the space design outdoor airflow is required for makeup air that is exhausted from the space or transfer air that is required for makeup air that is exhausted from other spaces.
5. Spaces with one of the following occupancy classifications as defined in Table 403.3.1.1 of the *International Mechanical Code*: correctional cells, education laboratories, barber, beauty and nail salons, and bowling alley seating areas.

CEPI-110-21/CEPI-109-21 Consensus Proposal

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

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|---|---|
| Proposal # | CEPI-222-21 Roof Replacement exception |
| CDP ID # | 362 |
| Code | IECC CE |
| Code Section(s) | C503.1, C503.1.1 New Section n |
| Location | base |
| Proponent | Bill McHugh bill@mc-hugh.us |
| Proposal Status | SC rev |
| Subcommittee | CE Envelope |
| Subcommittee Notes | **Reason statement**: to be consistent with action taken on CEPI-225 |
| Recommendation | **Disapprove**. |
| Vote | Disapprove 15-0-1 |
| Recommendation Date | 2/17/22 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee_____X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

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|---|---|
| Proposal # | CEPI-223-21 Roof replacement |
| CDP ID # | 355 |
| Code | IECC CE |
| Code Section(s) | C503.1, C503.2.1 New Section n |
| Location | base |
| Proponent | Darren Meyers dmeyers@ieccode.com |
| Proposal Status | SC rev |
| Subcommittee | CE Envelope |
| Subcommittee Notes | **Reason statement**: to be consistent with action taken on CEPI-225 |
| Recommendation | **Disapprove** |
| Vote | Disapprove 14-1-2 |
| Recommendation Date | 2/17/22 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee_____X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |

# International Energy Conservation Code

## Code Change Proposal Tracking Sheet

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|---|---|
| Proposal # | CEPI-009-21 Kitchen Exhaust |
| CDP ID # | 65 |
| Code | IECC CE |
| Code Section(s) | C201, C403.7.5 New Section n |
| Location | base |
| Proponent | Nicholas O'Neil noneil@energy350.com |
| Proposal Status | SC rev |
| Subcommittee | CE HVACR & WH |
| Subcommittee Notes | • Nick O'Neil (NEEA) spoke as the proponent<br>• Has been required for some time, and this clarifies the requirements.<br>• Allows method of sensing to be more general.<br>• Moves some of the requirements to the charging language.<br>• Discussion and modifications made by subcommittee to continue the direct reference to UL 710 and to reference IMC in the code language<br>• Discussion and confirmation that energy recovery is allowed on non-grease hoods. |
| Recommendation | Approve as modified, see attached modification.<br><br>Reason: Subcommittee referenced reason statement in proposal.<br><br>Demand control kitchen ventilation has been commonplace on make-up air hoods for years and has appeared in the IECC since 2015. This proposal clarifies the section by relocating several nested requirements to the charging language and mandating DCKV on hoods of 5000 cfm or greater unless they have an energy recovery device, or are UL-710 hoods with a maximum 250 cfm/lf flowrate or below the 5,000 cfm threshold.<br><br>This cleans up the section to make it clearer that DCKV is required on most kitchen exhaust hoods and moves less common compliance paths (such as heat recovery and UL 710 listed hoods) to exceptions rather than in the charging language making this provision easier to understand. It also removes the transfer air requirement which is not common on systems above this size threshold to utilize in real world applications. |
| Vote | Approve as modified 14-0-1 |

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|---|---|
| Recommendation Date | 3/10/2022 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee ___X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br>To Subcommittee_____ |
| Date | |

# CEPI-9-21 AS MODIFIED

## IECC®: SECTION 202 (New), C403.7.5

**Proponents:**

**Nicholas O'Neil, representing NEEA (noneil@energy350.com); Kevin Rose, representing Northwest Energy Efficiency Alliance (NEEA) (krose@neea.org)**

**2021 International Energy Conservation Code**

## Add new definition as follows:

**C202 DEMAND CONTROL KITCHEN VENTILATION (DCKV). A system that provides *automatic*, continuous control over exhaust hood and, where provided, make-up airflows in response to one or more sensors that monitor cooking activity or through direct communication with cooking appliances.**

## Revise as follows:

**C403.7.5 Kitchen exhaust systems.**

**Replacement air introduced directly into the exhaust hood cavity shall not be greater than 10 percent of the hood exhaust airflow. Conditioned supply air delivered to any space shall not exceed the greater of the following:**

1. The ventilation rate required to meet the space heating or cooling load.
2. The hood exhaust flow minus the available transfer air from adjacent space where available transfer air is that portion of outdoor *ventilation air* not required to satisfy other exhaust needs or not required to maintain pressurization of adjacent spaces

**Kitchen exhaust hood systems serving Type I exhaust hoods shall be provided with *demand control kitchen ventilation (DCKV)* controls w~~W~~here a kitchen or kitchen/dining facility has a total Type I kitchen hood exhaust airflow rate ~~is~~ greater than 5,000 cfm (2360 L/s).,*DCKV* systems shall be configured to provide a minimum of 50 percent reduction from design conditions of exhaust and replacement airflow. Systems shall include controls necessary to modulate exhaust and replacement airflows in response to appliance operation and to maintain the full capture and containment of smoke, effluent and combustion products during cooking and idle operation. ~~e~~Each hood shall be a *listed,* factory-built commercial exhaust hood in compliance with UL 710~~. Each hood~~ and shall have a maximum exhaust airflow as specified in Table C403.7.5. ~~and shall comply with one of the following:~~**

~~1. Not less than 50 percent of all replacement air shall be transfer air that would otherwise be exhausted.~~

~~2. Demand ventilation systems on not less than 75 percent of the exhaust air that are configured to provide not less than a 50-percent reduction in exhaust and replacement air system airflow rates, including controls necessary to modulate airflow in response to appliance operation and to maintain full capture and containment of smoke, effluent and combustion products during cooking and idle.~~

~~3. Listed energy recovery devices with a sensible heat recovery effectiveness of not less than 40 percent on not less than 50 percent of the total exhaust airflow.~~

**Where a single hood, or hood section, is installed over appliances with different duty ratings, the maximum allowable flow rate for the hood or hood section shall be based on the requirements for the highest appliance duty rating under the hood or hood section.**

**~~Exception~~ Exceptions: ~~Where not less than 75 percent of all the replacement air is transfer air that would otherwise be exhausted.~~**

1. UL 710 *listed* exhaust hoods that have a design maximum exhaust airflow not greater than 250 cfm per linear foot of hood that serve kitchen or kitchen/dining facilities with a total kitchen hood exhaust airflow rate less than 5000 cfm (2360 L/s).
2. Where allowed by the *International Mechanical Code*, an *energy recovery ventilation system* is installed on the kitchen exhaust with a sensible heat recovery effectiveness of not less than 40 percent on not less than 50 percent of the total exhaust hood airflow.

**TABLE C403.7.5**

**MAXIMUM NET EXHAUST FLOW RATE, CFM PER LINEAR FOOT OF HOOD LENGTH**

| TYPE OF HOOD | LIGHT-DUTY EQUIPMENT | MEDIUM-DUTY EQUIPMENT | HEAVY-DUTY EQUIPMENT | EXTRA-HEAVY-DUTY EQUIPMENT |
|---|---|---|---|---|
| Wall-mounted canopy | 140 | 210 | 280 | 385 |
| Single island | 280 | 350 | 420 | 490 |
| Double island (per side) | 175 | 210 | 280 | 385 |
| Eyebrow | 175 | 175 | NA | NA |
| Backshelf/Pass-over | 210 | 210 | 280 | NA |

For SI: 1 cfm = 0.4719 L/s; 1 foot = 304.8 mm.

NA = Not Allowed.

## Reason Statement:

**Demand control kitchen ventilation has been commonplace on make-up air hoods for years and has appeared in the IECC since 2015. This proposal clarifies the section by relocating several nested requirements to the charging language and mandating DCKV on hoods of 5000 cfm or greater unless they have an energy recovery device, or are UL-710 hoods with a maximum 250 cfm/lf flowrate or below the 5,000 cfm threshold.**

**This cleans up the section to make it clearer that DCKV is required on most kitchen exhaust hoods and moves less common compliance paths (such as heat recovery and UL 710 listed hoods) to exceptions rather than in the charging language making this provision easier to understand. It also removes the transfer air requirement which is not common on systems above this size threshold to utilize in real world applications.**

## Cost Impact:

**The code change proposal will neither increase nor decrease the cost of construction.**

**Because the threshold for which this applies remains the same for kitchens with a total exhaust airflow of 5,000 cfm there is no expectation that costs will increase. Prior analysis for adding variable speed fans and associated controls have shown an incremental cost of $11,500 regardless of hood size. The 5,000cfm threshold was chosen as the cost-effective breakpoint given the cost and is not changing as part of this proposal.**

