**CEPI-221-21 (Replacement 5/9/2022)**

IECC®: SECTION C503, C503.1, C503.2, C503.2.1, C503.2.2, C503.2.3, C503.2.4 (New), C503.2.5 (New), C503.2.6 (New), C503.2.7 (New)

Proponents: Jay Crandell, P.E., ABTG/ARES Consulting, representing Foam Sheathing Committee of the American Chemistry Council (jcrandell@aresconsulting.biz)

**2021 International Energy Conservation Code**

**SECTION C503 ALTERATIONS**

Add new definitions as follows:

APPROVED SOURCE. An independent person, firm or corporation, approved by the *code official*, who is competent and experienced in the application of engineering principles to materials, methods or systems analyses.

CONSTRUCTION DOCUMENTS. Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building *permit*.

Revise as follows:

C503.1 General. *Alterations* to any *building* or structure shall comply with the requirements of Section C503. *Alterations* shall be such that the existing *building* or structure is not less conforming to the provisions of this code than the existing *building* or structure was prior to the *alteration*. *Alterations* to an existing *building*, *building* system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing *building* or *building* system to comply with this code. *Alterations* shall not create an unsafe or hazardous condition or overload existing *building* systems.

Exception: The following *alterations* need not comply with the requirements for new construction, provided that the energy use of the building is not increased:

1. Storm windows installed over existing *fenestration*.
2. Surface-applied window film installed on existing single-pane *fenestration* assemblies reducing solar heat gain, provided that the code does not require the glazing or *fenestration* to be replaced.
3. ~~Existing ceiling, wall or floor cavities exposed during construction, provided that these cavities are filled with insulation.~~
4. ~~Construction where the existing roof, wall or floor cavity is not exposed.~~

3.~~5.~~ *Roof recover*.

4. *Roof replacement* where roof assembly insulation is integral to or located below the structural roof deck.

5.~~6.~~ *Air barriers* shall not be required for *roof recover* and roof replacement where the *alterations* or renovations to the building do not include *alterations*, renovations or *repairs* to the remainder of the building envelope.

6. An existing building undergoing alterations that complies with Section C407.

**C503.2 Building thermal envelope.** Alterations of existing *building thermal envelope* assemblies shall comply with this section. New *building thermal envelope* assemblies that are part of the *alteration* shall comply with Section~~s~~ C402 ~~C402.1 through C402.5~~. An area-weighted average U-factor for new and altered portions of the *building thermal envelope* shall be permitted to satisfy the U-factor requirements in Table C402.1.4. The existing *R*-value of insulation shall not be reduced or the *U*-factor of a *building thermal envelope* assembly be increased as part of a *building thermal envelope* alteration except where complying with Section C407.

Exception: Where the existing building exceeds the fenestration area limitations of Section C402.4.1 prior to alteration, the building is exempt from Section C402.4.1 provided that there is no ~~not an~~ increase in fenestration area.

C503.2.1 Roof alterations ~~replacement~~. Insulation complying *~~Roof replacements~~* ~~shall comply~~ with Section~~s~~ C402.1 ~~C402.1.3, C402.1.4, C402.1.5 or C407~~ and Section C402.2.1, or an *approved* design that minimizes deviation from the insulation requirements, shall be provided for the following roof alterations: ~~where the existing roof assembly is part of the~~ *~~building thermal envelope~~* ~~and contains insulation entirely above the roof deck. In no case shall the~~ *~~R~~*~~-value of the roof insulation be reduced or the~~ *~~U~~*~~-factor of the roof assembly be increased as part of the~~ *~~roof replacement~~*~~.~~

1. An *alteration* to roof-ceiling construction where there is no insulation above *conditioned space*,
2. *Roof replacement~~s~~* for roofs with insulation entirely above deck,

Exception: Where compliance with Section C402.1 cannot be met due to limiting conditions on an existing roof, an *approved* design shall comply with the following:

1. *Construction documents* that include a report by a *registered design professional* or other *approved source* documenting details of the limiting conditions affecting compliance with the insulation requirements.
2. *Construction documents* that include a roof design by a *registered design professional* or other *approved source* that minimizes deviation from the insulation requirements.
3. Conversion of unconditioned attic space into *conditioned space*.
4. Replacement of ceiling finishes exposing cavities or surfaces of the roof-ceiling construction.