# International Energy Conservation Code

# Code Change Proposal Tracking Sheet

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|---|---|
| Proposal # | CEPI-014-21 Dedicated Out Air Systems |
| CDP ID # | 526 |
| Code | IECC CE |
| Code Section(s) | C202 New Section n |
| Location | base |
| Proponent | Nicholas O'Neil noneil@energy350.com |
| Proposal Status | SC rev |
| Subcommittee | CE HVACR & WH |
| Subcommittee Notes | • Subcommittee made several friendly editorial modifications and simplifications to the as-proposed language that do not alter the intent of the proposal<br>• Some discussion at the subcommittee meeting that US DOE is currently also evaluating definitions for this equipment, but this process is not final as of 2/10/2022. Subcommittee discussed incorporating any changes, if needed, during Public Comment process.<br>• After approving as-modified during 2/10/2022 meeting, subcommittee decided not to forward this on to E4C Committee yet because the subcommittee still needs to hear CEPI-088 which deals with the same topic and there might be a need to revisit it. |
| Recommendation | Approve As Modified<br><br>Reason Statement: Both DOAS and DX-DOAS terms are used in the IECC (in C403 and C406) but do not have definitions explaining what they are. These definitions are added to provide clarity when talking about DOAS and are coped from common definitions used in ASHRAE 90.1, the WA State Energy Code, and Title 24. |
| Vote | Approve As-Modified 14-0-1 |
| Recommendation Date | 2/10/2022 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee __X_____ |
| Consensus Committee | |

| | |
|---|---|
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

## CEPI-14-21 As Modified by HVACR 2/10/22

**IECC®: C202 (New)**

**Proponents: Nicholas O'Neil, representing NEEA (noneil@energy350.com); Kevin Rose, representing Northwest Energy Efficiency Alliance (NEEA) (krose@neea.org)**

### 2021 International Energy Conservation Code

**Add new definition as follows:**

**DEDICATED OUTDOOR AIR SYSTEM (DOAS). A *ventilation* system that supplies 100 percent outdoor air primarily for the purpose of *ventilation* and that is a separate system from the *zone* space-conditioning system.**

**DX-DEDICATED OUTDOOR AIR SYSTEM UNITS (DX-DOAS UNITS). A type of air-cooled, water-cooled or water source factory assembled product that dehumidifies 100 percent outdoor air to a low dew point and includes reheat that is capable of controlling the supply dry-bulb temperature of the dehumidified air to the designated supply air temperature. ~~This conditioned outdoor air is then delivered directly or indirectly to the conditioned spaces.~~ It may precondition outdoor air ~~by containing an enthalpy wheel, sensible wheel, desiccant wheel, plate heat exchanger, heat pipes, or other heat or mass transfer apparatus~~ with an *energy recovery ventilation system*.**

**Reason: Both DOAS and DX-DOAS terms are used in the IECC (in C403 and C406) but do not have definitions explaining what they are. These definitions are added to provide clarity when talking about DOAS and are coped from common definitions used in ASHRAE 90.1, the WA State Energy Code, and Title 24.**

# International Energy Conservation Code

# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-097-21 Boiler Controls |
| CDP ID # | 67 |
| Code | IECC CE |
| Code Section(s) | C403.3.4 (New), C403.3.4.1 (New), C403.3.4, TABLE C403.3.4 New Section y |
| Location | base |
| Proponent | Nicholas O'Neil noneil@energy350.com |
| Proposal Status | SC rev |
| Subcommittee | CE HVACR & WH |
| Subcommittee Notes | • Proponent made some modifications to the original proposal after discussion with individual committee members<br>• Based on requirements in Title 24<br>• Committee discussed some potential concerns with proposal regarding coverage of process loads and variable speed motor requirement<br>• Minor clarifying modifications were made in subcommittee meeting |
| Recommendation | Approve as modified, see attached modifications<br><br>Reason: Boiler oxygen controls, combustion air controls, and variable fan motors have been commonplace in state codes on larger boilers for quite some time. This proposal would align existing requirements in state codes with IECC. The effect will be an improvement in the part-load operation of larger boilers. |
| Vote | Approved as modified 12-1-4 |
| Recommendation Date | 3/10/2022 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee __X_____ |
| Consensus Committee | |
| Committee Response | |

| | |
|---|---|
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# CEPI-97-21 As Modified

## IECC®: SECTION 202 (New), C403.3.4 (New), C403.3.4.1 (New), TABLE C403.3.4.1 (New), C403.3.4, TABLE C403.3.4

**Proponents:**

**Nicholas O'Neil, representing NEEA (noneil@energy350.com); Kevin Rose, representing Northwest Energy Efficiency Alliance (NEEA) (krose@neea.org)**

**2021 International Energy Conservation Code**

**Add new definition as follows:**

C202 PROCESS APPLICATION. A manufacturing, industrial, or commercial procedure or activity where the primary purpose is other than conditioning spaces and maintaining comfort and amenities for the occupants of a building.

**Add new text as follows:**

**C403.3.4 Boilers.**

*Boiler Systems* shall comply with the following:

1. Combustion air positive shut-off shall be provided on all newly installed *boiler systems* as follows:
   - 1.1. All *boiler systems* with an input capacity of 2,500,000 Btu/h and above, in which the boiler is designed to operate with a nonpositive vent static pressure.
   - 1.2. All *boiler systems* where one stack serves two or more boilers with a total combined input capacity per stack of 2,500,000 Btu/h.
2. *Boiler system* combustion air fans with motors 10 horsepower or larger shall meet one of the following for newly installed boilers:
   - 2.1. The fan motor shall be variable speed, or
   - 2.2. The fan motor shall include controls that limit the fan motor demand to no more than 30 percent of the total design wattage at 50 percent of design air volume.

C403.3.4.1 Boiler oxygen concentration controls.

Newly installed boilers with input capacity not less than 5,000,000 Btu/h and steady state full-load combustion efficiency less than 90 percent shall maintain stack-gas oxygen concentrations not greater than the values specified in Table 403.3.4.1. Combustion air volume shall be controlled with respect to measured flue gas oxygen concentration. The use of a common gas and combustion air control linkage or jack shaft is prohibited.

TABLE C403.3.4.1 BOILER OXYGEN CONCENTRATIONS

| ***Boiler System* Application** | **Maximum stack-gas oxygen concentration[a]** |
|---|---|
| ≤10% of the *boiler system* capacity is used for *process applications* at design conditions | 5% |
| All Others | 3% |

**a. Concentration levels measured by volume on a dry basis over firing rates of 20 to 100 percent.**

**Exception:**
**These concentration limits do not apply where 50% or more of the *boiler system* capacity serves *Group R-2* occupancies.**

# Revise as follows:

**~~C403.3.4~~ C403.3.4.2 Boiler turndown.**

***Boiler systems* with design input of greater than 1,000,000 Btu/h (293 kW) shall comply with the turndown ratio specified in Table ~~C403.3.4~~ C403.3.4.2.**

The system turndown requirement shall be met through the use of multiple single-input boilers, one or more *modulating boilers* or a combination of single-input and *modulating boilers*.

**TABLE ~~C403.3.4~~ C403.3.4.2 BOILER TURNDOWN**

| BOILER SYSTEM DESIGN INPUT (Btu/h) | MINIMUM TURNDOWN RATIO |
|---|---|
| ≥ 1,000,000 and ≤ 5,000,000 | 3 to 1 |
| > 5,000,000 and ≤ 10,000,000 | 4 to 1 |
| > 10,000,000 | 5 to 1 |

**For SI: 1 British thermal unit per hour = 0.2931 W.**

# International Energy Conservation Code

# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-101-21 Occupied Standby Controls |
| CDP ID # | 48 |
| Code | IECC CE |
| Code Section(s) | C403.4.3 New Section y |
| Location | base |
| Proponent | Emily Toto etoto@ashrae.org |
| Proposal Status | SC rev |
| Subcommittee | CE HVACR & WH |
| Subcommittee Notes | CEPI-101 is no longer needed because of the approval of CEPI-108. |
| Recommendation | Disapprove<br><br>Reason: Duplicative of actions taken on CEPI-108, not needed. |
| Vote | 15-0-1 |
| Recommendation Date | 2/24/2022 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee __X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-105-21 DX Condensor Fan Control |
| CDP ID # | 213 |
| Code | IECC CE |
| Code Section(s) | C403.5.1 table New Section n |
| Location | base |
| Proponent | Glory O'Brien glory.obrien@westernmechanicalsolutions.com |
| Proposal Status | SC rev |
| Subcommittee | CE HVACR & WH |
| Subcommittee Notes | • Proponent was not on the call<br>• Subcommittee had concerns that requirements in the proposal would lead to preemption issues<br>• Subcommittee comments that there are other ways to provide modulating control, and elements of proposal are vague and would be difficult to enforce.<br>• Added cost is not defined |
| Recommendation | Disapprove<br><br>Reason: Proposal violates preemption and is not well crafted for enforcement |
| Vote | Disapprove 14-0-1 |
| Recommendation Date | |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee _X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# International Energy Conservation Code

# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-107-21 direct digital contral airflow rates |
| CDP ID # | 50 |
| Code | IECC CE |
| Code Section(s) | C403.6.1 New Section n |
| Location | base |
| Proponent | Emily Toto etoto@ashrae.org |
| Proposal Status | SC rev |
| Subcommittee | CE HVACR & WH |
| Subcommittee Notes | General committee discussion that this is a good proposal and an opportunity for improvement in the code. |
| Recommendation | Approve<br>Reason: Subcommittee referred to the reason statement in the original proposal. To summarize, this proposal modifies language for options to determine minimum air for each zone in a VAV system. The revised language is supported by studies and research showing the current language and practice often leads to oversizing systems. This proposal is expected to both reduce energy costs and improve comfort. |
| Vote | Approve 16-0-0 |
| Recommendation Date | 3/10/2022 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee ___X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# International Energy Conservation Code

# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-108-21 Ventilation Occupied Standby Controls |
| CDP ID # | 86 |
| Code | IECC CE |
| Code Section(s) | C403.7, C403.7.8, C403.7.8.1 , C403.7.8.2 New Section y |
| Location | base |
| Proponent | Jonathan McHugh jon@mchughenergy.com |
| Proposal Status | SC rev |
| Subcommittee | CE HVACR & WH |
| Subcommittee Notes | The proposal would add occupied standby controls to IECC. It uses the same occupancy controls already required for lighting |
| Recommendation | Approve<br><br>Reason: This proposal is a compilation of two ASHRAE documents plus addendum, with a needed clarification of intent. |
| Vote | 15-0-0 |
| Recommendation Date | 2/24/2022 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee __X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-112-21 Energy Recovery, series |
| CDP ID # | 108 |
| Code | IECC CE |
| Code Section(s) | C403.7.3 New Section n |
| Location | base |
| Proponent | Emily Toto etoto@ashrae.org |
| Proposal Status | SC rev |
| Subcommittee | CE HVACR & WH |
| Subcommittee Notes | • Subcommittee discussed that this is a good fix to code language to address a beneficial configuration that is common in warmer, humid climates and clarify that series energy recovery is allowable.<br>• Discussion and input from DOAS manufacturers that this approach makes sense |
| Recommendation | Approve<br><br>Reason: Subcommittee referenced the reason statement from the proposal.<br><br>Based on addendum n to 90.1-2019<br>This proposal<br>1. Adds a definition for series energy recovery.<br>2. Provides an exception for systems equipped with series energy recovery to the requirement.<br>Series energy recovery is a well-established method to provide both passive free cooling and reheating to an airstream. It is typically done with a wrap-around coil where heat is absorbed into the fluid upstream of a dehumidifying cooling and released downstream of the coil to provide reheat. A sensible-only plate heat exchanger can be employed as well. Unlike condenser heat recovery, which only provides free reheat, this process reduces the load on the dehumidifying cooling coil. The requirement to provide cool air from a 100% outside air unit while the building needs cooling is so that the work done by the compressor to cool the air is not wasted. When air is provided at higher temperatures, the zone cooling systems must recool the air. The exception for series energy recovery is warranted because any excess reheat was provided by a reduction of the cooling load on the dehumidifying coil, so there is no net gain in compressor load. The exception is desirable because adding the capability to control the discharge temperature of a series energy recovery system is expensive. |
| Vote | Approve 13-0-1 |

| | |
|---|---|
| Recommendation Date | |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee __X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-113-21 ERV Nontransient dwelling units |
| CDP ID # | 434 |
| Code | IECC CE |
| Code Section(s) | C403.7.4.1 New Section n |
| Location | base |
| Proponent | Mike Moore mmoore@statorllc.com |
| Proposal Status | SC rev |
| Subcommittee | CE HVACR & WH |
| Subcommittee Notes | • Mike Moore (Home Ventilation Institute) spoke as the proponent, provided a modified version of the original proposal to better coordinate with Residential Consensus Committee's approval of REPI-69.<br>• Recent research shows that there is a lot of leakage to corridors in multifamily. Codes now do not allow corridors to provide ventilation air. Balanced ventilation is needed to meet mechanical codes.<br>• Subcommittee discussed why the open-ended corridor/no corridor to exception 2. The proponent explained that research shows that there is significant leakage between closed corridors and apartments.<br>• Subcommittee discussion around balanced ventilation systems. Proponent said that the IMC does not speak to such requirements.<br>• Subcommittee discussion around climate zones in exceptions |
| Recommendation | Approve as modified, please refer to attached modification.<br><br>Reason: Subcommittee referenced the reason statement from the proposal and proponent modifications.<br><br>This proposal expands the requirement for energy recovery ventilators for high-rise dwelling units in Group R-2 buildings based on a cost effectiveness analysis. The proposal expands the climate zones and dwelling unit sizes where an ERV is considered to be cost effective. This modification is meant to coordinate with the Residential Consensus Committee's approval of REPI-69, which will result in some low-rise R2 dwelling units referencing the C403.7.4.1 to determine if an ERV is required. This revised draft of CEPI-113 will ensure that its proposed climate zone expansion would only apply to dwelling units less than 500 ft2 on an enclosed corridor, which is the intention on this proposal and a cornerstone of the cost-effectiveness analysis supporting CEPI-113. |
| Vote | Approve as modified 13-0-3 |
| Recommendation Date | 3/10/2022 |

| | |
|---|---|
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee _X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

CEPI-113-21 AS MODIFIED

**C403.7.4.1 Nontransient dwelling units.** Nontransient dwelling units shall be provided with outdoor air energy recovery ventilation systems with an enthalpy recovery ratio of not less than 50 percent at cooling design condition andnot less than 60 percent at heating design condition.

**Exceptions:**

1. Nontransient dwelling units in Climate Zone 3C.
2. Nontransient dwelling units with not more than 500 square feet (46 m2) of conditioned floor area that are located inClimate Zones 0, 1, 2, 3, 4C, and 5C and either adjoin an open-ended corridor or do not adjoin a corridor.
3. Nontransient dwelling units with not more than 500 square feet (46 m2) of conditioned floor area that are located in Climate Zones 1A, 2B, 3B, and 3C.
4. Enthalpy recovery ratio requirements at heating design condition in Climate Zones 0, 1 and 2.

5. Enthalpy recovery ratio requirements at cooling design condition in Climate Zones 4, 5, 6, 7 and 8.

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-205-21 Performance renewable energy |
| CDP ID # | 548 |
| Code | IECC CE |
| Code Section(s) | C407.2 New Section n |
| Location | base |
| Proponent | Joe Cain JoeCainPE@gmail.com |
| Proposal Status | SC rev |
| Subcommittee | CE Model, Metrics |
| Subcommittee Notes | The SC was concerned that this CCP could allow energy efficiency to be "traded off" for solar. |
| Recommendation | Reject |
| Vote | Accept-2, Reject-18, Revise-0 |
| Recommendation Date | 3/7/22 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee_____✓_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-209-21 Mandatory Performance Table Envelope items |
| CDP ID # | 167 |
| Code | IECC CE |
| Code Section(s) | C407.2 table New Section n |
| Location | base |
| Proponent | Jay Crandell jcrandell@aresconsulting.biz |
| Proposal Status | SC rev |
| Subcommittee | CE Model, Metrics |
| Subcommittee Notes | The SC supports this CCP, although there were some commenters were not comfortable with the reference to C402.2.4.1 Insulation Installation. The concern is that C402.2.4.1 which is "tradable" is included in Table C407.2 which is "non-tradable". |
| Recommendation | Accept |
| Vote | Accept-15, Reject-2, Revise-1 |
| Recommendation Date | 3/7/22 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee_____✓_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-212-21 Performance Standard Ref Table Roof |
| CDP ID # | 335 |
| Code | IECC CE |
| Code Section(s) | C407.4.1(1) table New Section n |
| Location | base |
| Proponent | Jay Crandell jcrandell@aresconsulting.biz |
| Proposal Status | SC rev |
| Subcommittee | CE Model, Metrics |
| Subcommittee Notes | The SC unanimously accepted this proposal to correct the solar absorptance and emittance factors contained in Table C407.4.1(1) |
| Recommendation | Accept the CCP as modified. |
| Vote | Accept-19, Reject-0, Revise-0 |
| Recommendation Date | 3/7/22 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee_____✓_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CECPI-2-21 Comm. Minimum Renewable Capacity Consensus Proposal |
| CDP ID # | 592 |
| Code | IECC CE |
| Code Section(s) | New Sections |
| Location | base |
| Proponent | Electrical Power, Lighting, and Renewable Subcommittee |
| Proposal Status | SC rev |
| Subcommittee | CE Elec, Light |
| Subcommittee Notes | |
| Recommendation | As proposed |
| Vote | 10-3-3 |
| Recommendation Date | 3/14/22 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee___X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-150-21 Scope of Exterior Lighting |
| CDP ID # | 383 |
| Code | IECC CE |
| Code Section(s) | C405.2 New Section n |
| Location | base |
| Proponent | Jack Bailey jbailey@oneluxstudio.com |
| Proposal Status | SC rev |
| Subcommittee | CE Elec, Light |
| Subcommittee Notes | Reason: This change clarifies when lighting controls are required and is consistent with other provisions with the IECC |
| Recommendation | AS SUBMITTED |
| Vote | 10 - 4 - 2 |
| Recommendation Date | March 15, 2022 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee_____X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

# International Energy Conservation Code
# Code Change Proposal Tracking Sheet

| | |
|---|---|
| Proposal # | CEPI-153-21 Occupant sensor |
| CDP ID # | 77 |
| Code | IECC CE |
| Code Section(s) | C405.2.1.1 New Section n |
| Location | base |
| Proponent | Glenn Heinmiller glenn@lampartners.com |
| Proposal Status | SC rev |
| Subcommittee | CE Elec, Light |
| Subcommittee Notes | Reason: this proposal reduces flexibility of code without significant energy savings. |
| Recommendation | DISAPPROVE |
| Vote | 11 - 3 - 1 |
| Recommendation Date | March 15, 2022 |
| Next Step | To Subcommittee_____<br>To Advisory Group_____<br>To Consensus Committee_____X_____ |
| Consensus Committee | |
| Committee Response | |
| Vote | Affirmative_____ Negative_____ Table_____<br><br>To Subcommittee_____ |
| Date | |

## CECPI-3-21 Merged C402.5 Structure Proposal – V6

*(Includes comments on V4 made before and during the IECC-C Subcommittee. It also reflects sub-committee action on CEPI-71, CEPI-61 and CEPI-62)*

*Note: There are explanatory tables and the color coding is explained at the end of the proposal*

**Modify as shown below. Also renumber sections in C402.1 as appropriate due to the movement of C402.5.5 to C402.1.3:**

**C402.5 Air leakage—building thermal envelope.** The *building thermal envelope* shall comply with Sections C402.5.1 through Section ~~C402.5.11.1~~ C402.5.8.1~~., or the building *thermal envelope* shall be tested in accordance with Section C402.5.2 or C402.5.3. Where compliance is based on such testing, the building shall also comply with Sections C402.5.7, C402.5.8 and C402.5.9.~~

**C402.5.1 Air barriers.** A continuous ~~air barrier~~ *air barrier* shall be provided throughout the *building thermal envelope*. The *air barrier* is permitted to be any combination of inside, outside, or within the *building thermal envelope* The ~~air barrier~~ *air barrier* shall comply with Sections C402.5.1.1, and C402.5.1.2. The *air leakage* performance of the *air barrier* shall be verified in accordance with Section C402.5.2.

**Exception:** ~~Air barriers~~ *Air barriers* are not required in buildings ~~located~~ in *Climate Zone* 2B.

**C402.5.1.1 Air barrier design and documentation requirements.** Design of the continuous *air barrier* shall be documented in the following manner :

1. Components comprising the continuous *air barrier* and their position within each *building thermal envelope* assembly shall be identified.
2. Joints, interconnections, and penetrations of the continuous *air barrier* components shall be detailed.
3. The continuity of the *air barrier* at building element assemblies that enclose conditioned space or provide a boundary between conditioned space and unconditioned space shall be identified.
4. Documentation of the continuous air barrier shall detail methods of sealing the air barrier such as wrapping, caulking, gasketing, taping or other *approved* methods at the following locations:
   - 4.1. Joints around fenestration and door frames.
   - 4.2. Joints between walls and floors, between walls at building corners, between walls and roofs including parapets and copings, where above-grade walls meet foundations and similar intersections.
   - 4.3. Penetrations or attachments through the continuous *air barrier* in building envelope roofs, walls, and floors.
   - 4.4. Building assemblies used as ducts or plenums.
   - 4.5. Changes in continuous *air barrier* materials and assemblies.
5. Identify where testing will or will not be performed in accordance with Section C402.5.2. Where testing will not be performed, a plan for field inspections required by C402.5.2.3 shall be provided that includes the following:
   - 5.1 Schedule for periodic inspection(s),
   - 5.2 Continuous air barrier scope of work,
   - 5.3 List of critical inspection items,
   - 5.4 Inspection documentation requirements, and

5.5 Provisions for corrective actions where needed.

**~~C402.5.1.1~~ C402.5.1.2 Air barrier construction.** The *continuous air barrier* shall be constructed to comply with the following:

1. The ~~air barrier~~ *air barrier* shall be continuous for all assemblies that ~~are~~ comprise the ~~thermal envelope of the building~~ *building thermal envelope* and across the joints and assemblies.
2. Air barrier joints and seams shall be sealed, including sealing transitions in places and changes in materials. The joints and seals shall be securely installed in or on the joint for its entire length so as not to dislodge, loosen or otherwise impair its ability to resist positive and negative pressure differentials such as those from design wind load, stack effect and mechanical ventilation.
3. Penetrations of the ~~air barrier~~ *air barrier* shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Sealing shall allow for expansion, contraction and mechanical vibration. ~~Joints and seams associated with penetrations shall be sealed in the same manner or taped.~~ Sealing materials shall be securely installed around the penetration so as not to dislodge, loosen or otherwise impair the penetrations' ability to resist positive and negative pressure ~~from wind, stack effect and mechanical ventilation~~. Sealing of concealed fire sprinklers, where required, shall be in a manner that is recommended by the fire sprinkler manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.
4. Recessed lighting fixtures shall comply with Section ~~C402.5.10~~ C402.5.1.2.1. Where similar objects are installed that penetrate the ~~air barrier~~ *air barrier*, provisions shall be made to maintain the integrity of the ~~air barrier~~ *air barrier*.
5. ~~5.~~ Electrical and communication boxes shall comply with ~~C402.5.11~~ C402.5.1.2.2 ~~to maintain the integrity of the air barrier.~~

~~**C402.5.1.2 Air barrier compliance.** A continuous air barrier for the opaque building envelope shall comply with the following:~~

~~1. Buildings or portions of buildings, including Group R and I occupancies, shall meet the provisions of Section C402.5.2.~~

~~**Exception:** Buildings in Climate Zones 2B, 3C and 5C.~~

~~2. Buildings or portions of buildings other than Group R and I occupancies shall meet the provisions of Section C402.5.3.~~

~~**Exceptions:**~~

~~1. Buildings in Climate Zones 2B, 3B, 3C and 5C.~~

~~2. Buildings larger than 5,000 square feet (464.5 m2) floor area in Climate Zones 0B, 1, 2A, 4B and 4C.~~

~~3. Buildings between 5,000 square feet (464.5 m2) and 50,000 square feet (4645 m2) floor area in Climate Zones 0A, 3A and 5B.~~

~~3. Buildings or portions of buildings that do not complete air barrier testing shall meet the provisions of Section C402.5.1.3 or C402.5.1.4 in addition to Section C402.5.1.5.~~

**C402.5.2 Air leakage compliance.** *Air leakage* of the *building thermal envelope* shall be tested by an *approved* third party in accordance with C402.5.2.1. The measured *air leakage* shall not be greater than

0.35 cfm/ft$^2$ (1.8 L/s × m$^2$) of the *building thermal envelope* area at a pressure differential of 0.3 inch water gauge (75 Pa) with the calculated *building thermal envelope* surface area being the sum of the above- and below-grade *building thermal envelope*.

**Exceptions:**

1. Where the measured *air leakage* rate is greater than 0.35 cfm/ft$^2$ (1.8 L/s × m$^2$) but is not greater than 0.45 cfm/ft$^2$ (2.3 L/s × m$^2$), the *approved* third party shall perform a diagnostic evaluation using smoke tracer or infrared imaging. The evaluation shall be conducted while the building is pressurized along with a visual inspection of the *air barrier* in accordance with ASTM E1186. All identified leaks shall be sealed where such sealing can be made without damaging existing building components. A report specifying the corrective actions taken to seal leaks shall be deemed to establish compliance with the requirements of this section where submitted to the code official and the building owner. Where the measured *air leakage rate* is greater than 0.45 cfm/ft2 (2.3 L/s × m2), corrective actions must be made to the building and an additional test completed for which the results are 0.45 cfm/ft$^2$ (2.3 L/s × m$^2$), or less.
2. Buildings in Climate Zones 2B.
3. Buildings larger than 25,000 square feet (2300 m$^2$) floor area in Climate Zones 0 through 4, other than Group R and I occupancies, that comply with Section C402.5.2.3.
4. As an alternative, buildings or portions of buildings, containing Group R and I occupancies, shall be permitted to be tested by an *approved* third party in accordance with C402.5.2.2. The reported *air leakage* of the *building thermal envelope* shall not be greater than 0.27 cfm/ft$^2$ (1.4 L/s x m$^2$) of the *testing unit enclosure area* at a pressure differential of 0.2 inch water gauge (50 Pa).

**C402.5.2.1 Whole building test method and reporting**. The *building thermal envelope* shall be tested for *air leakage* in accordance with ASTM E3158 or an equivalent *approved* method. A report that includes the tested surface area, floor area, air by volume, stories above grade, and leakage rates shall be submitted to the code official and the building owner.

**Exceptions:**

1. For buildings less than 10,000 ft$^2$ (1000 m$^2$) the entire *building thermal envelope* shall be permitted to be tested in accordance with ASTM E779, ASTM E3158 or ASTM E1827 or an equivalent *approved* method.
2. For buildings greater than 50,000 ft$^2$ (4645 m$^2$), portions of the building shall be permitted to be tested and the measured *air leakage* shall be area-weighted by the surface areas of the *building thermal envelope* in each portion. The weighted average tested *air leakage* shall not be greater than the whole building leakage limit. The following portions of the building shall be tested:
    1. The entire *building thermal envelope* area of stories that have any conditioned spaces directly under a roof.
    2. The entire *building thermal envelope* area of stories that have a building entrance, a floor over unconditioned space, a loading dock, or that are below grade.
    3. Representative above-grade portions of the building totaling not less than 25 percent of the wall area enclosing the remaining conditioned space.

**C402.5.2.2 Dwelling and sleeping unit enclosure test method and reporting.** The *building thermal envelope* shall be tested for *air leakage* in accordance with ASTM E779, ANSI/RESNET/ICC 380, ASTM

E1827, or an equivalent *approved* method. Where multiple *dwelling units* or *sleeping units* or other occupiable conditioned spaces are contained within one *building thermal envelope*, each unit shall be considered an individual testing unit, and the building *air leakage* shall be the weighted average of all testing unit results, weighted by each *testing unit enclosure area*. Units shall be tested without simultaneously pressurizing adjacent units and shall be separately tested ~~test~~ as follows:

1. Where buildings have less than eight testing units, each testing unit shall be tested.
2. Where buildings have eight or more testing units, the greater of seven units or 20 percent of the testing units in the building shall be tested, including a top floor unit, a middle floor unit, a ground floor unit and a unit with the largest *testing unit enclosure area*. For each tested unit that exceeds the maximum *air leakage* rate, an additional three units shall be tested, including a mixture of testing unit types and locations.