**C503.2.2 Vertical fenestration. *(Section unchanged)***

**C503.2.3 Skylight area. *(Section unchanged)***

Add new text as follows:

C503.2.4 Above-grade wall alterations. *Above-grade wall* alterations shall comply with the following:

1. Where wall cavities are exposed, the cavity shall be filled with *cavity insulation* complying with Section C303.1.4. New cavities created shall be insulated in accordance with Section C402.1 or an *approved* design that minimizes deviation from the insulation requirements.
2. Where exterior wall coverings and fenestration are added or replaced for the full extent of any exterior wall assembly on one or more elevations of the building, insulationshall be provided where required in accordance with one of the following:
   1. An R-value of *continuous insulation* not less than that designated in Table C402.1.3 for the applicable above-grade wall type and existing cavity insulation R-value, if any;
   2. An R-value of not less than that required to bring the *above-grade wall* into compliance with Table C402.1.4; or,
   3. An *approved* design that minimizes deviation from the insulation requirements of Section C402.1.
3. Where Items 1 and 2 apply, the insulation shall be provided in accordance with Section C402.1.

Where any of the above requirements are applicable, the *above-grade wall* alteration shall comply with Sections 1402.2 and 1404.3 of the *International Building Code.*

C503.2.5 Floor alterations. Where an alteration to a floor or floor overhang exposes cavities or surfaces to which insulation can be applied, and the floor or floor overhang is part of the *building thermal envelope*, the floor or floor overhang shall be brought into compliance with Section C402.1 or an *approved* design that minimizes deviation from the insulation requirements. This requirement applies to floor alterations where the floor cavities or surfaces are exposed and accessible prior to construction.

C503.2.6 Below-grade wall alterations. Where unconditioned below-grade space is changed to *conditioned space*, walls enclosing such conditioned spaceshall be insulated where required in accordance with Section C402.1. Where the below-grade space is *conditioned space* and where walls enclosing such space are altered, they shall be insulated where required in accordance with Section C402.1.

**C503.2.7 Air barrier.** Altered b*uilding thermal envelope* assemblies shall be provided with an *air barrier* in accordance with Section C402.5.1. Such *air barrier* need not be continuous with unaltered portions of the *building thermal envelope*. Testing requirements of Section C402.5.1.2 shall not be required.

**MODIFICATIONS TO ORIGINAL CEPI-221-21 RESULTING IN THE ABOVE REPLACEMENT PROPOSAL**

**(FOR INFORMATION ONLY)**

Original Proposal (underline & ~~strike-out~~)

Text modifying original proposal for correlation with prior proposal actions (double underlined & ~~strike-out~~)

Work group modifications (double underlined & ~~strike-out~~)

**SECTION C503 ALTERATIONS**

Add new definitions as follows:

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CONSTRUCTION DOCUMENTS. Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building *permit*.

Revise as follows:

C503.1 General. *Alterations* to any *building* or structure shall comply with the requirements of Section C503. *Alterations* shall be such that the existing *building* or structure is not less conforming to the provisions of this code than the existing *building* or structure was prior to the *alteration*. *Alterations* to an existing *building*, *building* system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portions of the existing *building* or *building* system to comply with this code. *Alterations* shall not create an unsafe or hazardous condition or overload existing *building* systems.

Exception: The following *alterations* need not comply with the requirements for new construction, provided that the energy use of the building is not increased:

1. Storm windows installed over existing *fenestration*.
2. Surface-applied window film installed on existing single-pane *fenestration* assemblies reducing solar heat gain, provided that the code does not require the glazing or *fenestration* to be replaced.
3. ~~Existing ceiling, wall or floor cavities exposed during construction, provided that these cavities are filled with insulation.~~
4. ~~Construction where the existing roof, wall or floor cavity is not exposed.~~

3.~~5.~~ *Roof recover*.

4. *Roof replacement* where roof assembly insulation is integral to or located below the structural roof deck.

5.~~6.~~ *Air barriers* shall not be required for *roof recover* and roof replacement where the *alterations* or renovations to the building do not include *alterations*, renovations or *repairs* to the remainder of the building envelope.

6. An existing building undergoing alterations that complies with Section C407.

**C503.2 Building thermal envelope.** Alterations of existing *building thermal envelope* assemblies shall comply with this section. New *building thermal envelope* assemblies that are part of the *alteration* shall comply with Section~~s~~ C402 ~~C402.1 through C402.5~~. An area-weighted average U-factor for new and altered portions of the *building thermal envelope* shall be permitted to satisfy the U-factor requirements in Table C402.1.4. ~~In no case shall the~~ The existing *R*-value of insulation shall not be reduced or the *U*-factor of a *building thermal envelope* assembly be increased as part of a *building thermal envelope* alteration except where complying with Section C407.

Exception: Where the existing building exceeds the fenestration area limitations of Section C402.4.1 prior to alteration, the building is exempt from Section C402.4.1 provided that there is no ~~not an~~ increase in fenestration area.