**C402.5.2.3 Building envelope design and construction verification criteria.** Where Sections C402.5.2.1 and C402.5.2.2 are not applicable, the installation of the continuous *air barrier* shall be verified by the *code official*, *a registered design professional* or *approved agency* in accordance with the following:

**1.** A review of the construction documents and other supporting data shall be conducted to assess compliance with the requirements in Section C402.5.1**.**
2. Inspection of continuous *air barrier* components and assemblies shall be conducted during construction to verify compliance with the requirements of Sections C402.5.2.3.1 or C402.5.2.3.2. The *air barrier* shall remain accessible for inspection and repair.
3. A final inspection report shall be provided for inspections completed by the *registered design professional* or *approved agency*. The inspection report shall be provided to the building owner or owner's authorized agent and the *code official*. The report shall identify deficiencies found during inspection and details of corrective measures taken.

~~**C402.5.1.3**~~ **C402.5.2.3.1 Materials.** Materials with an air permeability not greater than 0.004 cfm/ft$^2$ (0.02 L/s × m$^2$) under a pressure differential of 0.3 inch water gauge (75 Pa) ~~when~~ where tested in accordance with ASTM E2178 shall comply with this section. Materials in Items 1 through 16 below shall be deemed to comply with this section, provided that joints are sealed and materials are installed as air barriers in accordance with the manufacturer's instructions.

1. Plywood with a thickness of not less than 3/8 inch (10 mm).
2. Oriented strand board having a thickness of not less than 3/8 inch (10 mm).
3. Extruded polystyrene insulation board having a thickness of not less than 1/2 inch (12.7 mm).
4. Foil-back polyisocyanurate insulation board having a thickness of not less than 1/2 inch (12.7 mm).
5. Closed-cell spray foam having a ~~minimum~~ density of not less than 1.5 pcf (2.4 kg/m3) and having a thickness of not less than 11/2 inches (38 mm).
6. Open-cell spray foam with a density ~~between~~ greater than 0.4 and less than 1.5 pcf (0.6 and 2.4 kg/m3) and having a thickness of not less than 4.5 inches (113 mm).
7. Exterior or interior gypsum board having a thickness of not less than 1/2 inch (12.7 mm).
8. Cement board having a thickness of not less than 1/2 inch (12.7 mm).
9. Built-up roofing membrane.
10. Modified bituminous roof membrane.

11. Single-ply roof membrane.
12. A Portland cement/sand parge, or gypsum plaster having a thickness of not less than 5/8 inch (15.9 mm).
13. Cast-in-place and precast concrete.
14. Fully grouted concrete block masonry.
15. Sheet steel or aluminum.
16. Solid or hollow masonry constructed of clay or shale masonry units.

~~**C402.5.1.4**~~ **C402.5.2.3.2 Assemblies**. Assemblies of materials and components with an average air leakage not greater than 0.04 cfm/ft$^2$ (0.2 L/s × m$^2$) under a pressure differential of 0.3 inch of water gauge ~~(w.g.)~~(75 Pa) ~~when~~ where tested in accordance with ASTM E2357, ASTM E1677, ASTM D8052 or ASTM E283 shall comply with this section. Assemblies listed in Items 1 through 3 below shall be deemed to comply, provided that joints are sealed and the requirements of Section C402.5.1.1 are met.

1. Concrete masonry walls coated with either one application of block filler or two applications of a paint or sealer coating.
2. Masonry walls constructed of clay or shale masonry units with a nominal width greater than or equal to ~~of~~ 4 inches (102 mm) ~~or more~~.
3. A Portland cement~~/~~sand parge, stucco or plaster not less than 1/2 inch (12.7 mm) in thickness.

~~**C402.5.1.5 Building envelope performance verification.** The installation of the continuous air barrier shall be verified by the code official, a registered design professional or approved agency in accordance with the following:~~

~~1. A review of the construction documents and other supporting data shall be conducted to assess compliance with the requirements in Section C402.5.1.~~
~~2. Inspection of continuous air barrier components and assemblies shall be conducted during construction while the air barrier is still accessible for inspection and repair to verify compliance with the requirements of Sections C402.5.1.3 and C402.5.1.4.~~
~~3. A final commissioning report shall be provided for inspections completed by the registered design professional or approved agency. The commissioning report shall be provided to the building owner or owner's authorized agent and the code official. The report shall identify deficiencies found during the review of the construction documents and inspection and details of corrective measures taken.~~

~~**C402.5.2 Dwelling and sleeping unit enclosure testing.** The building thermal envelope shall be tested in accordance with ASTM E779, ANSI/RESNET/ICC 380, ASTM E1827 or an equivalent method approved by the code official. The measured air leakage shall not exceed 0.30 cfm/ft2 (1.5 L/s m2) of the testing unit enclosure area at a pressure differential of 0.2 inch water gauge (50 Pa). Where multiple dwelling units or sleeping units or other occupiable conditioned spaces are contained within one building thermal envelope, each unit shall be considered an individual testing unit, and the building air leakage shall be the weighted average of all testing unit results, weighted by each testing unit's enclosure area. Units shall be tested separately with an unguarded blower door test as follows:~~

~~1. Where buildings have fewer than eight testing units, each testing unit shall be tested.~~
~~2. For buildings with eight or more testing units, the greater of seven units or 20 percent of the testing units in the building shall be tested, including a top floor unit, a ground floor unit and a~~

~~unit with the largest testing unit enclosure area. For each tested unit that exceeds the maximum air leakage rate, an additional two units shall be tested, including a mixture of testing unit types and locations.~~

~~**C402.5.3 Building thermal envelope testing.** The building thermal envelope shall be tested in accordance with ASTM E779, ANSI/RESNET/ICC 380, ASTM E3158 or ASTM E1827 or an equivalent method approved by the code official. The measured air leakage shall not exceed 0.40 cfm/ft2 (2.0 L/s × m2) of the building thermal envelope area at a pressure differential of 0.3 inch water gauge (75 Pa). Alternatively, portions of the building shall be tested and the measured air leakages shall be area weighted by the surface areas of the building envelope in each portion. The weighted average test results shall not exceed the whole building leakage limit. In the alternative approach, the following portions of the building shall be tested:~~

~~1. The entire envelope area of all stories that have any spaces directly under a roof.~~
~~2. The entire envelope area of all stories that have a building entrance, exposed floor, or loading dock, or are below grade.~~
~~3. Representative above-grade sections of the building totaling at least 25 percent of the wall area enclosing the remaining conditioned space.~~

~~**Exception:** Where the measured air leakage rate exceeds 0.40 cfm/ft2 (2.0 L/s × m2) but does not exceed 0.60 cfm/ft2 (3.0 L/s × m2), a diagnostic evaluation using smoke tracer or infrared imaging shall be conducted while the building is pressurized along with a visual inspection of the air barrier. Any leaks noted shall be sealed where such sealing can be made without destruction of existing building components. An additional report identifying the corrective actions taken to seal leaks shall be submitted to the code official and the building owner, and shall be deemed to comply with the requirements of this section.~~

~~**C402.5.4**~~ **C402.5.3 Air leakage of fenestration.** The *air leakage* of fenestration assemblies shall ~~meet~~ comply with ~~the provisions of~~ Table ~~C402.5.4~~ C402.5.3. Testing shall be conducted by an accredited, independent testing laboratory in accordance with the applicable reference test standard in Table ~~C402.5.4~~ C402.5.3 ~~by an accredited, independent testing laboratory~~ and *labeled* by the manufacturer.

**Exceptions:**

1. Field-fabricated fenestration assemblies that are sealed in accordance with Section ~~C402.5.1~~ C402.5.1.2.
2. Fenestration in buildings that ~~comply with the testing alternative~~ are tested for *air leakage* of in accordance with Section ~~C402.5~~ C402.5.2 are not required to meet the air leakage requirements in Table ~~C402.5.4~~ C402.5.3.

**TABLE ~~C402.5.4~~ C402.5.3**

**MAXIMUM AIR LEAKAGE RATE FOR FENESTRATION ASSEMBLIES**

*No changes in table*

~~**C402.5.5**~~ **C402.1.3 Rooms containing fuel-burning appliances.** In *Climate Zones* 3 through 8, where combustion air is supplied through openings in an exterior wall to a room or space containing a space-conditioning fuel-burning appliance, one of the following shall apply:

1. The room or space containing the appliance shall be located outside of the *building thermal envelope.*
2. The room or space containing the appliance shall be enclosed and isolated from conditioned spaces inside the *building thermal envelope*. Such rooms shall comply with all of the following:
   - 2.1 The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be insulated to be not less than equivalent to the insulation requirement of below-grade walls as specified in Table C402.1.3 or Table C402.1.4.
   - 2.2 The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be sealed in accordance with Section ~~C402.5.1.1~~ C402.5.1.2.
   - 2.3 The doors into the enclosed room or space shall be fully gasketed.
   - 2.4 Piping serving as part of a heating or cooling system ~~Water lines~~ and ducts in the enclosed room or space shall be insulated in accordance with Section C403. Service water piping shall be insulated in accordance with Section C404.
   - 2.5 Where an air duct supplying combustion air to the enclosed room or space passes through *conditioned space*, the duct shall be insulated to an R-value of not less than R-8.

**Exception:** Fireplaces and stoves complying with Sections 901 through 905 of the *International Mechanical Code*, and Section 2111.14 of the *International Building Code*.

~~**C402.5.6**~~ **C402.5.4 Doors and access openings to shafts, chutes, stairways and elevator lobbies.** Doors and *access* openings from conditioned space to shafts, chutes stairways and elevator lobbies not within the scope of the fenestration assemblies covered by Section ~~C402.5.4~~ C402.5.3 shall be gasketed, weather-stripped or sealed.

**Exceptions:**

1. Door openings required to comply with Section 716 of the *International Building Code*.

2. Doors and door openings required by the *International Building Code* to comply with UL 1784 ~~by the *International Building Code*~~.

~~**C402.5.7**~~ **C402.5.5 Air intakes, exhaust openings, stairways and shafts.** Stairway enclosures, elevator shaft vents and other outdoor air intakes and exhaust openings integral to the building envelope shall be provided with dampers in accordance with Section C403.7.7.

~~**C402.5.8**~~ **C402.5.7 Loading dock weather seals.** Cargo door openings and loading door openings shall be equipped with weather seals that restrict ~~infiltration~~ *air leakage* and provide direct contact along the top and sides of vehicles that are parked in the doorway.

~~C402.5.9~~ C402.5.6 **Vestibules.** Building entrances shall be protected with an enclosed vestibule. ~~, with all doors~~ Doors opening into and out of the vestibule shall be equipped with self-closing devices. Vestibules shall be designed so that in passing through the vestibule it is not necessary for the interior and exterior doors to open at the same time. The installation of one or more revolving doors in the *building entrance* shall not eliminate the requirement that a vestibule be provided on any doors adjacent to revolving doors.

**Exceptions:** Vestibules are not required for the following:

1. Buildings in *Climate Zones* 0 through 2.

2. Doors not intended to be used by the public, such as doors to mechanical or electrical equipment rooms, or intended solely for employee use.

3. Doors opening directly from a *sleeping unit* or dwelling unit.

4. Doors that open directly from a space less than 3,000 square feet (298 m2) in area.

5. Revolving doors.

6. Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.

7. Doors that have an air curtain with a velocity of not less than 6.56 feet per second (2 m/s) at the floor that have been tested in accordance with ANSI/AMCA 220 and installed in accordance with the manufacturer's instructions. Manual or automatic controls shall be provided that will operate the air curtain with the opening and closing of the door. Air curtains and their controls shall comply with Section C408.2.3.

~~C402.5.10~~ C402.5.1.2.1 **Recessed lighting.** Recessed luminaires installed in the *building thermal envelope* shall be all of the following:

1. IC-rated.

2. Labeled as having an air leakage rate of not ~~more~~ greater than 2.0 cfm (0.944 L/s) ~~when~~ where tested in accordance with ASTM E283 at a 1.57 psf (75 Pa) pressure differential.

3. Sealed with a gasket or caulk between the housing and interior wall or ceiling covering.

~~C402.5.11~~ C402.5.1.2.2 **Electrical and communication boxes.** Electrical and communication boxes that penetrate the air barrier of the building thermal envelope, and that do not comply with ~~C402.5.11.1~~ C402.5.1.2.2.1, shall be caulked, taped, gasketed, or otherwise sealed to the air barrier element being penetrated. All openings on the concealed portion of the box shall be sealed. Where present, insulation shall rest against all concealed portions of the box.

~~C402.5.11.1~~ C402.5.1.2.2.1 **Air-sealed boxes.** Where air-sealed boxes are installed, they shall be marked in accordance with NEMA OS 4. Air-sealed boxes shall be installed in accordance with the manufacturer's instructions.

~~C402.5.11~~ C402.5.8 **Operable openings interlocking.** Where occupancies ~~utilize~~ have operable openings to the outdoors that are larger than 40 square feet (3.7 m2) in area, such openings shall be interlocked

with the heating and cooling system ~~so as~~ to raise the cooling setpoint to 90°F (32°C) and lower the heating setpoint to 55°F (13°C) whenever the operable opening is open. The change in heating and cooling setpoints shall occur ~~within 10 minutes of opening~~ when the operable opening has been open for a period not to exceed 10 minutes.

**Exceptions:**

1. Operable openings into separately ~~Separately~~ zoned areas associated with the preparation of food that contain appliances that contribute to the HVAC loads of a restaurant or similar type of occupancy.

2. ~~Warehouses~~ Storage occupancies that utilize overhead doors for the function of the occupancy, where *approved* ~~approved by the code official~~.

3. ~~The first entrance doors where~~ Doors located in the exterior wall ~~and~~ that are part of a vestibule system.

~~**C402.5.11.1**~~ **C402.5.8.1 Operable controls.** Controls shall comply with Section C403.13.

…….

**C406.9 Reduced air ~~infiltration~~ leakage.** ~~Air infiltration~~ *Air leakage* of the ~~shall be verified by whole-building pressurization testing conducted in accordance with ASTM E779 or ASTM E1827~~ *building thermal envelope* shall be tested ~~testing conducted~~ by an *approved* third party in accordance with Section C402.5.2.1 ~~by an independent third party~~. The measured *air leakage* ~~rate of the building envelope~~ shall not exceed ~~0.25~~ 0.22 cfm/ft$^2$ (~~2.0~~ 1.1 L/s × m$^2$) of the *building thermal envelope* at ~~under~~ a pressure differential of 0.3 inch~~es~~ water gauge ~~column~~ (75 Pa), with the calculated surface area being the sum of the above- and below-grade *building thermal envelope* ~~building envelope~~. ~~A report that includes the tested surface area, floor area, air by volume, stories above grade, and leakage rates shall be submitted to the code official and the building owner.~~

~~**Exceptions**:~~

~~1. For buildings having over 250,000 square feet (25 000 m2) of conditioned floor area, air leakage testing need not be conducted on the whole building where testing is conducted on representative above-grade sections of the building. Tested areas shall total not less than 25 percent of the conditioned floor area and shall be tested in accordance with this section.~~

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**Reason:** This proposal is a merged proposal based on parts or all of proposals CEPI-55, CEPI-56, CEPI-57, CEPI-58, CEPI-63 Pt1, and CEPI-70 aimed primarily at reorganizing the structure of Section C402.5 to reduce redundancy and improve the clarity of the section. Section C402.5 is currently one of the most intricate and potentially confusing sections of the code, and this proposal seeks to simplify it by improving the flow of the text. Reorganization focused on the re-structure of the existing testing requirements to have clear performance requirements, testing criteria requirements and whole building testing exceptions. Specifically:

- The restructuring separates sections specifying the air leakage maximum values from sections specifying the methods by which these values are tested and verified. This allows for the enhanced air leakage option in Section C406 to be tested by the same by the same test method as the basic requirements in Section C402.5. This will enable consistency between the two sections and reduce divergence as the code is developed in future code cycles. Furthermore, this section separation will allow an easier revision of the code as new technology are deployed in the industry.
- Adding a clarification that the Group R & I sleeping and dwelling unit testing is optional. Group R & I buildings are permitted to use whole building testing.
- Removes overlapping exceptions, and repeated testing references.

Some additional requirements contained in CEPI-57 and CEPI-58 are included.

**Summary of changes in merged, re-structure proposal:**

The restructure is shown in the table below.

- Referenced Section and Table numbers is shown in the proposal text in green to aid in review.
- Clauses/requirements/exceptions dealing with the performance level stringency and climate zone and building size test exceptions that were recommended by the SC action on overlay proposals (CEPI-71, CEPI-61 & CEPI-62) are highlighted in red. Changes in stringency from CEPI-71 are shown below.

| | **IECC-2021** | **Based on CEPI-71** |
|---|---|---|
| Whole Building leakage limit | 0.40 cfm/ft$^2$ (2.0 L/s × m$^2$) @0.3 inch water gauge (75 Pa) | 0.35 cfm/ft$^2$ (1.8 L/s × m2) @ 0.3 inch water gauge (75 Pa) |
| Oops clause upper limit | 0.60 cfm/ft$^2$ (2.3 L/s × m$^2$) @0.3 inch water gauge (75 Pa) | 0.45 cfm/ft$^2$ (2.3 L/s × m$^2$) @0.3 inch water gauge (75 Pa) |
| Dwelling unit leakage limit | 0.30 cfm/ft$^2$ (1.5 L/s x m$^2$) @ 0.2 inch water gauge (50 Pa). | 0.27 cfm/ft$^2$ (1.4 L/s x m$^2$) @ 0.2 inch water gauge (50 Pa). |
| C406.9 Energy credit (whole building) | 0.25 cfm/ft$^2$ (2.0 L/s × m$^2$) @ 0.3 inches water column (75 Pa) | 0.22 cfm/ft$^2$ (1.1 L/s × m$^2$) @ 0.3 inches water column (75 Pa) |

- CEPI-57 and CEPI-58 contained additions of text and some revisions that were not included in other proposals. Those provisions which were included in the merged proposal are included as underlined text in blue.
- Changes from previously approved proposals were included and are shown in purple (CEPI-32, CEPI-60, CEPI-68 and CEPI-69) are included and shown in purple.