C503.2.1 Roof alterations ~~replacement~~. ~~Roof~~ ~~i~~Insulation complying *~~Roof replacements~~* ~~shall comply~~ with Section C402.1 ~~C402.1.3, C402.1.4, C402.1.5 or C407~~ and Section C402.2.1, or an *approved* design that minimizes deviation from the insulation requirements, shall be provided for the following roof alterations ~~conditions~~ ~~as applicable~~: ~~where the existing roof assembly is part of the~~ *~~building thermal envelope~~* ~~and contains insulation entirely above the roof deck. In no case shall the~~ *~~R~~*~~-value of the roof insulation be reduced or the~~ *~~U~~*~~-factor of the roof assembly be increased as part of the~~ *~~roof replacement~~*~~.~~

1. An *alteration* to roof-ceiling construction where there is no insulation above *conditioned space.*
2. *Roof replacement~~s~~* for roofs with insulation entirely above deck.

Exception: Where compliance with Section C402.1 cannot be met due to limiting conditions on an existing roof, an *approved* design ~~the following~~ shall ~~be permitted to demonstrate compliance~~ comply with the following ~~insulation requirements~~:

1. *Construction documents* that include a report by a *registered design professional* or other *approved source* documenting details of the limiting conditions affecting compliance with the insulation requirements.
2. *Construction documents* that include a roof design by a *registered design professional* or other *approved source* that minimizes deviation from the insulation requirements.
3. Conversion of unconditioned attic space into *conditioned space*.*~~,~~* ~~and~~
4. Replacement of ceiling finishes exposing cavities or surfaces of the roof-ceiling construction. ~~assembly to which insulation can be applied.~~

**C503.2.2 Vertical fenestration. *(Section unchanged)***

**C503.2.3 Skylight area. *(Section unchanged)***

Add new text as follows:

C503.2.4 Above-grade wall alterations. *Above-grade wall* alterations shall comply with the following ~~requirements as applicable~~:

1. Where ~~interior finishes are removed exposing~~ wall cavities are exposed, the cavity shall be filled with ~~existing or new~~ *cavity insulation* complying with Section C303.1.4. New cavities created shall be insulated in accordance with Section C402.1 or an *approved* design that minimizes deviation from the insulation requirements.
2. Where exterior wall coverings and fenestration are added or ~~removed and~~ replaced for the full extent of any exterior wall assembly on one or more elevations of the building, *~~continuous~~ insulation* shall be provided where required in accordance with one of the following: ~~Sections C402.1.3, C402.1.4, C402.1.5, or an~~ *~~approved~~* ~~design~~**~~.~~**
   1. An R-value of *continuous insulation* not less than that designated in Table C402.1.3 for the applicable above-grade wall type and existing cavity insulation R-value, if any.
   2. An R-value of not less than that required to bring the above-grade wall into compliance with Table C402.1.4, or
   3. An *approved* design that minimizes deviation from the insulation requirements of Section C402.1
3. Where Items 1 and 2 apply, the insulation shall be provided in accordance with Section C402.1 ~~C402.1.3, C402.1.4, C402.1.5, or C407~~.
4. ~~Where new interior finishes or exterior wall coverings are applied to the full extent of any exterior wall assembly of mass construction, insulation shall be provided where required in accordance with Sections C402.1.3, C402.1.4, C402.1.5, or an~~ *~~approved~~* ~~design.~~

Where any of the above requirements are applicable, the *above-grade wall* alteration shall comply with Sections 1402.2 and 1404.3 of the *International Building Code.* ~~with the insulation and water vapor retarder requirements of Section 1404.3 of the~~ *~~International Building Code~~*~~. Where the exterior wall coverings are removed and replaced, the above-grade wall alteration shall comply with the weather protection requirements of Section 1402.2 of the~~ *~~International Building Code~~*~~.~~

C503.2.5 Floor alterations. Where an alteration to a floor or floor overhang exposes cavities or surfaces to which insulation can be applied, and the floor or floor overhang is part of the *building thermal envelope*, the floor or floor overhang shall be brought into compliance with Section C402.1 ~~C402.1.3, C402.1.4, C402.1.5,~~ or an *approved* design that minimizes deviation from the insulation requirements. This requirement ~~shall apply~~ applies to floor alterations where the floor cavities or surfaces are exposed and accessible prior to construction.

C503.2.6 Below-grade wall alterations. Where ~~an unfinished~~ unconditioned below-grade space is changed to *conditioned space*, walls enclosing such conditioned space ~~the~~ *~~below-grade walls~~* shall be insulated where required in accordance with Section C402.1 ~~C402.1.3, C402.1.4, or C402.1.5~~. Where the below-grade space is *conditioned space* and ~~a~~ *~~below grade wall~~* ~~is~~ where walls enclosing such space are altered ~~by removing or adding interior finishes~~, ~~it~~ they shall be insulated where required in accordance with Section C402.1 ~~C402.1.3, C402.1.4, or C402.1.5~~.