| Structure (Merged) Proposal Section | IECC-C 2021 Section | Revisions |
|---|---|---|
| **C402.1.3 Rooms containing fuel-burning appliances.** | C402.5.5 | Moved section to a more appropriate place in the code |
| | | |
| **C402.5 Air leakage – building thermal envelope.** | C402.5 | |
| **C402.5.1 Air Barriers.** | C402.5.1 | Clarifies separation of verification requirements from the air barrier construction requirements. |
| **C402.5.1.1 Air barrier design and documentation** | n/a | Added from CEPI-57 |
| **C402.5.1.2 Air barrier construction.** | C402.5.1.1 | |
| **C402.5.1.2.1 Recessed lighting.** | C402.5.10 | Moved section |
| **C402.5.1.2.2 Electrical and communication boxes** | n/a | Added from CEPI -60 (moved in restructure) |
| **C402.5.1.2.2.1 Air-sealed boxes** | n/a | Added from CEPI -60 (moved in restructure) |
| **C402.5.2 Air leakage compliance.** | C402.5.3 & C402.5.1.2 | Moved and split section to separate air leakage minimum from testing criteria. Climate Zone and building size testing criteria are included in |
| **C402.5.2.1 Whole building test method and reporting** | C402.5.3 | Separated out whole building testing section |
| **C402.5.2.2 Dwelling and sleeping unit enclosure test method and reporting.** | C402.5.2 | Separated dwelling unit test procedure |
| **C402..5.2.3 Building envelope design and construction verification criteria.** | C402.5.1.5 | |
| **C402.5.2.3.1 Materials** | C402.5.1.3 | |
| **C402.5.2.3.2 Assemblies.** | C402.5.1.4 | |
| **C402.5.3 Air leakage of fenestration.** | C402.5.4 | |
| **C402.5.4 Doors and access openings to shafts, chutes, stairways** | C402.5.6 | |
| **C402.5.5 Air intakes, exhaust openings, stairways and shafts.** | C402.5.7 | |
| **C402.5.6 Vestibules.** | C402.5.9 | |
| **C402.5.7 Loading dock weather seals.** | C402.5.8 | |
| **C402.5.8 Operable openings interlocking.** | C402.5.11 | |
| **C402.5.8.1 Operable controls.** | C402.5.11.1 | |

**Cost Impact:**

The code change proposal will neither increase nor decrease the cost of construction as written, because it is just rearranging the current requirements for better clarity and usability. This reorganization also includes changes from other approved proposals (CEPI-32, CEPI-60, CEPI-68 and

CEPI-69), whose cost impact statements also indicate that they will neither increase nor decrease the cost of construction.

## Merged C402.5 Structure Proposal V6: Clean Version w/ color coding)

**Moved Section (originally C402.5.5), renumber subsequent sections:**

**C402.1.3 Rooms containing fuel-burning appliances.** In *Climate Zones* 3 through 8, where combustion air is supplied through openings in an exterior wall to a room or space containing a space-conditioning fuel-burning appliance, one of the following shall apply:

3. The room or space containing the appliance shall be located outside of the *building thermal envelope.*
4. The room or space containing the appliance shall be enclosed and isolated from conditioned spaces inside the *building thermal envelope*. Such rooms shall comply with all of the following:
   - 4.1 The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be insulated to be not less than equivalent to the insulation requirement of below-grade walls as specified in Table C402.1.3 or Table C402.1.4.
   - 4.2 The walls, floors and ceilings that separate the enclosed room or space from conditioned spaces shall be sealed in accordance with Section ~~C402.5.1.1~~ C402.5.1.2.
   - 4.3 The doors into the enclosed room or space shall be fully gasketed.
   - 4.4 Piping serving as part of a heating or cooling system and ducts in the enclosed room or space shall be insulated in accordance with Section C403. Service water piping shall be insulated in accordance with Section C404.
   - 4.5 Where an air duct supplying combustion air to the enclosed room or space passes through *conditioned space*, the duct shall be insulated to an R-value of not less than R-8.

**Exception:** Fireplaces and stoves complying with Sections 901 through 905 of the *International Mechanical Code*, and Section 2111.14 of the *International Building Code*.

…….

**C402.5 Air leakage—building thermal envelope.** The *building thermal envelope* shall comply with Sections C402.5.1 through Section C402.5.8.1.

**C402.5.1 Air barriers.** A continuous *air barrier* shall be provided throughout the *building thermal envelope*. The *air barrier* is permitted to be any combination of inside, outside, or within the *building thermal envelope* The *air barrier* shall comply with Sections C402.5.1.1, and C402.5.1.2. The *air leakage* performance of the *air barrier* shall be verified in accordance with Section C402.5.2.

**Exception:** *Air barriers* are not required in buildings in *Climate Zone* 2B.

**C402.5.1.1 Air barrier design and documentation requirements.** Design of the continuous *air barrier* shall be documented in the following manner :

6. Components comprising the continuous *air barrier* and their position within each *building thermal envelope* assembly shall be identified.
7. Joints, interconnections, and penetrations of the continuous *air barrier* components shall be detailed.
8. The continuity of the *air barrier* building element assemblies that enclose conditioned space or provide a boundary between conditioned space and unconditioned space shall be identified.
9. Documentation of the continuous air barrier shall detail methods of sealing the air barrier such as wrapping, caulking, gasketing, taping or other *approved* methods at the following locations:
   9.1. Joints around fenestration and door frames.
   9.2. Joints between walls and floors, between walls at building corners, between walls and roofs including parapets and copings, where above-grade walls meet foundations, and similar intersections.
   9.3. Penetrations or attachments through the continuous *air barrier* in building envelope roofs, walls, and floors.
   9.4. Building assemblies used as ducts or plenums.
   9.5. Changes in continuous *air barrier* materials and assemblies.
10. Identify where testing will or will not be performed in accordance with Section C402.5.2. Where testing will not be performed, a plan for field inspections required by C402.5.2.3 shall be provided that includes the following:
    5.6 Schedule for periodic inspection,
    5.7 Continuous air barrier scope of work,
    5.8 List of critical inspection items,
    5.9 Inspection documentation requirements, and
    5.10 Provisions for corrective actions where needed.

**C402.5.1.2 Air barrier construction.** The *continuous air barrier* shall be constructed to comply with the following:

6. The *air barrier* shall be continuous for all assemblies that comprise the *building thermal envelope* and across the joints and assemblies.
7. Air barrier joints and seams shall be sealed, including sealing transitions in places and changes in materials. The joints and seals shall be securely installed in or on the joint for its entire length so as not to dislodge, loosen or otherwise impair its ability to resist positive and negative pressure differentials such as those from design wind loads, stack effect and mechanical ventilation.
8. Penetrations of the *air barrier* shall be caulked, gasketed or otherwise sealed in a manner compatible with the construction materials and location. Sealing shall allow for expansion, contraction and mechanical vibration. Sealing materials shall be securely installed around the penetration so as not to dislodge, loosen or otherwise impair the penetrations' ability to resist positive and negative pressure. Sealing of concealed fire sprinklers, where required, shall be in a manner that is recommended by the fire sprinkler manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.
9. Recessed lighting fixtures shall comply with Section C402.5.1.2.1. Where similar objects are installed that penetrate the *air barrier*, provisions shall be made to maintain the integrity of the *air barrier*.
10. Electrical and communication boxes shall comply with C402.5.1.2.2.

**C402.5.1.2.1 Recessed lighting.** Recessed luminaires installed in the *building thermal envelope* shall be all of the following:

1. IC-rated.

2. Labeled as having an air leakage rate of not ~~more~~ greater than 2.0 cfm (0.944 L/s) ~~when~~ where tested in accordance with ASTM E283 at a 1.57 psf (75 Pa) pressure differential.

3. Sealed with a gasket or caulk between the housing and interior wall or ceiling covering.

**C402.5.1.2.2 Electrical and communication boxes.** Electrical and communication boxes that penetrate the air barrier of the building thermal envelope, and that do not comply with C402.5.1.2.2.1, shall be caulked, taped, gasketed, or otherwise sealed to the air barrier element being penetrated. All openings on the concealed portion of the box shall be sealed. Where present, insulation shall rest against all concealed portions of the box.

**C402.5.1.2.2.1 Air-sealed boxes.** Where air-sealed boxes are installed, they shall be marked in accordance with NEMA OS 4. Air-sealed boxes shall be installed in accordance with the manufacturer's instructions.

**C402.5.2 Air leakage compliance.** *Air leakage* of the *building thermal envelope* shall be tested by an *approved* third party in accordance with C402.5.2.1. The measured *air leakage* shall not be greater than 0.35 cfm/ft$^2$ (1.8 L/s × m$^2$) of the *building thermal envelope* area at a pressure differential of 0.3 inch water gauge (75 Pa) with the calculated *building thermal envelope* surface area being the sum of the above- and below-grade *building thermal envelope*.

**Exceptions:**

5. Where the measured *air leakage* rate is greater than 0.35 cfm/ft$^2$ (1.8 L/s × m$^2$) but is not greater than 0.45 cfm/ft$^2$ (2.3 L/s × m$^2$), the *approved* third party shall perform a diagnostic evaluation using smoke tracer or infrared imaging. The evaluation shall be conducted while the building is pressurized along with a visual inspection of the *air barrier* in accordance with ASTM E1186. All identified leaks shall be sealed where such sealing can be made without damaging existing building components. A report specifying the corrective actions taken to seal leaks shall be deemed to establish compliance with the requirements of this section where submitted to the code official and the building owner. Where the measured *air leakage rate* is greater than 0.45 cfm/ft2 (2.3 L/s × m2), corrective actions must be made to the building and an additional test completed for which the results are 0.45 cfm/ft$^2$ (2.3 L/s × m$^2$), or less.
6. Buildings in Climate Zones 2B.
7. Buildings larger than 25,000 square feet (2300 m$^2$) floor area in Climate Zones 0 through 4, other than Group R and I occupancies, that comply with C402.5.2.3.
8. As an alternative, buildings or portions of buildings, containing Group R and I occupancies, shall be permitted to be tested by an *approved* third party in accordance with C402.5.2.2. The reported *air leakage* of the *building thermal envelope* shall not be greater than 0.27 cfm/ft$^2$ (1.4 L/s x m$^2$) of the *testing unit enclosure area* at a pressure differential of 0.2 inch water gauge (50 Pa).

**C402.5.2.1 Whole building test method and reporting**. The *building thermal envelope* shall be tested for *air leakage* in accordance with ASTM E3158 or an equivalent *approved* method. A report that includes the tested surface area, floor area, air by volume, stories above grade, and leakage rates shall be submitted to the code official and the building owner.

**Exceptions:**

3. For buildings less than 10,000 $ft^2$ (1000 $m^2$) the entire *building thermal envelope* shall be permitted to be tested in accordance with ASTM E779, ASTM E3158 or ASTM E1827 or an equivalent *approved* method.
4. For buildings greater than 50,000 $ft^2$ (4645 $m^2$), portions of the building shall be permitted to be tested and the measured *air leakage* shall be area-weighted by the surface areas of the *building thermal envelope* in each portion. The weighted average tested *air leakage* shall not be greater than the whole building leakage limit. The following portions of the building shall be tested:
    4. The entire *building thermal envelope* area of stories that have any conditioned spaces directly under a roof.
    5. The entire *building thermal envelope* area of stories that have a building entrance, a floor over unconditioned space, a loading dock, or that are below grade.
    6. Representative above-grade portions of the building totaling not less than 25 percent of the wall area enclosing the remaining conditioned space.

**C402.5.2.2 Dwelling and sleeping unit enclosure test method and reporting.** The *building thermal envelope* shall be tested for *air leakage* in accordance with ASTM E779, ANSI/RESNET/ICC 380, ASTM E1827, or an equivalent *approved* method. Where multiple *dwelling units* or *sleeping units* or other occupiable conditioned spaces are contained within one *building thermal envelope*, each unit shall be considered an individual testing unit, and the building *air leakage* shall be the weighted average of all testing unit results, weighted by each *testing unit enclosure area*. Units shall be tested without simultaneously pressurizing adjacent units and shall be separately tested ~~test~~ as follows:

3. Where buildings have less than eight testing units, each testing unit shall be tested.
4. Where buildings have eight or more testing units, the greater of seven units or 20 percent of the testing units in the building shall be tested, including a top floor unit, a middle floor unit, a ground floor unit and a unit with the largest *testing unit enclosure area*. For each tested unit that exceeds the maximum *air leakage* rate, an additional three units shall be tested, including a mixture of testing unit types and locations.

**C402.5.2.3 Building envelope design and construction verification criteria.** Where Sections C402.5.2.1 and C402.5.2.2 are not applicable, the installation of the continuous *air barrier* shall be verified by the *code official*, *a registered design professional* or *approved agency* in accordance with the following:

**4.** A review of the construction documents and other supporting data shall be conducted to assess compliance with the requirements in Section C402.5.1**.**
5. Inspection of continuous *air barrier* components and assemblies shall be conducted during construction to verify compliance with the requirements of Sections C402.5.2.3.1 or C402.5.2.3.2. The *air barrier* shall remain accessible for inspection and repair.
6. A final inspection report shall be provided for inspections completed by the *registered design professional* or *approved agency*. The inspection report shall be provided to the building owner or owner's authorized agent and the *code official*. The report shall identify deficiencies found during inspection and details of corrective measures taken.

**C402.5.2.3.1 Materials.** Materials with an air permeability not greater than 0.004 cfm/$ft^2$ (0.02 L/s × $m^2$) under a pressure differential of 0.3 inch water gauge (75 Pa) where tested in accordance with ASTM E2178 shall comply with this section. Materials in Items 1 through 16 below shall be deemed to comply with this section, provided that joints are sealed and materials are installed as air barriers in accordance with the manufacturer's instructions.

17. Plywood with a thickness of not less than 3/8 inch (10 mm).

18. Oriented strand board having a thickness of not less than 3/8 inch (10 mm).
19. Extruded polystyrene insulation board having a thickness of not less than 1/2 inch (12.7 mm).
20. Foil-back polyisocyanurate insulation board having a thickness of not less than 1/2 inch (12.7 mm).
21. Closed-cell spray foam having a density of not less than 1.5 pcf (2.4 kg/m3) and having a thickness of not less than 11/2 inches (38 mm).
22. Open-cell spray foam with a density greater than 0.4 and less than 1.5 pcf (0.6 and 2.4 kg/m3) and having a thickness of not less than 4.5 inches (113 mm).
23. Exterior or interior gypsum board having a thickness of not less than 1/2 inch (12.7 mm).
24. Cement board having a thickness of not less than 1/2 inch (12.7 mm).
25. Built-up roofing membrane.
26. Modified bituminous roof membrane.
27. Single-ply roof membrane.
28. A Portland cement/sand parge, or gypsum plaster having a thickness of not less than 5/8 inch (15.9 mm).
29. Cast-in-place and precast concrete.
30. Fully grouted concrete block masonry.
31. Sheet steel or aluminum.
32. Solid or hollow masonry constructed of clay or shale masonry units.

**C402.5.2.3.2 Assemblies**. Assemblies of materials and components with an average air leakage not greater than 0.04 cfm/ft$^2$ (0.2 L/s × m$^2$) under a pressure differential of 0.3 inch of water gauge (75 Pa) where tested in accordance with ASTM E2357, ASTM E1677, ASTM D8052 or ASTM E283 shall comply with this section. Assemblies listed in Items 1 through 3 below shall be deemed to comply, provided that joints are sealed and the requirements of Section C402.5.1.1 are met.

4. Concrete masonry walls coated with either one application of block filler or two applications of a paint or sealer coating.
5. Masonry walls constructed of clay or shale masonry units with a nominal width greater than or equal to 4 inches (102 mm).
6. A Portland cement~~/~~sand parge, stucco or plaster not less than 1/2 inch (12.7 mm) in thickness.

**C402.5.3 Air leakage of fenestration.** The *air leakage* of fenestration assemblies shall ~~meet~~ comply with Table C402.5.3. Testing shall be conducted by an accredited, independent testing laboratory in accordance with the applicable reference test standard in Table C402.5.3 and *labeled* by the manufacturer.

**Exceptions:**

3. Field-fabricated fenestration assemblies that are sealed in accordance with Section C402.5.1.2.
4. Fenestration in buildings that are tested for *air leakage* of in accordance with Section C402.5.2 are not required to meet the air leakage requirements in Table C402.5.3.

**TABLE C402.5.3**

**MAXIMUM AIR LEAKAGE RATE FOR FENESTRATION ASSEMBLIES**

*No changes in table*

**C402.5.4 Doors and access openings to shafts, chutes, stairways and elevator lobbies.** Doors and *access* openings from conditioned space to shafts, chutes stairways and elevator lobbies not within the scope of the fenestration assemblies covered by Section C402.5.3 shall be gasketed, weather-stripped or sealed.

**Exceptions:**

1. Door openings required to comply with Section 716 of the *International Building Code*.

2. Doors and door openings required by the *International Building Code* to comply with UL 1784.

**C402.5.5 Air intakes, exhaust openings, stairways and shafts.** Stairway enclosures, elevator shaft vents and other outdoor air intakes and exhaust openings integral to the building envelope shall be provided with dampers in accordance with Section C403.7.7.

**C402.5.6 Vestibules.** Building entrances shall be protected with an enclosed vestibule. Doors opening into and out of the vestibule equipped with self-closing devices. Vestibules shall be designed so that in passing through the vestibule it is not necessary for the interior and exterior doors to open at the same time. The installation of one or more revolving doors in the *building entrance* shall not eliminate the requirement that a vestibule be provided on any doors adjacent to revolving doors.

**Exceptions:** Vestibules are not required for the following:

1. Buildings in *Climate Zones* 0 through 2.

2. Doors not intended to be used by the public, such as doors to mechanical or electrical equipment rooms, or intended solely for employee use.

3. Doors opening directly from a *sleeping unit* or dwelling unit.

4. Doors that open directly from a space less than 3,000 square feet (298 m2) in area.

5. Revolving doors.

6. Doors used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.

7. Doors that have an air curtain with a velocity of not less than 6.56 feet per second (2 m/s) at the floor that have been tested in accordance with ANSI/AMCA 220 and installed in accordance with the manufacturer's instructions. Manual or automatic controls shall be provided that will operate the air curtain with the opening and closing of the door. Air curtains and their controls shall comply with Section C408.2.3.

**C402.5.7 Loading dock weather seals.** Cargo door openings and loading door openings shall be equipped with weather seals that restrict *air leakage* and provide direct contact along the top and sides of vehicles that are parked in the doorway.

**C402.5.8 Operable openings interlocking.** Where occupancies have operable openings to the outdoors that are larger than 40 square feet (3.7 m2) in area, such openings shall be interlocked with the heating and cooling system ~~so as~~ to raise the cooling setpoint to 90°F (32°C) and lower the heating setpoint to

55°F (13°C) whenever the operable opening is open. The change in heating and cooling setpoints shall occur when the operable opening has been open for a period not to exceed 10 minutes.

**Exceptions:**

1. Operable openings into separately zoned areas associated with the preparation of food that contain appliances that contribute to the HVAC loads of a restaurant or similar type of occupancy.

2. Storage occupancies that utilize overhead doors for the function of the occupancy, where *approved*.

3. Doors located in the exterior wall that are part of a vestibule system.

**C402.5.8.1 Operable controls.** Controls shall comply with Section C403.13.

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**C406.9 Reduced air leakage.** *Air leakage* of the *building thermal envelope* shall be tested by an *approved* third party in accordance with Section C402.5.2.1. The measured *air leakage* shall not exceed 0.22 cfm/ft$^2$ (1.1 L/s × m$^2$) of the *building thermal envelope* at a pressure differential of 0.3 inch water gauge (75 Pa), with the calculated surface area being the sum of the above- and below-grade *building thermal envelope*.