**C503.2.7 Air barrier.** Altered b*~~B~~uilding thermal envelope* assemblies ~~altered in accordance with Section C503.2~~ shall be provided with an *air barrier* in accordance with Section C402.5.1. ~~and the~~ Such *air barrier* ~~shall~~ need not be ~~required to be made~~ continuous with unaltered portions of the *building thermal envelope*. Testing requirements of Section C402.5.1.2 shall not be required.

**Reason (for AS MODIFIED):** This modified proposal updates CEPI-221 to correlate with CEPI-225 (AM) already approved. It also makes a minor editorial change to correlate with CEPI-226 (AM). In addition, a number of editorial changes and a couple of technical improvements are made to correlate with action on REPI-150 (similar to CEPI-221) for the residential provisions by the Residential Main Committee (vote 30-13-1). Finally, several comments received have been considered as noted in the comment bar. In general, the original objective and reason for CEPI-221 (shown below) is unchanged.

Cost Impact (MODIFICATIONS ONLY): The modification will reduce the cost of construction compared to the original proposal.

The exception language for roof alterations creates a reasonable process (use of an approved source with expertise in roofing design) to allow flexibility in conducting a roof replacement for existing roofs with insulation entirely above deck where limiting conditions may not reasonably permit full compliance with insulation requirements for new roofs with insulating entirely above deck. Provisions for other types of alterations retain the flexibility of allowing an approved design for similar reasons.

Reason (ORIGINAL PROPOSAL): Existing building alterations are perhaps one of the primary opportunities to reduce national energy consumption, yet Chapter 5 misses many opportunities to effectively address this need. There are many opportunities to cost-effectively improve energy efficiency of the existing building stock by use of reasonable criteria to trigger (or avoid) requirements for alterations with flexibility in the manner or extent of compliance where needed. This proposal attempts to strike that balance in a practical and cost-effective manner for building envelope assemblies of existing building that are undergoing specific types of alterations. Consequently, this proposal will help to address the 40% of national energy use that is attributed to the existing building stock and will only apply where alterations are proposed that provide opportunity to improve the performance of the existing building stock. A similar coordinated proposal was also submitted for the IECC-R committee.

Key changes made in this proposal are summarized as follows:

1. Exceptions 3 and 4 of Section C503.1 are deleted as they are now addressed and preserved within requirements in new Section C503.2.4 for above-grade walls.
2. New exception 4 is added to Section C503.1 for roof replacements for roof assemblies that do not have insulation entirely above deck (which is addressed separately in Section C503.2.1).
3. A clause to prevent reduction of insulation levels in existing thermal envelope assemblies is moved from Section C503.2.1 to Section C503.2 to apply to all building thermal envelope alterations.
4. Section C503.2.1 is revised to address multiple types of roof alterations, including roof replacements for roofs with insulation entirely above deck.
5. A new Section C503.2.4 is provided for above-grade wall alterations which identifies conditions where it is appropriate and practical to provide insulation (if not already present). Language is also provided to ensure coordination with building code moisture control requirements which require integration with and can influence the method of complying with the insulation requirements.
6. A new Section C503.2.5 is provided for floor alterations and takes an approach similar to that done for above-grade walls (although with fewer conditional requirements).
7. A new Section C503.2.6 is provided for below-grade wall alterations. This captures the cases where a below-grade space is being converted to conditioned space and where below-grade wall alterations allow addition of insulation if the below grade space is already conditioned space.
8. Finally, new Section C503.2.7 is provided to address air barrier installation in building thermal envelope assemblies that are altered within the scope of Section C503.2. However, it is made clear that continuity of the air barrier with unaltered portions of the building thermal envelope is not required. This avoids causing an alteration to extend beyond its intended scope and extent. This is also consistent with the intent behind existing exception #6 to Section C503.1 dealing with air barriers in roof replacements.

Cost Impact: The code change proposal will increase the cost of construction.

Where requirements are triggered and where upgrades in energy efficiency were not already planned for an alteration, this proposal will increase cost for a limited set of envelope alteration activities for existing buildings. Some existing requirements such as roof replacements and filling of exposed stud cavities remain unchanged. For those existing buildings with deficient insulation levels (or no insulation) and where planned alterations allow that deficiency to be addressed efficiently, the cost-benefits are expected to closely align with that for new buildings. However, it is not possible to conduct a simple cost-benefit analysis for existing buildings because of the multitude of variables involved and the flexibility provided in this proposal that make it nearly impossible to quantify with any reasonable level of certainty. Thus, we consider these proposed provisions to be cost-effective by judgment as these types of existing building thermal envelope upgrades are currently being used in the existing building/remodeling/renovation market, although not consistently or in an enforceable manner.